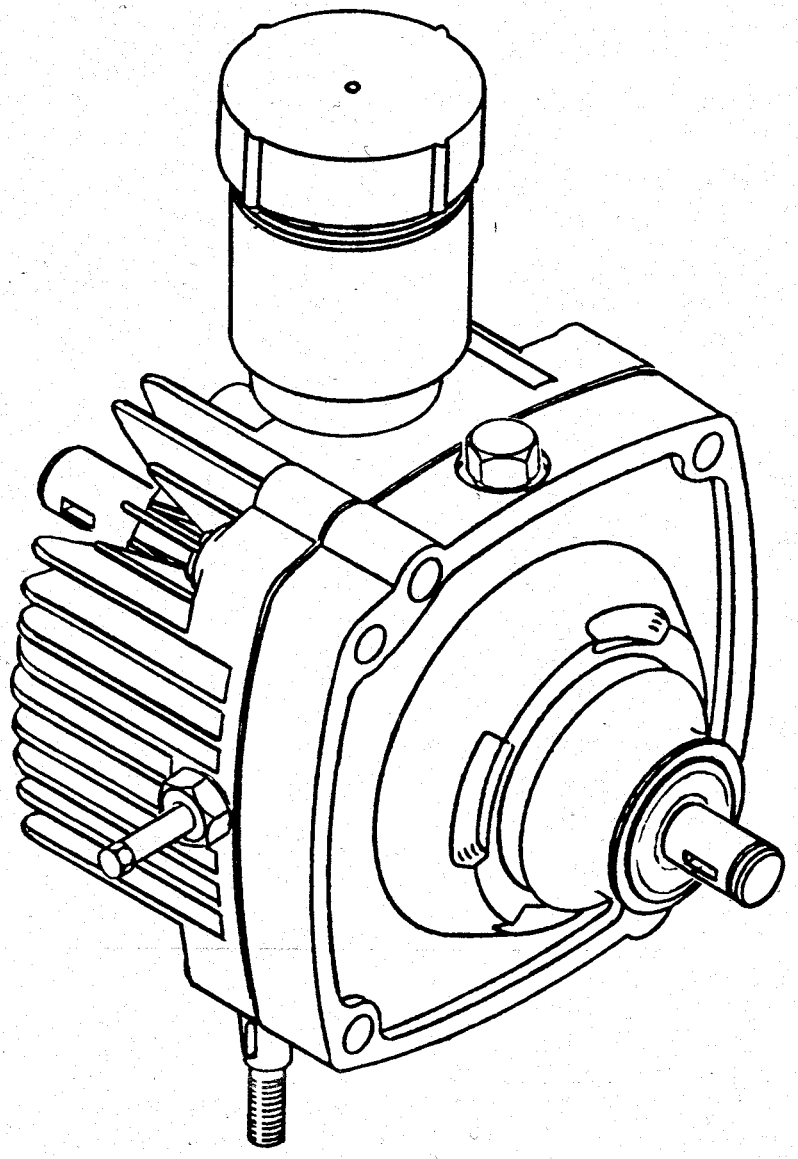
NO. 7-403

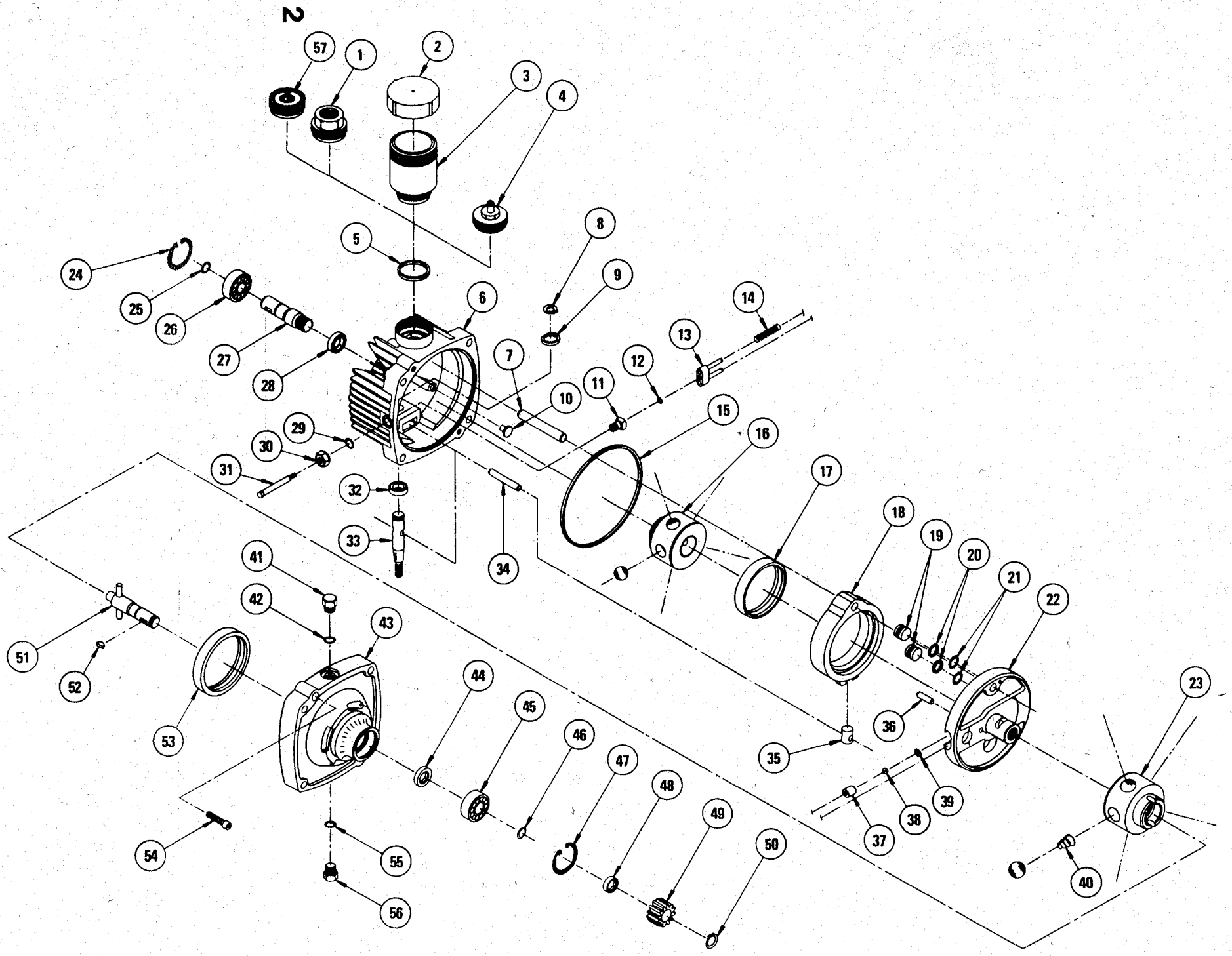
Eaton
Hydraulics
Division

Repair Information

Eaton Hydrostatic Transmissions – Model 6/7



EATON


2
57
1
2
3
4
5
24
25
26
27
28
6
8
9
7
10
11
12
13
14
15
16
17
18
19
20
21
22
23
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56

General Parts List
Model 6 and 7

Item No.	Description
1	Reservoir Adapter
2	Reservoir Cover Subassembly
3	Reservoir Body
4	Reservoir Adapter
5	Seal Ring
6	Cover Service Kit
7	Dowel Pin
8	Retaining Ring
9	Washer
10	Button (Model 7 only)
11	Guide Fitting Subassembly
12	O-Ring
13	Dump Valve Bracket
14	Spring
15	Seal Ring
16	Pump Rotor and Ball Assembly
17	Pump Race
18	Cam Ring Assembly (includes No. 17)
19	Piston (Model 7 only)
20	Back-Up Ring (Model 7 only)
21	O-Ring (Model 7 only)
22	Pintle Subassembly
23	Motor Rotor and Ball Assembly
24	Retaining Ring
25	Snap Ring
26	Bearing
27	Input Shaft
28	Seal
29	O-Ring

Item No.	Description
30	Nut and Gasket Subassembly
31	Dump Valve Shaft
32	Seal
33	Control Shaft Kit
34	Dowel
35	Cam Ring Insert
36	Pin
37	Check Valve Body
38	Ball
39	Retaining Ring
40	Spring
41	Plug Subassembly
42	O-Ring
43	Body
44	Seal
45	Bearing
46	Snap Ring
47	Retaining Ring
48	Spacer
49	Gear
50	Retaining Ring
51	Output Shaft Subassembly
52	Key
53	Motor Race
54	Cap Screw
55	O-Ring
56	Plug Subassembly
57	Plug

This list is for identification of parts only. To insure the correct replacement parts for your transmission, it will be necessary to order parts by part number. Consult your supplier for a parts list for your specific model number.

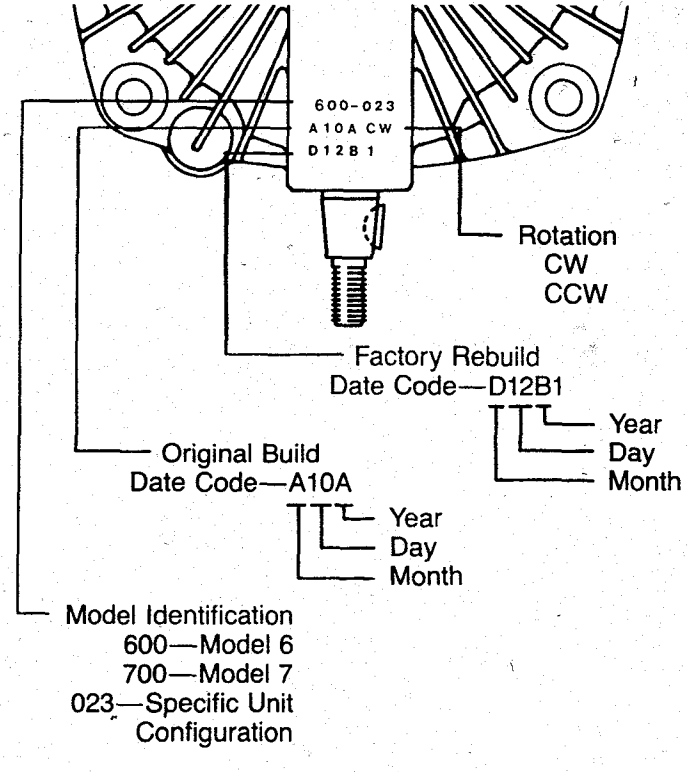
Contents

Product Identification and Ordering Information

Refer to specific listing covering your Eaton transmission. Parts listings are available from the Hydraulics Division, Minneapolis Plant.

When ordering parts, please include the following:

- Model Number
- Date Code
- Part Number
- Part Name
- Quantity of Parts



Special tools to aid in Disassembly/Reassembly

2" x 6" x 10" wooden block with ¾" dia. hole in the center.

2 large, wide rubber bands.

5/16-18 tap.

Light petroleum jelly (such as Vaseline).

Steel bar stock or piece of wood—2" dia. x 2½" long.

Disassembly/Reassembly

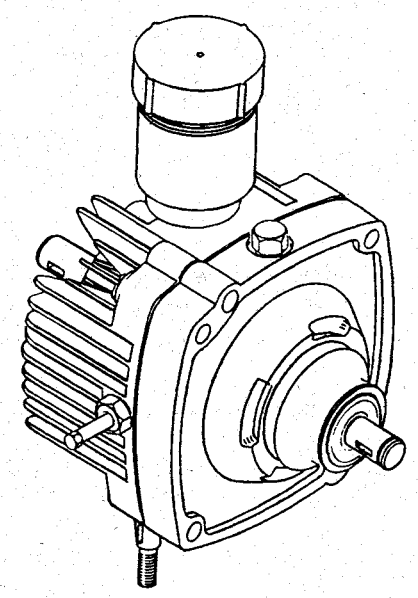


Fig. 1

Clean the transmission exterior thoroughly before repairs are begun. Use a cleaning solution that will not affect paint, gaskets, rubber seals, and plastic.

Important: When compressed air is used in cleaning, do not expose lip seals or bearing surfaces to high pressure.

Drain fluid from transmission.

Note: A 2" x 6" x 10" wooden block with a ¾ inch hole in the center is recommended for a suitable bench fixture.

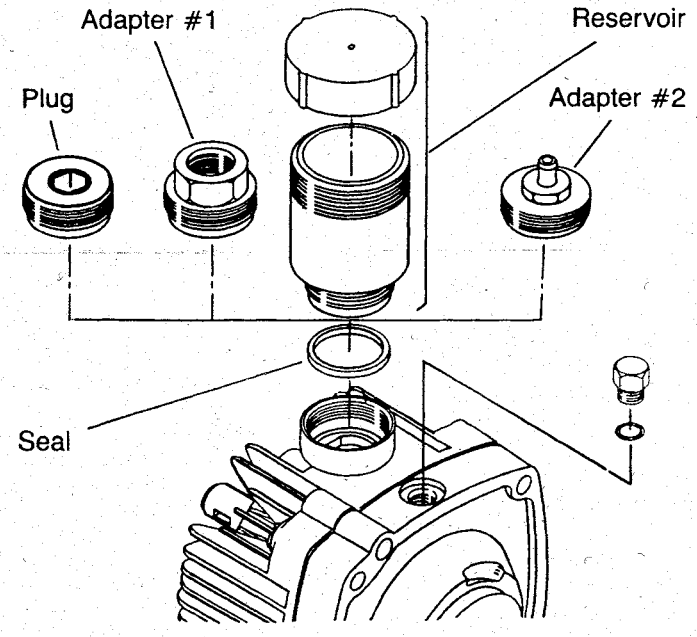


Fig. 2

Reservoir/Adapter—Disassembly

Eaton light duty transmissions are equipped with one of two adapters or a reservoir as shown in Fig. 2.

1 Remove the adapter or reservoir by rotating *clockwise.*
Important: The adapters and reservoir have left hand threads. To remove turn *clockwise.*
To remove adapter #1 use a six point 1½" hex wrench or socket.
To remove adapter #2 use a six point 1" hex wrench or socket.
To remove the reservoir use a small filter or web wrench.

2 Remove the seal ring from the cover and discard.

Note: We recommend that all seals be replaced with new ones whenever the transmission is disassembled and reassembled.

Body/Cover—Disassembly

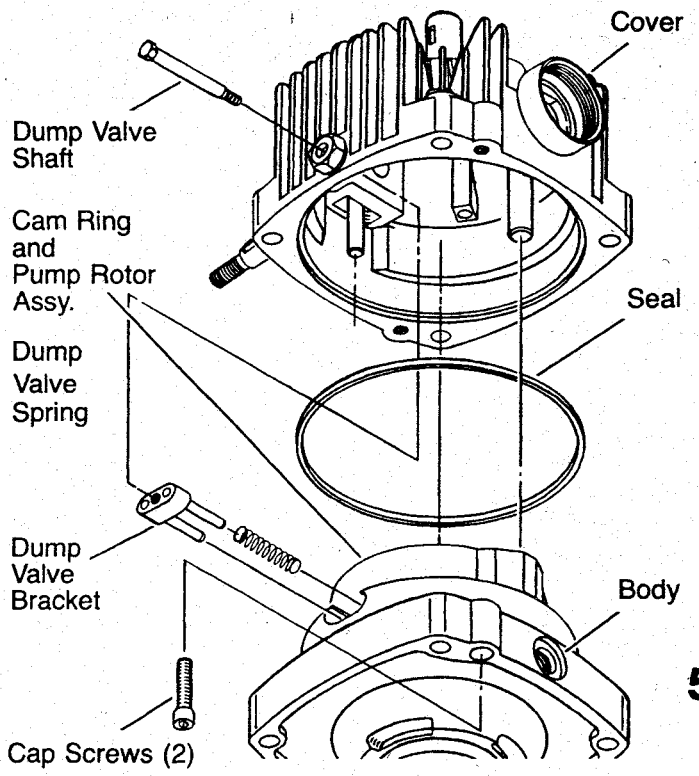


Fig. 3

Important: Before disassembling the transmission, scribe a line across the cover and body to ensure correct reassembly. Incorrect assembly will change output shaft rotation.

3 Use ¼ inch allen wrench to remove the (2) 5/16 cap screws. Where applicable, remove the dump valve shaft.

4 Lift the cover to separate from the body.

Important: Do not allow the cam ring, pintle, or pump rotor assembly to lift with the cover. The pump ball piston assembly must remain intact as the ball pistons are matched to the pump rotor bores.

If the cover does not separate easily from the body because of fluid seal, tap the body and or cover with plastic hammer to break the seal.

5 Remove the dump valve bracket, and springs, when used.

6 Remove the seal ring and discard.

Cover—Disassembly

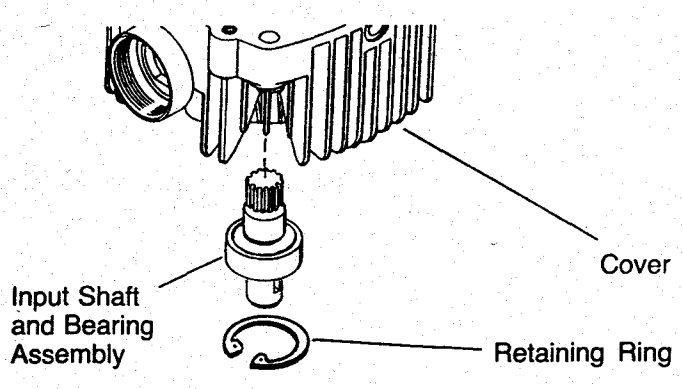


Fig. 4

7 Remove input shaft retaining ring. Press or drive the input shaft and bearing assembly from the cover.

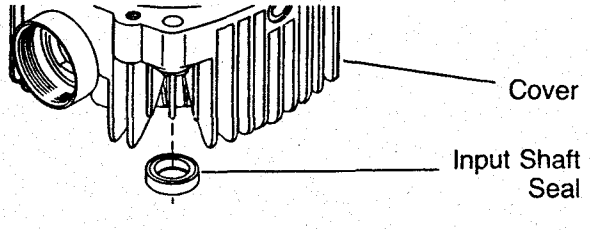


Fig. 5

8 Press or drive the input shaft seal from the cover.

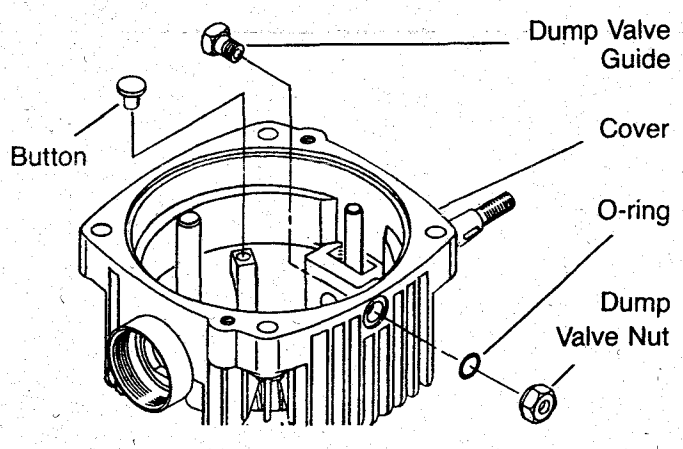


Fig. 6

9 Remove the button from the cover (model 7 only).

Where applicable, remove the dump valve guide, nut, and o-ring. Discard the o-ring.

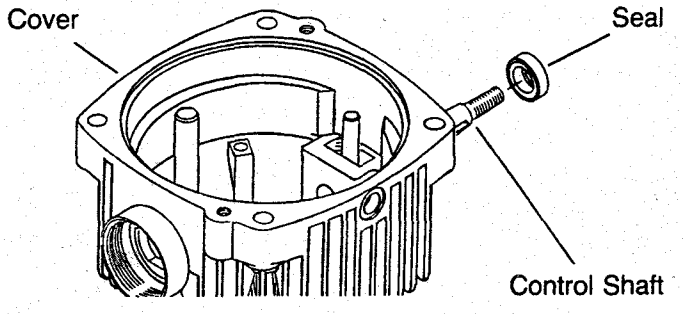


Fig. 7

10 Use a sharp, narrow tool to pierce the top metal part of the oil seal and remove seal from the cover.

Important: Do not scratch the control shaft or distort the seal counter bore when removing seal.

Cam Ring—Disassembly/Inspection

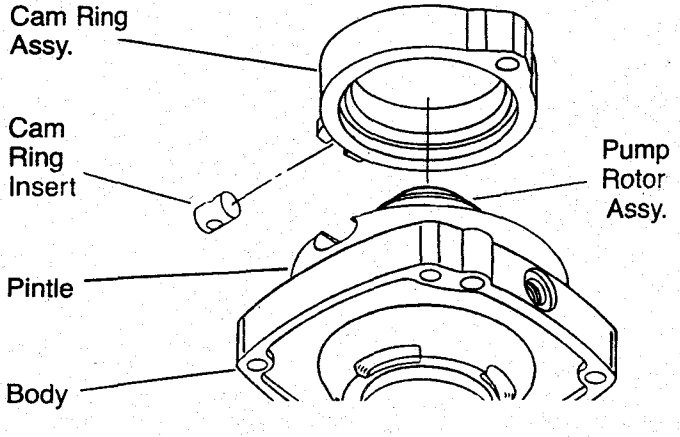


Fig. 8

11 Remove the cam ring assembly from the pintle. Remove the cam ring insert.

Important: Use special care when removing the cam ring from the pump rotor assembly. The ball pistons must remain in place as they are matched to the rotor bores. Use a wide rubber band to hold the ball pistons in place.

12 Inspect area where the ball pistons contact the pump race. This area must be smooth and completely free of irregularities. If it is not, replace the pump race.

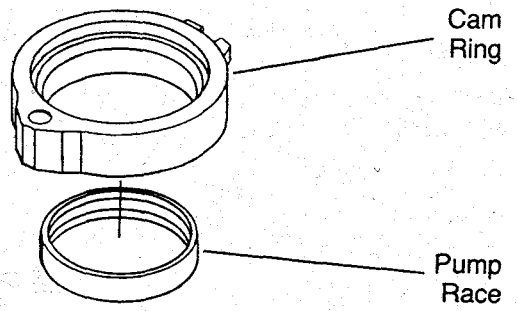


Fig. 9

Note: The pump race is press fit in the cam ring and will require a press to remove it. The cam ring and pump race are available as an assembly.

Note: If irregularities are noted in the pump race, it is reasonable to assume that one or more ball pistons and rotor bores will also be damaged.

Pump Rotor—Removal

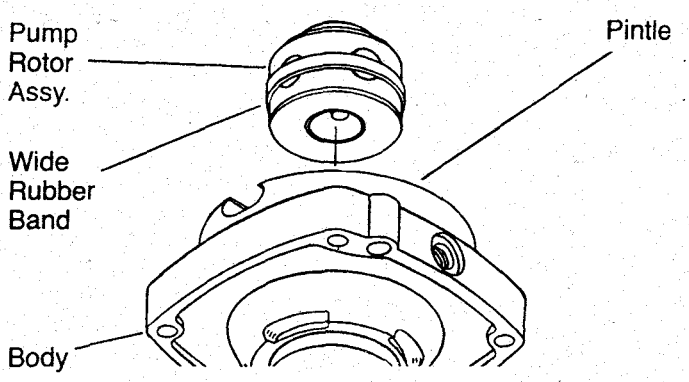


Fig. 10

13 Hold the pintle assembly in position against the body and remove the pump rotor assembly intact.

Pintle Assy.—Removal

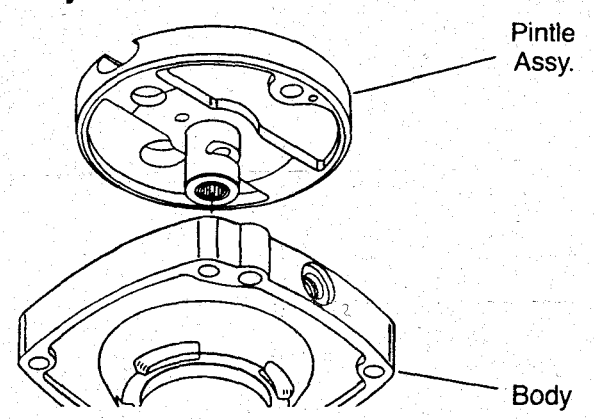


Fig. 11

14 Hold the motor rotor assembly in the bottom position and tap lightly on the body. Lift the pintle assembly out of the body.

Pintle Assembly—Disassembly/Inspection

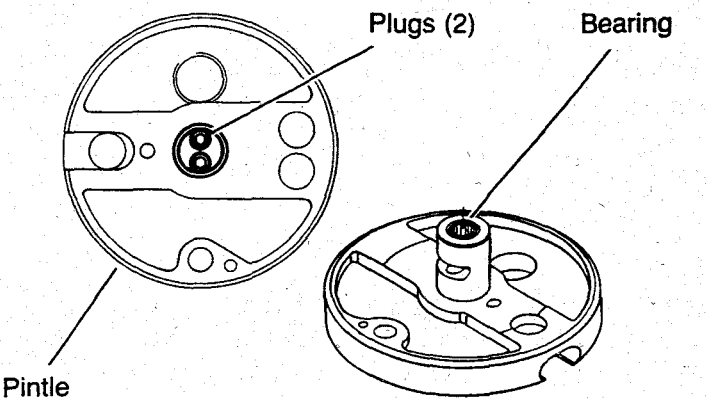


Fig. 12

15 We do not recommend complete disassembly of the pintle assembly for cleaning. Normal flushing should be all that is required. However, if complete disassembly is required, use the following procedures:

Note: Do not remove the two large plugs located on pintle journal.

16 Inspect the pintle journals, particularly in the porting area for any irregularities such as scoring or grooves cut between ports.

If any irregularities are noted: Replace the pintle assembly.

Check Valve—Removal

Note: Removal of check valves is not necessary if check valve balls move freely and seat properly.

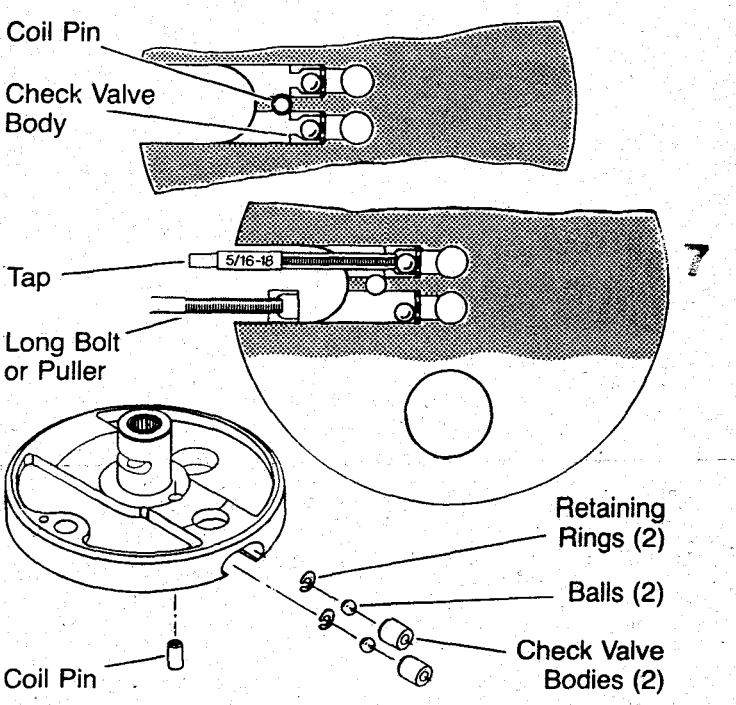


Fig. 13

17 Press or drive out the coil pin that retains the two check valve bodies. Use a four blade 5/16-18 tap to tap holes in check valve bodies. Insert a long bolt or a threaded puller, pull the check valve bodies from the pintle housing and discard them.

18 Remove check balls and retaining ring.

19 Inspect check valve balls and retaining rings. Replace any defective parts.

Check Valve—Installation

20 Install retaining rings and check valve balls in bores of pintle. Press *new* check valve bodies in bores. Press far enough for coil pin clearance.

Important: To prevent dislodging of retaining rings *do not drive* check valve bodies into bores.

21 Press coil pin into pintle until flush with or slightly below surface.

Dampening Piston—Removal (Model 7 Only)

Note: Remove only if surface is scored.

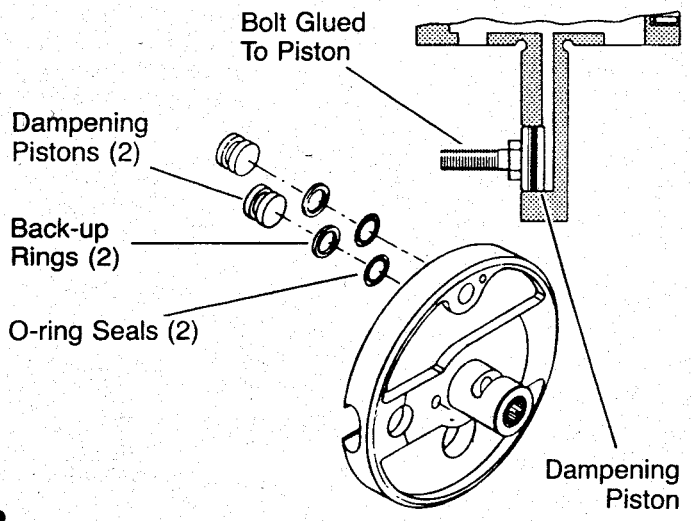


Fig. 14

22 To remove pistons, firmly tap the outside edge of pintle on a work surface. Remove back-up ring and o-ring from pistons.

Important: When dislodging dampening pistons, do not hit pintle journals or the pintle housing will be ruined.

Note: If tapping of pintle does not dislodge the pistons, use adhesive to cement a bolt or similar object to the pistons and pull them from the bore.

Dampening Piston—Installation

23 Install new back-up rings nearest to the smooth piston face and o-rings in grove on a new piston.

24 Lubricate outer surface of the pistons. Press pistons (smooth face up) in bores in pintle to the bottom position.

Motor Rotor—Removal

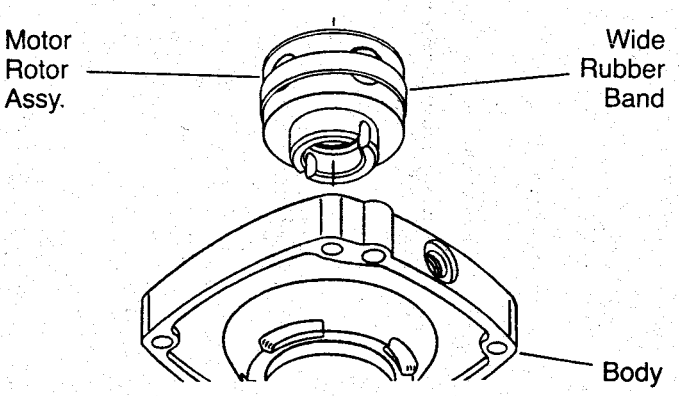


Fig. 15

25 Remove the motor assembly intact from the body.

Important: Use special care when removing the motor rotor from the body. The ball pistons MUST remain in place as they are matched to the motor bores. Use a wide rubber band to hold the ball pistons in place.

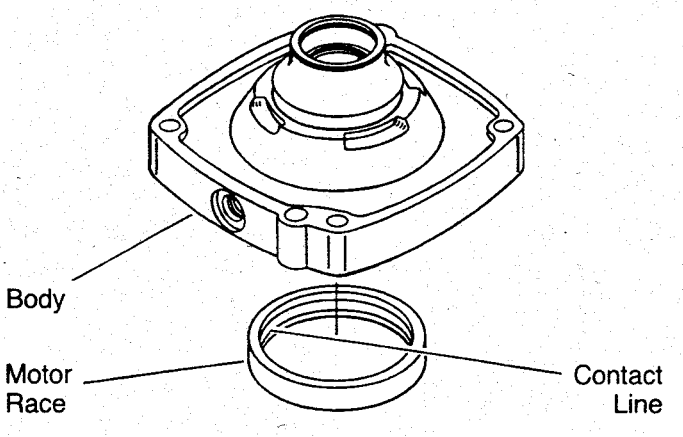


Fig. 16

26 Inspect the contact line of the motor ball pistons on the motor race located in body. This contact area must be smooth and completely free of any irregularities. If any irregularities are noted, replace the motor race.

Note: If irregularities are noted in the motor race, it is reasonable to assume that one or more ball pistons and rotor bores will also be damaged.

Rotor Assemblies—Disassembly Inspection

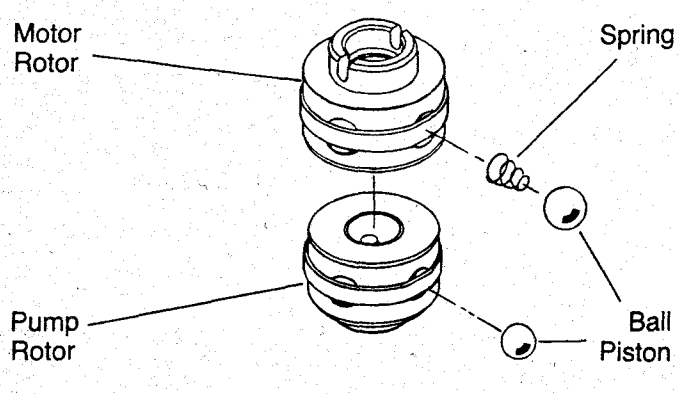


Fig. 17

27 Inspect the rotor assemblies. Remove the piston balls from the rotor, one at a time, by working clockwise from the letter stamped in the face of the rotor and placing in a prepared container.

Note: Each ball must be replaced in the same bore from which it was removed. Use a suitable container for piston ball storage such as an egg carton or ice cube tray.

28 Inspect for broken or collapsed springs in the motor rotor assembly.

Note: When broken or collapsed springs are found with no other irregularities, the springs may be replaced individually without replacing the complete motor rotor assembly.

29 Inspect the piston balls. They must be smooth and completely free of any irregularities.

30 Inspect the rotor bores, rotor bushing and pintle journals for irregularities or excessive clearance. The ball piston to rotor bore clearance is select fit electronically to .0002 to .0006 of an inch. When irregularities or excessive clearance are noted, replace the complete rotor assembly.

Install ball pistons in their matching bores. Hold them in place with a rubber band.

Body—Disassembly

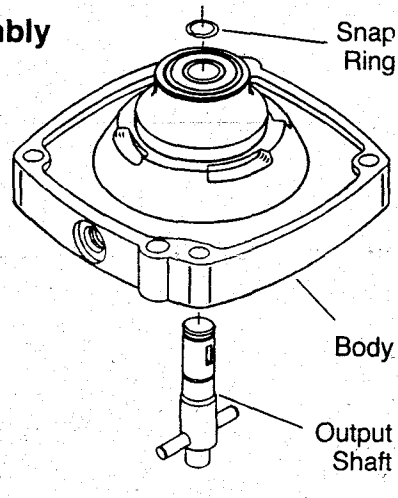


Fig. 18

31 Remove the snap ring that retains the output shaft and tap or press the shaft from the body.

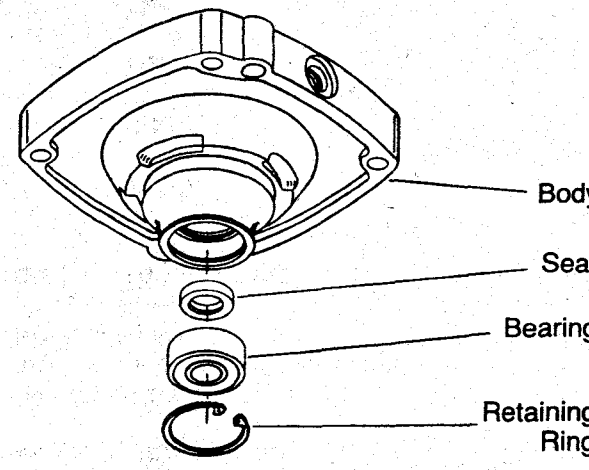


Fig. 19

32 Remove the large retaining ring that retains the output bearing to body. Drive or press the output bearing and seal from the motor body.

Cover—Reassembly

33 Inspect cover assembly, especially around the control shaft area. Replace the cover assembly if it is broken, cracked or if side clearance between control shaft and cover exceeds .006".

34 In most cases, it will not be necessary to remove the control shaft from the cover. If the dowel is loose or broken in the control shaft, remove the shaft using the following procedures.

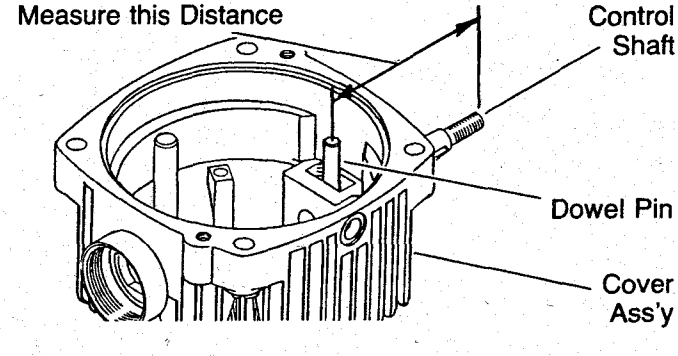


Fig. 20

35 Measure the distance between center of dowel pin and the end of the shaft as shown in Figure 20.

36 Turn cover over. Use this dimension to locate dowel pin in cover face. Drill 11/32" diameter hole at center point of dowel pin. Drill hole exactly in line with center of shaft.

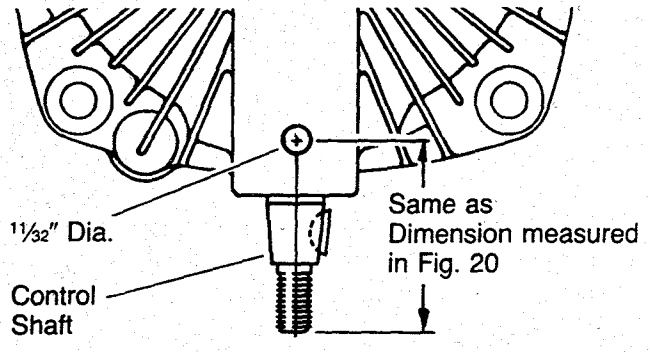


Fig. 21

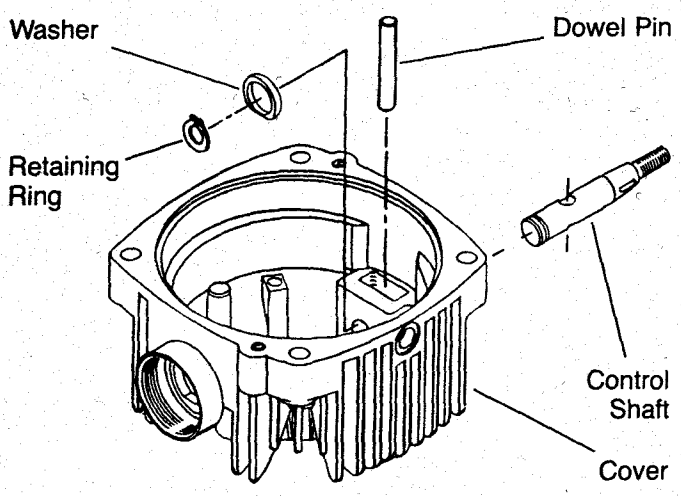


Fig. 22

37 Press loose or broken dowel pin out. Remove retaining ring and washer from end of control shaft. Remove control shaft outward from the cover.

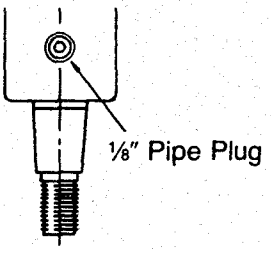


Fig. 23

38 Tap hole drilled with 1/8" pipe tap. Install 1/8" flush type pipe plug.

39 Lubricate a new control shaft and install in cover. Replace washer and retaining ring on end of control shaft. Press new dowel pin through shaft leaving 1 1/8 inch of dowel extending from shaft.

Important: When pressing the new dowel pin into the control shaft, the Woodruff key in control shaft must be to the left looking at the threaded end of shaft.

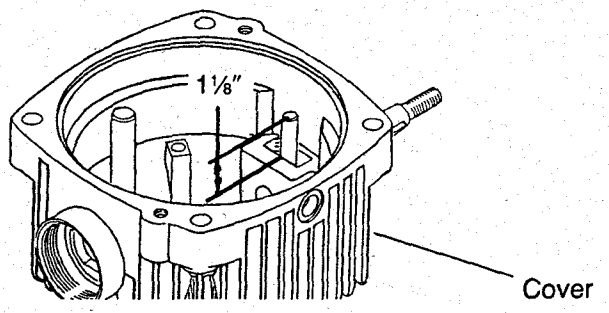


Fig. 24

40 Lubricate I.D. of new oil seal with clean lubricant. Then press or tap seal in bore until completely seated.

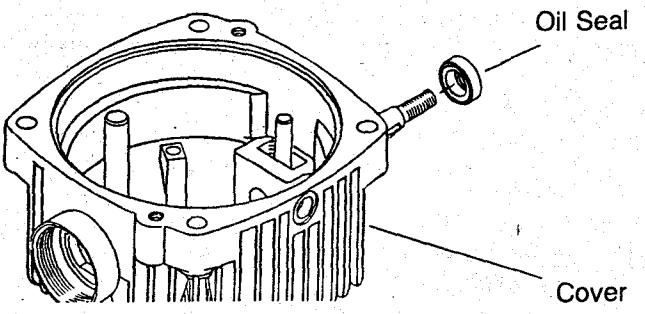


Fig. 25

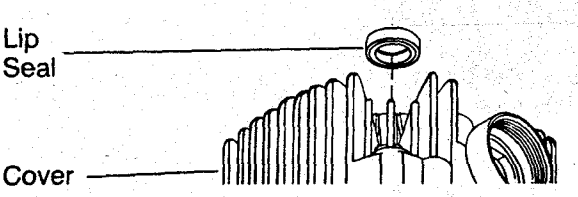


Fig. 26

41 Lubricate inner surface of the lip seal with a clean lubricant. Press or tap seal into the bottom position in cover counter bore.

Important: Be careful not to damage the inner portion of the oil seal. Excessive pressing or driving of the oil seal will damage the rubber portion of the seal.

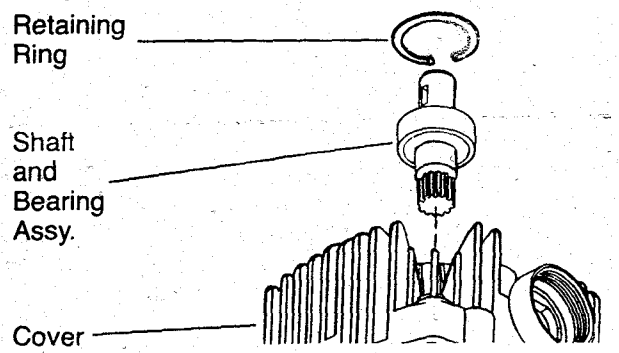


Fig. 27

42 Install the input shaft assembly into bottom position in the counter bore in cover. Install the retaining ring in the groove located in front cover.

Cam Ring—Installation

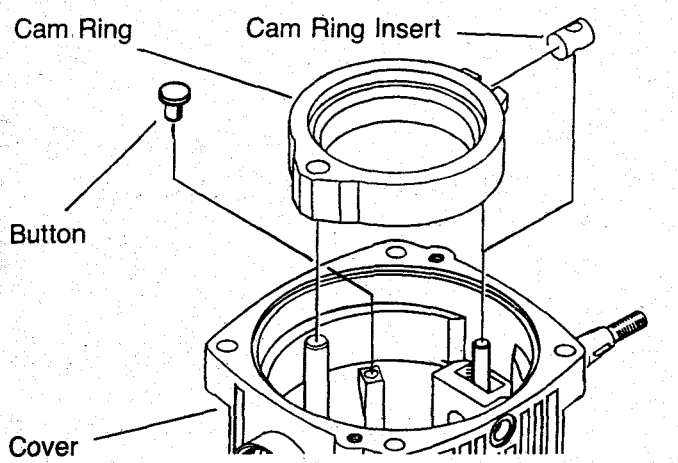


Fig. 28

43 Install the button in the hole located in the cover. (In Model 7 only)

44 Install the cam ring insert with the hole away from the cam ring as shown in Figure 28.

45 Align the cam ring with the control shaft pin and the cam ring pivot pin.

Install the cam ring with the flush side of the bearing race facing the cover. Press in firmly until the cam ring has bottomed in the cover assembly.

Important: Cam ring must move freely from stop to stop. If binding occurs at either stop rotate the cam ring insert 180°. Check the cam ring movement again.

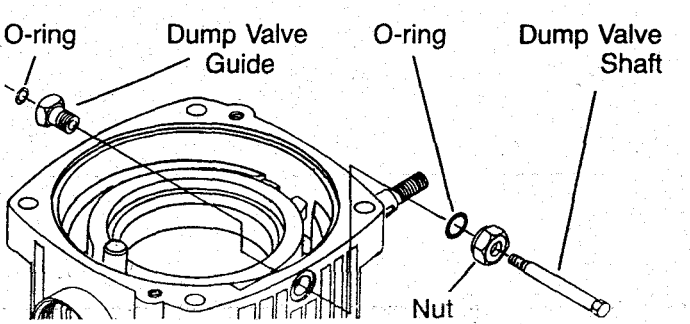


Fig. 29

46 Where applicable, lubricate O-Ring and install in groove located in dump valve guide. Install guide through cover and install O-Ring and nut. Lubricate dump valve, valve shaft and install in guide assembly.

Note: Check dump valve shaft for freedom of movement.

Pump Rotor-Installation

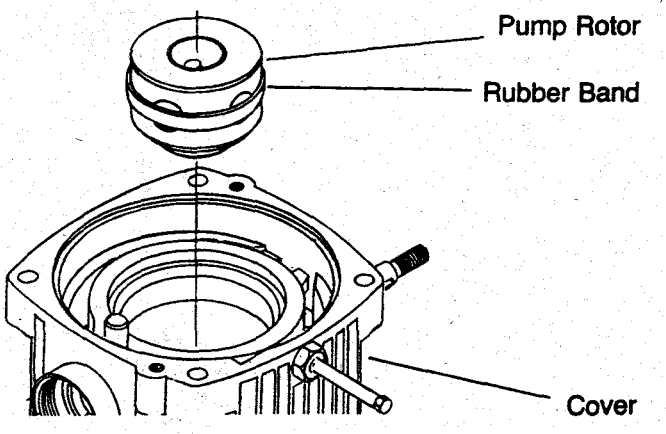


Fig. 30

47 Align the internal spline in the pump rotor assembly with the external spline on the input shaft and install the pump rotor in the cover.

Remove the rubber band retaining the ball pistons (if used).

Pintle—Installation

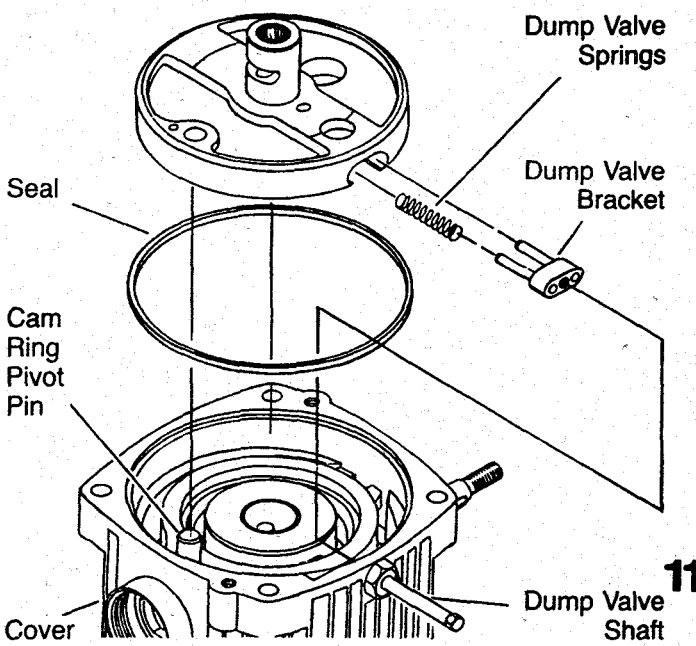


Fig. 31

48 Install the two springs and dump valve bracket into pintle assembly.

Use a small screwdriver to compress and hold dump valve bracket into pintle to clear previously installed dump valve guide located in cover.

49 Align pintle assembly with the cam ring pivot pin and guide pintle assembly into pump rotor. Push to bottom position in cover.

Note: Do not force pintle through the pump rotor assembly as it is a slip fit. The pump rotor assembly must turn freely on the pintle by hand. If not recheck pintle installation.

50 Push dump valve shaft in and thread into dump valve bracket. **Torque to 2-3 Foot Pounds.**

51 Lightly grease new cover sealing ring and install in the groove in the cover.

Body—Reassembly

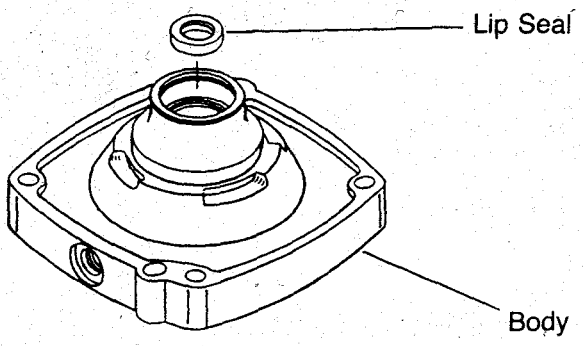


Fig. 32

52 Lubricate inner surface of new lip seal and install with the rubber lip of the seal toward the counter bore in body.

Important: Do not over press or drive the seal, this may damage the rubber sealing portion of the seal or distort counter bore.

53 Install output shaft into body, protecting the shaft seal lip from keyway and snap ring grooves.

Support the output shaft from underneath body so that the cross pin in output shaft is tight against body.

Use a solid block (steel or hardwood) 2 inches in diameter by at least 1½ inches long to support the output shaft.

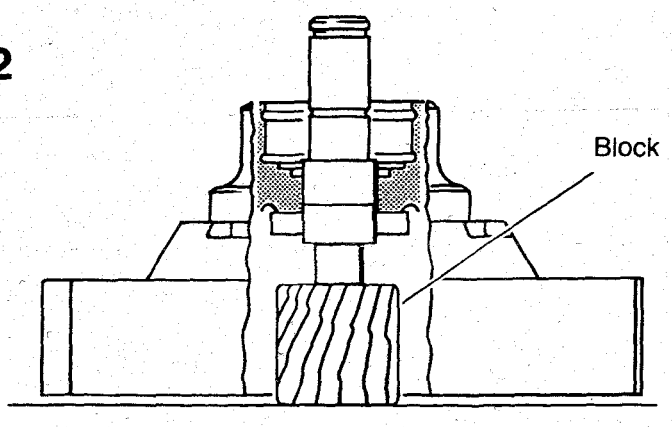


Fig. 33

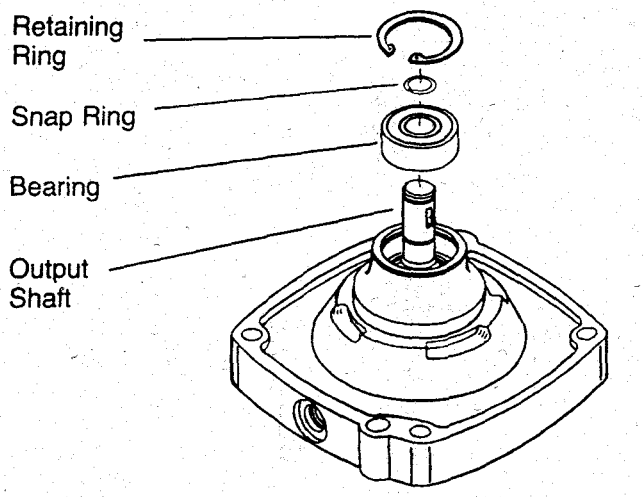


Fig. 34

54 Install output shaft bearing by positioning bearing over output shaft and pressing on outer race of ball bearing to the bottom position in body.

55 Install small snap ring on output shaft against inner bearing race.

56 Install the large retaining ring used to retain ball bearing in body.

Note: The output shaft must rotate freely by hand. If it doesn't, recheck bearing installation.

Motor Rotor—Installation

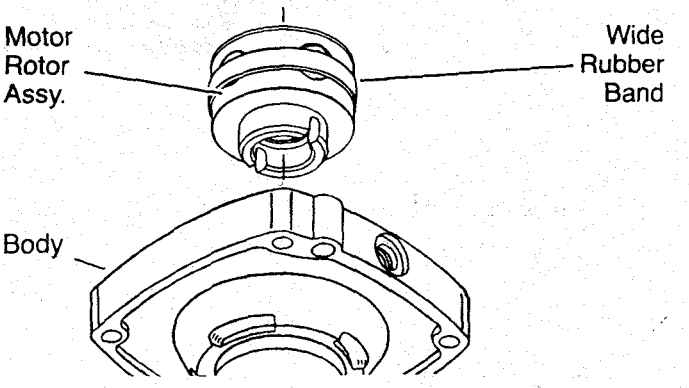


Fig. 35

57 Align the slot in the motor rotor assembly with the cross pin on the output shaft and install the motor rotor in body.

58 Remove the rubber band retaining the ball pistons in their respective bores (if used).

Cover/Body—Reassembly

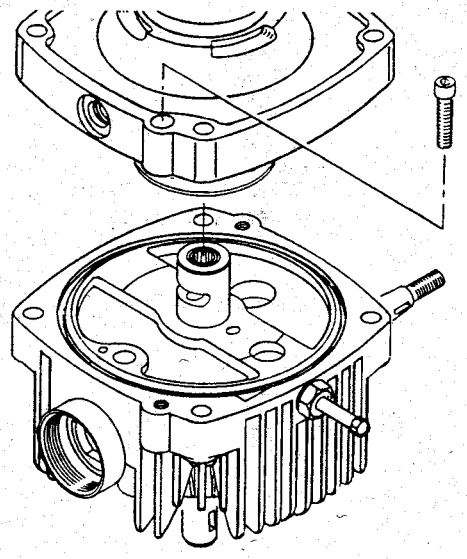


Fig. 36

Important: Be sure to realign previous scribed line for correct ouput rotation. If body assembly is installed 180° as previous assembled output rotation will be reversed.

59 Hold the motor rotor assembly in position and install body on pintle.

Note: Do not force motor rotor assembly on pintle as it is a slip fit and must turn freely by hand.

60 Install the (2) 5/16 x 1¼ socket heat cap screws and torque to 15 foot pounds.

Reservoir/Adapter—Reassembly

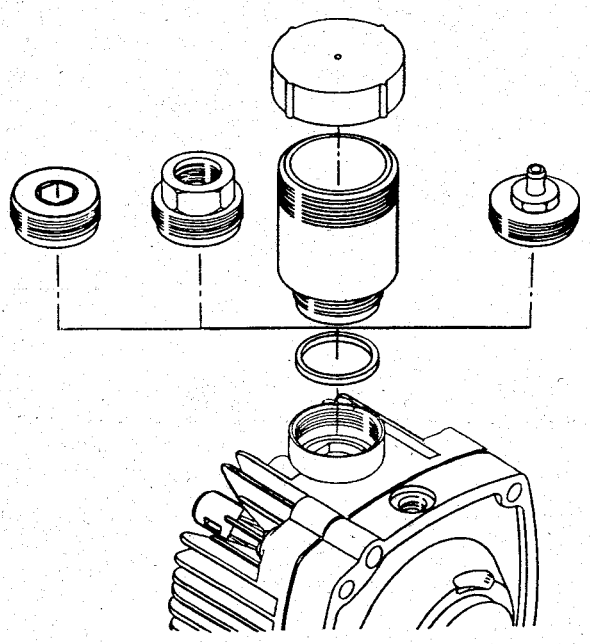


Fig. 37

61 Lightly grease sealing ring and install into recess in cover.

62 Install the adapter or reservoir in cover by rotating *counterclockwise.*

Torque to Approximately 8–12 ft. lbs.

Important: The adapters and reservoir are threaded left hand. To install, turn counterclockwise.

Start-up Procedure

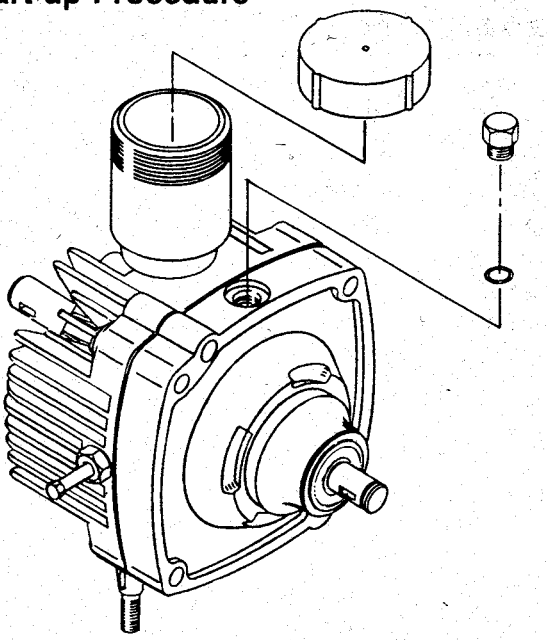


Fig. 38

63 Remove the ⅜ hex head plug to vent the transmission. See Page 16 for fluid recommendations.

Attached Reservoir

Fill the transmission with the proper fluid through reservoir until fluid overflows from opening in body.

Rotate both the input and output shafts to purge any trapped air from transmission. Refill reservoir until fluid reappears and install hex head plug, **Torque to 2-5 Foot Pounds.**

Fill reservoir to oil level cold mark.

Separate Reservoir

Fill the transmission with the proper fluid through customer supplied separate reservoir until fluid overflows from opening in body.

Rotate both the input and output shafts to purge any trapped air from transmission. Refill reservoir until fluid reappears and install hex head plug. **Torque to 2-5 Foot Pounds.**

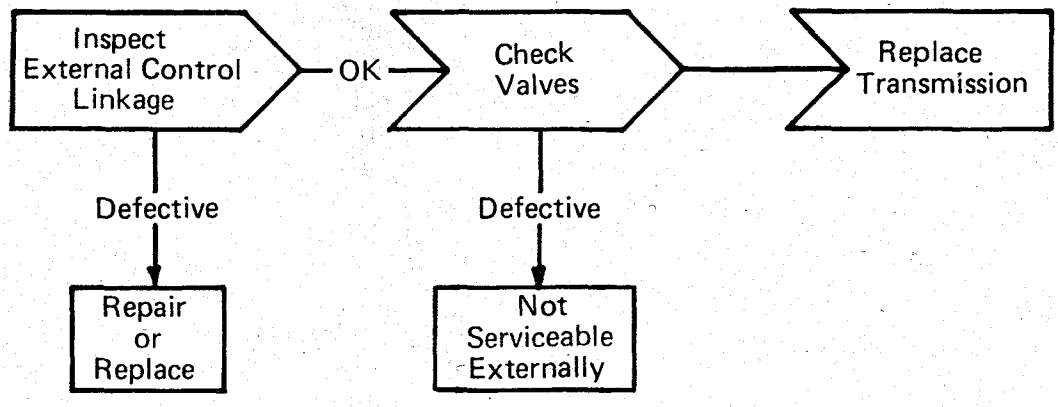
Fill reservoir to proper fluid level shown.

Trouble Shooting Instructions

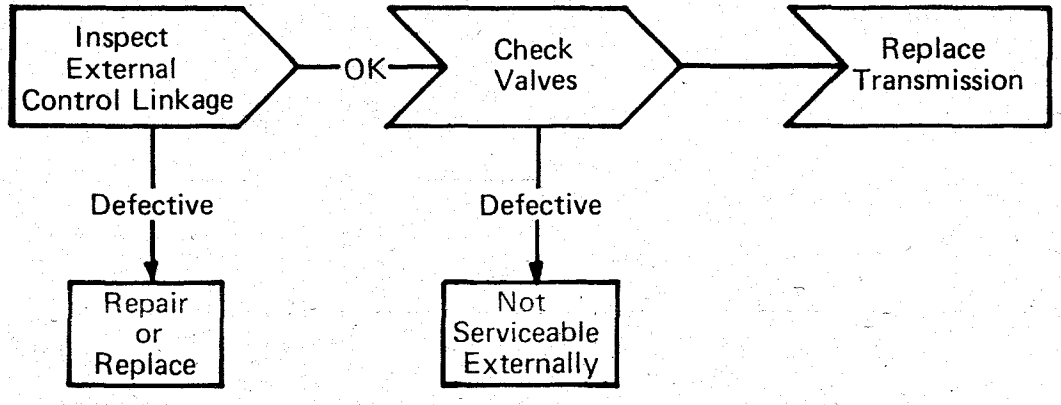
This fault-logic troubleshooting section is designed as a diagnostic aid in locating transmission problems by the user.

Match the transmission problem with the problem statements and follow the action steps shown in the diagrams. This will give the user expedient aids in correcting the problem and eliminating unnecessary machine down time.

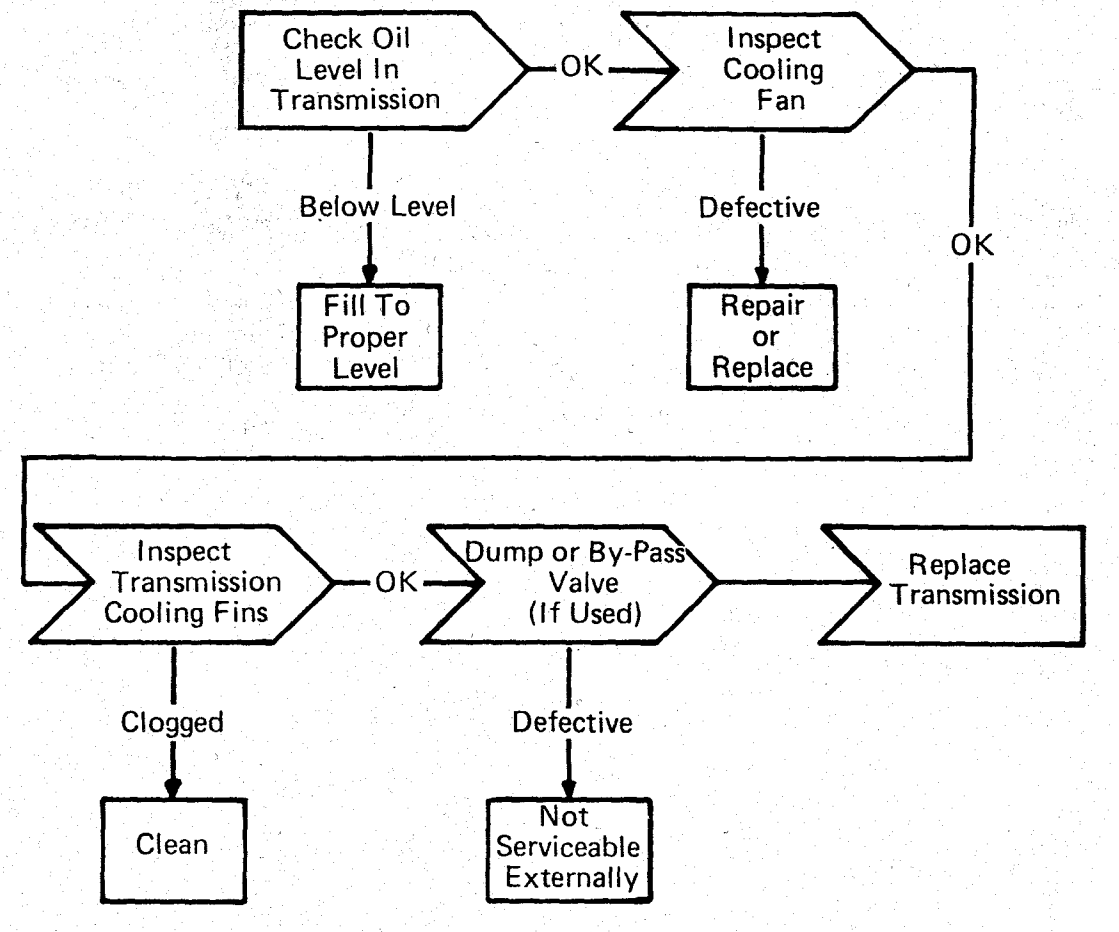
System Jerky When Starting



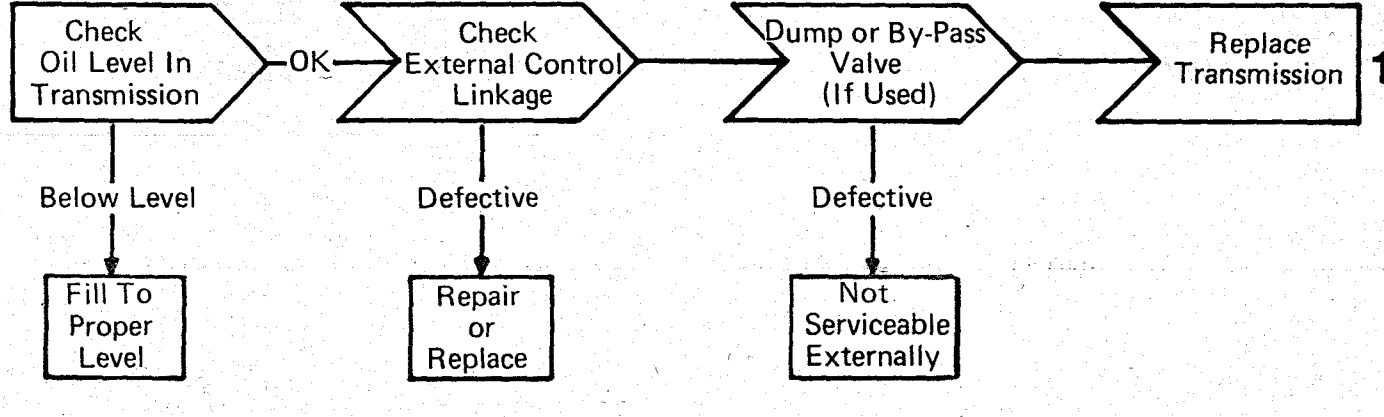
System Operates in One Direction Only



System Operating Hot



Loss of Power or System Will Not Operate in Either Direction



EATON
HYDROSTATIC TRANSMISSION
MODEL 6 / 7
REPAIR MANUAL
NO. 7-403

Hydrostatic Fluid Recommendations

A reputable supplier can help you make the best selection of hydraulic fluid for use in Eaton hydrostatic products.

For satisfactory operation, the following recommendations apply:

1. The filter system used in the hydraulic circuit should be capable of cleaning and maintaining the hydraulic fluid to meet ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 μm and a maximum of 80 particles per milliliter greater than 15 μm.
2. At normal operating temperatures, optimum viscosity ranges are from 80-180 SUS (16-39 cSt). Viscosity should never fall below 60 SUS (10 cSt) and, at the lowest expected start-up temperature, should not exceed 10,000 SUS (2158 cSt).
3. The fluid should be chemically stable, incorporating rust and oxidation inhibitors.

   Specific types of fluid meeting these requirements are:

   - Premium hydraulic oil*
   - Engine crankcase oil–SAE 10w, SAE 20w-20, SAE 30
   - Automatic transmission oil
   - Hydraulic transmission oil
   - Synthetic fire resistant fluid–

     Quintolubric 822-220, -300 or -450
     Quaker Chemical Co.
     Conshohocken, PA 19428

     Cosmolubric HF-122, -130, -144 or -1530
     E.F. Houghton & Co.
     Valley Forge, PA

     Milisafe Code 1274 (280 Series) 280-150, -300 or -500
     Future Trend Industries
     Cottage Grove, MN 55016

Note: If the natural color of the fluid has become black or milky, it is possible that an overheating or water contaminant problem exists.

For accurate level readings, take readings when the fluid is cold.

*Supplied in Model 6 and 7 Transmissions, Model 750 and 770 Transaxles, and 780 Transaxles without charge pumps that are shipped from the Spencer factory. The viscosity of this factory fluid is equivalent to SAE 20w-20. The preferred fulids for all light duty transmissions, pumps, transaxles and motor axles are those having a viscosity equivalent to SAE 20w-20, SAE 30 or SAE 40.

Eaton Corporation **Hydraulics Division** 15151 Highway 5 Eden Prairie. MN 55344 Telephone (612) 937-9800

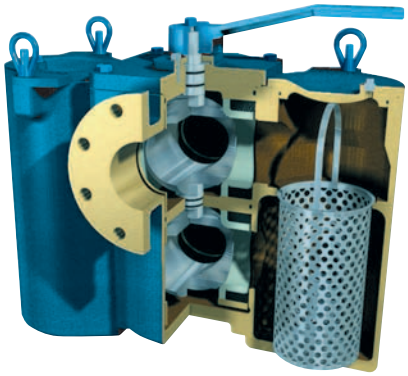
EATON

REVISED OCTOBER, 1988
FORM NO. 7-403-108

Model 53BTX

Ball Type Basket Strainer

DN 20 to DN 100 ($^3/_4$" to 4")
Iron, Bronze, Carbon Steel or Stainless Steel



- A dual basket strainer design that allows continuous flow of the fluid during cleaning. No shut down is required to clean the dirty basket so the process is not interrupted.
- The change over from one basket to another is made by turning the single lever.
- Threaded connections are provided on the side and bottom of both basket chambers so that the process liquid can be completely drained if necessary.
- Large capacity baskets increase operating time and reduce the frequency of cleaning.
- Double stem O-rings provide positive sealing even under the most arduous service conditions.
- The unique reinforced seats require no adjustment and are designed to provide the longest possible life.
- Piston seal chamber covers with quick open fixings allow the baskets to be removed quickly and easily for cleaning without any special tools.
- The 53BTX will operate effectively without any lubrication of the diverter mechanism, unlike other designs which require regular injections of grease.
- A low profile design combined with full size baskets allows easy installation without compromising the low pressure drop.

These value added features:	Give these benefits
Patented diverter cartridge	Simplifies removal and replacement of the seals and internal components
Dynamic ball sealing system	Leak tight isolation of the off-line basket chamber during cleaning. No adjustment required

Selection Chart

Size	Body and cartridge	Connections	Seats / Seals	Diverter balls	Rating
DN 20 to 65	Iron	Threaded	PTFE / Buna N*	Stainless Steel	PN 16 13.8 bar @ 66°C
DN 50 to 100		Flanged			ANSI 125 200 PSIG @ 150°F
DN 20 to 65	Bronze Carbon Steel Stainless Steel	Threaded**			PN 16 13.8 bar @ 66°C
DN 50 to 100		Flanged			ANSI 150 200 PSIG @ 150°F

* Viton® Standard for Stainless Steel models, optional for Iron, Bronze and Carbon Steel
** DN 65 threaded is not available in Carbon Steel or Stainless Steel

DUPLEX

Model 50

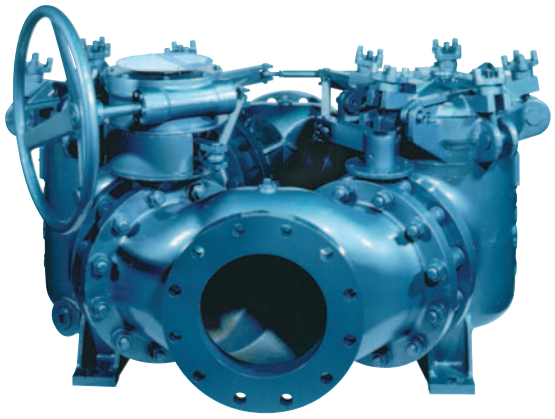
Basket Strainer

DN 125 to 200 (5" to 8")
Iron, Bronze, Carbon Steel or Stainless

These value added features:	Give these benefits
Dual basket design	Uninterrupted flow during changeover
Tapered & lifting diverter plug	Will not seize - Assured operation
No plug lubrication required	No introduction of grease into system
Quick open yokes and covers	Fast access to basket chambers
Large capacity baskets	Lower operating pressure loss Longer run time between cleaning

Selection Chart

Size	Body Material	Plug Material	End Connections	Seals	Rating
DN 125 to 200	Iron or Bronze	Iron or Bronze	ANSI 125/DIN PN 10/16	Buna N	DN 125 & 150 13.8 bar @ 38°C
DN 150 to 200	Carbon Steel	Iron, Bronze or St/St	ANSI 150/DIN PN 10/16	Buna N	DN 200 10.35 bar @ 38°C
DN 150 to 200	Stainless Steel	Stainless Steel	ANSI 150/DIN PN 10/16	Viton®	



Model 50

Basket Strainer

DN 250 to 450 (10" to 18")
Iron or Bronze

These value added features:	Give these benefits
Compact butterfly valve design	Positive isolation between chambers
Dual basket design	Uninterrupted flow during changeover
Quick open hinged covers	Fast access to basket chambers
Linked reduction gearbox	Single hand wheel operation
Convoluted baskets	Optimum filtration area
Straight through flow design	Minimum clean pressure drop

Selection Chart

Size	Body Material	End Connections	Seals	Rating
DN 250 to 300	Iron	ANSI 125/DIN PN 16	Buna N	13.8 bar @ 38°C
	Bronze	ANSI 150/DIN PN 16		
DN 350 to 450	Iron	ANSI 125/DIN PN 16		10.35 bar @ 38°C
	Bronze	ANSI 150/DIN PN 16		

Model 53BTX-SJ

Jacketed Duplex Basket Strainer

DN 50 to 80 (2" to 3")
Carbon Steel or Stainless Steel

These value added features:	Give these benefits
Continuous flow	No shutdown for basket cleaning
Large integral welded jacket	Even and efficient heat distribution
Threaded jacket connections	Simple and safe installation
All metal fixings	Strong and rugged

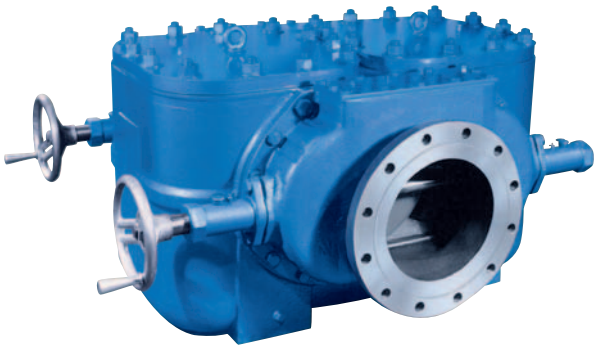
Selection Chart

Size	Body Material	Diverter Balls	End Connections	Seals	Rating
DN 50 to 80	Carbon Steel	Stainless Steel	ANSI 150/DIN PN 16	PTFE/Buna N	13.8 bar @ 38°C
	Stainless Steel	Stainless Steel	ANSI 150/DIN PN 16	PTFE/Viton®	13.8 bar @ 38°C

Model 570

Multi Basket Strainer

DN 200 to 600 (8" to 24")
Cast Iron, Carbon Steel or Stainless Steel



These value added features:	Give these benefits
Sliding gate valve design	Uninterrupted flow during changeover
8 individual baskets	Optimum filtration but easy to lift out
Low profile compact body	Easy access to baskets. Minimum space requirement for installation
Low centre to base dimension	Fits in ground level pipeline
High capacity	Large volumes of water can be passed through a single strainer

Selection Chart

Size	Body Material	End Connections	Seals	Rating
DN 200 to 600	Iron	ANSI 125/DIN PN 10	Compressed, non-asbestos, synthetic fibre	8.6 bar @ 38°C
DN 200 to 600	Carbon Steel	ANSI 150/DIN PN 16		10 bar @ 38°C
	Stainless Steel			
DN 200 to 400	Carbon Steel	ANSI 300/DIN PN 20		20.7 bar @ 38°C
	Stainless Steel			

EATON | Vickers

Filtration Master Catalog

Technical Catalog

Introduction to Eaton Filtration

Fluid Power is one of the most reliable and repeatable forms of power and motion control. When problems are encountered, 80% of the time they are related to inadequate contamination control practices. Eaton has more than a 75-year history of dedication to helping engineers develop, operate and maintain reliable, high quality power and motion control systems.

For a hydraulic or oil lubricated machine, the development of a target cleanliness level and the plan to achieve it is as much a part of system design as the selection of the pump, valves, actuators or bearings.

Vickers Systemic Approach to Contamination Control

- Set a target Cleanliness Level
- Select filters and filter placements to achieve target
- Sample fluid and confirm achievement

The systemic contamination control approach assures the user of the hydraulic system a cost effective approach to contamination control that allows the price of the filters and elements to be quickly recovered by the savings of improved performance, increased component life, increased oil life, increased uptime and fewer repairs.

The goal of systemic contamination control is always the same: to clean the fluid to the point that contamination is not a factor in the failure (catastrophic, intermittent, or degradation) of any component in the system during the desired useful life of that system.

The first step towards this goal is the setting of a target cleanliness level that takes into account the specific needs of the system.

Sources of Contamination

Eaton doc. 561, page 8

Once the target has been set, the next step is to select and position filters in the system so that the target can be achieved in a cost effective manner.

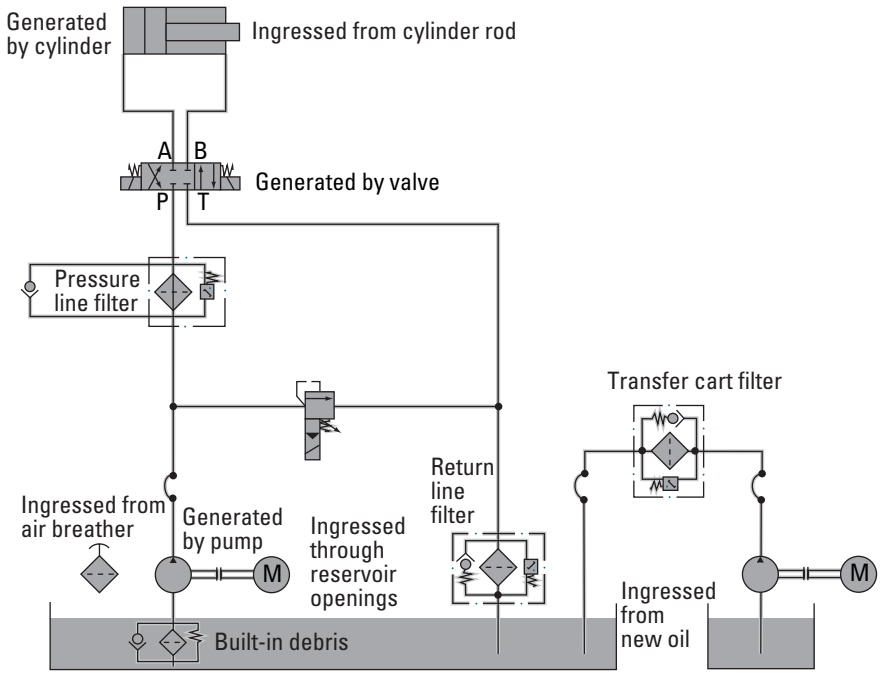
After the machine is in operation, the last and ongoing step is to confirm that the target cleanliness level is being maintained.

This is most often accomplished by sending a fluid sample to a particle counting laboratory that gives cleanliness code data to established standards. If the target is being met, the system only needs to have filters maintained and the fluid retested periodically. If the cleanliness target is not being achieved, corrective actions need to be taken. Sometimes a change in maintenance practices is needed, but at other times a shift to a finer grade of filter elements or additional filter housings may be needed.

There are four primary sources for solid contamination to enter a hydraulic fluid.

They are: contaminated new oil, built-in contamination, ingressed contamination and internally-generated contamination.

Eaton Fluid Analysis Service PN 894276



Introduction to Eaton Filtration

Contaminated New Oil

Although hydraulic and lubrication fluids are refined and blended under relatively clean conditions, the fluid travels through many hoses and pipes before it is stored in drums or in a bulk tank at the user's facility. At this point, the fluid is no longer clean as the fluid lines it has traveled through have contributed metal and rubber particles, and the drums have added flakes of metal or scale. Storage tanks are a real problem because water condenses in them causing rust particles. Contamination from the atmosphere can

Eaton Clean Cart

also find its way into the tank unless satisfactory air breathers are fitted.

If the fluid is stored under reasonable conditions, the principal contaminants on delivery to the machine will be metal, silica and fibers. With fluids from reputable suppliers, sampling has shown typical Cleanliness Levels of 17/16/14 or dirtier. Using a portable transfer cart fitted with a high efficiency filter, contamination should be removed from new fluids before the contamination enters and damages the components in the system.

Built-in Contamination

New machinery always contains a certain amount of built-in contamination. Care in system assembly and in new component flushing reduces this but never eliminates it. Typical built-in

Eaton H20 Gate Reservoir Breather BR110

contaminants are burrs, chips, flash, dirt, dust, fiber, sand, moisture, pipe sealant, weld splatter, paint and flushing solution.

Ingressed Contamination

Contamination from the immediate surroundings can be ingressed into the fluid power or lubrication system. On large installations, such as those within steelworks or automotive plants, it is relatively easy to know the environmental conditions, though they vary considerably. For example, a coke oven system operates in conditions very different from a similar system in a cold mill. For mobile equipment, there is a very wide variation in environmental conditions by application, location and even by weather conditions (i.e. high winds).

The key is to severely limit the access that environmental contamination has to enter the hydraulic or lubrication system. There are four major ways dirt can enter a system: reservoir vent ports (breathers), power unit or system access plates, components left open during maintenance and cylinder seals.

Generated Contamination

The most dangerous contamination to a system is the contamination generated by the system itself. These particles are "work hardened" to a greater hardness than the surface from which they came, and are very aggressive in causing further wear in the system. In a system running on properly cleaned fluid very few particles are generated, although all components (especially pumps) create a small amount of particles during routine operation. In a system where these particles are not quickly captured the elevated contamination levels will cause the number of additional generated particles to increase at a highly accelerated rate! The best way to prevent contamination generation within a system is to start with a clean (fully flushed) system and keep the system fluid clean.

Filter Element Initial Efficiency

The international standard for rating the efficiency of a hydraulic or lubrication filter is the Multipass Filter Performance Beta Test (ISO 16889). The results of this test are reported as a ratio of number of particles greater than a designated size upstream of the test filter compared with the number of same size particles downstream of the test filter. These results are then expressed as a Beta ratio. Most Eaton™ filters are rated at Beta x(c)=1000. See individual filter "Features and Benefits" for more detail.

BETA RATIOS AND CORRESPONDING EFFICIENCIES

Beta Ratios	Efficiency
1	0%
2	50.00%
5	80.00%
10	90.00%
20	95.00%
75	98.00%
100	99.00%
200	99.50%
1000	99.90%
5000	99.98%

Beta ratios and dirt capacity are only a guide to system cleanliness needs ref. Eaton doc. 561, page 19

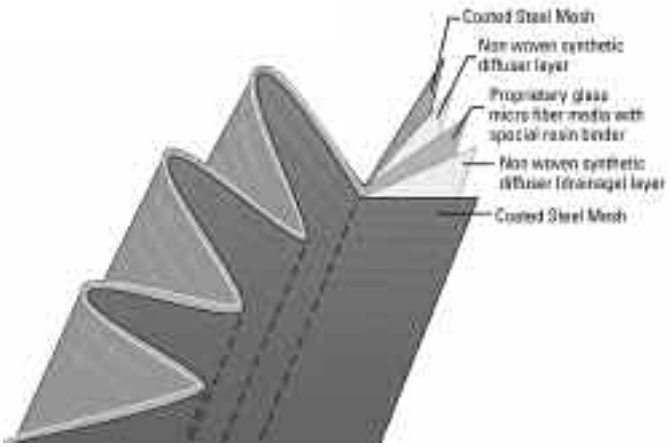
Multipass testing has greatly aided engineers in the development of better and more efficient filter elements, and it has helped the design engineer who needed to specify a filter element's performance. But, there's little correlation between multipass efficiencies and system cleanliness needs. In the final performance analysis, the goal is properly cleaned fluid and not just very high Beta ratios and dirt capacity. The most important information needed by a designer or user of a hydraulic system is the system cleanliness they can expect when that filter and media are properly installed in the system.

Each grade of Eaton high efficiency filter media construction is thoroughly multipass tested and then rated with the system cleanliness level expected to be achieved with the use of that product. The assumptions behind these cleanliness ratings are: 1) the filter sees full system flow, 2) the filter is the primary filter in the system, and 3) air breathers along with recognized maintenance practices will limit dirt ingression from the atmosphere.

A major problem in correlating multipass test claims to real world fluid cleanliness levels is that real systems operation greatly stresses the element. In active systems, flow rate changes (often several times a minute), pressure pulses (hundreds a minute), decompression shock waves, cold starts and other variables all work to degrade a filter's performance. In multipass testing the element is subject to one gradual rise in differential pressure as the element loads!

Flow fatigue test protocol (ISO 3724) leaves many important questions unanswered. Again the element is tested in laboratory conditions that cannot duplicate the interaction of the many forces working to stress and degrade the element. This laboratory test may fail to answer the question of how an aged element will perform during the latter part of its service life.

Eaton Media Construction



The best way to deal with this issue is to look at the construction and feel the element pleats. Are the pleats well supported? Do they flex under hand pressure? Any element that fails these simple tests will fail to maintain efficiency and integrity, and will not maintain the targeted cleanliness level.

Additionally, look at the pack construction. Steel wire mesh is very important in element construction. Wire keeps the pleats from flexing and gives the filter medium the support it needs to keep from failing due to fatigue. The downstream wire mesh also serves as a last chance protection in case of unexpectedly severe stress that causes element media rupture.

Filter Condition Indicators

After the filters are placed within the system, the next consideration is how the user is going to know when to change the element. The answer recommended in DIN 24550 standard is to have all filters fitted with a differential pressure indicator that gives an easy-to-read indication that the element needs to be changed. Eaton

LIMITS ON CORRELATION BETWEEN "BETA" AND SYSTEM CLEANLINESS AND "DIRT CAPACITY" AND SERVICE LIFE

	Laboratory Procedure	Real World
Pressure Rise	One gradual rise	Thousands of changes
Fatigue Cycles	One	Millions
Element Aging	Minutes	Months
Element Life	One hour	800+ hours
Contaminant	AC fine test dust	Debris, water, gas
Challenge Rate	Constant	Always changing
Fluid Used	MIL 5606	Wide variety
Temperature	100°F (38°C)	-20°F to 200°F (-7° to 93°C)
Flow	Steady	Thousands of changes

indicators are designed to indicate at a pressure drop 20% below the bypass setting which equates to 95% of the element's service life. This indication before bypass feature was incorporated to allow safe operation of the machine until the next shift change or convenient maintenance opportunity.

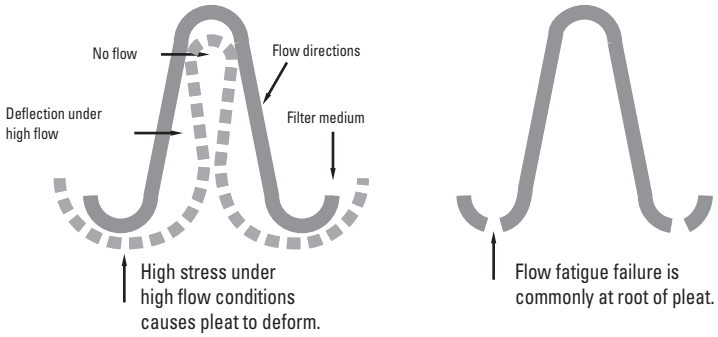
Element Service Life

As in any aspect of machine design or maintenance, cost of installation and operation are very important concerns. For filters, the length of time an element lasts in service and the initial cost of that element, combine to determine the economics of using that product.

The most important aspect of gaining long element service life is to minimize the ingression! Reservoirs need to be fitted with vent filters (=3µm) that remove the dirt before it enters the system. Access port and doors need to be kept sealed so that dirt cannot be drawn into the system. Cylinder rods that extend into contamination laden environments should be shielded to minimize the dirt being drawn into the system.

The second important aspect to long element service life is to keep the cleanliness level of the fluid at or below target. Periods of machine operation with dirty fluid cause accelerated internal wear that loads a filter element. (It's important the debris is caught as it saves the system, but it does cost the element part of its service life.) Always change an element on indication and always use genuine Eaton elements because of their consistent performance and superior strength under stress.

In poorly supported elements, changes in flow and pressure drop cause the sides of element corrugations to flex and the root to stretch, giving rise to fatigue stresses. Dirt capacity is also lost as areas of the medium have no flow.
Eaton doc. 561, page 21



The third issue in long element service life is the "dirt capacity" of the element. This value is calculated as part of the multipass efficiency test. Because of the many differences between the test conditions and real system operation, different dirt capacity values do not correlate well to changes in element service life. Dirt capacity can only be used to compare elements under very specific laboratory situations, and as a result published dirt capacity values should be used as general information rather than specific comparable data.

Eaton elements are designed to give long life and reliable service in hydraulic or lubrication applications. This is achieved with our multi-layer construction. Each layer provides additional strength or capacity leading to overall superior performance. Some elements focus heavily on media structure only, which can give increased "dirt capacity" under laboratory conditions, but no increase in service life is experienced in real systems.

An often overlooked aspect of dirt capacity and service life is the effect of element area. When comparing an element of "x" area with an element of "2x" area, one would expect twice the life for the larger element. But, in real systems, the life extension is most often between 2.5 and 3.5 times as long. This is because the reduced flow density through a unit area of media allows for more effective contaminant capture. Larger elements are the most cost effective approach to contamination control from the perspective of operating costs.

Guide for Selecting Filters

Target Cleanlines

Using the Vickers Target Cleanliness Worksheet (#578), it is easy to determine the target ISO Cleanliness Level for a system. This target is based on the application's components and system dynamics.

Placement and Media

Use the chart below to help select the appropriate filter placement and grade of media to acheive the target cleanliness level. For more detail, consult the Eaton Guide to Systemic Contaminaton Control, your Vickers representative, or the ANSI System Standards for Stationary Industrial Machinery.

Filter Placement

The chart below helps engineers select the grade of Vickers media and the filter placement(s) that will acheive the required target cleanliness. It assumes the system will experience "average" ingression and that maintenance of the system will be consistent with current technology.

If in operation the system is running dirtier than expected, corrective actions should be initiated. Suggested corrective actions are:

- Check the indicator to see if the filters are on by-pass.
- Check the sources of ingression and correct problems.
- Check that the filters are positioned properly to see maximum fluid flow.
- Consider using a finer Pak grade
- Add additional filters to the system.

Note: All systems need a sealed reservoir with vent port filtration.

CAUTION

Before servicing the element, the bleed plug in filter housing must be loosened to relieve pressure. This will minimize fluid overflow.

Housing

The selected housing should be rated within the required flow and pressures of the application.

Important: If the system fluid's specific gravity (SG) is greater than 0.9 (for example, water glycol), the housing pressure drop (ΔP) should be corrected for actual application.

Specific Gravity Corrections for Pressure Drops

The filter housing flow curves in this catalog can be adjusted using the following equation:

Adjusted $\Delta P_{Housing} = \Delta P_{Curve} \times \text{Actual SG} \div 0.9$

Bypass Valve

Bypass valve selection is based upon system requirements. According to ANSI Standard 12.2.6, filter assemblies whose elements cannot withstand full system differential pressure without damage should be equipped with bypass valves. Generally, a higher bypass pressure setting will allow for longer element life.

Some systems require filtration with no bypass, such as servo applications. Vickers H-Pak media is recommended for non-bypass systems.

Indicator

To meet ANSI Standard 12.2.5, filter assemblies should have a device to indicate when the filter requires servicing. Per ANSI Standard 12.2.6, the indicator should "trip" at approximately 80% of the bypass pressure setting. If using a non-bypass housing, an indicator selling of approximately 100 psid is recommended. Differential pressure indicators are rated 6,000 psi working, 3,500 psi fatigue.Δ

TARGET CLEANLINESS		RECOMMENDED FILTER PLACEMENT FOR HIGH INGRESSION SYSTEMS WITH FIXED VOLUME PUMPS.	RECOMMENDED FILTER PLACEMENT FOR SYSTEMS WITH VARIABLE VOLUME PUMPS.	RECOMMENDED FILTER PLACEMENT FOR HIGH INGRESSION SYSTEMS WITH VARIABLE VOLUME PUMPS.		
	Full flow pressure line or return line	Full flow pressure line or return line	Pressure line/ recirculating loop at 20% of system volume per minute	Pressure line plus return line plus recirculating loop	Recirculating loop at 20% of system volume per minute	Recirculating loop at 10% of system volume per minute
14/12/10	-	03	03	03	-	-
15/13/11	-	03	03	05	-	-
16/14/12	03	05	05	05 or 10	03	03
17/15/13	03	05	05	05 or 10	03	03
18/16/14	05	10	05 or 10	10	05	03
16/14/10	05 or 10	10	10	10	05 or 10	05

Guide for Selecting Filters

Surge Control

Surge Control is used on systems where spikes and surges in the hydraulic system could prematurely trip the indicator. Surge controls slow the indicator response. If the indicator encounters a continuous high differential pressure, it will trip at the rated setting.

Element

The Vickers element media grade should be selected to acheive the Target Cleanliness Level. The Vickers media construction should be chosen based upon system requirements such as flow characterstics, pressure surges and specific application conditions.

Important: If the system fluid's specific gravity (SG) is greater than 0.9 (for example, water glycol), the element pressure drop (ΔP) should be corrected.

H-Pak Construction

For systems where a bypass valve is undesirable, such as servo systems, the H-Pak media provides high collapse rated housing pressures. H-Pak media construction utilizes 304 stainless steel inner and outer mesh support along with heavier core tubes and media support to protect the system.

C-Pak Construction

C-Pak media uses five layer construction. C-Pak incorporates epoxy coated carbon steel as the two outer face layers to retain the inner media pak layers.

R-Pak Construction

The R-Pak spin-on filter elements are designed for low clean pressure drop and high efficiency. R-Pak incorporates a five layer media construction with outer layers of epoxy coated carbon steel wire to retain the inner media pak layers.

L-Pak Construction

The L-Pak is specially designed for lubrication applications. Using the same five layer construction as the C-Pak, the L-Pak also has a deep pleat construction to maximize element life in steady flow, low pulsation systems.

Viscosity Corrections for Pressure Drops

The element flow curves can be adjusted using the following equations:

Adjusted Clean $\Delta P_{Element}$ =

Actual viscosity in cP ÷ 29 x ΔP_{Curve}

Actual viscosity in cSt/32 x Actual SG ÷ 0.9 x ΔP_{Curve}

Actual viscosity in SUS/150 x Actual SG ÷ 0.9 x ΔP_{Curve}

A good "rule of thumb". To ensure satisfactory element life, the clean element pressure drop should generally be less than or equal to 40 percent of the indicator's rated differential pressure:

$\Delta P_{Element} = 0.4 \times \Delta P_{Indicator}$

The best way to extend element service life is to minimize ingression (vents, seals, cylinder rods) and maintain system cleanliness at or below the Target Cleanliness Level.

Eaton Fluid Power Training

Learn from the Hydraulics Experts!

Knowledge is power. And nowhere can your team strengthen its knowledge more effectively than through lessons learned in courses offered by Eaton Fluid Power Training.

Participants in Eaton Fluid Power Training courses can save their company significant money by reducing unplanned downtime and maximizing the effectiveness of planned downtime. Each year more than 2,500 people attend training courses at Eaton training facilities in Eden Prairie, Minnesota, and Maumee, Ohio.

Systemic Contamination Control

Among Eaton Fluid Power Training's most beneficial courses is *Systemic Contamination Control.* This two-day course covers the fundamentals of systemic contamination control, including why contaminated oil can significantly reduce the service life of components in a hydraulic system and how keeping systems clean can result in significant savings by reducing downtime due to premature component failures. Also covered are contamination control requirements of hydraulic systems, enabling participants to properly design, maintain and purchase hydraulic systems and components. The course includes hands-on sampling and draw-down testing of fluid samples.

Specific topics covered in Eaton's *Systemic Contamination Control* course include:

Participants in Eaton's Systemic Contamination Control course learn how to determine the cleanliness of a hydraulic system using the Eaton Target-Pro portable particle counter.

- **Fluid characteristics** Purposes and properties of hydraulic fluid, types of fluid and fluid failures
- **Contamination control** Critical clearances in components, fluid testing methods, filter ratings, beta ratios, media construction and breakdown, Delta P indicators, filter selection and fluid sampling methods
- **Particle count methodology** Eaton Target-Pro® portable particle counter and Eaton Fluid Analysis Kits, which rate a system's cleanliness through detailed laboratory testing

Maintenance, sales and design personnel will benefit from the course that is offered at Eaton Fluid Power Training facilities, as well as at Eaton distributor and customer locations. For a complete course description, visit **www.eatonhydraulics.com /training.**

To contract the services of Eaton Fluid Power Training, call 1-800-413-8809.

Fluid Analysis

Eaton Fluid Analysis Service

Eaton hydraulic components have a global reputation for quality, reliability and performance. That reputation is built on a tradition of customer service and we stand behind every one of our products.

Our Fluid Analysis Service follows that same tradition. We provide our customers with comprehensive fluid testing and diagnostic services, with detailed reports that are easy to understand.

To find out how the Eaton Fluid Analysis Service can help your operation, read on.

Then call us to get started.

A Name You Trust

Only one fluid analysis lab lets you put years of Eaton experience to work for you. So when the health of your hydraulic system is at stake, choose a partner with more than 75 years of experience. Contact your Eaton representative for more information on our Fluid Analysis Service.

Critical Analysis

Fluid is the lifeblood of every hydraulic power system. To keep yours running efficiently and effectively, you need to know what's in it. What you don't know can hurt you.

The Eaton Fluid Analysis Service analyzes hydraulic fluid in much the same way a medical lab tests a blood sample. Just as a blood test helps a doctor diagnose health problems, a sample of hydraulic fluid can help us pinpoint sources of contamination and determine whether or not your system uses adequate filtration.

We can help you reduce catastrophic equipment failures, maintain optimum component performance, and identify any substandard maintenance practices. Your bottom-line benefit is increased productivity.

Clear Benefits

We offer testing designed to tell you the most about your hydraulic fluid. We use sophisticated computer programs and laboratory diagnostic equipment such as an Energy Dispersive X-ray Fluorescence and an inductively coupled plasma spectrophotometer.

After we use this advanced equipment to provide the most detailed possible analysis of your hydraulic fluid, we create reports that are always easy to read and understand. By taking the mystery out of fluid analysis, we provide a service that clearly explains the benefits of clean fluid.

Comprehensive Testing

The Eaton Fluid Analysis Service is certified to ISO 12025 and offers a full range of tests specifically designed for the analysis of hydraulic and lubrication system fluid. Our laboratory equipment and test procedures provide an exact analysis of your hydraulic or oil lubricated system, and our drawdown particle isolation procedure ensures accurate results.

Our testing procedures can include:

Photomicrography: We scan and photograph a filter patch using an optical microscope to find particle size and type. The scanning process verifies the automatic particle count to identify samples needing special preparation. This provides confirmation of automatic counter results, and helps us see what contaminants are in the fluid.

Viscosity (ASTM D445): We use this test to determine the viscosity of your oil. Without proper hydraulic fluid viscosity, your equipment will suffer. Incorrect viscosity leads to fluid breakdown, inefficient equipment operation, premature system failure and damage to other components.

Water (ASTM E203): We determine the water content in hydraulic fluid, which helps us predict quality and performance characteristics for the fluid and system components. Excess water reduces the viscosity of hydraulic fluid, which increases the likelihood of adverse chemical reactions and degrades equipment performance.

Drawdown Particle Isolation: Using this test, we determine the insoluble contaminates in hydraulic fluids, both insoluble particles and gel-like matter, organics and inorganics. Used in conjunction with photomicrography, the drawdown patch helps us identify the source and type of fluid contaminants.

Automatic Particle Count (ISO 11500): We use a high-intensity laser light source and a photo sensor to count the number and size of particles in the fluid sample and then define contaminants according to size distribution and quantities. Automatic particle counting is quick, repeatable and accurate. It provides reliable information we can use to check against ISO Standard 4406, which defines the relationship between particle counts and hydraulic fluid cleanliness. This lets us determine exactly what corrective actions, if any, are needed. The lab is also capable of testing to the new ISO 4406(1999) standard (4µ, 6µ,14µ).

Spectrometric Analysis (ASTM D 5185): This shows us the concentration of oil-soluble elements and indicates the additives and trace metal content in the fluids. We use this technique to evaluate the condition of the additives in a fluid rather than its particulate contamination. Used in conjunction with automatic particle counting, it helps us accurately assess the cleanliness level of the fluid.

Energy Dispersive X-ray Fluorescence (ASTM E 1508): We perform Energy Dispersive X-ray Fluorescence (XRF) analysis on samples with extremely high concentrations of particulate contamination. By isolating chemical elements, we pinpoint contaminant types so we can establish their origins, and so you can take corrective action.

Fluid Analysis

Easy-to-Read Reports

We present your fluid test results in a format that is easy to understand. Results typically include these items:

Vacuum Pump PN 894279

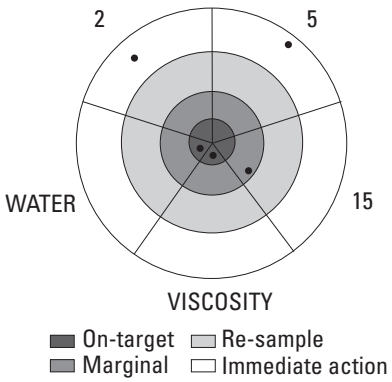
1. **Results Target:** A results target compares your actual fluid cleanliness results and your ideal cleanliness level. If you don't have a target level yet, we can use your sample to help you determine what it should be.

2. **Trend Information:** We evaluate data from your previous two samples along with the results of your current sample. This provides a trend analysis of critical measurements, and shows changes in the fluid over time.

   pH (ASTM E 70) represents the strength of acidity in hydraulic fluid, and is usually measured for water-containing hydraulic fluids (water/glycols, invert emulsions). Typical values are 8.5–10.5.

   Total Acid Number, or **TAN (ASTM D 974)**, is the amount of acid and acid-acting material constituents in hydraulic fluid. An increase in TAN indicates oxidation or acid contamination. Some hydraulic fluids exhibit higher acid numbers than others. Typical values are 0.1–3.0.

Fluid Test Results



Time	**TEST 1** Present	**TEST 2** Previous #1	**TEST 3** Previous #2
Viscosity @ 100°F cSt (SUS)	45.0 (210)	45.5 (212)	45.8 (213)
Water % Weight	0.03%	0.03%	0.03%
pH Note: pH is for water containing fluids only.	9.4	9.5	9.6
TAN mg KOH/gm Note: TAN is for synthetic fluids only.	2.1	2.0	2.1

Particle Count Summary

Time	**TEST 1** Present	**TEST 2** Previous #1	**TEST 3** Previous #2
>2µ	65,120	4,100	418
>5µ	12,220	1,250	88
>10µ	5,800	700	39
>15µ	900	250	22
>25µ	125	60	4
>50µ	12.0	5.0	1.0
Cleanliness Code	23/21/17	19/17/15	16/14/12

KIT FEATURES

Kit Part #	**Automatic Particle Count ISO 11500**	**Water ASTM E203**	**TAN/PH (if applicable)**	**Viscosity ASTM D445**	**Photo Microscopy Drawdown Particle Isolation**	**Energy Dispersive XRF ASTM E1508 (if applicable)**	**Spectrographic Analysis ASTM D5185**
894276	•	•	•	•	•	•	
894277	•	•	•	•	•	•	•

Each kit includes:

- Super clean sample bottle
- Packaging for sending sample
- Numbered test sample data form
- Fluid analysis service

Also available is PN 894279, Vacuum Pump for extracting oil sample, and PN 932339, Ultra Clean Bottle.

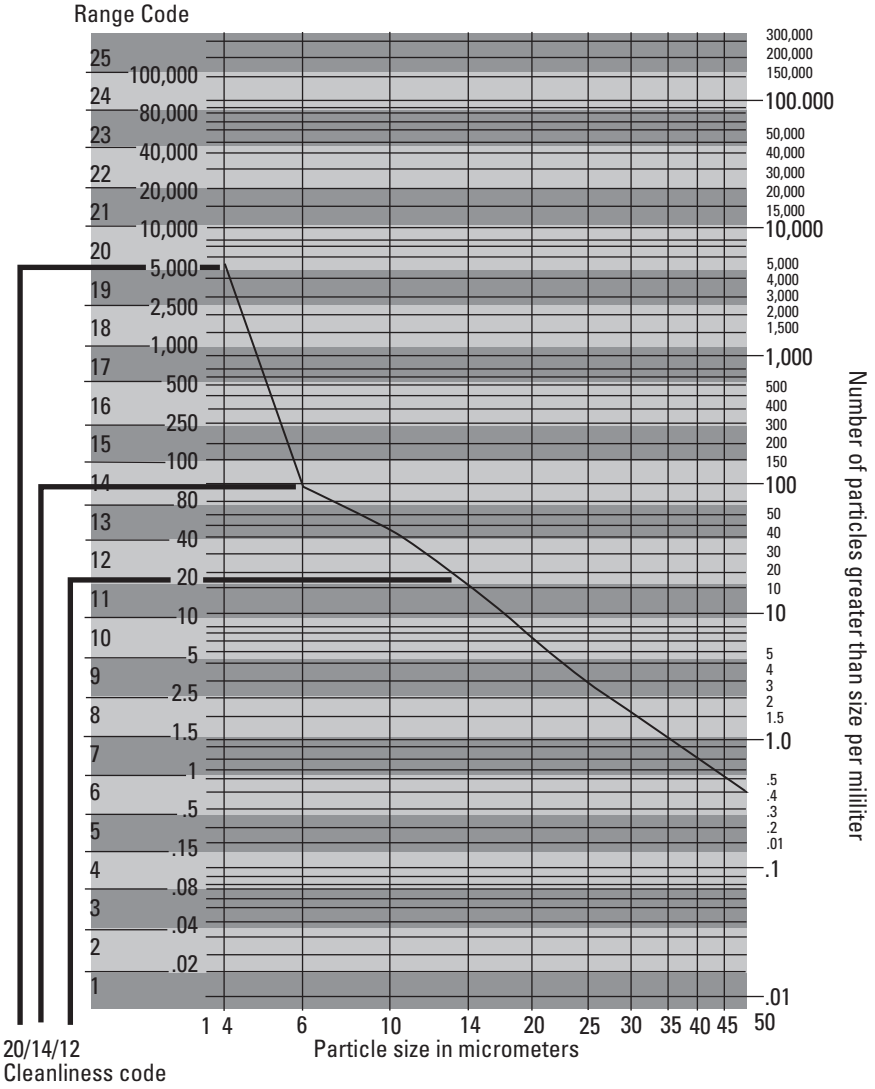
Items not in bold are non-standard and may have a longer lead time

Fluid Analysis

3. Cleanliness Code Graph: This graph uses the ISO 4406 standard for measuring and depicting the amount and size of particles per milliliter in hydraulic fluid, shown in a log-log2 graph that charts the amount of particles greater than certain micron sizes per milliliter of fluid.

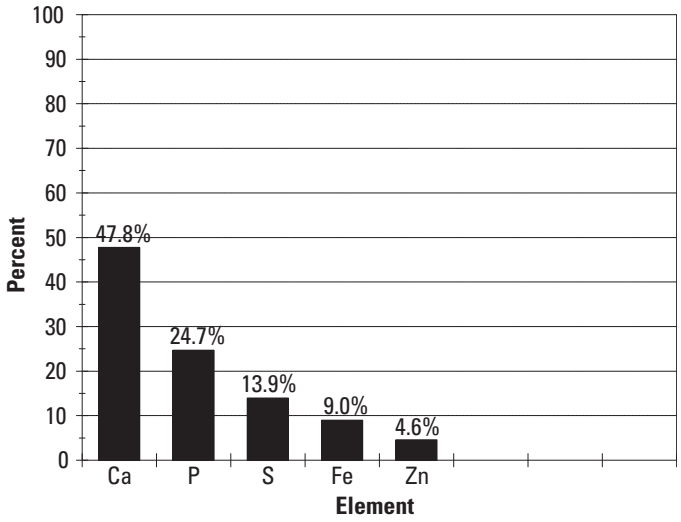
Recommendations: This section of the report provides you with valuable information on the cleanliness of your hydraulic system, as well as tips on maintaining or improving its current condition.

Cleanliness Code Graph



Sample XRF Analysis Results

When a fluid sample shows high particulate contamination, we use Energy Dispersive X-ray Fluorescence (XRF) analysis to isolate and identify chemical elements. The results are shown in a graph like this.



Particle Counter

Target Pro 2

Lab Quality in the Field

Eaton's Target-Pro 2 Portable Particle Counter gives you laboratory quality particle count results in the field. It combines state-of-the-art laser particle counting technology with a user-friendly interface and compact size. It allows you to monitor the fluid cleanliness of hydraulic and lubrication systems and take action if necessary.

The Target-Pro 2 (PN 5002405) includes two rolls of thermal paper, one waste bottle, one waste hose, one pressure hose, one power adapter, one RS-232 serial cable, and Target-Pro 2 software for Windows. A Bottle Sampler (PN 5002406) is available as an option.

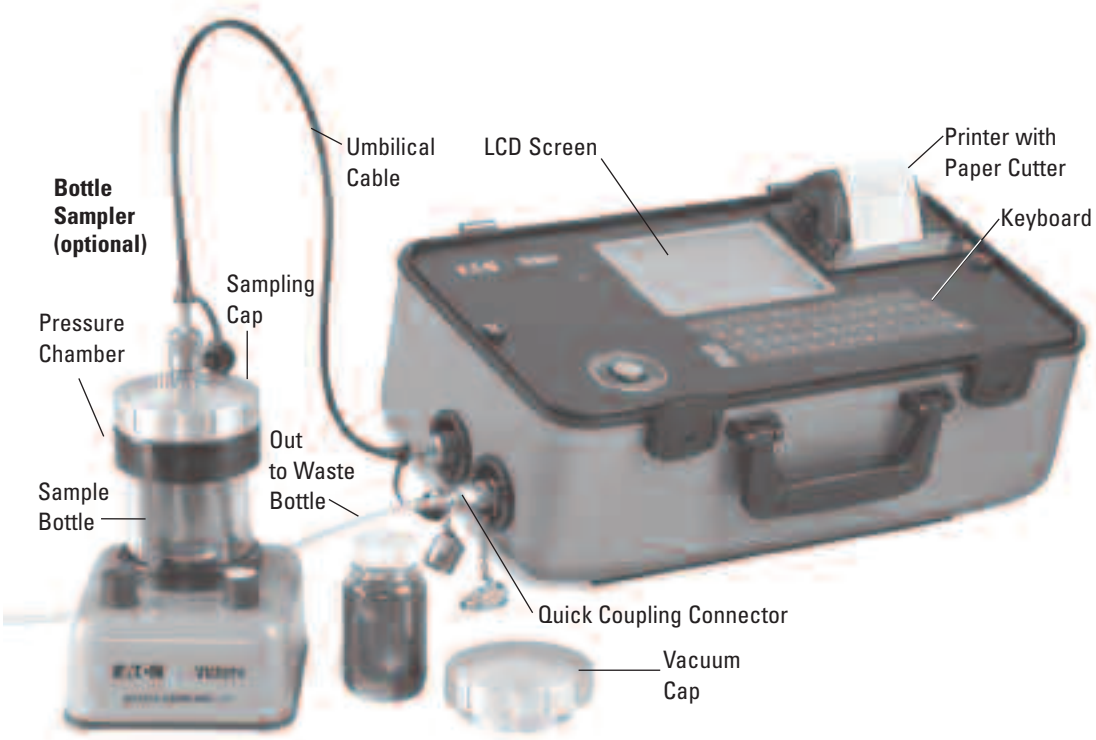
The Eaton Method of Systemic Contamination Control:

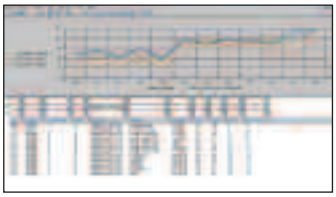
1. **Set:** Set a Target Cleanliness Level for the system.
2. **Select:** Achieve the Target Cleanliness by appropriate filter selection and placement.
3. **Sample:** Maintain the Target Cleanliness by monitoring the system and taking action as necessary.

The Target-Pro 2 measures and quantifies solid contaminants in hydraulic, lubrication and transmission applications. It is designed to provide laboratory accuracy at the job site, whether your application is mobile or stationary.

Particle Counter

Target Pro 2





Target-Pro 2 software for Windows, included with the analyzer, allows you to download test results and analyze cleanliness trends over time.

TECHNICAL INFORMATION

Technology	Automatic Optical Particle Analyzer
Laser Package	Twin Laser and Twin Optical Diode Detectors
LCD display	(backlit)
Sensitivity	>4, 6, 14, 21, 25, 38, 50, 68 µm(c), Micron range to revised ISO 4406 Standard
Accuracy/Repeatability	Better than 3% typical
Calibration	Each unit is individually calibrated with ISO Medium Test Dust (MTD) to ISO 11171:1999 on equipment certified by I.F.T.S.
Analysis Range	ISO 8 to ISO 24 to ISO 4406 (NAS 1638-2 to 12)
Report/Print Format	ISO and NAS codes, with individual particle counts as a built-in option
Printer	Fixed head thermal printer (384 dots per line)
Target-Pro 2 Sample Volume	15 ml. (normal), 30 ml. (dynamic) 24 ml. (bottle sampler) 15 ml. (continuous), 8ml. (short)

Operation	Max. system working pressure, 400 bar; Min. working pressure, 2 bar
Viscosity Range	to 400 centistokes
Operating Temperature	+5 to +80°C
Fluid Compatibility	Mineral oil and petroleum based fluids (consult Eaton for other fluids)
Typical Test Time	Result in <2.5 mins. (normal test)
Power	Internal rechargeable battery (AC charger) or external 12/24 volt DC power supply
Data Storage	600 tests
Computer Interface	RS-232 (serial) communication port
Hose Connections	minimess fittings microbore hose, 1.5 m waste fluid hose
Dimensions	Height 210mm; Depth 260mm; Width 430mm; Weight 7.6 kg

5002405 - Particle Counter
5002406 - Bottle Sampling

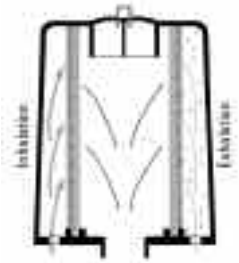
Note:

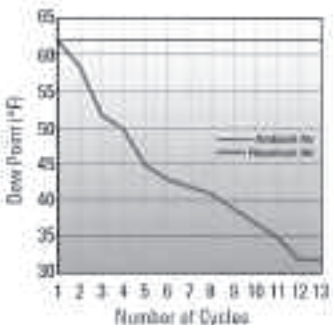
The Target–Pro should only be operated on petroleum based fluids, synthetic or biodegradable fluids. For phosphate esters, Skydrol®, crankcase fluids with high soot content, or water glycol, please consult Eaton.

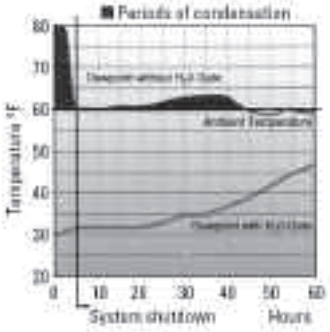
Breathers

Hydraulic reservoirs "breathe" air in and out as the oil level rises and falls. This circulating air contains particles and moisture that can cause corrosion, increase equipment wear and reduce fluid performance. In typical systems, the internal hydraulic fluid is warmer than the external environment. This difference in temperatures causes water vapor to form. Breathers protect your hydraulic system by filtering out damaging moisture and particles.

More than 25% of the samples sent to the Eaton Fluid Analysis Laboratory for analysis have significant water contamination. In an operating system, the H20-gate Vent Breather creates a moisture barrier when there is a 5°F (2°C) difference between reservoir and ambient temperature and when there is a 10% per minute exchange of air volume above the fluid. The Mobile-gate breather is smaller in size but is also $^1/_4$ the size and $^1/_2$ the capacity of the H20-gate. These temperature and air flow conditions are present in most hydraulic systems which employ a cylinder.







Part Numbers:

NPT Mobile-gate	**MBR110**
Flange Mobile-gate	**MBR120**
H20-gate	**BR110**
Dirt-gate	**BR210**

Performs as a gate

During the "inhalation" cycle, the proprietary media blocks the water vapor from entering the reservoir. During the "exhalation" cycle, the media allows the moisture in the reservoir air to exit. The moisture is carried off the media by the exiting air, restoring the media's water barrier capacity and the moisture barrier mechanism is not affected by the amount of exposure to moisture. The reservoir air is maintained at a low relative humidity and more importantly, at a lower dew point temperature than the ambient temperature.

Works even when the system is shut down.

The H20-gate and Mobile-gate Vent Breather retard the vapor equilibrium process and work to prevent condensation even after the system is shut and cooled down, such as overnight. As this chart illustrates, the dewpoint is slow to climb, even after the system temperature has dropped to the ambient temperature. Once the system has reached ambient temperature, condensation does not occur.

Reduces humidity inside reservoir.

The H20-gate and Mobile-gate Vent Breathers lower and stabilize the relative humidity of air inside the reservoir, leading to a lower dewpoint (Tdewpoint < Tambient = NO CONDENSATION) at a rate and amount that will be dependent upon several conditions: the ambient conditions, the internal reservoir heat, amount and frequency of reservoir air flow through the vent and the temperature of the reservoir surfaces.

BREATHER FEATURES

	H_2O-gate	Dirt-gate	Mobile-gate
Visual Indicator	•	•	•
Particle Control	•	•	•
Water/Moisture Control	•		•
Corrosion Resistant Housing	•	•	•
Flow Rate	708 L/min (187 USgpm)	708 L/min (187 USgpm)	473 L/min (125 USgpm)

Breathers

H2O-gate™ Reservoir Breather

Features/Benefits:

- Visual Mechanical Indicator: Actuates when particles have blocked the media, before the pump cavitates.
- Proprietary Media: Reduces dew point temperature to prevent condensation and is 99.7% efficient in blocking particles 3µ and larger.
- Reversible Flow Through Media: Allows for moisture to exit the reservoir.
- Media contains oil attractant layer to collect and return oil splashes.
- Easy Installation: Lightweight design can be hand tightened onto adapter.
- Durable Plastic Housing: Protects the media from external splashing.
- Superior breather filters both moisture and particles from air.
- Effective up to 121°C (250°F)
- Rated up to 25 SCFM

Part Numbers:

H20-gate	**BR110**
Bayonet Adapter	**924710**
Screw-in Adapter	**P-077002**

Dirt-gate™ Reservoir Breather

Features/Benefits:

- Visual Mechanical Indicator: Actuates when particles have blocked the media, before the pump cavitates.
- Easy Installation: Lightweight design can be hand tightened onto adapter.
- Durable Plastic Housing: Protects the media from external splashing.
- High Efficiency: (99% at 2 microns)
- Very Low Pressure Drop
- Filters out particles
- Effective up to 121°C (250°F)
- Rated up to 25 SCFM

Part Numbers:

Dirt-gate	**BR210**
Bayonet Adapter	**924710**
Screw-in Adapter	**P-077002**

Note:

This breather does not filter moisture from air.

Mobile-gate™ Filler Breather Assemblies

MBR120

MBR110

Features/Benefits:

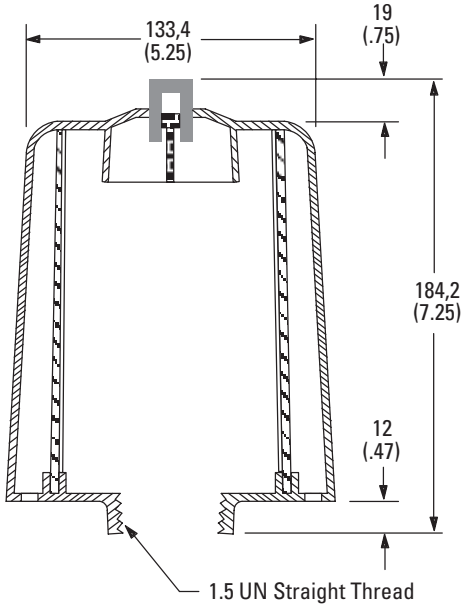
- Proprietary Media: Reduces dew point temperature to prevent condensation and is 99.7% efficient in blocking particles 10µ and larger.
- Water Barrier: Regenerates its water shedding capacity with each cycle.
- Reversible Flow Through Media: Allows for moisture to exit the reservoir.
- Easy Installation: Lightweight design can be hand tightened.
- Rugged metal housing is long lasting and ideal for mobile applications.
- Rated to 16.7 SCFM

Part Number

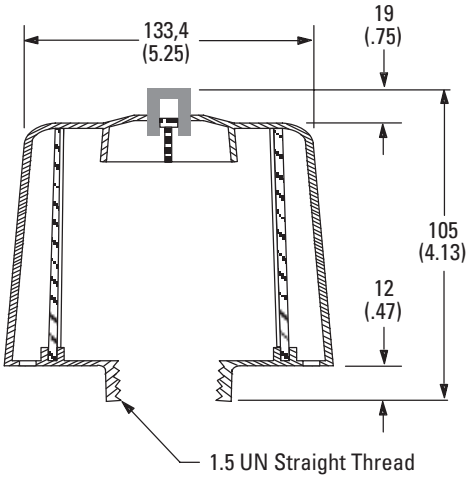
MBR110	**5002486**
MBR120	**5002487**

Items not in bold are non-standard and may have a longer lead time

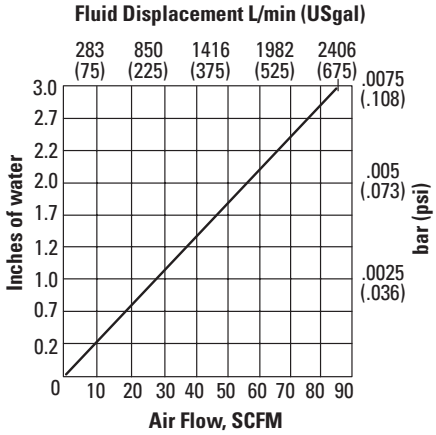
H2O-gate Specifications



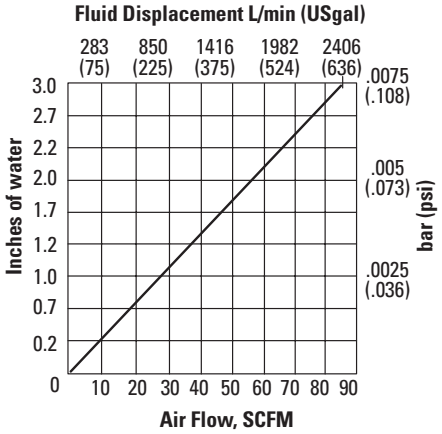
Dirt-gate Specifications



H2O-gate Pressure Drop

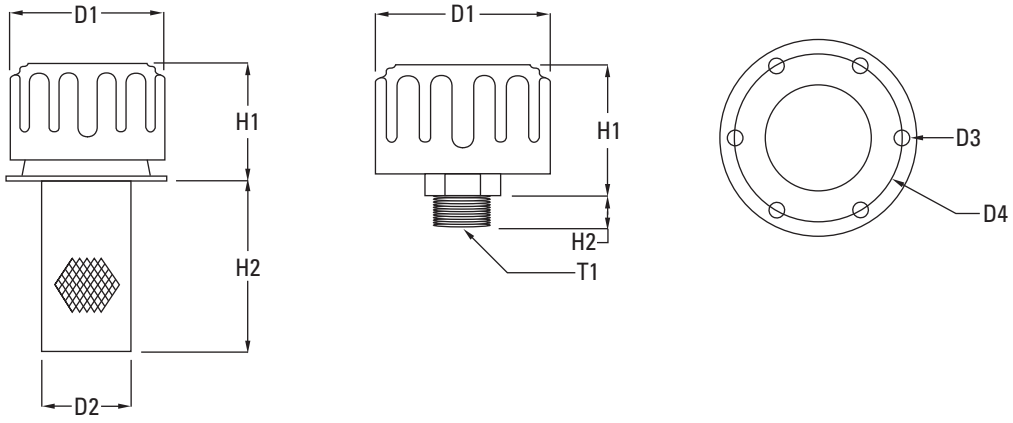


Dirt-gate Pressure Drop



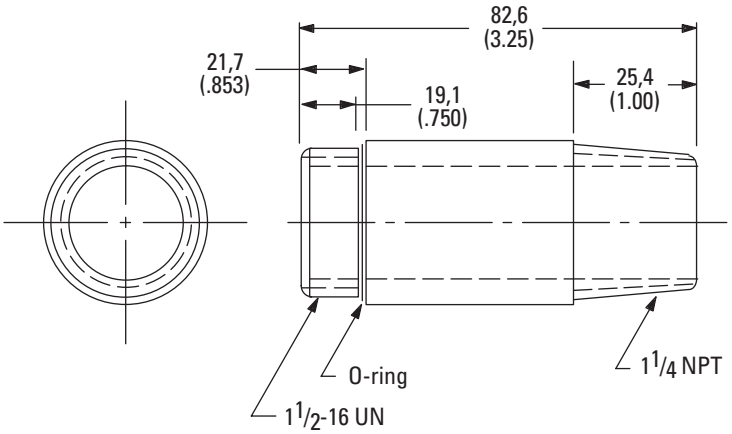
Mobile-gate Specifications

PART NUMBER	FLOW		DIMENSIONS (in)						
	USgpm	L/min	D1	D2	D3	D4	H1	H2	T1
MBR110	125	475	3.08	-	-		2.33	0.63	NPT 3/4
MBR120	125	475	3.08	1.88	-		2.50	3.50	-
MBR120 FLANGE	-	-	-	-	0.25	2.81	-	-	-

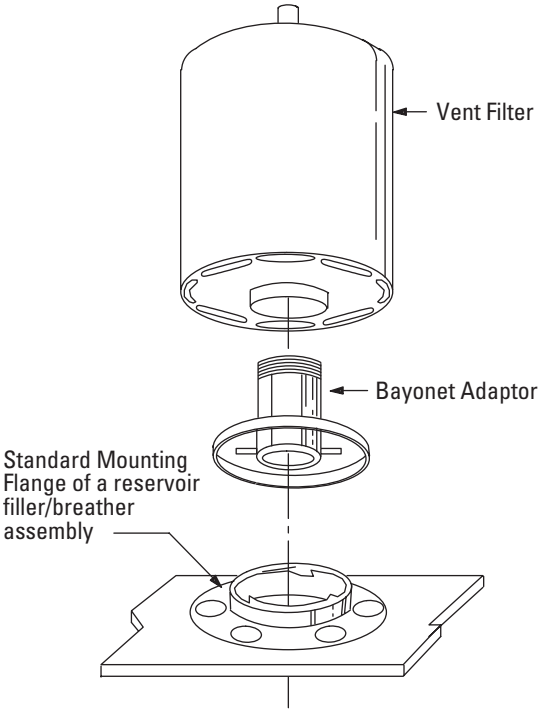


Installation Dimensions

Threaded Pipe Adaptor



Bayonet Adaptor



All Eaton Vent Filters are easily applied to reservoirs via Spin-On adaptors.

MODELS AND PART NUMBERS

Part Number	Description	Vent Filters Applicable
924710	Bayonet, no check	BR110, BR210
P-077002	Threaded pipe	BR110, BR210

Return Line Filters

General Data

Return line filters usually have spin-on type elements, cartridge elements in an in-line mounted housing, or cartridge elements within a housing that is mounted directly within the reservoir itself (sometimes referred to as an in-tank filter).

Return line filters may also be equipped with fluid sampling devices to monitor the fluid cleanliness level. Secondary ports may also be incorporated to add make-up fluid and ensure that the fluid is transferred through a filter before entering the system.

Return line filters are:

- An integral part of an effective contamination control solution.
- Ideal for systems where the pump is the sensitive component.
- An economic means of achieving the target cleanliness level.
- Often placed before the fluid enters the reservoir in order to prevent debris and particles from recirculating through the system.
- A crucial component when cylinders are present in the system. Cylinders potentially contribute a large amount of contamination ingression and return line filters are ideal for this type of control solution.
- Sometimes the only filters necessary (combined with a breather) when seeing the entire system flow on a continuous basis.
- Only a part of an effective contamination control solution when the system employs variable displacement pumps. Filters in systems like this may be supplemented by pressure and/or off-line filters.

Applications

- Stroke boom delimbers
- Drilling platforms
- Die cast machines/ injection molding
- Large machine tools

Return Line Filters

HV3R Series

Flows to 280 L/min (75 USgpm)
Pressures to 50 bar (725 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual and electrical indicators with lamp options for system design flexibility
- Fully serviceable without tools
- Zero leak by-pass valve construction
- Wide range of element lengths for maximum design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- High collapse elements available for non-bypass applications

HV3R Series Filter and Element Model Code

Sample model code:

HV3R1SC4RLB2C05

DESIGN SPECIFICATIONS

Rated flow:	Length 1	160 L/min (42 USgpm)
	Length 2	240 L/min (63 USgpm)
	Length 4	280 L/min (74 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids Optional seals available for phosphate esters.
Temp range:		-30°C to 121°C (-22°F to 250°F)
Pressure rating:	Operating	50 bar (725 psi)
	Fatigue	50 bar (725 psi)
Material:	Head	Aluminum
	Bowl	Carbon Steel
	Collar	Carbon Steel
Dry weight: (Approximate)	Length 1	2,3 kg (5.1 lbs)
	Length 2	2,5 kg (5.5 lbs)
	Length 4	3,4 kg (7.5 lbs)

HV3R	*	**	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - HV3R

2 Element Collapse Rating

1 - 17 bar (250 psi) Low Collapse
4 - 207 bar (3000 psi) High Collapse

3 Port Options

BC - G 1-¼ to ISO 228
SC - 1.625 - 12UN SAE-20 str. Thd. (1-¼" tube)

4 Valve Options

1 - Non-Bypass
3 - Bypass set at 1.7 bar (25 psi)
4 - Bypass set at 3 bar (43 psi)
6 - Bypass set at 6 bar (87 psi)

5 Indicator Options

JN - No Indicator (plug), No Connector
QB - Electrical 1 bar (15 psi) Brad Harrison
QJ - Electrical 1 bar (15 psi) Hirschmann w 24V light
QK - Electrical 1 bar (15 psi) Hirschmann w 115V light
QL - Electrical 1 bar (15 psi) Hirschmann w 230V light
QH - Electrical 1 bar (15 psi) Hirschmann
LN - Visual (30 psi) No Connector
RB - Electrical 2 bar (30 psi) Brad Harrison
RJ - Electrical 2 bar (30 psi) Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi) Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi) Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi) Hirschmann
AN - Visual (70 psi) No Connector
UB - Electrical 4.9 bar (70 psi) Brad Harrison
UJ - Electrical 4.9 bar (70 psi) Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi) Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi) Hirshman w 230 volt light
UH - Electrical 4.9 bar (70 psi) Hirschmann

6 Seal Material

B - Buna-N
V - Viton-A
Viton is a registered trademark of E.I. DuPont

7 Assembly Length

mm (inch)
1 - 207 (8.15)
2 - 266 (10.47)
4 - 447 (17.6)

8 Element Construction

C - 17 bar (250 psi) Low Collapse
H - 207 bar (3000 psi) High Collapse
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
***20**	22/**19/16** or better
XX	no element

Return Line Filters

HV3R Series

Flows to 280 L/min (75 USgpm)
Pressures to 50 bar (725 psi)

V3R ***** ***** ***** ******

1 2 3 4 5

V3R Element Model Code

Sample model code:
V3RB1C05

1 Filter Element
V3R - For use with HV3R series housings

2 Seal Material
B - Buna-N
V - Viton-A

3 Element Length
mm (inch)
1 - 114 (4.5)
2 - 173 (6.8)
4 - 356 (14)

4 Element Construction
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)

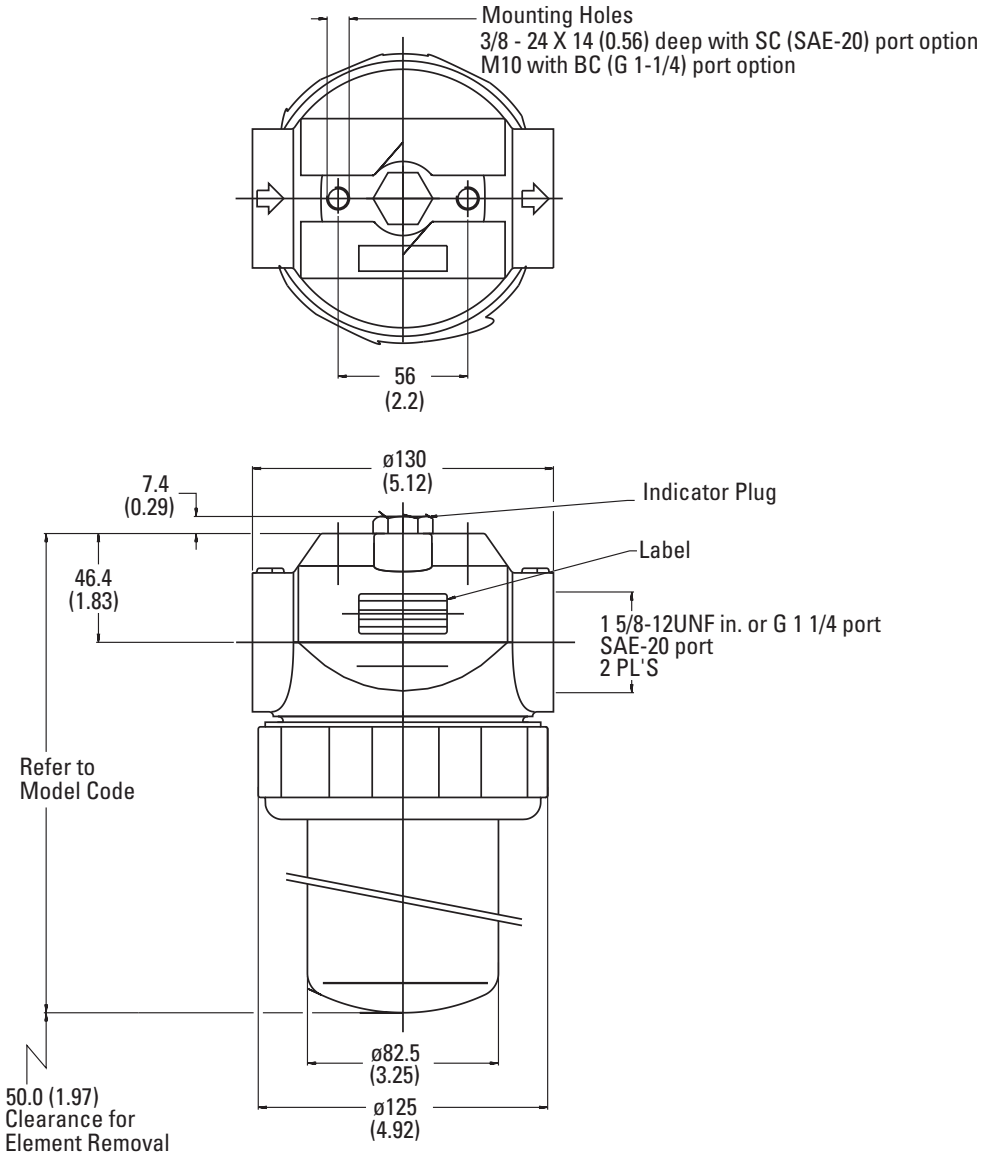
5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
***20**	22/**19/16** or better

*** C - Pak only**

Housing Dimensions

mm (inch)



Items not in bold are non-standard and may have a longer lead time

Return Line Filters

HV3R Series

Flow Data

Flows to 280 L/min (75 USgpm)
Pressures to 50 bar (725 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HV3R Filter Elements Flow Data

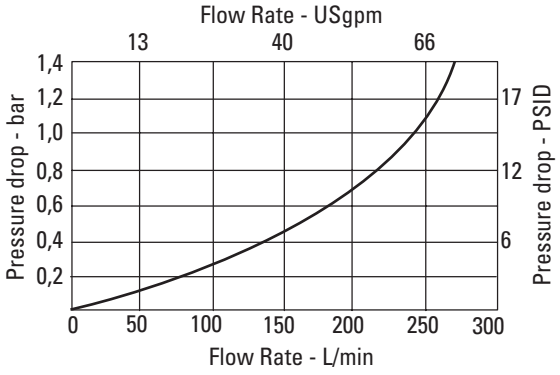
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	1	0.013 (0.717)	0.009 (0.479)	0.005 (0.252)	0.004 (0.193)
	2	0.008 (0.450)	0.006 (0.332)	0.004 (0.196)	0.002 (0.127)
	4	0.004 (0.220)	0.003 (0.170)	0.002 (0.092)	0.001 (0.071)
H -pak	1	0.017 (0.919)	0.010 (0.569)	0.006 (0.321)	xxx
	2	0.011 (0.578)	0.007 (0.374)	0.004 (0.214)	xxx
	4	0.006 (0.312)	0.003 (0.184)	0.002 (0.097)	xxx

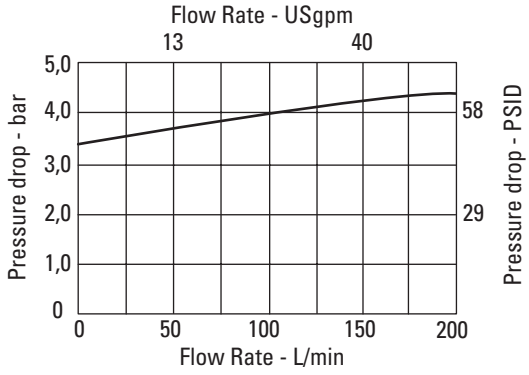
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HV3R1SC4RLB2C05 - Filter assembly having '2' length filter element with micron rating code '05' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.7x 0.8/0.9	+	100 x 0.006 x 46/32 x 0.8/0.9
	=	0.620	+	0.76
	=	**1.38 bar**		

Return Line Filters

HV6R Series

Flows to 1,700 L/min (450 USgpm)
Pressures to 25 bar (360 psi)

Features and Benefits

- Beta Ratio: $\beta_{X(C)}$ = 1,000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Easy to remove cap to facilitate element change and minimize spillage
- Vent and drain ports to facilitate maintenance and system start-up
- Delta P visual, electrical, and electrical indicators with lamp options for system design flexibility
- High efficiency replacement elements in standard configurations (C-Pak)

DESIGN SPECIFICATIONS

Rated flow:	Length 5 Length 8	1,300 L/min (343 USgpm) 1,700 L/min (450 USgpm)
Fluid compatibility:	Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.	
Temp range:	-30°C to *121°C (-22°F to *250°F)	
Pressure rating:	Operating Fatigue	25 bar (360 psi) 25 bar (360 psi)
Material:	Head, Housing, Lid	Aluminum
Dry weight: (Approximate)	Length 5 Length 8	17 kg (37 lbs) 23 kg (50 lbs)
Port Size:	4in SAE Code 61 Flange with Metric threads (M16 bolts provided)	

HV6R Series Filter and Element Model Code

Sample model code:

HV6R1MT4RLB8C05

HV6R	1	*	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - HV6R

2 Element Collapse Rating

1 - 10 bar (150 psi)

3 Mounting Options

F - In-line
T - In-tank

4 Valve Options

1 - Non-Bypass
2 - Bypass set at 1.7 bar (25 psi) cracking pressure
4 - Bypass set at 3 bar (43 psi) cracking pressure

5 Indicator Options

AN - Visual 4.9 bar (70 psi) No Connector
KN - Visual 1 bar (15 psi) No Connector
LN - Visual 2 bar (30 psi) No Connector
JN - No Indicator (plug), No Connector
QB - Electrical 1 bar (15 psi) Brad Harrison
QJ - Electrical 1 bar (15 psi) Hirschmann w 24V light
QK - Electrical 1 bar (15 psi) Hirschmann w 115V light
QL - Electrical 1 bar (15 psi) Hirschmann w 230V light
QH - Electrical 1 bar (15 psi) Hirschmann
RB - Electrical 2 bar (30 psi) Brad Harrison
RJ - Electrical 2 bar (30 psi) Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi) Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi) Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi) Hirschmann
UB - Electrical 4.9 bar (70 psi) Brad Harrison
UJ - Electrical 4.9 bar (70 psi) Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi) Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi) Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi) Hirschmann

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
5 - 606 (23.9)
8 - 1045 (41.1)

8 Element Construction

C - Standard Construction
L - Deep pleat Construction
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

HV6R Series

Flows to 1,700 L/min (450 USgpm)
Pressures to 25 bar (360 psi)

V041 1 * * * **

1 2 3 4 5 6

V041 Element Model Code

Sample model code:
V0411B5L03

1 Filter element
V041 - For use with HV6R series housings

2 Element collapse rating
1 - 10 bar (150 psi) Low Collapse

3 Seal material
B - Buna-N
V - Viton-A

4 Element length
mm (inch)
5 - 406 (16)
8 - 990 (39)

5 Element construction
C - C-Pak (code 03, 05, 10, 20)
L - L-Pak (code 03, 05, 10, 20)

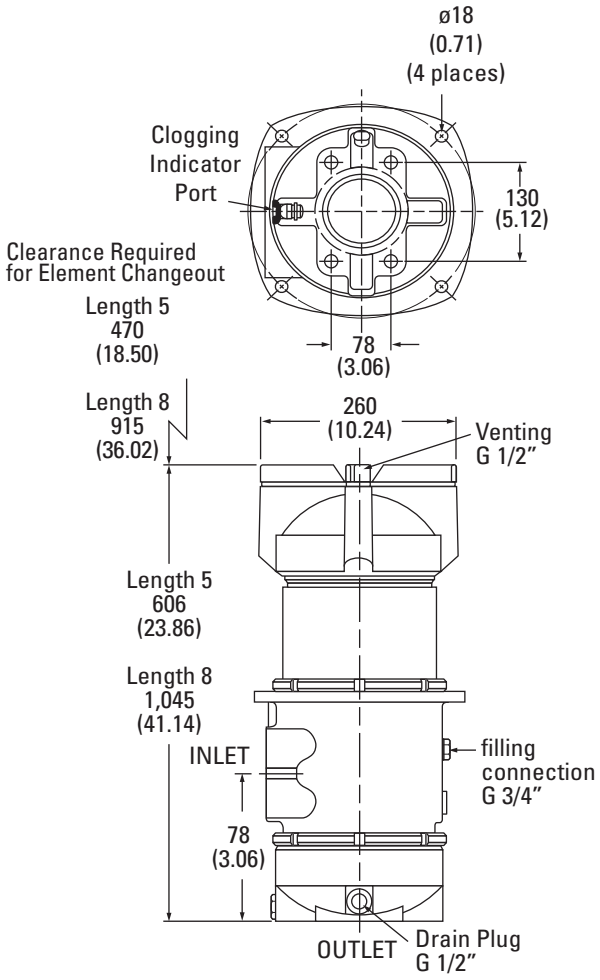
6 Fluid cleanliness rating
Target fluid

Code	cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

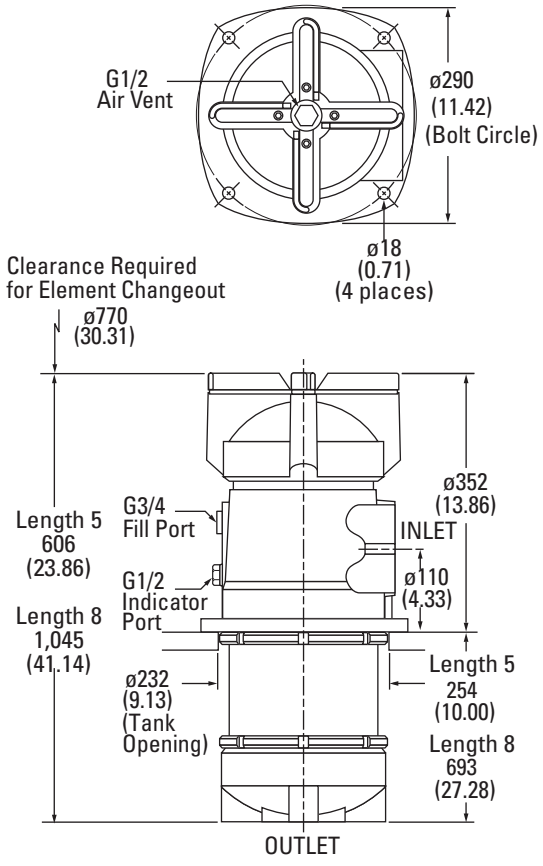
Housing Dimensions

mm (inch)

In-line HV6R



In-tank HV6R



Items not in bold are non-standard and may have a longer lead time

Return Line Filters

HV6R Series

Flow Data

Flows to 1,700 L/min (450 USgpm)
Pressures to 25 bar (360 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HV6R Filter Elements Flow Data

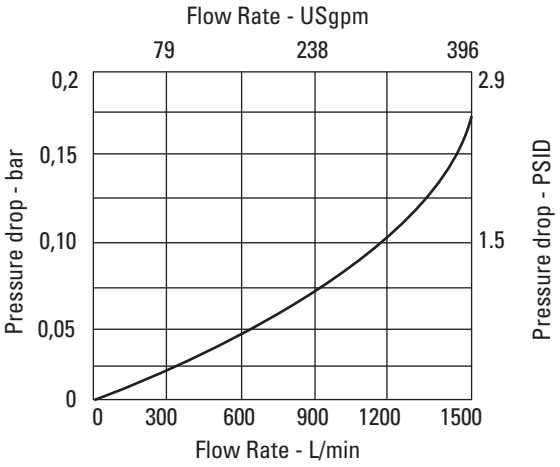
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	5	0.001 (0.055)	0.001 (0.046)	0.001 (0.026)	0.001 (0.014)
	8	0.001 (0.023)	0.001 (0.019)	0.001 (0.011)	0.001 (0.006)
L -pak	5	0.001 (0.046)	0.001 (0.038)	0.001 (0.021)	0.001 (0.012)
	8	0.001 (0.017)	0.001 (0.014)	0.001 (0.008)	0.001 (0.004)

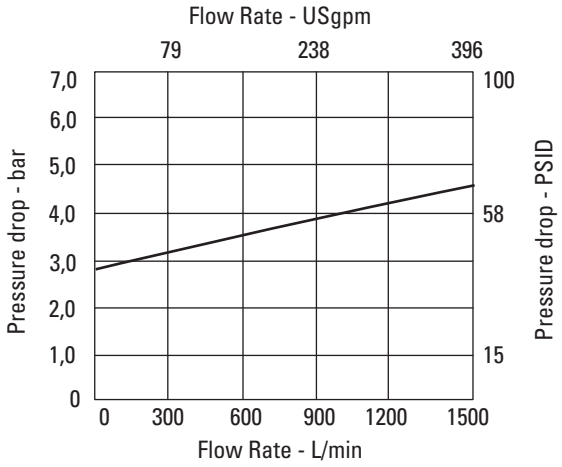
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HV6R1MT4RLB8C05 - Filter assembly having '8' length filter element with micron rating code '05' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.) 0.8

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.01x 0.8/0.9	+	200 x 0.001 x 46/32 x 0.8/0.9
	=	0.008	+	0.25
	=	**0.26 bar**		

Return Line Filters

HV6RD Series

Flows to 1,700 L/min (450 USgpm)
Pressures to 25 bar (360 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)} = 1000$ to ISO 16889
- Extremely large filtration area and flow capacity
- Designed for both in-tank and inline applications
- Easy filter replacement using screw-on lid
- Vent and drain ports are standard
- Anodization is not required for aluminum alloy when using water based fluids
- Reusable contamination basket prevents re-entry of retained contaminants into the reservoir during element replacement
- Filters can be fitted with clogging indicators to monitor the contamination level of the element
- HV6RD duplex filters have a ball-type selector valve to provide continuous filtration and eliminate the need to shut-down the system during element changeout

Series HV6RD Filter Model Code

Sample model code:

HV6RD1F2KNB1C05

Note:

Elements used in the HV6RD are not dimensionally equivalent to elements in the HV6R series. An indicator is supplied for each side.

DESIGN SPECIFICATIONS

Rated flow:	Length 1 Length 2	1300 L/min (343 USgpm) 1700 L/min (450 USgpm)
Fluid compatibility:	Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.	
Temp range:	-30°C to +121°C (-22°F to +250°F)	
Pressure rating:	Operating Fatigue	25 bar (360 psi) 25 bar (360 psi)
Material:	Head Housing Manifolds	Aluminum Aluminum Ductile Iron
Dry weight: (Approximate)	Length 1 Length 2	33,6 kg. (74 lbs) 79,8 kg. (176 lbs)
Port size:	4 in SAE Code 61 Flange with metric threads (M16 bolts provided)	

For additional filtration HV6RD filters can be configured with multiple housings/elements evenly mounted parallel to a single head. These configurations can be designed in evenly balanced series, for example: 2x2 would be 4 total elements with 2 on each side of the head. Contact Eaton to specify.

HV6RD	1	*	*	*	*	*	*	**	*
1	2	3	4	5	6	7	8	9	10

1 Filter Series - HV6RD

2 Element Collapse Rating

1 - 10 bar (150 psi) Low collapse

3 Mounting Options

F - Inline
T - In-Tank

4 Valve Options

1 - Non-Bypass
2 - Bypass set at 1.7 bar (25 psi) pressure
4 - Bypass set at 3 bar (43 psi) cracking
6 - Bypass set at 6 bar (87 psi) pressure

5 Indicator Options

AN - Visual 4.9 bar (70 psi) No Connector
KN - Visual 1 bar (15 psi) No Connector
LN - Visual 2 bar (30 psi) No Connector
JN - No Indicator (plug), No Connector
MB - Electrical 1 bar (15 psi) Brad Harrison
MJ - Electrical 1 bar (15 psi) Hirshman w 24 volt light
MK - Electrical 1 bar (15 psi) Hirschmann w 115 volt light
ML - Electrical 1 bar (15 psi) Hirschmann w 230 volt light
MH - Electrical 1 bar (15 psi) Hirschmann
RB - Electrical 2 bar (30 psi) Brad Harrison
RJ - Electrical 2 bar (30 psi) Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi) Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi) Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi) Hirschmann
UB - Electrical 4.9 bar (70 psi) Brad Harrison
UJ - Electrical 4.9 bar (70 psi) Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi) Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi) Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi) Hirschmann

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length
mm (inch)

1 - 606 (24)
2 - 1045 (41)

8 Element Construction

C - Standard Construction
L - Deep Pleat Construction
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

10 Flow Path

A - Front inlet, front outlet
B - Front inlet, back outlet
C - Top inlet, front outlet
D - Top inlet, bottom outlet
E - In-Tank mount

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

HV6RD Series

Flows to 1,700 L/min (450 USgpm)
Pressures to 25 bar (360 psi)

V301 2 * * * *

1 2 3 4 5 6

V301 Element model code

Sample model code:
V3012B1C10

1 Filter Element - V301

2 Element Collapse Rating
2 - 17 bar (250 psi) Collapse

3 Seal Material
B - Buna-N
V - Viton-A

4 Element Length
mm (in)
1 - 254 (10)
2 - 693 (27)

5 Element Construction
C - C-pak (code 03, 05, 10, 20)
L - L-pak (code 03, 05, 10, 20)

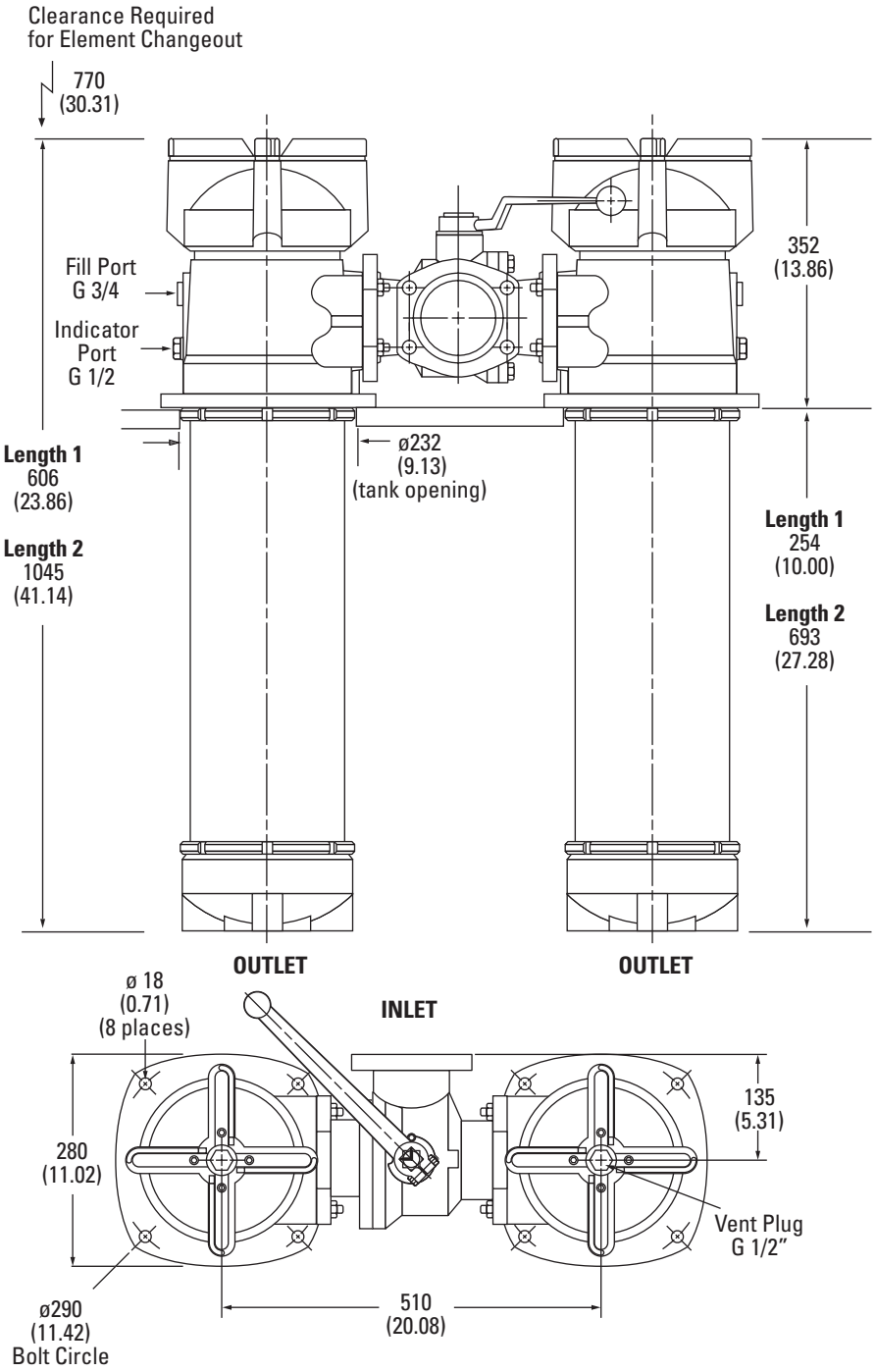
6 Fluid Cleanliness Rating
Target fluid

Code	cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions

mm (inch)

In-tank



Items not in bold are non-standard and may have a longer lead time

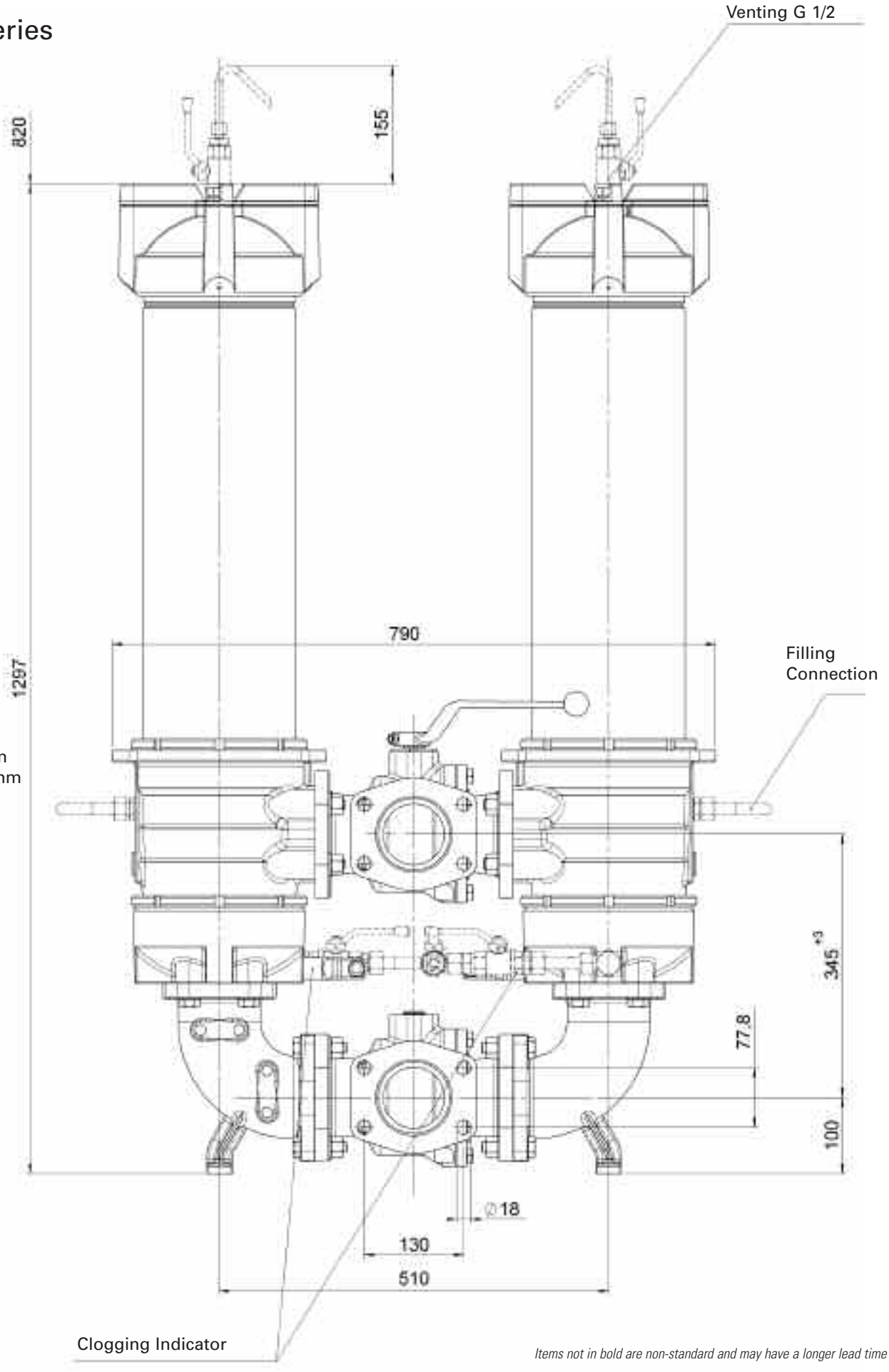
Return Line Filters

HV6RD Series

Housing Dimensions

mm (inch)

In-Line



Items not in bold are non-standard and may have a longer lead time

Return Line Filters

HV6RD Series

Flow Data

Flows to 1,700 L/min (450 USgpm)
Pressures to 25 bar (360 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HV6RD Filter Elements Flow Data

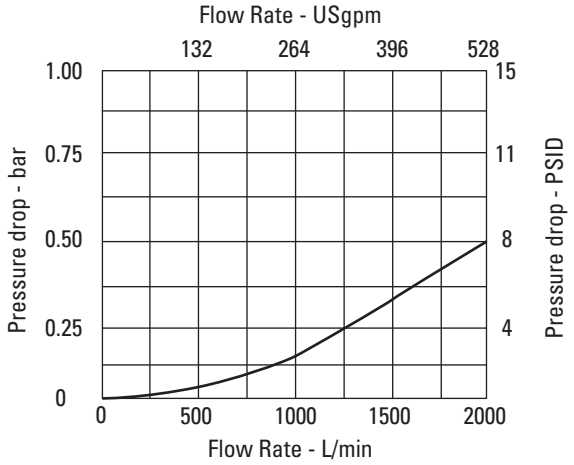
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	1	0.001 (0.055)	0.001 (0.046)	0.001 (0.026)	0.001 (0.014)
	2	0.001 (0.023)	0.001 (0.019)	0.001 (0.011)	0.001 (0.006)
L -pak	1	0.001 (0.046)	0.001 (0.038)	0.001 (0.021)	0.001 (0.012)
	2	0.001 (0.017)	0.001 (0.014)	0.001 (0.008)	0.001 (0.004)

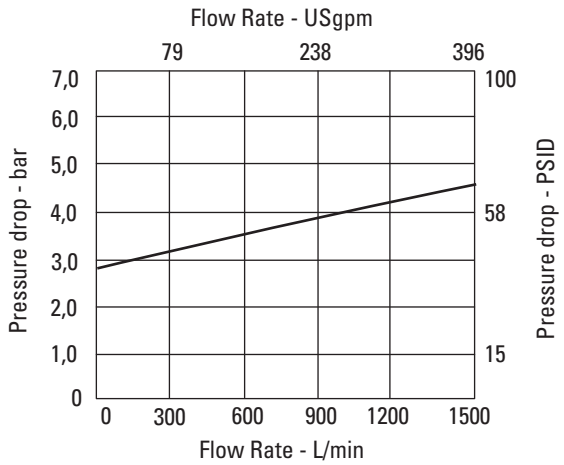
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HV6RD1F2ANB1C05 - Filter assembly having '1' length filter element with micron rating code '05' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.05 x 0.8/0.9	+	200 x 0.001 x 46/32 x 0.8/0.9
	=	0.044	+	0.25
	=	**0.44 bar**		

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

OFR30 Series

Flows to 115 L/min (30 USgpm)
Pressures to 40 bar (600 psi)

Features and Benefits

- OFR-30 conforms to HF3 specifications
- Flows to 115 L/min (30 USgpm)
- Visual indicator is standard
- Electrical indicator also available
- Bypass valve is standard
- Replacement elements available in C-Pak

DESIGN SPECIFICATIONS

Rated flow:		115 L/min (30 US gpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids.
Temp range:		-40°C to +107°C (- 40°F to +225°F)
Pressure rating:	Operating	40 bar (600 psi)
Bypass setting:		1.7 bar (25 psi)
Material:	Head Bowl	Die cast aluminum Carbon steel
Dry weight: (Approximate)		5,4 kg (12lbs)

OFR30 Series Filter and Element Model Code

Sample model code:
OFR30SBC03M30

OFR 30 * * * ** * 30
1 2 3 4 5 6 7 8

1 Filter Type - OFR

2 Flow Capacity
30 - 115 L/min (30 USgpm)

3 Port Options
B - G1 (formerly 1" BSPF) thread
F - 1" SAE 4-bolt flange Code 61
S - 1.3125-12 UN SAE-16 straight thread 1" O.D. tube

4 Seal Material
B - Buna
V - Viton

5 Element Construction
C - C-Pak (code 03, 05 10, 20)
X - no element

6 Fluid Cleanliness Rating

Code	Target Fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**
20	22/**19/16**
XX	**no element**

7 Delta Indicator Options
M - Mechanical 1.7 bar (25psi)
E - Electrical 1.7 bar (25psi)

8 Design
30 - Standard Design

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

OFR30 Series

Flows to 115 L/min (30 USgpm)
Pressures to 40 bar (600 psi)

V602 1 * 2 C **
1 2 3 4 5 6

V602 Element Model Codes

(Meets HF3 Specifications)

Sample model code:
V6021B2C03

1 Filter Element -V602

2 Element Collapse Rating
1 - 10 bar (150 psi) Low Collapse

3 Seals
B - Buna-N
V - Viton-A

4 Element Length
mm (inch)
2 - 203 (8) (HF3 length)

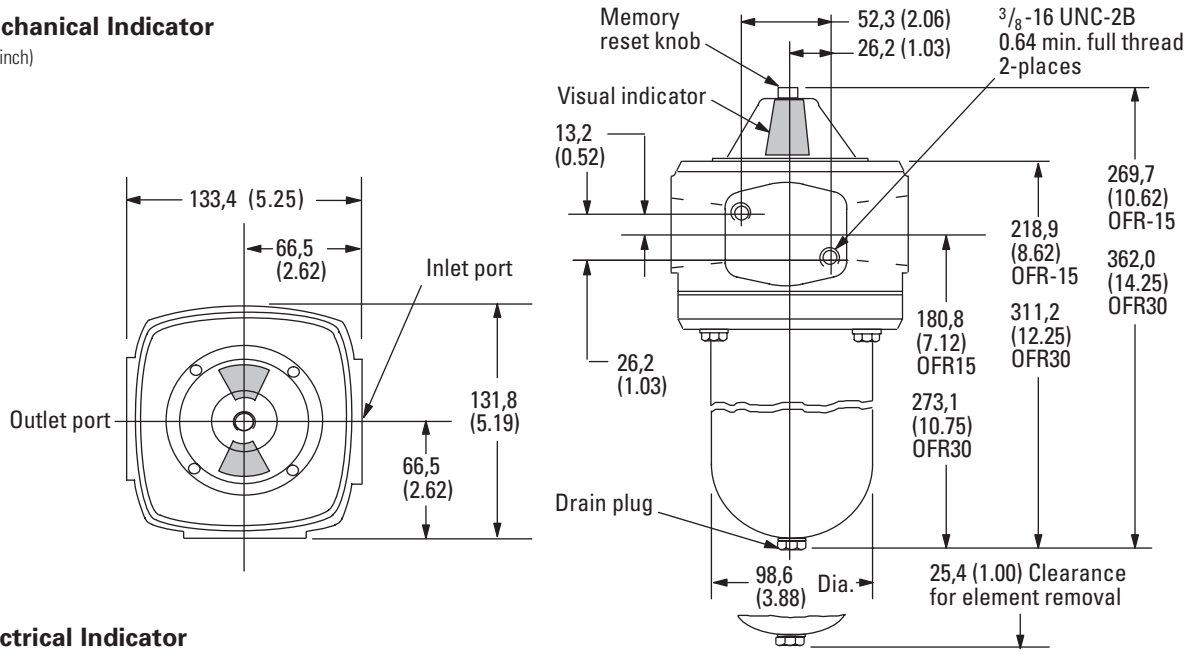
5 Element Construction
C - C-Pak (code 03, 05, 10, 20)

6 Fluid Cleanliness Ratings

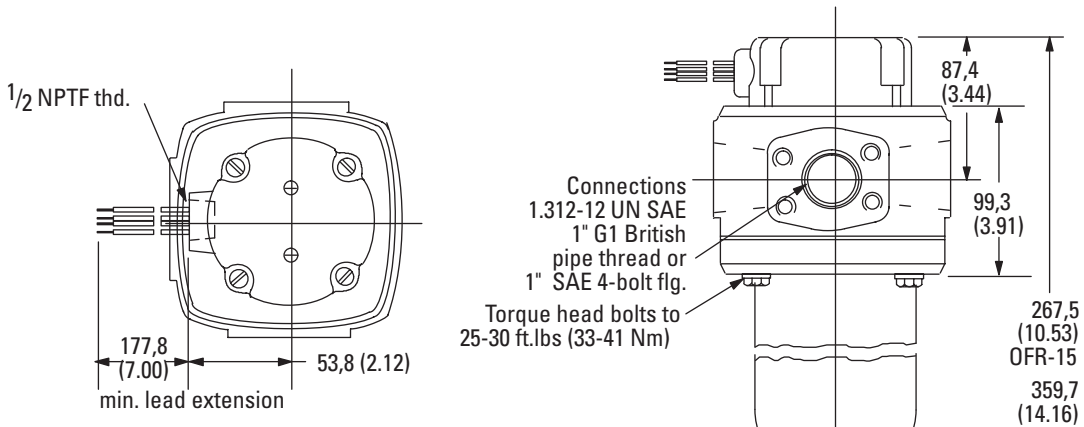
Code	Target fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**
20	22/**19/16**

Housing Dimensions

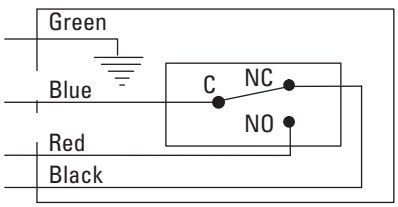
Mechanical Indicator
mm (inch)



Electrical Indicator
mm (inch)



Electrical Indicator Switch Circuit



Items not in bold are non-standard and may have a longer lead time

Return Line Filters

OFR 30 Series

Flow Data

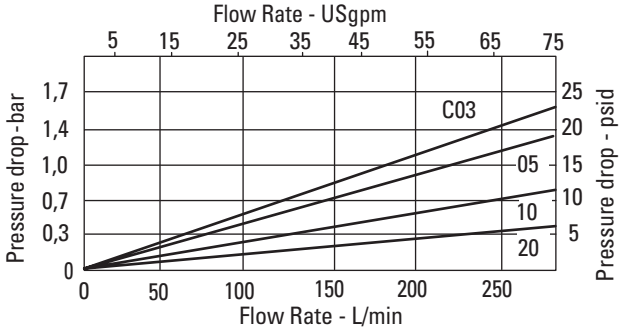
Flows to 115 L/min (30 USgpm)
Pressures to 40 bar (600 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤ 0.9

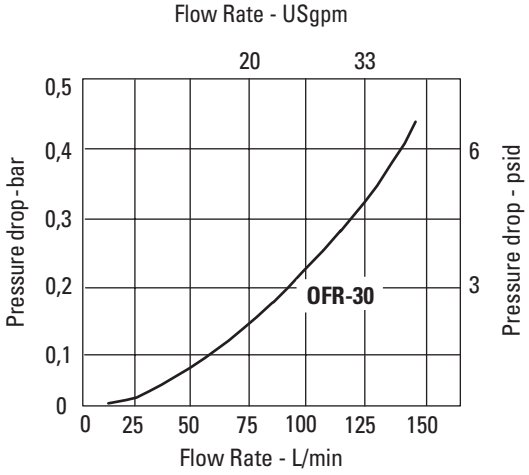
Element Flow Data

OFR30 C-Pak

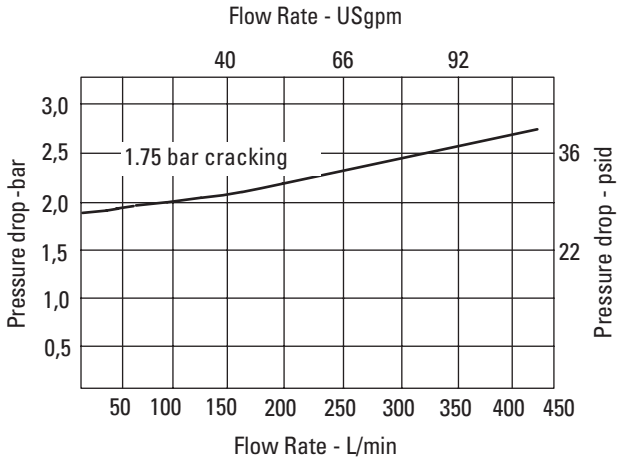


Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : OFR30SBC03M30 - Filter assembly having filter element with micron rating code '03' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.22 x 0.8/0.9	+	0.5 x 46/32 x 0.8/0.9
	=	0.193	+	0.632
	=	**0.83 bar**		

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

OFR 60/120 Series

Flows to 450 L/min (120 USgpm)
Pressures to 27 bar (400 psi)

Features and Benefits

- Visual indicator is standard
- Electrical indicator also available
- Bypass valve is standard
- Replacement elements available in C-Pak

DESIGN SPECIFICATIONS

Rated flow:	OFR60 OFR120	225 L/min (60 USgpm) 450 L/min (120 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids.
Temp range:		-40°C to +107°C (-40°F to +225°F)
Pressure rating:	Operating	27 bar (400 psi)
Material:	Head Bowl	Die cast aluminum Carbon steel
Dry weight: (Approximate)	OFR60 OFR120	6,8 kg (15 lbs) 9,5 kg (21 lbs)

OFR 60/120 Series Filter and Element Model Code

Sample model code:
OFR060SBC03M2530

OFR	***	*	*	*	**	*	**	30
1	2	3	4	5	6	7	8	9

1 Filter Type
OFR - Oil filter return line

2 Flow Capacity
060 - 227 L/min (60 USgpm)
120 - 454 L/min (120 USgpm)

3 Port Options
F - 1-1/2" SAE 4-bolt flange Code 61
S - 1.875-12 UN SAE-24 straight thread for 1-1/2" O.D. tube

4 Seal Material
B - Buna
V - Viton

5 Element Construction
C - C-Pak (code 03, 05 10, 20)
X - no element

6 Fluid cleanliness rating

Code	Target fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**
20	22/**19/16**
XX	**no element**

7 P Indicator Options
M - Mechanical
E - Electrical

8 Bypass Setting
25 - Bypass set at 1.7 bar (25 psi) Standard cracking pressure
35 - Bypass set at 2 bar (35 psi) cracking pressure
50 - Bypass set at 3 bar (50 psi) cracking pressure**

** **CAUTION**
Applications involving high flow surges may cause element collapse due to instantaneous pressure spikes.

9 Design
30 - Standard Design

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

OFR 60/120 Series

Flows to 450 L/min (120 USgpm)
Pressures to 27 bar (400 psi)

V405 1 * * C **

1 2 3 4 5 6

V405 Element Model Code

(Meets HF4 Standard)

Sample model code:

V4051B3C03

1 Filter Element - V405

2 Element Collapse Rating

1 - 10 bar (150 psi)

3 Seals

B - Buna-N
V - Viton-A

4 Element Length

mm (inch)

3 - 229 (9) (Use in OFR-60)*
6 - 457 (18) (Use in OFR-120)

5 Element Construction

C - C-Pak (code 03, 05, 10, 20)

6 Fluid Cleanliness Rating

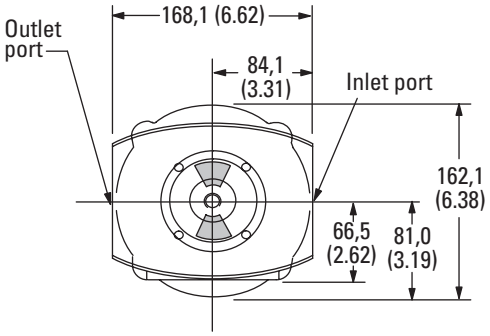
Code	Target fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**
20	22/**19/16**

*NOTE: Two 9 inch elements and a P-227567-01 reusable connector can also be used in the OFR-120 housing. This arrangement meets HF4 specifications.

Housing Dimensions

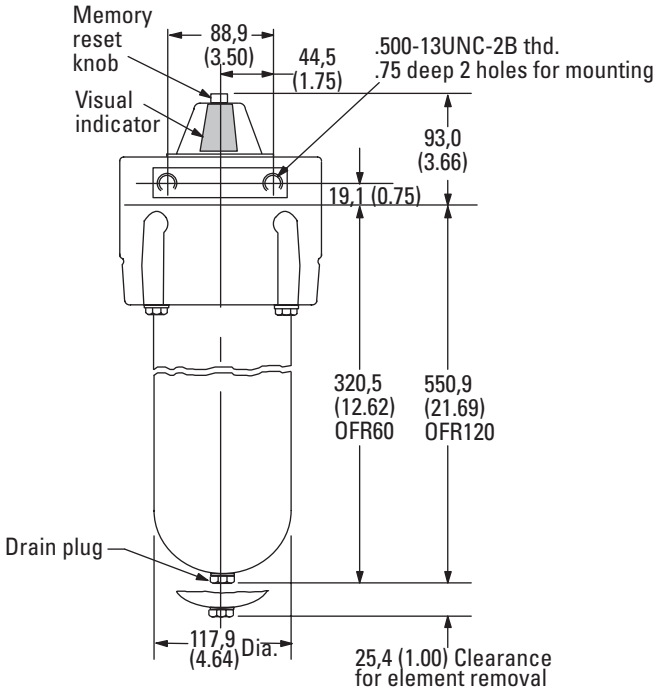
Mechanical Indicator

mm (inch)



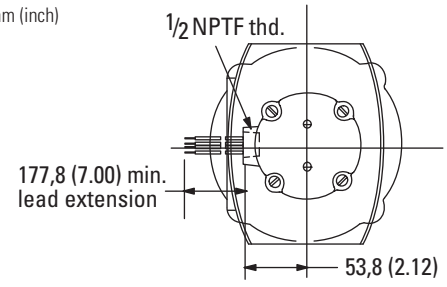
Note:

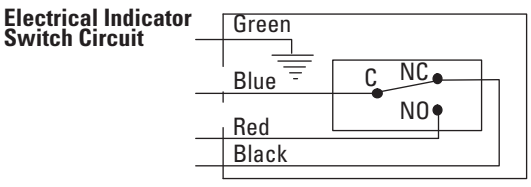
Plastic plug, part number 737365, is installed in the filter element to close the end of the element. When servicing element, remove and retain plastic plug 737365. Install new element with plastic plug on bottom.

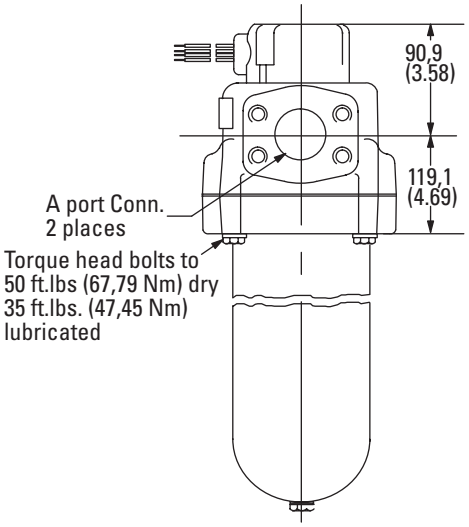


Electrical Indicator

mm (inch)







Items not in bold are non-standard and may have a longer lead time

Return Line Filters

OFR 60/120 Series

Flows to 450 L/min (120 USgpm)
Pressures to 27 bar (400 psi)

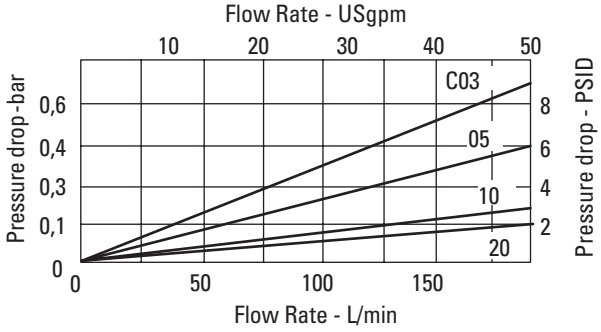
Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

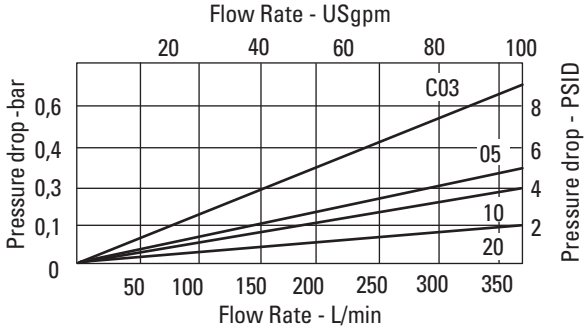
Flow Data

Element Flow Data

OFR60 C-Pak Element

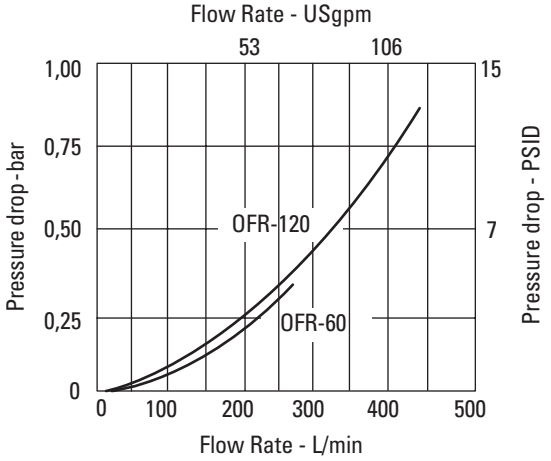


OFR120 C-Pak Element

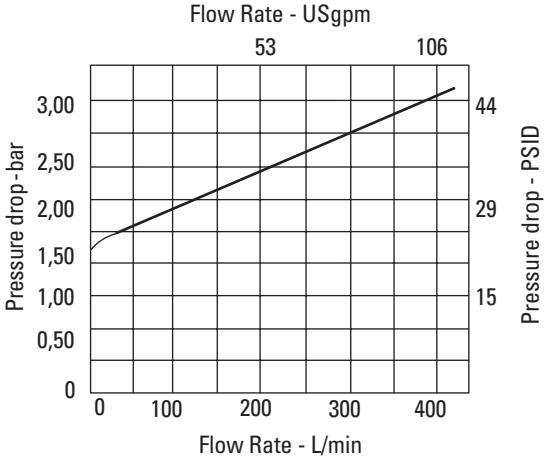


Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : OFR060SBC03M2530 - Filter assembly having a filter element with micron rating code '03' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.2 x 0.8/0.9	+	0.7 x 46/32 x 0.8/0.9
	=	0.170	+	0.885
	=	**1.07 bar**		

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

DLR DIN Series Filters

Flows to 400 L/min (106 USgpm)
Pressures to 25 bar (363 psi)

Features and Benefits

- Beta Ratio: $\beta_{X(C)}$ = 1000 to ISO 16889
- Visual, electrical and electrical indicators with light options for system design flexibility
- Fully serviceable without tools
- Zero leak by-pass valve construction
- Wide range of element lengths for maximum design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels

DESIGN SPECIFICATIONS

Rated flow:	160	160 L/min (42.2 USgpm)
	250	250 L/min (66.0 USgpm)
	400	400 L/min (105.7 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters
Temp range:		-30˚C to +100˚C (-22˚F to +212˚F)
Pressure rating:	Operating	25 bar (363 psi)
Material:		Aluminum
Dry weight:	160	4,3 kg (9.5 lbs)
	250	4,9 kg (10.8 lbs)
	400	5,9 kg (13.0 lbs)

DLR Series Filter

Sample model code:

DLR1160BE6ANBC03

DLR 1 * ** * ** * * **
1 2 3 4 5 6 7 8 9**

1 Filter Series
DLR - DIN Low Pressure Return

2 Element Collapse Rating
1 - Low Collapse

3 Nominal Size
160 - 160L/min (42.2USgpm)
250 - 250L/min (66.0USgpm)
400 - 400L/min (105.7USgpm)

4 Port Size
BE - G 1-1/4 (Length 160 only)
BF - G 1-1/2 (Length 250 only)
BK - 1-1/2" SAE Flange Code 61 with M16 bolts (DN38) (Length 400 only)

5 Valve Options
1 - Non-Bypass
6 - 7 Bar (100 psi)

6 Indicator Options
AN - Visual 4.9 bar (70 psi) No Connector
JN - No Indicator, No Connector
TH - Electrical 4.9 bar (70 psi) Hirschmann

7 Seal Material
B - Buna-N
V - Viton-A

8 Element Construction
C - Standard Construction
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**
XX	no element

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

DLR DIN Series Filters

Flows to 400 L/min (106 USgpm)
Pressures to 25 bar (363 psi)

VDP * * C ****

1 2 3 4 5

Element model code

Sample model code:
VDP160BC06

1 Filter Element
VDP - DIN Standard Element

2 Nominal Size - Flow Assembly Length
160 - 160L/min (42.2USgpm) 297mm(11.7")
250 - 250L/min (66.0USgpm) 375mm(14.8")
400 - 400L/min (105.7USgpm) 525mm(20.7")

3 Seal Material
B - Buna-N
V - Viton-A

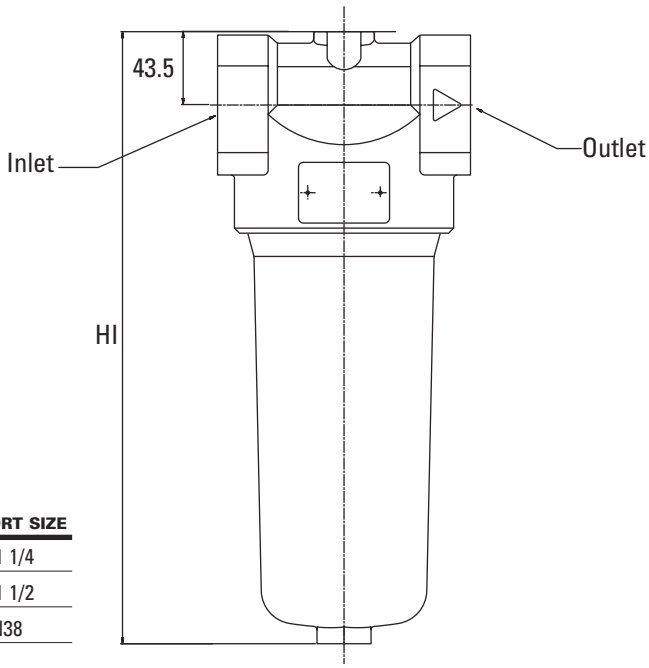
4 Element Construction
C - Standard Construction

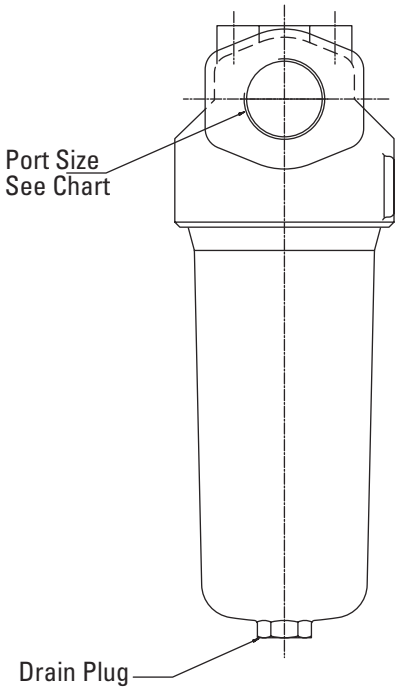
5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**

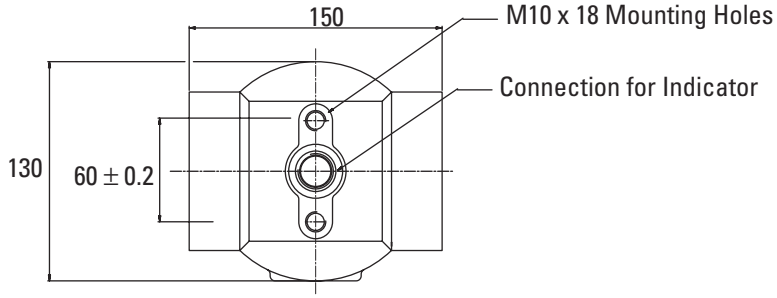
DLR Housing

Dimensions in mm





TYPE	HI	PORT SIZE
DLR 160	285	G 1 1/4
DLR 250	363	G 1 1/2
DLR 400	513	DN38



Items not in bold are non-standard and may have a longer lead time

Return Line Filters

DLR DIN Series Filters

Flows to 400 L/min (106 USgpm)
Pressures to 25 bar (363 psi)

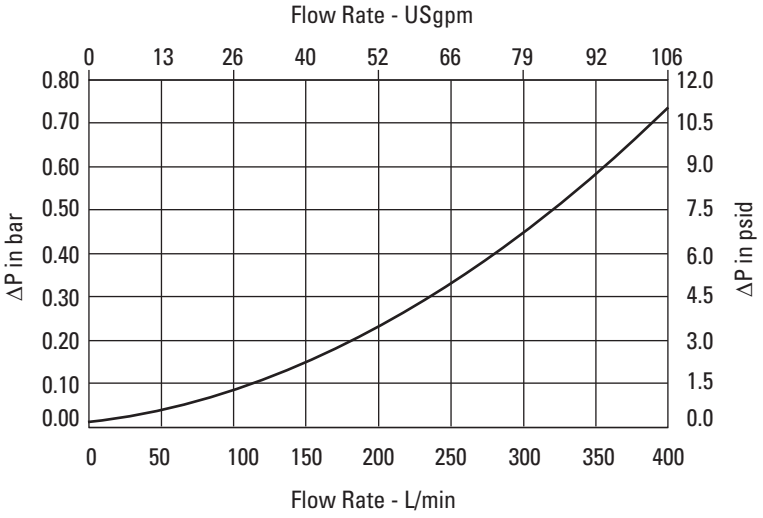
DLR DIN Filter Elements Flow Data

'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	6	10	25
C -pak	160	0.013 (0.717)	0.009 (0.479)	0.005 (0.252)	0.004 (0.193)
	250	0.005 (0.275)	0.003 (0.178)	0.002 (0.111)	0.001 (0.091)
	400	0.003 (0.178)	0.002 (0.111)	0.001 (0.073)	0.001 (0.055)

Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

DLR 160/250/400 Housing



Sample ΔP Calculation : DLR1160BE6ANBC03 - Filter assembly having '160' size filter element with micron rating code '03' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.8x 0.8/0.9	+	100 x 0.013 x 46/32 x 0.8/0.9
	=	0.700	+	1.65
	=	**2.35 bar**		

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

LND Duplex

Flows to 400 L/min (105 USgpm)
Pressures to 25 bar (360 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Lightweight duplex filter constructed of aluminum
- Aluminum alloy is water tolerant - anodization is not required for high water based fluids (HWBF)
- The screw-in bowl allows the filter element to be easily removed for replacement or cleaning
- The standard model is supplied with vent and drain plugs and also a connection for differential clogging indicator

DESIGN SPECIFICATIONS

Rated flow:	Length 1	160 L/min (42 USgpm)
	Length 2	250 L/min (66 USgpm)
	Length 4	400 L/min (105 USgpm)
Fluid compatibility:		Compatible with all petroleum oils and synthetic fluids rated for use with Fluoro-Rubber or Ethylene Propylene seals.
Temp range:		-30°C to + 121°C (-22°F to 250°F)
Pressure rating:	Operating	25 bar (360 psi)
	Fatigue	25 bar (360 psi)
Material:		Aluminum
Dry weight:	Length 1	10,3 kg (22.7 lbs)
(Approximate)	Length 2	11,6 kg (25.6 lbs)
	Length 4	13,0 kg (28.7 lbs)

LND	1	SD	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

LND Series Filter and Element Model Code

Sample model code:
LND1SD7ANV2C05

1 Filter Series - LND

2 Element Collapse Rating
1 - 250 psi Low Collapse

3 Port Options
SD - 1.875 - 12 UN SAE - 24 Straight thread

4 Valve Options
1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
7 - Bypass set at 7 bar (102 psi) cracking pressure

5 Indicator Options
AN - Visual 4.9 bar (70 psi) No Connector
JN - No Indicator (plug), No Connector
LN - Visual 2 bar (30 psi) No Connector
RB - Electrical 2 bar (30 psi) Brad Harrison
RH - Electrical 2 bar (30 psi) Hirshmann
RJ - Electrical 2 bar (30 psi) Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi) Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi) Hirschmann w 230 volt light
UB - Electrical 4.9 bar (70 psi) Brad Harrison
UH - Electrical 4.9 bar (70 psi) Hirschmann
UJ - Electrical 4.9 bar (70 psi) Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi) Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi) Hirschmann w 230 volt light

6 Seal Material
B - Buna-N
V - Viton-A

7 Assembly Length
mm (inch)
1 - 297 (11.7")
2 - 375 (14.8")
4 - 525 (20.7)

8 Element Construction
C - Standard Construction
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Items not in bold are non-standard and may have a longer lead time

Return Line Filters

LND Duplex

Flows to 400 L/min (105 USgpm)
Pressures to 25 bar (360 psi)

VDP ******* ***** **C** ******

1 2 3 4 5

Element model code

Sample model code:

VDP160BC06
(2 elements required)

1 Filter Element

VDP - DIN Standard Element

2 Nominal Size - Flow Assembly Length

160 - 160L/min (42.2USgpm) 297mm(11.7")
250 - 250L/min (66.0USgpm) 375mm(14.8")
400 - 400L/min (105.7USgpm) 525mm(20.7")

3 Seal Material

B - Buna-N
V - Viton-A

4 Element Construction

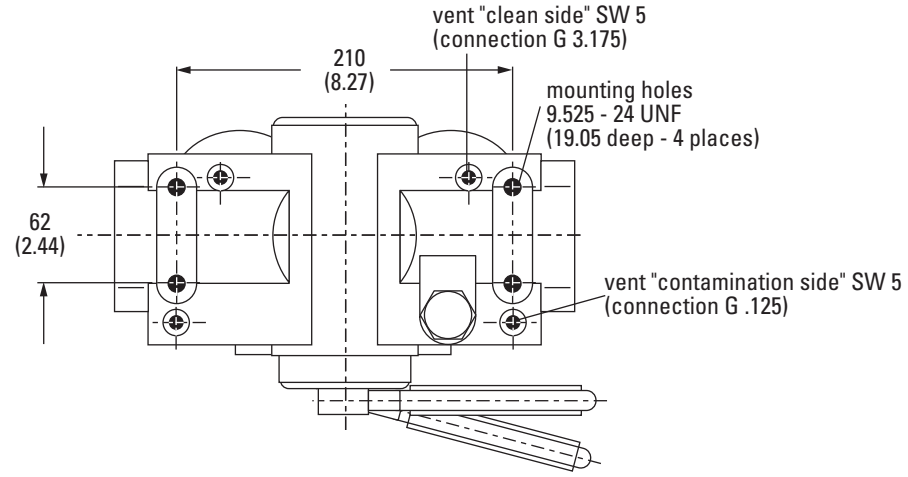
C - Standard Construction

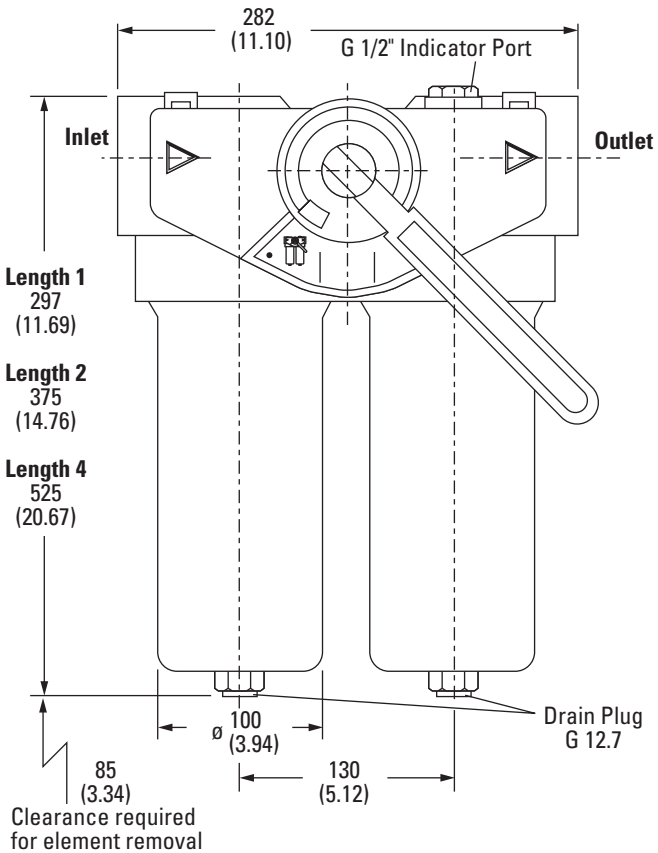
5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**

Housing Dimensions

mm (inch)





Items not in bold are non-standard and may have a longer lead time

Return Line Filters

LND Duplex

Flow Data

Flows to 400 L/min (105 USgpm)
Pressures to 25 bar (360 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

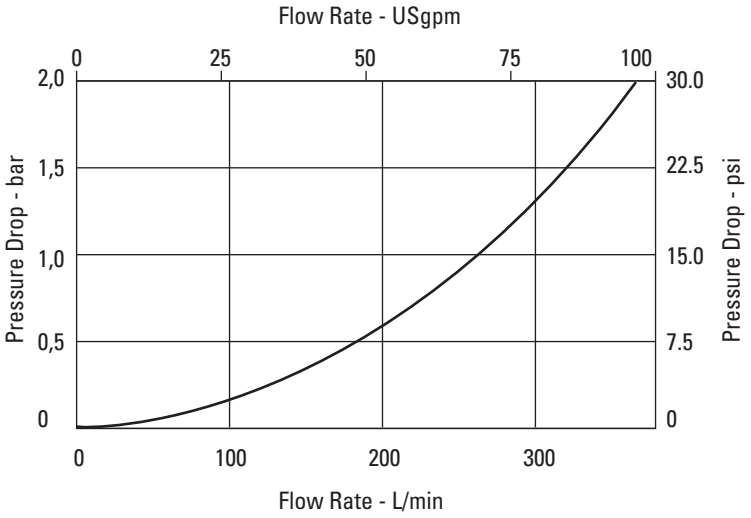
LND Filter Elements Flow Data

'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	25
C -pak	1	0.013 (0.717)	0.009 (0.479)	0.005 (0.252)	0.004 (0.193)
	2	0.005 (0.275)	0.003 (0.178)	0.002 (0.111)	0.001 (0.091)
	4	0.003 (0.178)	0.002 (0.111)	0.001 (0.073)	0.001 (0.055)

Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data



Sample ΔP Calculation : LND1SD1ANV2C05 - Filter assembly having '2' length filter element with micron rating code '05' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.2 x 0.8/0.9	+	100 x 0.003 x 46/32 x 0.8/0.9
	=	0.170	+	0.38
	=	**0.55 bar**		

Items not in bold are non-standard and may have a longer lead time

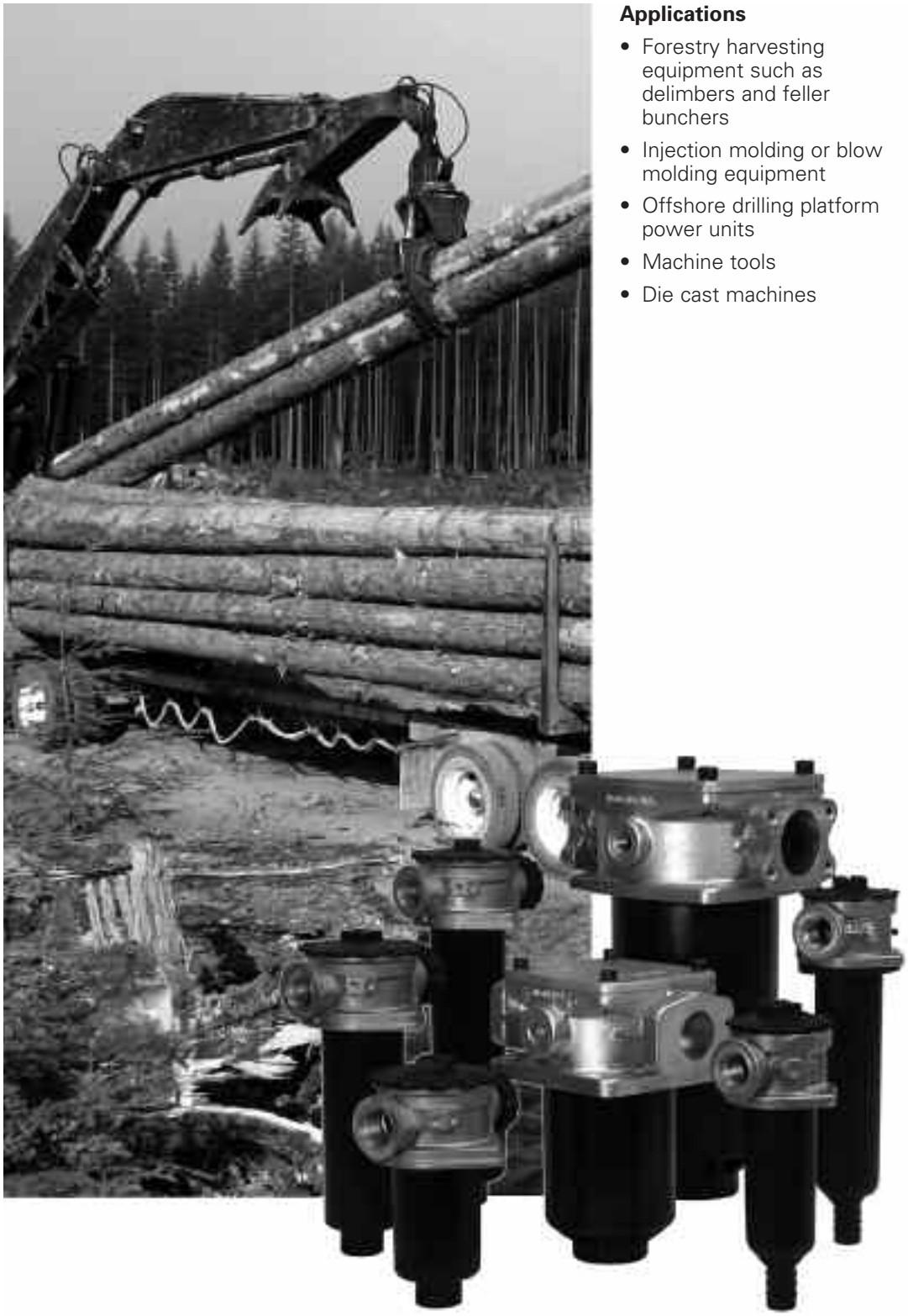
Notes

In-tank Filters

General Data

In-tank filters are a special type of low pressure return line filters. In-tank filters are mounted directly to the reservoir tank top and have an accessible head that is located outside of the reservoir while the body of the housing is located inside the reservoir. The exposed cover allows the element to be easily replaced as needed.

The filter housing may be equipped with diffusers to ensure that the returning oil energy is gradually dissipated within the reservoir fluid to minimize the potential for aerating or foaming of the oil. In addition, the diffuser helps direct the fluid outward against the walls of the reservoir to aid in the heat transfer capability of the reservoir.



Applications

- Forestry harvesting equipment such as delimbers and feller bunchers
- Injection molding or blow molding equipment
- Offshore drilling platform power units
- Machine tools
- Die cast machines

Items not in bold are non-standard and may have a longer lead time

In-tank Filters
OFMT020 Series

Flows to 50 L/min (13.2 USgpm)
Pressures to 7 bar (100 psi)

Features and Benefits

- High efficiency filter elements with superior dirt-holding capacity designed for return lines and installed semi-immersed in a reservoir
- Excellent pressure drop characteristics
- P indicator options for flexibility in system design
- Bowl length options for design flexibility
- Easy element changes
- Bypass valve prevents excessive pressure drop and prevents element collapse and release of retained contaminants back into hydraulic system
- Designed to comply with ISO standards

DESIGN SPECIFICATIONS

Rated flow:	Length 1	30 L/min (7.9 USgpm)
	Length 2	35 L/min (9.2 USgpm)
	Length 3	50 L/min (13.2 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids
Temp range:		-25°C to +110°C (-13°F to +230°F)
Pressure rating:	Operating	7 bar (100 psi)
	Fatigue	7 bar (100 psi)
Material:	Head	Die Cast Aluminum
	Cover	Nylon
	Bowl	Nylon
Dry weight: (Approximate)	Length 1	0,3 kg. (0.66 lbs.)
	Length 2	0,4 kg. (0.88 lbs.)
	Length 3	0,5 kg. (1.10 lbs.)

OFMT 020 Series Filter and Element Model Code

Sample model code:

OFMT0201SAG7A06HBT

OFMT020	*	*	*	**	A**	H	B	T
1	2	3	4	5	6	7	8	9

1 Filter Series - OFMT020

2 Assembly Length
mm (inch)
1 - 102 (4.0)
2 - 165 (6.5)
3 - 210 (8.3)

3 Breather Options
S - No breather
C - 10 µm breather
M - 40 µm breather

4 Seal Material
A - Buna-N
V - Viton-A

5 Port Options
G1 - G 3/8 to ISO 228
G2 - G 1/2 to ISO 228
G4 - 3/8" NPT
G5 - 1/2" NPT
G7 - 0.5625 - 18 UN SAE-6 Straight thread
G8 - 0.75 - 16 UN SAE-8 Straight thread

6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A03	16/**14/12** or better
A06	18/**16/14** or better
A10	20/**18/15** or better

7 Element Collapse Rating
H - 10 bar (150 psi)

8 Valve Options
B - Bypass set at 1.7 bar (25 psi) cracking pressure

9 Indicator Options
T - No Indicator (plug), No Connector

Items not in bold are non-standard and may have a longer lead time

In-tank Filters
OFMT020 Series

Flows to 50 L/min (13.2 USgpm)
Pressures to 7 bar (100 psi)

FM020 * A H ***

1 2 3 4 5

Element model code

Sample model code:
FM0202A06HA

1 Filter Element - FM 020

2 Asembly Length
mm (inch)
1 - 102 (4.0)
2 - 165 (6.5)
3 - 210 (8.3)

3 Fluid Cleanliness Rating

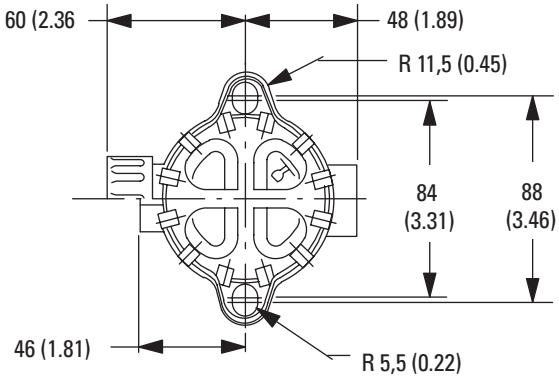
Code	Target fluid cleanliness level
A03	16/**15/12** or better
A06	18/**16/14** or better
A10	19/**17/14** or better

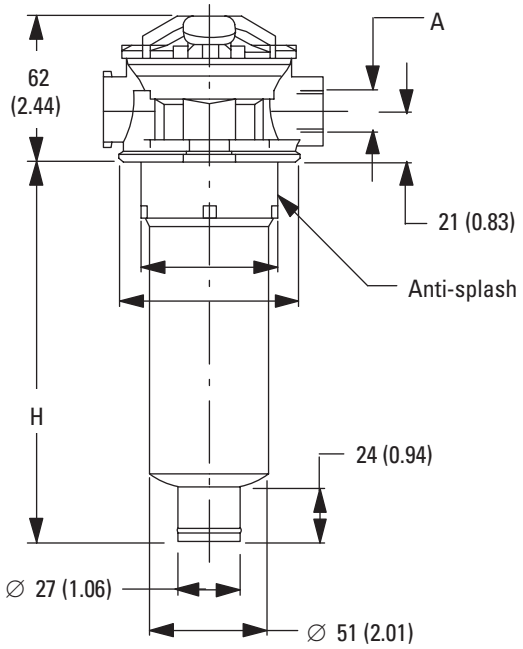
4 Element Collapse Rating
H - 10 bar (150 psi)

5 Seal Material
A - Buna-N
V - Viton-A
Note: Element comes with bypass set at 25 psi cracking pressure

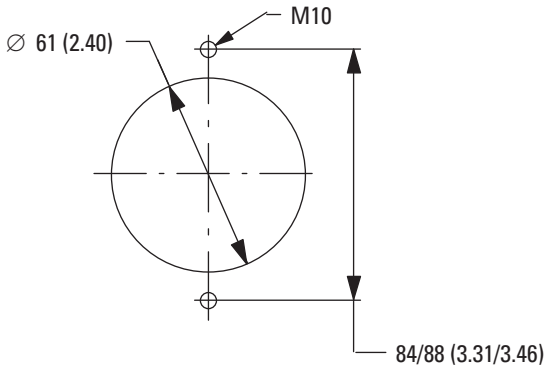
Housing Dimensions

mm (inch)





Holes required on tank



Items not in bold are non-standard and may have a longer lead time

In-tank Filters

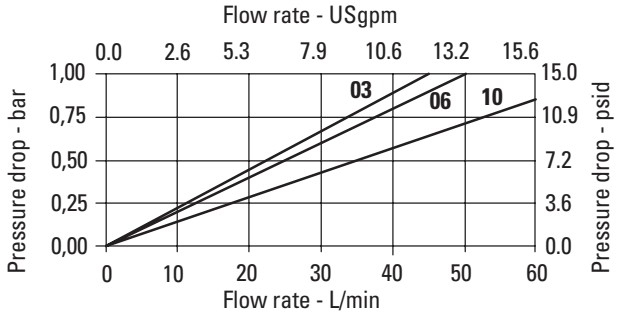
OFMT020 Series

Flows to 50 L/min (13.2 USgpm)
Pressures to 7 bar (100 psi)

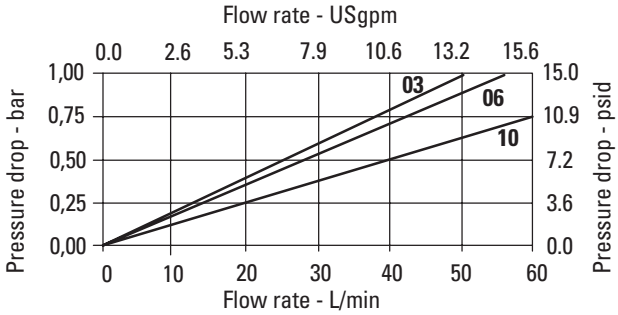
Flow Data

Element Flow Data

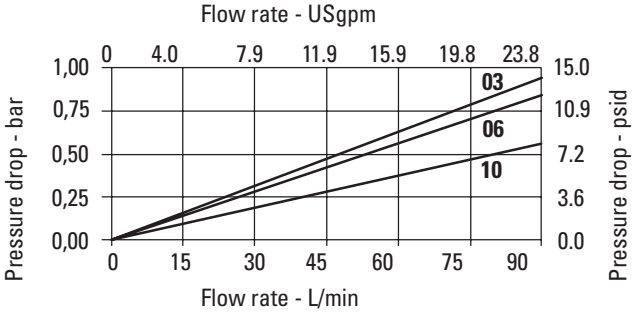
OFMT020 H-Pak Length 1



OFMT020 H-Pak Length 2

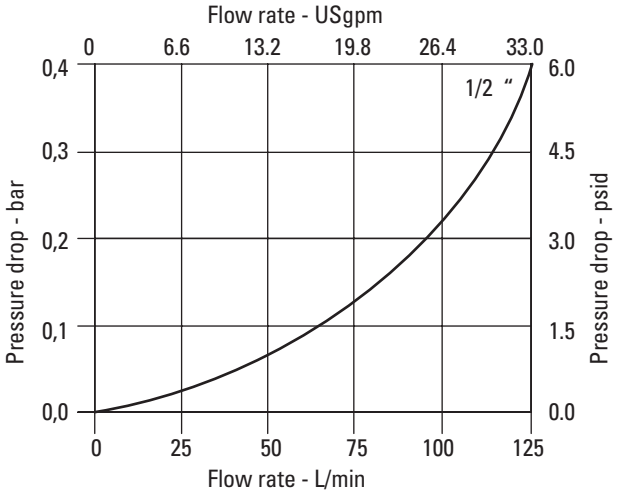


OFMT020 H-Pak Length 3



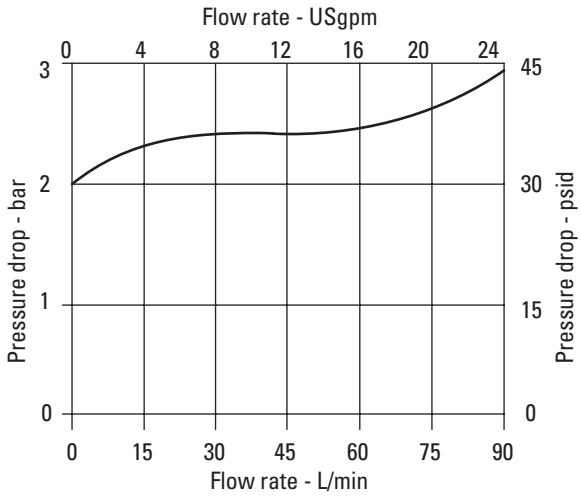
Housing/Bypass Valve Flow Data

Housing



Bypass Valve

Based on mineral oil with density of 0,86 kg/dm
ΔP varies proportionally to density.



Sample ΔP Calculation : OFMT0201SAG7A06HBT - Filter assembly having filter element with micron rating code '06' at 25 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.02 x 0.8/0.9	+	0.5 x 46/32 x 0.8/0.9
	=	0.017	+	0.632
	=	**0.65 bar**		

In-tank Filters
OFMT100 Series

Flows to 70 L/min (18.5 USgpm)
Pressures to 7 bar (100 psi)

Features and Benefits

- High efficiency filter elements with superior dirt-holding capacity designed for return lines and installed semi-immersed in a reservoir
- Excellent pressure drop characteristics
- P indicator options for flexibility in system design
- Bowl length options for design flexibility
- Easy element changes
- Bypass valve prevents excessive pressure drop and prevents element collapse and release of retained contaminants back into hydraulic system
- Designed to comply with ISO standards

DESIGN SPECIFICATIONS

Rated flow:	Length 1	35 L/min (9.2 USgpm)
	Length 2	45 L/min (11.9 USgpm)
	Length 3	70 L/min (18.5 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids
Temp range:		-25°C to +110°C (-13°F to +230°F)
Pressure rating:	Operating	7 bar (100 psi)
	Fatigue	7 bar (100 psi)
Material:	Head	Die Cast Aluminum
	Cover and Bowl	Nylon
Dry weight: (Approximate)	Length 1	0,3 kg. (0.66 lbs.)
	Length 2	0,4 kg. (0.88 lbs.)
	Length 3	0,5 kg. (1.10 lbs.)

OFMT 100 Series Filter and Element Model Code

Sample model code:

OFMT1001SAG7A06HBT

OFMT100	*	*	*	G*	A**	H	B	T
1	2	3	4	5	6	7	8	9

1 Filter Series - OFMT 100

2 Assembly Length
mm (inch)
1 - 102 (4.0)
2 - 145 (5.7)
3 - 225 (8.9)

3 Breather Options
S - No breather
C - 10 µm breather
M - 40 µm breather

4 Seal Material
A - Buna-N
V - Viton-A

5 Port Options
G1 - G 3/4 to ISO 228
G2 - G 1 to ISO 228
G3 - G 1-1/4 to ISO 228
G4 - 3/4" NPT
G5 - 1" NPT
G6 - 1.0625 - 12 UN SAE - 12 Straight thread
G7 - 1.3125 - 12 UN SAE - 16 Straight thread
G8 - 1.625 - 12 UN SAE - 20 Straight thread

6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A03	16/**14/12** or better
A06	18/**16/14** or better
A10	20/**18/15** or better

7 Element Collapse Rating
H - 10 bar (150 psi)

8 Valve Options
B - Bypass set at 1.7 bar (25 psi) cracking pressure

9 Indicator Options
T - No Indicator (plug), No Connector

Items not in bold are non-standard and may have a longer lead time

In-tank Filters
OFMT100 Series

Flows to 70 L/min (18.5 USgpm)
Pressures to 7 bar (100 psi))

FM100 * A H ***

1 2 3 4 5

Element model code

Sample model code:
FM1002A06HA

1 Filter Element - FM 100

2 Assembly Length
mm (inch)
1 - 102 (4.0)
2 - 145 (5.7)
3 - 225 (8.9)

3 Fluid Cleanliness Rating

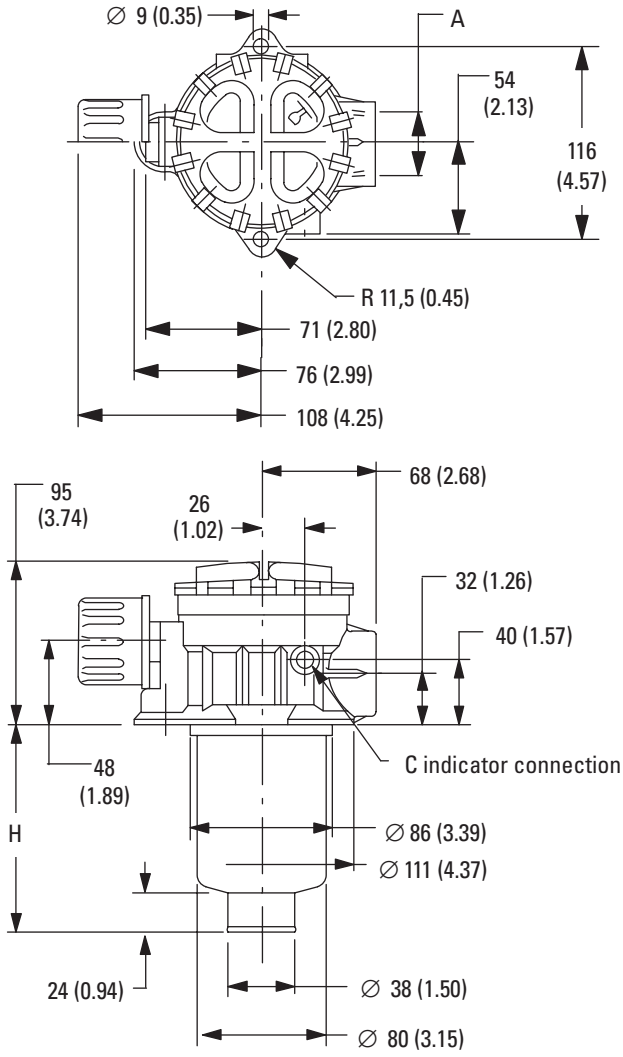
Code	Target fluid cleanliness level
A03	16/**15/12** or better
A06	18/**16/14** or better
A10	19/**17/14** or better

4 Element Collapse Rating
H - 10 bar (150 psi)

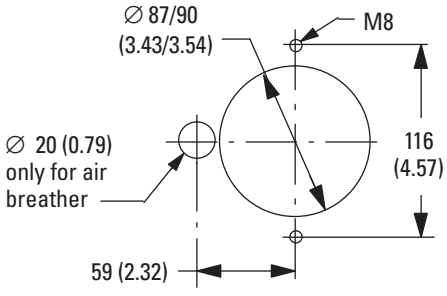
5 Seal Material
A - Buna-N
V - Viton-A
Note: Element comes with bypass set at 25 psi cracking pressure

Housing Dimensions

mm (inch)



Holes required on tank



Items not in bold are non-standard and may have a longer lead time

In-tank Filters

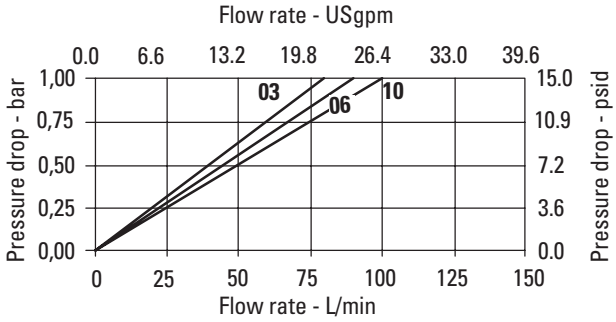
OFMT100 Series

Flows to 70 L/min (18.5 USgpm)
Pressures to 7 bar (100 psi))

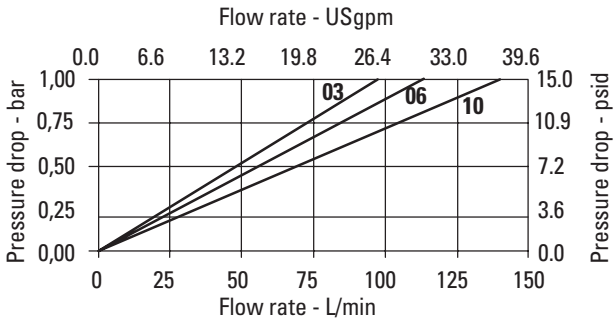
Flow Data

Element Flow Data

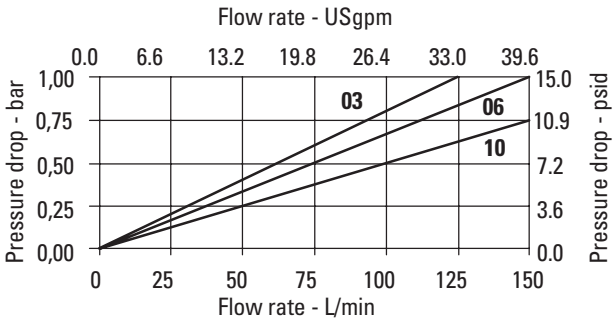
OFMT100 H-Pak Length 1



OFMT100 H-Pak Length 2

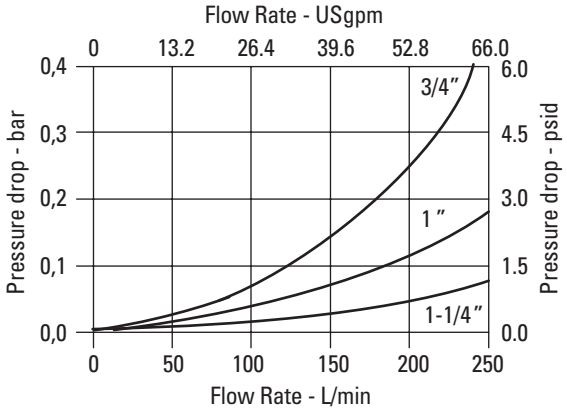


OFMT100 H-Pak Length 3



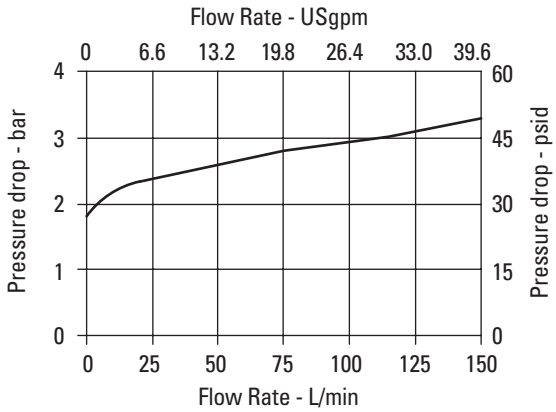
Housing/Bypass Valve Flow Data

Housing



Bypass Valve

Based on mineral oil with density of 0,86 kg/dm^3.
ΔP varies proportionally to density.



Sample ΔP Calculation : OFMT1001SAG7A06HBT - Filter assembly having filter element with micron rating code '06' at 50 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.015 x 0.8/0.9	+	0.55 x 46/32 x 0.8/0.9
	=	0.013	+	0.695
	=	**0.71 bar**		

In-tank Filters
OFRT100 Series

Flows to 105 L/min (27.7 USgpm)
Pressures to 10 bar (150 psi)

Features and Benefits

- High efficiency filter elements with superior dirt-holding capacity designed for return lines and installed semi-immersed in a reservoir
- Excellent pressure drop characteristics
- Indicators ordered separately
- Bowl length options for design flexibility
- Easy element changes
- Bypass valve prevents excessive pressure drop and prevents element collapse and release of retained contaminant's back into hydraulic system
- Designed to comply with ISO standards

OFRT 100 Series Filter and Element Model Code

Sample model code:

OFRT1001COSAG7A06T

DESIGN SPECIFICATIONS

Rated flow:	Length 1	35 L/min (9.2 USgpm)
	Length 2	40 L/min (10.6 USgpm)
	Length 3	75 L/min (19.8 USgpm)
	Length 4	105 L/min (27.7 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids, Optional seals available for phosphate esters.
Temp range:		-25°C to 110°C (-13°F to 230°F)
Pressure rating:	Operating	10 bar (150 psi)
	Fatigue	10 bar (150 psi)
Material:	Head	Die Cast Aluminum
	Cover	Nylon
Dry weight: (Approximate)	Length 1	1,0 kg. (2.20 lbs.)
	Length 2	1,2 kg. (2.63 lbs.)
	Length 3	1,3 kg. (2.87 lbs.)
	Length 4	1,5 kg. (3.31 lbs.)

OFRT100	*	C	*	*	*	G*	A**	T
1	2	3	4	5	6	7	8	9

1 Filter Series - OFRT 100

2 Assembly Length

mm (inch)

1 - 225 (8.8)
2 - 269 (10.6)
3 - 319 (12.6)
4 - 419 (16.5)

Length given does not include diffuser

3 Bypass Options

C - Bypass set at 1.7 bar (25 psi) cracking pressure

4 Diffuser Options

O - No diffuser
D - With diffuser

5 Breather Options

S - No breather
C - 10 µm breather
M - 40 µm breather

6 Seal Material

A - Buna-N
V - Viton-A

7 Port Options

G1 - G 3/4 to ISO 228
G2 - G 1 to ISO 228
G3 - G 1-1/4 to ISO 228
G4 - 3/4 NPT
G5 - 1" NPT
G6 - 1-1/4" NPT
G7 - 1.0625 - 12 UN SAE - 12 Straight thread
G8 - 1.3125 - 12 UN SAE - 16 Straight thread
G9 - 1.625 - 12 UN SAE - 20 Straight thread

8 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	20/**18/15** or better

9 Indicator Options

T - No Indicator (plug), No Connector

Items not in bold are non-standard and may have a longer lead time

In-tank Filters
OFRT100 Series

Flows to 105 L/min (27.7 USgpm)
Pressures to 10 bar (150 psi)

FT100 * A ***

1 2 3 4

Element model code

Sample model code:
FT1002A06A

1 Filter Element - FT 100

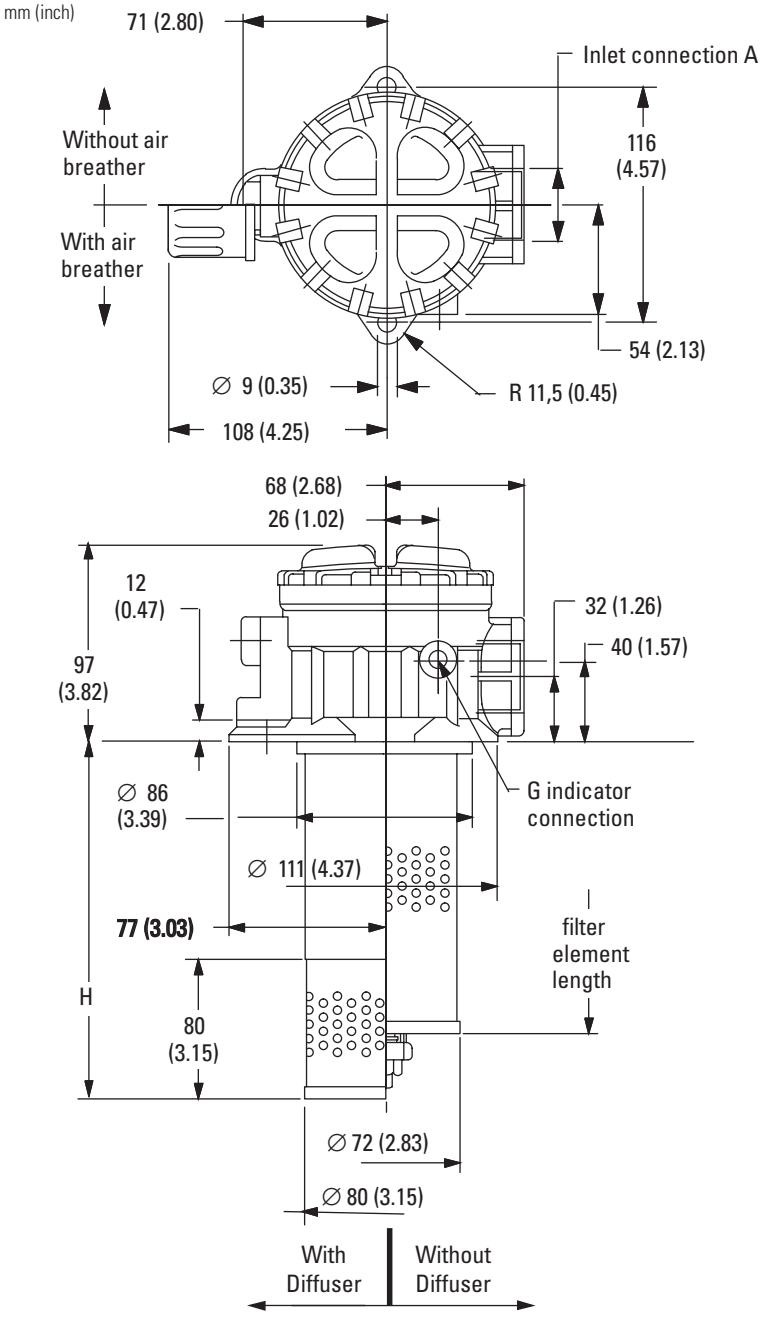
2 Element Length
mm (inch)
1 - 128 (5.0)
2 - 172 (6.8)
3 - 222 (8.7)
4 - 322 (12.7)

3 Fluid Cleanliness Rating

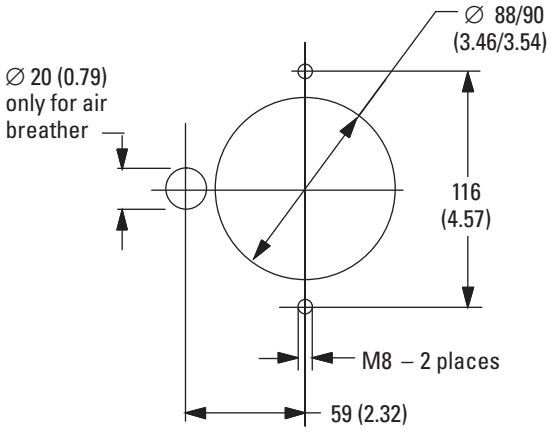
Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	20/**18/15** or better

4 Seal Material
A - Buna-N
V - Viton-A

Housing Dimensions



Holes required on tank



Items not in bold are non-standard and may have a longer lead time

In-tank Filters

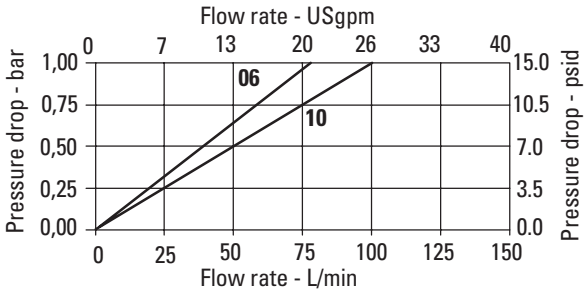
OFRT100 Series

Flows to 105 L/min (27.7 USgpm)
Pressures to 10 bar (150 psi)

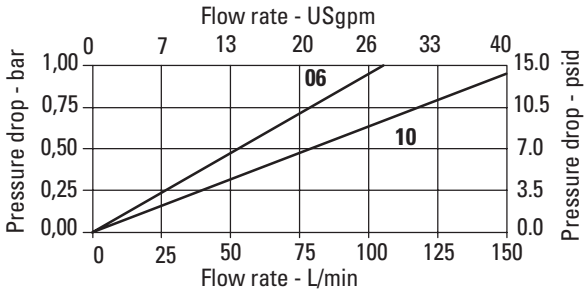
Flow Data

Element Flow Data

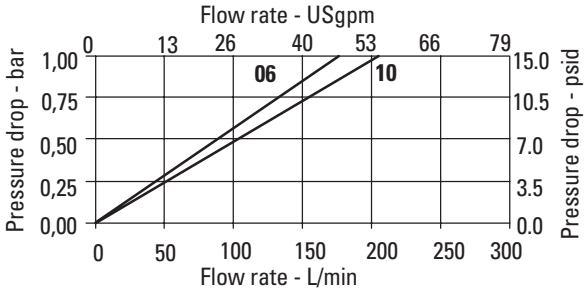
OFRT100 Length 1



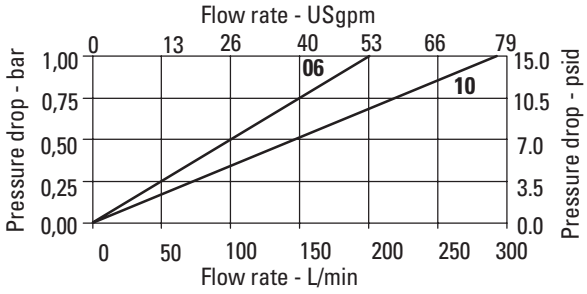
OFRT100 Length 2



OFRT100 Length 3

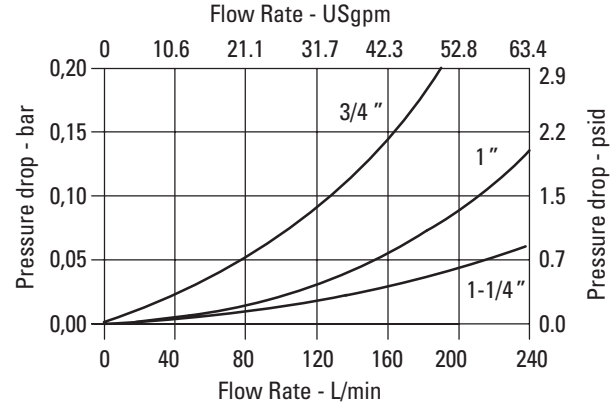


OFRT100 Length 4



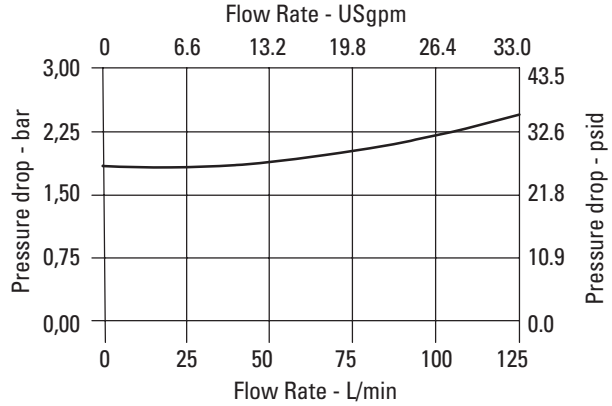
Housing/Bypass Valve Flow Data

Housing



Bypass Valve

Based on mineral oil with density of 0,86 kg/dm^3.
ΔP varies proportionally to density.



Sample ΔP Calculation : OFRT1001COSAG7A06T - Filter assembly having filter element with micron rating code '06' at 25 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.01 x 0.8/0.9	+	0.3 x 46/32 x 0.8/0.9
	=	0.008	+	0.38
	=	**0.49 bar**		

In-tank Filters
OFRT250 Series

Flows to 105 L/min (27.7 USgpm)
Pressures to 10 bar (150 psi)

Features and Benefits

- High efficiency filter elements with superior dirt-holding capacity designed for return lines and installed semi-immersed in a reservoir
- Excellent pressure drop characteristics
- Indicators ordered separately
- Bowl length options for design flexibility
- Easy element changes
- Bypass valve prevents excessive pressure drop and prevents element collapse and release of retained contaminants back into hydraulic system
- Designed to comply with ISO standards

OFRT 250 Series Filter and Element Model Code

Sample model code:

OFRT2501COSAG7A06T

DESIGN SPECIFICATIONS

Rated flow:	Length 1	115 L/min (30.4 USgpm)
	Length 2	160 L/min (42.3 USgpm)
	Length 3	205 L/min (54.2 USgpm)
	Length 4	360 L/min (95.1 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids, Optional seals available for phosphate esters.
Temp range:		-25°C to +110°C (-13°F to +230°F)
Pressure rating:	Operating	10 bar (150 psi)
	Fatigue	10 bar (150 psi)
Material:	Head	Die Cast Aluminum
	Cover	Aluminum
Dry weight: (Approximate)	Length 1	3,9 kg. (8.60 lbs.)
	Length 2	4,1 kg. (9.04 lbs.)
	Length 3	4,6 kg. (10.14 lbs.)
	Length 4	4,8 kg. (10.58 lbs.)

OFRT250	*	C	*	S	*	**	A**	T
1	2	3	4	5	6	7	8	9

1 Filter Series - OFRT 250

2 Assembly Length
mm (inch)
1 - 285 (11.2)
2 - 335 (13.2)
3 - 405 (15.9)
4 - 610 (24.0)
Length given does not include diffuser

3 Bypass Options
C - Bypass set at 1.7 bar (25 psi) cracking pressure

4 Diffuser Options
O - No diffuser
D - With diffuser

5 Breather Options
S - No breather

6 Seal Material
A - Buna-N
V - Viton-A

7 Port Options (G-threaded, F-flanged)
G1 - G1-1/2 to ISO 228
G2 - G - 1-1/2 and G 1-1/4 to ISO 228 (dual)
G4 - 1-1/2" NPT
G5 - 1-1/2 " and 1-1/4" NPT (dual)
G7 - 1.875 - 12 UN SAE -24 Straight thread
G8 - 1.625 - 12 UN SAE - 20 and 1.875 - 12 UN SAE - 24 Straight thread (dual)
F1 - 1-1/2" SAE Flange Code 61 with metric bolts
F2 - 1-1/2" and 1-1/4" in SAE Flange Code 61 with metric bolts (dual)
F3 - 1-1/2 in SAE Flange Code 61 with UNC bolts
F4 - 1-½ in and 1-¼ in SAE Flange Code 61 with UNC bolts

8 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	20/**18/15** or better

9 Indicator Options
T - No Indicator (plug), No Connector

Items not in bold are non-standard and may have a longer lead time

In-tank Filters
OFRT250 Series

Flows to 105 L/min (27.7 USgpm)
Pressures to 10 bar (150 psi)

FT250 * A ***

1 2 3 4

Element model code

Sample model code:
FT2502A06A

1 Filter Element - FT 250

2 Element Length
mm (inch)
1 - 175 (6.9)
2 - 225 (8.9)
3 - 295 (11.6)
4 - 500 (19.7)

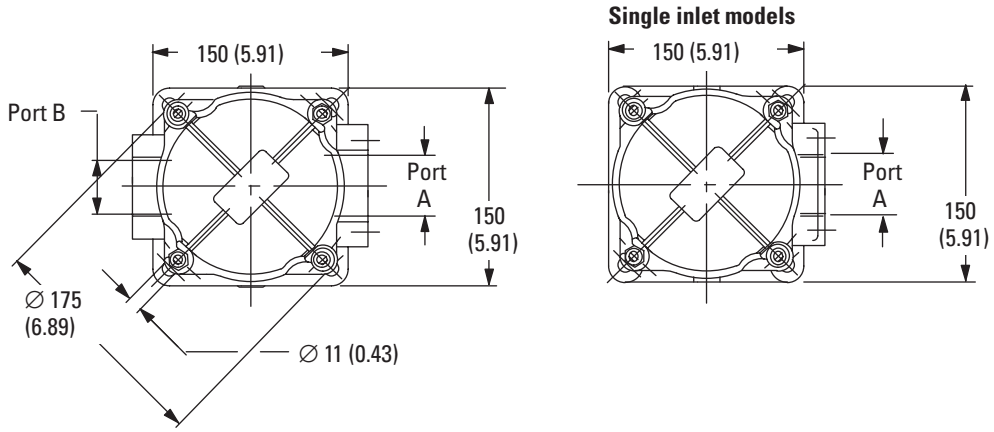
3 Fluid Cleanliness Rating

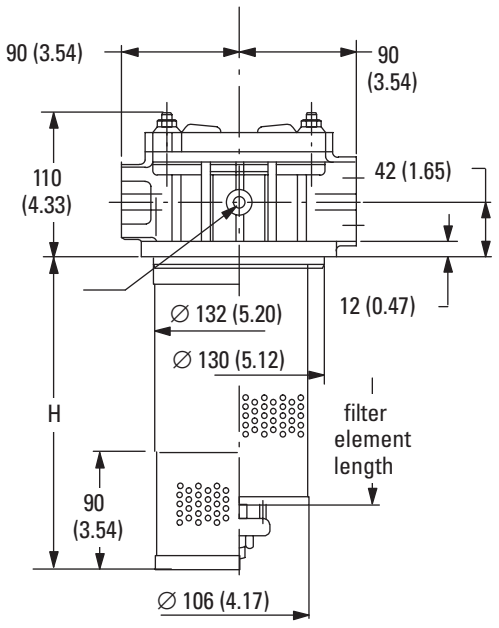
Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	19/**17/14** or better

4 Seal Material
A - Buna-N
V - Viton-A

Housing Dimensions

mm (inch)





Items not in bold are non-standard and may have a longer lead time

In-tank Filters

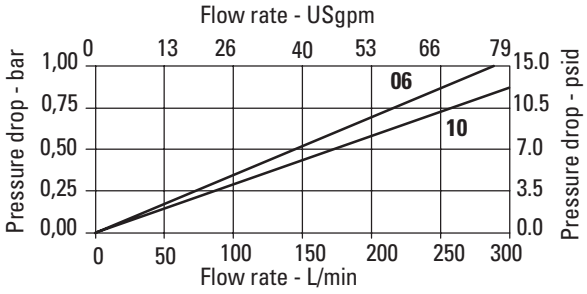
OFRT250 Series

Flows to 105 L/min (27.7 USgpm)
Pressures to 10 bar (150 psi)

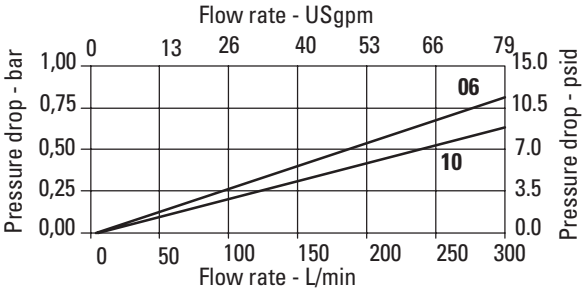
Flow Data

Element Flow Data

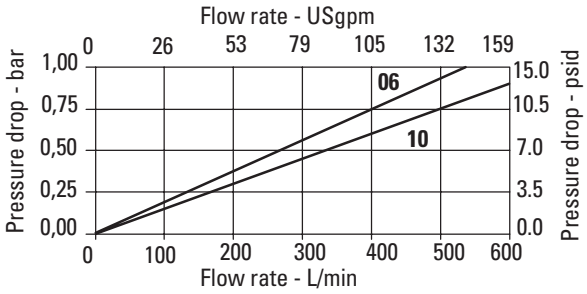
OFRT250 Length 1



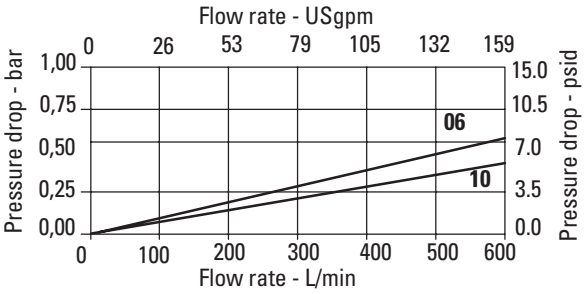
OFRT250 Length 2



OFRT250 Length 3

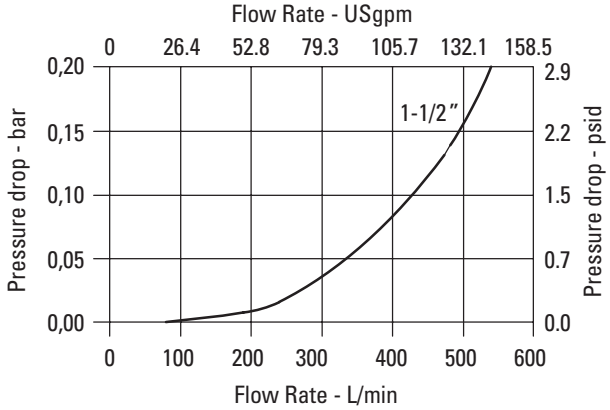


OFRT250 Length 4



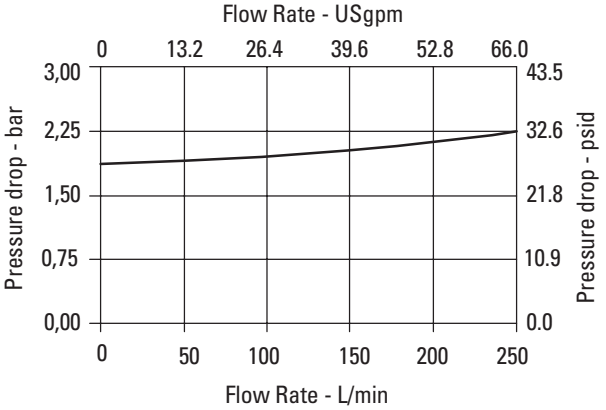
Housing/Bypass Valve Flow Data

Housing



Bypass Valve

Based on mineral oil with density of 0,86 kg/dm^3.
ΔP varies proportionally to density.



Sample ΔP Calculation : OFRT2501COSAG7A06T - Filter assembly having filter element with micron rating code '06' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.01 x 0.8/0.9	+	0.3 x 46/32 x 0.8/0.9
	=	0.008	+	0.38
	=	**0.49 bar**		

In-tank Filters
OFRT630 Series

Flows to 480 L/min (126.8 USgpm)
Pressures to 10 bar (150 psi)

Features and Benefits

- High efficiency filter elements with superior dirt-holding capacity designed for return lines and installed semi-immersed in a reservoir
- Excellent pressure drop characteristics
- Indicators ordered separately
- Bowl length options for design flexibility
- Easy element changes
- Bypass valve prevents excessive pressure drop and prevents element collapse and release of retained contaminant's back into hydraulic system
- Designed to comply with ISO standards

OFRT 630 Series Filter and Element Model Code

Sample model code:

OFRT6301COSAF3A06T

DESIGN SPECIFICATIONS

Rated flow:	Length 1	320 L/min (84.5 USgpm)
	Length 2	400 L/min (105.7 USgpm)
	Length 3	440 L/min (116.2 USgpm)
	Length 4	480 L/min (126.8 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids, Optional seals available for phosphate esters.
Temp range:		-25°C to 110°C (-13°F to 230°F)
Pressure rating:	Operating	10 bar (150 psi)
	Fatigue	10 bar (150 psi)
Material:	Head	Die Cast Aluminum
	Cover	Aluminum
Dry weight: (Approximate)	Length 1	8,2 kg. (18.1 lbs.)
	Length 2	8,7 kg. (19.2 lbs.)
	Length 3	9,0 kg. (19.8 lbs.)
	Length 4	9,5 kg. (20.9 lbs.)

OFRT630	*	C	*	S	*	F*	A**	T
1	2	3	4	5	6	7	8	9

1 Filter Series - OFRT 630

2 Assembly Length
mm (inch)
1 - 400 (15.7)
2 - 480 (18.8)
3 - 580 (22.8)
4 - 670 (26.4)
Length given does not include diffuser

3 Bypass Options
C - Bypass set at 1.7 bar (25 psi) cracking pressure

4 Diffuser Options
O - No diffuser
D - With diffuser

5 Breather Options
S - No breather

6 Seal Material
A - Buna-N
V - Viton-A

7 Port Options
F1 - 2-1/2 in SAE Flange Code 61 with metric bolts
F2 - 2 in and 2-1/2 in SAE Flange Code 61 with metric bolts (dual)
F3 - 2-1/2 in SAE Flange Code 61 with UNC bolts
F4 - 2 in and 2-1/2 in SAE Flange Code 61 with UNC bolts

8 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	20/**18/15** or better

9 Indicator Options
T - No Indicator (plug), No Connector

Items not in bold are non-standard and may have a longer lead time

In-tank Filters
OFRT630 Series

Flows to 480 L/min (126.8 USgpm)
Pressures to 10 bar (150 psi)

FT630 * A ***

1 2 3 4

Element model code

Sample model code:
FT6302A06A

1 Filter Element - FT 630

2 Element Length
mm (inch)
1 - 260 (10.2)
2 - 340 (13.4)
3 - 440 (17.3)
4 - 530 (20.9)

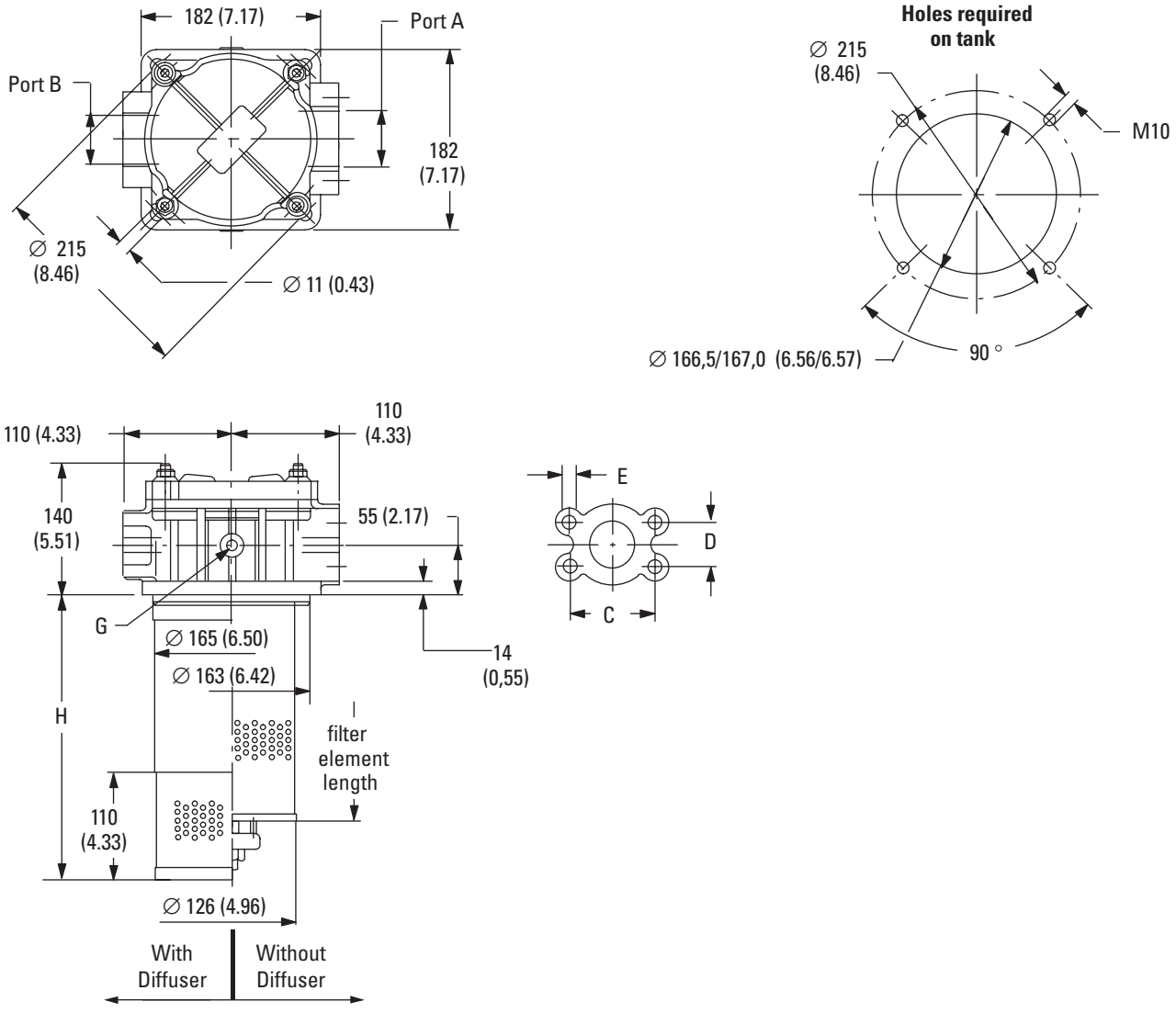
3 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	19/**17/14** or better

4 Seal Material
A - Buna-N
V - Viton-A

Housing Dimensions

mm (inch)



Items not in bold are non-standard and may have a longer lead time

In-tank Filters

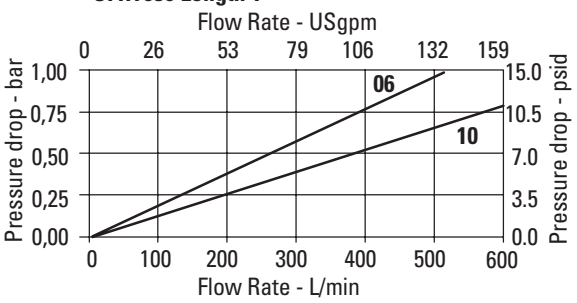
OFRT630 Series

Flows to 480 L/min (126.8 USgpm)
Pressures to 10 bar (150 psi)

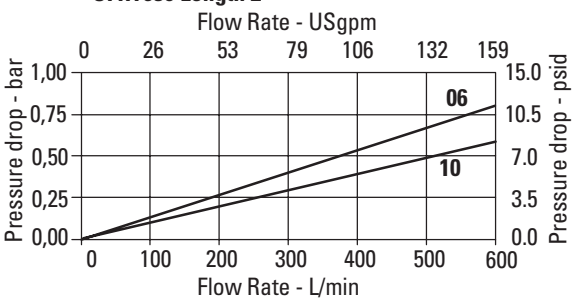
Flow Data

Element Flow Data

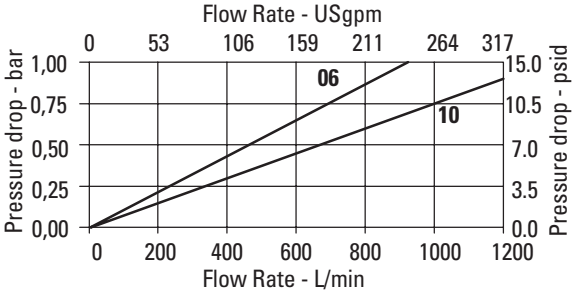
OFRT630 Length 1



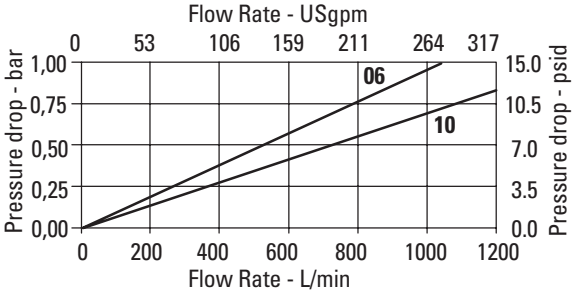
OFRT630 Length 2



OFRT630 Length 3

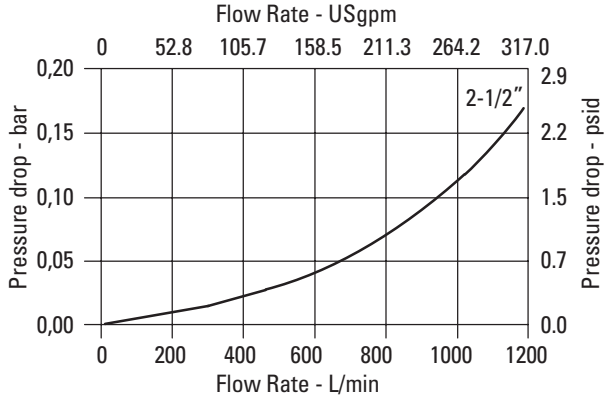


OFRT630 Length 4



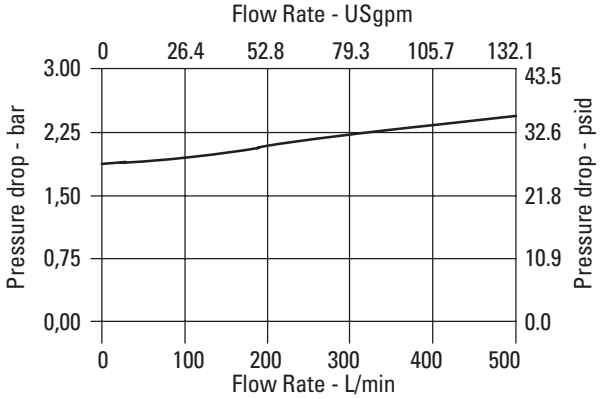
Housing/Bypass Valve Flow Data

Housing



Bypass Valve

Based on mineral oil with density of 0,86 kg/dm ^{3}.
ΔP varies proportionally to density.



Sample ΔP Calculation : OFRT6301COSAF3A06T - Filter assembly having filter element with micron rating code '06' at 300 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.02 x 0.8/0.9	+	0.6 x 46/32 x 0.8/0.9
	=	0.017	+	0.76
	=	**0.77 bar**		

In-tank Filters
OFRT850 Series

Flows to 1,500 L/min (396.3 USgpm)
Pressures to 10 bar (150 psi)

Features and Benefits

- High efficiency filter elements with superior dirt-holding capacity designed for return lines and installed semi-immersed or totally immersed in a reservoir
- Excellent pressure drop characteristics
- Indicators ordered separately
- Bowl length options for design flexibility
- Easy element changes
- Bypass valve prevents excessive pressure drop and prevents element collapse and release of retained contaminant's back into hydraulic system
- Designed to comply with ISO standards

OFRT 850 Series Filter and Element Model Code

Sample model code:

OFRT8501COSAF3A06T

DESIGN SPECIFICATIONS

Rated flow:	Length 1	650 L/min (171.7 USgpm)
	Length 2	1000 L/min (264.2 USgpm)
	Length 3	1200 L/min (317.0 USgpm)
	Length 4	1500 L/min (396.3 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids, optional seals available for phosphate esters.
Temp range:		-25°C to 110°C (-13°F to 230°F)
Pressure rating:	Operating	10 bar (150 psi)
	Fatigue	10 bar (150 psi)
Material:	Head	Die Cast Aluminum
	Cover	Steel
Dry weight: (Approximate)	Length 1	30 kg. (66.14 lbs.)
	Length 2	34 kg. (74.96 lbs.)
	Length 3	37 kg. (81.57 lbs.)
	Length 4	41 kg. (90.39 lbs.)

OFRT850	*	C	*	S	*	F3	A**	T
1	2	3	4	5	6	7	8	9

1 Filter Series - OFRT 850

2 Assembly Length
mm (inch)
1 - 572 (22.5)
2 - 787 (31.0)
3 - 1067 (42.0)
4 - 1332 (52.4)

3 Bypass Options
C - Bypass set at 1.7 bar (25 psi) cracking pressure

4 Diffuser Options
O - No diffuser
D - With diffuser

5 Breather Options
S - No breather

6 Seal Material
A - Buna-N
V - Viton-A

7 Port Options
F3 - DN 100 PN 10/16 3" SAE/Metric Bolt Holes

8 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
A06	18/**16/14** or better
A10	20/**18/15** or better

9 Indicator Options
T - No Indicator (plug), No Connector

In-tank Filters
OFRT850 Series

Flows to 1,500 L/min (396.3 USgpm)
Pressures to 10 bar (150 psi)

FT850 * A ***

1 2 3 4

Element model code

Sample model code:
FT8502A06A

1 Filter Element - FT 850

2 Element Length
mm (inch)
1 - 388 (15.2)
2 - 603 (23.7)
3 - 883 (34.7)
4 - 1148 (45.2)

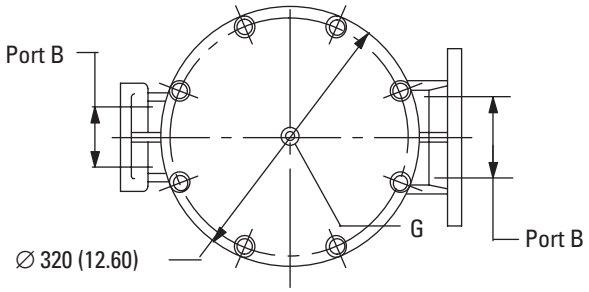
3 Fluid Cleanliness Rating

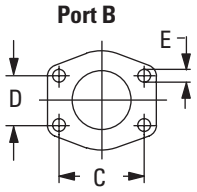
Code	Target fluid cleanliness level
A06	18/**16**/**14** or better
A10	19/17/14 or better

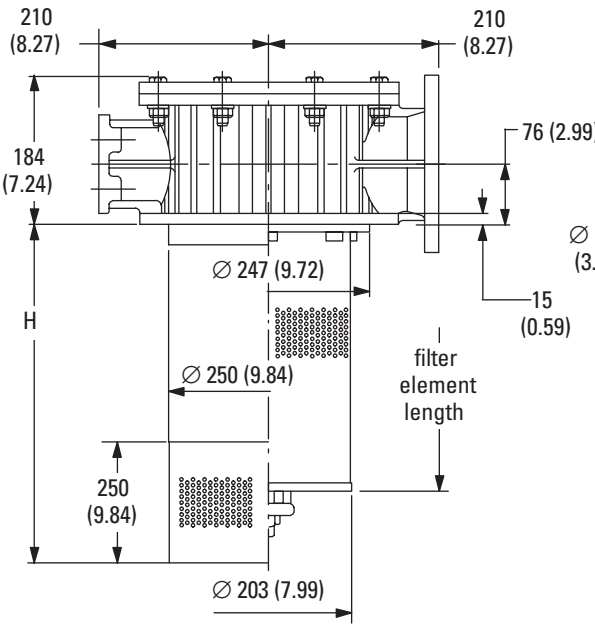
4 Seal Material
A - Buna-N
V - Viton-A

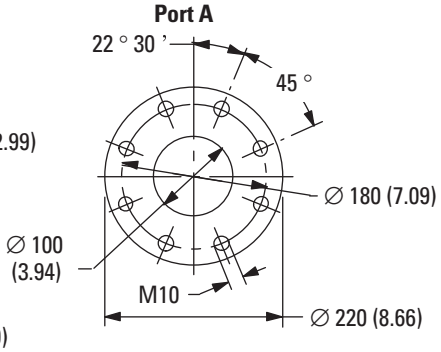
Housing Dimensions

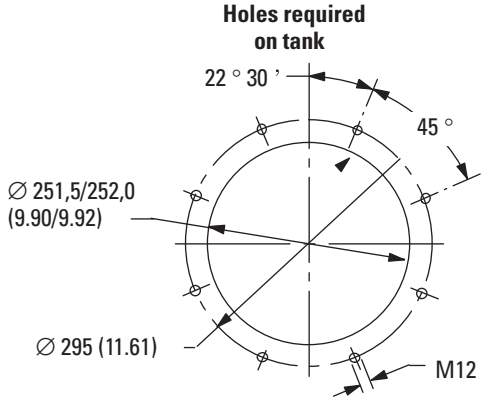
mm (inch)











In-tank Filters

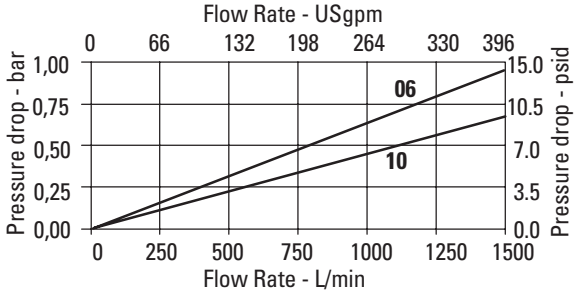
OFRT850 Series

Flows to 1,500 L/min (396.3 USgpm)
Pressures to 10 bar (150 psi)

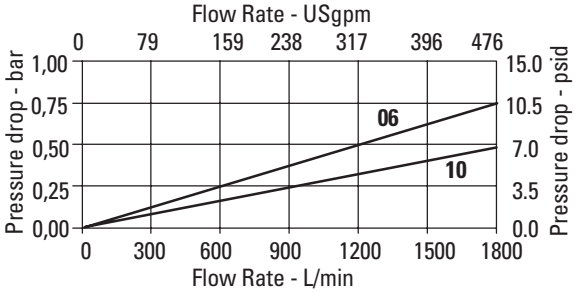
Flow Data

Element Flow Data

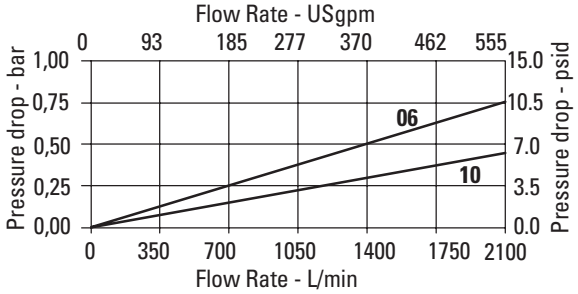
OFRT850 Length 1



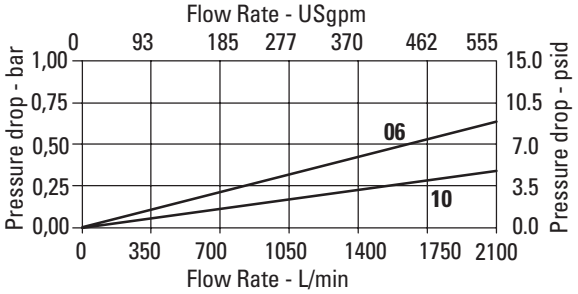
OFRT850 Length 2



OFRT850 Length 3

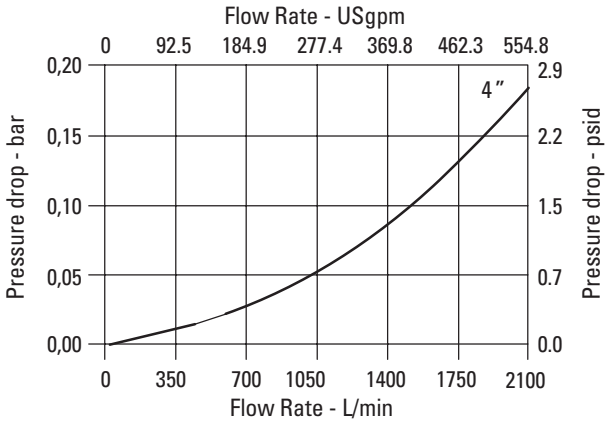


OFRT850 Length 4



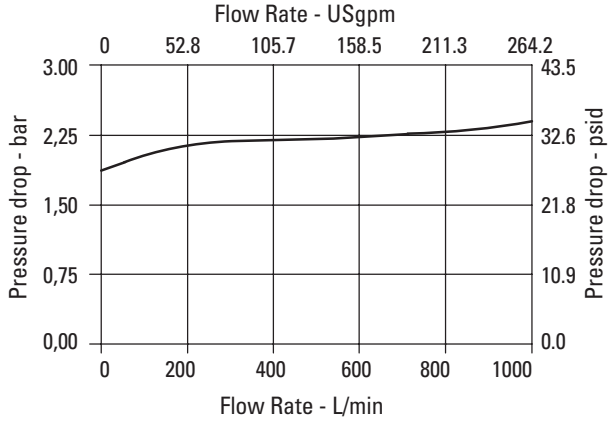
Housing/Bypass Valve Flow Data

Housing



Bypass Valve

Based on mineral oil with density of 0,86 kg/dm^3.
ΔP varies proportionally to density.



Sample ΔP Calculation : OFRT8501COSAF3A06T - Filter assembly having filter element with micron rating code '06' at 500 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.02 x 0.8/0.9	+	0.3 x 46/32 x 0.8/0.9
	=	0.017	+	0.38
	=	**0.39 bar**		

In-tank Filters
ORFM Series

Flows to 850 L/min (225 USgpm)
Pressures to 10 bar (145 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Ideal for mobile applications due to lightweight and compact design
- Clogging indication cavities are standard
- Housing and lid are constructed of durable plastic polyamide or aluminum
- Aluminum alloy does not require anodizing for water-based fluids
- Lengths 2/3/4 have filter bowls that are removed to change the element and also serve as a contamination basket
- Lengths 1/5/6/7 have filter elements that have a separate, reusable contamination basket

ORFM Series Filter and Element Model Code

Sample model code:
ORFM1SA2LNB1C05X

DESIGN SPECIFICATIONS

Rated flow:	Length 1		30 L/min (8 USgpm)
	Length 2		75 L/min (20 USgpm)
	Length 3		90 L/min (24 USgpm)
	Length 4		165 L/min (43 USgpm)
	Length 5		330 L/Min (87 USgpm)
	Length 6		660 L/min (174 USgpm)
	Length 7		850 L/min (225 USgpm)
Fluid compatibility:	Compatible with all petroleum oil and synthetic fluids rated for use with fluoro-rubber or ethylene propylene seals.		
Temp range:	-30°C to +121°C (-22°F to +250°F)		
Pressure rating:	Operating		10 bar (145 psi)
	Fatigue		10 bar (145 psi)
Material:	Length 1	Head, Bowl, Lid	Plastic
	Length 2/3/4	Head	Aluminum
		Bowl, Lid	Plastic
	Length 5/6/7	Head, Bowl, Lid	Aluminum
Dry weight: (Approximate)	Length 1		.32 kg. (0.7 lbs)
	Length 2		.59 kg. (1.3 lbs)
	Length 3		.41 kg. (0.9 lbs)
	Length 4		.68 kg. (1.5 lbs)
	Length 5		3.1 kg. (6.8 lbs)
	Length 6		6.0 kg. (13.2 lbs)
	Length 7		6.5 kg. (14.3 lbs)

ORFM	1	**	*	*	*	*	*	**	*
1	2	3	4	5	6	7	8	9	10

1 Filter Series- ORFM

2 Element Collapse Rating
1 - 10 bar (145 psi) Low Collapse

3 Port Options
SA - NPT 1/2" – length 1 only
SB - SAE-16 (1" tube) – length 2 & 4 only
SC - SAE-12 (3/4" tube) – length 3 only
SD - SAE Flange (code 61) (1" tube) – length 5 only
SE - SAE-24 (1-1/2" tube) – length 5 only
SF - SAE Flange (code 61) (2" tube) – length 6 & 7 only

4 Valve Options
0 - No Bypass*****
1 - Bypass set at 25 psi (1.7 bar) cracking pressure
2 - Bypass set at 43 psi (3 bar) cracking pressure
3 - Bypass set at 87 psi (6 bar) cracking pressure

5 Indicator Options**
AN - Visual 4.9 bar (70 psi), No Connector
KN - Visual 1 bar (15 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
JN - No Indicator (plug), No Connector
MB - Electrical 1 bar (15 psi), Brad Harrison
MJ - Electrical 1 bar (15 psi), Hirschmann w 24 volt light
MK - Electrical 1 bar (15 psi), Hirschmann w 115 volt light
ML - Electrical 1 bar (15 psi), Hirschmann w 230 volt light
MH - Electrical 1 bar (15 psi), Hirschmann
RB - Electrical 2 bar (30 psi), Brad Harrison
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical2 bar (30 psi), Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi), Hirschmann
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 (70 psi), Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi), Hirschmann
GA - Gauge 0-4 Bar (0-60 psi). Use with valve option "1"
GB - Gauge 0-10 Bar (0-160 psi). Use with valve options "2" & "3"

6 Seal Material
B - Buna-N
V - Viton-A

7 Assembly Length
mm (inch)
1 - 156 (6.2)
2 - 205 (8.1)
3 - 246 (9.6)
4 - 289 (11.4)
5 - 270 (10.6)
6 - 426 (16.8)
7 - 507 (19.9)

8 Element Construction
C - Standard Construction
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/14/12 or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

10 Diffusor
D - Diffusor
X - No diffusor

* For use with external bypass check valve (6 bar) 87 psi maximum.
** For indicator options, refer to Static Indicators on page 150.

In-tank Filters

ORFM Series

Flows to 850 L/min (225 USgpm)
Pressures to 10 bar (145 psi)

V209 1 * * C **

1 2 3 4 5 6

V209 Element model code

Sample model code:
V2091B3C10

1 Filter Element - V209

2 Valve Options

0 - No Bypass*
1 - Bypass set at (1.7 bar) 25 psi cracking pressure
2 - Bypass set at (3 bar) 43 psi cracking pressure
3 - Bypass set at (6 bar) 87 psi cracking pressure

3 Seal Material

B - Buna-N
V - Viton-A

4 Assembly Length

mm (inch)

1 - 156 (6.1)
2 - 204.8 (8.1)
3 - 246 (9.5)
4 - 288.8 (11.3)
5 - 270 (10.6)
6- 426 (16.8)
7- 507 (19.9)

5 Element Construction

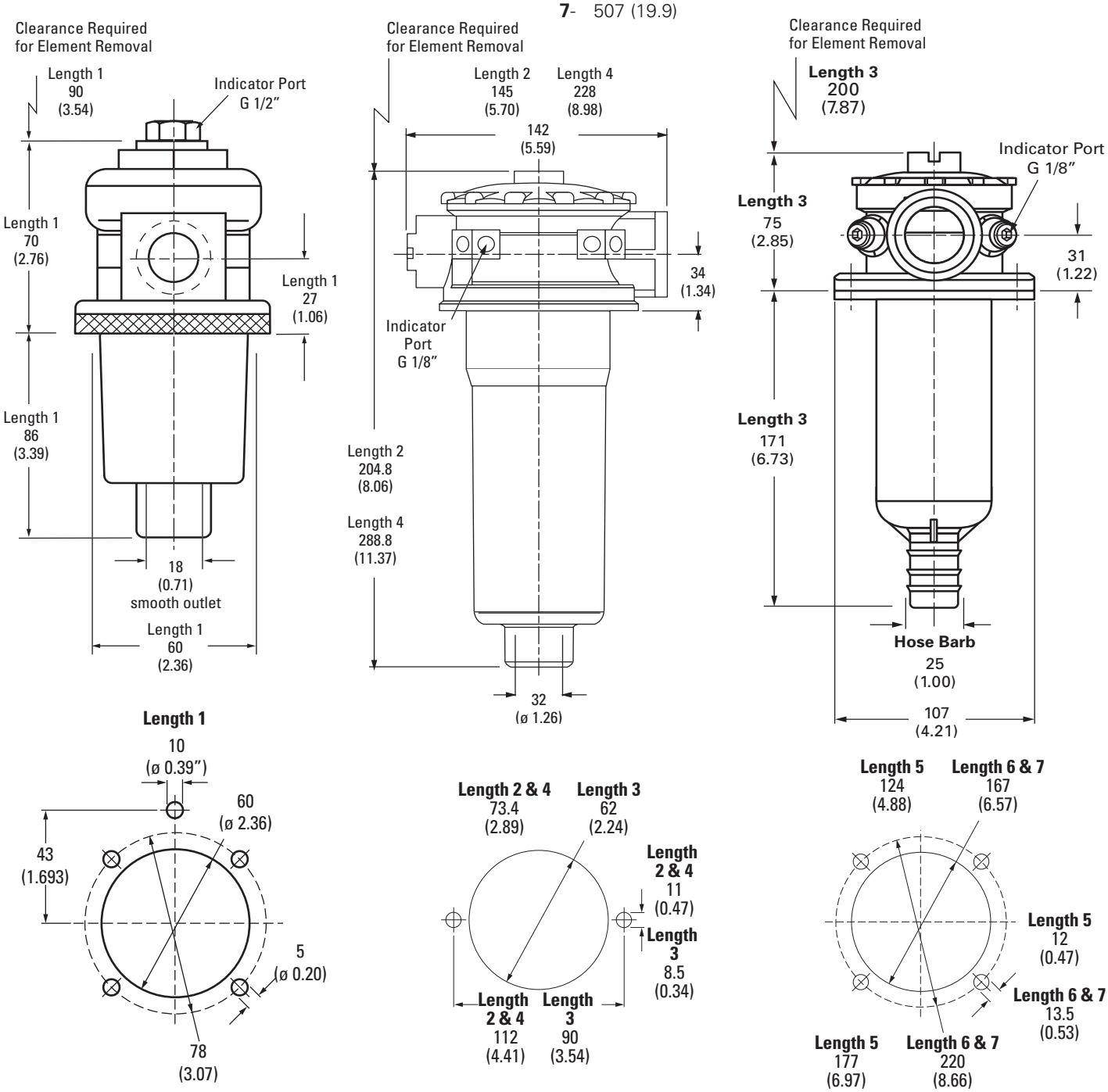
C - Standard Construction

6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/14/12 or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

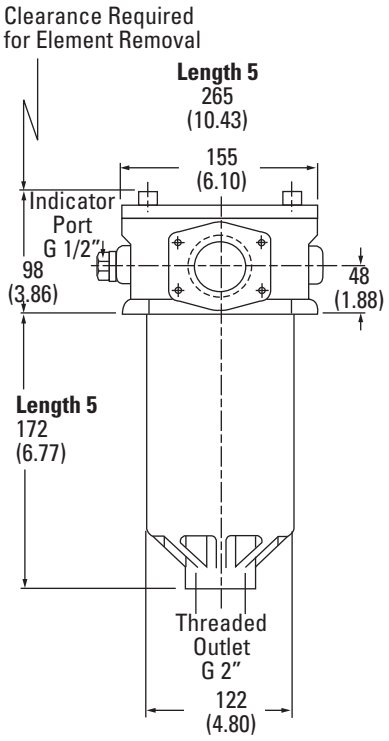
Housing Dimensions

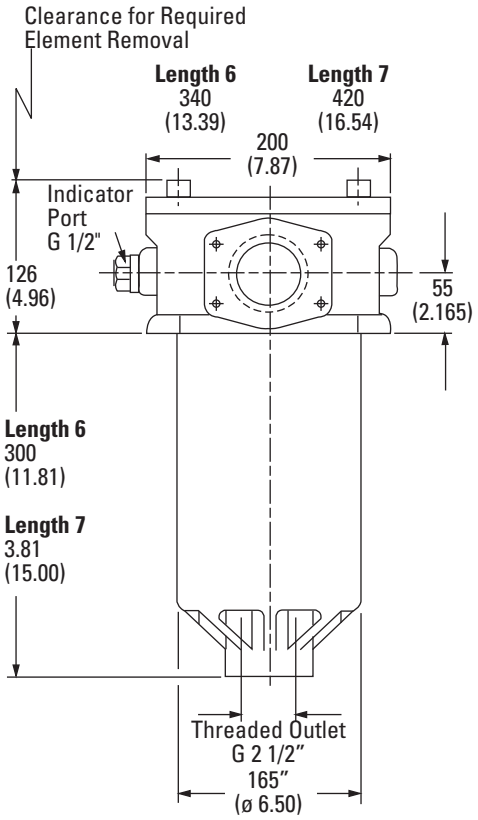
mm (inch)



Housing Dimensions

mm (inch)





ORFM Clogging Indicator Locations

LENGTH	LOCATION OF CLOGGING INDICATOR
1	Clogging Indicator on top centerline
2/4	Clogging Indicator Left Back 90° to inlet
3	Clogging Indicator Left Front 45° to inlet
5	Clogging Indicator Left Side 90° to inlet
6/7	Clogging Indicator Left Side 90° to inlet

In-tank Filters

ORFM Series

Flow Data

Element Flow Data

ORFM Filter Elements

'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	1	0.068 (3.748)	0.044 (2.407)	0.027 (1.470)	0.015 (0.808)
	2	0.022 (1.208)	0.014 (0.779)	0.008 (0.444)	0.004 (0.240)
	3	0.015 (0.815)	0.010 (0.553)	0.007 (0.369)	0.003 (0.175)
	4	0.011 (0.615)	0.008 (0.429)	0.004 (0.245)	0.002 (0.132)
	5	0.004 (0.231)	0.003 (0.149)	0.004 (0.092)	0.001 (0.065)
	6	0.002 (0.105)	0.001 (0.066)	0.001 (0.042)	0.001 (0.028)
	7	0.001 (0.081)	0.001 (0.054)	0.001 (0.036)	0.001 (0.023)

Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

In-tank Filters

ORFM Series

Flow Data

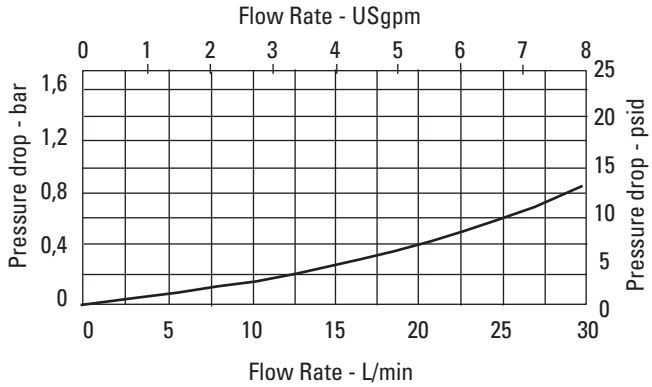
Flows to 1,320 L/min (349 USgpm)
Pressures to 10 bar (145 psi)

Flow versus pressure drop:

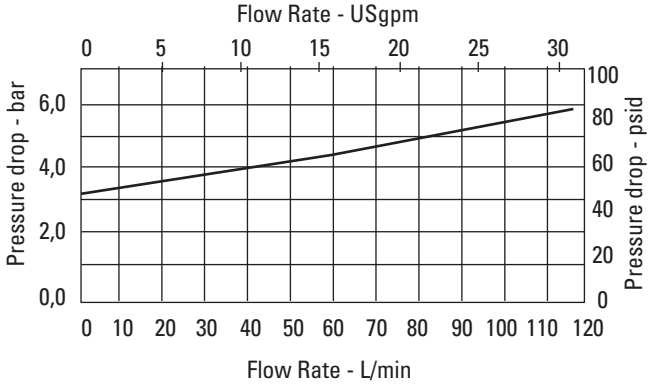
150 SUS (32 cSt) oil with specific gravity of ≤0.9

Housing/Bypass Valve Flow Data

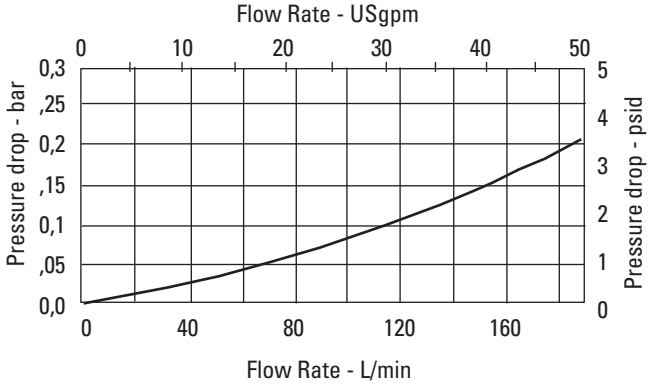
ORFM Length 1 Housing



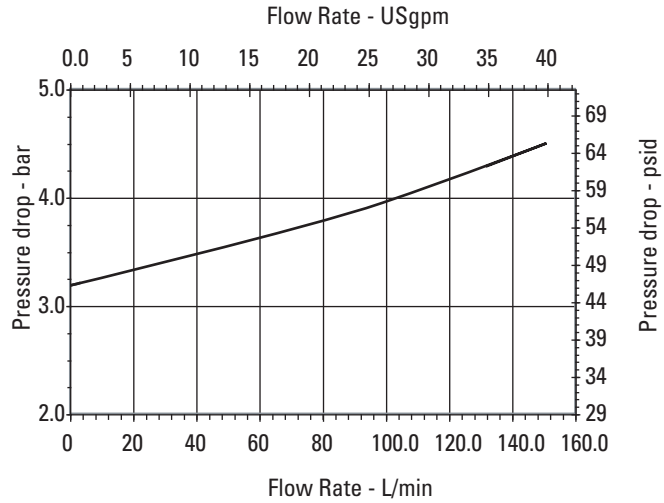
ORFM Length 1 Bypass



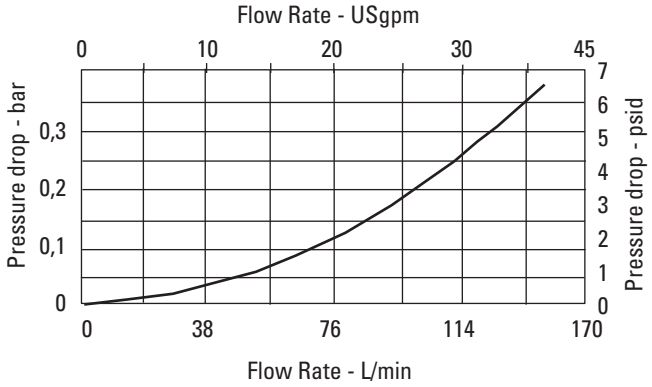
ORFM Length 2 & 4 Housing



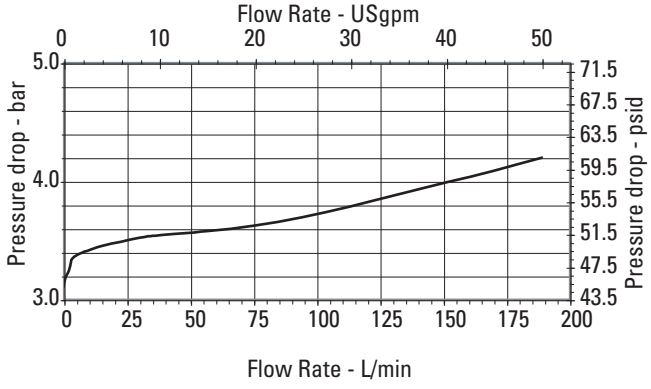
ORFM Length 2/4 Bypass



ORFM Length 3 Housing



ORFM Length 3 Bypass



In-tank Filters

ORFM Series

Flow Data

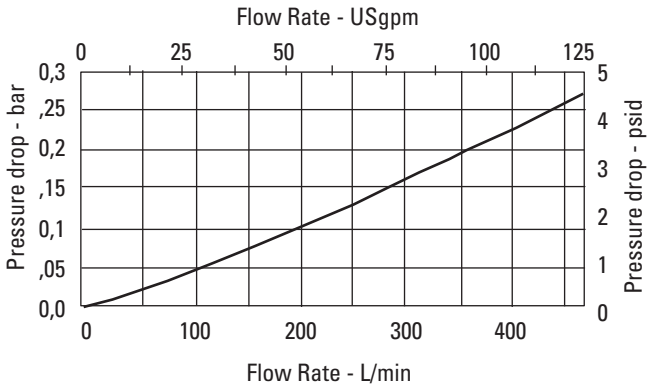
Flows to 1,320 L/min (349 USgpm)
Pressures to 10 bar (145 psi)

Flow versus pressure drop:

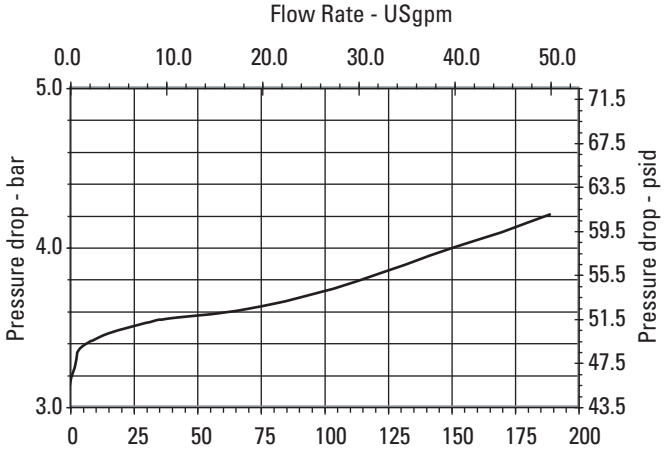
150 SUS (32 cSt) oil with specific gravity of ≤0.9

Housing/Bypass Valve Flow Data

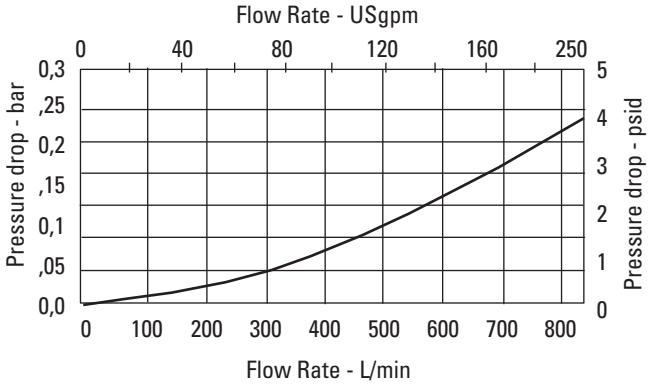
ORFM Length 5 Housing



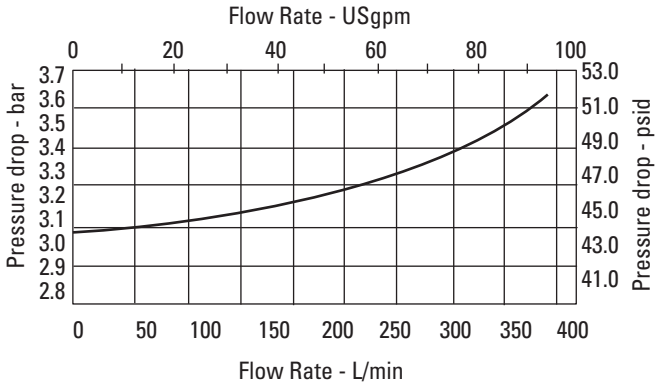
ORFM Length 5 Bypass



ORFM Length 6 & 7 Housing



ORFM Length 6 & 7 Bypass



Sample ΔP Calculation : ORFM1SA2LNB1C05X - Filter assembly having '1' length filter element with micron rating code '05' at 25 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.6 x 0.8/0.9	+	25 x 0.044 x 46/32 x 0.8/0.9
	=	0.520	+	1.39
	=	**1.91 bar**		

In-tank Filters
ORF 1300

Flows to 1,300 L/min (343 USgpm)
Pressures to 25 bar (360PSI)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Non-welded housing design reduces stress concentrations prevents fatigue failure
- O-ring seals are used to provide positive, reliable sealing
- Bolt-on lid requires minimal clearance for removal
- Reusable contamination basket prevents loss of retained contaminants into the reservoir during element replacement
- Clogging indicators can be serviced without interruption of the hydraulic system
- Single piece casting provides rigidity for inline or in-tank mounting

ORF 1300 Series Filter and Element Model Code

Sample model code:

ORF1F2JNB1C05

DESIGN SPECIFICATIONS

Rated flow:		1300 L/min (343 USgpm)
Fluid compatibility:		Compatible with all petroleum oils and synthetic fluids rated for use with Fluoro-Rubber or Ethylene Propylene seals.
Temp range:		-30°C to + 121°C (-22°F to 250°F)
Pressure rating:	Operating Fatigue	25 bar (360 psi) 25 bar (360 psi)
Material:	Housing, Lid, Transfer Valve:	Ductile Iron
Dry weight: (Approximate)		43kg (94.8 lbs)

ORF	1	F	*	**	*	1	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - ORF

2 Element Collapse Rating

1 - 17 bar (250 psi) Low Collapse

3 Port Options

F - 4" SAE Flange, Code 61

4 Valve Options

0 - Non-Bypass
1 - Bypass set at 1.7 bar (25 psi) cracking pressure
2 - Bypass set at 2.9 bar (43 psi) cracking pressure
3 - Bypass set at 5.9 bar (87 psi) cracking pressure

5 Indicator Options*

AN - Visual 4.9 bar (70 psi), No Connector
KN - Visual 1 bar (15 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
JN - No Indicator (plug), No Connector
MB - Electrical 1 bar (15 psi), Brad Harrison
MJ - Electrical 1 bar (15 psi), Hirschmann w 24 volt light
MK - Electrical 1 bar (15 psi), Hirschmann w 115 volt light
ML - Electrical 1 bar (15 psi), Hirschmann w 230 volt light
MH - Electrical 1 bar (15 psi), Hirschmann
RB - Electrical 2 bar (30 psi), Brad Harrison
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi), Hirschmann
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi), Hirschmann
GA - Gauge 0-4 Bar (0-60 psi). Use with valve option "1"
GB - Gauge 0-10 Bar (0-160 psi). Use with valve option "2"

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
1 - 584 (23.0)

8 Element Construction

C - Standard Construction
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

* For indicator options, refer to Static Indicators on page

In-tank Filters
ORF 1300

Flows to 1,300 L/min (343 USgpm)
Pressures to 25 bar (360PSI)

V209 1 * 8 C **

1 2 3 4 5 6

Element model code

Sample model code:
V2091B8C10

1 Filter element - V209

2 Element Collapse Rating
1 - 17 bar (250 psi) Low Collapse

3 Seal material
B - Buna-N
V - Viton-A

4 Element Length
mm (inch)
8 - 253 (9.96)

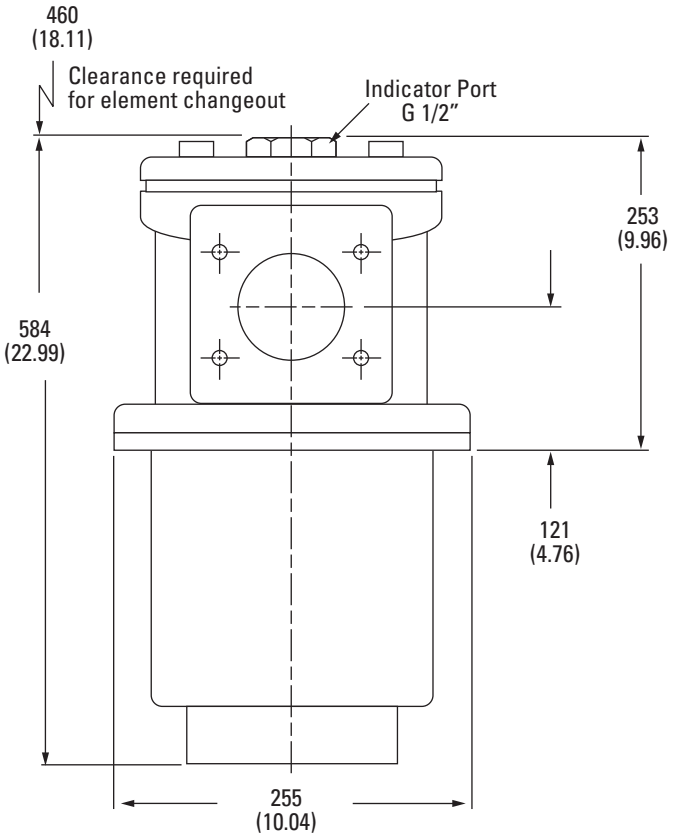
5 Element construction
C - Standard Construction

6 Fluid cleanliness rating

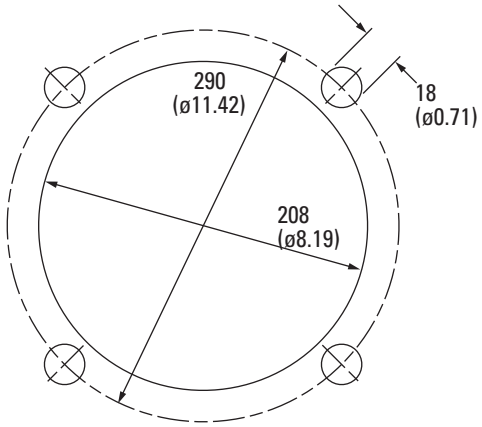
Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions

mm (inch)



Mounting Pattern



In-tank Filters

ORF 1300

Flow Data

Flows to 1,300 L/min (343 USgpm
Pressures to 25 bar (360PSI)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

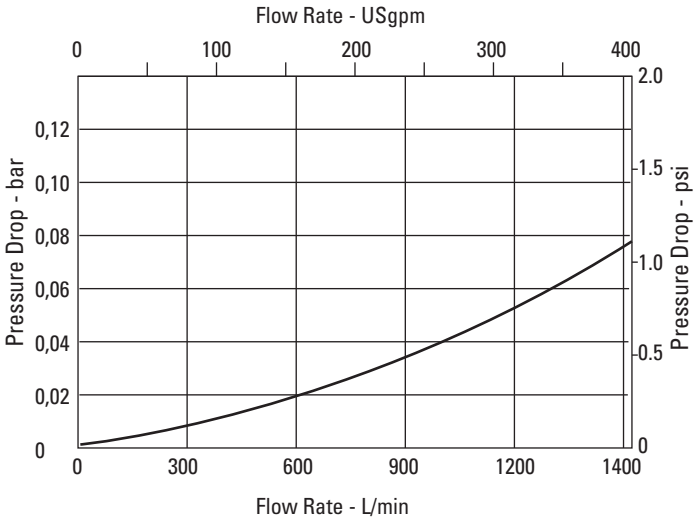
ORF1300 Filter Elements Flow Data

'K' factor - bar/lpm (psi/gpm)

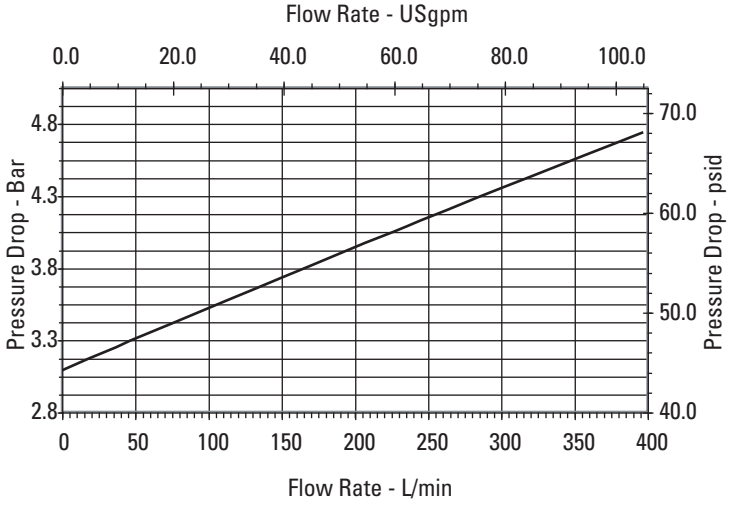
ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	1	0.001 (0.048)	0.001 (0.037)	0.001 (0.034)	0.001 (0.019)

Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing



Bypass Valve



Sample ΔP Calculation : ORF1F2JNB1C05 - Filter assembly having '1' length filter element with micron rating code '05' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.01 x 0.8/0.9	+	200 x 0.001 x 46/32 x 0.8/0.9
	=	0.008	+	0.25
	=	**0.26 bar**		

In-tank Filters

DRT DIN Series Filters

Flows to 630 L/min (166 USgpm)
Pressures to 10 bar (145 psi)

Features and Benefits

- Beta Ratio: $\beta_{X(C)}$ = 1000 to ISO 16889
- Gauge and electrical switch options available to monitor element loading
- In-tank configuration minimizes space requirements and potential system leakage points
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels

DESIGN SPECIFICATIONS

Rated flow:	040	40 L/min (11USgpm)
	063	63 L/min (17USgpm)
	100	100 L/min (26USgpm)
	160	160 L/min (42USgpm)
	250	250 L/min (66USgpm)
	400	400 L/min (106USgpm)
	630	630L/min (166USgpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters
Temp range:		-10°C to + 100°C (+14°F to +212°F)
Pressure rating:	Operating	25 bar (363 psi)
Material:		Aluminum
Dry weight:	040	1,5 kg (3.3lbs)
	063	1,5 kg (3.3lbs)
	100	1,5kg (3.3lbs)
	160	3,8kg (8.4lbs)
	250	3,8kg (8.4lbs)
	400	9,0kg (19.8lbs)
	630	9,0kg (19.8lbs)

DRT 1 * ** 4 ** N * * **

1 2 3 4 5 6 7 8 9 10

DRT Series Filter

Sample model code:
DRT1100BD4XXNBC06

1 Filter Series
DRT - DIN In-Tank

2 Element Collapse Rating
1 - Low Collapse

3 Nominal Size
040 - 40 L/min (11USgpm)
063 - 63 L/min (17USgpm)
100 - 100 L/min (26USgpm)
160 - 160 L/min (42USgpm)
250 - 250 L/min (66USgpm)
400 - 400 L/min (106USgpm)
630 - 630L/min (166USgpm)

4 Port Size
BB - G ½ (Length 040 only)
BC - G ¾ (Length 063 only)
BD - G 1 (Length 100 only)
BE - G 1 ¼ (Length 160 only)
BF - G 1 ½ (Length 250 only)
BM - 2 ½ in SAE Flange Code 61 with metric bolts (DN 64) (Length 400 and 630 only)

5 Valve Options
4 - Bypass set at 3 bar (50 psi) cracking pressure

6 Indicator Options*
XX - No Indicator
GB - 0-10 bar (0-145 psi) gauge
RH - Electrical switch Hirschmann

7 Secondary Port
N - No Secondary Port

8 Seal Material
B - Buna-N
V - Viton-A

9 Element Construction
C - Standard Construction
X - no element

10 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**
XX	no element

* For indicator options, refer to Static Indicators on page 150.

In-tank Filters

DRT DIN Series Filters

Flows to 630 L/min (166 USgpm)
Pressures to 10 bar (145 psi)

VDT * * C ****

1 2 3 4 5

Element model code

Sample model code:
VDT250BC06

1 Filter Element
VDT - DIN Standard Element

2 Nominal Size
040 - 40 L/min (11USgpm)
063 - 63 L/min (17USgpm)
100 - 100 L/min (26USgpm)
160 - 160 L/min (42USgpm)
250 - 250 L/min (66USgpm)
400 - 400 L/min (106USgpm)
630 - 630L/min (166USgpm)

3 Seal Material
B - Buna-N
V - Viton-A

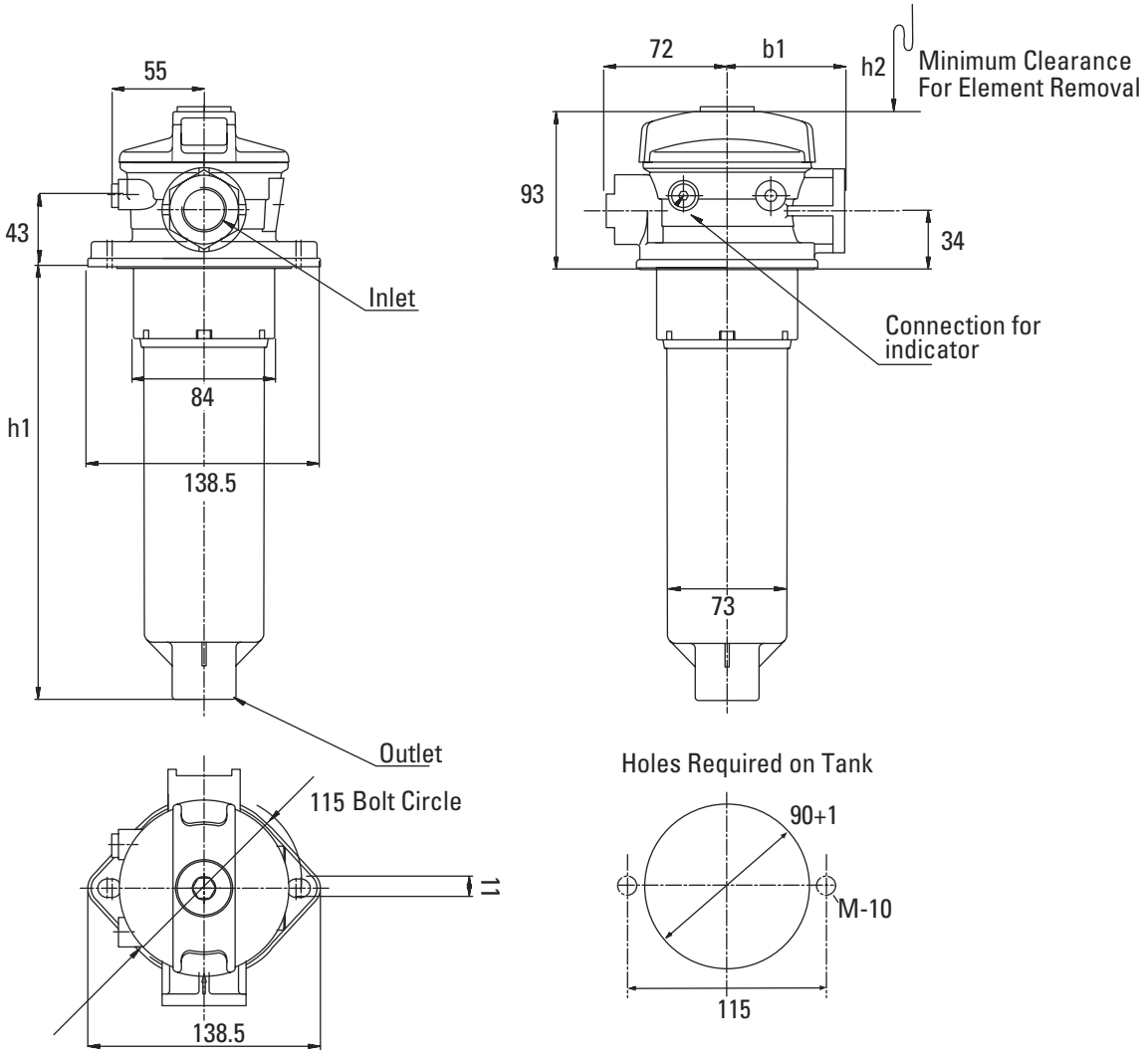
4 Element Construction
C - Standard Construction

5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**

Dimensions DRT 040, 063, 100 Series

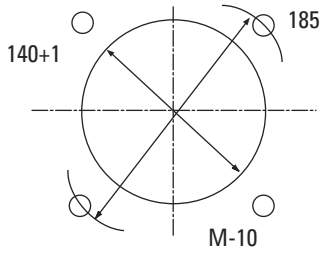
Dimensions in mm

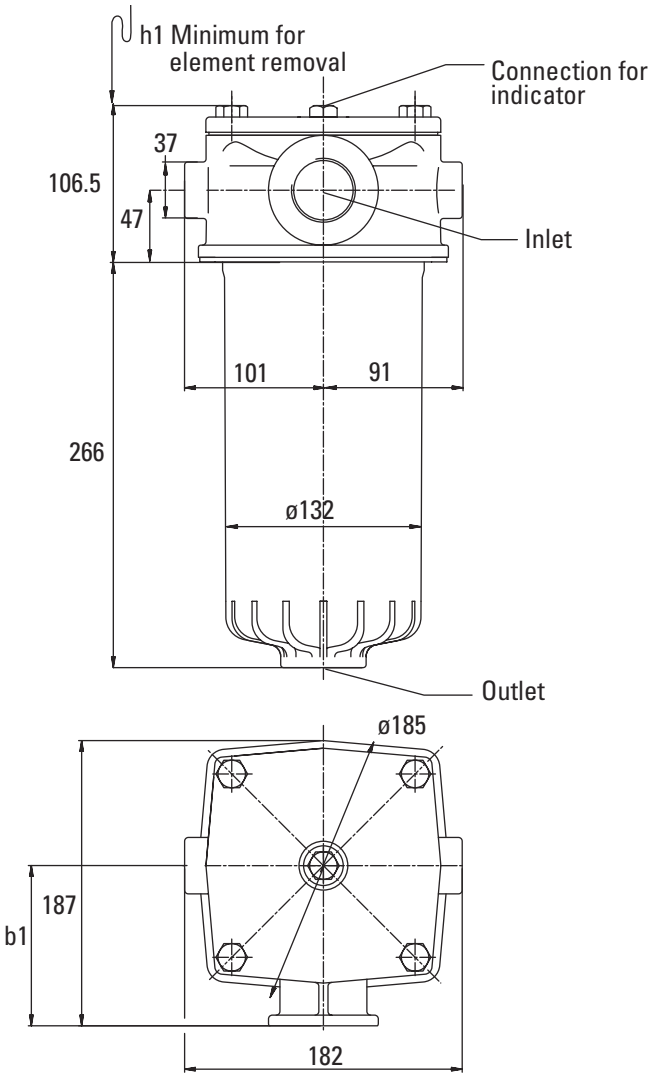


Flows to 630 L/min (166 USgpm)
Pressures to 10 bar (145 psi)

Dimensions DRT 160 and 250 Series

Dimensions in mm





In-tank Filters

DRT DIN Series Filters

Flows to 630 L/min (166 USgpm)
Pressures to 10 bar (145 psi)

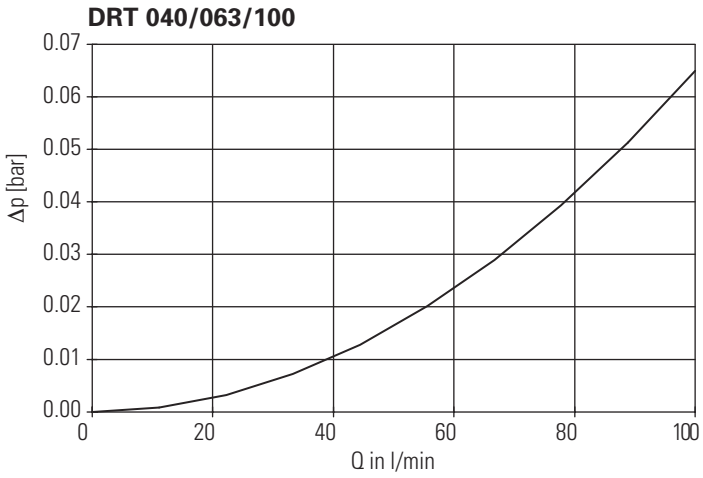
Housing Flow Data

DRT 040, 063, 100 Series Housing Data

Flow versus pressure drop:

32 cSt oil with specific gravity of ≤ 0.9
(See page 5 for specific gravity corrections for pressure drop.)

TYPE	INLET PORT	b1	h1	h2
DRT 040	G 1/2	81	122	150
DRT 063	G 3/4	70	206	200
DRT 100	G 1	70	260	290

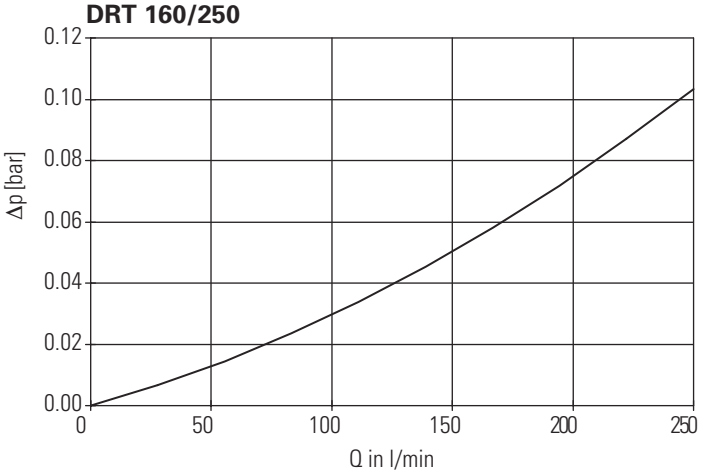


DRT 160 and 250 Series Housing Data

Flow versus pressure drop:

32 cSt oil with specific gravity of ≤ 0.9
(See page 5 for specific gravity corrections for pressure drop.)

TYPE	INLET PORT	b1	h1
DRT 160	G 1 1/4	141	210
DRT 250	G 1 1/2	105	300

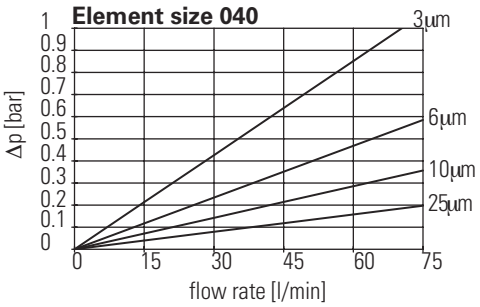


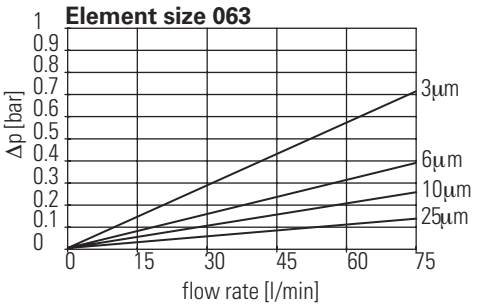
In-tank Filters

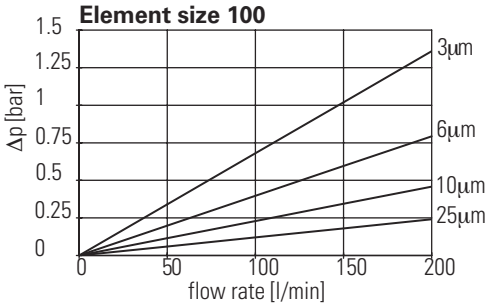
DRT DIN Series Filters

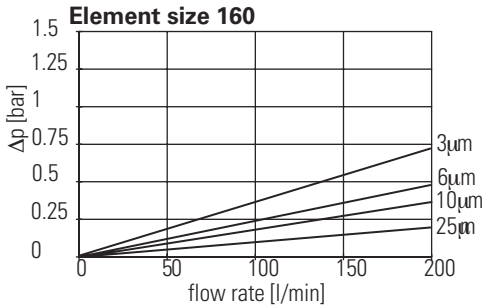
Flows to 630 L/min (166 USgpm)
Pressures to 10 bar (145 psi)

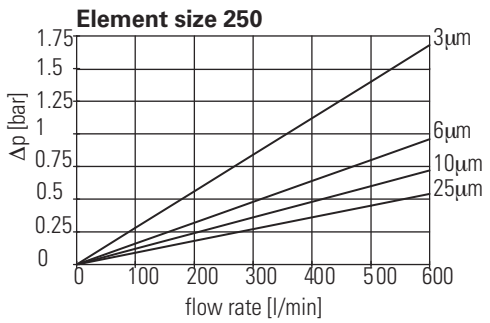
Element Flow Data

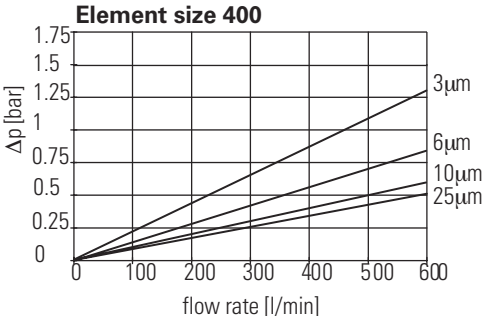


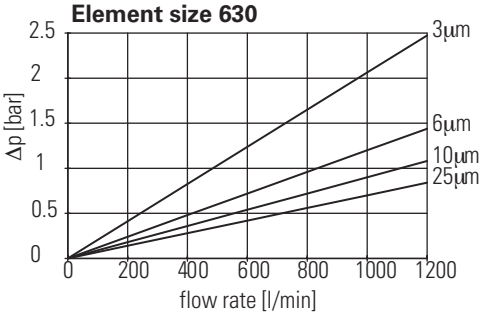












Sample ΔP Calculation : DRT1100BD4XXNBC06 - Filter assembly having filter element with micron rating code '06' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.065 x 0.8/0.9	+	0.3 x 46/32 x 0.8/0.9
	=	0.057	+	0.38
	=	**0.43 bar**		

In-tank Filters
HF4RT Series

Flows to 454 L/min (120 USgpm)
Pressures to 7 bar (100 psi)

Pop-rivets for shipping purposes only. Remove prior to installation.

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards.
- Conforms to HF4 specifications
- Gauge and electrical switch options available to monitor element loading
- In-tank configuration minimizes space requirements and potential system leakage points
- Optional secondary port allows filtration of a second return line without additional fittings or filtered fill port
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels. Optional extend tube allows smaller filtration unit to be used where needed

DESIGN SPECIFICATIONS

Rated flow:	Length 3	189 L/min (50 USgpm)
	Length 6	379 L/min (100 USgpm)
	Length 7	454 L/min (120 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids Optional seals available for phosphate esters.
Temp range:		-30°C to 121°C (-22°F to 250°F)
Pressure rating:	Operating	7 bar (100 psi)
	Fatigue	7 bar (100 psi)
Material:	Head	Aluminum
	Cover	Aluminum
	Bowl	Carbon Steel
Dry weight: (Approximate)	Length 3	4,5 kg. (10.0 lbs.)
	Length 6	6,6 kg. (14.5 lbs.)
	Length 7	8,4 kg. (18.6 lbs.)

HF4RT Series Filter and Element Model Code

Sample model code:

HF4RT1SD313XXBC05

HF4RT	1	**	*	**	*	**	*	*	**
1	2	3	4	5	6	7	8	9	10

1 Filter Series - HF4RT

2 Element Collapse Rating

1 - 10 bar (150 psi) Low Collapse

3 Port Options

BC - G1¼ to ISO 228
ME - 1½" - SAE 4 bolt Flange Code 61 (M12 x 1.75)
SD - 1.875 - 12 UN SAE-24 str. Thd. (1½" tube)
FE - 1½" - SAE 4 bolt Flange Code 61 (UNC)

4 Valve Options

3 - Bypass set at 1.7 bar (25 psi) cracking pressure
4 - Bypass set at 3 bar (43 psi) cracking pressure

5 Indicator Options*

XX - No indicator
GA - Gauge 0-4 bar (0-60psi)
GB - Gauge 0-10 bar (0-160psi)
MB - Electrical, 15 PSI Brad Harrison
RB - Electrical, 30 PSI Brad Harrison
MH - Electrical, 15 PSI Hirschmann
RH - Electrical, 30 PSI Hirschmann

6 Assembly Length
mm (inch)

3 - 378 (14.9)
6 - 584 (23)
7 - 787 (31)

7 Secondary Port

BC - G1¼ to ISO 228 - use with BC Inlet Port
SD - 1.875 - 12 UN SAE-24 str. Thd. (1½" tube) - use with SD Inlet Port
SZ - 2.50 - 12 UN SAE-32 str. Thd. (2" tube) - use with FE Inlet Port
XX - No Secondary Port

Note: No secondary port option is available with the ME inlet port option.

8 Seal Material

B - Buna-N
V - Viton-A

9 Element Construction

C - Standard Construction
X - no element

10 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

* For indicator options, refer to Static Indicators on page 150.

In-tank Filters
HF4RT Series

Flows to 280 L/min (75 USgpm)
Pressures to 50 bar (725 psi)

V405 1 * * C **
1 2 3 4 5 6

V405 Element Model Code

Sample model code:
V4051B3C05

1 Filter Element
V405 - For use with HF4RT

2 Element Collapse Rating
1 - 10 bar (150 psi) Low Collapse

3 Seal Material
B - Buna-N
V - Viton-A

4 Element Length
mm (inch)
3 - 229 (9)
6 - 457 (18)
7 - 686 (27)

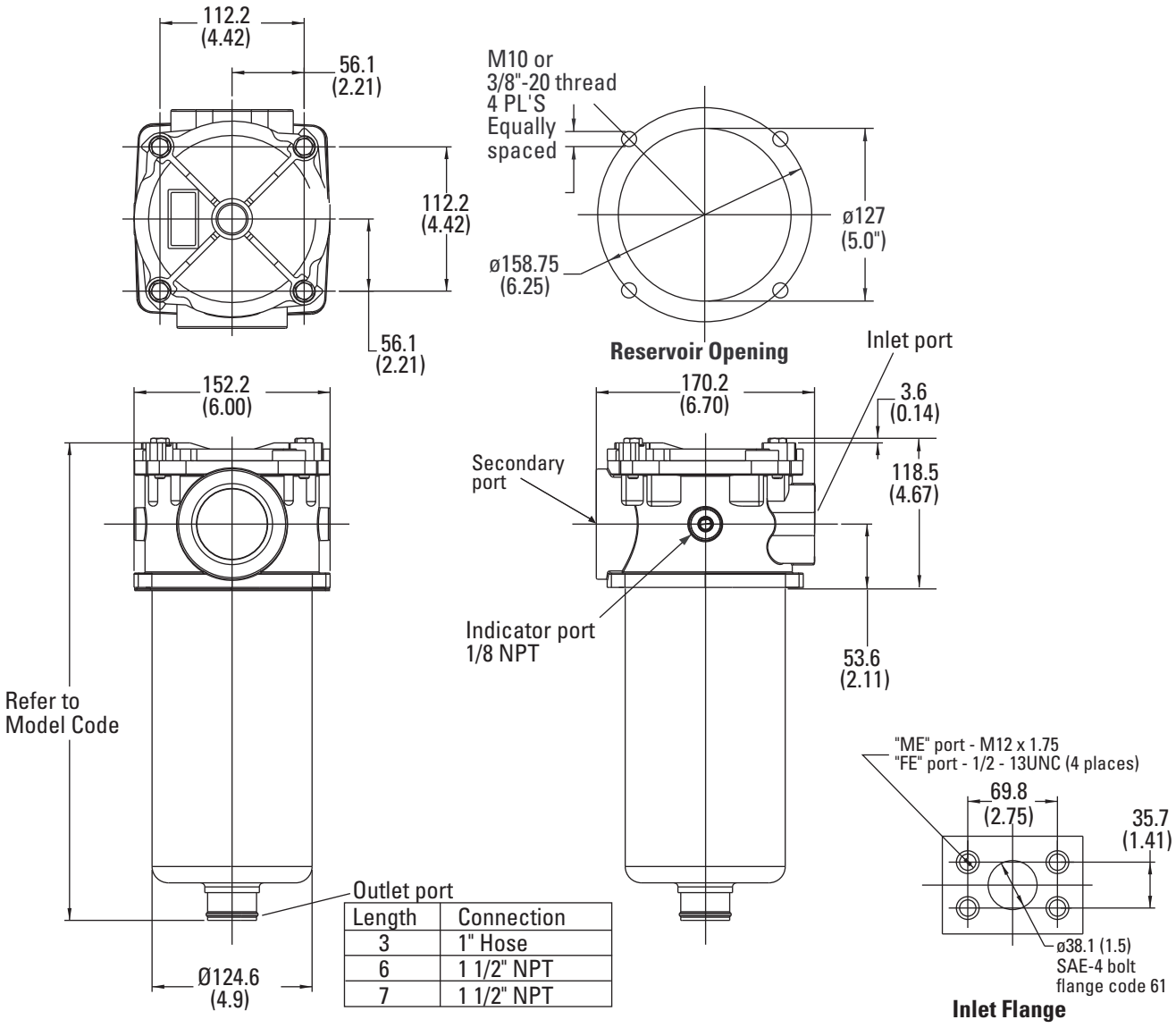
5 Element Construction
C - C-Pak (code 03, 05, 10, 20)

6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions

mm (inch)



Length	Connection
3	1" Hose
6	1 1/2" NPT
7	1 1/2" NPT

In-tank Filters

HF4RT Series

Flow Data

Flows to 280 L/min (75 USgpm)
Pressures to 50 bar (725 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HF4RT Filter Elements Flow Data

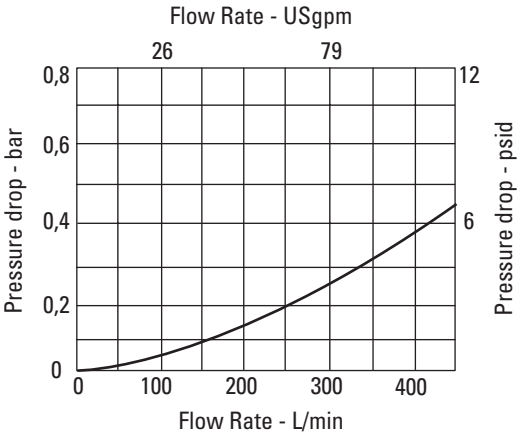
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	3	0.003 (0.168)	0.003 (0.140)	0.001 (0.078)	0.001 (0.044)
	6	0.001 (0.080)	0.001 (0.066)	0.001 (0.037)	0.001 (0.021)
	7	0.001 (0.051)	0.001 (0.043)	0.001 (0.024)	0.001 (0.013)

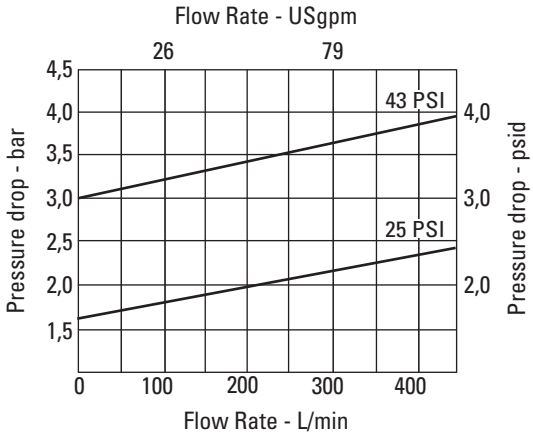
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HF4RT1SD3XX3XXBC05 - Filter assembly having '3' length filter element with micron rating code '05' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.15 x 0.8/0.9	+	200 x 0.003 x 46/32 x 0.8/0.9
	=	0.130	+	0.76
	=	**0.89 bar**		

In-tank Filters

OSS Suction Strainers

Flows to 380 L/min (100 USgpm)

Features and Benefits

- Filters coarse particulate to prevent pump damage

Note: Check or verify inlet condition before use.

DESIGN SPECIFICATIONS

Rated flow:	Length 1	30 L/min (8 USgpm)
	Length 2 w/1 1/4" NPT	75 L/min (20 USgpm)
	Length 2 w/1 1/2" NPT	115 L/min (30 USgpm)
	Length 3	190 L/min (50 USgpm)
	Length 4 w/1 1/4" NPT	380 L/min (100 USgpm)
Fluid compatibility:		Compatible with all petroleum oils and synthetic fluids rated for use with Fluoro-Rubber or Ethylene Propylene seals.
Temp range:		-28 to +100˚C (-20 to +210˚F)
Material:	Wire Mesh	Steel
	Fittings	Nylon
Dry weight:	Length 1	0,2 kg. (0.4 lbs.)
	Length 2	0,3 kg. (0.6 lbs.)
	Length 3	0,5 kg. (1.1 lbs.)
	Length 4	0,8 kg. (1.8 lbs.)

OSS Series Filter and Element Model Code

Sample model code:

OSS3D1M

MODEL CODE:	PART NUMBER
OSS1B1M	5003890
OSS2C1M	5003891
OSS2D1M	5003892
OSS3D1M	5003893
OSS4E1M	5003894

OSS * * 1 M

1 2 3 4 5

1 Filter Series - OSS

2 Length

mm (inch)

1 - 109 (4.3)
2 - 142 (5.6)
3 - 203 (8.0)
4 - 277 (10.9)

3 Port Options

B - 3/4" NPT (Length 1 only)
C - 1-1/4" NPT (Length 2 only)
D - 1-1/2" NPT (Length 2, 3 only)
E - 3" NPT (Length 4 only)

4 Valve Options

1 - Bypass set at 0.2 bar (3 psi) cracking pressure

5 Construction

M - 100 Wire Mesh

Items not in bold are non-standard and may have a longer lead time

In-tank Filters

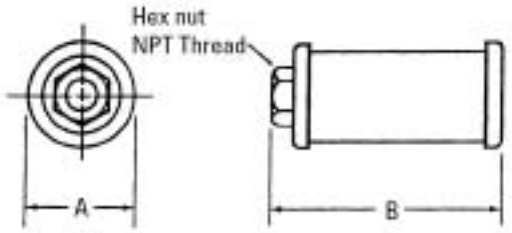
OSS Suction Strainers

Flow Data

Element Flow Data

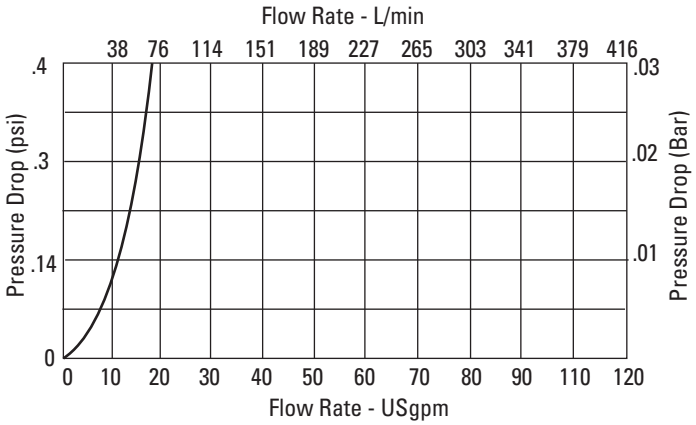
Housing Dimensions

mm (inch)

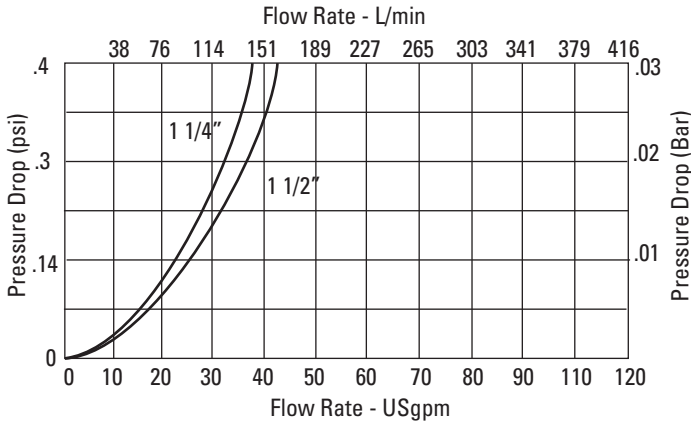


LENGTH	A MM(INCH)	B MM(INCH)	SCREEN AREA (IN^2)
1	68.6 (2.7)	109.2 (4.3)	40
2	86.4(3.4)	142.2(5.6)	128
3	101.6(4.0)	208.2(8.0)	200
4	132.1(5.2)	276.9(10.9)	379

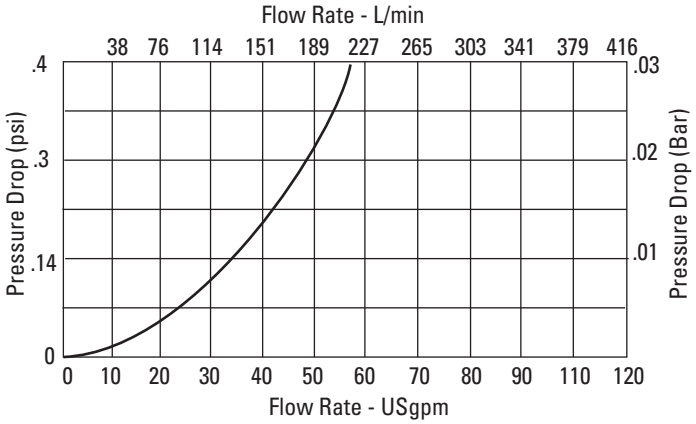
OSS Filter Length 1



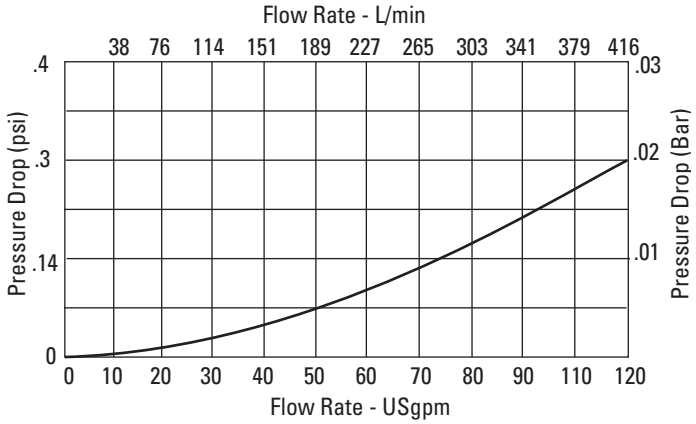
OSS Filter Length 2



OSS Filter Length 3



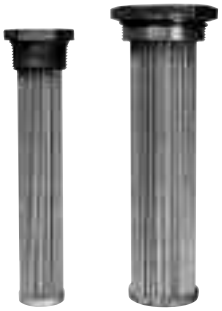
OSS Filter Length 4



In-tank Filters

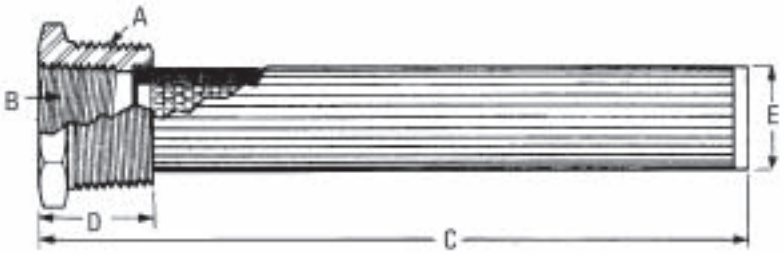
OTM Tank Mounted Strainers

Flows to 380 L/min (100 USgpm)



DESIGN SPECIFICATIONS

Rated flow:		See chart below
Housing and Element Compatibility:		Compatible with all petroleum based fluids, water glycols, synthetic fluids and phosphate ester fluids
Temp range:		-28 to +100˚C (-20 to +210˚F)
Material:		Stainless Steel Cast Iron
Dry weight: (Approximate with element)	Length 1 Length 2 Length 3 Length 4 Length 5 Length 6	0,1 kg. (0.20 lbs.) 0,2 kg. (0.55 lbs.) 0,3 kg. (0.65 lbs.) 0,5 kg. (1.05 lbs.) 1,0 kg. (2.15 lbs.) 1,8 kg. (4.05 lbs.)
Bypass Valve:		5 psid in all OTM strainers



MODEL CODE	A	B	C	D	E	SCREEN AREA		RATED FLOW	
		Port Size	mm (in)	mm (in)	mm (in)	(sq. cm)	(sq.inch)	L/min & USgpm	
OTM1	1" NPT	1/2" NPT	135.6 (5.3)	26.9 (1.06)	29.7 (1.1)	225.75	35	19	5
OTM2	1 1/4" NPT	3/4" NPT	207.5 (8.2)	30.4 (1.2)	34.5 (1.3)	412.80	64	38	10
OTM3	1 1/2" NPT	1" NPT	208.2 (8.2)	30.9 (1.2)	42.1 (1.6)	554.70	86	57	15
OTM4	2" NPT	1 1/4" NPT	229.6 (9.0)	34.2 (1.3)	53.8 (2.1)	806.25	125	95	25
OTM5	3" NPT	2" NPT	246.3 (9.7)	43.1 (1.7)	76.2 (3.0)	1677	260	190	50
OTM6	4" NPT	3" NPT	287 (11.3)	45.7 (1.8)	101.6 (4.0)	2031.75	315	380	100

MODEL CODE:	PART NUMBER
OTM1	**5003895**
OTM2	**5003896**
OTM3	**5003897**
OTM4	**5003898**
OTM5	**5003899**
OTM6	**5003900**

Standard items are in bold print.

Indicating Inlet Strainers

General Data

These units have been designed for use in the intake lines of hydraulic pumps to afford a degree of protection from contaminants to the pump and other components in the hydraulic system.

Bypass Valve

An integral relief valve parallels the element and is preset to open at a 0.1 bar (2 psi) (standard) or 0.2bar (3 psi) (optional) pressure drop across the element. Element bypassing can be caused by excess flow rates, high fluid viscosity, dirt-loaded elements, or a combination of these.

Air Bleed

These strainers include a standard integral air bleed. It provides faster pump priming on startup and limits the agglomeration of small air bubbles into larger ones. Large air bubbles are detrimental to pump operation.

The unit may be mounted in any position desired. To ensure proper operation of the air bleed feature, however, the inlet port must be pointed down.

Magnets

Magnets are available as an accessory and are installed in the filter on the outside of the element. They act to attract and retain ferrous particles of all sizes, some of which could be small enough to pass through the element mesh and into the pump if no magnets were present.

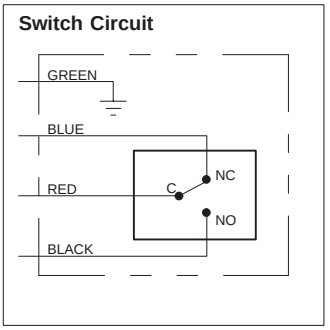
Indicators

Visual

A highly visible mechanical indicator is linked to the bypass valve. The indicator shows green when the bypass valve is closed and progressively more yellow as a warning when the element pressure drop gets into the danger zone. Red indicates an open bypass valve. The indicator will also automatically show red, (bypass condition) if the unit is accidentally operated without an element. The visual indicator can also be reassembled to provide a "memory" function. If the protecting hood is removed and the rotary indicator turned 180° on its stem, the unit will indicate the maximum opening of the bypass and remain in that position until reset by rotating the knurled projecting knob.

Electrical

A lever-actuated electric switch is mounted in the indicator enclosure. The switch is depressed by a cam mounted to the bypass valve just prior to the opening of the valve. This changes the completion of the electrical switch circuit from the common and the normally closed terminals to the common and normally open terminals.



Switch actuation will also occur when the unit is accidentally operated without an element.

A 1/2" pipe tap is provided for connecting a conduit, and lengths of color coded wires are soldered to the switch terminals for connecting to the external circuit through the conduit wires. The switch contacts are rated for 5 amps resistive loading up to 250V AC.

10F, 50F Series
Indicating Inlet Strainers

Flows to 329 L/min (87 USgpm)
Pressure to 0.3 bar (5 psi) vacuum to 20 bar (300 psi) positive

Features and Benefits

- Stainless elements have 149 micron (100 mesh) screen to protect pumps from solid contaminants
- Available flows to 329 L/min (87 USgpm) on pressure inlets and 254 L/min (67 USgpm) on vacuum inlets
- Standard integral air bleed feature prevents formation of large bubbles. This provides faster priming of pumps at startup and prevents pump damage
- Housing can be adapted to handle most hydraulic fluids
- Large, easy to read, standard visual indicator (or optional electrical indicator) informs operator when element needs to be cleaned
- Elements can be cleaned and reused
- Standard bypass valve protects against pump damage

DESIGN SPECIFICATIONS

Rated flow:		See Table
Filtration:		Filter is supplied with 149 micron (100 mesh) wire cloth element.
Fluid compatibility:		Standard model is compatible with most petroleum oil, water glycol, and water-in-oil fluids. Optional seals and coatings are available for use in phosphate esters and oil-water emulsions. See fluids and seals note in model code.
Temp range:		-40°C to + 107°C (-40°F to 225°F)
Pressure rating:	10F and 50F	0,3 bar (5 psi)
Material:	Cover Housing	Die Cast Aluminum Cast Aluminum
Dry weight: Approximate	10F 50F	2,5kg (5.5 lbs) 5,7kg (12.5 lbs)

Maximum Flow Ratings

This table presents recommendations for use in both pressurized inlet systems and the more common vacuum inlet systems. The effects of fluid viscosity, specific gravity, and fluid flow rate on the pump inlet system (including the filter) have been taken into consideration. Even with a bypass condition in effect due to element dirt loading, a margin of pump protection is still afforded.

MODEL SERIES	VACUUM INLET* NORMAL SERVICE†	VACUUM INLET* SPECIAL SERVICE††	PRESSURIZED INLET** NORMAL SERVICE†	PRESSURIZED INLET** SPECIAL SERVICE††
	L/min (USgpm)	L/min (USgpm)	L/min (USgpm)	L/min (USgpm)
10FA	45 (12)	30 (8)	61 (16)	42 (11)
50FB	106 (28)	76 (20)	140 (37)	95 (25)
50FC	178 (47)	125 (33)	257 (68)	167 (44)
50FD	254 (67)	178 (47)	329 (87)	238 (63)

* 0.3 bar (5 psi) vacuum to 0 bar (0 psi)
** 0 bar (0 psi) to 20 bar (300 psi)
† For use with petroleum oil up to 48 cSt (225 SUS) with less than 457mm (18") lift on vacuum applications.
†† For use with petroleum oils above 48 cSt (225 SUS) and fire resistant fluids.

Model Code

Sample model code:

10FA1BBMB3X12

**	F	*	1	**	*	*	*	*	**
1	2	3	4	5	6	7	8	9	10

1 Package Size
10 - 10 size
50 - 50 size

2 Model Series
F -Indicating type inlet filter

3 Port Size
A - 1" (10F)
B - 1-1/2" (50F)
C - 2" (50F)
D - 2-1/2" (50F)

4 Mean Filtration Rating
1 -149 micron (100 mesh)

5 Port Type
BB - G1 (formerly 1" BSPF) thd. (10F only)
FF - 4-bolt SAE flange
SS - SAE straight thd. in housing (except 50FD)
PF - Inlet: NPTF pipe thd. in housing Outlet: 4-bolt SAE flange
SF - Inlet: SAE Straight thd. in housing Outlet: 4-bolt SAE flange (except 50FD)

6 Indicator
E - Electrical
L - Less (without) indicator parts
M - Mechanical

7 Seals
B - Buna - N
V - Viton

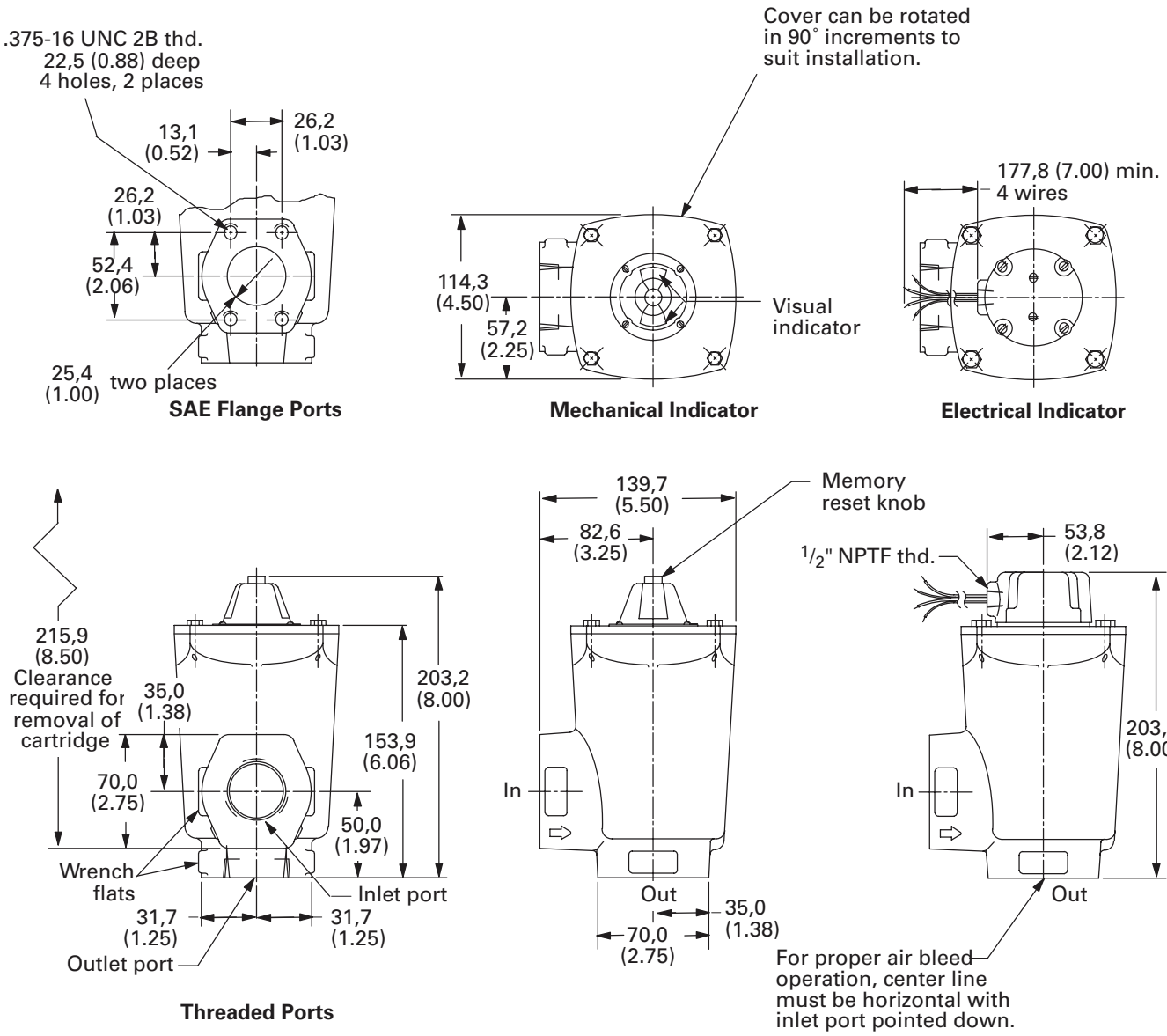
8 Bypass valve
3 - 0.2 bar (3 psi) differential opening pressure
2 - 0.1 bar (2 psi) differential opening pressure

9 Option
M - Magnets
X - No Magnets

10 Design Number
12 - Mechanical indicator or no indicator
20 - Electrical indicator

10FA Model Series

mm (inch)



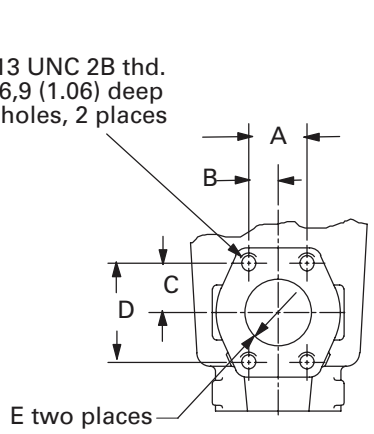
ELEMENT AREA CM² (IN²)	INLET AND OUTLET PORT THREADS				
	PIPE THREAD*	SAE STRAIGHT THREAD	TUBE SIZE	NPTF FLANGE*	WELDED FLANGE
419.4 (65)	1" NPTF G1 (1" BSPF)	1.312-12 UN	1.000	FLI-8-08P-10	FLI-8-08W-10

*Not recommended

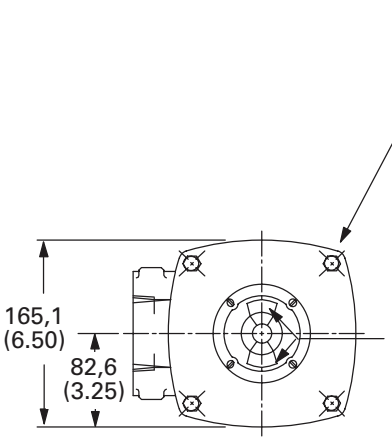
50F Series
Indicating Inlet Strainers

50F* Model Series

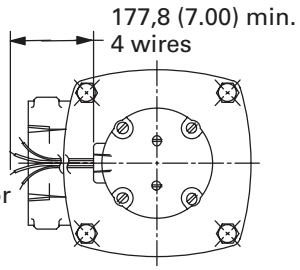
mm (inch)



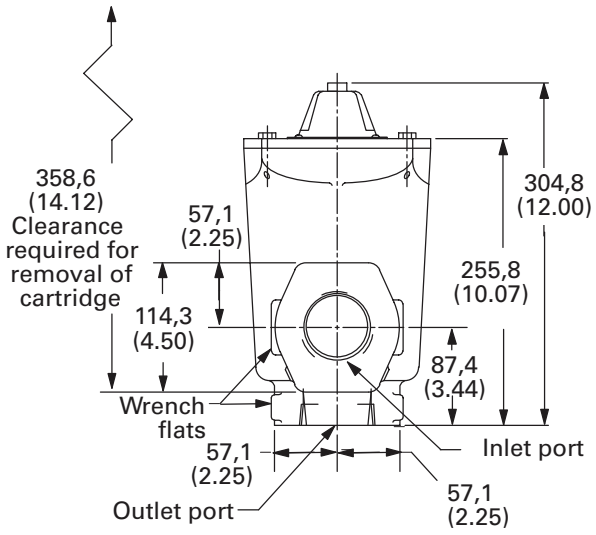
SAE Flange Ports



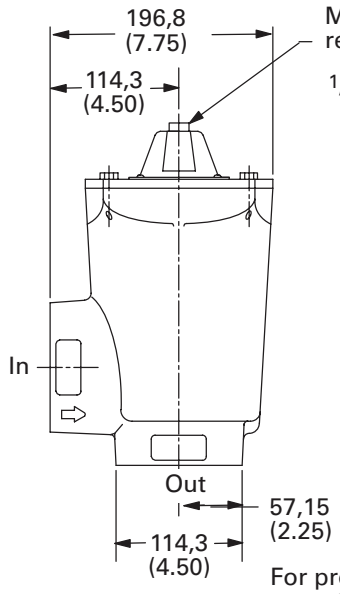
Mechanical Indicator

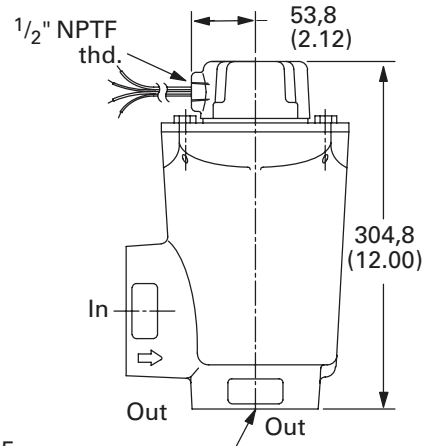


Electrical Indicator



Threaded Ports





For proper air bleed operation, center line must be horizontal with inlet port pointed down.

MODEL	ELEMENT AREA CM² (IN²)	INLET AND OUTLET PORT THREADS					SAE FLANGE PORT DIMENSIONS				
		PIPE THREAD*	SAE STRAIGHT THREAD	TUBE SIZE	NPTF FLANGE*	WELDED FLANGE	A	B	C	D	E
50FB	645,2 (100)	11/2"	1.875-12 UN	1.50	FLI-12-12P-10	FLI-12-12W-10	35,7 (1.41)	17,8 (0.70)	35,1 (1.38)	69,8 (2.75)	38,1 (1.50)
50FC	1419,4 (220)	2"	2.500-12 UN	2.00	FLI-16-16P-10	FLI-16-16W-10	42,9 (1.68)	21,3 (0.84)	38,9 (1.53)	77,8 (3.06)	50,8 (2.00)
50FD	1419,3 (220)	21/2"	-	-	FLI-20-20P-10	FLI-20-20W-10	50,8 (2.00)	25,4 (1.00)	44,4 (1.75)	88,9 (3.50)	63,5 (2.50)

*Not recommended

Spin-on Filters

General Data

Spin-on filters typically consist of a head mounted directly in-line with the return piping and a canister containing an element which screws onto a threaded post. The canister seals to the head to prevent leakage.

These are an effective and economical choice of filter where the return line pressure is low and there are no large flow surges with the return line. They are also easily installed without specialty equipment or tooling.

Applications

- Agricultural equipment - tractors, spreaders, harvesters
- Metal forming presses
- Strapping systems
- Brush Chippers
- Turf maintenance equipment
- Small power units

Spin-on Filters
OFRS15

Flows to 57 L/min (15 USgpm)
Pressures to 7 bar (100 psi)

Features and Benefits

- Simple spin-on element design for easy maintenance
- Bypass valves prevent excessive pressure drop and accidental element collapse
- Two available ports for use as gauge and/or diagnostic ports

DESIGN SPECIFICATIONS

Rated flow:		57 L/min 15 USgpm)
Fluid compatibility:		Compatible with most most petroleum oil, water glycol, oil-in-water and water-in-oil fluids.
Temp range:		40°C to +107°C (-40°F to +225°F)
Pressure rating:	Operating	7 bar (100 psi)
Material:	Head Bowl	Die cast aluminum Carbon steel
Dry weight:		1,0 kg (2.2 lbs.)

OFRS	15	*	*	***	*	*	*	**	10
1	2	3	4	5	6	7	8	9	10

OFRS15 Series Filter and Element Model Code

Sample model code:
OFRS15S2R03PBE1010

1 Filter Series - OFRS

2 Flow Rating
15 -15 USgpm (57 L/min)

3 Port Type
B - G1 to ISO 228
P - 1in NPT
S - 1.312-12 UN SAE-16 straight thd.

4 Assembly Length
mm (inch)
1 - 194,6 (7.7)
2 - 250,4 (9.9)
X - no element

5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
R03	16/**14/12**
R05	18/**16/14**
R10	20/**18/15**
XXX -	no element

6 Pressure Gauge Option
P - Pressure gauge 0-8 bar (0-120 psi);l p/n 736129
C - Color Coded Pressure Gauge (For use with 1.7 bar (25 psi) bypass only); p/n P-232965-01
X - No Gauge

7 Inlet Gauge Port Location (1/8" NPT)
B - Location B
X - No Gauge

8 Outlet Gauge Port Location (1/8" NPT)
E - Location E
X - No Gauge

9 Bypass Valve
10 -Bypass valve set at 0.6 bar (10 psi)
25 - Bypass valve set at 1.7 bar (25 psi)

10 Design Number
10 - Standard Design

Spin-on Filters
OFRS15

Flows to 57 L/min (15 USgpm)
Pressures to 7 bar (100 psi)

V019 1 B * R **

1 2 3 4 5 6

V019 Element Model Code

Sample model code:
V0191B2R03

1 Series Designation
V019 - Filter element for use with OFRS15

2 Element Collapse Rating
1 - 10 bar (150 psi)

3 Seal Material
B - Buna–N

4 Element Length
mm (inch)
1 - 147 mm (5.8 in)
2 - 203 mm (8.0 in)

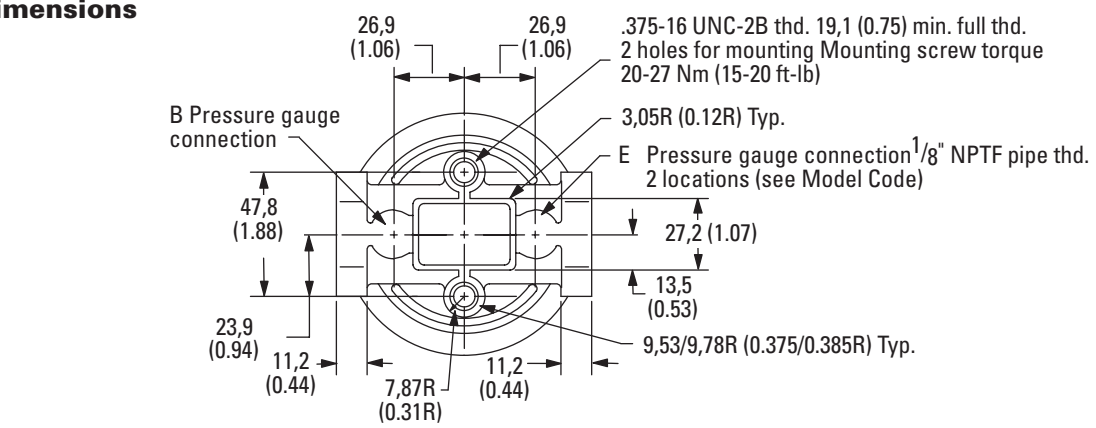
5 Element Construction
R - R–Pak

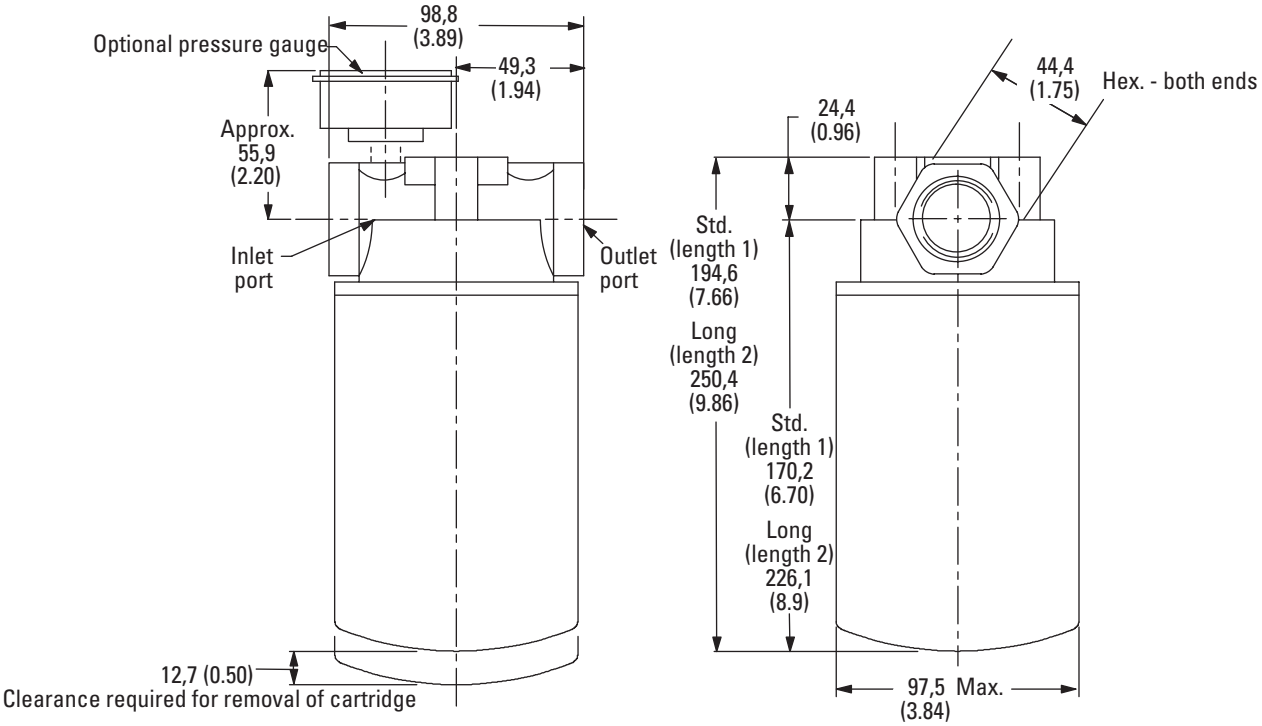
6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**

Housing Dimensions

mm (inch)





Spin-on Filters

OFRS15

Flow Data

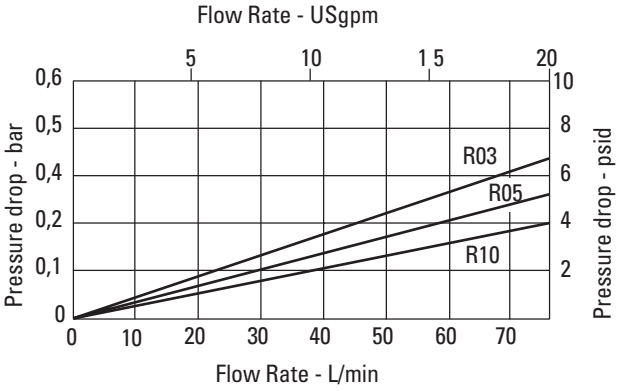
Flows to 60 L/min (15 USgpm)
Pressures to 7 bar (100 psi)

Flow versus pressure drop:

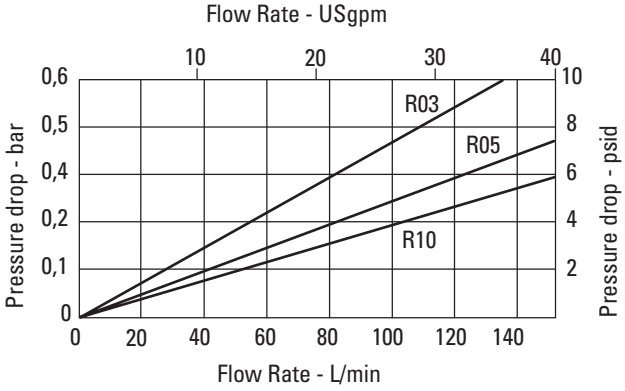
150 SUS (32 cSt) oil with specific gravity of ≤0.9

Element Flow Data

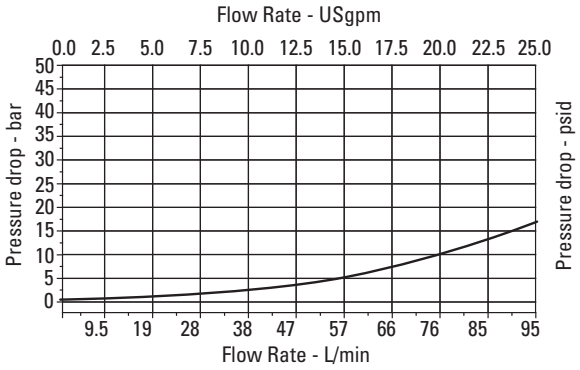
OFRS 15 Element Length 1

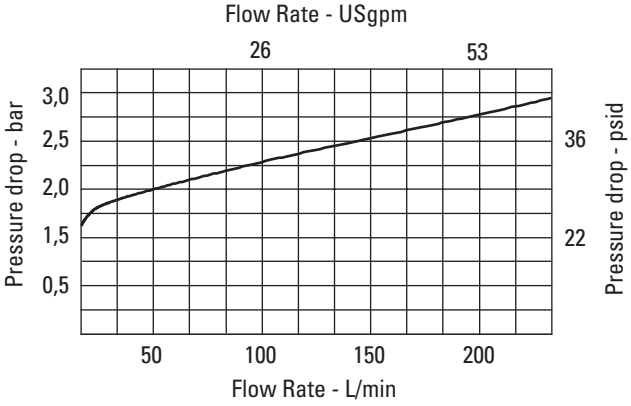


OFRS 15 Element Length 2



Housing/Bypass Valve Flow Data





Sample ΔP Calculation : OFRS15S2R03PBE1010 - Filter assembly having '2' length spinon filter element with micron rating code '03' at 50 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.4 x 0.8/0.9	+	0.08 x 46/32 x 0.8/0.9
	=	0.350	+	0.1
	=	**0.45 bar**		

Spin-on Filters
OFRS25

Flows to 95 L/min (25 USgpm)
Pressures to 7 bar (100 psi)

Features and Benefits

- Simple spin-on element design for easy maintenance
- Bypass valve prevents excessive pressure drop and accidental element collapse
- Six available ports for use as gauge and/or diagnostic ports

DESIGN SPECIFICATIONS

Rated flow:	Length 1 Length 2	55 L/min (15 USgpm) 95 L/min (25 USgpm)
Fluid compatibility:		Suitable for use with petroleum based, oil-water emulsions, high water based and most water-glycol fluids.
Temp range:		40°C to +107°C (-40°F to +225°F)
Pressure rating:	Operating	7 bar (100 psi)
Material:	Head Canister	Die cast aluminum Carbon steel
Dry weight:		0,9 kg (2.0 lbs)

OFRS25 Series Filter and Element Model Code

Sample model code:
OFRS25S1R03PAF2510

OFRS	25	*	*	***	*	*	*	**	10
1	2	3	4	5	6	7	8	9	10

1 Filter Series - OFRS

2 Flow Rating
25 - 25 USgpm (95 L/min)

3 Port Type
B - G1 (formerly 1" BSPF) thd.
F - 1" SAE-4-bolt flange code 61
P - 1" NPTF
S - 1.312-12 UN SAE-16 straight thd. for 1" OD tube

4 Assembly Length
mm (inch)
1 - 194,1 (7.6)
2 - 250,4 (9.9)
X - no element

5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
R03	16/**14/12**
R05	18/**16/14**
R10	20/**18/15**
XXX	no element

6 Pressure Gauge Option
P - Pressure gauge 0-120 psi (0-8 bar); p/n 736129
X - No Gauge

7 Inlet Gauge Port Location (1/8" NPTF)
A - Location A
B - Location B
C - Location C
X - No Gauge

8 Outlet Gauge Port Location (1/8" NPTF)
D - Location D
E - Location E
F - Location F
X - No Gauge
NOTE: Gauges cannot be mounted side by side. If inlet and outlet gauges are required, specify non-adjacent ports such as A and E.

9 Bypass Valve
XX - Non-bypass
25 - Bypass valve set at 1.7 bar (25 psi)

10 Design Number
10 - Standard Design

Spin-on Filters
OFRS25

Flows to 95 L/min (25 USgpm)
Pressures to 7 bar (100 psi)

V019 1 B * R **

1 2 3 4 5 6

V019 Element Model Code

Sample model code:
V0191B2R03

1 Series Designation
V019 - Filter element for use with OFRS25

2 Element Collapse Rating
1 - 10 bar (150 psi)

3 Seal Material
B - Buna–N

4 Element Length
mm (inch)
1 - 147 (5.8)
2 - 203 (8.0)

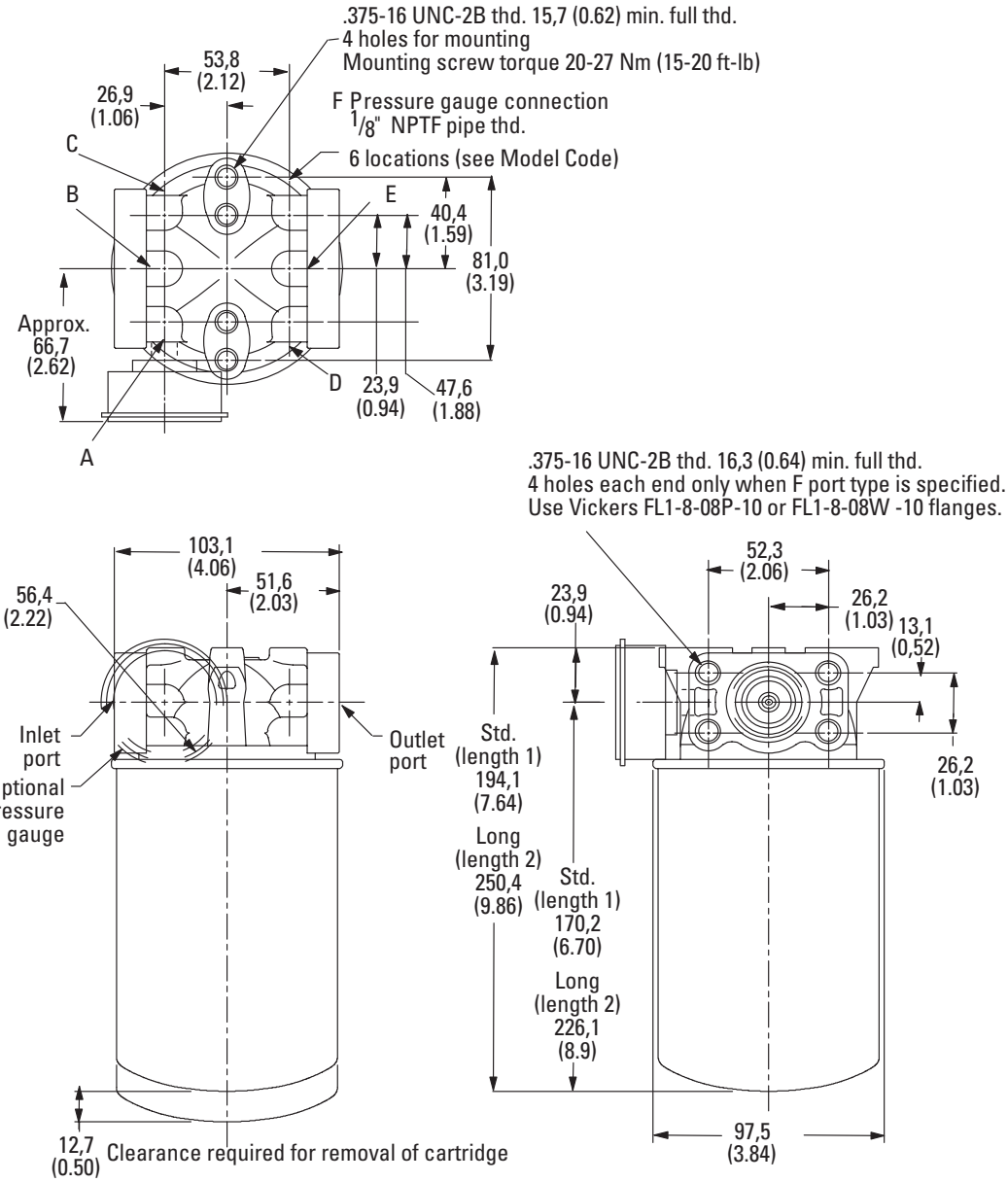
5 Element Construction
R - R–Pak

6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**

Housing Dimensions

mm (inch)



Spin-on Filters

OFRS25

Flow Data

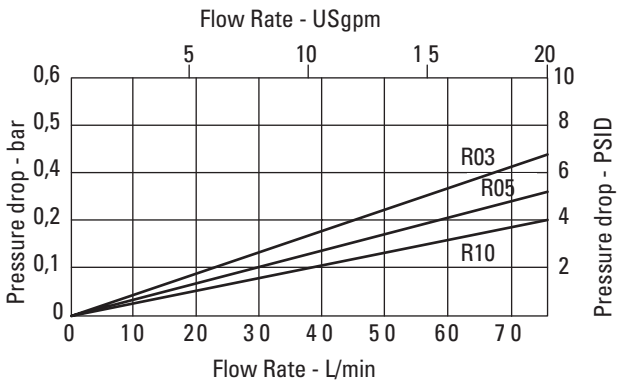
Flows to 95 L/min (25 USgpm)
Pressures to 7 bar (100 psi)

Flow versus pressure drop:

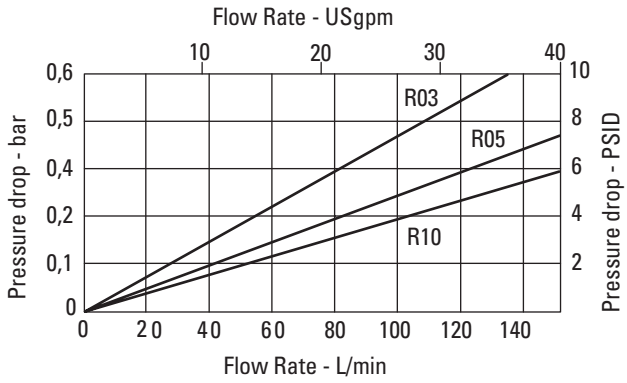
150 SUS (32 cSt) oil with specific gravity of ≤0.9

Element Flow Data

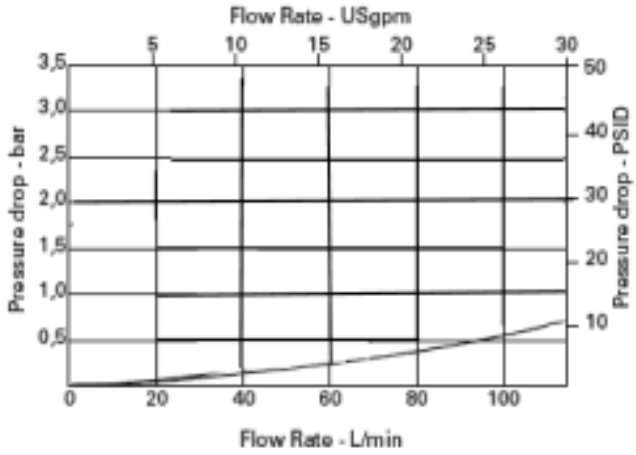
OFRS Element Length 1

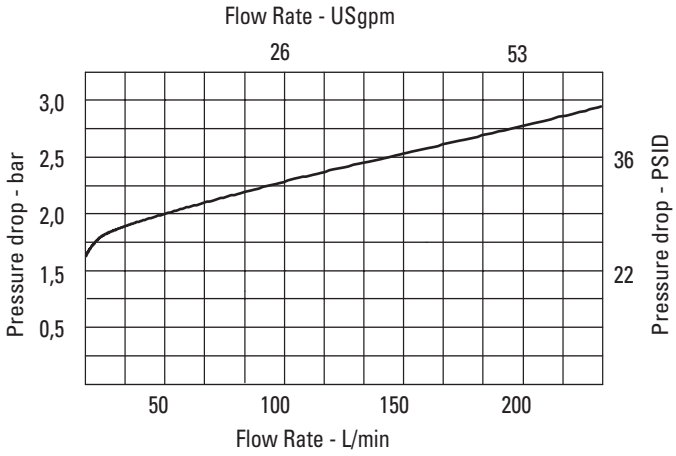


OFRS Element Length 2



Housing/Bypass Valve Flow Data





Sample ΔP Calculation : OFRS25S1R03PAF2510 - Filter assembly having '1' length spinon filter element with micron rating code '03' at 70 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.25 x 0.8/0.9	+	0.42 x 46/32 x 0.8/0.9
	=	0.220	+	0.53
	=	**0.75 bar**		

Spin-on Filters
OFSS30

Flows to 113 LPM (30 USgpm)
Pressures to 10 bar (150 psi)

Features and Benefits

- Simple spin-on element design for easy maintenance
- Bypass valves prevent excessive pressure drop and accidental element collapse
- Two available ports for use as gauge and/or diagnostic ports

DESIGN SPECIFICATIONS

Rated flow:		115 L/min (30 USgpm)
Temp range:		-27°C to +107°C (-20°F to +225°F)
Pressure rating:	Operating Fatigue	10 bar (150 psi) 20 bar (300 psi)
Material:	Head Bowl	Die cast aluminum Carbon steel
Dry weight:		1,0 kg (2.2 lbs.)

Filter Heads, Elements and Indicator must be ordered separately for OFSS30 Filters.
Note: Only 1 indicator gauge option available, P/N 5003906.

Example: **OFSS30E2** **Filter Head**
V176CBR05 **Element**
5003906 **Indicator Gauge**

OFSS30 Series Filter Head Model Code

OFSS30 * 2
1 2 3

1 Filter Series - OFSS30

2 Port Options
B - 3/4" NPT
E - SAE 12

3 Valve Options
2 - Bypass set at 1.7 bar (25 psi) cracking pressure

Sample model code:
OFSS30B2

MODEL CODE:	PART NUMBER
OFSS30B2	5003904
OFSS30E2	5003905

V176 Element Model Code

V176 C B *
1 2 3 4

1 Series Designation
V176 - For use with OFSS30 spin-ons

2 Element Collapse Rating
C - 6.9 bar (100 psi) Low Collapse

3 Seal Material
B - Buna–N

4 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
R05	18/**16/14**
R10	20/**18/15**
W15	Water Removal

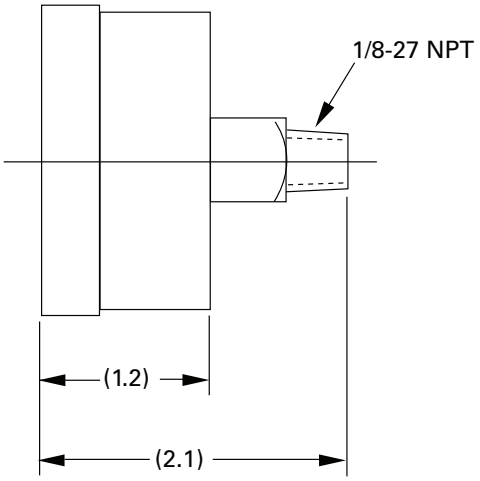
Sample model code:
V176CBR10

MODEL CODE:	PART NUMBER
V176CBR05	5003901
V176CBR10	5003902
V176CBW15	5003903

Spin-on Filters
OFSS30

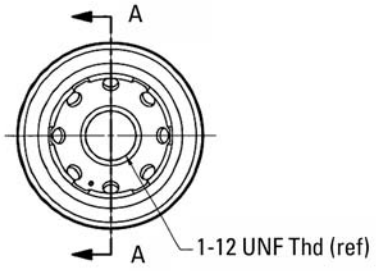
Flows to 113 LPM (30 USgpm)
Pressures to 10 bar (150 psi)

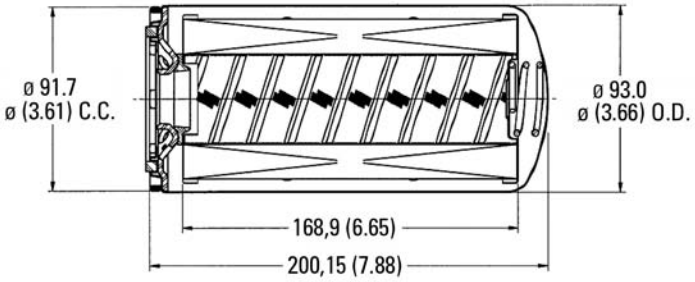
Visual 0-100 psi, color coded indicator gauge 1/8-27 NPTF, part number 5003906

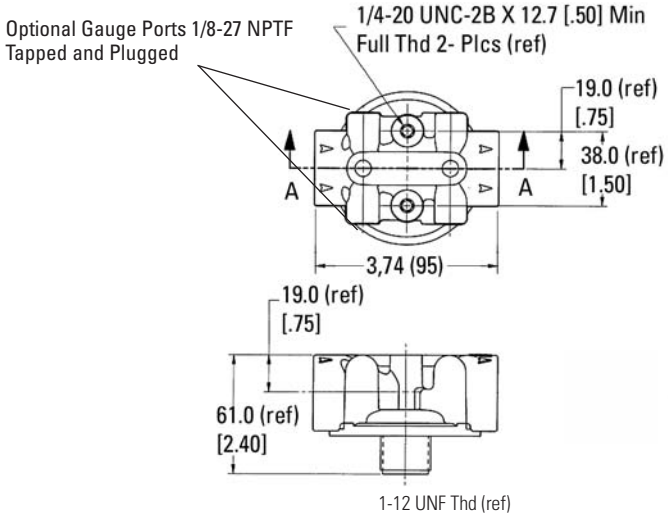


Housing Dimensions

mm (inch)







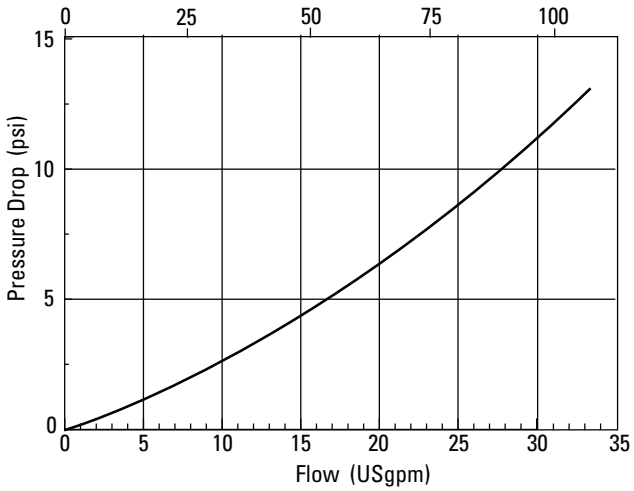
Spin-on Filters

OFSS30

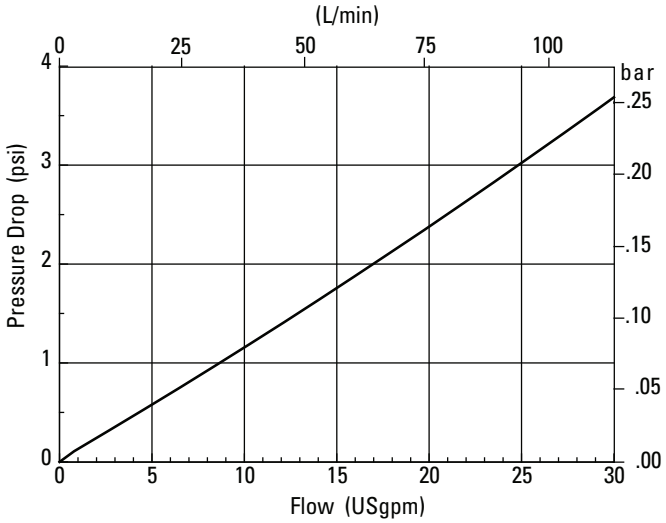
Flow Data

Element Flow Data

OFSS30 5 Micron Element Flow

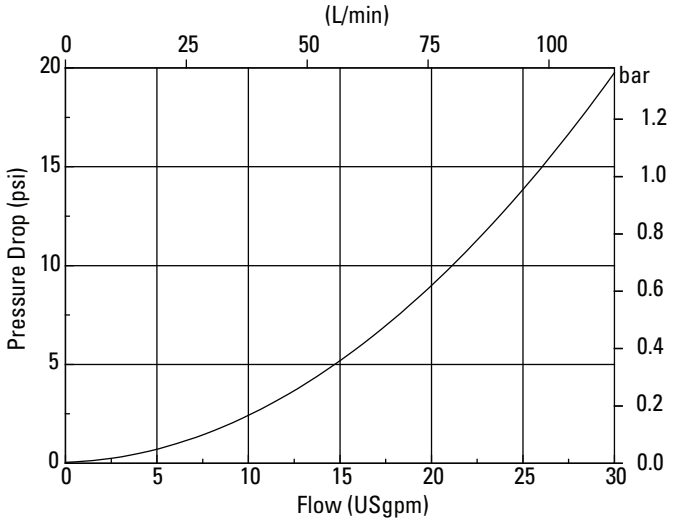


OFSS30 10 Micron Element Flow

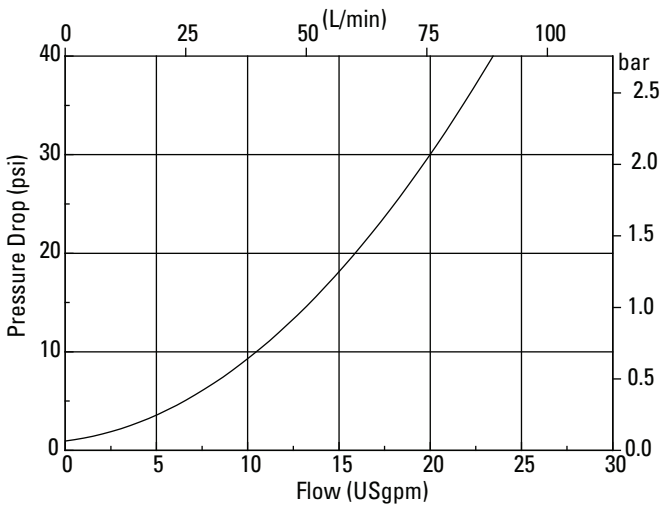


Housing Flow Data

Housing



OFSS30 Water Removal Element Flow



Spin-on Filters
OFRP35 Series

Flows to 130 L/min (35 USgpm)
Pressures to 35 bar (500 psi)

Features and Benefits

- Ideal for charge pump applications and hydrostatic transmissions
- Spin-on element design for easy maintenance
- One port available for use with electric indicator
- Bypass valves prevent excessive pressure drop and accidental element collapse

DESIGN SPECIFICATIONS

Rated flow:		130 L/min (35 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids.
Temp range:		-29°C to +121°C (-20°F to +250°F)
Pressure rating:	Operating	35 bar (500 psi)
	Fatigue	35 bar (500 psi)
Material:	Head	Die cast aluminum
	Bowl	Steel, cold rolled
Dry weight: (Approximate)	Length 1	1,0 kg (2.2 lbs.)
	Length 2	2,2 kg (4.8 lbs.)

Filter Head and Element must be ordered separately for OFRP35 Filters.

OFRP35 Series Filter Head Model Code

Sample model code for Head:

OFRP35SAV25

MODEL CODE:	PART NUMBER
OFRP35SAV25	5002466
OFRP35STE50	5002467
OFRP35SBV25	5002468
OFRP35SBN25	5002469

OFRP | 35 | ** | * | **

1 2 3 4 5

1 Filter Series - OFRP

2 Flow rating

35 - 132.5 L/min (35 USgpm)

3 Port type

SA - 1.062 12 UN SAE-12 (3/4" tube)

SB - 1.312 12 UN SAE-16 (1" tube)

ST - 1.062 12 UN SAE-12 (3/4" tube) with third port to tank

4 Indicator Option*

V - Visual indicator left side, blank plate right side, for SA and SB ports

N - No indicator

E - Electrical, single post, 3 bar (43 psid) for ST Port only 3 bar (50 psi)

* Indicators are included and shipped installed on "V" and "E" indicator options. Indicators may also be ordered separately as stated below:

MODEL CODE:	PART NUMBER
VI 25	5002470
EL25DC	5002471
EL25ACDC	5002472
EL50DC	5002473

5 Bypass valve

25 -Bypass valve set at 1.7 bar (25 psi) for SA and SB ports

50 -Bypass valve set at 3 bar (50 psi) for ST port type only

Spin-on Filters

OFRP35 Series

Flows to 130 L/min (35 USgpm)
Pressures to 35 bar (500 psi)

V0311 B * R **

1 2 3 4 5

V0311 Element Model Code

Sample model code:

V0311B2R05

MODEL CODE:	PART NUMBER
V0311B1R05	**5002474**
V0311B2R05	**5002475**
V0311B2R12	**5002476**
V0311B1R08	**5002477**
V0311B2R08	**5002478**
V0311B1R18	**5002479**
V0311B2R18	**5002480**

1 Filter Element

V0311 - Filter element for use with OFRP35 only

2 Seal material

B - Buna–N

3 Element Length

mm (inch)
1 - 147 (6.0)
2 - 203 (9.4)

4 Element Construction

R - R-Pak

5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
05	18/**16/14**
08	19/**17/14**
12	20/**18/15 (length 2 only)**
18	22/**19/16**

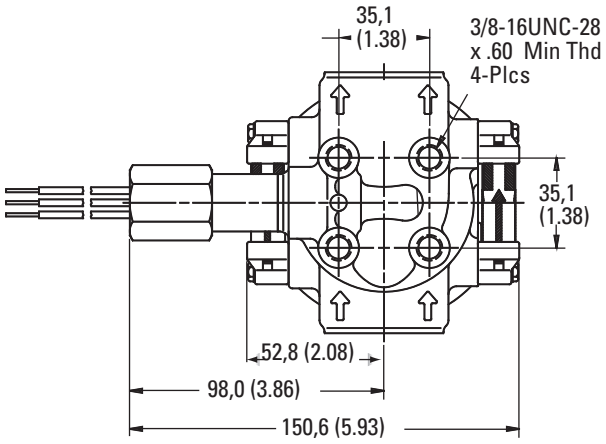
Fluid Cleanliness Rating:

05, 08, 18 rated for 150 PSID collapse, 12 rated for 300 PSID collapse and recommended for ST port type

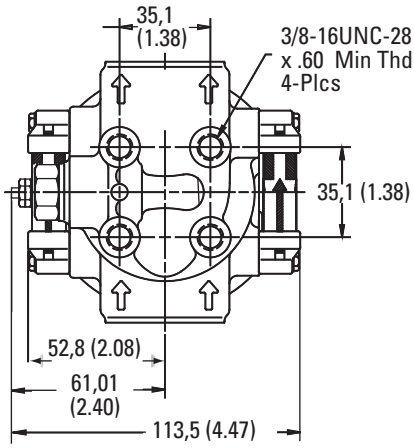
Housing Dimensions

mm (inch)

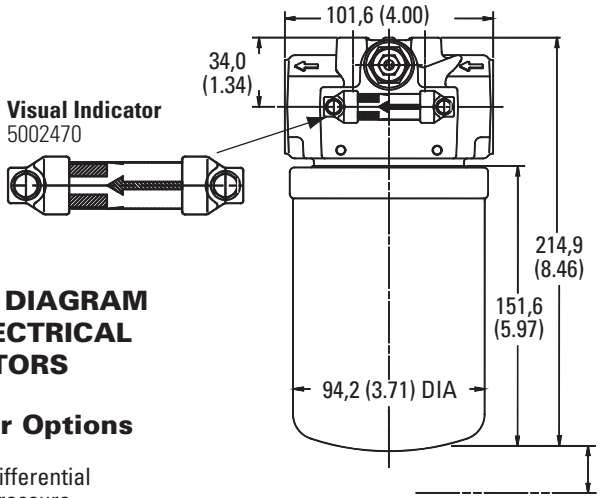
OFRP35 with optional electrical indicator



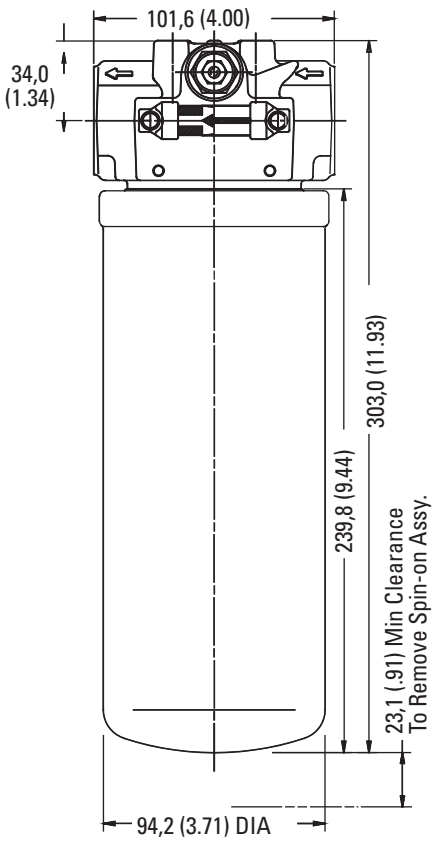
OFRP35 with optional electrical indicator



OFRP35 with B1 Length Filter Element

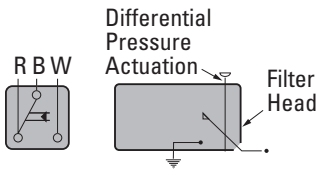


OFRP35 with B2 Length Filter Element



WIRING DIAGRAM FOR ELECTRICAL INDICATORS

Indicator Options



5002472	5002471	5002473	5002470
3 wire AC/DC	Single post	Single post	Visual
2 amps at 24 V DC 2 amps at 110 V AC	6-30 V DC	6-30 V DC	N/A
25 psid	25 psid	50 psid	25 psid
EL25ACDC	EL25DC	EL50DC	VI25

Spin-on Filters

OFRP35 Series

Flow Data

Flows to 130 L/min (35 USgpm)
Pressures to 35 bar (500 psi)

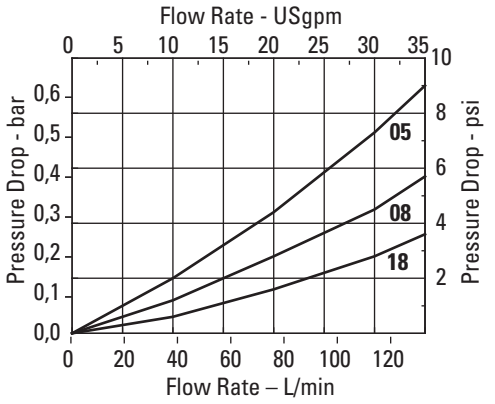
Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

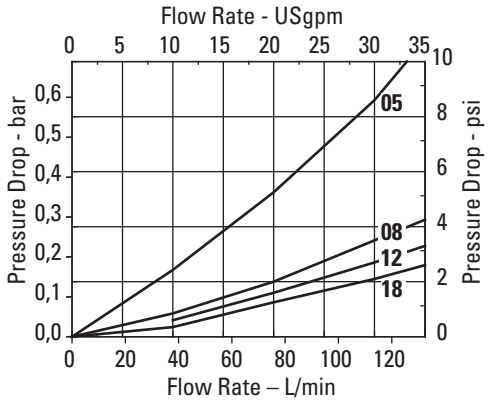
Element Flow Data

mm (inch)

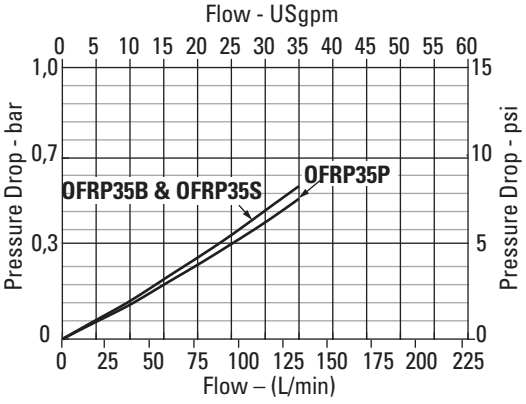
OFRP35 R-Pak Element Length 1



OFRP35 R-Pak Element Length 2

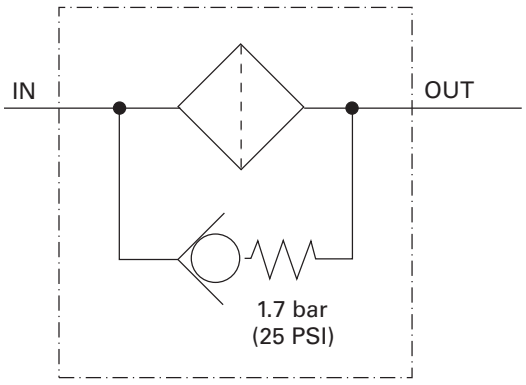


Housing/Bypass Valve Flow Data

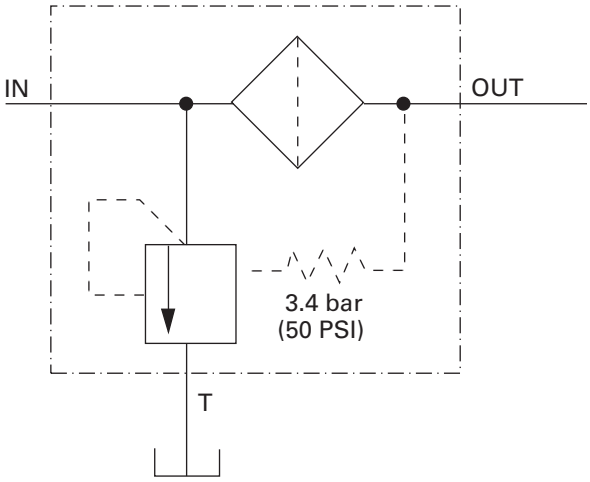


ST Port Option

SA and SB Port Options



ST Port Option



Spin-on Filters
OFRS60 Series

Flows to 227 L/min (60 USgpm)
Pressures to 7 bar (100 psi)

Features and Benefits

- Available with Vickers proprietary R-Pak media
- Simple spin-on element design for easy maintenance
- Optional bypass valves prevent excessive pressure drop and accidental element collapse
- Six available ports for use as gauge and/or diagnostic ports
- H20-Pro Water Removing Element available

DESIGN SPECIFICATIONS

Rated flow:	Length 1 Length 2	114 L/min (30 USgpm) 227 L/min (60 USgpm)
Fluid compatibility		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids
Temp range:		40°C to +107°C (-40°F to +225°F)
Pressure rating:	Operating	7 bar (100 psi)
Material:	Head Canister	Die cast aluminum Carbon steel
Dry weight:	Length 1 Length 2	4,4 kg (5.0 lbs) 5,6 kg (6.5 lbs)

OFRS60 Series Filter and Element Model Code

Sample model code:
OFRS601S1R03PAF2510

OFRS	60	*	*	*	*	**	*	*	*	**	10
1	2	3	4	5	6	7	8	9	10	11	12

1 Series designation - OFRS

2 Flow rating
60 -60 USgpm (227 L/min)

3 Mounting
1 - Body or line mounting
2 - Reservoir mount flange (outlet)

4 Port type
B - G1-1/2 (formerly 1/2" BSPF) thd.
F - 1-1/2" SAE 4-bolt flange
P - 1-1/2" NPTF
S - 1.875-12 UN SAE-24 straight thd. for 1-1/2" OD tube

5 Canister Length
mm (inch)
1 - 184 (7)
2 - 286 (11)
X - no element

6 Element construction
R - R-Pak (code 03,05,10,20)
W- Water Removal (10, length 2 only)
X - no element

7 Fluid cleanliness rating

Code	Target fluid cleanliness level	Element Construction
03	16/**14/12**	R-Pak
05	18/**16/14**	R-Pak
10	20/**18/15**	R-Pak or water removal
20	22/**19/16**	R-Pak
XX - No element		

8 Pressure gauge option
P - Pressure gauge; p/n 736129
X - No Gauge

9 Inlet gauge port location (1/8" NPTF)
A - Location A
B - Location B
C - Location C
X – No Gauge

10 Outlet gauge port location (1/8" NPTF)
D - Location D
E - Location E
F - Location F
X - No Gauge
NOTE: Gauges cannot be mounted side by side. If inlet and outlet gauges are required, specify non-adjacent ports such as A and E.

11 Bypass valve
XX - No bypass valve
25 - Bypass valve set at 1.7 bar (25 psi) cracking pressure

12 Design number
10 -Standard Design

Spin-on Filters
OFRS60 Series

Flows to 227 L/min (60 USgpm)
Pressures to 7 bar (100 psi)

V021 1 B * * **

1 2 3 4 5 6

V021 Element Model Code

Sample model code:
VO211B1R03

1 Filter Element
V021 - Filter element for use with HS22 and OFRS-60 series filters (R-Pak construction only)

2 Element Collapse Rating
1 - 10 bar (150 psi) Low Pressure

3 Seal Material
B - Buna-N

4 Canister Length
mm (inch)
1 - 184 (7)
2 - 286 (11)

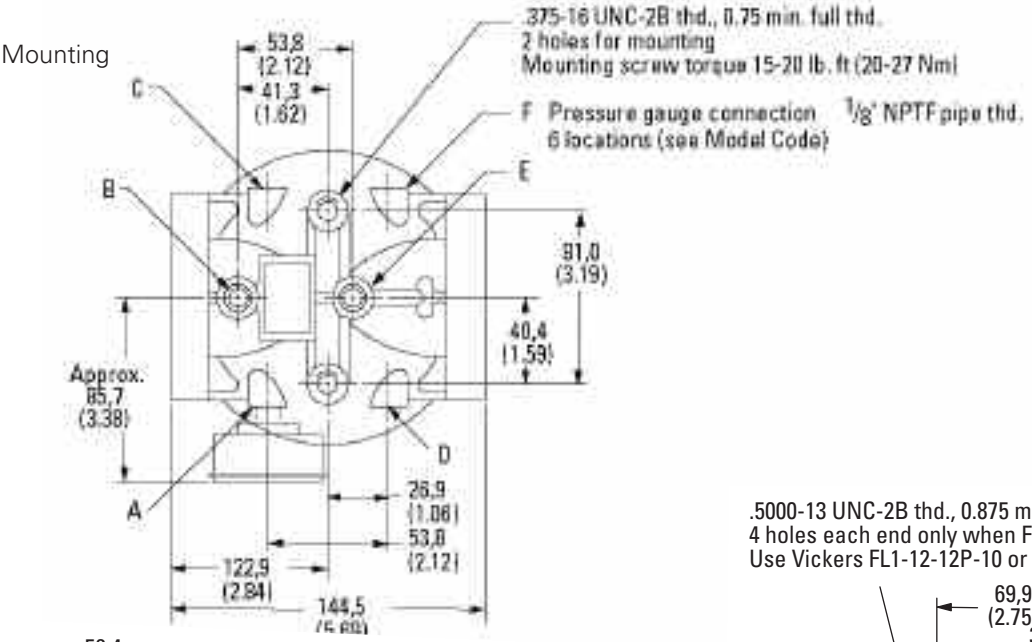
5 Element Construction
R - R-Pak (code 3,5,10,20)
W- Water Removal (10, length 2 only)

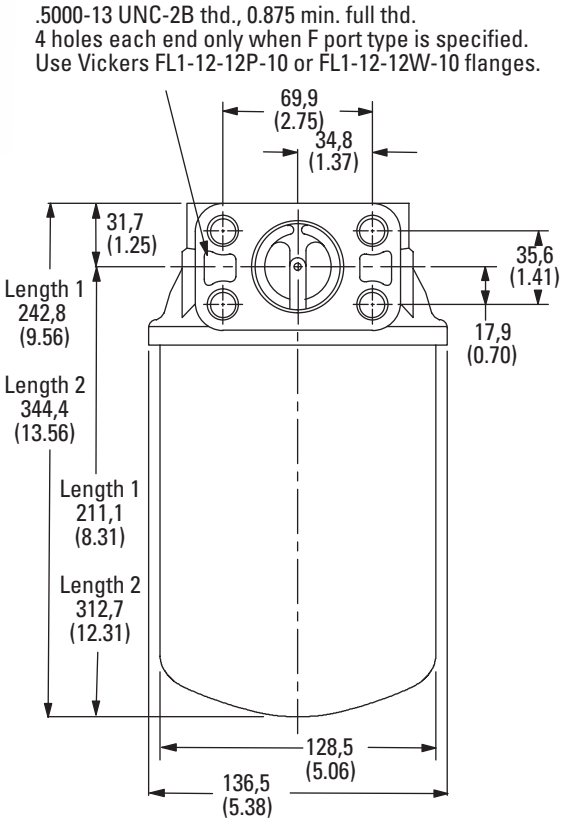
6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level	Element construction
03	16/**14/12**	R-Pak
05	18/**16/14**	R-Pak
10	20/**18/15**	R-Pak or water removal
20	22/**19/16**	R-Pak

Housing Dimensions

OFRS-60
Body or Line Mounting
mm (inch)





Spin-on Filters

OFRS60 Series

Flows to 227 L/min (60 USgpm)
Pressures to 7 bar (100 psi)

Housing Dimensions

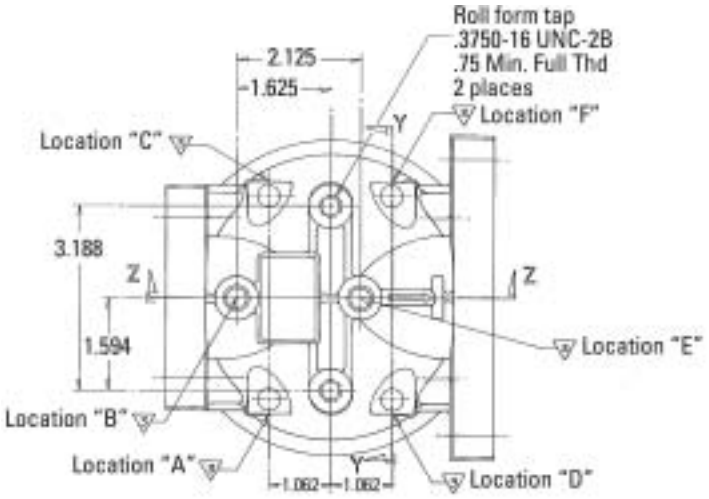
OFRS-60-2
Manifold Mounting
Outlet Port Connection
mm (inch)

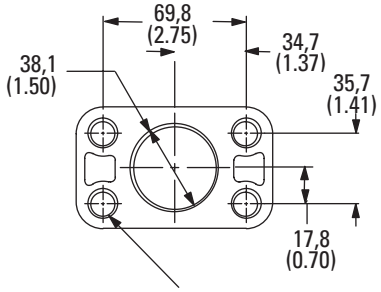
Note:

A, B, C Inlet gauge port locations

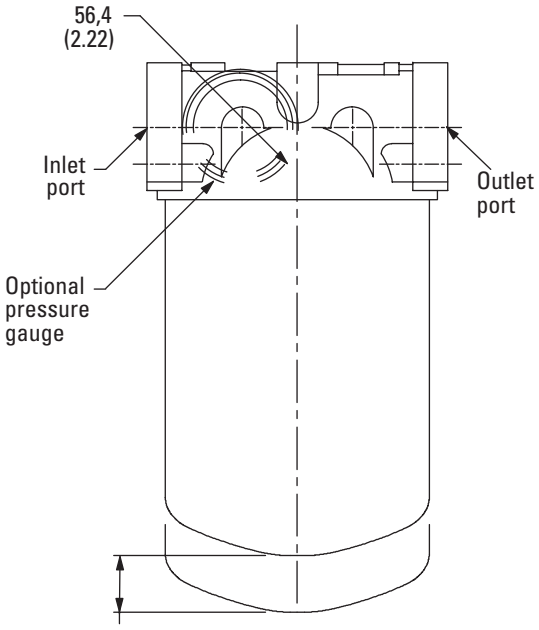
D, E, F Outlet gauge port locations

Pressure gauge in locations D and F will require additional fitting to clear mounting bolt hex nuts. Use Aeroquip No. 2040-2-2S or equivalent must be ordered separately.

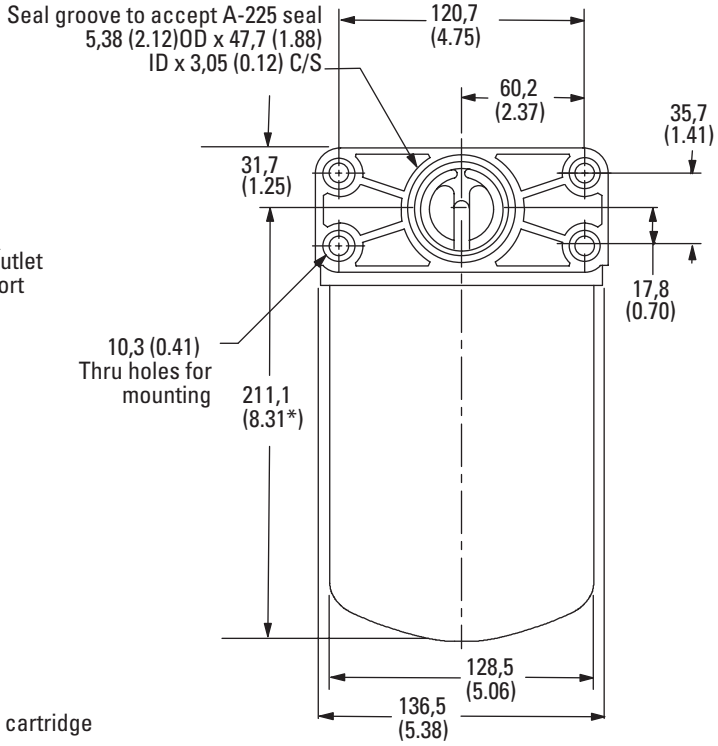




.5000-13 UNC-2B thd., 0.875 min. full thd.
4 holes each end only when F port type is specified.
Use Vickers FL1-12-12P-10 or FL1-12-12W-10 flanges.



33,3 (1.31) Clearance required for removal of cartridge



* Add 101,6 (4.00) for long 10mm element.

Spin-on Filters

OFRS60 Series

Flow Data

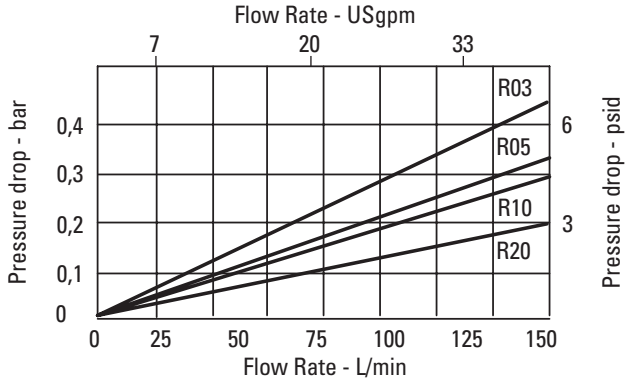
Flows to 227 L/min (60 USgpm)
Pressures to 7 bar (100 psi)

Flow versus pressure drop:

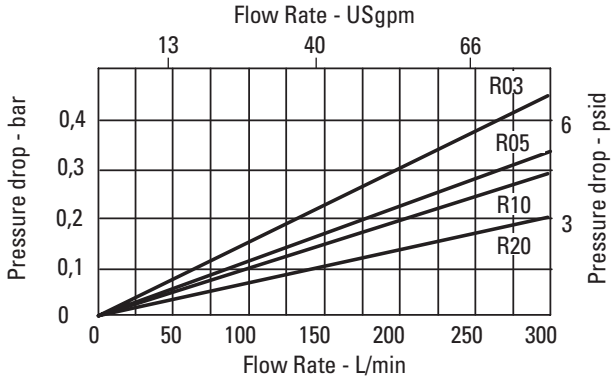
150 SUS (32 cSt) oil with specific gravity of ≤0.9

Element Flow Data

OFRS60 R-Pak Element Length 1

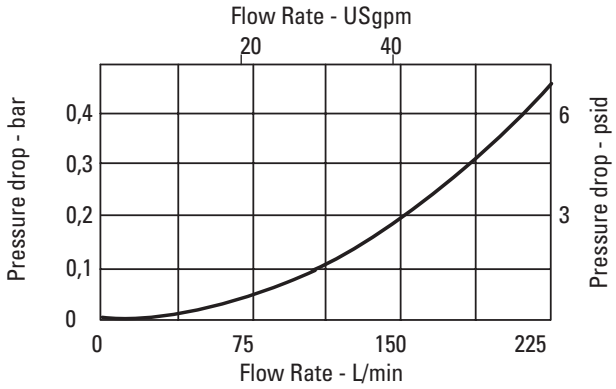


OFRS60 R-Pak Element Length 2

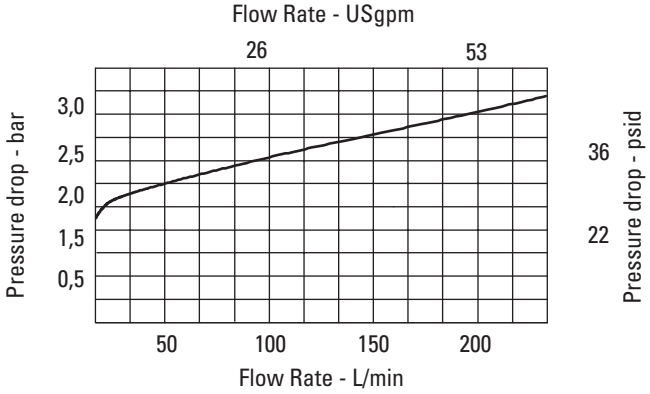


Housing/Bypass Valve Flow Data

Housing Flow Data



Bypass Valve



Sample ΔP Calculation : OFRS601S1R03PAF2510 - Filter assembly having '1' length filter element with micron rating code '03' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.11 x 0.8/0.9	+	0.29 x 46/32 x 0.8/0.9
	=	0.090	+	0.36
	=	**0.45 bar**		

Spin-on Filters
HS22 Series

Flows to 450 L/min (120 USgpm)
Pressures to 14 bar (200 psi)

Features and Benefits

- Designed to comply with ANSI specifications and ISO cleanliness standards
- Dual flow path design maximizes flow capability and service life
- Spin-on element make servicing fast and easy
- High efficiency replacement elements in standard configurations (R-Pak) to meet Target Cleanliness Levels

DESIGN SPECIFICATIONS

Rated flow:	Length 1 Length 2	227 L/min (60 USgpm) 454 L/min(120 USgpm)
Fluid compatibility		Compatible with most petroleum ol, water glycol, oil-in-water and water-in-oil fluids
Temp range:		-32°C to +107°C (-25°F to +225°F)
Pressure rating:	Operating	14 bar (200 psi)
Material:	Head	Aluminum
Dry weight:	Length 1 Length 2	7.3 kg (16 lbs) 8.6 kg (19 lbs)

HS22	1	**	*	*	N	B	*	*	**
1	2	3	4	5	6	7	8	9	10

HS22 Series Filter and Element Model Code

Sample model code:
HS221SD32NB2R05

1 Filter Series - HS22

2 Element Collapse Rating
1 - 150 psi Low Pressure

3 Port options
BD - G1-1/2 to ISO 228
ME - 1-1/2" SAE 4 bolt Flange Code 61 (M12 x 1.75)
SD - 1.875 - 12 UN sae-24 str. Thd (1-1/2 tube)
FE - 1-1/2" SAE 4 bolt Flange Code 61 (UNC)

4 Valve options
3 - Bypass set at 1.7 bar (25 psi) cracking pressure
4 - Bypass set at 3 bar (50 psi) cracking pressure

5 Indicator options
1 - No indicator
2 - 13.7 bar (200 psi) gauge
4 - 4 bar (60 psi) gauge

6 Receptical
N - None

7 Seal material
B - Buna-N

8 Assembly Length
mm (inch)
1 - 253 (10)
2 - 355 (14)
X - No Element

9 Element Construction
R - R-Pak (code 3, 5,10, 20)
W- Water Removal (10, length 2 only)
X - No Element

10 Fluid cleanliness rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	No Element

Spin-on Filters
HS22 Series

Flows to 450 L/min (120 USgpm)
Pressures to 14 bar (200 psi)

V021 1 B * * **

1 2 3 4 5 6

V021 Element Model Code

Sample model code:
V0211B1R03

1 Filter Element

V021 - Filter element for use with HS22 and OFRS-60 series filters (R-Pak construction only)

2 Element Collapse Rating

1 - 10 bar (150 psi) Low Pressure

3 Seal Material

B - Buna-N

4 Canister Length

mm (inch)
1 - 184 (7)
2 - 286 (11)

5 Element Construction

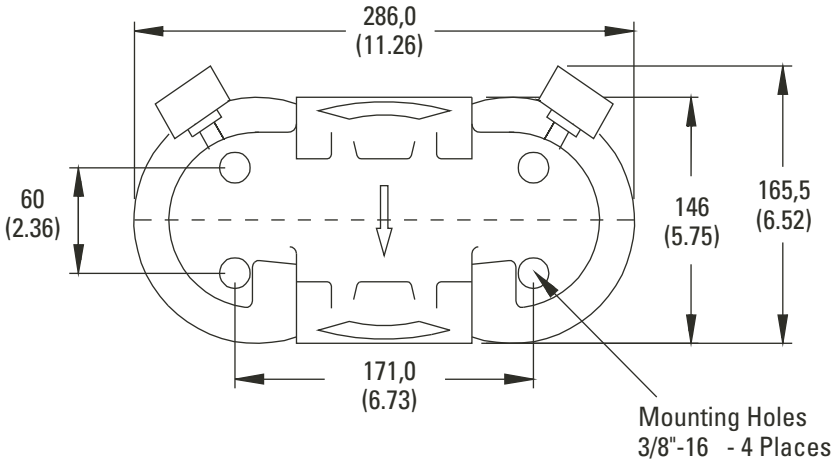
R - R-Pak (code 3, 5,10, 20)
W- Water Removal (Code 10, length 2 only)

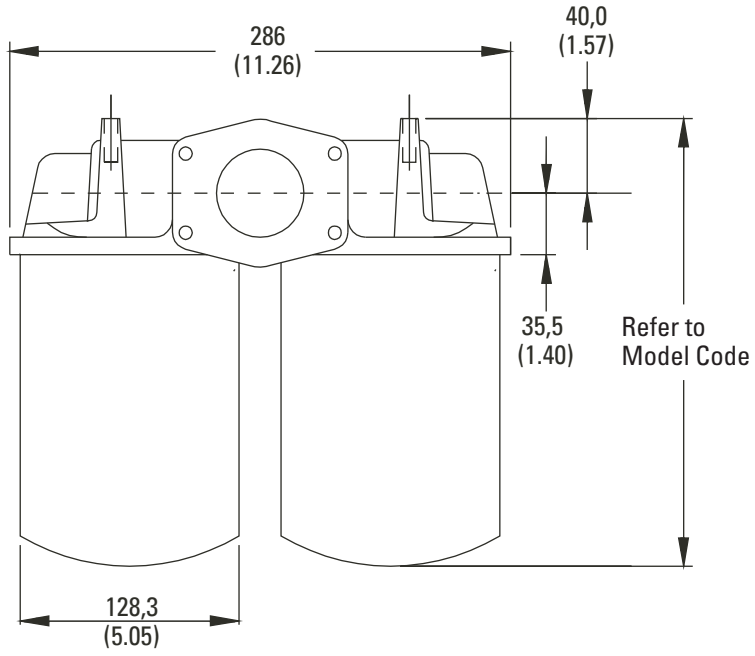
6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level	Element construction
03	16/**14/12**	R-Pak
05	18/**16/14**	R-Pak
10	20/**18/15**	R-Pak or water removal
20	22/**19/16**	R-Pak

Housing Dimensions

mm (inch)





Spin-on Filters

HS22 Series

Flow Data

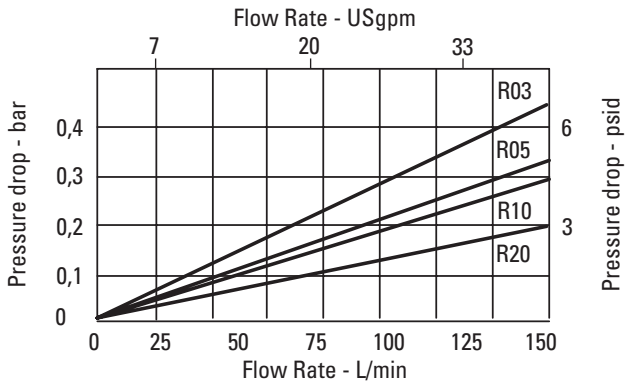
Flows to 450 L/min (120 USgpm)
Pressures to 14 bar (200 psi)

Flow versus pressure drop:

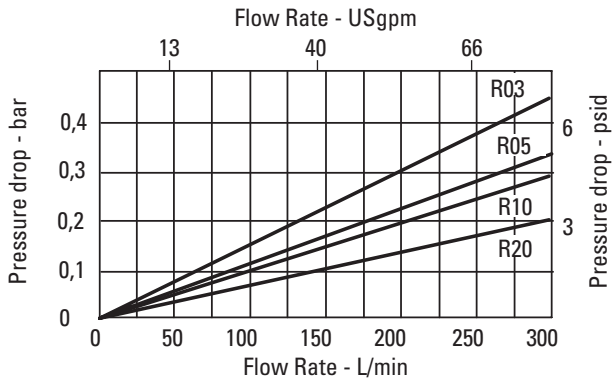
150 SUS (32 cSt) oil with specific gravity of ≤0.9

Element Flow Data

HS22 R-Pak Element Length 1

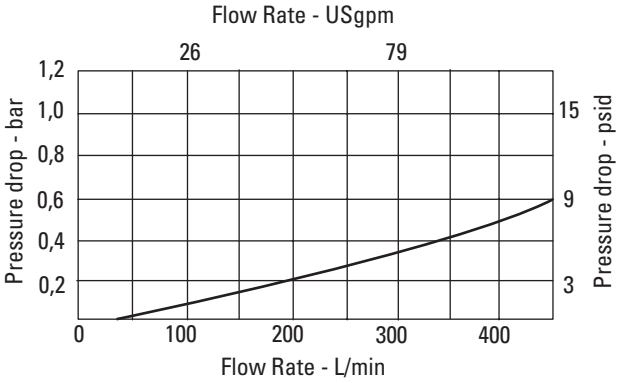


HS22 R-Pak Element Length 2

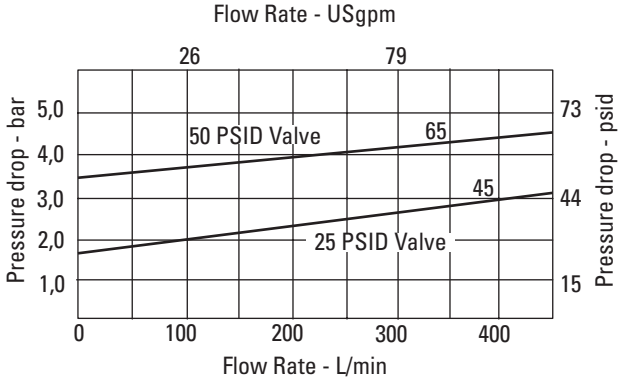


Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HS221SD32NB2RO5 - Filter assembly having '2' length filter element with micron rating code '05' at 250 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

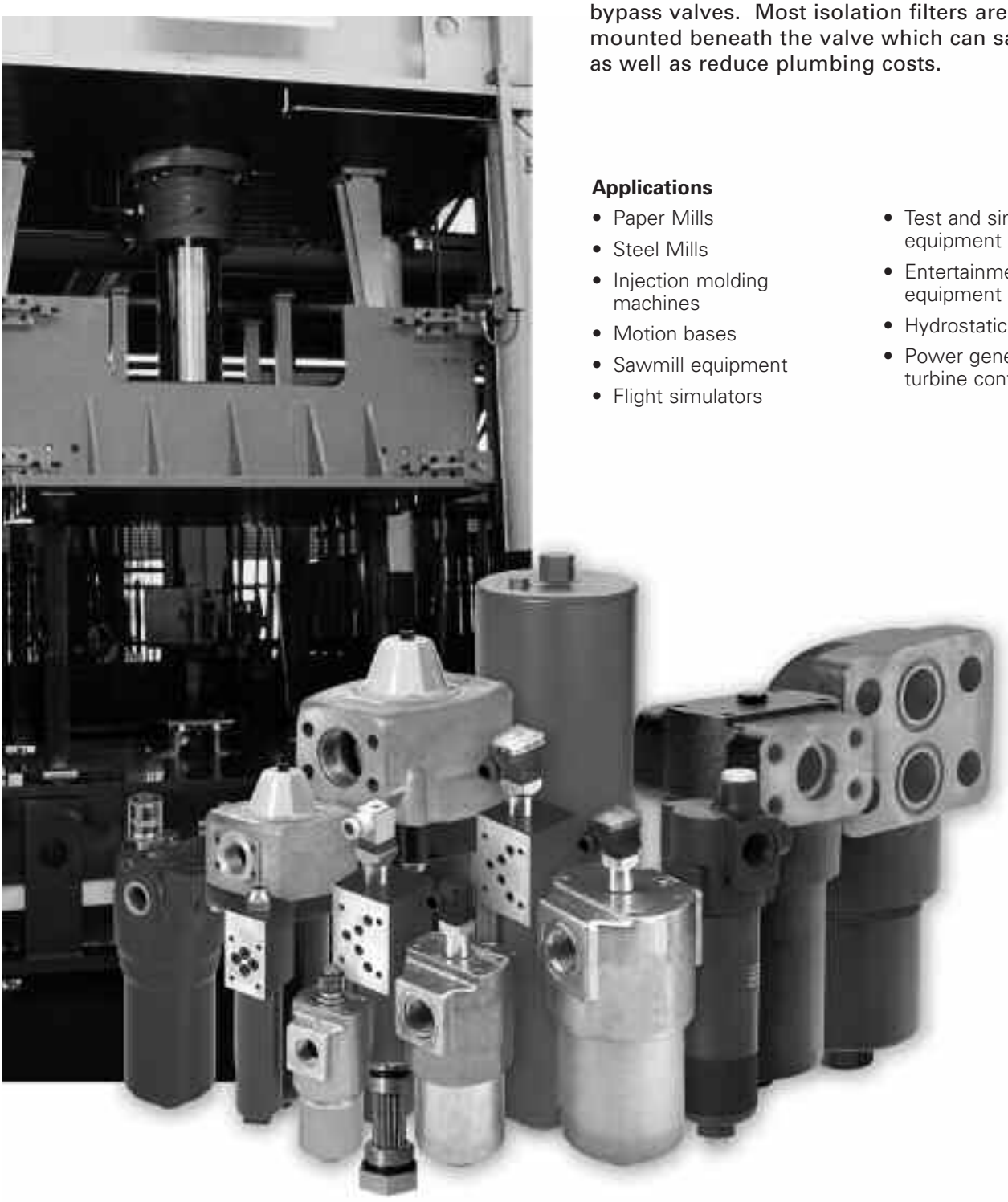
ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.3 x 0.8/0.9	+	0.37 x 46/32 x 0.8/0.9
	=	0.260	+	0.47
	=	**0.73 bar**		

Pressure Filters

General Data

Pressure filters are used to protect downstream components from contamination levels beyond the recommended cleanliness target. Because they are typically sized for the output of the pump, pressure filters tend to be smaller than return line filters when cylinders are present. In systems using accumulators, pressure filters must be sized according to the large effective flow rates present during parts of the duty cycle.

In some applications, pressure filters are used as isolation filters to protect specific components such as proportional or servo valves. Typically these filters are non-bypass and employ elements that are capable of withstanding full system differential pressure without collapsing. While these filters are sized to handle only a specific components' required flow, the use of high collapse elements result in a higher cost than elements used in housings with bypass valves. Most isolation filters are direct-mounted beneath the valve which can save space as well as reduce plumbing costs.



Applications

- Paper Mills
- Steel Mills
- Injection molding machines
- Motion bases
- Sawmill equipment
- Flight simulators
- Test and simulation equipment
- Entertainment stage equipment
- Hydrostatic drives
- Power generation turbine control systems

Pressure Filters
ECF Series

Flows to 19 L/min (5 USgpm)
Pressures to 200 bar (3,000 psi)

Features and Benefits

- Integrated throwaway element which is screwed into the manifold port for last chance filtration

DESIGN SPECIFICATIONS

Rated flow:		19 L/min (5 USgpm)
Fluid compatibility:		Compatible with all petroleum-/oil-based and synthetic fluids. Not rated for use with fluoro-rubber or ethylene propylene seals.
Temp range:		-30°C to +121°C (-22°F to 250°F)
Pressure rating:	Operating	200 bar (3000 psi)
Cavity:		BC20-S3
Material:	Head Bowl	Aluminum Aluminum
Dry weight: (Approximate)		0,11 kg (0.25 lbs)

ECF Series Filter and Element Model Code

Sample model code:
ECF1SB1J3CV025

ECF	1	SB	1	J	3	*	V	***
1	2	3	4	5	6	7	8	9

1 Filter Series - ECF

2 Element Collapse Rating
1 - 17 bar (250 psi) low collapse

3 Port Options
SB - 1.312-12 UN SAE-16 straight thread

4 Valve Options
1 - Non-Bypass (Screw directly into cavity)

5 Indicator Options
J - No indicator

6 Assembly Length
mm (inch)
3 - 80.2 (3.16)

7 Element Construction
C - Standard construction
M - Wire screen

8 Seal Material
V - Viton-A

9 Fluid Cleanliness

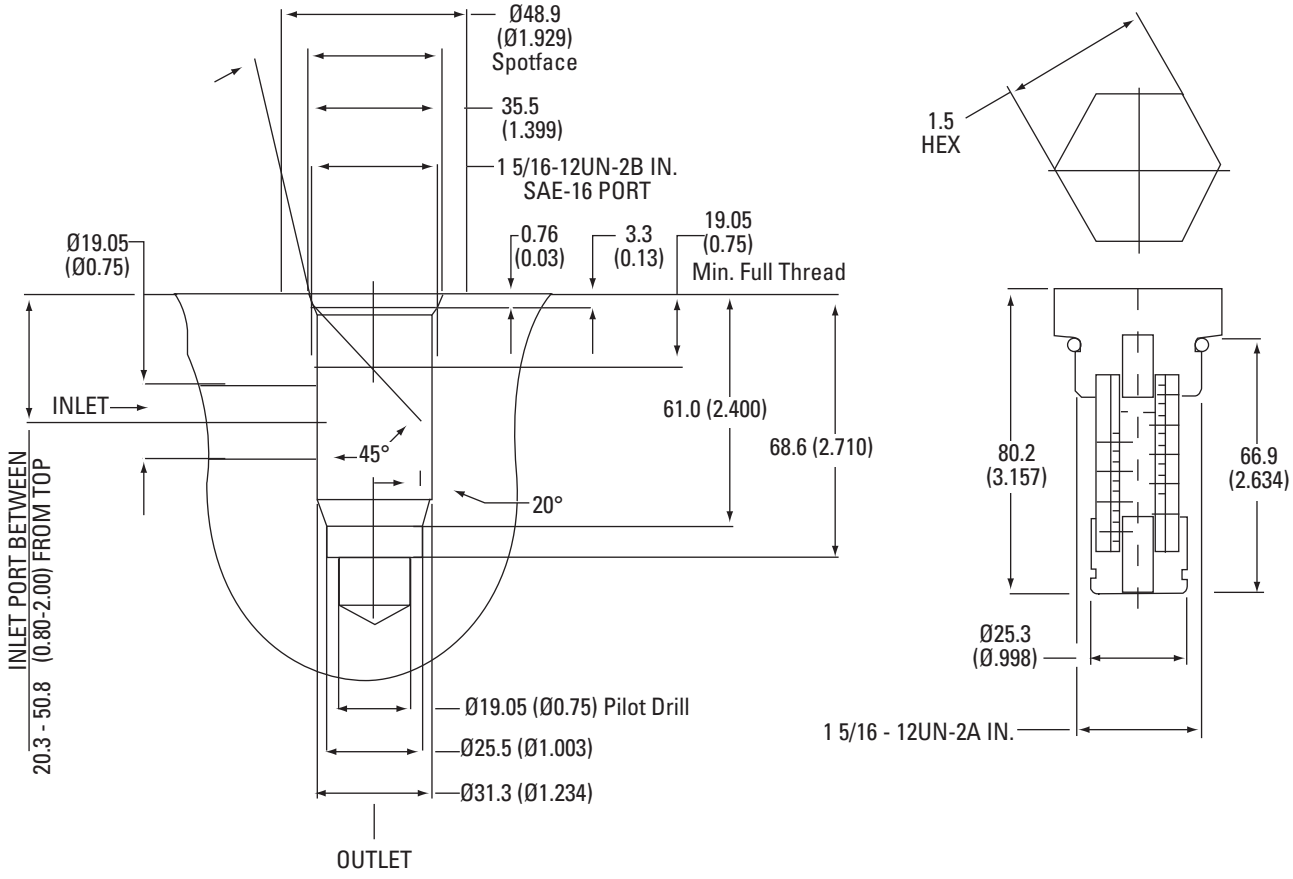
Code	Fluid Cleanliness Rating	Element Construction
015	20/**18/15**	C-Pak
025		Wirescreen
100		Wirescreen

Pressure Filters
ECF Series

Flows to 19 L/min (5 USgpm)
Pressures to 207 bar (3,000 psi)

Housing Dimensions

mm (inch)

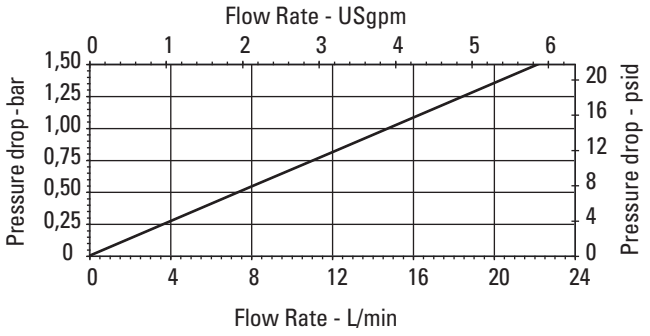


Housing/Element Flow Data

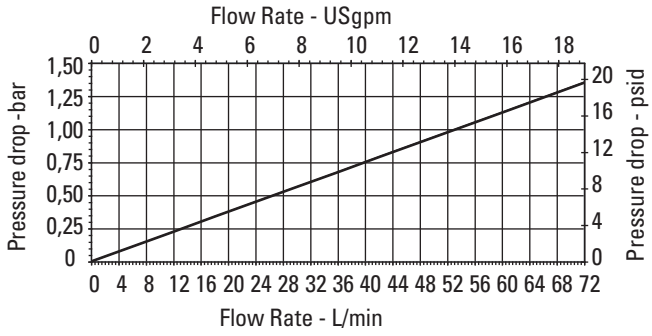
Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

ECF15



ECF 25/150



Pressure Filters
LV2P Series

Flows to 110 L/min (29 USgpm)
Pressures to 100 bar (1,500 psi)

Features and Benefits

- Beta Ratio: $\beta_{X(C)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual, electrical, and electrical indicators with lamp options for system design flexibility
- Poppet type by-pass valve construction
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- High collapse elements available for non-bypass applications

DESIGN SPECIFICATIONS

Rated flow:	Length 3 Length 6	60 L/min (16 USgpm) 110 L/min (29 USgpm)
Fluid compatibility:	Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.	
Temp range:		-26°C to +121°C (-15°F to +250°F)
Pressure rating:	Operating Fatigue	100 bar (1500 psi) 100 bar (1500 psi)
Material:	Head Bowl	Aluminum Aluminum
Dry weight: (Approximate)	Length 3 Length 6	1,5 kg (3.3 lbs) 1,8 kg (4.0 lbs)

LV2P * SA * ** * * * **

1 2 3 4 5 6 7 8 9

LV2P Series Filter Assembly Model Code

Sample model code:

LV2P1SA4LNB3C05

1 Filter Series - LV2P

2 Element Collapse Rating

1 - 17 bar (250 psi) Low Collapse
4 - 103 bar (1500 psi) High Collapse

3 Port Options

SA - 1.062 - 12UN SAE-12 (3/4" tube)

4 Valve Options

1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
6 - Bypass set at 6 bar (90 psi) cracking pressure

5 Indicator Options

AN - Visual 4.9 bar (70 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
JN - No Indicator (plug), No Connector
RB - Electrical 2 bar (30 psi), Brad Harrison
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi), Hirschmann
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi), Hirschmann

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
3 - 187 (7.36)
6 - 254 (10.0)

8 Element Construction

C - C-Pak (Code 03, 05, 10, 20)
H - H-Pak (Code 03, 05, 10)
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Pressure Filters
LV2P Series

Flows to 110 L/min (29 USgpm)
Pressures to 100 bar (1,500 psi)

V0513 * * * **

1 2 3 4 5

V0513 Element Model Codes

Sample model code:
V0513B6C05

1 Filter Element
V0513 - For use with LV2P series housings

2 Seal Material
B - Buna-N
V - Viton-A

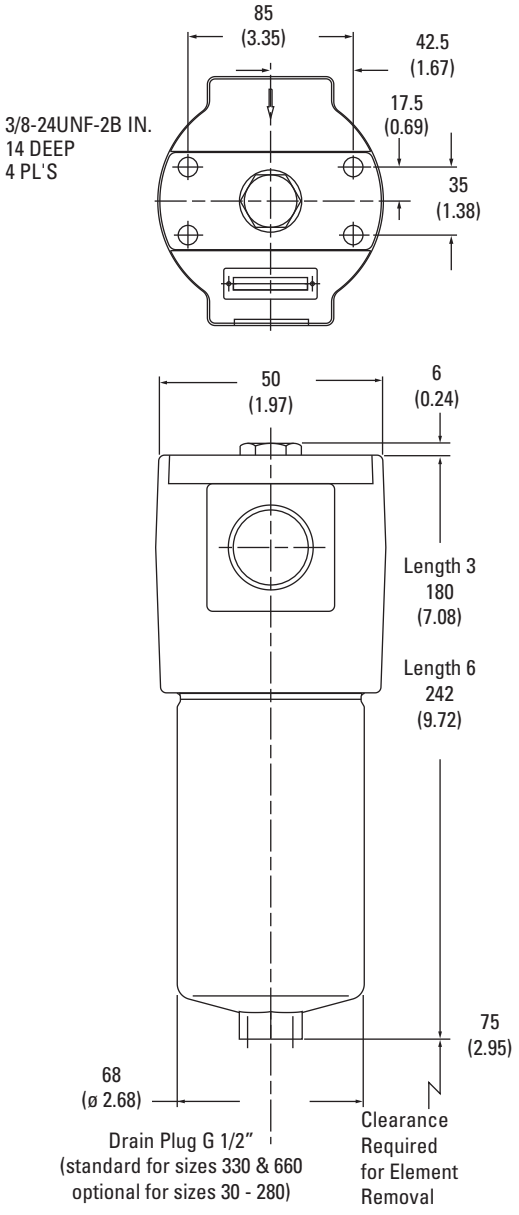
3 Element Length
mm (inch)
3 - 140 (5.51)
6 - 207 (8.15)

4 Element Construction
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)

5 Fluid Cleanliness Ratings

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions
mm (inch)



Pressure Filters

LV2P Series

Flow Data

Flows to 110 L/min (29 USgpm)
Pressures to 100 bar (1500 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤ 0.9

LV2P Filter Elements Flow Data

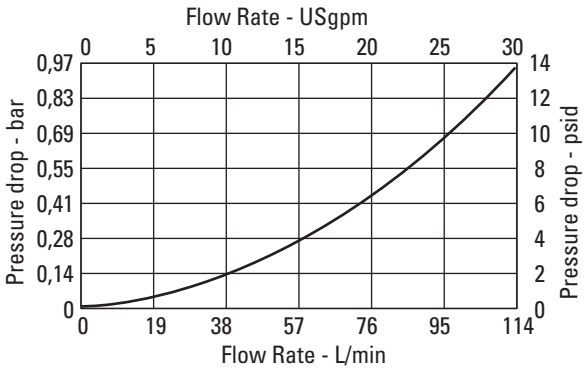
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	25
C - pak	3	0.029 (1.581)	0.020 (0.816)	0.013 (0.723)	0.008 (0.433)
	6	0.015 (0.818)	0.011 (0.585)	0.007 (0.360)	0.004 (0.204)
H - pak	3	0.059 (3.210)	0.033 (1.784)	0.018 (0.993)	xxx
	6	0.025 (1.394)	0.015 (0.818)	0.009 (0.488)	xxx

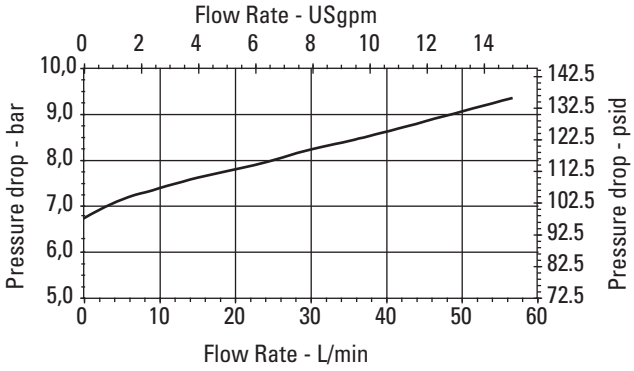
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : LV2P1SA4LNB3C05 - Filter assembly having '3' length filter element with micron rating code '05' at 50 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.20x 0.8/0.9	+	50 x 0.020 x 46/32 x 0.8/0.9
	=	0.170	+	1.61
	=	**1.78 bar**		

Pressure Filters
LV4P Series

Flows to 330 L/min (87 USgpm)
Pressures to 100 bar (1,500 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual, electrical, and electrical indicators with lamp options for system design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- Poppet type by-pass valve construction
- High collapse elements available for non-bypass applications

DESIGN SPECIFICATIONS

Rated flow:	Length 5 Length 7	160 L/min (42 USgpm) 330 L/min (87 USgpm)
Fluid compatibility:	Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.	
Temp range:		-40°C to +121°C (-40°F to +250°F))
Pressure rating:	Operating Fatigue	100 bar (1500 psi) 100 bar (1500 psi)
Material:	Head Bowl	Aluminum Aluminum
Dry weight: (Approximate)	Length 5 Length 7	3,7 kg (8.2 lbs) 8,0 kg (17.6 lbs)

LV4P Series Filter Assembly Model Code

Sample model code:
LV4P1SC4LNB5C05

LV4P	*	S*	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - LV4P

2 Element Collapse Rating
1 - 17 bar (250 psi) Low Collapse
4 - 103 bar (1500 psi) High Collapse

3 Port Options
Length 5:
SC - 1.625 - 12UN SAE-20 Str. thd. (1¼" tube)
Length 7:
SD - 1.875 - 12UN SAE-24 Str. thd. (1½" tube)

4 Valve Options
1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
6 - Bypass set at 6 bar (90 psi) cracking pressure

5 Indicator Options
AN - Visual 4.9 bar (70 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
JN - No Indicator (plug), No Connector
RB - Electrical 2 bar (30 psi), Brad Harrison
RJ - Electrical 2 bar (30 psi), Hirshmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi), Hirschmann
UB - Electrical 2 bar (70 psi), Brad Harrison
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi), Hirschmann

6 Seal Material
B - Buna-N
V - Viton-A

7 Assembly Length
mm (inch)
5 - 247 (9.73)
7 - 312 (12.29)

8 Element Construction
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Pressure Filters
LV4P Series

Flows to 330 L/min (87 USgpm)
Pressures to 100 bar (1,500 psi)

**V0513 * * * **

1 2 3 4 5

V0513 Element Model Codes

Sample model code:
V0513B5C05

1 Filter Element
V0513 - For use with LV4P series housings

2 Seal Material
B - Buna-N
V - Viton-A

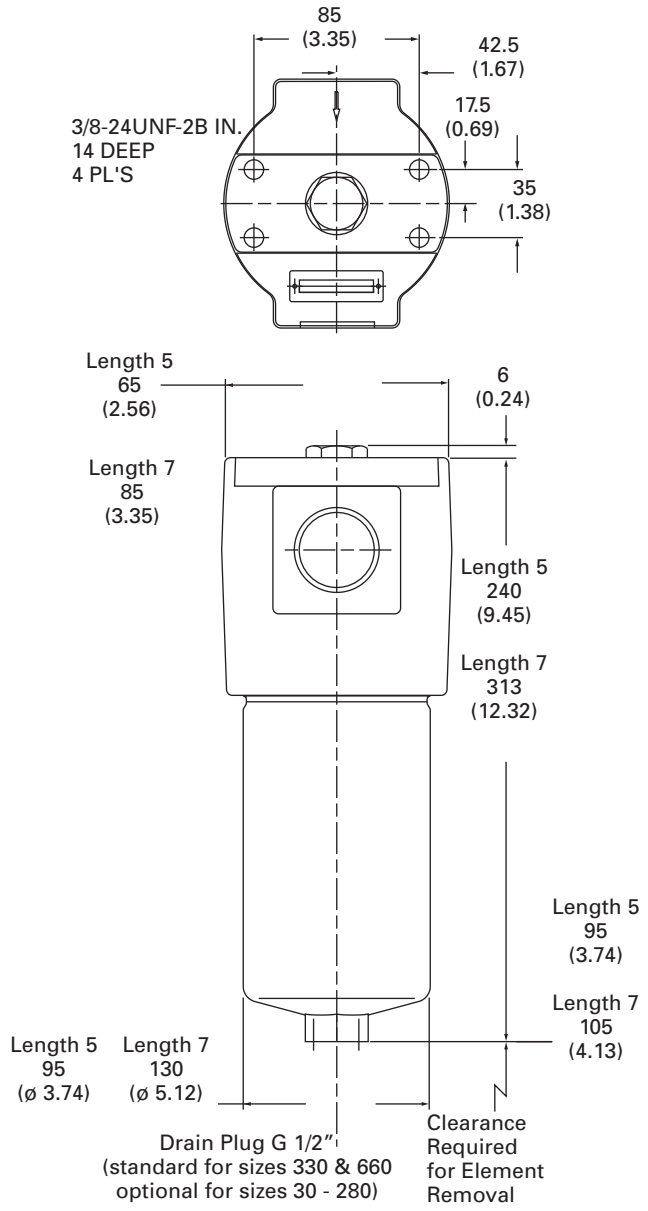
3 Element Length
mm (inch)
5 - 147 (5.8)
7 - 180 (7.09)

4 Element Construction
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)

Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions
mm (inch)



Pressure Filters

LV4P Series

Flow Data

Flows to 330 L/min (87 USgpm)
Pressures to 100 bar (1,500 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤ 0.9

LV4P Filter Elements Flow Data

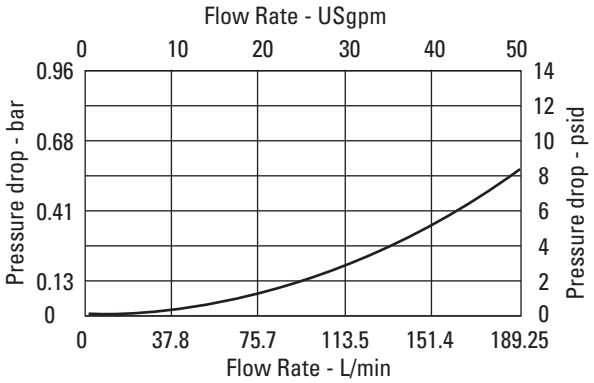
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	25
C - pak	5	0.013 (0.717)	0.009 (0.479)	0.005 (0.252)	0.004 (0.193)
	7	0.005 (0.294)	0.004 (0.214)	0.003 (0.162)	0.002 (0.095)
H - pak	5	0.017 (0.919)	0.010 (0.569)	0.006 (0.321)	xxx
	7	0.008 (0.421)	0.004 (0.244)	0.003 (0.153)	xxx

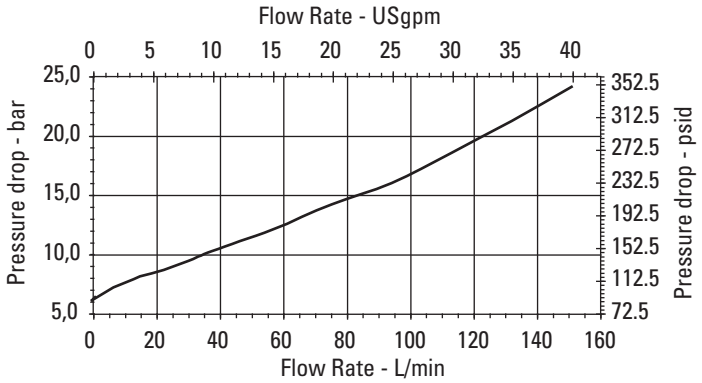
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

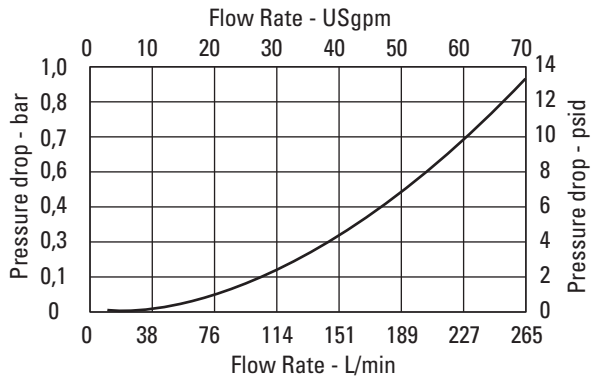
Length 5 Housing



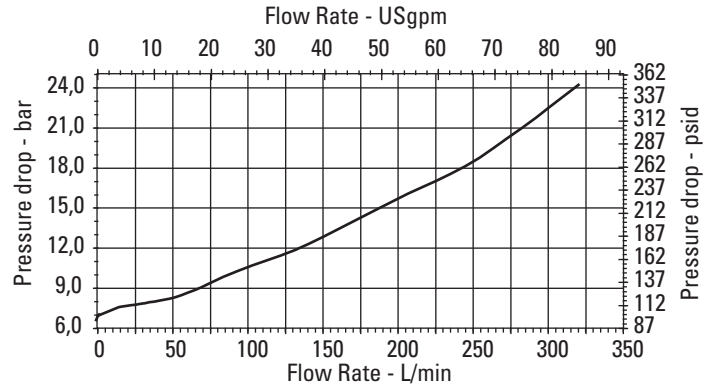
Length 5 Bypass



Length 7 Housing



Length 7 Bypass



Sample ΔP Calculation : LV4P1SC4LNB5C05 - Filter assembly having '5' length filter element with micron rating code '05' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.10 x 0.8/0.9	+	100 x 0.009 x 46/32 x 0.8/0.9
	=	0.088	+	1.143
	=	**1.23 bar**		

Pressure Filters
HF2P Series

Flows to 90 L/min (24 USgpm)
Pressures to 280 bar (4,000 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual, electrical, and electrical indicators with lamp options for system design flexibility
- Conforms to HF2 automotive specifications
- Compact design for use with servo and proportional valves
- Manifold mounting option for system flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- High collapse elements available for non-bypass applications

DESIGN SPECIFICATIONS

Rated flow:	Length 1 Length 2	45 L/min (12 USgpm) 91 L/min (24 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.
Temp range:		-26°C to +121°C (-15°F to +250°F)
Pressure rating:	Operating Fatigue	280 bar (4000 psi) 280 bar (4000 psi)
Material:	Head Bowl	Ductile iron Carbon Steel
Dry weight: (Approximate)	Length 1 Length 2	4,6 kg (10.1lbs) 5,9 kg (134lbs)

HF2P Series Filter and Element Model Code

Sample model code:

HF2P1SA4LNB2C05

HF2P	*	**	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - HF2P

2 Element Collapse Rating

1 - 17 bar (250 psi) Low Collapse
4 - 207 bar (3000 psi) High Collapse

NOTE: Use 1 only with bypass valve or monitored P indicator.

3 Port Options

BA - G3/4 to ISO 228
SA - 1.062 - 12UN SAE-12 ($^3/_4$" tube)
WS - Subplate mounting

4 Valve Options

1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
6 - Bypass set at 6 bar (90 psi) cracking pressure

5 Indicator Options

AN - Visual 4.9 bar (70 psi), No Connector
JN - No Indicator (plug), No Connector
LN - Visual 2 bar (30 psi), No Connector
ON - Visual 7.9 bar (115 psi), No Connector
RB - Electrical 2 bar (30 psi), Brad Harrison
RH - Electrical 2 bar (30 psi), Hirschmann
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
TB - Electrical 7.9 bar (115 psi), Brad Harrison
TH - Electrical 7.9 bar (115 psi), Hirschmann
TJ - Electrical 7.9 bar (115 psi), Hirschmann w 24 volt light
TK - Electrical 7.9 bar (115 psi), Hirschmann w 115 volt light
TL - Electrical 7.9 bar (115 psi), Hirschmann w 230 volt light
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UH - Electrical 4.9 bar (70 psi), Hirschmann
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
1 - 211.9 (8.3)
2 - 304.9 (12.0)

8 Element Construction

C - 17 bar (250 psi) Low Collapse
H - 207 bar (3000 psi) High Collapse
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Pressure Filters
HF2P Series

Flows to 90 L/min (24 USgpm)
Pressures to 280 bar (4,000 psi)

V304 * * * * **

1 2 3 4 5 6

V304 Element Model Code

Sample model code:
V3041B1C05

1 Filter Element
V304 - For use with HF2P series filters

2 Element Collapse Rating
1 - 17 bar (250 psi) (C-Pak only)
5 - 207 bar (3000 psi) (H-Pak only)

3 Seal Material
B - Buna-N
V - Viton-A

4 Element Length
mm (inch)
1 - 101 (4)
2 - 203 (8)

5 Element Construction
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)

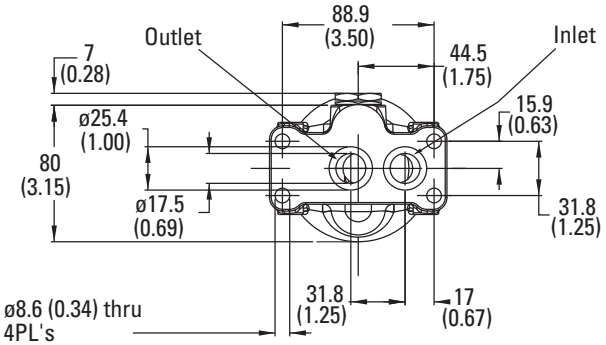
6 Fluid Cleanliness Ratings

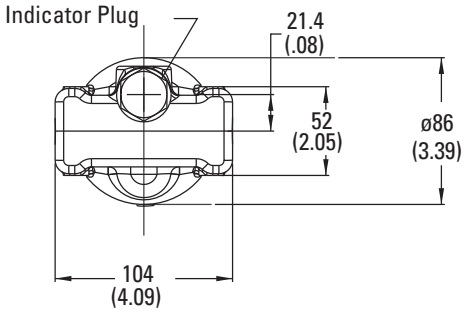
Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

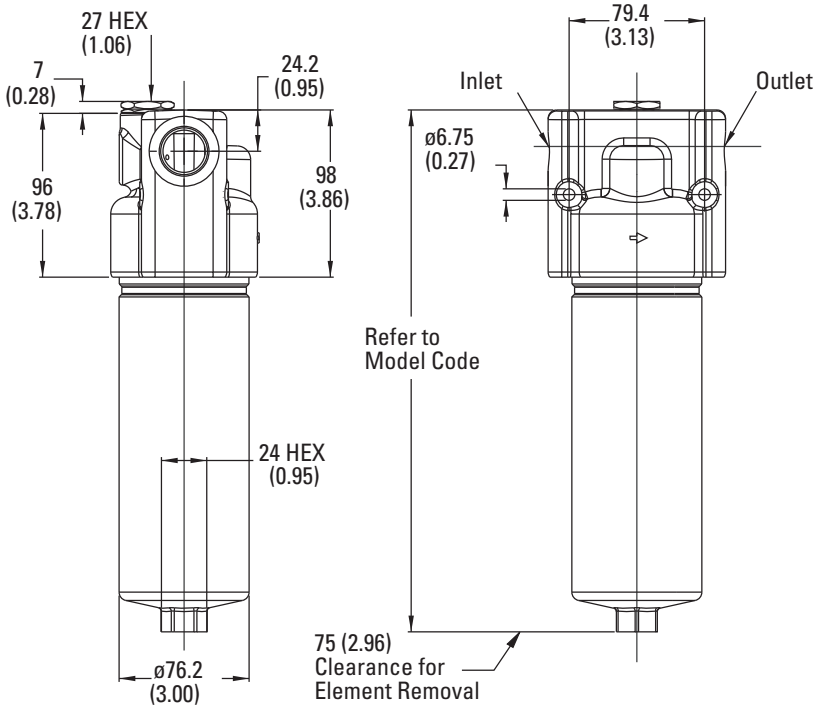
Housing Dimensions

mm (inch)

Subplate Mounting







Pressure Filters

HF2P Series

Flow Data

Flows to 90 L/min (24 USgpm)
Pressures to 280 bar (4,000 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HF2P Filter Elements Flow Data

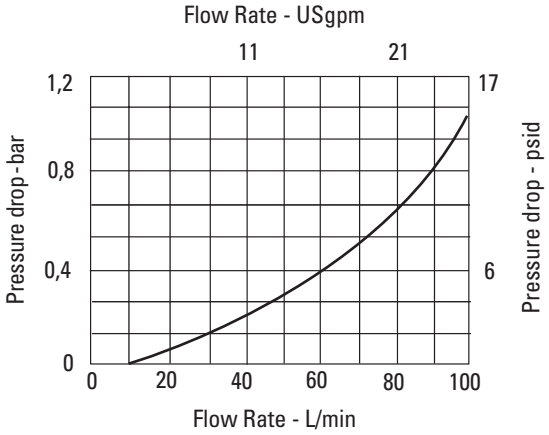
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	25
C - pak	1	0.037 (2.046)	0.032 (1.735)	0.017 (0.924)	0.010 (0.531)
	2	0.018 (1.011)	0.016 (0.858)	0.008 (0.457)	0.005 (0.262)
H - pak	1	0.044 (2.396)	0.031 (1.688)	0.019 (1.026)	xxx
	2	0.021 (0.865)	0.015 (0.820)	0.009 (0.499)	xxx

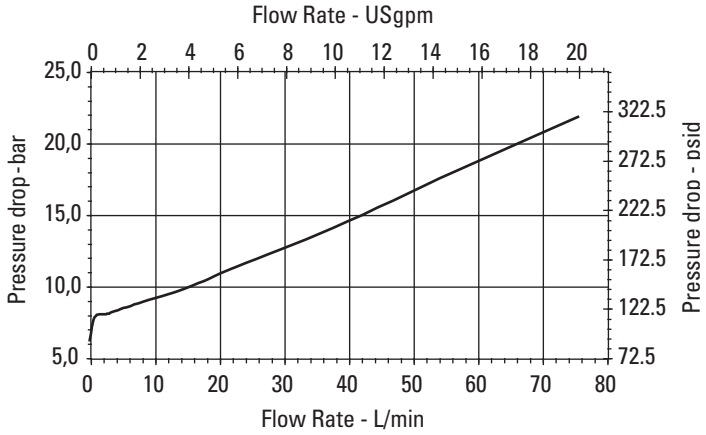
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HF2P1SA4LNB2C05 - Filter assembly having '2' length filter element with micron rating code '05' at 50 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.26 x 0.8/0.9	+	50 x 0.016 x 46/32 x 0.8/0.9
	=	0.220	+	1.01
	=	**1.23 bar**		

Pressure Filters
MF2P Series

Flows to 113.5 L/min (30 USgpm)
Pressures to 275.5 bar (4,000 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual, electrical, and electrical indicators with lamp options for system design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- Poppet type leak by-pass valve construction

DESIGN SPECIFICATIONS

Rated flow:	Length 5 Length 7	68 L/min (18 USgpm) 113.5 L/min (30 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.
Temp range:		-26°C to +121°C (-15°F to +250°F)
Pressure rating:	Operating Fatigue	276 bar (4000 psi) 276 bar (4000 psi)
Material:	Head Bowl	Ductile iron Steel
Dry weight: (Approximate)	Length 5 Length 7	3,9 kg (8.3 lbs) 4,5 kg (9.9 lbs)

MF2P Series Filter Assembly Model Code

Sample model code:

MF2P1SA5ANB5C05

MF2P	1	SA	5	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - MF2P

2 Element Collapse Rating

1 - 17 bar (250 psi) Low Collapse

3 Port Options

SA - 1.062 - 12UN SAE-12 (3/4" tube)

4 Valve Options

5 - Bypass set at 100 psi (7 bar) cracking pressure

5 Indicator Options

AN - Visual 4.9 bar (70 psi), No Connector
JN - No Indicator (plug), No Connector
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi), Hirschmann

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
5 - 210 (8.27)
7 - 263 (10.36)

8 Element Construction

C - 250 psi Low Collapse
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Pressure Filters
MF2P Series

Flows to 113.5 L/min (30 USgpm)
Pressures to 275.5 bar (4,000 psi)

**V0512 * * C **

1 2 3 4 5

V0512 Element Model Codes

Sample model code:
V0512B5C05

1 Filter Element
V0512 - For use with MF2P series housings

2 Seal Material
B - Buna-N
V - Viton-A

3 Element Length
mm (inch)
5 - 117 (5)
7 - 169 (7)

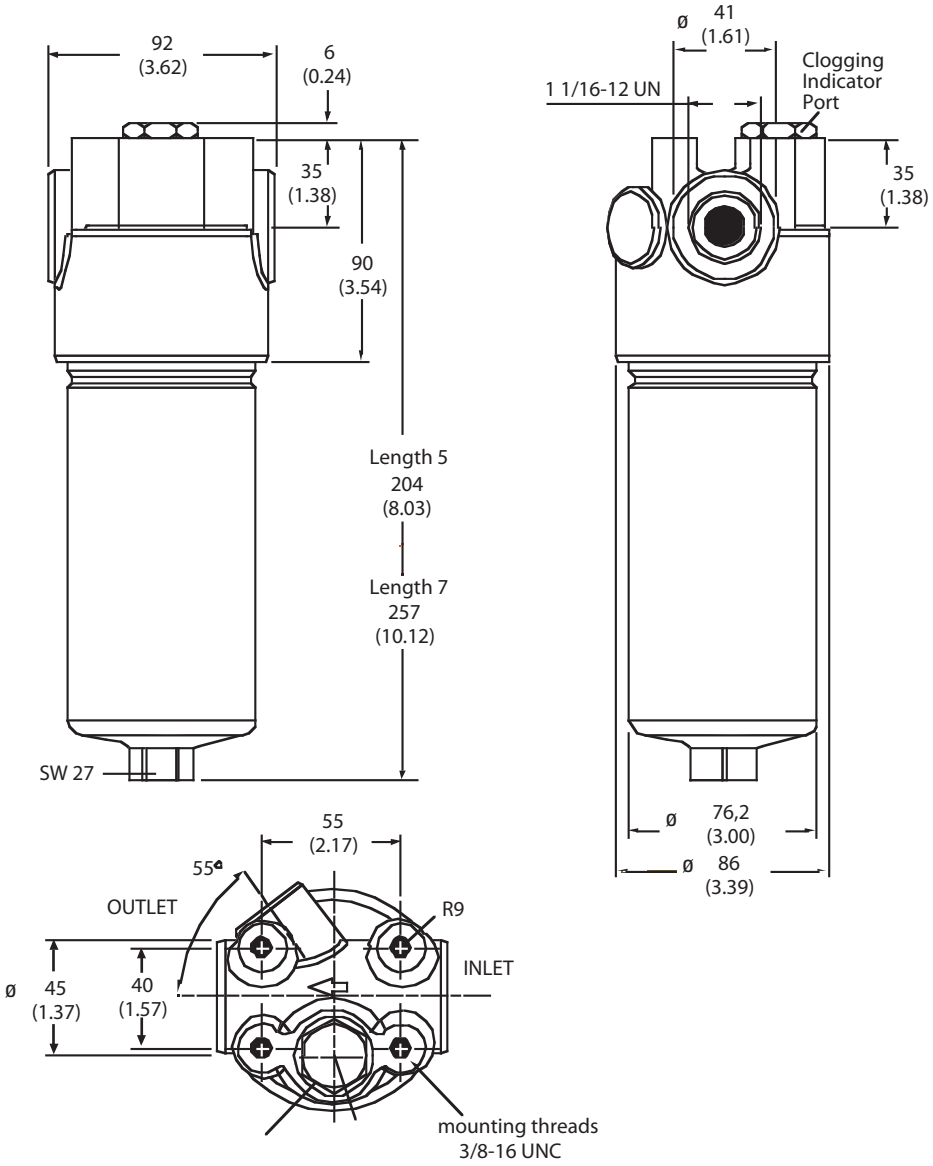
4 Element Construction
C - C-Pak (code 03, 05, 10, 20)

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions

mm (inch)



Pressure Filters

MF2P Series

Flow Data

Flows to 113.5 L/min (30 USgpm)
Pressures to 275.5 bar (4,000 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤ 0.9

MF2P Filter Elements Flow Data

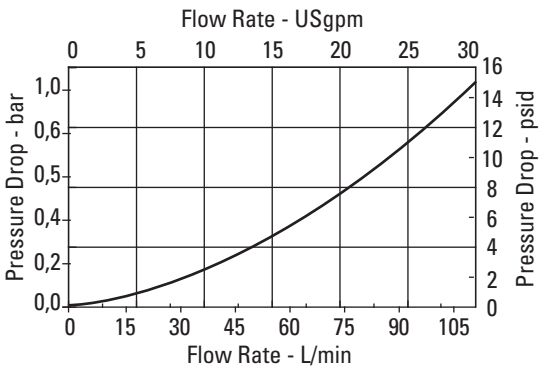
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	25
C - pak	5	0.014 (0.750)	0.011 (0.602)	0.008 (0.443)	0.005 (0.263)
	7	0.009 (0.509)	0.008 (0.411)	0.005 (0.290)	0.003 (0.169)

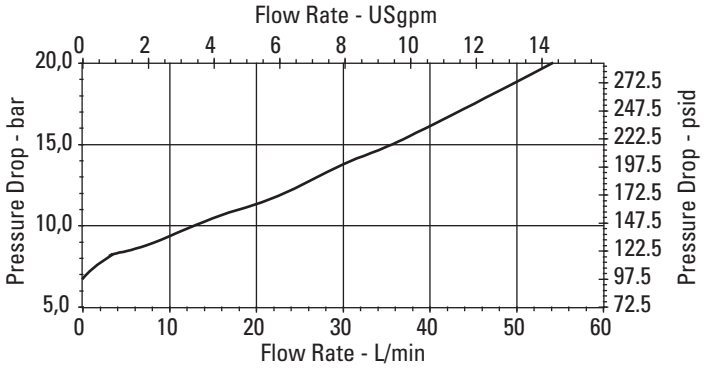
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass



Sample ΔP Calculation : MF2P1SA5UNB5C05 - Filter assembly having '5' length filter element with micron rating code '05' at 50 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.3 x 0.8/0.9	+	50 x 0.011 x 46/32 x 0.8/0.9
	=	0.260	+	0.69
	=	**0.95 bar**		

Pressure Filters

OFPH03, OFPH05 Series

Flows to 53 L/min (14 USgpm)
Pressures to 310 bar (4,500 psi)

Features and Benefits

- Beta Ratio: $\beta_{X(C)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual and electrical indicators with lamp options for system design flexibility
- Poppet type by-pass valve construction
- Wide range of element lengths for maximum design flexibility
- High efficiency replacement elements in standard configurations (H-Pak) to meet Target Cleanliness Levels
- Designed to mount directly underneath D03, D05 and CETOP Valves. The fluid is filtered prior to entering the valve "P" (Pressure) Port

DESIGN SPECIFICATIONS

Rated flow:	**Length 3**	23 L/min (6 USgpm)
	Length 5	45 L/min (12 USgpm)
	Length 6	53 L/min (14 USgpm)
Fluid Compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.
Temp range:		26°C to +121°C (-15°F to +250°F)
Pressure Rating:	**Operating:**	310 bar (4500 psi)
	Fatigue:	310 bar (4500 psi)
Material:	**Head**	Ductile Iron
	Bowl	Carbon Steel
Dry weight: (Approximate)	**Length 3**	2,3 kg (5.1 lbs)
	Length 5	4,7 kg (10.4 lbs)
	Length 6	5,4 kg (11.9 lbs)

OFPH Series Filter Model Codes

Sample model code:

OFPH031SATNBH03

OFPH	***	S	*	**	*	*	**
1	2	3	4	5	6	7	8

1 Filter Series - OFPH

2 Body Size (D03 or D05) and Assembly Length

mm (inch)

031 - OFPH031 226 (8.9)
051 - OFPH051 254 (10.0)
052 - OFPH052 325 (12.8)

3 Valve Options

S - Without bypass valve

4 Port Options

A - Modular stacking, Bowl Side A
B - Modular stacking, Bowl Side B

5 Indicator Options

TN - Visual 7.9 bar (115 psi), No Connector
JN - No Indicator (plug), No Connector
TB - Electrical 7.9 bar (115 psi), Brad Harrison
TJ - Electrical 7.9 bar (115 psi), Hirschmann w 24 volt light
TK - Electrical 7.9 bar (115 psi), Hirschmann w 115 volt light
TL - Electrical 7.9 bar (115 psi), Hirschmann w 230 volt light
TH - Electrical 7.9 bar (115 psi), Hirschmann

6 Seals

B - Buna-N
V - Viton-A

7 Element Series (collapse rating)

H - 207 bar (3000 psi)
X - no element

8 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Pressure Filters

OFPH03, OFPH05 Series

Flows to 53 L/min (14 USgpm)
Pressures to 310 bar (4,500 psi)

*****	*	*	H	**
1	2	3	4	5

V0603, V0604 and V0114 Series Replacement Element Model Codes

Sample model code:

V0603B3H03

1 Element Series

V0603 - For use with OFPH031 series filters

V0604 - For use with OFPH051 series filters

V0114 - For use with OFPH052 series filters

2 Seals

B - Buna-N

V - Viton-A

3 Element Length

3 - OFPH031 (V0603 only)

5 - OFPH051 (V0604 only)

6 - OFPH052 (V0114 only)

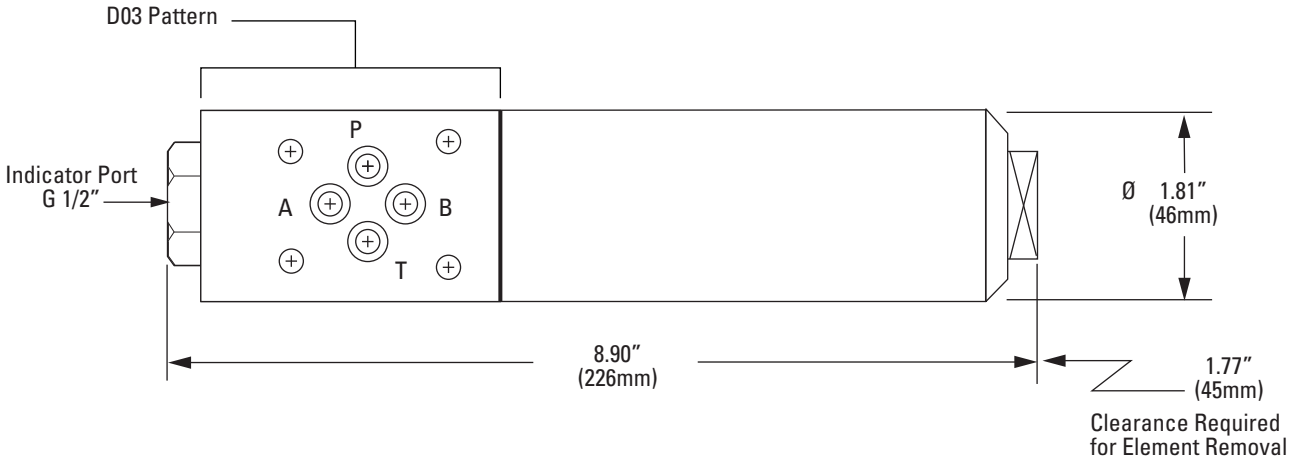
4 Element Collapse Pressure

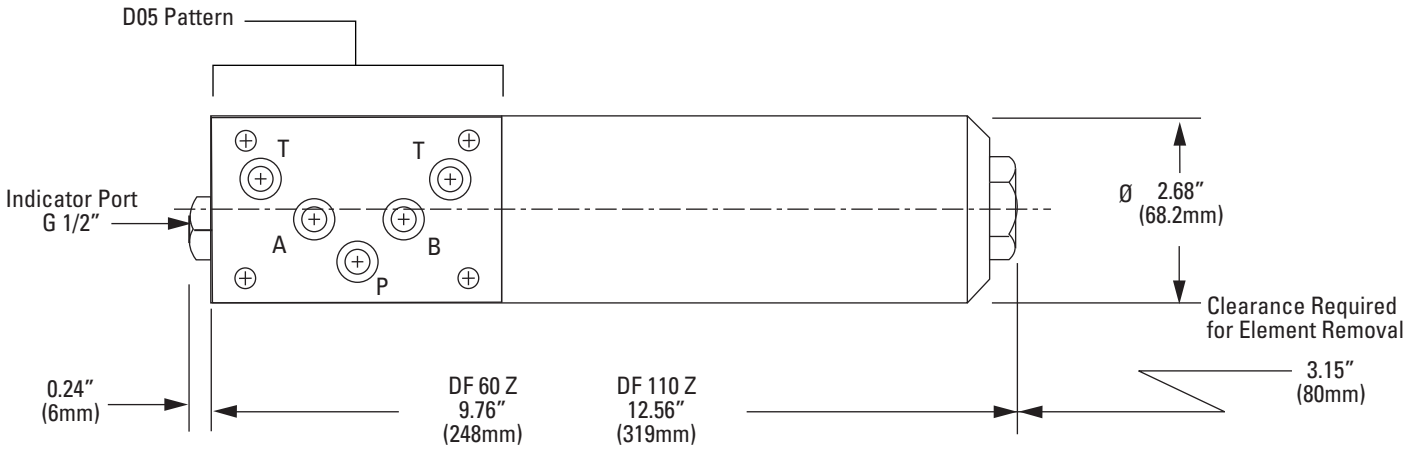
H - 207 bar (3000 psi)

5 Fluid Cleanliness Rating	
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions - D03 Pattern

mm (inch)





Pressure Filters

OFPH03, OFPH05 Series

Flow Data

Flows to 53 L/min (14 USgpm)
Pressures to 310 bar (4,500 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤ 0.9

OFPH Filter Elements Flow Data

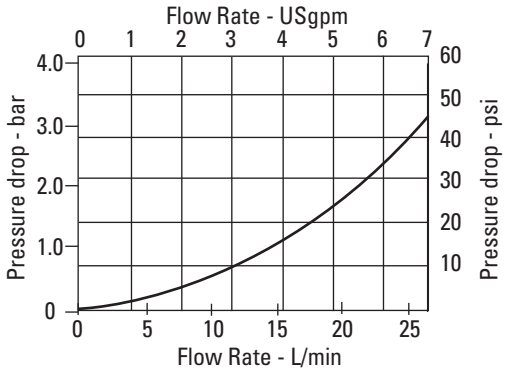
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	25
H - pak	3	0.075 (4.466)	0.067 (3.978)	0.053 (3.096)	0.031 (1.795)
	5	0.059 (3.210)	0.033 (1.784)	0.018 (0.993)	0.023 (1.227)
	6	0.025 (1.394)	0.015 (0.818)	0.009 (0.488)	0.010 (0.563)

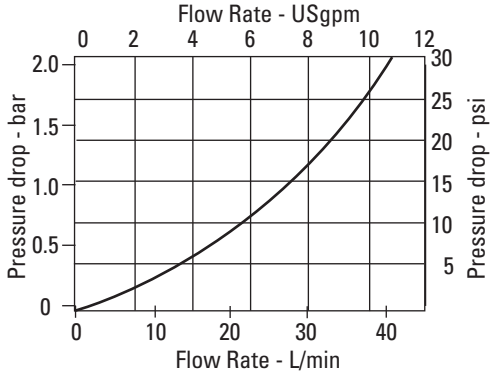
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing Flow Data

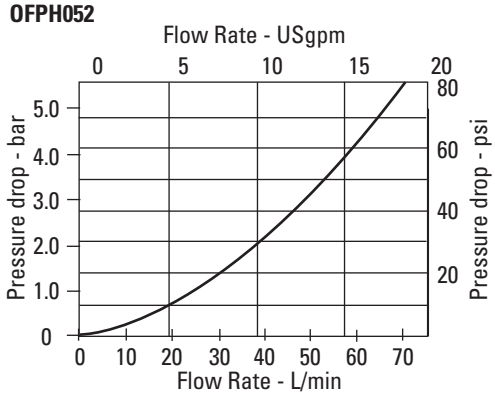
OFPH031



OFPH051



OFPH052



Sample ΔP Calculation : OFPH031SAATNBHC05 - Filter assembly having '3' length filter element with micron rating code '05' at 20 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	1.6 x 0.8/0.9	+	20 x 0.067 x 46/32 x 0.8/0.9
	=	1.400	+	1.7
	=	**3.1 bar**		

Pressure Filters
HF4P Series

Flows to 570 L/min (150 USgpm)
Pressures to 345 bar (5,000 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual and electrical indicators with lamp options for system design flexibility
- Conforms to HF4 specifications
- Fatigue rated to 5000 psi for maximum reliability in rugged applications
- Top loading design to ease maintenance and minimize spillage
- Multiple filter element lengths for design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- High collapse elements available for non-bypass applications

Series Filter and Element Model Code

Sample model code:

HF4P1SD4LNB6C05

DESIGN SPECIFICATIONS

Rated flow:	Length 3	189 L/min (50 USgpm)
	Length 6	379 L/min (100 USgpm)
	Length 7	568 L/min (150 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.
Temp range:		-26°C to +121°C (-15°F to +250°F)
Pressure rating:	Operating	345 bar (5000 psi)
	Fatigue	345 bar (5000 psi)
Material:	Head	Ductile Iron
	Bowl	Carbon Steel
	Lid	Ductile Iron
Dry weight: (Approximate)	Length 3	28,8 kg (63.4 lbs)
	Length 6	38,7 kg (85.3 lbs)
	Length 7	51,5 kg (113.6 lbs)

HF4P	*	**	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - HF4P

2 Element Collapse Rating

1 - 10 bar (150 psi) Low Collapse
4 - 207 bar (3000 psi) High Collapse

3 Port options

BD - G1½ to ISO 228
ME - 1½" SAE 4 bolt Flange Code 61 (M12 x 1.75)
MR - 1½" SAE 4 bolt Flange Code 62 (M16 x 2.0)
SD - 1.875 - 12 UN SAE-24 str. Thd. (1½" tube)
FE - 1½" SAE 4 bolt Flange Code 61 (UNC)
FR - 1½" SAE 4 bolt Flange Code 62 (UNC)
WS - Subplate mounting

4 Valve options

1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
6 - Bypass set at 6 bar (90 psi) cracking pressure

5 Indicator options

AN - Visual 4.9 bar (70 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
JN - No Indicator (plug), No Connector
RB - Electrical 2 bar (30 psi), Brad Harrison
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
RH - Electrical 2 bar (30 psi), Hirschmann
TB - Electrical 7.9 bar (115 psi), Brad Harrison
TJ - Electrical 7.9 bar (115 psi), Hirschmann w/ 24 volt light
TK - Electrical 7.9 bar (115 psi), Hirschmann w/ 115 volt light
TL - Electrical 7.9 bar (115 psi), Hirschmann w/ 230 volt light
TH - Electrical 7.9 bar (115 psi), Hirschmann
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light
UH - Electrical 4.9 bar (70 psi), Hirschmann

6 Seal material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
3 - 447 (17.6)
6 - 685.3 (27)
7 - 923.5 (36.4)

8 Element construction

C - 10 bar (150 psi) Low Collapse
H - 207 bar (3000 psi) High Collapse
X - no element

9 Fluid cleanliness rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20*	22/**19/16** or better
XX	no element

* C-Pak only

Pressure Filters

HF4P Series

Flows to 570 L/min (150 USgpm)
Pressures to 345 bar (5,000 psi)

V405 * * * * **

1 2 3 4 5 6

V405 Element model code

(Meets HF4 Standard)

Sample model code:

V4051B3C03

1 Filter Element - V405

2 Element Collapse Rating

1 - 10 bar (150 psi)
4 - 206.9 bar (3000 psi) High Collapse
NOTE: Use 1 only with bypass valve or monitored delta P indicator.

3 Seals

B - Buna-N
V - Viton-A

4 Element Length

mm (inch)
3 - 229 (9)
6 - 457 (18)
7 - 686 (27)

5 Element Construction

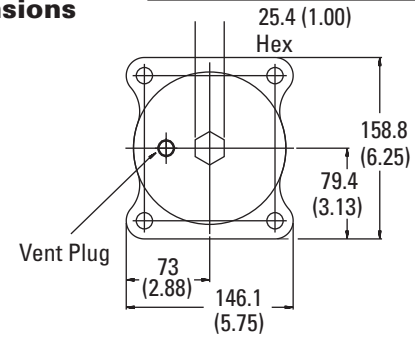
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)

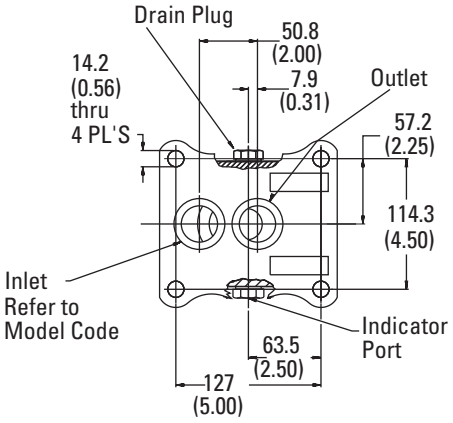
6 Fluid Cleanliness Rating

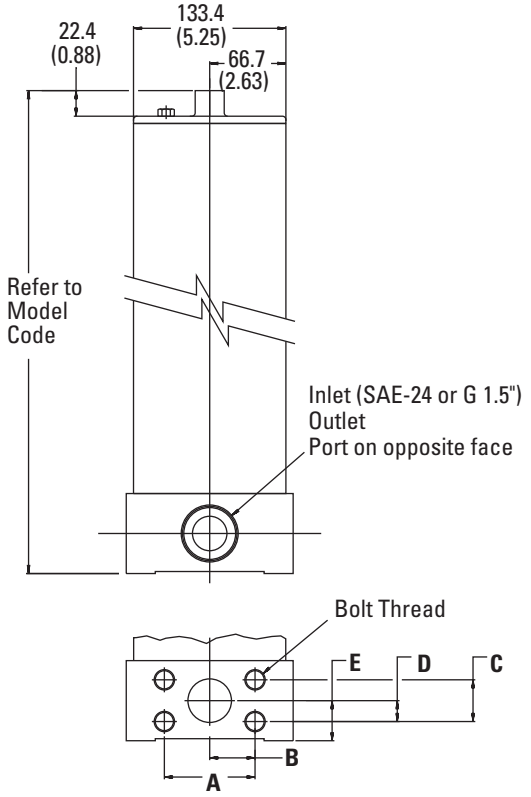
Code	Target fluid cleanliness level
03	16/**14/12**
05	18/**16/14**
10	20/**18/15**
20	22/**19/16**

Housing Dimensions

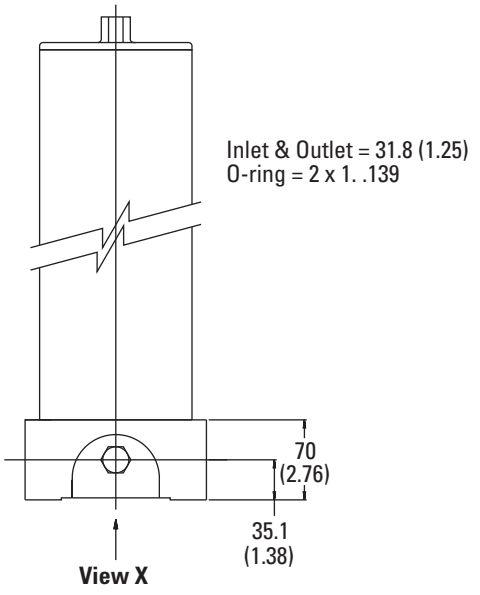
mm (inch)







View X - Subplate Mounting



	A	B	C	D	E
	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
ME	69.8 (2.75)	37.9 (1.375)	35.7 (1.406)	17.9 (.703)	35.1 (1.38)
MR	79.3 (3.125)	39.4 (1.56)	36.5 (1.437)	18.2 (.718)	35.1 (1.38)
FE	69.8 (2.75)	37.9 (1.375)	35.7 (1.406)	17.9 (.703)	35.1 (1.38)
FR	79.3 (3.125)	39.4 (1.56)	36.5 (1.437)	18.2 (.718)	35.1 (1.38)

Pressure Filters

HF4P Series

Flow Data

Flows to 570 L/min (150 USgpm)
Pressures to 345 bar (5,000 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HF4P Filter Elements Flow Data

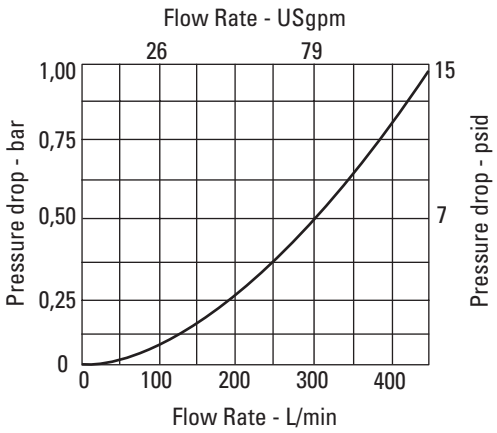
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	3	0.003 (0.168)	0.003 (0.140)	0.001 (0.078)	0.001 (0.044)
	6	0.001 (0.080)	0.001 (0.066)	0.001 (0.037)	0.001 (0.021)
	7	0.001 (0.051)	0.001 (0.043)	0.001 (0.024)	0.001 (0.013)
H -pak	3	0.004 (0.206)	0.003 (0.145)	0.002 (0.088)	xxx
	6	0.002 (0.096)	0.001 (0.068)	0.001 (0.041)	xxx
	7	0.001 (0.062)	0.001 (0.044)	0.001 (0.026)	xxx

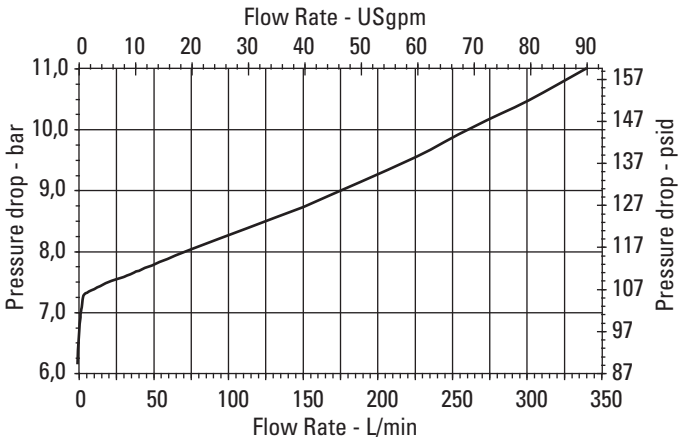
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HF4P1SD4LNB6C05 - Filter assembly having '6' length filter element with micron rating code '05' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.26 x 0.8/0.9	+	200 x 0.001 x 46/32 x 0.8/0.9
	=	0.220	+	0.25
	=	**0.47 bar**		

Pressure Filters
HF3P Series

Flows to 454 L/min (120 USgpm)
Pressures to 410 bar (6,000 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)} = 1000$ to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual, electrical, and electrical indicators with lamp options for system design flexibility
- Conforms to HF3 automotive specifications
- Fatigue rated to 6000 psi for maximum reliability in the most rugged applications
- Reverse flow valve option for hydrostatic transmission applications
- Multiple filter element lengths for design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- High collapse elements available for non-bypass applications

DESIGN SPECIFICATIONS

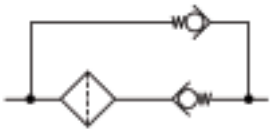
Rated flow:	Length 1	106 L/min (28 USgpm)
	Length 2	208 L/min (55 USgpm)
	Length 4	344 L/min (91 USgpm)
	Length 5	454 L/min (120 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.
Temp range:		-26°C to +121°C (-15°F to +250°F)
Pressure rating:	Operating	410 bar (6000 psi)
	Fatigue	410 bar (6000 psi)
Material:	Head	Ductile iron
	Bowl	Carbon Steel
Dry weight:	Length 1	20,3 kg (44.8lbs)
(Approximate)	Length 2	22,5 kg (49.5lbs)
(Approximate)	Length 4	28,5 kg (62.9lbs)
(Approximate)	Length 5	43,4 kg (95.7lbs)

HF3P Series Filter and Element Model Code

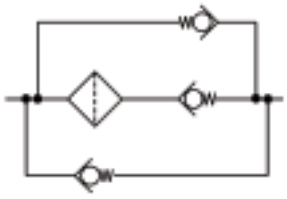
Sample model code:

HF3P1SB4LNB2C05

HF3P * ** * ** * * * **
1 2 3 4 5 6 7 8 9



Reverse Flow Non-bypass (Valve Option 8)



Reverse Flow Bypass (Valve Option 9)

1 Filter Series - HF3P

2 Element Collapse Rating

1 - 17 bar (250 psi) Low Collapse
4 - 207 bar (3000 psi) High Collapse

3 Port Options

BB - G1 to ISO 228
BD - G1-½ to ISO 228
ME - 1-½" SAE 4 bolt Flange Code 61 (M12 x 1.75)
MJ - 2" SAE 4 bolt Flange Code 61 (M12 x 1.75)
MU - 2" SAE 4 bolt Flange Code 62 (M20 x 2.5)
SB - 1.312 - 12 UN SAE-16 str. Thd. (1" tube)
SD - 1.875 - 12 UN SAE-24 str. Thd. (1-½" tube)
FE - 1½" SAE 4 bolt Flange Code 61 (UNC)
FJ - 2" SAE 4 bolt Flange Code 61 (UNC)
FU - 2" SAE 4 bolt Flange Code 62 (UNC)

4 Valve Options

1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
6 - Bypass set at 6 bar (90 psi) cracking pressure
8 - Reverse Flow Valve Non-Bypass*
9 - Reverse Flow Valve 2.9 bar (43 psi) Bypass*

* Reverse flow bypass available with BD, MU, SD and FU ports only.

5 Indicator Options

AN - Visual 4.9 bar (70 psi), No Connector
JN - No Indicator (plug), No Connector
KN - Visual 1 bar (15 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
ON - Visual 7.9 bar (115 psi), No Connector
RB - Electrical 2 bar (30 psi), Brad Harrison
RH - Electrical 2 bar (30 psi), Hirschmann
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
TB - Electrical 7.9 bar (115 psi), Brad Harrison
TH - Electrical 7.9 ba (115 psi), Hirschmann
TJ - Electrical 7.9 bar (115 psi), Hirschmann w 24 volt light
TK - Electrical 7.9 bar (115 psi), Hirschmann w 115 volt light
TL - Electrical 7.9 bar (115 psi), Hirschmann w 230 volt light
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UH - Electrical 4.9 bar (70 psi), Hirschmann
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
1 - 230 (9.1)
2 - 293 (11.5)
4 - 414 (16.3)
5 - 569 (22.4)

8 Element Construction

C - 17 bar (250 psi) Low Collapse
H - 207 bar (3000 psi) High Collapse
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better (C-Pak only)
XX	no element

Pressure Filters

HF3P Series

Flows to 454 L/min (120 USgpm)
Pressures to 420 bar (6,000 psi)

V602 * * * * **

1 2 3 4 5 6

V602 Element Model Code

Sample model code:

V6021B1C03

1 Filter element

V602 - For use with HF3P, series filters

2 Element collapse rating

1 - 17 bar (250 psi) Collapse
4 - 207 bar (3000 psi) High Collapse

NOTE: Use 1 only with bypass valve.

3 Seal material

B - Buna-N
V - Viton-A

4 Element length

mm (inch)
1 - 101 (4)
2 - 203 (8)
4 - 330 (13)
5 - 406 (16)

5 Element construction

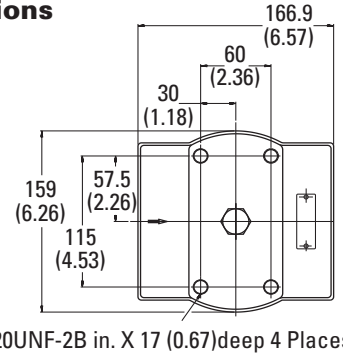
C - C-Pak (code 03, 05, 10, 20)
H - H-Pak (code 03, 05, 10)

6 Fluid cleanliness rating

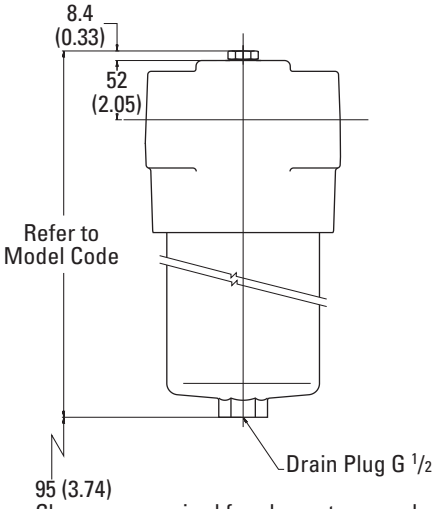
Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions

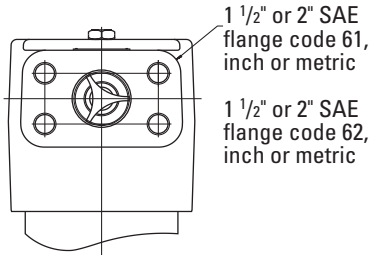
mm (inch)

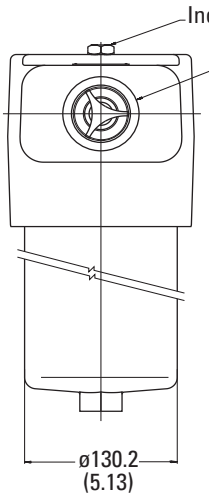


1/2-20UNF-2B in. X 17 (0.67)deep 4 Places

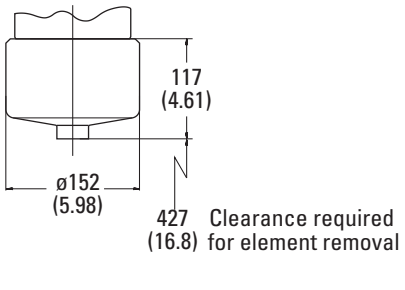


Inlet & Outlet Porting



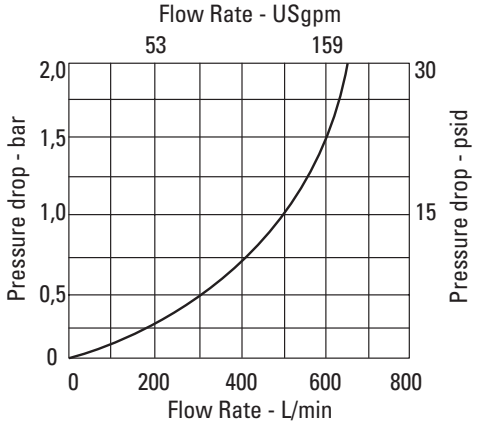


16" Housing

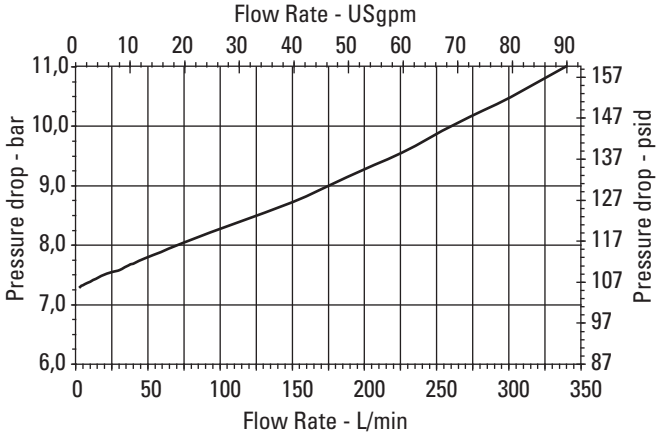


Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Pressure Filters

HF3P Series

Flow Data

Flows to 454 L/min (120 USgpm)
Pressures to 420 bar (6,000 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

Element Flow Data

HF3P Filter Elements

'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	1	0.011 (0.589)	0.009 (0.499)	0.005 (0.266)	0.003 (0.153)
	2	0.005 (0.288)	0.004 (0.241)	0.002 (0.135)	0.001 (0.076)
	4	0.003 (0.175)	0.003 (0.146)	0.001 (0.082)	0.001 (0.046)
	5	0.002 (0.132)	0.002 (0.110)	0.001 (0.061)	0.001 (0.034)
H -pak	1	0.017 (0.936)	0.012 (0.659)	0.007 (0.401)	xxx
	2	0.008 (0.455)	0.006 (0.320)	0.004 (0.195)	xxx
	4	0.005 (0.273)	0.004 (0.192)	0.002 (0.117)	xxx
	5	0.004 (0.206)	0.003 (0.145)	0.002 (0.088)	xxx

Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Sample ΔP Calculation : HF3P1SB4LNB2C05 - Filter assembly having '2' length filter element with micron rating code '05' at 100 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.12 x 0.8/0.9	+	100 x 0.001 x 46/32 x 0.8/0.9
	=	0.100	+	0.127
	=	**0.22 bar**		

Pressure Filters
HF3PS Series

Flows to 565 L/min (150 USgpm)
Pressures to 410 bar (6,000 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to comply with ANSI specifications and ISO cleanliness standards
- Visual, and electrical indicators with lamp options for system design flexibility
- Conforms to HF3 automotive specifications
- Fatigue rated to 6000 psi for maximum reliability in rugged applications
- Side manifold mounting for ease of maintenance in many applications
- Multiple filter element lengths for design flexibility
- High efficiency replacement elements in standard configurations (C-Pak) to meet Target Cleanliness Levels
- High collapse elements available for non-bypass applications

HF3PS Series Filter and Element Model Code

Sample model code:

HF3PS1WS4LNB5C05

DESIGN SPECIFICATIONS

Rated flow:	Length 2 Length 4 Length 5	265 L/min (70 USgpm) 454 L/min (120 USgpm) 565 L/min (150 USgpm)
Fluid compatibility:		Compatible with most petroleum oil, water glycol, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.
Temp range:		-26°C to +121°C (-15°F to +250°F)
Pressure rating:	Operating Fatigue	310 bar (4500 psi) 410 bar (6000 psi)
Material:	Head Bowl	Ductile iron Carbon Steel
Dry weight: (Approximate)	Length 2 Length 4 Length 5	21,8 kg (48.0 lbs) 28,5 kg (62.8 lbs) 41,4 kg (91.3 lbs)

HF3PS	*	WS	*	**	*	*	*	**
1	2	3	4	5	6	7	8	9

1 Filter Series - HF3PS

2 Element Collapse Rating

1 - 17 bar 17 bar (250 psi) Low Collapse
4 - 207 bar (3,000 psi) High Collapse

3 Port Options

WS - Subplate mounting

4 Valve Options

1 - Non-Bypass
4 - Bypass set at 2.9 bar (43 psi) cracking pressure
6 - Bypass set at 6 bar (90 psi) cracking pressure

5 Indicator Options

AN - Visual 4.9 bar (70 psi), No Connector
JN - No Indicator (plug), No Connector
KN - Visual 1 bar (15 psi), No Connector
LN - Visual 2 bar (30 psi), No Connector
ON - Visual 7.9 bar (115 psi), No Connector
RB - Electrical 2 bar (30 psi), Brad Harrison
RH - Electrical 2 bar (30 psi), Hirschmann
RJ - Electrical 2 bar (30 psi), Hirschmann w 24 volt light
RK - Electrical 2 bar (30 psi), Hirschmann w 115 volt light
RL - Electrical 2 bar (30 psi), Hirschmann w 230 volt light
TB - Electrical 7.9 bar (115 psi), Brad Harrison
TH - Electrical 7.9 bar (115 psi), Hirschmann
TJ - Electrical 7.9 bar (115 psi), Hirschmann w 24 volt light
TK - Electrical 7.9 bar (115 psi), Hirshmann w 115 volt light
TL - Electrical 7.9 bar (115 psi), Hirschmann w 230 volt light
UB - Electrical 4.9 bar (70 psi), Brad Harrison
UH - Electrical 4.9 bar (70 psi), Hirschmann
UJ - Electrical 4.9 bar (70 psi), Hirschmann w 24 volt light
UK - Electrical 4.9 bar (70 psi), Hirschmann w 115 volt light
UL - Electrical 4.9 bar (70 psi), Hirschmann w 230 volt light

6 Seal Material

B - Buna-N
V - Viton-A

7 Assembly Length

mm (inch)
2 - 340 (13.3)
4 - 461 (18.1)
5 - 614 (24.2)

8 Element Construction

C - 17 bar (250 psi) Low Collapse
H - 207 bar (3000 psi) High Collapse
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better
XX	no element

Pressure Filters
HF3PS Series

Flows to 565 L/min (150 USgpm)
Pressures to 310 bar (4,500 psi)

V602 * * * * **

1 2 3 4 5 6

V602 Element Model Code

Sample model code:
V6021B1C03

1 Filter Element
V602 - For use with HF3P, HF3PS and OFR30 series filters

2 Element Collapse Rating
1 - 17 bar (250 psi) Low Collapse
4 - 206.9 bar (3,000 PSI) High Collapse
NOTE: Use 1 only with bypass valve.

3 Seal Material
B - Buna-N
V - Viton-A

4 Element Length
mm (inch)
2 - 203 (8)
4 - 330 (13)
5 - 406 (16)

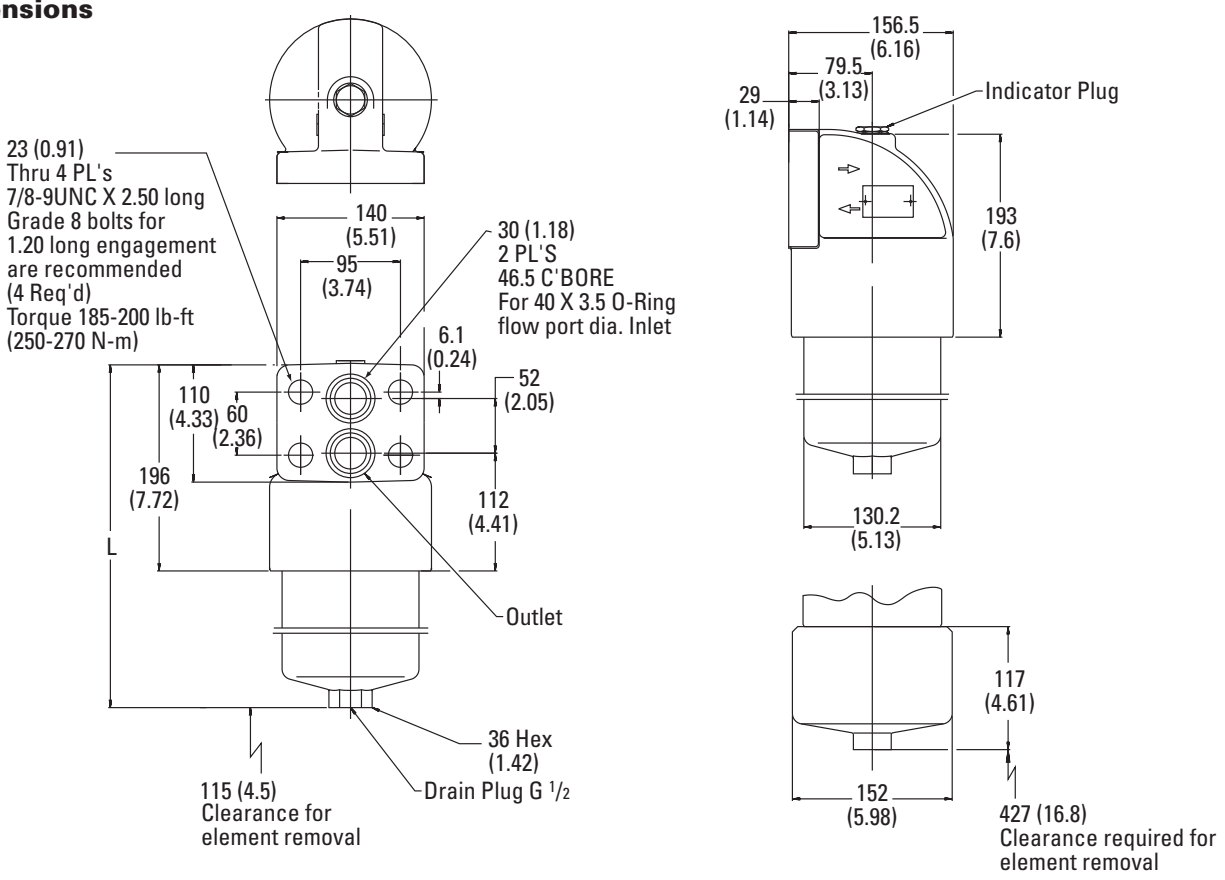
5 Element Construction
C - C-Pak (code 3, 5, 10, 20)
H - H-Pak (code 3, 5, 10)

6 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12** or better
05	18/**16/14** or better
10	20/**18/15** or better
20	22/**19/16** or better

Housing Dimensions

mm (inch)



Pressure Filters

HF3PS Series

Flow Data

Flows to 565 L/min (150 USgpm)
Pressures to 310 bar (4,500 psi)

Flow versus pressure drop:

150 SUS (32 cSt) oil with specific gravity of ≤0.9

HF3PS Filter Elements Flow Data

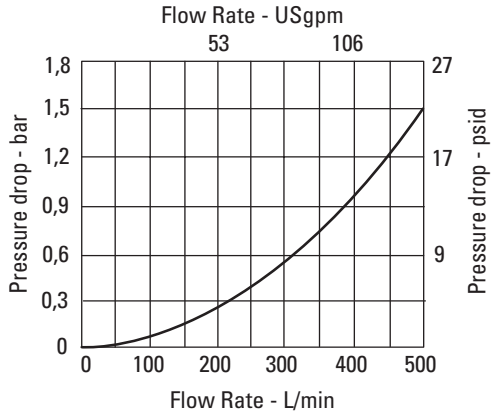
'K' factor - bar/lpm (psi/gpm)

ELEMENT TYPE / SIZE		MICRON RATING			
		03	05	10	20
C -pak	1	0.011 (0.589)	0.009 (0.499)	0.005 (0.266)	0.003 (0.153)
	2	0.005 (0.288)	0.004 (0.241)	0.002 (0.135)	0.001 (0.076)
	4	0.003 (0.175)	0.003 (0.146)	0.001 (0.082)	0.001 (0.046)
	5	0.002 (0.132)	0.002 (0.110)	0.001 (0.061)	0.001 (0.034)
H -pak	1	0.017 (0.936)	0.012 (0.659)	0.007 (0.401)	xxx
	2	0.008 (0.455)	0.006 (0.320)	0.004 (0.195)	xxx
	4	0.005 (0.273)	0.004 (0.192)	0.002 (0.117)	xxx
	5	0.004 (0.206)	0.003 (0.145)	0.002 (0.088)	xxx

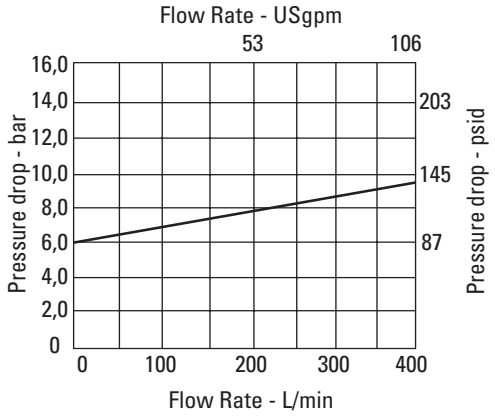
Note: For flow in gpm, use the values inside the brackets.
Note: The values for bar/lpm have been rounded to the third decimal.

Housing/Bypass Valve Flow Data

Housing



Bypass Valve



Sample ΔP Calculation : HF3PS1WS4LNB5C05 - Filter assembly having '5' length filter element with micron rating code '05' at 200 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing factor from graph x sp.gr.(actual)/0.9	+	Flow Rate (Lpm) x Element 'K' factor (bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.28 x 0.8/0.9	+	200 x 0.002 x 46/32 x 0.8/0.9
	=	0.250	+	0.51
	=	**0.76 bar**		

Pressure Filters

DMP DIN Series Filters

Flows to 100 L/min (25 USgpm)
Pressures to 100 bar (1,450 psi)

Features and Benefits

- Beta Ratio: $\beta_{X(c)}$ = 1000 to ISO 16889
- Designed to Comply with DIN 24550 specifications
- Fatigue rated to 100 Bar
- Visual and electrical indicators with light options for system design flexibility
- High efficiency six layer media elements
- Bypass and non-bypass options available

DESIGN SPECIFICATIONS

Rated flow:	040	40 L/min (11USgpm)
	063	63 L/min (17USgpm)
	100	100 L/min (26USgpm)
Fluid compatibility:		Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters
Temp range:		-10°C to + 100°C (+14°F to +212°F)
Pressure rating:	Fatigue	100 bar (1450 psi)
Material:	040/063	Aluminum
	100	Aluminum and Steel
Dry weight:	040	1,8kg (4.0 lbs)
	063	1,8kg (4.0 lbs)
	100	4,2kg (9.3 lbs)

DMP * *** ** * ** * * **
1 2 3 4 5 6 7 8 9

DMP Series Filter

Sample model code:
DMP1100BD6ANBC06

1 Filter Series
DMP - DIN Medium Pressure

2 Element Collapse Rating
1 - 30 bar (435 psi) Low Collapse
4 - 160 bar (2,320 psi) High Collapse

3 Nominal Size
040 - 40 L/min (10.6 USgpm)
063 - 63 L/min (16.6 USgpm)
100 - 100 L/min (26.4 USgpm)

4 Port Size
BB - G ½ (Length 040 only)
BC - G ¾ (Length 063 only)
BD - G 1 (Length 100 only)

5 Valve Options
1 - Non-Bypass
6 - Bypass set at 7 bar (100 psi) cracking pressure

6 Indicator Options
AN - Visual 5 bar (70 psi), No Connector
JN - No Indicator, No Connector
TB - Electrical 5 bar (70 psi), Brad Harrison Connector
TH - Electrical 5 bar (70 psi), Hirschmann

7 Seal Material
B - Buna-N
V - Viton-A

8 Element Construction
C - Standard Construction
H - High Collapse
X - no element

9 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**
XX	no element

Pressure Filters

DMP DIN Series Filters

Flows to 100 L/min (25 USgpm)
Pressures to 100 bar (1,450 psi)

VDP *** * * **
1 2 3 4 5

Element model code

Sample model code:
VDP160BC06

1 Filter Element
VDP - DIN Standard Element

2 Nominal Size
040 - 40 L/min (10.6 USgpm)
063 - 63 L/min (16.6 USgpm)
100 - 100 L/min (26.4 USgpm)

3 Seal Material
B - Buna-N
V - Viton-A

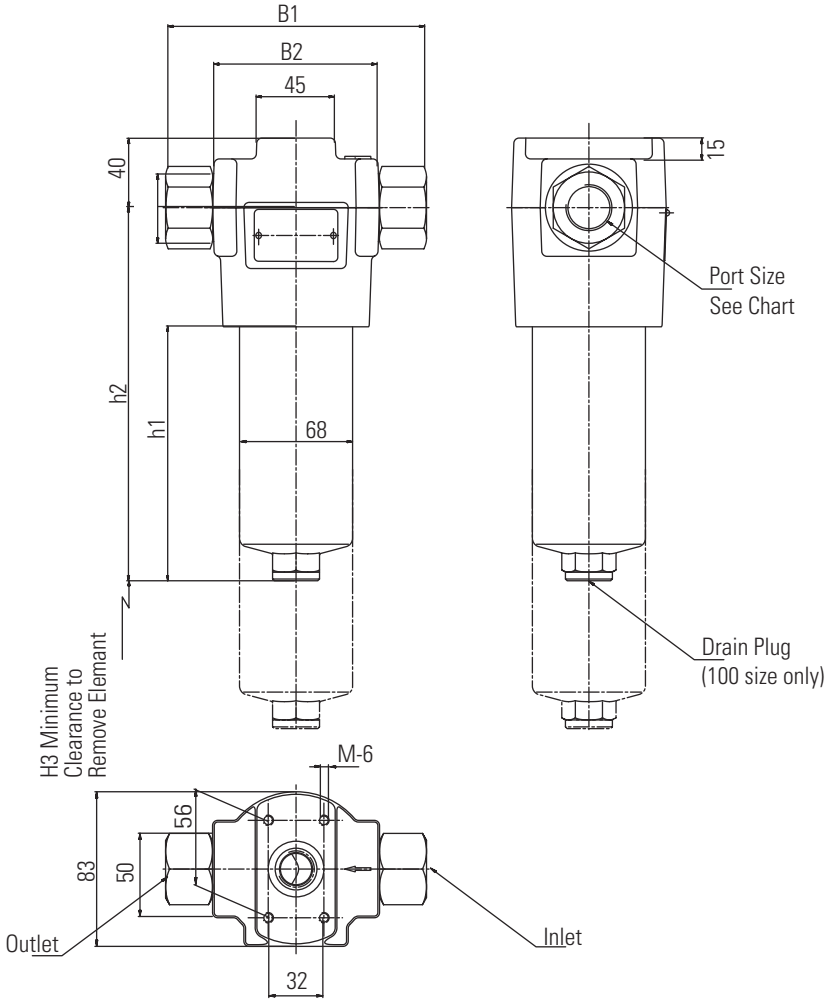
4 Element Construction
C - Standard Construction
H - High Collapse

5 Fluid Cleanliness Rating

Code	Target fluid cleanliness level
03	16/**14/12 or better**
06	18/**16/14 or better**
10	20/**18/15 or better**
25	22/**19/16 or better**

Dimensions DRT Series

Dimensions in mm



Pressure Filters

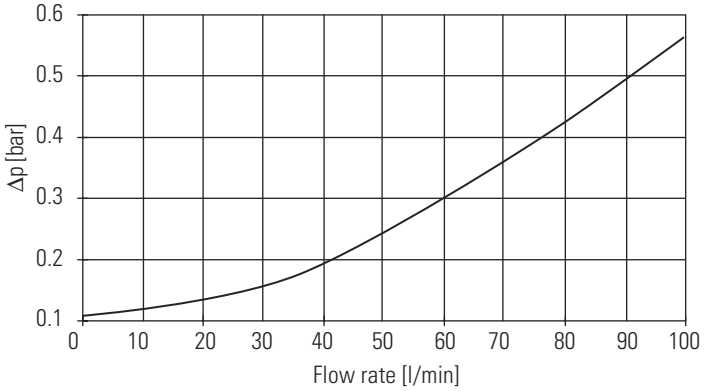
Flows to 100 L/min (25 USgpm)
Pressures to 100 bar (1,450 psi)

DMP DIN Series Filters

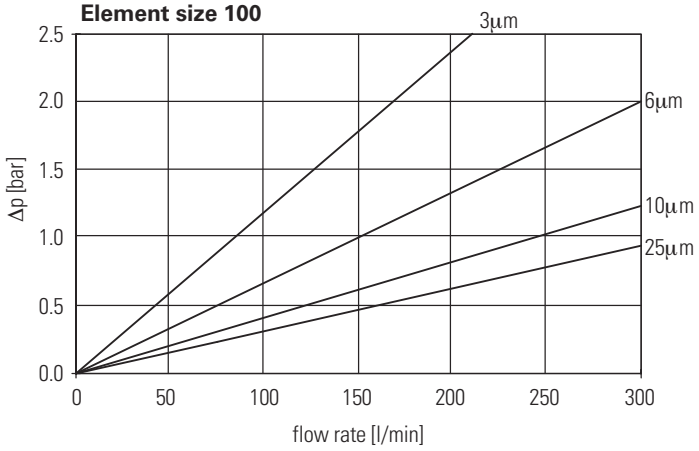
Housing and Element Flow Data

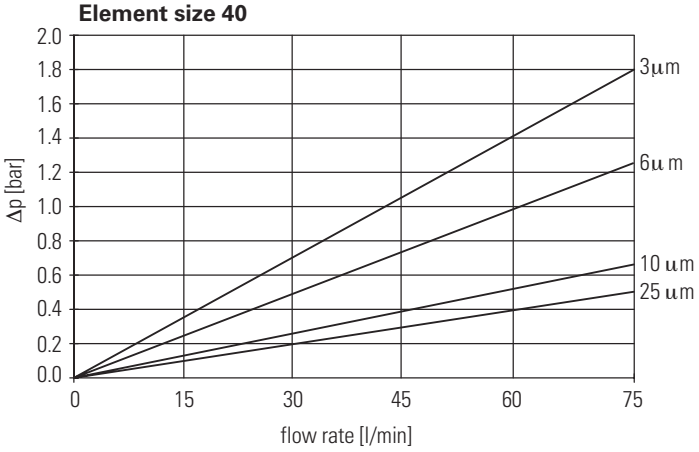
DMP 040, 063, 100 Series Housing Data

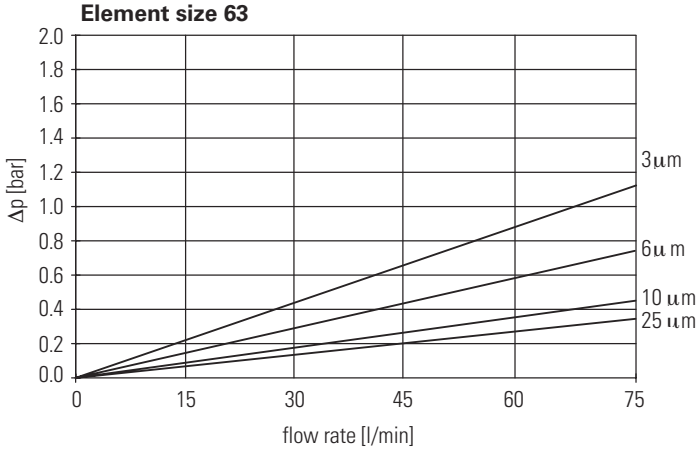
TYPE	PORT SIZE	B1	B2	H1	H2	H3
DMP 040	G 1/2	–	92	91	146	75
DMP 063	G 3/4	–	92	152	207	75
DMP 100	G 1	160	–	246	301	85



DMP Series Element Flow Data







Pressure Filters

DHP DIN Series Filters

Flows to 400 L/min (106 USgpm)
Pressures to 400 bar (5,801 psi)

Features and Benefits

- Beta Ratio: $\beta_{x(c)}$ = 1000 to ISO 16889
- Designed to Comply with DIN 24550 specifications
- Fatigue rated: 063, 100, and 250 size:(400 bar) 400 size: (210 bar)
- Visual and electrical indicators with light options for system design flexibility
- High efficiency six layer media elements
- Bypass and non-bypass options available

DESIGN SPECIFICATIONS

Rated flow:	063		63L/min (16.6USgpm)
	100		100L/min (26.4USgpm)
	250		250L/min (66.0USgpm)
	400		400L/min (105.7USgpm)
Housing & Element Compatibility:	Compatible with most petroleum oil, water glycol, and oil in-water fluids. Optional seals available for phosphate esters.		
Temp range:			-10°C to + 100°C (+14°F to +212°F)
Pressure rating:	Operating	063, 100, 250	400 bar (5800PSI)
		400	210 bar (3045PSI)
Material:			Nodular Iron and Steel
Dry weight:	063		6.0kg (13.2lbs.)
(Approximate with element)	100		7.5kg (16.5lbs.)
	250		13.0kg (28.6lbs.)
	400		28.0kg (61.7lbs.)

DHP Series Filter Model Code

Sample model code:

DHP1100BD6ANBC06

DHP * *** ** * ** * * **

1 2 3 4 5 6 7 8 9

1 Filter Series

DHP - DIN High Pressure

2 Element Collapse Rating

1 - 30 bar (435 psi) Low Collapse
4 - 160 bar (2320 psi) High Collapse

3 Nominal Size

063 - 63L/min (16.6USgpm)
100 - 100L/min (26.4USgpm)
250 - 250L/min (66.0USgpm)
400 - 400L/min (105.7USgpm)

4 Port Size

TYPE	PORT SIZE	FILTER SIZE 63	100	250	400
BC	G 3/4	•			
BD	G 1		•		
BE	G 1-1/2			•	
BK	DN38				•

5 Valve Options

1 - Non-Bypass
6 - Bypass set at 7 bar (100 psi) cracking pressure

6 Indicator Options

AN- Visual 5 bar (70 psi), No Connector
JN- No Indicator, No Connector
TB- Electrical 5 bar (70 psi), Brad Harrison Connector
TH- Electrical 5 bar (70 psi), Hirschmann

7 Seal Material

B - Buna-N
V - Viton-A

Viton is a registered trademark of E.I. DuPont

8 Element Construction

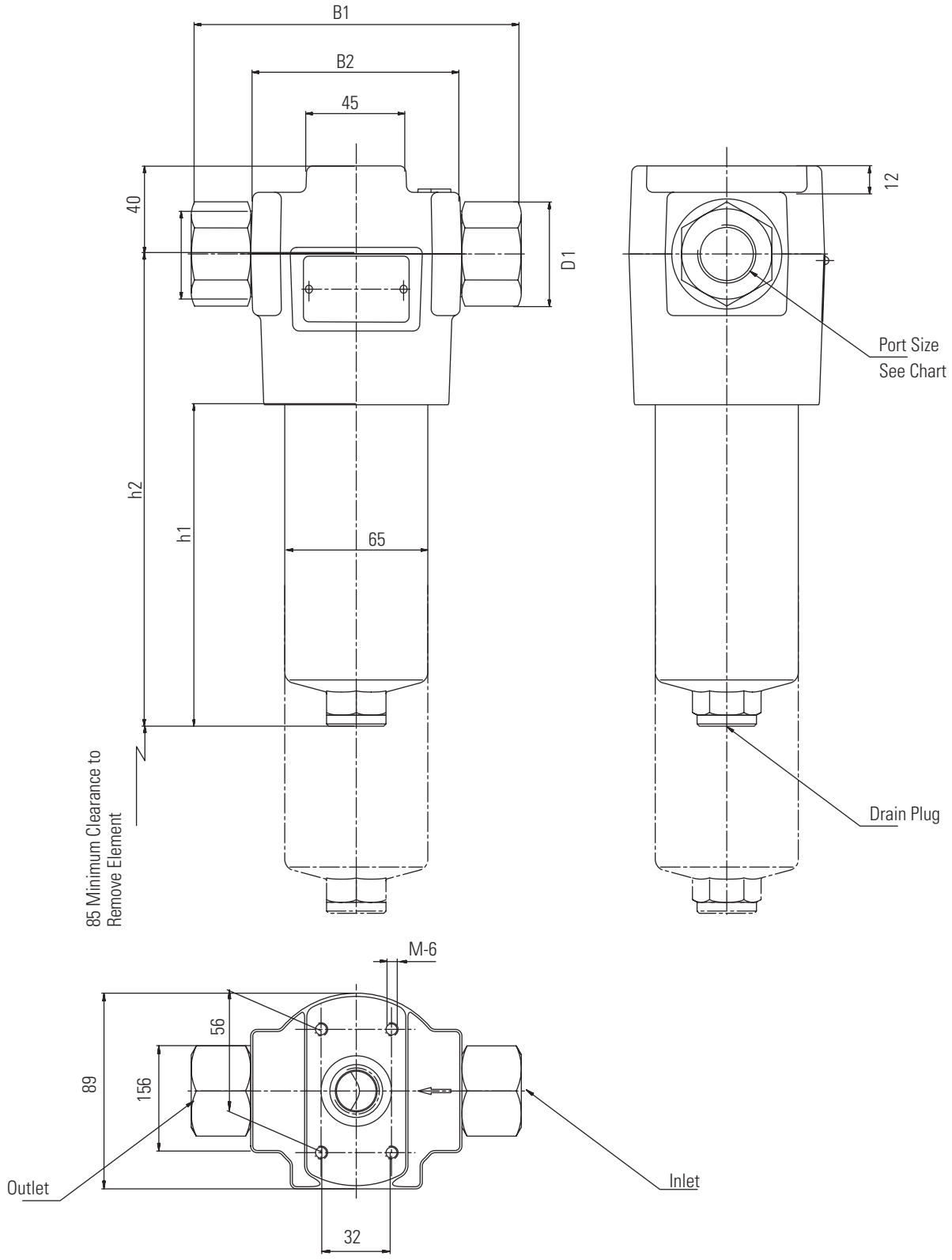
C - Standard Construction
H - High Collapse Construction
X - no element

9 Media Code

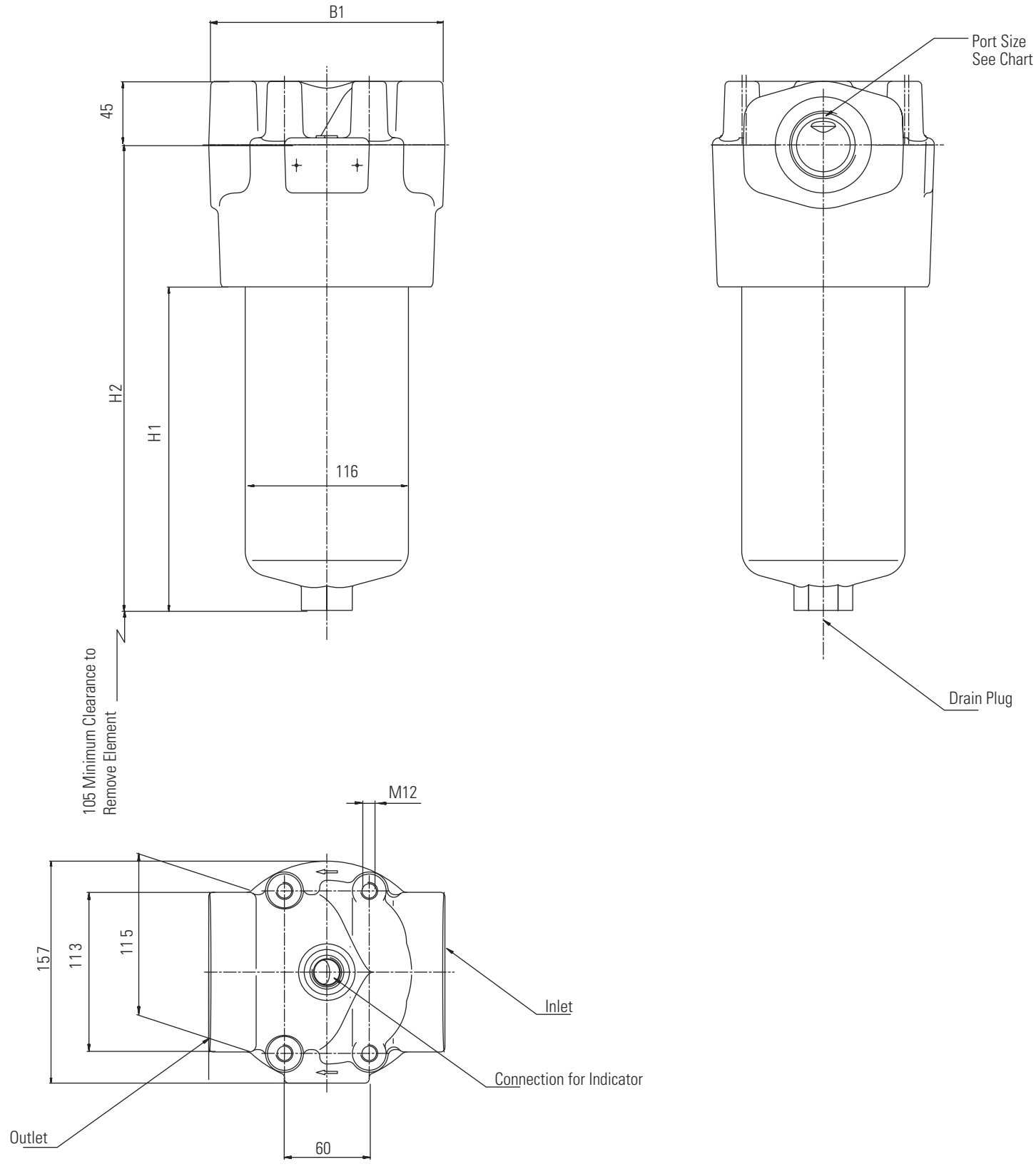
03 - 16/14/12 or better
06 - 18/16/14 or better
10 - 20/18/15 or better
25 - 22/19/16 or better
XX - no element

Flows to 400 L/min (106 USgpm)
Pressures to 400 bar (5,801 psi)

Dimensions DHP 063, 100 Series



Dimensions DHP 250 and 400 Series



Flows to 400 L/min (106 USgpm)
Pressures to 400 bar (5,801 psi)

DHP 063, 100 Series Housing Data

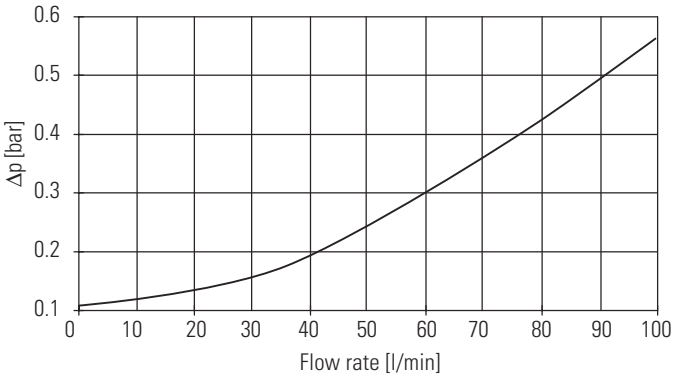
Filter Housing Flow Data

Flow versus pressure drop:

32 cSt oil with specific gravity of ≤ 0.9
(See page 5 for specific gravity corrections for pressure drop.)

TYPE	PORT SIZE	B1	B2	D1	H1	H2
DHP 063	G 3/4	150	–	–	146	215
DHP 100	G 1	–	96	50	236	305

DHP 063/100



DHP 250, 400 Series Housing Data

Filter Housing Flow Data

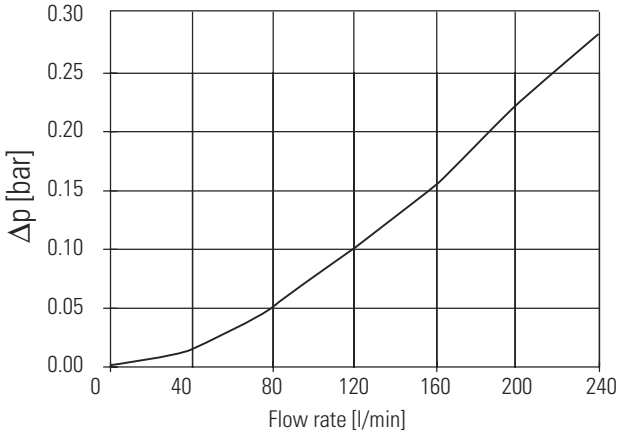
Flow versus pressure drop:

32 cSt oil with specific gravity of ≤ 0.9
(See page 5 for specific gravity corrections for pressure drop.)

TYPE	PORT SIZE	B1	H1	H2
DFN 250	G 1 1/2	167	229	330
DFN 400	DN 38*	158	379	480

** Flange SAE 1 1/2", 3000 PSI (210 bar)*

DHP 250 /400



Pressure Filters

DHP DIN Series Filters

Element Model Code

(For use in DHP, DMP, and DLR Series Housings)

VDP *** * * **

1 2 3 4 5

Sample model code:

VDP063BC06

1 Filter Element

VDP - DIN Standard Element

2 Nominal Size

063 - 63L/min (16.6USgpm)
100 - 100L/min (26.4USgpm)
250 - 250L/min (66.0USgpm)
400 - 400L/min (105.7USgpm)

3 Seal Material

B - Buna-N
V - Viton-A
Viton is a registered trademark of E.I. DuPont

4 Element Construction

C - Standard Construction
H - High Collapse Construction

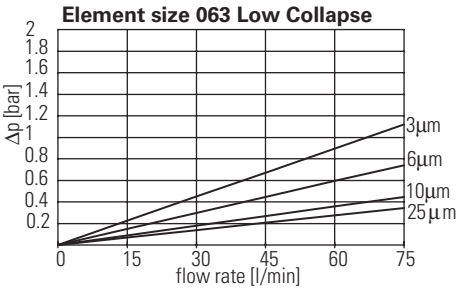
5 Media Grade

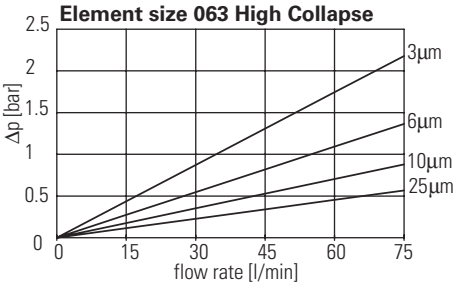
03 16/14/12 or better
06 18/16/14 or better
10 20/18/15 or better
25 22/19/16 or better

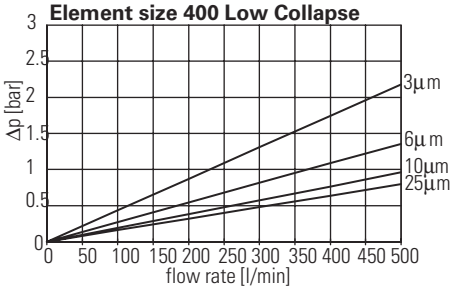
VDP Series Element Flow Data

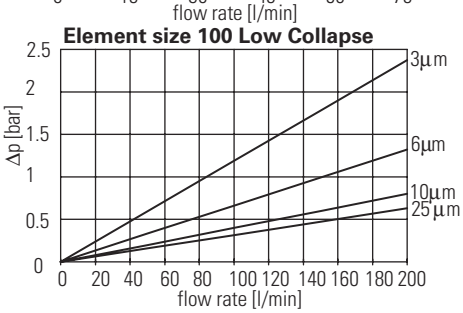
Flow versus pressure drop: 32 cSt oil with specific gravity of ≤ 0.9

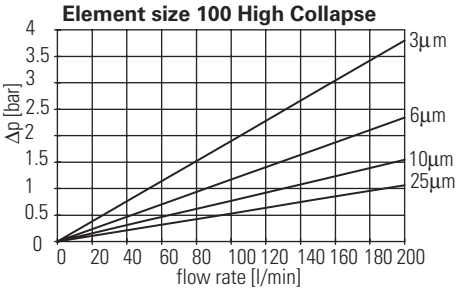
(See page 6 for viscosity corrections for pressure drop.)

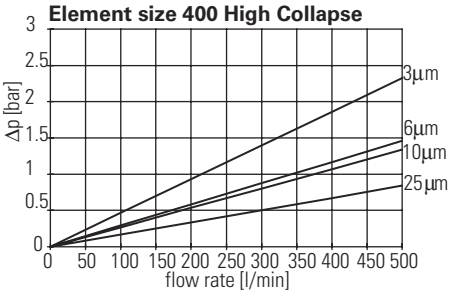


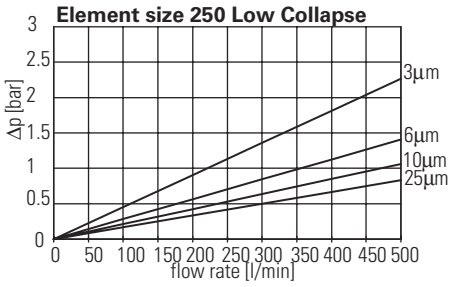


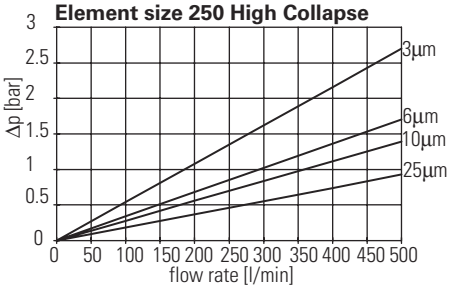












Sample ΔP Calculation : DHP1100BC4ANBC06 - Filter assembly having filter element with micron rating code '06' at 70 L/min flow rate using a hydraulic fluid at 46 cSt viscosity & specific gravity (sp.gr.)0.8.

ΔP Assembly	=	ΔP Housing	+	ΔP Element
	=	Housing ΔP from graph x sp.gr.(actual)/0.9	+	Element ΔP valve from from graph(bar/lpm) x [actual cSt / 32] x [Sp.Gr(actual) / 0.9]
	=	0.35 x 0.8/0.9	+	0.4 x 46/32 x 0.8/0.9
	=	0.310	+	0.51
	=	**0.82 bar**		

Off-Line Filters

General Data

Off-line filtration systems (also referred to as a kidney loops or recirculation loops) are typically found in variable volume pump systems where system filters do not see continuous flow or where the return flow volume makes a return filter impractical. These systems typically consist of a separate pump and filter plumbed to the reservoir along with associated components to provide a continuous recirculating flow of fluid from the reservoir through the filter and back to the reservoir.

There are many advantages to incorporating an off-line filtration package. Because the system is at a low pressure and the flow is continuous with little or no flow surges, economical low pressure filter housings can be used. In addition, because temperature control is necessary to ensure that the components see the proper viscosity and that the oxidation rate of the fluid is optimized, heat exchangers can be used within the off-line system to achieve the necessary operating parameters. The off-line system can also be used as the make-up point to add fluid to the system and help ensure that only clean fluid is introduced to the system. The off-line system can also be shut-down
to change filter elements without securing the main system.

Rarely can an off-line filtration system be used as the sole contamination control solution. It is normally used to supplement the main system filters and a typical recommended size for the off-line system flow rate is approximately 20% of the total main system volume.

In addition to hydraulic systems, off-line filtration systems can be used on gearbox applications to clean the fluid where there are no other lubrication circulation systems present.

Applications

- Pulp and paper mill equipment
- Large central hydraulic power units
- Injection molding equipment
- Stamping presses
- Extrusion machines

Off-Line Filters

EPHHF

Eaton Portable Handheld

Flows to 15 L/min (4 USgpm)
Pressures to 3.5 bar (50 psi)

Features and Benefits

- Ideal for maintaining construction, agricultural machinery, off-highway trucks and vehicles
- Equally useful for servicing a wide variety of industrial equipment
- Incorporates a highly efficient spin-on filter element
- Relief valve housing
- Static pressure gauge clogging indicator
- Element easily replaced with stap wrench

Applications

- The portable filtration unit is a compact filter/pump device used for transferring and filtering hydraulic fluids
- Removing water from oil
- Changing oil in hydraulic systems
- Filling hydraulic systems with filtered oil
- Off-line filtration of hydraulic systems with inadequate filtering capacity

DESIGN SPECIFICATIONS

Rated flow:	15 L/min (4 USgpm)
Fluid Compatibility:	Compatible with petroleum based fluids
Material:	Aluminum
Temp range:	Up to 80°C (180°F)
Dry weight: (Approximate)	12.5 kg (27.5 lbs)
Pressure rating:	3.5 bar (50 psi)

TECHNICAL DATA

Fluid Compatibility:	Petroleum based oils
Nominal Flow:	4 GPM/ 15 l/min
Maximum Oil Temperature:	80°C (180°F)
Viscosity Range:	40 to 2300 SUS 5-500 mm2/sec
Max. Operating Pressure:	50 psi/3.5 bar
Weight:	27.5 lb/12.5 kg
Electrical Motor:	110 VAC (0.25 HP/0.18 KW)
Dimensions:	Length 3660mm (14.41") Width 3650mm (14.37")
	Height 3650mm (14.37")

Note: V0211B1 series Elements ordered separately.
See OFRS60 Catalog pages for more information on V0211B1 series elements.

Off-Line Filters

CC OFRS 60
Clean Cart

Flows to 19 L/min (5 USgpm)
Pressures to 4 bar (65 psi)

Features and Benefits

- Choice of 3, 5, 10, or 20 µm absolute rated filter elements, all with Beta Ratios ≥ 200 for maximum efficiency
- 10m of water removal elements with capacity of 0.45 quarts of water each
- Welded tubular steel frame for durability
- Dirt-tolerant, self-priming vane pump
- Compact design, balanced weight, and large tires for easy handling
- Spiral-reinforced, clear, 10' PVC hoses with 20" steel end wands
- 520µm cleanable strainer before the pump

Applications

- Filter particles and/or water from new oil while filling a reservoir
- Recirculate and filter oil during start-up, when contamination is often heaviest
- Recirculate and filter oil off-line on systems with inadequate filtering capacity
- Empty a storage tank or reservoir
- Ideal for use in industrial plants and in other demanding applications because of their efficiency, capacity, and durability

DESIGN SPECIFICATIONS

Rated flow:	CCOFRS60 05 CCOFRS60 10	part #5003889 part #5003912	19 L/min (5 USgpm) 38 L/min (10 USgpm)
Fluid Compatibility:			Compatible with petroleum based fluids
Material:			Steel
Temp range:			+10 to +54°C (+50 to +130°F)
Dry weight: (Approximate)			52 kg (115 lbs)
Pressure rating:			4.5 bar (65 psi)

TECHNICAL DATA

Fluid Compatibility:	Mineral oil, including lube and fuel oil. Note: Not allowed for use on water based fluids.
Motor:	1750rpm, 1/2 HP (5 USgpm), 3/4 HP (10 USgpm) 110V Single Phase
Electric Cord:	20' long
Pump:	Direct drive vane, 5 or 10 gpm, self-priming
Clogging Indicators:	Color coded static pressure gauge
Strainer:	Stainless steel, 520 µm
Hoses:	Spiral-reinforced clear PVC, standard 10' length, 20" steel wands
Dimensions:	Height 51" Width 21.5" Length 27.5"
Weight of Cart:	115 lbs
Operating Range:	Fluid temperature +10 to +54°C (+50 to +130°F) Pressure to 4 bar (65 psi) Viscosity 100 - 500 SUS

Note: V0211B1 series or V0211B2 series Elements ordered separately.
See OFRS60 Catalog pages for more information on V0211B1 or V0211B2 series elements.

Off-Line Filters

OLF15V

Off-Line Filtration Package

Flows to 19 L/min (4.9 USgpm)
Pressures to 3 bar (45 psi)

Features and Benefits

- Ultra high efficiency membrane element technology Beta2>1000
- Compact design
- Water removal elements available
- 20 micron element available for gear box applications
- High capacity elements (200 grams)
- Single Vane pump- 5 USgpm (19 L/min) capacity at 3 bar
- Driven by AC motor

Applications

The OLF 15V is ideal for systems in which the ingression rate of contamination is relatively low. Applications well suited for the new product include:

- Plastic injection molding systems
- In-plant press systems
- The 20-micron element is normally more than adequate for gearbox applications.

DESIGN SPECIFICATIONS

Rated flow:	19 L/min (5 USgpm)
Fluid Compatibility:	Compatible with petroleum based fluids
Material:	Aluminum
Temp range:	-20 to +40°C (-4 to +104°F)
Dry weight: (Approximate)	11 kg (24.3 lbs)
Pressure rating:	3 bar (45 psi)

TECHNICAL DATA

Operating Range	
Viscosity:	3000 SUS
Operating Pressure:	3 bar (45 psi)
Suction Pressure:	-0.4 bar (11" Hg) max
Inlet Pressure	10 bar (145 psi) min
Fluid Temperature:	0 to +80°C (+32 to +175°F)
Ambient Temperature:	-20 to +40°C (-4 to +104°F)
Seals:	Buna-N
Maximum Flow Rate:	18.5 L/min (4.9 USgpm)
Elements	
Dirt Holding Capacity:	200g ISO MTD, or approximately 0.45lbs
Water Retention:	(ΔP = 2.5 bar [36 psi]): Approximately 0.5 quarts (0.5 liters)
Beta Ratio:	β_2 > 1000 (absolute value)
Maximum ΔP:	3 bar (45 psi)
Dimensions:	Length 538mm (21.2") Width 168mm (6.61") Height 109mm (7.48")

OLF	15V	*	********	**	**
1	2	3	4	5	6

OLF15V Off-Line Filtration Package Model Code

1 OLF- Filtration Unit

2 15V - (19 L/min) Vane Pump

3 Motor Voltage

K - 115 Volt AC, 1 Phase, 60Hz

M - 220 Volt AC, 1 Phase, 50Hz

N - 220/440 Volt AC, 3 Phase, 50 or 60Hz

4 Filter Element

V15BMC02 - 2 Micron filter element
V15BMW02 - 2 Micron filter with water removal element
V15BMC20 - 20 Micron filter element
V15BMW20 - 20 Micron filter with water removal element

5 Port Options

SB - 1-5/16-12 (SAE-16)
BB - G1 BSPP thread

6 Indicator Options

JN - No indicator (plug), No Connector

LN - Visual 2 bar (30 PSI), No Connector

RB - Electrical 2 bar (30 PSI), Brad Harrison

RH - Electrical 2 bar (30 PSI), Hirschmann

RJ - Electrical 2 bar (30 PSI), Hirschmann with 24 Volt light

RK - Electrical 2 bar (30 PSI), Hirschmann with 115 Volt light

RL - Electrical 2 bar (30 PSI), Hirschmann with 230 Volt light

Features and Benefits

Remove metal dustcover on discharge port. Discharge approximately 200 ml of oil to flush valve by turning knurled knob 1/4 turn to the right. Dispose of this sample in the appropriate manner. Locate clean oil sample bottle under discharge port.

Turn knurled knob 1/4 turn to the right until bottle is filled to the desired level. The knob can be backed off to throttle the rate of flow. When bottle is filled let go of the knurled knob, the valve will close automatically. Replace metal dustcover wrench tight. For more information see Fluid Analysis section at front of this catalog where sample kit options are listed.

Applications

Engine oil, lubricating oil, transmission fluid and hydraulic fluids in mobile construction equipment, military vehicles, trucks and stationary equipment.

For best results, Eaton FD15 Oil Sampling Valves should be installed in dynamic fluid lines in low pressure and return lines. If only one sampling point can be chosen, it should be in the return line, upstream of any return line filter. This will insure a representative sample of all components in the fluid system for their present condition.

0-50 psi

PART NUMBER	INLET PORTS
FD15-1026-04	1/4" NPTF
FD15-1025-04	7/16-20 Male ORB

As required in MIL-V-81940/2-1 this valve's flow rate is between 100 and 1500 milliliters per minute at pressures from 0–50 psi. (MIL-V-81940/2-1 applies only to pressures from 50–300 psi.)

50-300 psi

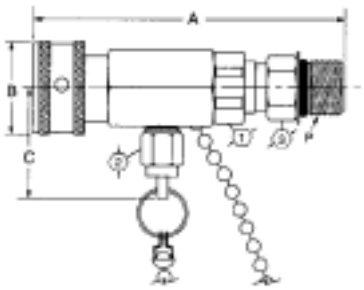
PART NUMBER	INLET PORTS
FD15–1000–02	1/8" NPTF
FD15–1000–04*	1/4" NPTF
FD15–1002–04	7/16-20 Male ORB

*The 1/4" NPTF version is qualified to MIL-V-81940/2-1 and its performance is representative of the other inlet port configurations listed above. QPL-81940-9 6-5-89

DESIGN SPECIFICATIONS

Construction:	Corrosion resistant plated steel with brass internal components and Buna-N seal
Operating Temp range:	-53°C to +135°C (-65°F to +275°F)
Minimum Burst Pressure:	1200psi
Minimum Particle Restriction:	500 microns
Maximum Torque to Operate:	10 in. lbs.

Note: This valve is not intended for aerospace applications



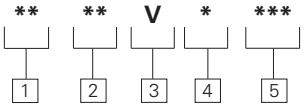
INDICATOR OPTIONS (3,000 PSI - USE WITH FILTER MODELS HV6R, HV3R)

Coupling Size	Thread Size (P)	Dimension Data A	B	C	⟨1⟩	⟨2⟩	⟨3⟩	Part No. Buna-N
–	1/8-27	2.42	1.00	1.30	.69	.38	–	FD15-1000-02
–	1/4-18	2.56	1.00	1.30	.59	.38	–	FD15-1000-04
–	7/16-20	2.79	1.00	1.30	.69	.38	.56	FD12-1002-04
–	1/4-18	2.56	1.00	1.30	.69	.38	–	FD15-1026-04
–	7/16-20	2.79	1.00	1.30	.69	.38	.56	FD12-1025-04

DESIGN SPECIFICATIONS

Material:	PV/PE Series PHV/PHE Series	Aluminum Stainless Steel
Fluid compatibility:	Compatible with most petroleum oil, oil-in-water and water-in-oil fluids. Optional seals available for phosphate esters.	
Installation Torque:	PV/PE Series PHV/PHE Series	33 Nm (24 lbs-ft) 100 Nm (74 lbs-ft)
Temp range:		-26°C to +120°C (-15°F to +250°F)
Switch Rating (all models):		3A@24VDC 5A@250VAC
Dry weight: (Approximate)	PV PHV PE PHE	55g (0.1lbs) 110g (0 2lbs) 150g (0.3lbs) 250g (0.6lbs)
Pressure rating:	PV/PE Series PHV/PHE Series	210 bar (3000PSI) 420 bar (6000PSI)

Indicator Model Code



1 Indicator type and pressure rating

PV - visual 210 bar (3000psi)
PE - electrical 210 bar (3000psi)
PHV- visual 420 bar (6000psi)
PHE - electrical 420 bar (6000psi)

2 Pressure setting

1B - 1 bar (15psid)
2B - 2 bar (30psid)
5B - 5 bar (75psid)
8B - 8 bar (115psid)

3 Seal material

V - Viton-A

4 Connector

B - Brad Harrison 5 Pin
H - Hirschmann
N - None (use with PV indicators)

5 Light option

L24 - 24 Volt Lamp
L115 -115 Volt Lamp
L230 -230 Volt Lamp

INDICATOR OPTIONS (3000 PSI - USE WITH FILTER MODELS HV6R, HV3R)

Description	Model	Filter Assembly Code Letters
POPUP VISUAL 15 psi	PV 1B VN	KN
POPUP VISUAL 30 psi	PV 2B VN	LN
POPUP VISUAL 70 psi	PV 5B VN	AN
BRAD HARRISON 5 PIN ELECTRICAL 15 psi	PE 1B V B	QB
BRAD HARRISON 5 PIN ELECTRICAL 30 psi	PE 2B V B	RB
BRAD HARRISON 5 PIN ELECTRICAL 70 psi	PE 5B V B	UB
HIRSCHMANN ELECTRICAL 15 psi	PE 1B V H	QH
HIRSCHMANN ELECTRICAL 30 psi	PE 2B V H	RH
HIRSCHMANN ELECTRICAL 70 psi	PE 5B V H	UH
HIRSCHMANN VISUAL ELECTRICAL 15 psi - L24	PE 1B V H L24	QJ
HIRSCHMANN VISUAL ELECTRICAL 30 psi - L24	PE 2B V H L24	RJ
HIRSCHMANN VISUAL ELECTRICAL 70 psi - L24	PE 5B V H L24	UJ
HIRSCHMANN VISUAL ELECTRICAL 15 psi - L115	PE 1B V H L115	QK
HIRSCHMANN VISUAL ELECTRICAL 30 psi - L115	PE 2B V H L115	RK
HIRSCHMANN VISUAL ELECTRICAL 70 psi - L115	PE 5B V H L115	UK
HIRSCHMANN VISUAL ELECTRICAL 15 psi - L230	PE 1B V H L230	QL
HIRSCHMANN VISUAL ELECTRICAL 30 psi - L230	PE 2B V H L230	RL
HIRSCHMANN VISUAL ELECTRICAL 70 psi - L230	PE 5B V H L230	UL

Accessories

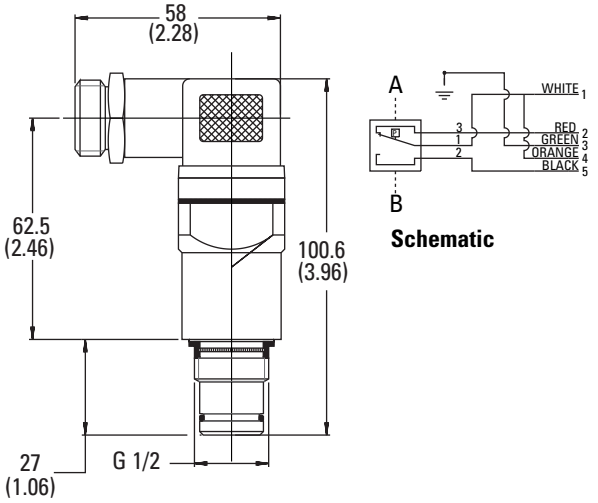
Differential Indicators

INDICATOR OPTIONS (6,000 PSI - USE WITH FILTER MODELS HF2P, HF3P, HF3PS, HF4, MF2P)

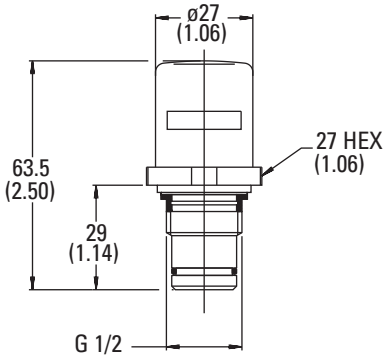
Description	Model	Filter Assembly Code Letters
Popup Visual 30psi	PHV 2B VN	LN
Popup Visual 70 Psi	PHV 5B VN	AN
Popup Visual 115 Psi	PHV 8B VN	ON
Brad Harrison 5 Pin Electrical 30 Psi	PHE 2B V B	RB
Brad Harrison 5 Pin Electrical 70 Psi	PHE 5B V B	UB
Brad Harrison 5 Pin Electrical 115 Psi	PHE 8B V B	TB
Hirschmann Electrical 30 Psi	PHE 2B V H	RH
Hirschmann Electrical 70 Psi	PHE 5B V H	UH
Hirschmann Electrical 115 Psi	PHE 8B V H	TH
Hirschmann Visual Electrical 30 Psi - L24	PHE 2B V H L24	RJ
Hirschmann Visual Electrical 70 Psi - L24	PHE 5B V H L24	UJ
Hirschmann Visual Electrical 115 Psi - L24	PHE 8B V H L24	TJ
Hirschmann Visual Electrical 30 Psi - L115	PHE 2B V H L115	RK
Hirschmann Visual Electrical 70 Psi - L115	PHE 5B V H L115	UK
Hirschmann Visual Electrical 115 Psi - L115	PHE 8B V H L115	TK
Hirschmann Visual Electrical 30 Psi - L230	PHE 2B V H L230	RL
Hirschmann Visual Electrical 70 Psi - L230	PHE 5B V H L230	UL
Hirschmann Visual Electrical 115 Psi - L230	PHE 8B V H L230	TL
Indicator Plug	3040056	—

Differential Indicator Dimensional Schematics

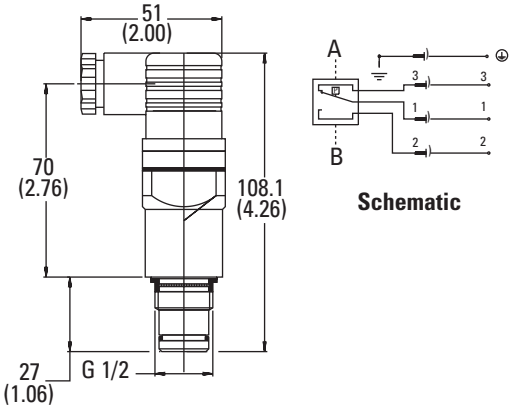
PE * B V B
PHE * B V B



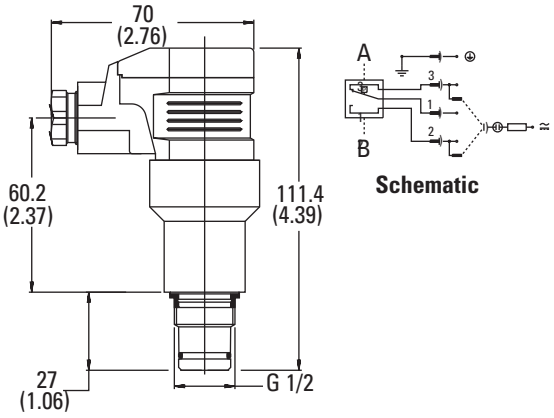
PV * B VN



PE * B V H
PHE * B V H

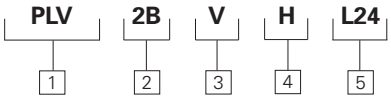


PE * B V H L * *
PHE * B V H L * *



Accessories

Static Indicators



Indicator Model Code

1 Indicator type and pressure rating

PLV - Visual
PLE - Electrical
SLV - Visual
SLE - Electrical

2 Pressure setting

1B - 1 bar (15psid)
2B - 2 bar (30psid)
5B - 5 bar (75psid)
1.4B - 1.4 bar (20psid)

3 Seal Material

V - Viton-A

4 Connector

B - Brad Harrison 5 Pin
N - Hirschmann
H - None

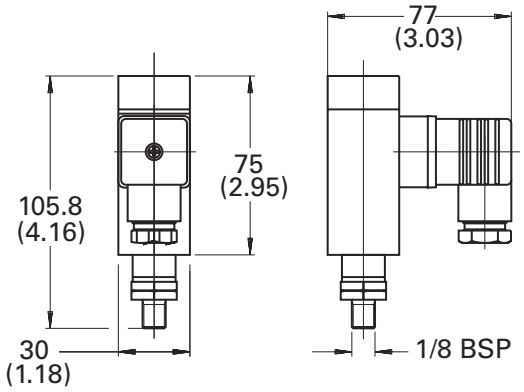
5 Light Options

L24 - 24 Volt Lamp
L115 - 115 Volt Lamp
L230 - 230 Volt Lamp
N - None

	INDICATORS FOR ORFM SERIES LENGTH 1-4 & HF4RT SERIES	EATON MODEL CODE	INDICATORS FOR ORFM SERIES-LENGTH 5-7; ORF1300 SERIES & DRT SERIES	EATON MODEL CODE
KN	Visual, 15 PSI, No connector	PLV 1B V N N	Visual, 15 PSI, No connector	SLV 1B V N N
MH	Electrical, 15 PSI, Hirschmann	PLE 1B V H N	Electrical, 15 PSI, Hirschmann	SLE 1B V H N
MB	Electrical, 15 PSI, Brad Harrison	PLE 1B V B N	Electrical, 15 PSI, Brad Harrison	SLE 1B V B N
MJ	Electrical, 15 PSI, Hirschmann w 24 Volt light	PLE 1B V H L24	Electrical, 15 PSI, Hirschmann w 24 Volt light	SLE 1B V H L24
MK	Electrical, 15 PSI, Hirschmann w 115 Volt light	PLE 1B V H L115	Electrical, 15 PSI, Hirschmann w 115 Volt light	SLE 1B V H L115
ML	Electrical, 15 PSI, Hirschmann w 230 Volt light	PLE 1B V H L230	Electrical, 15 PSI, Hirschmann w 230 Volt light	SLE 1B V H L230
LN	Visual, 30 PSI, No connector	PLV 2B V N N	Visual, 30 PSI, No connector	SLV 2B V N N
RH	Visual, 30 PSI, Hirschmann	PLE 2B V H N	Visual, 30 PSI, Hirschmann	SLE 2B V H N
RB	Electrical, 30 PSI, Brad Harrison	PLE 2B V B N	Electrical, 30 PSI, Brad Harrison	SLE 2B V B N
RJ	Electrical, 30 PSI, Hirschmann w 24 Volt light	PLE 2B V H L24	Electrical, 30 PSI, Hirschmann w 24 Volt light	SLE 2B V H L24
RK	Electrical, 30 PSI, Hirschmann w 115 Volt light	PLE 2B V H L115	Electrical, 30 PSI, Hirschmann w 115 Volt light	SLE 2B V H L115
RL	Electrical, 30 PSI, Hirschmann w 230 Volt light	PLE 2B V H L230	Electrical, 30 PSI, Hirschmann w 230 Volt light	SLE 2B V H L230
AN	Visual, 70 PSI, No connector	PLV 5B V N N	Visual, 70 PSI, No connector	SLV 5B V N N
UH	Electrical, 70 PSI, Hirschmann	PLE 5B V H N	Electrical, 70 PSI, Hirschmann	SLE 5B V H N
UB	Electrical, 70 PSI, Brad Harrison	PLE 5B V B N	Electrical, 70 PSI, Brad Harrison	SLE 5B V B N
UJ	Electrical, 70 PSI, Hirschmann w 24 Volt light	PLE 5B V H L24	Electrical, 70 PSI, Hirschmann w 24 Volt light	SLE 5B V H L24
UK	Electrical, 70 PSI, Hirschmann w 115 Volt light	PLE 5B V H L115	Electrical, 70 PSI, Hirschmann w 115 Volt light	SLE 5B V H L115
UL	Electrical, 70 PSI, Hirschmann w 230 Volt light	PLE 5B V H L230	Electrical, 70 PSI, Hirschmann w 230 Volt light	SLE 5B V H L230

Electrical Pressure Switch

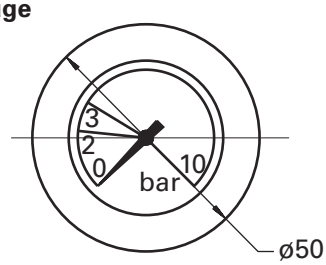
Hirschmann Connector

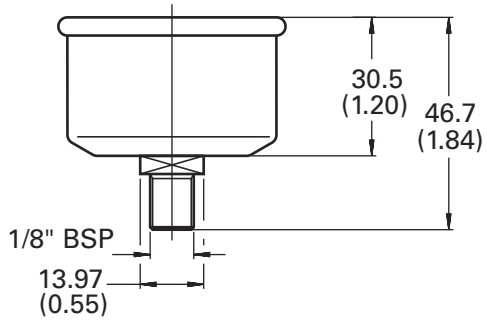


HOUSING	PART NUMBER
DRT	3039708 Electrical Switch 30 psi Hirschmann Connector

Gauge

0-10 Bar Gauge





HOUSING	PART NUMBER
DRT	3039703 Gauge 0 - 10 Bar

Note: Gauges indicate pressure in both bar and psi

Accessories
Indicator Switch

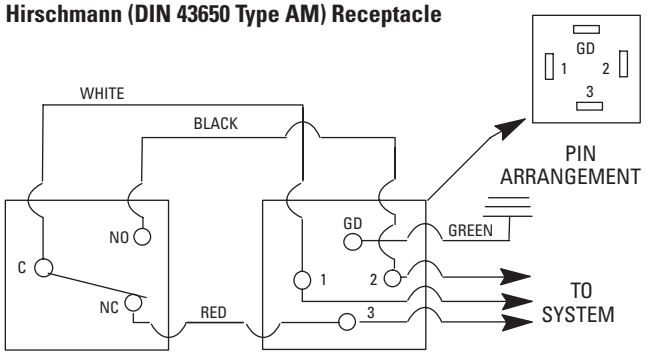
Schematic Wiring Diagram

Note: The female connector is to be furnished by the customer.

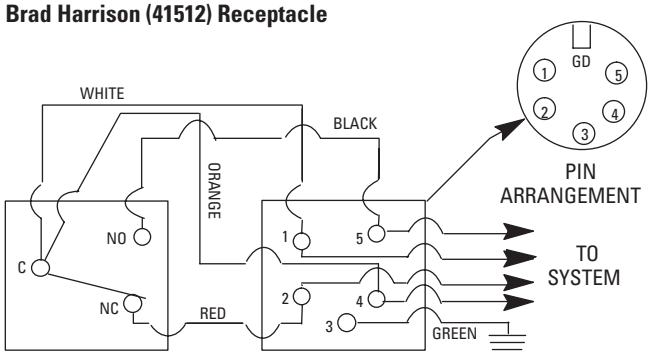
Note: When fitting indicator, torque to 41-47 Nm.

ELECTRICAL	
Switch:	SPDT
Rating:	7 amps, resistive 4 amps, inductive 2 amps, lamp load @28 VDC, 115 VAC 60 Hz & 220 VAC 50 Hz or 60 Hz

Hirschmann (DIN 43650 Type AM) Receptacle



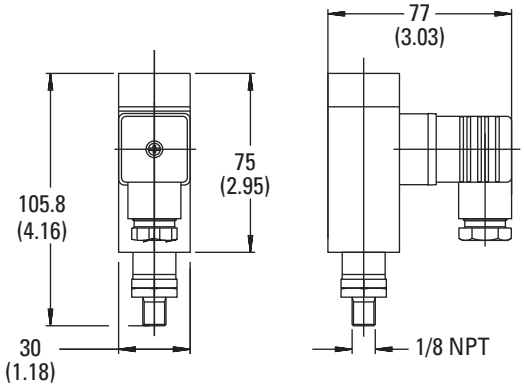
Brad Harrison (41512) Receptacle



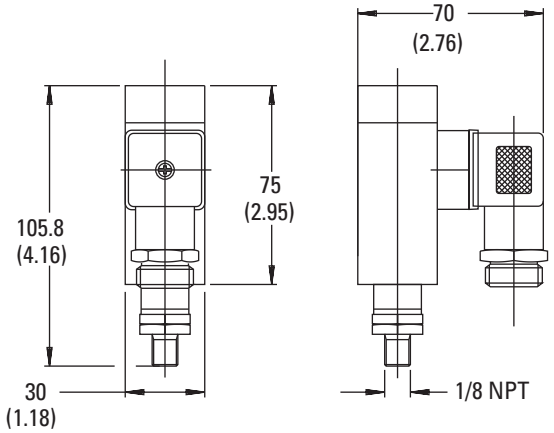
Electrical Pressure Switch

HOUSING	PART NUMBER
HF4RT	3039705 Electrical Switch 15 psi Brad Harrison Connector 3039707 Electrical Switch 15 psi Hirshmann Connector
HF4RT	3039706 Electrical Switch 30 psi Brad Harrison Connector 3039708 Electrical Switch 30 psi Hirshmann Connector

Hirshmann Connector



Brad Harrison Connector



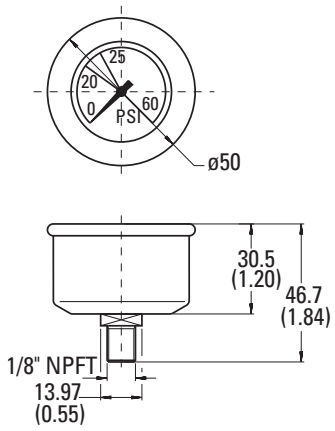
Accessories

Gauge

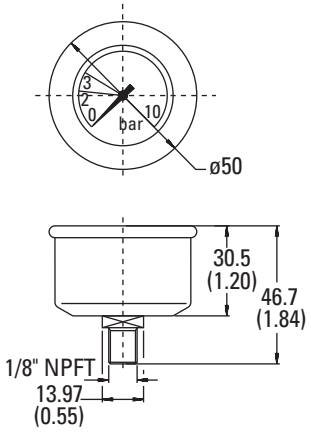
HOUSING	PART NUMBER
HF4RT	3039703 Gauge 0-160 psi (use with 43 psi Bypass Valve) 3039704 Gauge 0-60 psi (use with 25 psi Bypass Valve)

Note: Gauges indicate pressure in both bar and psi

0-4 Bar (0-60 PSI) Gauge



0-10 Bar (0-160 PSI) Gauge

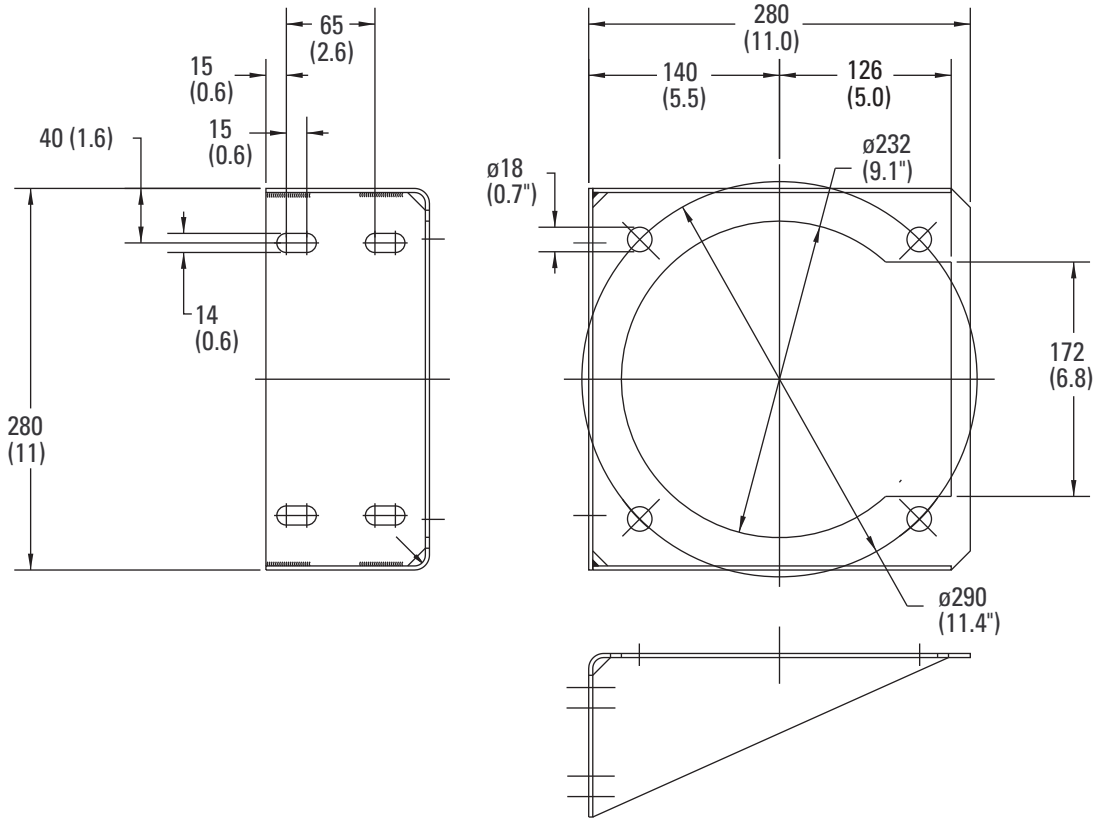


Mounting Bracket

HV6R Housing

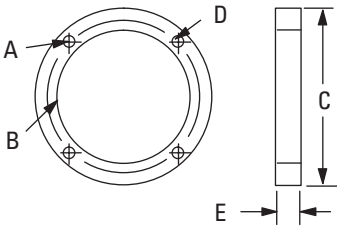
mm (inch)

Order part number 3039702



Weld Flange for HF4RT

Order part number P-232964-1



DIMENSIONS

Housing	A	B	C	D	E
		ø	diameter	length	
HL 15, HL 16 P-232964-01	7/16 - 20 UNF thru (4) on 6.25 dia. BC equally spaced	127,0 (5.00)	181,0 (7.12)	7/16 - 20 UNF x 0.75 Recommended bolts	12,7 (0.50)

Seal Kits

Note
Seal kits include all soft goods to fully service a unit.

SERIES	SEAL TYPE	SEAL KIT PART #
HV6R	Buna-N Viton-A*	3039688 3039689
HV3R	Buna-N Viton-A	3039690 3039691
HF4RT	Buna-N Viton-A	3039692 3039693
HF2P	Buna-N Viton-A	3039694 3039695
HF3P	Buna-N Viton-A	3039696 3039697
HF3PS	Buna-N Viton-A	3039698 3039699
HF4P	Buna-N Viton-A	3039700 3039701
OFR60/ 120	Buna-N Viton-A	590021 591761 (Bowl seal only)
OFR15/ 30	Buna-N Viton-A	226214 262422 (Bowl seal only)

** Viton is a registered trademark of E.I. Dupont*

Notes

Notes

Eaton
Hydraulics Operations USA
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
Tel: 952-937-9800
Fax: 952-294-7722
www.hydraulics.eaton.com

Eaton
Hydraulics Operations Europe
Route de la Longeraie 7
1110 Morges
Switzerland
Tel: +41 (0) 21 811 4600
Fax: +41 (0) 21 811 4601

Eaton
Hydraulics Operations Asia Pacific
11th Floor Hong Kong New World Tower
300 Huaihai Zhong Road
Shanghai 200021
China
Tel: 86-21-6387-9988
Fax: 86-21-6335-3912

Vickers

Printed in USA
Document No. E-FIFI-MC002-E2
Supersedes E-FIFI-MC002-E1
December 2007

EATON | Vickers

Pneumatic Cylinders
Light Duty

L Series

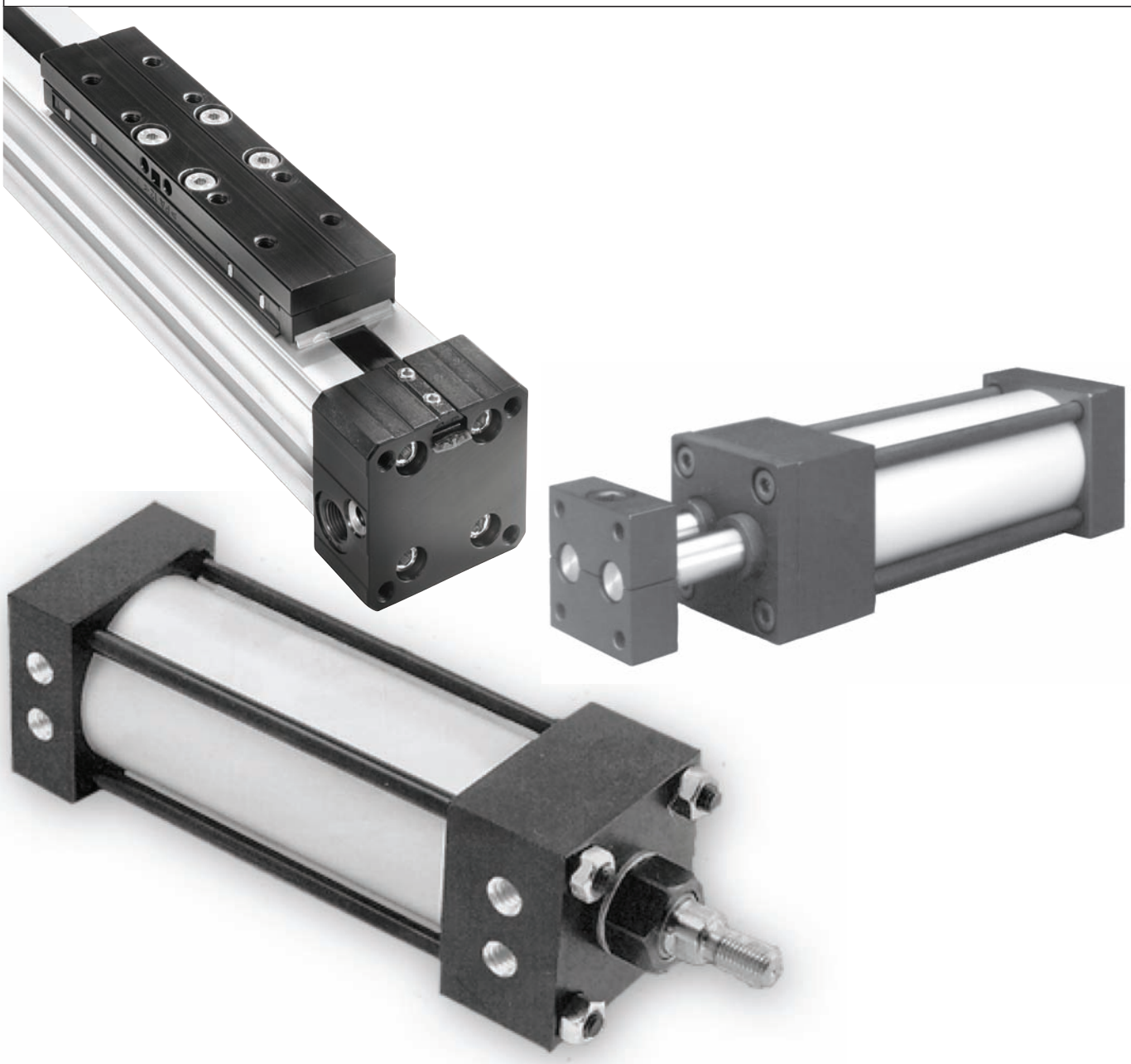


Table of Contents

How to Order

Standard Cylinders

Eaton has created an easy system for ordering Vickers™ Series VP/VN, ML, RL, BL or SL cylinders. This system has been developed to improve our service to you. The model code consists of sixteen alpha–numeric digits which fully describe the most common standard options offered on Series VP/VN, ML, RL, BL or SL cylinders.

To specify your Series VP/VN, ML, RL, BL or SL cylinder, review the following pages for a full description of each option available and select the desired code.

This model code system will:

- **Simplify the re–order process.**
Each Series VP/VN, ML, RL, BL or SL cylinder is assigned a sixteen digit model code. That code is unique to a particular cylinder description. That way, when you re–order your Series VP/VN, ML, RL, BL or SL cylinder, you're assured of exactly the same top quality cylinder design.

- **Improve identification.**
Every Series VP/VN, ML, RL, BL or SL cylinder has its 16 digit model code clearly labeled on the product. Each 16 digit code completely describes a specific cylinder. This allows seals and replacement components to be easily identified in the field.

- **Facilitate communications.**
This fully descriptive model code system allows you to work directly with your local Eaton sales engineer to identify and service your Vickers cylinder.

NOTE
See pages 4, 68, 89, 104 and 116 for a summary of model code options.

Custom Cylinders

Although the model code has been arranged to cover the vast majority of available options, there will be occasions when you require an option which cannot be coded. When specifying such an option, enter an "X" for the appropriate item in the sixteen digit model code, then describe your requirements. For example, if you have an application which requires a custom thread on the end of the piston rod, enter an "X" for item 7. Then add a full description at the end of the model code, such as "With 3.25 inch total rod projection and M22 x 1.5 thread 1.375 inches long." The cylinder will then be given a unique five digit design number on receipt of order (as explained below).

Replacement Cylinders

Every custom cylinder is assigned a unique design number. This number is contained in the last five digits of the 16 digit model code, and item 12 is always an alpha character. In other words, the "Stroke" and "Extra Rod Projection" locations (items 12 through 16) become the "Design Number" items for custom cylinders. When ordering a replacement cylinder, simply give the 16 digit model code or the five digit design number to your local Sales Representative.

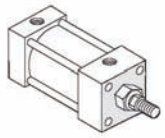
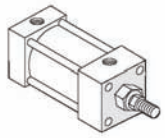
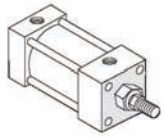
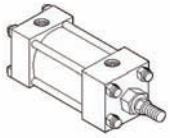
Replacement Parts

Each design number is stored in a quick retrieval computerized storage system. This gives our field sales representatives rapid access to assist you in identifying and specifying genuine Vickers replacement parts.

Warranty

Eaton is proud to offer a comprehensive two year warranty on the L Series pneumatic cylinders.

L-Series Features and Benefits

Product Name/Description	Key Applications	Features/Benefits	
Non-Lubricated Air/Hydraulic Cylinder VP Series 	Packaging, bottling, machine tool	• High strength steel design for robust performance • Superior cushion seal design for smoother, faster operation	• Wide range of standard options for faster response
Corrosion Resistant Air Cylinder (NFPA) VN Series 	Packaging, bottling, machine tool	• Unique hybrid aluminum/ stainless combination for ultimate corrosion protection at a better price	• Better performance & protection than competitive aluminum products
ISO 6431/VDMA 24562 Air Cylinder ML Series 	Packaging, bottling, material handling, machine tool, auto assembly, commercial laundry	• ISO 6431/VDMA 24562 dimensionally interchangeable • Tie rod design with smooth body	• Broad standard options for flexibility • Collar nut design for bolt-on mountings • Fast product delivery
Rodless Air Cylinder RL Series 	Paper mill, textiles, material handing, packaging, transfer lines	• Unique sealing system with higher pressure rating in industry • Lightweight, space saving design built at 50% space of conventional cylinders	• Long strokes without rod buckling risk; high load carrying capability • Simple, cost-effective guide options • Designed for serviceability
Stainless Steel Air Cylinder (NFPA) SL Series 	Food processing, medical, packaging, milking parlors, automatic car washes	• NFPA tie rod dimensionally interchangeable • Superior corrosion resistance for tough environments	• Robust design with non-metallic piston wear band, composite bearing insert, and stainless steel rod cartridge
Non-Rotating Cylinders (NFPA) BL Series 	Machine tool, fixturing, clamping, packaging	• NFPA interchangeable • Twin rod design for non-rotating, anti-torque applications	

Series VP/VN Features

Wiper Seal

Urethane wiper seal keeps contaminates from getting into cylinder by aggressively wiping foreign materials from the piston rod, enhancing the rod seal life.

Head/Cap

Precision machined from alloy aluminum, then black anodized for corrosion resistance in Series VP, and electroless nickel plated for Series VN option.

Adjustable Captive Cushion Adjusting Screw

One-piece stainless steel cushion screw with fine threads is held captive by a stainless steel press-in retaining washer. This allows for safe and precise adjustment of the cushion without inadvertent removal.

Cylinder Body

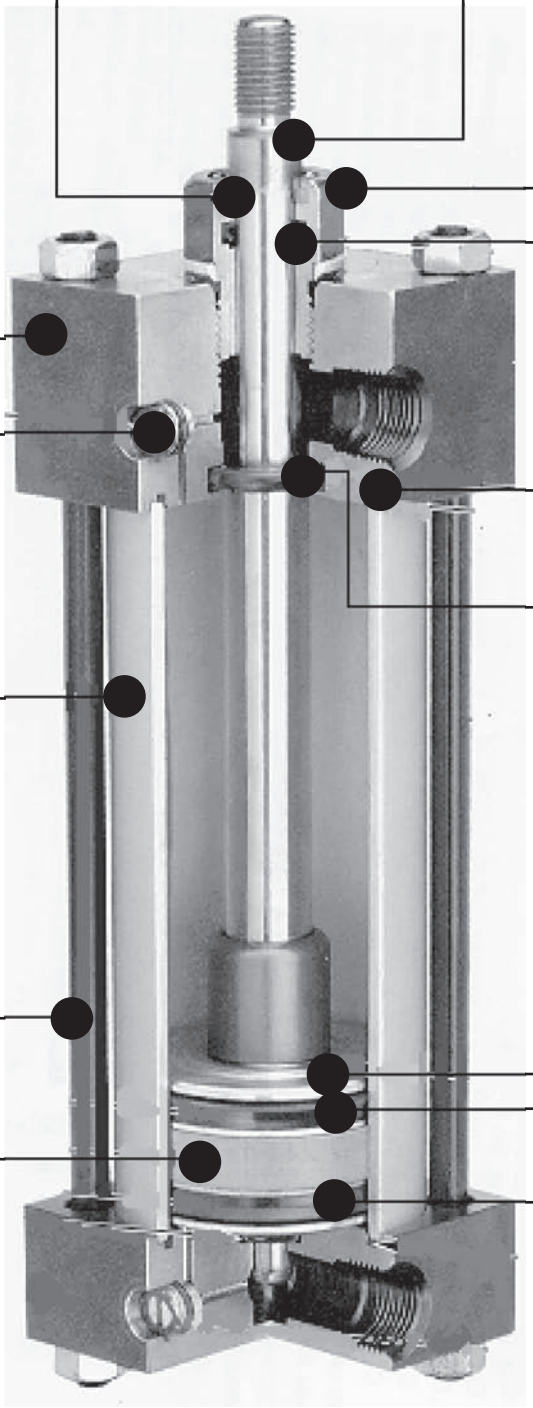
High-strength aluminum alloy tubing is clear anodized on the O.D. and hard anodic coated on the I.D., resulting in a smooth, file hard (60RC), corrosion and score resistant surface finish for extended seal life in Series VP. Stainless steel tubing is used in Series VN option.

Tie Rods

High-strength steel in Series VP, and stainless steel for Series VN option, maintains uniform compression on body end seals.

Wear Ring

Reinforced Teflon® compounded with polyphenylene sulfide provides supreme wear and excellent bearing support.



Teflon® and Viton® are registered trademarks of E.I. Dupont Company.

Piston Rod

Hard chrome plated high-tensile carbon steel, ground and polished in Series VP, and stainless steel for Series VN option.

Rod Bearing

Externally removable threaded steel bearing cartridge with black oxide finish in Series VP, or stainless steel for Series VN option, both with an oil-impregnated sintered iron rod bearing.

Rod Seal

Nitrile lip-type seal is pressure energized and wear compensating for durability and long life.

O-Ring Body Seal

Nitrile material is standard, with Viton® optional.

Super Cushion Seals

Advanced design features a unique, one-piece, compound seal of nitrile* captured within a precision machined groove. Linear and radial "float" of the cushion seals eliminates misalignment. Super Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional on 1-1/2 thru 8 inch bore cylinders.) *Nitrile seals on the 5/8" & 1" rod diameter. For rod sizes 1–3/8" and larger, urethane seals are standard.

Piston

Machined solid aluminum alloy, light-weight for low inertia, yet strong. (Threaded and installed with high strength threadlocker adhesive.)

Piston Seals

Long-wearing nitrile cup seals.

Series VP/VN
Model Code

VP 10 AT 2 N 1 K A 45A 00 0

1, 2 | 3, 4 | 5, 6 | 7 | 8 | 9 | 10 | 11 | 12, 13, 14 | 15, 16 | 17

1, 2 Series (ANSI B93, 15/ NFPA)

VP – Non-lubricated air/hydraulic cylinder
VN – Corrosion resistant air cylinder

3, 4 Mounting Style

Code	Style	ANSI Code
	1-1/2 thru 8" Bore	
01	– Side lug	MS2
02	– Side tapped	MS4
03	– End lug	MS7
07	– Head rectangular flange	MF1
08	– Head square	ME3
10	– Cap fixed clevis	MP1
12	– Cap rectangular flange	MF2
13	– Cap square	ME4
16	– Cap trunnion	MT2
17	– Head trunnion	MT1
18	– Sleeve nut for tapped face	–
21	– Cap extended tie rod	MX2
22	– Head extended tie rod	MX3
23	– Both ends extended tie rod	MX1
24	– No mounts	MX0
41	– Double rod, no mounts	–
45	– Angle	MS1
48	– Detachable eye	MP4
50	– Detachable clevis	MP2
	3/4 thru 1-1/8 Bore	
01	– Bolt thru	MS8
02	– Tapped	MS9
07	– Head rectangular flange	MF1
12	– Cap rectangular flange	MF2
18	– Head tapped face	MR1
20	– Threaded nose	MNR1
24	– No mounts	MX0
25	– Double rod w/bolt thru	–
47	– Fixed eye	MP3
48	– Detachable eye	MP4
50	– Detachable clevis	MP2

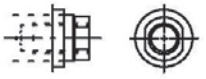
5, 6 Bore and Rod Diameter

Code	Bore	Rod
AT	3/4	5/16
1A	1-1/8	3/8
1B	1-1/8	1/2
CC	1-1/2	5/8
CE	1-1/2	1
DC	2	5/8
DE	2	1
EC	2-1/2	5/8
EE	2-1/2	1
GE	3-1/4	1
GH	3-1/4	1-3/8
HE	4	1
HH	4	1-3/8
KE	5	1
KH	5	1-3/8
LH	6	1-3/8
LL	6	1-3/4
MH	7	1-3/8
ML	7	1-3/4
NH	8	1-3/8
NL	8	1-3/4

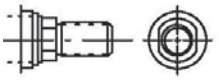
7 Rod End Types

Code

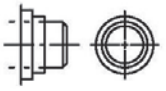
Type 2
Female
UN Thread



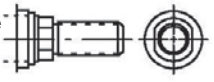
Type 5
Small Male
UN Thread



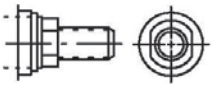
Type 6
Plain
No Attachment



Type 9
Intermediate
Male
UN Tread



Type S
Studded
Female
UN Tread



8 Seal Options

N – Standard
T – Viton®

9 Port Options

1 – Standard
2 – Oversized (NFPA)

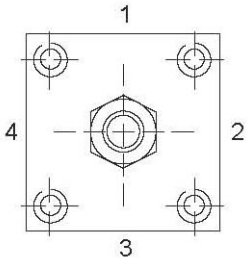
10 Port Locations

Positions are numbers as shown in item 6.

Code	Head	Cap
K	1	1
R	2	2
W	3	3
4	4	4

11 Cushion Location

Cushions are located as shown below when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no cushion.



Code	Head	Cap
A	–	–
B	–	1
C	–	2
D	–	3
E	–	4
F	1	–
G	2	–
H	3	–
J	4	–
K	1	1

12, 13, 14 Cylinder Stroke

Items 12 and 13 indicate stroke length from 00 inches through 99 inches.
Item 14 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	5/16

15, 16 Extra Rod Projection

Item 15 indicates inches from 0 thru 9.
Item 16 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	15/16

– OR –
Proximity Switch Magnet

PN – Magnet Not Required (No Proximity Switch Option)
PK – Magnet Furnished to Operate Hall Effect or Reed Type Switch

17 Custom

X – Custom Modification

1-1/2 – 8 inch Bores

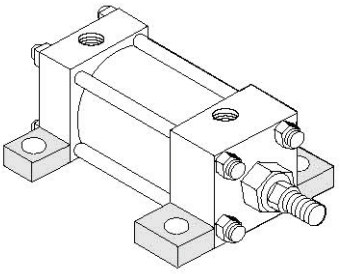
Available Mountings

The variety of standard ANSI/NFPA mountings available in 1-1/2"-8" bore Series VN/VP gives you a broad selection to match the proper mount to your application. Eaton offers rigid mounts (including side lug mounts, flange mounts, and extended tie rod mounts) and swivel mounts (including clevis mounts and trunnion mounts). A guide to proper mount selection is provided on pages 8 through 41. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series VN/VP cylinders are available in all mounting styles listed.

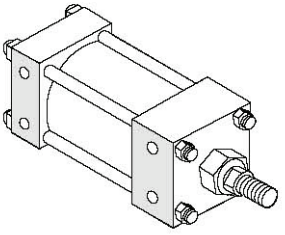
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

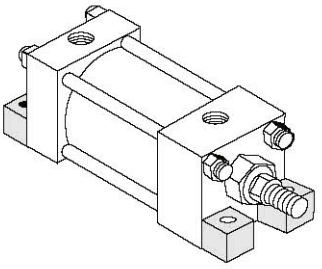
Code 01 (MS2)
Side Lug



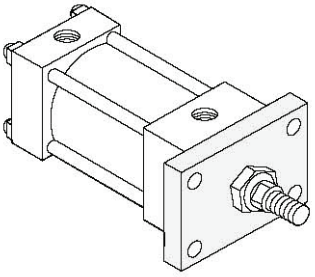
Code 02 (MS4)
Tapped



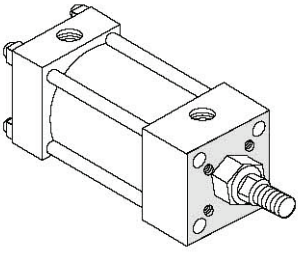
Code 03 (MS7)
End Lug



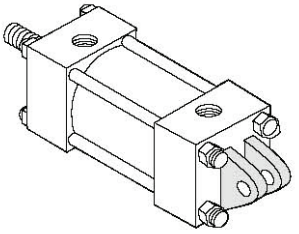
Code 07 (MF1)
Head Rectangular Flange



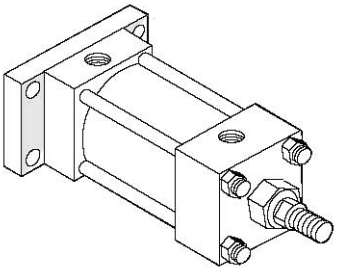
Code 08 (ME3)
Head Square



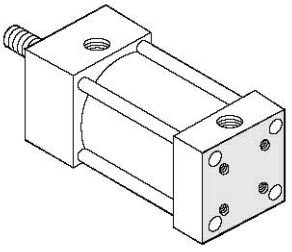
Code 10 (MP1)
Cap Fixed Clevis



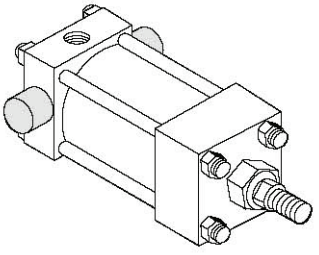
Code 12 (MF2)
Cap Rectangular Flange



Code 13 (ME4)
Cap Square

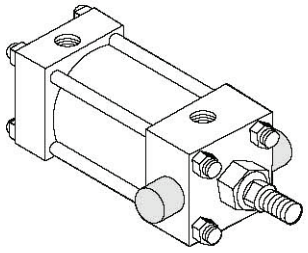


Code 16 (MT2)
Cap Trunnion

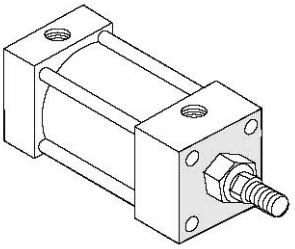


1-1/2 – 8 inch Bores

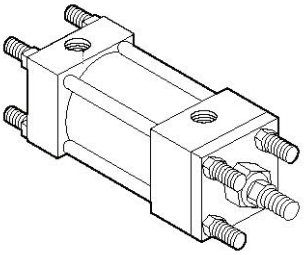
Code 17 (MT2)
Head Trunnion



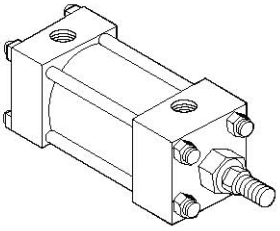
Code 18 Sleeve Nut Construction for Tapped Faces



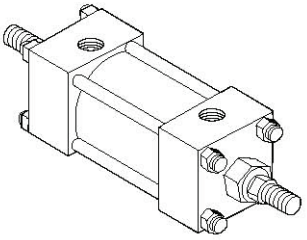
Codes 21 (MX2) Cap, 22 (MX3) head, 23 (MX1) Extended Tie Rod



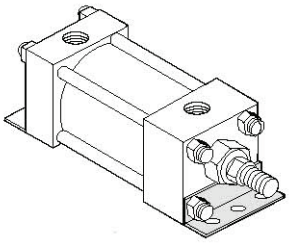
Code 24 (MX0)
No Mounts



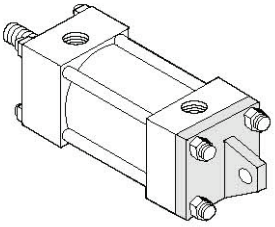
Double Rod
Code 41 (MX0)
No Mounts



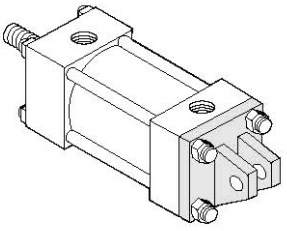
Code 45 (MS1)
Angle



Code 48 (MP4)
Cap Detachable Eye



Code 50 (MP2)
Cap Detachable Clevis



Series VP/VN Mounting Style:

3/4 & 1–1/8 inch Bores

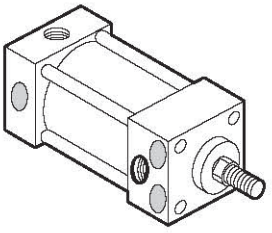
Available Mountings

The variety of standard ANSI/NFPA mountings available in 3/4"-1/8" bore Series VN/VP gives you a broad selection to match the proper mount to your application. Eaton offers rigid mounts (including side lug mounts, flange mounts, and extended tie rod mounts) and swivel mounts (including clevis mounts and trunnion mounts). A guide to proper mount selection is provided on pages 47 through 54. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series VN/VP cylinders are available in all mounting styles listed.

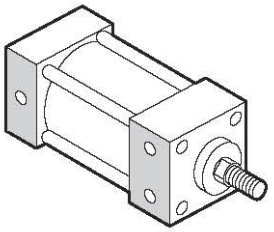
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

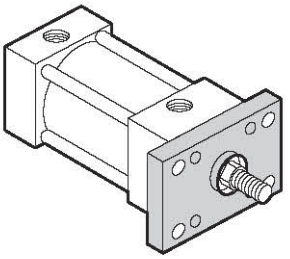
Code 01 (MS8)
Bolt Thru



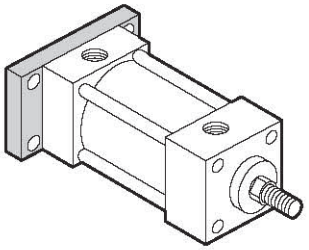
Code 02 (MS9)
Tapped



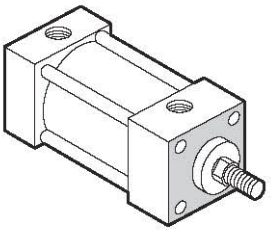
Code 07 (MF1)
Head Rectanular Flange



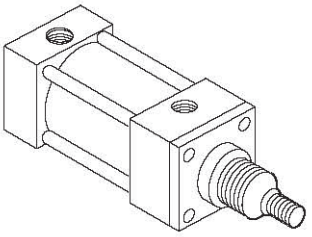
Code 12 (MF2)
Cap Rectangular Flange



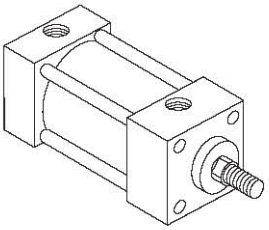
Code 18 (MR1)
Head Tapped Face



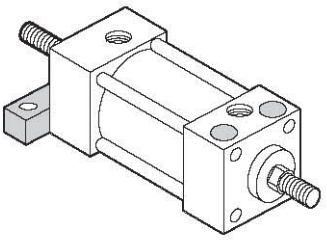
Code 20 (MNR1)
Threaded Nose Mounts



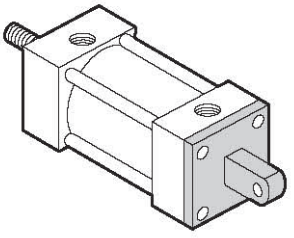
Code 24 (MX0)
No Mounts



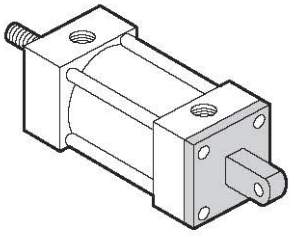
Code 25 Double Rod,
Bolt Thru



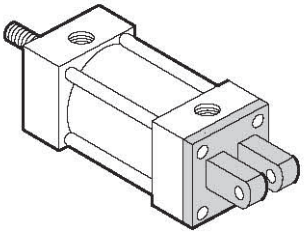
Code 47 (MP3)
Fixed Eye



Code 48 (MP4)
Detachable Eye



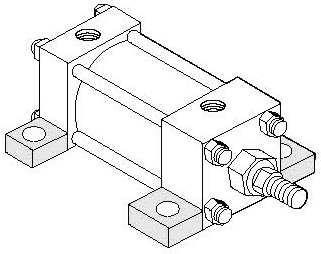
Code 50 (MP2)
Detachable Clevis



Series VP/VN Mounting Styles and Installation Dimensions

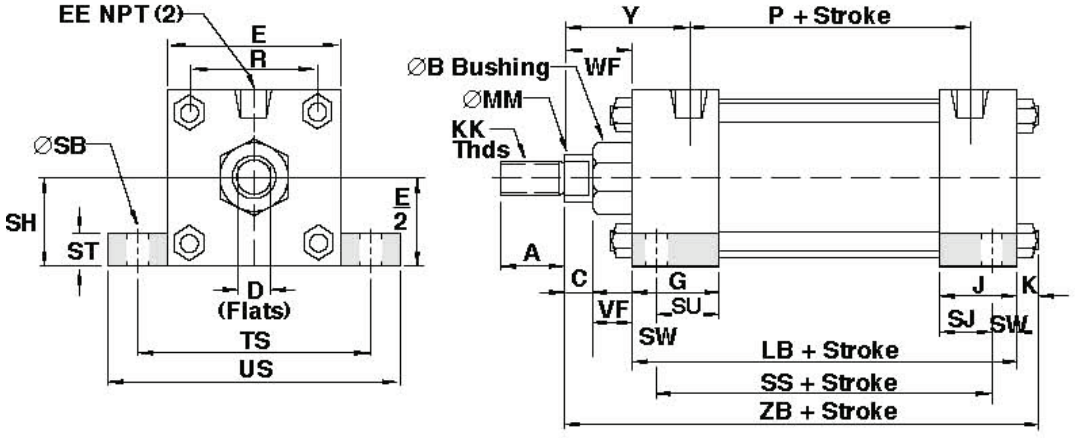
Code 01 Side Lug Mounts
(ANSI MS2)

Side lug mounts are for moving loads along a flat guided surface as in a carriage along rails.



The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to transverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



NOTE
Limit operating pressure to 400 psi (27 bar) non–shock hydraulic for minimum deflection. For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

Series VP/VN Mounting Styles and Installation Dimensions

Code 01 Side Lug Mounts
(ANSI MS2)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000 -.002	Std.	1.124	(28.55)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
B +.000 -.002	O.S.	1.499	(38.08)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(j9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
SB		.438	(11.11)	.438	(11.11)	.438	(11.11)	.563	(14.29)
SH		1.000	(25.40)	1.250	(31.75)	1.500	(38.10)	1.875	(47.63)
SJ		.625	(15.88)	.625	(15.88)	.625	(15.88)	.750	(19.05)
SS		2.875	(73.03)	2.875	(73.03)	3.000	(76.20)	3.250	(82.55)
ST		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)
SU		1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)
SW		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
TS		2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.750	(120.65)
US		3.500	(88.90)	4.000	(101.60)	4.500	(114.30)	5.750	(146.05)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XS	Std.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.875	(47.63)
	O.S.	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)	2.125	(53.98)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

All dimensions in inches (mm)

Series VP/VN- Mounting Styles and Installation Dimensions

Code 01 Side Lug Mounts
(ANSI MS2)

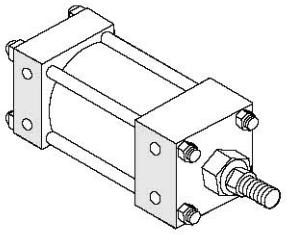
4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.813	(12.70)	.813	(12.70)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(j9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.639	(145.54)	6.442	(163.63)
.563	(14.29)	.813	(20.64)	.813	(20.64)	.813	(20.64)	.813	(20.64)
2.250	(57.15)	2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.250	(107.95)
.750	(19.05)	.813	(20.64)	.813	(20.64)	.813	(20.64)	.813	(20.64)
.750	(19.05)	.813	(20.64)	.813	(20.64)	.813	(20.64)	.813	(20.64)
.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.250	(31.75)	1.063	(26.99)	1.313	(33.34)	1.313	(33.34)	1.313	(33.34)
.500	(12.70)	.688	(17.46)	.688	(17.46)	.688	(17.46)	.688	(17.46)
5.500	(139.70)	6.875	(174.63)	7.875	(200.03)	8.875	(225.43)	9.875	(250.83)
6.500	(165.10)	8.250	(209.55)	9.250	(234.95)	10.250	(260.35)	11.250	(285.75)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
1.875	(47.63)	2.062	(52.37)	2.313	(58.74)	2.313	(58.74)	2.313	(58.74)
2.125	(53.98)	2.313	(58.74)	2.562	(65.07)	2.562	(65.07)	2.562	(65.07)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions

Tapped mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



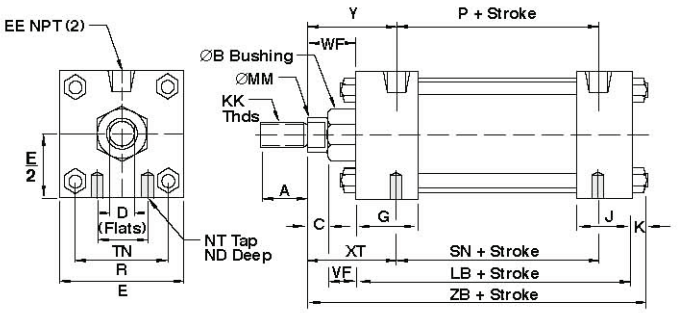
Code 02 Tapped Mounts

(ANSI MS4)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000 -.002	Std.	1.124	(28.55)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.499	(38.08)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(j9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
ND		.375	(9.53)	.375	(9.53)	.500	(12.70)	.750	(19.05)
NT		1/4 - 20		5/16 - 18		3/8 - 18		1/2 - 13	
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
SN		2.250	(57.15)	2.250	(57.15)	2.375	(60.33)	2.625	(66.68)
TN		.625	(15.88)	.875	(22.23)	1.250	(31.75)	1.500	(38.10)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XT	Std.	1.938	(49.21)	1.938	(49.21)	1.938	(49.21)	2.438	(61.91)
	O.S.	2.313	(58.74))	2.313	(58.74))	2.313	(58.74))	2.688	(68.26)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

All dimensions in inches (mm)

Series VP/VN-Mounting Styles and Installation Dimensions



Code 02 Tapped Mounts

(ANSI MS4)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.813	(12.70)	.813	(12.70)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(j9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
.750	(19.05)	.938	(23.81)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1/2 - 13		5/8 - 11		3/4 - 10		3/4 - 10		3/4 - 10	
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.639	(145.54)	6.442	(163.63)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
2.063	(52.37)	2.688	(68.28)	3.250	(82.55)	3.500	(88.90)	4.500	(114.30)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

All dimensions in inches (mm)

NOTE

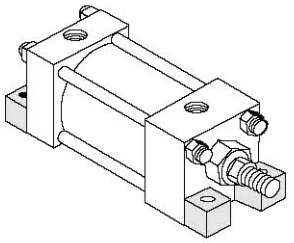
For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

Series VP/VN Mounting Styles and Installation Dimensions

End lug mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



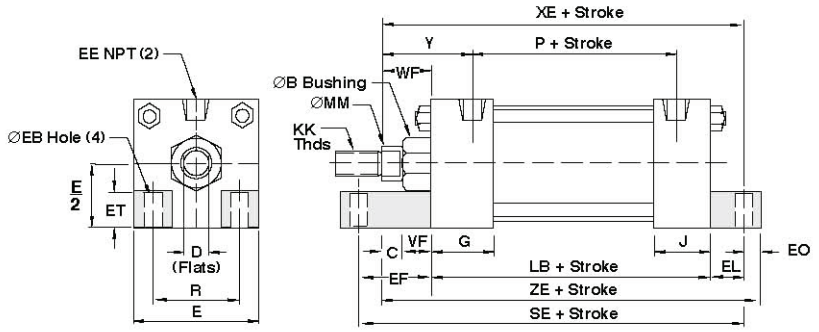
Code 03 End Lug Mounts

(ANSI MS7)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1″	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
+.000									
-.002	O.S.	1.499	(38.08)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EB		.313	(7.94)	.375	(9.53)	.375	(9.53)	.438	(11.11)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
EF		1.125	(28.58)	1.313	(33.34)	1.438	(36.51)	1.500	(38.10)
EL		.750	(19.05)	.938	(23.81)	1..063	(26.99)	.875	(22.23)
EO		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
ET		.500	(12.70)	.750	(19.05)	.750	(19.05)	1.000	(25.40)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
SE		5.500	(139.70)	5.875	(149.23)	6.250	(158.75)	6.625	(168.28)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XE	Std.	5.375	(136.53)	5.563	(141.29)	5.813	(147.64)	6.500	(165.10)
	O.S.	5.750	(146.05)	5.938	(150.81)	6.188	(157.16)	6.750	(171.45)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZE	Std.	5.625	(142.88)	5.875	(149.23)	6.125	(155.58)	6.875	(174.63)
	O.S.	6.000	(152.40)	6.250	(158.75)	6.500	(165.10)	7.125	(180.98)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 03 End Lug Mounts

(ANSI MS7)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.813	(12.70)	.813	(12.70)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.438	(11.11)	.563	(14.29)	.563	(14.29)	.688	(17.46)	.688	(17.46)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1.625	(41.28)	1.688	(42.88)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
1.000	(25.40)	1.063	(26.99)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)
.375	(9.53)	.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)
1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	2.063	(52.39)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.639	(145.54)	6.442	(163.63)
6.875	(174.63)	7.250	(184.15)	7.750	(196.85)	8.000	(203.20)	8.000	(203.20)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
6.625	(168.28)	6.938	(176.21)	7.625	(193.68)	7.875	(200.03)	7.875	(200.03)
6.875	(174.63)	7.188	(182.56)	7.875	(200.03)	8.125	(206.38)	8.125	(206.38)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
7.000	(177.80)	7.438	(188.91)	8.125	(206.38)	8.500	(215.90)	8.500	(215.90)
7.250	(184.15)	7.688	(195.26)	8.375	(212.73)	8.750	(222.25)	8.750	(222.25)

All dimensions in inches (mm)

NOTE

Limit operating pressure to 400 psi (27 bar) non–shock hydraulic for minimum deflection.

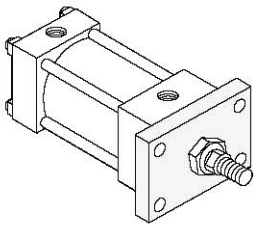
For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



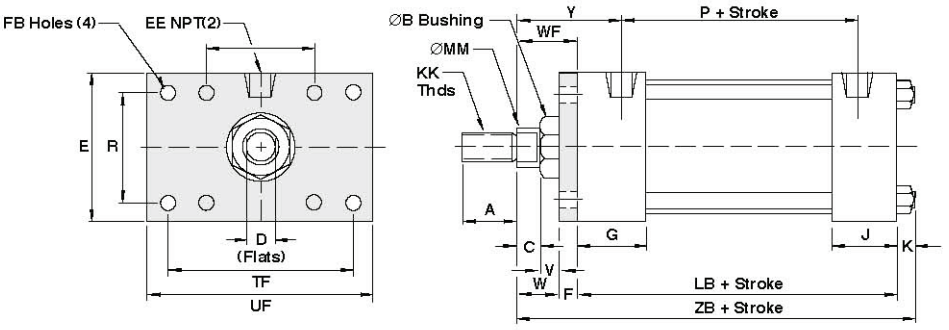
Code 07 Head Rectangular

Flange Mounts (ANSI MF1)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000 -.002	Std.	1.124	(28.55)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.499	(38.08)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
F		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FB		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18	5/8 - 18	5/8 - 18	1 - 14	1 - 14	1 - 14	1–3/8 - 12	
	O.S.	1 - 14	1 - 14	1 - 14	1–3/8 - 12	1–3/8 - 12	1–3/8 - 12	1–3/4 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
TF		2.750	(69.85)	3.375	(85.73)	3.875	(98.43)	4.688	(119.06)
UF		3.375	(85.73)	4.125	(104.78)	4.625	(117.48)	5.500	(139.70)
V	Std.	.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	375	(9.53)
W	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.750	(19.05)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 07 Head Rectangular

Flange Mounts (ANSI MF1)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)
.500	(12.70)	.500	(12.70)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12	
.813	(12.70)	.813	(12.70)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)
.500	(12.70)	.500	(12.70)	.750	(19.05)
.500	(12.70)	.500	(12.70)	.750	(19.05)
.500	(12.70)	.500	(12.70)	.750	(19.05)
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)
.438	(11.11)	.438	(11.11)	1.500	(38.10)
3/4 - 16		3/4 - 16		1 - 14	
1 - 14		1 - 14		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)
5.438	(138.11)	6.625	(168.28)	7.625	(193.68)
6.250	(158.75)	7.625	(193.68)	8.625	(219.08)
.250	(6.35)	.250	(6.35)	.250	(6.35)
375	(9.53)	375	(9.53)	375	(9.53)
.750	(19.05)	.750	(19.05)	.875	(22.23)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)

All dimensions in inches (mm)

NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

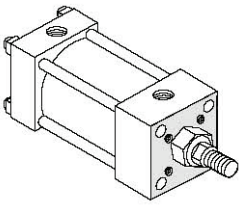
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

Series VP/VN- Mounting Styles and Installation Dimensions

These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling).

The mounting surface should be flat, and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



Code 08 Head Square

Mounts (ANSI ME3)

DIMENSION		7" BORE (177.80)		8" BORE (203.20)	
Rod	Std.	1–3/8"	(34.93)	1–3/8"	(34.93)
	O.S.	1–3/4"	(44.45)	1–3/4"	(44.45)
A	Std.	1.625	(41.28)	1.625	(41.28)
	O.S.	2.000	(50.80)	2.000	(50.80)
B +.000 -.002	Std.	1.625	(41.28)	1.625	(41.28)
	O.S.	2.000	(50.80)	2.000	(50.80)
C	Std.	.625	(15.88)	.625	(15.88)
	O.S.	.750	(19.05)	.750	(19.05)
CC	Std.	1–1/4 - 12		1–1/4 - 12	
	O.S.	1–1/2 - 12		1–1/2 - 12	
D	Std.	1.125	(15.88)	1.125	(15.88)
	O.S.	1.500	(38.10)	1.500	(38.10)
E		7.500	(190.50)	8.500	(215.90)
EB		.688	(17.46)	.688	(17.46)
EE		.750	(19.05)	.750	(19.05)
FF	Std.	1–3/8 - 12		1–3/8 - 12	
	O.S.	1–3/4 - 12		1–3/4 - 12	
G		2.000	(50.80)	2.000	(50.80)
J		1.500	(38.10)	1.500	(38.10)
K		.563	(14.29)	.563	(14.29)
KK	Std.	1 - 14		1 - 14	
	O.S.	1–1/4 - 12		1–1/4 - 12	
LB		5.125	(130.18)	5.125	(130.18)
MM	Std.	1.375	(34.93)	1.375	(34.93)
	O.S.	1.750	(44.45)	1.750	(44.45)
P		3.250	(82.55)	3.250	(82.55)
R		5.639	(145.54)	6.442	(163.63)
TE		6.750	(171.45)	7.570	(192.27)
VF	Std.	1.000	(25.40)	1.000	(25.40)
	O.S.	1.125	(28.58)	1.125	(28.58)
Y	Std.	2.813	(71.44)	2.813	(71.44)
	O.S.	3.063	(77.79)	3.063	(77.79)
ZB	Std.	7.313	(185.74)	7.313	(185.74)
	O.S.	7.563	(192.09)	7.563	(192.09)

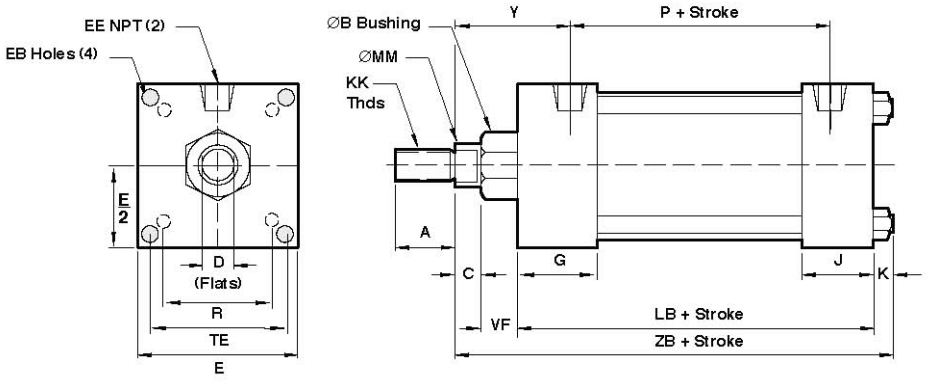
All dimensions in inches (mm)

NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

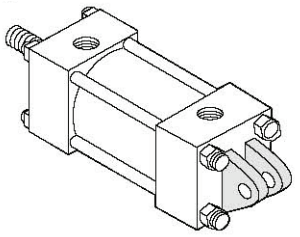
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

Code 08 Head Square Mounts (ANSI ME3)



Series VP/VN Mounting Styles and Installation Dimensions

These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.



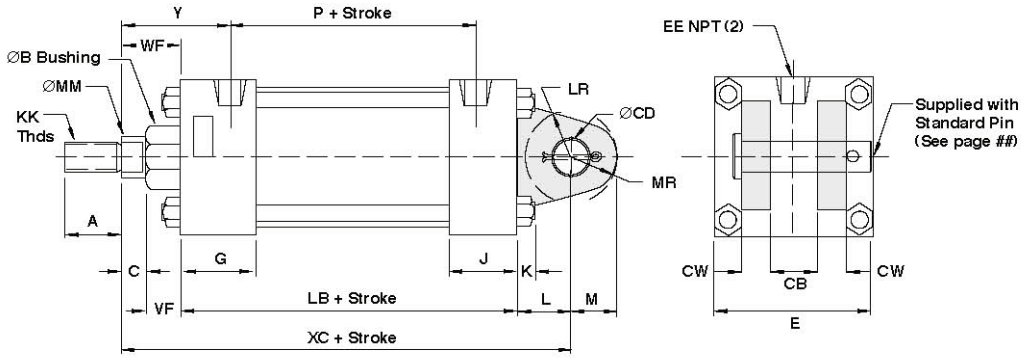
Code 10 Fixed Clevis

(MP1)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000 -.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CB		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
CD		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)
CW		.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
L		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
LR		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
M		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
MR		.625	(15.88)	.625	(15.88)	.625	(15.88)	.938	(23.81)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XC	Std.	5.375	(136.53)	5.375	(136.53)	5.500	(139.70)	6.875	(174.63)
	O.S.	5.750	(146.05)	5.750	(146.05)	5.875	(149.23)	7.125	(180.98)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 10 Fixed Clevis

(MP1)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
.813	(12.70)	.813	(12.70)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
.938	(23.81)	.938	(23.81)	1.188	(30.16)	1.188	(30.16)	1.188	(30.16)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
6.875	(174.63)	7.125	(180.98)	8.125	(206.38)	8.250	(209.55)	8.250	(209.55)
7.125	(180.98)	7.375	(187.33)	8.375	(212.73)	8.500	(215.90)	8.500	(215.90)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)

All dimensions in inches (mm)

NOTE

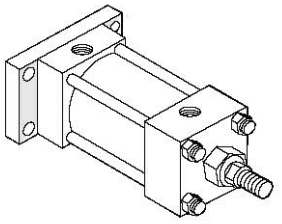
For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. Any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing), as in push presses. For tension applications (pulling), a head rectangular mount is more appropriate.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



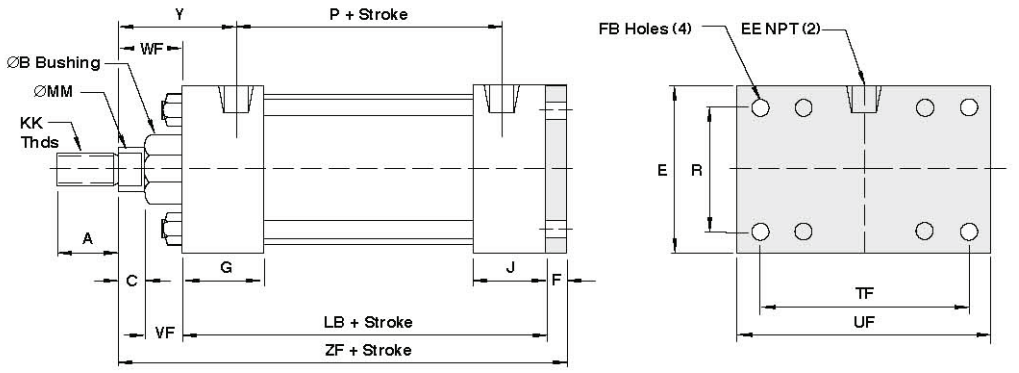
Code 12 Cap Rectangular

Flange Mounts (ANSI MF2)

DIMENSION		1 1/2" BOR (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CB		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
F		.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)
FB		.313	(7.94)	.375	(9.53)	.375	(9.53)	.438	(11.11)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
TF		2.750	(69.85)	3.375	(85.73)	3.875	(98.43)	4.687	(119.05)
UF		3.375	(85.73)	4.125	(104.78)	4.625	(117.48)	5.500	(139.70)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZF	Std.	5.000	(127.00)	5.000	(127.00)	5.125	(130.18)	6.250	(158.75)
	O.S.	5.375	(136.53)	5.375	(136.53)	5.500	(139.70)	6.500	(165.10)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 12 Cap Rectangular Flange Mounts (ANSI MF2)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)
7/8 - 14		7/8 - 14		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12	
.813	(12.70)	.813	(12.70)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)
.500	(12.70)	.500	(12.70)	.750	(19.05)
.625	(15.88)	.625	(15.88)	.750	(19.05)
.438	(11.11)	.563	(14.29)	.563	(14.29)
1 - 14		1 - 14		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)
3/4 - 16		3/4 - 16		1 - 14	
1 - 14		1 - 14		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)
3.323	(84.40)	4.101	(104.16)	4.879	(123.93)
5.438	(138.11)	6.625	(168.28)	7.625	(193.68)
6.250	(158.75)	7.625	(193.68)	8.625	(219.08)
.875	(22.23)	.875	(22.23)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)
6.250	(158.75)	6.500	(165.10)	7.375	(187.33)
6.500	(165.10)	6.750	(171.45)	7.625	(193.68)

All dimensions in inches (mm)

NOTE

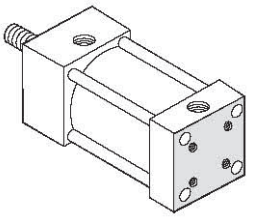
For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

Cap rectangular mounts are recommended for heavy duty applications.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing). The mounting surface should be flat and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



Code 13 Cap Square Mounts

(ANSI ME4)

DIMENSION		7" BORE (177.80)		8" BORE (203.20)	
Rod	Std.	1–3/8"	(34.93)	1–3/8"	(34.93)
	O.S.	1–3/4"	(44.45)	1–3/4"	(44.45)
A	Std.	1.625	(41.28)	1.625	(41.28)
	O.S.	2.000	(50.80)	2.000	(50.80)
B +.000 -.002	Std.	1.625	(41.28)	1.625	(41.28)
	O.S.	2.000	(50.80)	2.000	(50.80)
C	Std.	.625	(15.88)	.625	(15.88)
	O.S.	.750	(19.05)	.750	(19.05)
CC	Std.	1–1/4 - 12		1–1/4 - 12	
	O.S.	1–1/2 - 12		1–1/2 - 12	
D	Std.	1.125	(15.88)	1.125	(15.88)
	O.S.	1.500	(38.10)	1.500	(38.10)
E		7.500	(190.50)	8.500	(215.90)
EB		.688	(17.46)	.688	(17.46)
EE		.750	(19.05)	.750	(19.05)
FF	Std.	1–3/8 - 12		1–3/8 - 12	
	O.S.	1–3/4 - 12		1–3/4 - 12	
G		2.000	(50.80)	2.000	(50.80)
J		1.500	(38.10)	1.500	(38.10)
K		.563	(14.29)	.563	(14.29)
KK	Std.	1 - 14		1 - 14	
	O.S.	1–1/4 - 12		1–1/4 - 12	
LB		5.125	(130.18)	5.125	(130.18)
MM	Std.	1.375	(34.93)	1.375	(34.93)
	O.S.	1.750	(44.45)	1.750	(44.45)
P		3.250	(82.55)	3.250	(82.55)
R		5.639	(145.54)	6.442	(163.63)
TE		6.750	(171.45)	7.570	(192.27)
VF	Std.	1.000	(25.40)	1.000	(25.40)
	O.S.	1.125	(28.58)	1.125	(28.58)
Y	Std.	2.813	(71.44)	2.813	(71.44)
	O.S.	3.063	(77.79)	3.063	(77.79)
ZB	Std.	7.313	(185.74)	7.313	(185.74)
	O.S.	7.563	(192.09)	7.563	(192.09)

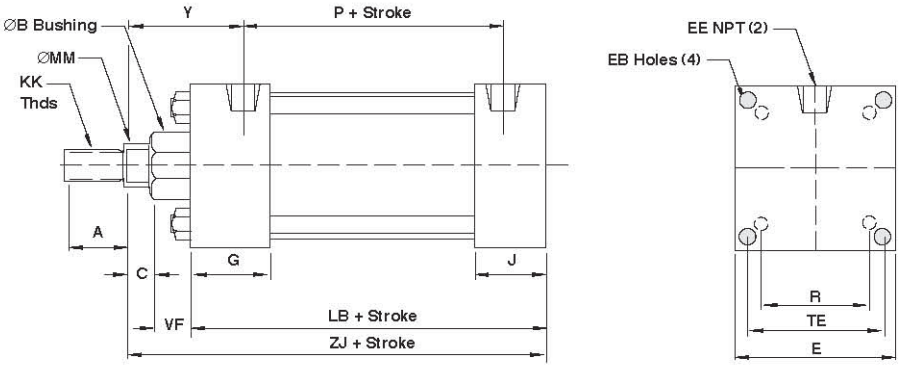
All dimensions in inches (mm)

NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

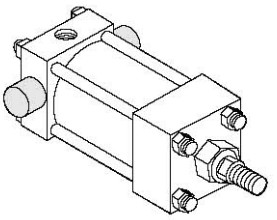
Code 13 Cap Square Mounts
(ANSI ME4)



Series VP/VN Mounting Styles and Installation Dimensions

These mounts are for applications in which the machine member travels in a curved path in one plane.

The mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

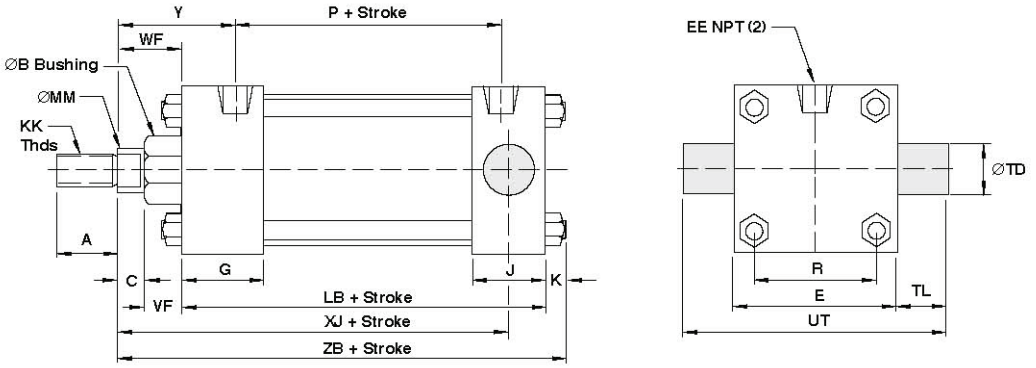


Code 16 Cap Trunnion Mounts (ANSI MT2)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000 -.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
TD +.000 –.001		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
TL		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
UT		4.000	(101.60)	4.500	(114.30)	5.000	(127.00)	5.750	(146.05)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XJ	Std.	4.125	(104.78)	4.125	(104.78)	4.250	(107.95)	5.000	(127.00)
	O.S.	5.750	(146.05)	5.750	(146.05)	5.875	(149.23)	7.125	(180.98)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 16 Cap Trunnion Mounts (ANSI MT2)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.875	(22.23)	.875	(22.23)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.730	(145.54)	6.435	(163.44)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
6.500	(165.10)	7.500	(190.50)	9.250	(234.95)	10.250	(260.35)	11.250	(285.75)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
5.250	(133.35)	5.500	(139.70)	6.125	(155.58)	6.250	(158.75)	6.250	(158.75)
7.125	(180.98)	7.375	(187.33)	8.375	(212.73)	8.500	(215.90)	8.500	(215.90)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

All dimensions in inches (mm)

NOTE

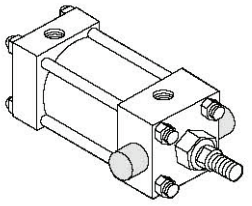
For strokes in excess of 30 inches, see "Stop tube selection" on page 45.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts are for applications in which the machine member travels in a curved path in one plane.

The mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

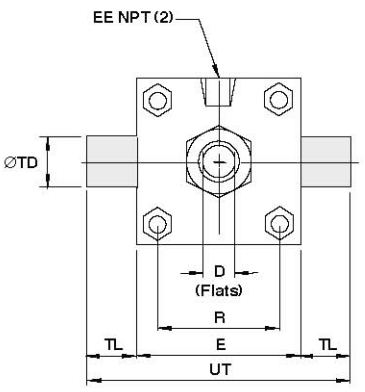


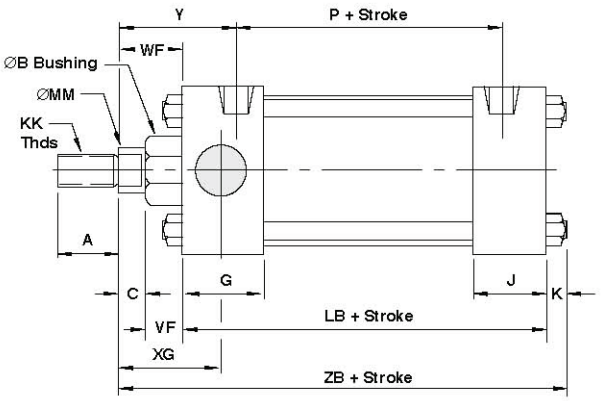
Code 17 Head Trunnion Mounts (ANSI MT1)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
+.000									
-.002B	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
TD +.000 –.001		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
TL		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
UT		4.000	(101.60)	4.500	(114.30)	5.000	(127.00)	5.750	(146.05)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XJ	Std.	4.125	(104.78)	4.125	(104.78)	4.250	(107.95)	5.000	(127.00)
	O.S.	5.750	(146.05)	5.750	(146.05)	5.875	(149.23)	7.125	(180.98)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions





Code 17 Head Trunnion Mounts (ANSI MT1)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8I"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.875	(22.23)	.875	(22.23)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.730	(145.54)	6.435	(163.44)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
6.500	(165.10)	7.500	(190.50)	9.250	(234.95)	10.250	(260.35)	11.250	(285.75)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
5.250	(133.35)	5.500	(139.70)	6.125	(155.58)	6.250	(158.75)	6.250	(158.75)
7.125	(180.98)	7.375	(187.33)	8.375	(212.73)	8.500	(215.90)	8.500	(215.90)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

All dimensions in inches (mm)

NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

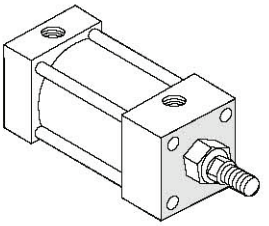
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts are for straight line force transfer applications in which the cylinder is used in tension (pulling).

The mounting surface should be flat and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



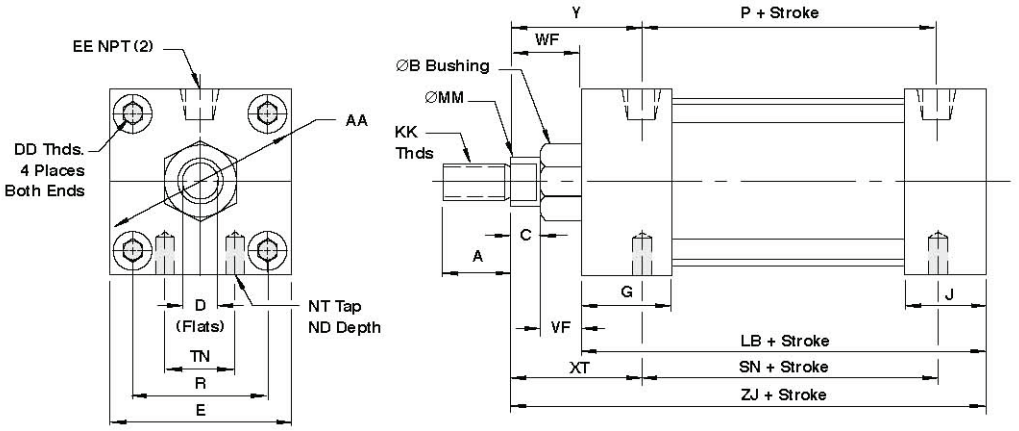
16 Sleeve Nut Construction
Basic Cylinder Side Tapped (Universal)

Code 18 Sleeve Nut, for Tapped Face Mounts

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
AA		2.020	(51.31)	2.600	(66.04)	3.100	(78.74)	3.900	(99.06)
B +.000 -.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(20.64)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
DD		1/4 - 28		5/16 - 24		5/16 - 24		3/8 - 24	
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
NT	1/4 - 20	5/16 - 18	3/8 -16	1/2 - 13	1/2 - 13	5/8 - 11	3/4 - 10		
ND		.375	(9.53)	.375	(9.53)	.500	(12.70)	.750	(19.05)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
SN		2.250	(57.15)	2.250	(57.15)	2.375	(60.33)	2.625	(66.68)
TN		.625	(15.88)	.875	(22.23)	1.250	(31.75)	1.500	(38.10)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XT	Std.	1.938	(49.21)	1.938	(49.21)	1.938	(49.21)	2.438	(61.91)
	O.S.	2.313	(58.74)	2.313	(58.74)	2.313	(58.74)	2.688	(68.26)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZJ	Std.	4.625	(117.48)	4.625	(117.48)	4.750	(120.65)	5.625	(142.88)
	O.S.	5.000	(127.00)	5.000	(127.00)	5.125	(130.18)	5.875	(149.23)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 18 Sleeve Nut, for Tapped Face Mounts

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)
4.700	(119.38)	5.800	(147.32)	6.900	(175.26)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12	
.813	(20.64)	.813	(20.64)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)
3/8 - 24		1/2 - 20		1/2 - 20	
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)
.500	(12.70)	.500	(12.70)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)
3/4 - 16		3/4 - 16		1 - 14	
1 - 14		1 - 14		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)
.750	(19.05)	.938	(23.81)	1.125	(28.58)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)
2.063	(52.39)	2.688	(68.26)	3.250	(82.55)
.875	(22.23)	.875	(22.23)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)
5.625	(142.88)	5.625	(142.88)	6.625	(168.28)
5.875	(149.23)	5.875	(149.23)	6.875	(174.63)

All dimensions in inches (mm)

NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

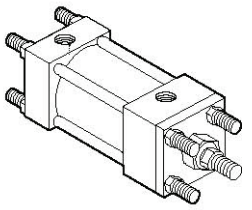
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts are for straight line force transfer applications. Both ends extended tie rod mounts are suited for tension and compression applications or applications where additional hardware is to be attached to cylinders.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the right column table.



Codes 21 Cap (MX2), **22 Head** (MX3), **& 23 Both Ends** (MX1) **Extended Tie Rod Mounts**

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000 -.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
BB		1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.375	(34.93)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.875	(22.23)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
DD		1/4 - 28		5/16 - 24		5/16 - 24		3/8 - 24	
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
F		.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

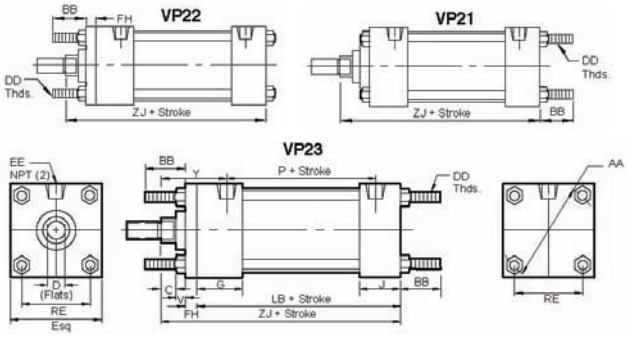
**BB dimension on 8 bore is from the head.

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions

Recommended Torques for Tightening Tie Rods

CYLINDER BORE	SERIES VP STEEL TIE ROD	SERIES VN STAINLESS TIE ROD
1–1/2"	6.6 ft. lbs.	3.75 ft. lbs.
2"	11 ft. lbs.	7.5 ft. lbs.
2–1/2"	13 ft. lbs.	7.5 ft. lbs.
3–3/4"	20 ft. lbs.	14 ft. lbs.
4"	24 ft. lbs.	14 ft. lbs.
5"	40 ft. lbs.	33 ft. lbs.
6"	48 ft. lbs.	33 ft. lbs.
7" & 8"	100 ft. lbs.	65 ft. lbs.



Codes 21 Cap (MX2), **22 Head** (MX3), **& 23 Both Ends** (MX1) **Extended Tie Rod Mounts**

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
1.375	(34.93)	1.813	(46.04)	1.813	(46.04)	2.313	(58.74)	2.313	(58.74)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)**
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.875	(22.23)	.875	(22.23)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
3/8 - 24		1/2 - 20		1/2 - 20		5/8 - 18		5/8 - 18	
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.730	(145.54)	6.442	(163.63)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

**BB dimension on 8 bore is from the head.

All dimensions in inches (mm)

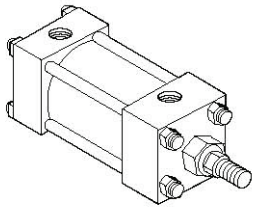
NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

Series VP/VN Mounting Styles and Installation Dimensions

The basic cylinder is often used by customers who have designed their own method of mounting. These mounting methods may include custom made mounting flanges, machining into the end caps, and clamping mechanisms to secure the cylinder. Consult Eaton engineering when using the cylinder in this fashion.



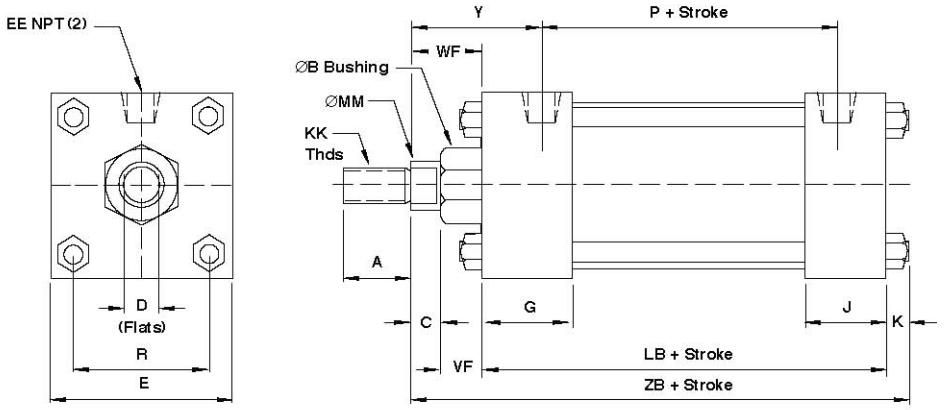
Code 24 No Mount Cylinder

(ANSI MX0)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.875	(22.23)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 24 No Mount Cylinder

(ANSI MX0)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.875	(22.23)	.875	(22.23)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.730	(145.54)	6.442	(163.63)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

All dimensions in inches (mm)

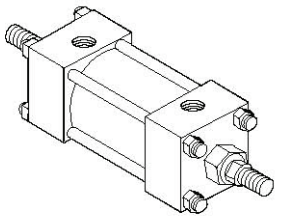
NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

Series VP/VN Mounting Styles and Installation Dimensions

Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod. The single rod mount application data is also applicable to double rod cylinders.

Rod and pilot related dimensions are typical for both ends.



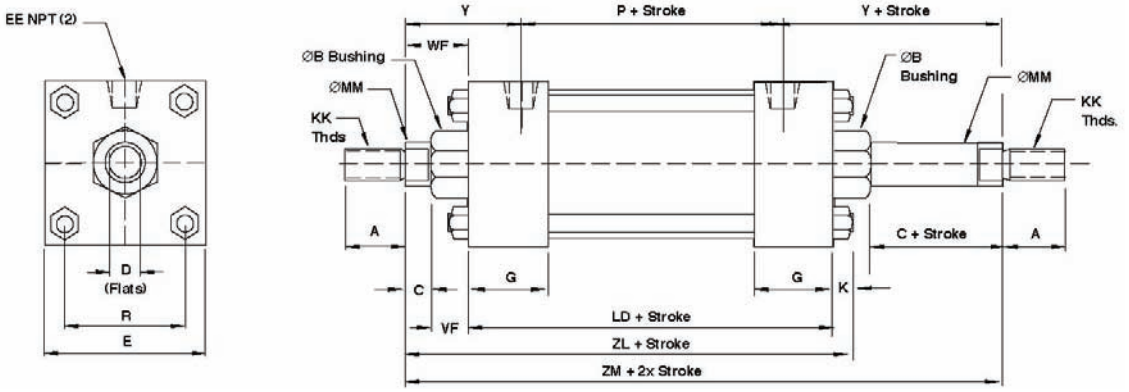
Code 41 Double Rod,

No Mount

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.875	(22.23)
	O.S.	.875	(22.23)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)
ZL	Std.	5.375	(136.53)	5.438	(138.11)	5.563	(141.29)	6.500	(165.10)
	O.S.	6.125	(155.58)	6.125	(155.58)	6.250	(158.75)	7.500	(190.50)
ZM	O.S.	6.875	(174.63)	6.875	(174.63)	7.000	(177.80)	8.000	(203.20)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 41 Double Rod, No Mount

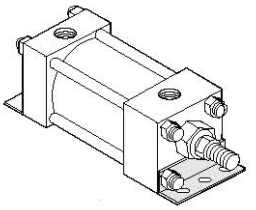
4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.875	(22.23)	.875	(22.23)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.730	(145.54)	6.442	(163.63)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
6.500	(165.10)	6.813	(174.04)	7.563	(192.09)	7.813	(198.44)	7.813	(198.44)
7.500	(190.50)	7.500	(190.50)	8.750	(222.25)	8.875	(225.43)	8.875	(225.43)
8.000	(203.20)	8.000	(203.20)	9.250	(234.95)	9.375	(238.13)	9.375	(238.13)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions

Angle mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

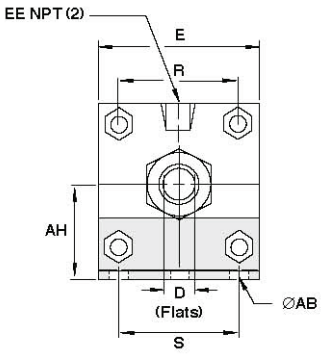


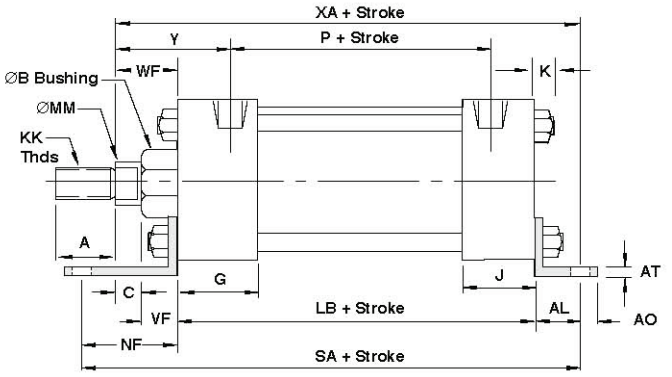
Code 45 Angle Mounts
(ANSI MS1)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
AB		.438	(11.11)	.438	(11.11)	.438	(11.11)	.563	(14.29)
AH		1.188	(30.16)	1.438	(36.51)	1.625	(41.28)	1.938	(49.21)
AL		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
AO		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
AT		.125	(3.18)	.125	(3.18)	.125	(3.18)	.125	(3.18)
+.000									
-.002B	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(20.64)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
NF		1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.875	(47.63)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)
S		1.250	(31.75)	1.750	(44.45)	2.250	(57.15)	2.750	(69.85)
SA		6.000	(152.40)	6.000	(152.40)	6.125	(155.58)	7.375	(187.33)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XA	Std.	5.625	(142.88)	5.438	(138.11)	5.750	(146.05)	6.875	(174.63)
	O.S.	6.000	(152.40)	6.000	(152.40)	6.125	(155.58)	7.125	(180.98)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions





Code 45 Angle Mounts
(ANSI MS1)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
.563	(14.29)	.688	(17.46)	.813	(20.64)	.813	(20.64)	.813	(20.64)
2.250	(57.15)	2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.250	(107.95)
1.250	(31.75)	1.375	(34.93)	1.375	(34.93)	1.813	(46.04)	1.813	(46.04)
.500	(12.70)	.625	(15.88)	.625	(15.88)	.688	(17.46)	.688	(17.46)
.125	(3.18)	.187	(4.75)	.187	(4.75)	.250	(6.35)	.250	(6.35)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.813	(20.64)	.813	(20.64)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
1.875	(47.63)	2.000	(50.80)	2.125	(53.98)	1.813	(46.04)	1.813	(46.04)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.730	(145.54)	6.442	(163.63)
3.500	(88.90)	4.250	(107.95)	5.250	(133.35)	6.125	(155.58)	7.125	(180.98)
7.375	(187.33)	7.875	(200.03)	8.500	(215.90)	8.750	(222.25)	8.750	(222.25)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
6.875	(174.63)	7.250	(184.15)	8.000	(203.20)	8.562	(217.47)	8.562	(217.47)
7.125	(180.98)	7.500	(190.50)	8.250	(209.55)	8.813	(223.84)	8.813	(223.84)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)

All dimensions in inches (mm)

NOTE

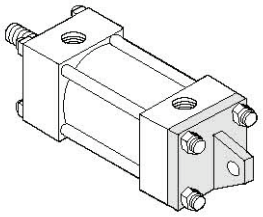
Limit operating pressure to 400 psi (27 bar) non–shock hydraulic for minimum deflection.

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

For applications with unsupported loads, the bearing must absorb more force. The larger available rod is recommended, and stop tubes should be considered.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

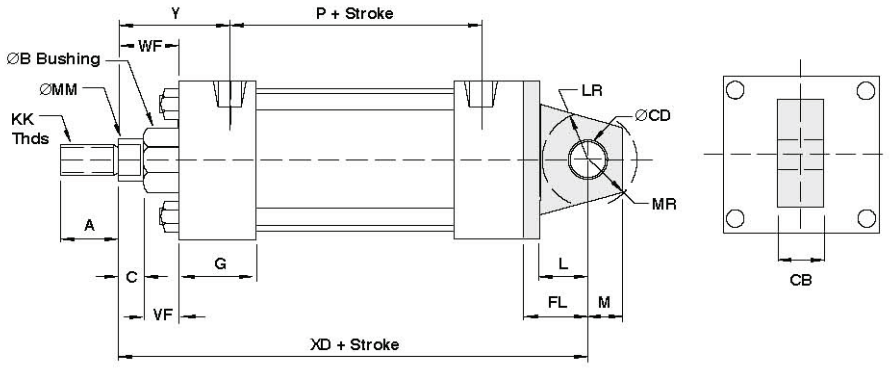


Code 48 Detachable Eye Mounts (MP4)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CB		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(20.64)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
FL		1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.875	(47.63)
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
L		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
LR		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
M		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
MR		.625	(15.88)	.625	(15.88)	.625	(15.88)	.938	(23.81)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XD	Std.	5.750	(146.05)	5.750	(146.05)	5.875	(149.23)	7.500	(190.50)
	O.S.	6.125	(155.58)	6.125	(155.58)	6.250	(158.75)	7.750	(196.85)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 48 Detachable Eye Mounts (MP4)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.813	(20.64)	.813	(20.64)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.875	(47.63)	1.875	(47.63)	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
.938	(23.81)	.938	(23.81)	1.188	(30.16)	1.188	(30.16)	1.188	(30.16)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
7.500	(190.50)	7.750	(196.85)	8.875	(225.43)	9.000	(228.60)	9.000	(228.60)
7.750	(196.85)	8.000	(203.20)	9.125	(231.78)	9.250	(234.95)	9.250	(234.95)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)

All dimensions in inches (mm)

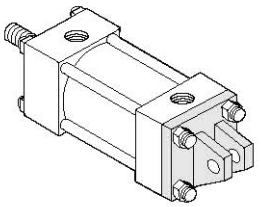
NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. Any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.

Series VP/VN Mounting Styles and Installation Dimensions

These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

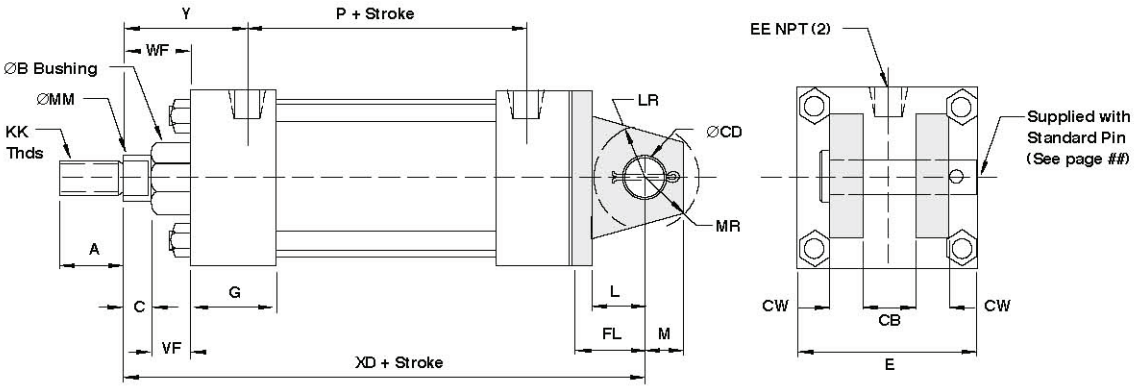


Code 50 Detachable Clevis
(MP2)

DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CB		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
CD		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)
CW		.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(20.64)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
FF	Std.	5/8 - 18		5/8 - 18		5/8 - 18		1 - 14	
	O.S.	1 - 14		1 - 14		1 - 14		1–3/8 - 12	
FL		1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.875	(47.63)
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(9.53)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
L		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)
LR		.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)
M		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
MR		.625	(15.88)	.625	(15.88)	.625	(15.88)	.938	(23.81)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)
XD	Std.	5.750	(146.05)	5.750	(146.05)	5.875	(149.23)	7.500	(190.50)
	O.S.	6.125	(155.58)	6.125	(155.58)	6.250	(158.75)	7.750	(196.85)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)

All dimensions in inches (mm)

Series VP/VN Mounting Styles and Installation Dimensions



Code 50 Detachable Clevis (MP2)

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
.813	(20.64)	.813	(20.64)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
1 - 14		1 - 14		1–3/8 - 12		1–3/8 - 12		1–3/8 - 12	
1–3/8 - 12		1–3/8 - 12		1–3/4 - 12		1–3/4 - 12		1–3/4 - 12	
1.875	(47.63)	1.875	(47.63)	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)
1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.375	(9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125	(130.18)	5.125	(130.18)
1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
.938	(23.81)	.938	(23.81)	1.188	(30.16)	1.188	(30.16)	1.188	(30.16)
2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
7.500	(190.50)	7.750	(196.85)	8.875	(225.43)	9.000	(228.60)	9.000	(228.60)
7.750	(196.85)	8.000	(203.20)	9.125	(231.78)	9.250	(234.95)	9.250	(234.95)
2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)

All dimensions in inches (mm)

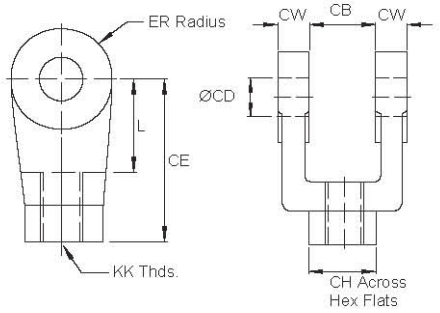
NOTE

For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. Any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.

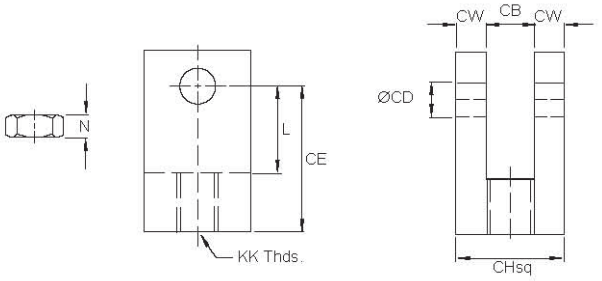
Series VP/VN Accessories for 1–1/2 thru 8 inch Bore Cylinders

NFPA Rod Clevis



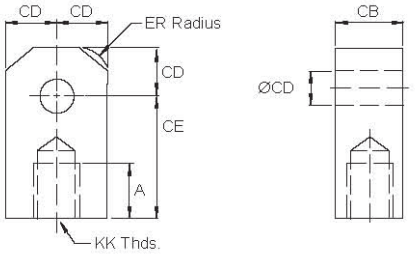
	VP62008A	VP62008B	VP6200CA	VP62010A	VP62016A
CB	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
CE	1.500 (38.10)	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)	4.125 (104.78)
CH	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CW	.500 (12.70)	.500 (12.70)	.625 (15.88)	.750 (19.05)	1.000 (25.40)
ER	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
KK	7/16–20	1/2–20	3/4–16	1–14	1-1/4–12
L	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)

Small Rod Clevis & Jam Nut



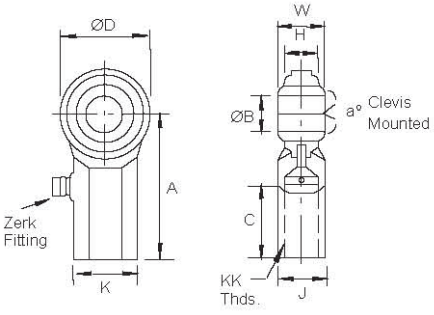
	VP62008C	VP6200CC
CB	.500 (12.70)	.750 (19.05)
CD	.500 (12.70)	.750 (19.05)
CE	1.375 (34.93)	1.750 (44.45)
CH	1.000 (25.40)	1.500 (38.10)
CW	.250 (6.35)	.375 (9.53)
KK	1/2–20	3/4–16
L	.750 (19.05)	1.000 (25.40)
N	.375 (9.53)	.500 (12.70)

NFPA Rod Eye



	VP60008A	VP60008C	VP6000CA	VP60010A	VP60016A
CB	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
CE	1.500 (38.10)	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)	4.125 (104.78)
ER	.5)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
L	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)

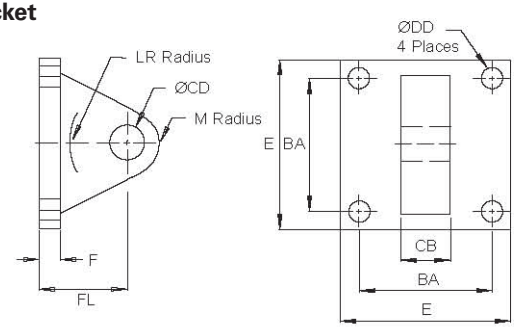
Spherical Rod Eye



		VP62008C	VP6200CC	VP60010B
Bore		1-1/2 & 2-1/2	3-1/4 , 4 & 5	6 & 8
a°	Misalign. Angle	12	14	14
A	± .015	2.125 (53.98)	2.875 (73.03)	4.125 (104.78)
B	+.0025 / –.0005	.500 (12.70)	.750 (19.05)	1.000 (25.40)
C	+.062 / –.031	1.062 (26.97)	1.562 (39.67)	2.125 (53.98)
D	± .010	1.312 (33.32)	1.750 (44.45)	2.750 (69.85)
H	REF.	.453 (11.51)	.593 (15.06)	1.000 (25.40)
J	± .010	.750 (19.05)	1.000 (25.40)	1.500 (38.10)
K	± .010	.875 (22.23)	1.125 (28.58)	1.625 (41.28)
KK	UNF-2B	1/2-20	3/4-16	1-14
W	+.000 / –.005	.625 (15.88)	.875 (22.23)	1.375 (34.93)

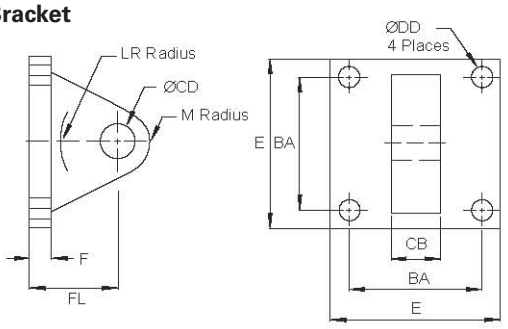
Series VP/VN Accessories for 1–1/2 thru 8 inch Bore Cylinders

NFPA Eye Bracket



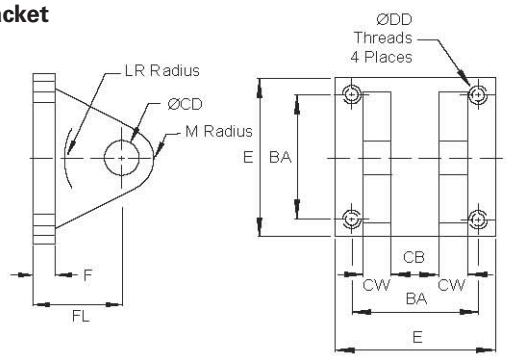
	VP62008A	VP62008B	VP6200CA	VP62010A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)	3.812 (96.82)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
DD	.406 (10.31)	.531 (13.49)	.656 (16.66)	.656 (16.66)
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)	5.000 (127.00)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)	.875 (22.23)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)	3.000 (76.20)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)

Alternate Eye Bracket



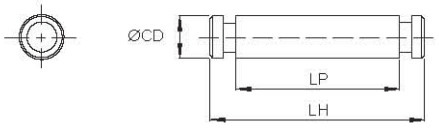
	VP78008B	VP78008C	VP78008D	VP7800CB	VP7800CC
BA	1.437 (36.50)	1.844 (46.84)	2.187 (55.55)	2.937 (74.60)	3.562 (90.47)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
DD	.281 (7.14)	.343 (8.71)	.343 (8.71)	.469 (11.91)	.469 (11.91)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
F	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.750 (44.45)	1.750 (44.45)
LR	.562 (14.27)	.562 (14.27)	.562 (14.27)	1.000 (25.40)	1.000 (25.40)
M	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)

NFPA Clevis Bracket



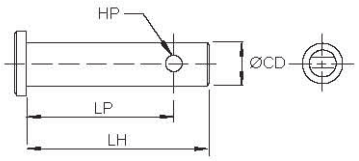
	VP61008A	VP6100CA	VP61010A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)
DD	3/8 – 24	1/2 – 20	5/8 – 18
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
M	.500 (12.70)	.812 (20.62)	1.000 (25.40)

NFPA Pin



	VP83008A	VP8300CA	VP83010A
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
LH	2.219 (56.36)	3.125 (79.38)	3.750 (95.25)
LP	1.875 (47.63)	2.750 (69.85)	3.250 (82.55)

Alternate Eye Bracket

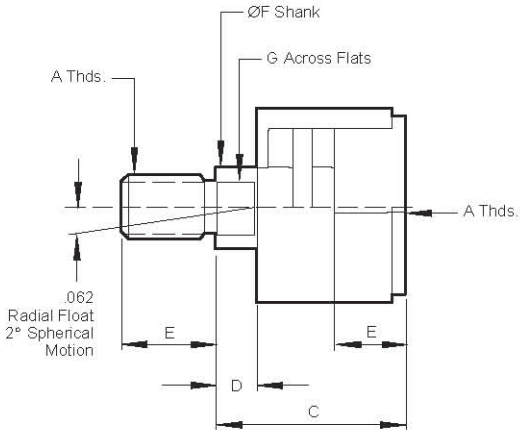


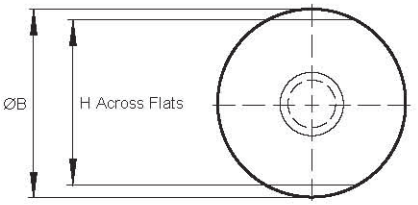
	VP83008B	VP83008C	VP83008CB	VP8300CC	VP83010B	VP83016B
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)
HP	.156 (3.96)	.156 (3.96)	.156 (3.96)	.156 (3.96)	.203 (5.16)	.250 (6.35)
LH	1.421 (36.09)	2.250 (57.15)	2.000 (50.80)	3.000 (76.20)	3.500 (88.90)	5.000 (127.00)
LP	1.266 (32.16)	2.093 (53.16)	1.843 (46.81)	2.843 (72.21)	3.297 (83.74)	4.500 (114.30)

All dimensions in inches (mm)

Series VP/VN Rod Alignment Coupler

The Rod Alignment Coupler allows 1/16 inch of radial float and 2 inches of spherical movement. This prevents cylinder binding due to misalignment thus extending bearing and seal life, and permits greater tolerance between the centerline of the cylinder and mating part for simplified installation.





	7756A–1/4–28	7756A–5/16–24	7756A–3/8–24	7756A–7/16–20	7756A–1/2–20	7756A–5/8–18	7756A–3/4–16	7756A–7/8–14	7756A–1–14	7756A–1–1/4–12	7756A–1–1/2–12	7756A–1–3/4–12
A	1/4-28	5/16-24	3/8-24	7/16-20	1/2-20	5/8-18	3/4-16	7/8-14	1-14	1–1/4-12	1–1/2-12	1–3/4-12
B	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.750 (44.45)	1.750 (44.45)	2.500 (63.50)	2.500 (63.50)	3.250 (82.50)	3.250 (82.50)
C	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.312 (58.72)	2.312 (58.72)	2.937 (74.60)	2.937 (74.60)	4.375 (111.13)	4.375 (111.13)
D	.250 (6.35)	.250 (6.35)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
E	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	2.250 (57.15)	2.250 (57.15)
F	.312 (7.92)	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.969 (24.61)	.969 (24.61)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
G	.187 (4.75))	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	1.156 (29.36)	1.156 (29.36)	1.500 (38.10)	1.500 (38.10)
H	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	2.250 (57.15)	2.250 (57.15)	3.000 (76.20)	3.000 (76.20)
Max Pull lbs. (kg)	1,500 (680)	2,075 (941)	2,075 (941)	2,500 (1134)	3,500 (1588)	4,750 (2155)	8,500 (3856)	9,750 (4423)	16,000 (7258)	19,500 (8845)	33,500 (15196)	33,500 (15196)

NOTE

A Rod Alignment Coupler is not recommended for unguided loads.

Series VP/VN Optional Rod Ends for 1-1/2 thru 8 inch Bore Cylinders

Rod End Types

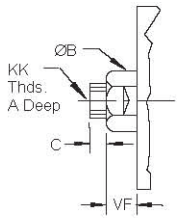
In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

Five different inch rod end configurations are available. If a custom design is required, contact your local Eaton sales engineer, and define your requirements.

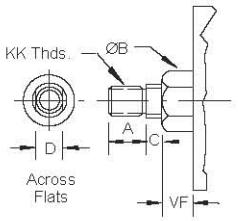
DIMENSION		1 1/2" BORE (38.10)		2" BORE (50.80)		2 1/2" BORE (63.50)		3 1/4" BORE (82.55)	
Rod	Std.	5/8"	(15.88)	5/8"	(15.88)	5/8"	(15.88)	1"	(25.40)
	O.S.	1"	(25.40)	1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)
B +.000									
-.002	Std.	1.124	(28.55)	1.124	(28.55)	1.124	(28.55)	1.499	(38.08)
	O.S.	1.499	(38.08)	1.499	(38.08)	1.499	(38.08)	1.999	(50.78)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)
CC	Std.	1/2 - 20		1/2 - 20		1/2 - 20		7/8 - 14	
	O.S.	7/8 - 14		7/8 - 14		7/8 - 14		1–1/4 - 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(20.64)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)
KK	Std.	7/16 - 20		7/16 - 20		7/16 - 20		3/4 - 16	
	O.S.	3/4 - 16		3/4 - 16		3/4 - 16		1 - 14	
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)

All dimensions in inches (mm)

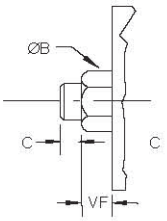
Series VP/VN Optional Rod Ends for 1-1/2 thru 8 inch Bore Cylinders



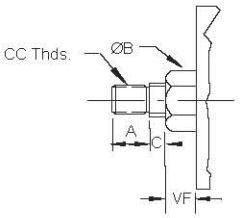
Type 2
Female
UN Thread



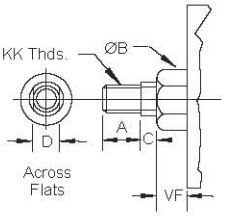
Type 5
Small Male
UN Thread



Type 6
Plain
No Attachment



Type 9
Intermediate Male
UN Thread

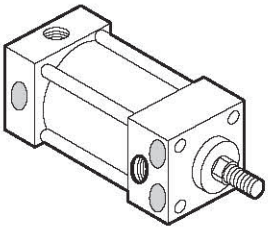


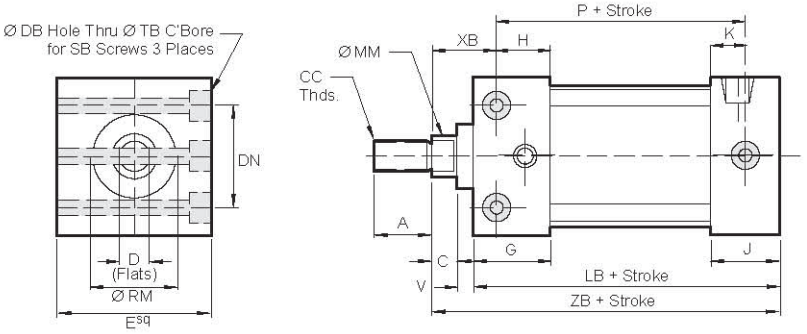
Type S
Studded Female
UN Thread

4" BORE (101.60)		5" BORE (127.00)		6" BORE (152.40)		7" BORE (177.80)		8" BORE (203.20)	
1"	(25.40)	1"	(25.40)	1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/8"	(34.93)
1–3/8"	(34.93)	1–3/8"	(34.93)	1–3/4"	(44.45)	1–3/4"	(44.45)	1–3/4"	(44.45)
1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
1.499	(38.08)	1.499	(38.08)	1.999	(50.78)	1.999	(50.78)	1.999	(50.78)
1.999	(50.78)	1.999	(50.78)	2.374	(60.30)	2.374	(60.30)	2.374	(60.30)
.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
7/8 - 14		7/8 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
1–1/4 - 12		1–1/4 - 12		1–1/2 - 12		1–1/2 - 12		1–1/2 - 12	
.813	(20.64)	.813	(20.64)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
3/4 - 16		3/4 - 16		1 - 14		1 - 14		1 - 14	
1 - 14		1 - 14		1–1/4 - 12		1–1/4 - 12		1–1/4 - 12	
.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)

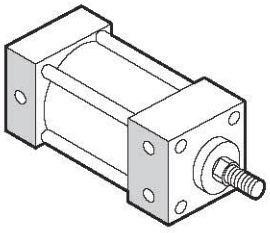
All dimensions in inches (mm)

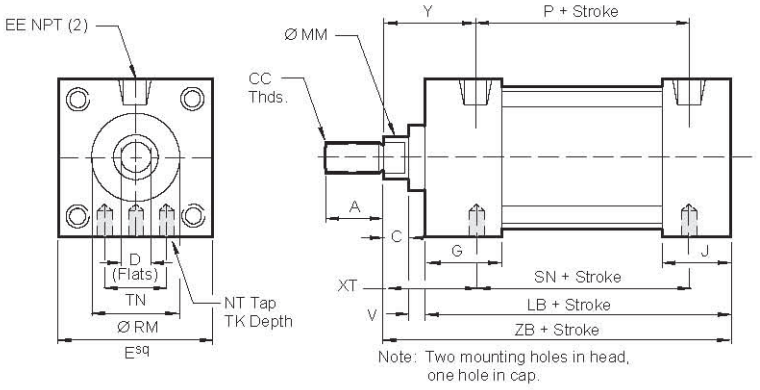
Code 01 Bolt Thru Mounts
(ANSI MS8)



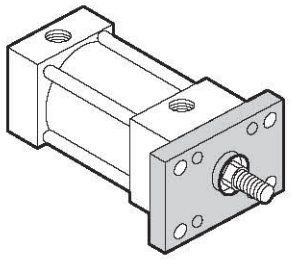


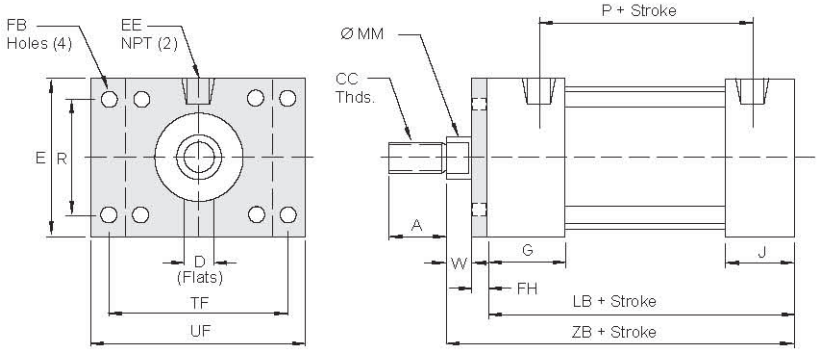
Code 02 Tapped Mounts
(ANSI MS9)





Code 07 Head Rectangular Flange Mounts (ANSI MF1)



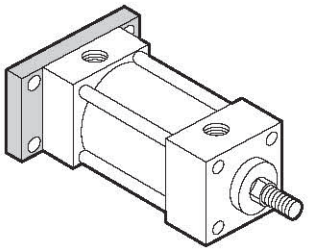


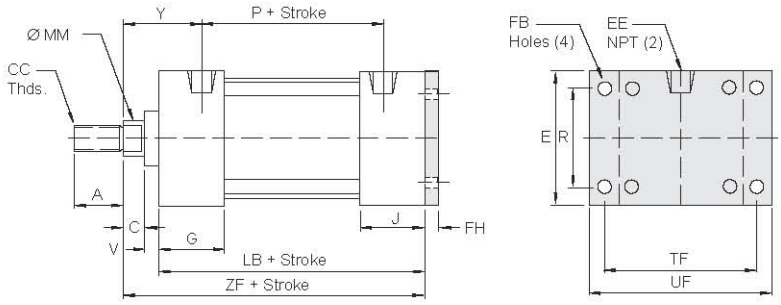
Series VP/VN 3/4 & 1–1/8 inch Bore Cylinders and Mounts

DIMENSION		01 BOLT THRU MOUNTS (MS8) 3/4"	01 BOLT THRU MOUNTS (MS8) 1–1/8"	02 SIDE TAPPED MOUNTS (MS4) 3/4"	02 SIDE TAPPED MOUNTS (MS4) 1–1/8"	07 HEAD RECT. FLANGE MOUNTS (MF1) 3/4"	07 HEAD RECT. FLANGE MOUNTS (MF1) 1–1/8"
Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	-	.500 (12.70)	-	.500 (12.70)	-	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	-	.750 (19.05)	-	.750 (19.05)	-	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CC	Std.	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24
	O.S.	-	1/2 - 20	-	1/2 - 20	-	1/2 - 20
D	Std.	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)
	O.S.	-	.437 (11.10)	-	.437 (11.10)	-	.437 (11.10)
DB		.172 (4.37)	.203 (5.16)	-	-	-	-
DN		.625 (15.88)	1.000 (25.40)	-	-	-	-
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)	-	-
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	-	-
FB		-	-	-	-	.219 (5.56)	.219 (5.56)
FH		-	-	-	-	.250 (6.35)	.250 (6.35)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
H		.687 (17.45)	.625 (15.88)	-	-	-	-
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
K		.375 (9.53)	.375 (9.53)	-	-	-	-
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
MM	Std.	.307 (7.80)	.307 (7.80)	.307 (7.80)	.307 (7.80)	.307 (7.80)	.307 (7.80)
	O.S.	-	.495 (12.57)	-	.495 (12.57)	-	.495 (12.57)
NT		-	-	8 - 32	10 - 32	-	-
P		-	-	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
R		-	-	-	-	.500 (12.70)	1.000 (25.40)
RM	Std.	.562 (14.27)	.750 (19.05)	.562 (14.27)	.750 (19.05)	-	-
	O.S.	-	1.000 (25.40)	-	1.000 (25.40)	-	-
SB		#8	#10	-	-	-	-
SN		-	-	1.812 (46.02)	1.750 (44.45)	-	-
TB		.281 (7.14)	.328 (8.33)	-	-	-	-
TF		-	-	-	-	1.500 (38.10)	2.000 (56.80)
TK		-	-	.187 (4.87)	.250 (6.35)	-	-
TN		-	-	.625 (15.88)	1.000 (25.40)	-	-
UF		-	-	-	-	2.000 (56.80)	2.500 (63.50)
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XT		-	-	.562 (14.27)	.625 (15.88)	-	-
W		-	-	-	-	.125 (3.18)	.125 (3.18)
XB		.562 (14.27)	.625 (15.88)	-	-	-	-
Y		-	-	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)
ZB		-	-	2.625 (66.68)	2.625 (66.68)	2.625 (66.68)	2.625 (66.68)

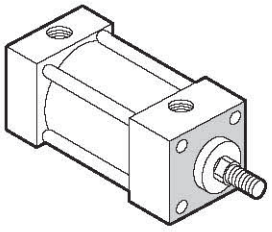
All dimensions in inches (mm)

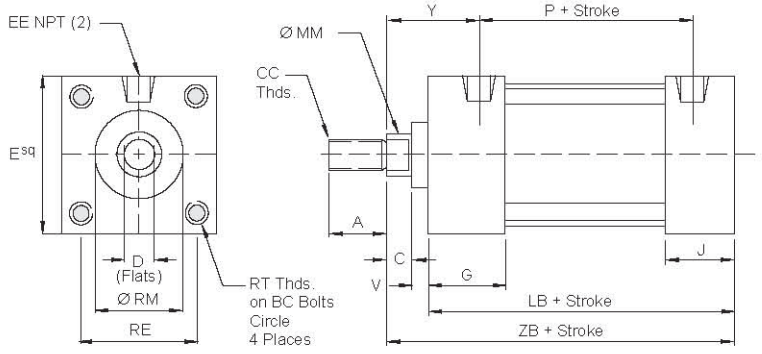
Code 12 Cap Rectangular Flange Mounts (ANSI MF2)



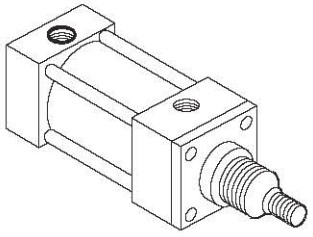


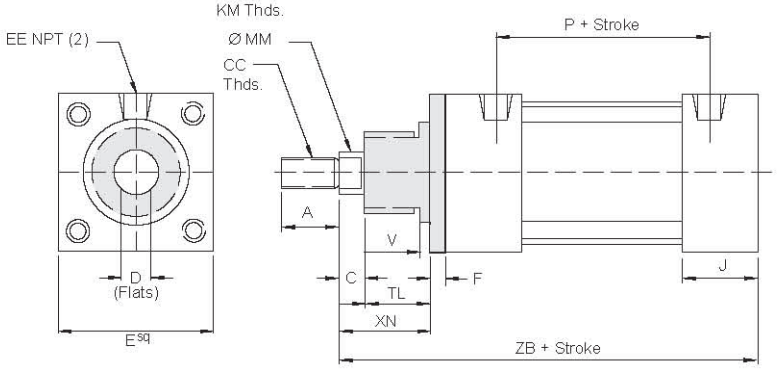
Code 18 Head Tapped Face Mounts (ANSI MR1)





Code 20 Threaded Nose Mounts (ANSI MNR1)



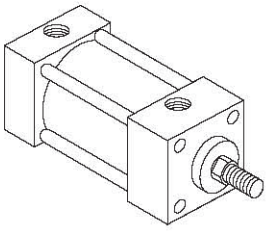


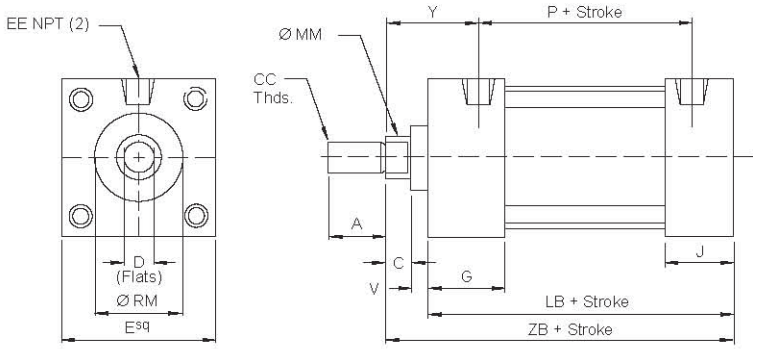
DIMENSION		12 CAP. RECT. FLANGE MOUNTS (MF2)		18 HEAD TAPPED FACE MOUNTS (MR1)		20 THREADED NOSE MOUNTS (MNR1)	
		3/4"	1–1/8"	3/4"	1–1/8"	3/4"	1–1/8"
Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	-	.500 (12.70)	-	.500 (12.70)	-	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	-	.750 (19.05)	-	.750 (19.05)	-	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CC	Std.	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24
	O.S.	-	1/2 - 20	-	1/2 - 20	-	1/2 - 20
D	Std.	-	-	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)
	O.S.	-	-	-	.437 (11.10)	-	.437 (11.10)
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
F		-	-	-	-	.250 (6.35)	.250 (6.35)
FB		.219 (5.56)	.219 (5.56)	-	-	-	-
FH		.250 (6.35)	.250 (6.35)	-	-	-	-
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
KM		-	-	-	-	5/8 - 18	1 - 14
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
MM	Std.	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)
	O.S.	-	.495 (12.57)	-	.495 (12.57)	-	.495 (12.57)
P		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
R		.500 (12.70)	1.000 (25.40)	-	-	-	-
RE		.750 (19.05)	1.125 (28.58)	.750 (19.05)	1.125 (28.58)	-	-
RM	Std.	-	-	.625 (15.88)	.750 (19.05)	.625 (15.88)	1.062 (26.97)
	O.S.	-	-	-	-	-	-
RT		-	-	8 - 32	10 - 32	-	-
TF		1.500 (38.10)	2.000 (50.80)	-	-	-	-
TL		-	-	-	-	.625 (15.88)	.875 (22.23)
UF		2.000 (50.80)	2.500 (63.50)	-	-	-	-
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XN		-	-	-	-	.875 (22.23)	1.125 (28.58)
Y		.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)
ZB		-	-	2.625 (66.68)	2.625 (66.68)	3.375 (85.73)	3.625 (92.08)
ZF		2.875 (73.03)	2.875 (73.03)	-	-	-	-

All dimensions in inches (mm)

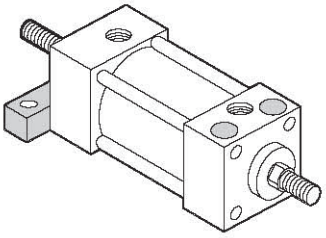
Code 24 No Mounts

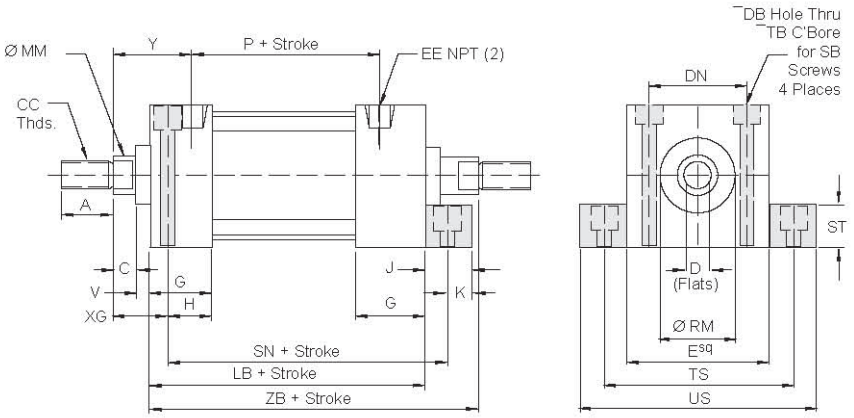
(ANSI MX0)





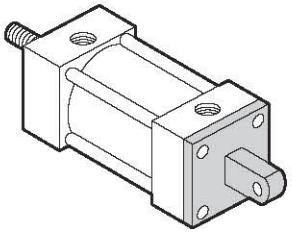
Code 25 Double Rod, Bolt Thru Mounts

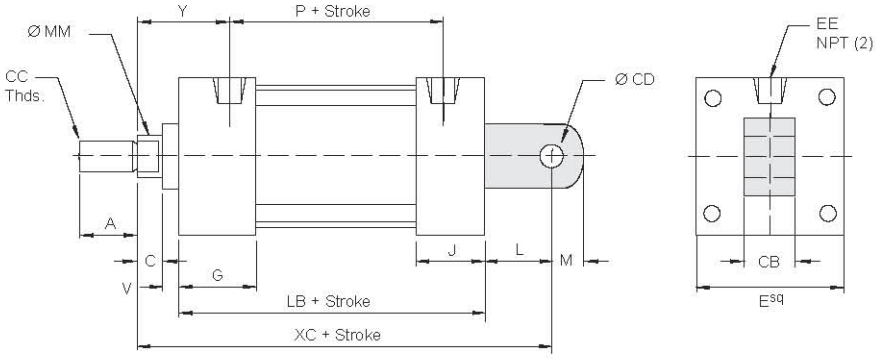




Code 47 Fixed Eye Mounts

(ANSI MP3)



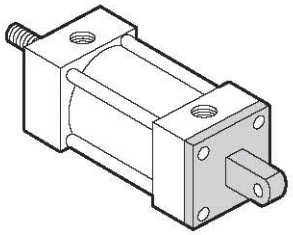


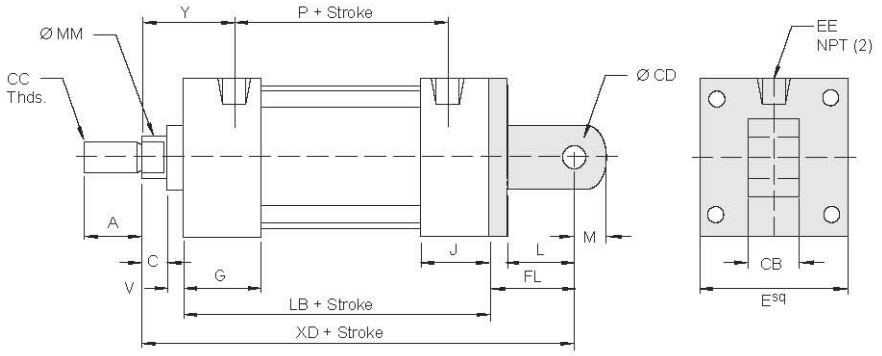
Series VP/VN 3/4 & 1–1/8 inch Bore Cylinders and Mounts

DIMENSION		24 NO MOUNT (MX0)		25 DOUBLE ROD BOLTTHRU MOUNTS (MS8)		47 FIXED EYE MOUNTS (MP3)	
		3/4"	1–1/8"	3/4"	1–1/8"	3/4"	1–1/8"
Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	-	.500 (12.70)	-	.500 (12.70)	-	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	-	.750 (19.05)	-	.750 (19.05)	-	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CB		-	-	-	-	.250 (6.35)	.375 (9.53)
CC	Std.	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24
	O.S.	-	1/2 - 20	-	1/2 - 20	-	1/2 - 20
CD		-	-	-	-	.250 (6.35)	.375 (9.53)
D	Std.	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)	.250 (6.35)	-
	O.S.	-	.437 (11.10)	-	.437 (11.10)	-	-
DB		-	-	.172 (4.37)	.203 (5.16)	-	-
DN		-	-	.625 (15.88)	1.000 (25.40)	-	-
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
H		-	-	.687 (17.45)	.625 (15.88)	-	-
J		.625 (15.88)	.625 (15.88)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
K		-	-	.250 (6.35)	.250 (6.35)	-	-
L		-	-	-	-	.437 (11.10)	.437 (11.10)
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
M		-	-	-	-	.250 (6.53)	.375 (9.53)
MM	Std.	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)
	O.S.	-	.495 (12.57)	-	.495 (12.57)	-	.495 (12.57)
P		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
RM	Std.	.562 (14.27)	.750 (19.05)	.625 (15.88)	.750 (19.05)	-	-
	O.S.	-	1.000 (25.40)	-	1.000 (25.40)	-	-
SB		-	-	#8	#10	-	-
SD		-	-	2.562 (65.07)	2.500 (63.50)	-	-
ST		-	-	.375 (9.53)	.375 (9.53)	-	-
TB		-	-	.281 (7.14)	.328 (8.33)	-	-
TS		-	-	1.375 (34.93)	1.875 (47.63)	-	-
US		-	-	1.750 (44.45)	2.250 (57.15)	-	-
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XC		-	-	-	-	3.062 (77.77))	3.062 (77.77))
XG		-	-	.562 (14.27)	.625 (15.88)	-	-
Y		.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)
ZB		2.625 (66.68)	2.625 (66.68)	3.250 (82.55)	3.250 (82.55)	-	-

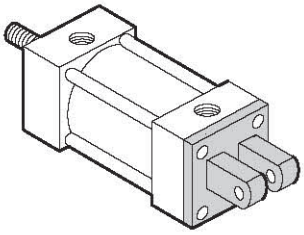
All dimensions in inches (mm)

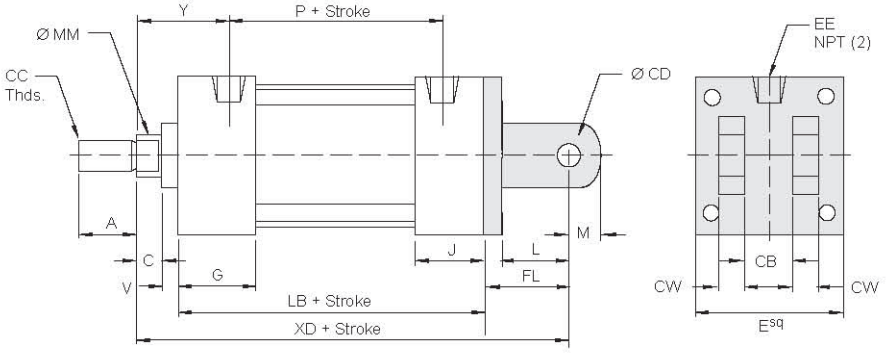
Code 48 Detachable Eye Mounts (ANSI MP4)





Code 50 Detachable Clevis Mounts (ANSI MP2)





DIMENSION		48 DETACHABLE EYE MOUNTS (MP4) 3/4"	48 DETACHABLE EYE MOUNTS (MP4) 1–1/8"	50 DETACHABLE CLEVIS MOUNTS (MP2) 3/4"	50 DETACHABLE CLEVIS MOUNTS (MP2) 1–1/8"
Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	-	.500 (12.70)	-	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	-	.750 (19.05)	-	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CB		.250 (6.35)	.375 (9.53)	.250 (6.35)	.375 (9.53)
CC	Std.	1/4 - 28	3/8 - 24	1/4 - 28	3/8 - 24
	O.S.	-	1/2 - 20	-	1/2 - 20
CD		.250 (6.35)	.375 (9.53)	.250 (6.35)	.375 (9.53)
D	Std.	.250 (6.35)	.312 (7.92)	-	-
	O.S.	-	.437 (11.10)	-	-
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
FL		.937 (23.80)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
L		.437 (11.10)	.625 (15.88)	.625 (15.88)	.625 (15.88)
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
M		.250 (6.35)	.375 (9.53)	.250 (6.35)	.375 (9.53)
MM	Std.	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)
	O.S.	-	.495 (12.57)	-	.495 (12.57)
P		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XD		3.562 (90.47)	3.750 (95.25)	3.750 (95.25)	3.750 (95.25)
Y		.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)

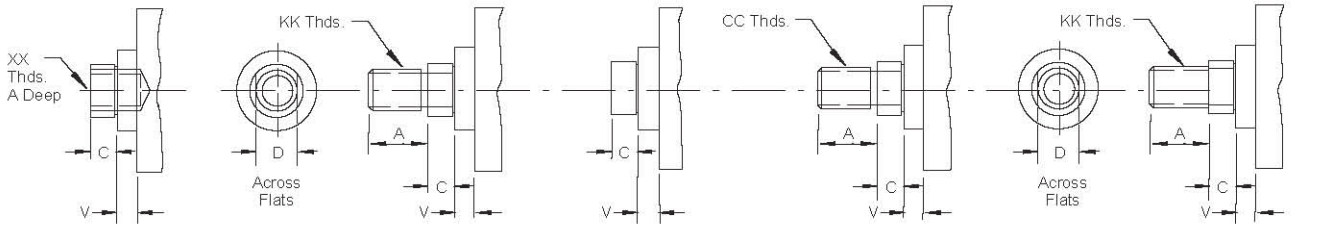
All dimensions in inches (mm)

Series VP/VN Rod Ends for 3/4 & 1–1/8 inch Bore Cylinders

Rod End Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

Three different inch rod end configurations are available. If a custom design is required, contact your local Eaton sales engineer, and define your requirements.



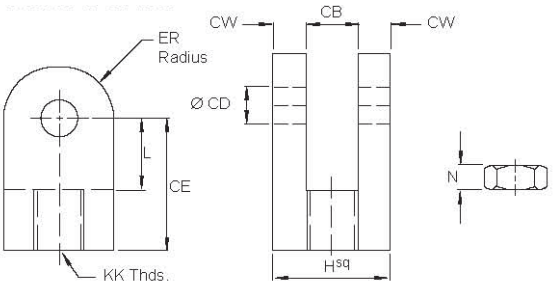
Type 2 Optional Female | Type 5 Standard Male | Type 6 Optional Plain | Type 9 Optional Male | Type S Optional Studded

DIMENSION		STANDARD & OPTIONAL ROD ENDS 3/4"	1–1/8"
Rod	Std.	.312 (7.92)	.375 (9.53)
	O.S.	-	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)
	O.S.	-	.750 (19.05)
C		.250 (6.35)	.250 (6.35)
CC	Std.	5/16 - 24	3/8 - 24
	O.S.	-	1/2 - 20
D	Std.	.250 (6.35)	.312 (7.92)
	O.S.	-	.437 (11.10)
KK	Std.	1/4 - 28	5/16 - 24
	O.S.	-	7/16 - 20
V		.125 (3.18)	.125 (3.18)
XX	Std.	10 - 32	1/4 - 28
	O.S.	-	3/8 - 24

All dimensions in inches (mm)

Series VP/VN Accessories for 3/4 & 1–1/8 inch Bore Cylinders

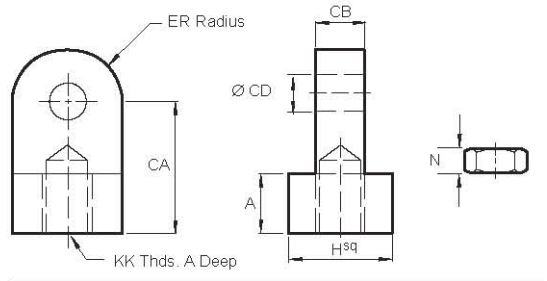
Rod Clevis



	3/4 VP62004A*	VP62004B*	1-1/8 VP62006A*	VP62006B*
CB	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
CD	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
CE	.812 (20.60)	.812 (20.60)	.875 (22.23)	.875 (22.23)
CW	.125 (3.18)	.125 (3.18)	.187 (4.75)	.187 (4.75)
ER	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
H	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
KK	1/4 – 28	5/16 – 24	3/8 – 24	1/2 – 20
L	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)
N	.156 (3.96)	.187 (4.75)	.219 (5.56)	.312 (7.92)

*Includes Jam Nut

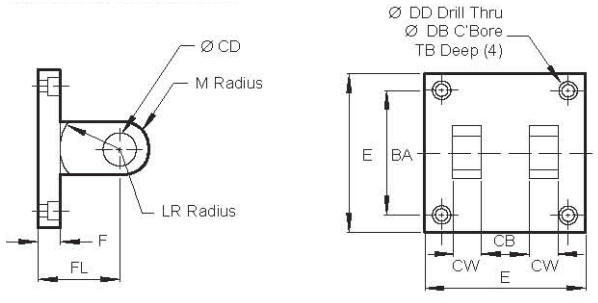
Rod Eye



	3/4 VP60004A*	VP60004B*	1-1/8 VP60006A*	VP60006B*
A	.312 (7.92)	.312 (7.92)	.437 (11.10)	.437 (11.10)
CA	.750 (19.05)	.750 (19.05)	.875 (22.23)	.875 (22.23)
CB	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
CD	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
ER	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
H	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
KK	1/4 – 28	5/16 – 24	3/8 – 24	1/2 – 20
N	.156 (3.96)	.187 (4.75)	.219 (5.56)	.312 (7.92)

*Includes Jam Nut

Clevis Bracket

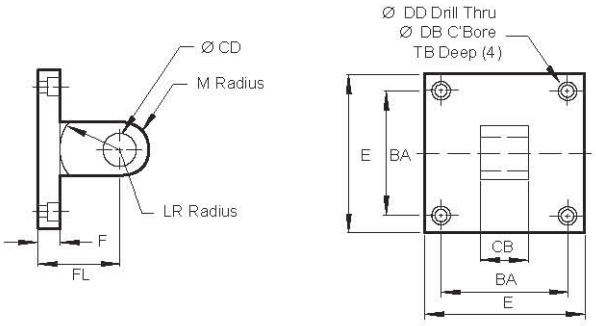


	3/4 VP61004A	1-1/8 VP61006A
BA	.750 (19.05)	1.125 (28.58)
CB	.250 (6.35)	.375 (9.53)
CD	.250 (6.35)	.375 (9.53)
CW	.250 (6.35)	.250 (6.35)
DB	.250 (6.35)	.328 (8.33)
DD	.156 (3.96)	.203 (5.16)
E	1.000 (25.40)	1.500 (38.10)
F	.500 (12.70)	.500 (12.70)
FL	1.125 (28.58)	1.125 (28.58)
LR	.437 (11.10)	.625 (15.88)
M	.250 (6.35)	.375 (9.53)
TB	.125 (3.18)	.250 (6.53)

All dimensions in inches (mm)

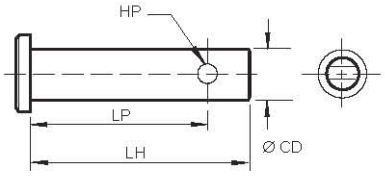
Series VP/VN Accessories for 3/4 & 1–1/8 inch Bore Cylinders

Eye Bracket



	3/4 VP78004A	1-1/8 VP78006A
BA	.750 (19.05)	1.125 (28.58)
CB	.250 (6.35)	.375 (9.53)
CD	.250 (6.35)	.375 (9.53)
DB	.250 (6.35)	.328 (8.33)
DD	.156 (3.96)	.203 (5.16)
E	1.000 (25.40)	1.500 (38.10)
F	.500 (12.70)	.500 (12.70)
FL	.937 (23.80)	1.125 (28.58)
LR	.437 (11.10)	.625 (15.88)
M	.250 (6.35)	.375 (9.53)
TB	.125 (3.18)	.250 (6.53)

Clevis Pin



	3/4 VP83004B	VP83004C	1-1/8 VP83006B	VP83006C
CD	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
HP	.094 (2.39)	.094 (2.39)	.156 (3.96)	.156 (3.96)
LH	.750 (19.05)	1.000 (25.40)	1.094 (27.79)	1.250 (31.75)
LP	.656 (16.66)	.906 (23.01)	.937 (23.80)	1.032 (26.21)
Use	VP62004A	VP78004A	VP62006A	VP78006A
w/	VP620048	VP61004A	VP62006B	VP61006A
	–	VP60004A	–	VP60006A

All dimensions in inches (mm)

Series VP/VN Switches for 3/4 thru 8 inch Bore Cylinders

Eaton utilizes a magnetically operated, non–contact sensing system consisting of a magnet in the piston, and a sensing switch clamped to the cylinder tie rod.

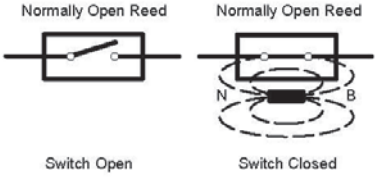
One or more switches may be mounted to provide an indication of piston position.

Switches use vinyl molded cable, and are supplied with adjustable mounting brackets allowing the switches to be securely positioned anywhere along the range of piston travel.

LED indicator lights facilitate installation and troubleshooting.

Reed Switch Working Principle

Reed switch sensors contain hermetically sealed reed elements (mechanical contacts) which are open in their normal state. When a magnetic field moves within proximity of the switch, magnetism is induced into the leads and forces the contacts to close.



Application Recommendations and Precautions

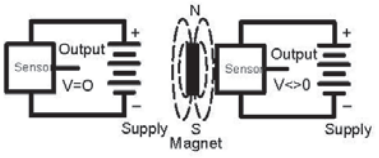
To provide maximum reliability:

1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit.

   Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.
4. Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch Model PS7–24 whenever capacitive loading may occur.

Hall Effect/Magnetoresistive Working Principle

The solid state (no moving parts) magnetoresistive sensor responds to a parallel magnetic pole by providing a digital signal to the output control circuit. this technique enables the sensing of weak magnetic fields, with no limit to the maximum strength of the magnetic field.



In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to:

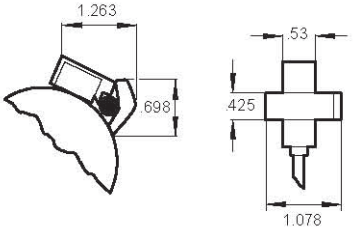
(1) strong magnetic fields,
(2) extreme temperature, and
(3) excessive ferrous filing or chip buildup.

Improper wiring may damage or destroy the switch. The wiring diagram, along with the listed power ratings, must be carefully observed before connecting power to the switch.

Lower power switches are designed for signaling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.

Switch and Mounting Bracket Dimensions

PS8-2 Series

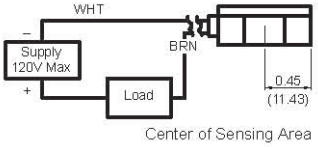


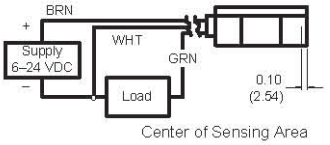
Series VP/VN Specifications: 3/4 thru 2–1/2 inch Bores

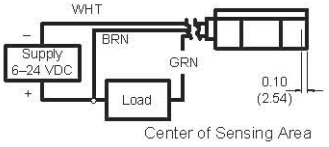
Metal Oxide Varsitor surge Suppression. Note: All PS7 and PS Series Switches are supplied with 9 foot leads.

Switch Model	PS8–2–04 Reed	PS8–2–31 Hall	PS8–2–32 Hall
Bore Sizes	3/4I thru 2–1/2I	3/4I thru 2–1/2I	3/4I thru 2–1/2I
Switch Type	Reed Switch *MOV & Light	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking PNP
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5–120 VDC/VAC 50/60 Hz	6–24 VDC	6–24 VDC
Switching Current	.5 Amp Max .005 Amp Min	.5 Amp Max	.5 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
Temperature Range	–22_F to +176_F	–22_F to +176_F	–22_F to +176_F

Wiring Diagrams

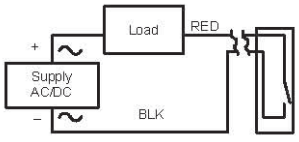


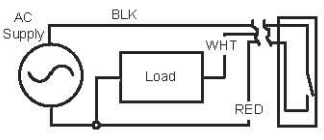


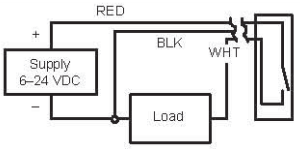


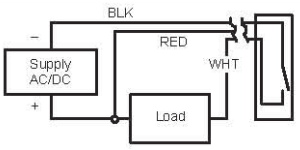
Specifications: 2 thru 8 inch Bores

PS7–04 Reed	PS7–24 Reed	PS7–31 Hall	PS7–32 Hall
2I thru 8I	2I thru 8I	2I thru 8I	2I thru 8I
Reed Switch *MOV & Light	Reed Switch *MOV & Light, 3 Wire	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking PNP
Normally Open	Normally Open	Normally Open	Normally Open
5–240 VDC/VAC 50/60 Hz	24–240 VAC 50/60 Hz	6–24 VAC	6–24 VAC
1 Amp Max	4 Amp Max 50 Amp Inrush	1 Amp Max	1 Amp Max
30 Watts Max	100 Watts Max	24 Watts Max	24 Watts Max
3 Volts	N/A	.5 Volts	.5 Volts
85 Gauss	85 Gauss	85 Gauss	85 Gauss
Parallel	Parallel	Parallel	Parallel
NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
–22_F to +176_F	–22_F to +176_F	–22_F to +176_F	–22_F to +176_F



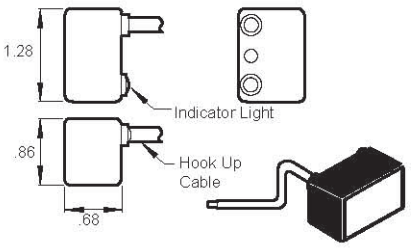


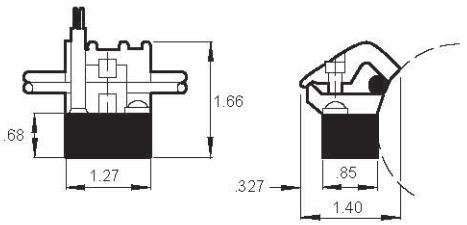


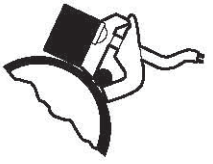


Note: For 8I bore add 9 to part number. Example: PS7–9–04

PS7 Series







Series VP/VN Technical Information

Operating Temperatures:

A Seal Code –40_F to 200_F (–40_C to 93_C)

T Seal Code –20_F to 400_F (–29_C to 204_C)

Operating Pressure:

250 psig air (17.2 bar)

400 psig hydraulic (27.6 bar)

Bore Sizes: 3/4", 1–1/8", 1–1/2", 2", 2–1/2", 3–1/4", 4", 5", 6", 8"

Note: 3/4" and 1–1/8" bores are not rated for hydraulic service.

Supply:

Filtered compressed air to 250 psi Petroleum based hydraulic fluid to 400 psi

Lubrication:

None required

Eaton's Vickers™ Pneumatic Cylinders are rated for "no lube added" service. All internal components are lubricated at time of assembly with a Teflon® based grease.

Series VP Materials:

Head and End Caps: anodized aluminum

Body: aluminum, clear anodized O.D., hard coat anodized I.D.

Rod: hard chrome plated steel

Piston: solid aluminum alloy

Rod Bearing: cast iron, Teflon® coated

Seals: urethane rod seal and wiper, nitrile piston seals

Tie Rods: steel

Alternate Series VN Materials:

Body: stainless steel

Rod: stainless steel

Rod Bearing: stainless steel

Tie Rods: stainless steel

Side Loading:

Cylinders are specifically designed to push and pull. Side loading of the piston rod should be avoided to ensure maximum operating performance and life.

Care should be taken during installation to properly align the load to be moved with the center line of the cylinder. The use of a rod alignment coupler (see page 45) is strongly recommended whenever possible.

Cylinder Weights

In pounds (kilograms)

				MOUNTING CODE							
BORE INCH	**(MM)**	**ROD INCH**	**(MM)**	**02, 24, 18**		**07**		**12, 13**		**23**	
11/2"	(38.10)	5/8"	(15.88)	1.9	(.86)	2.6	(1.18)	2.7	(.23)	2.1	(.95)
2"	(50.80)	5/8"	(15.88)	2.8	(1.27)	3.9	(.77)	4.0	(1.81)	3.1	(1.41)
		1"	(25.40)	3.4	(1.54)	4.4	(2.00)	4.6	(2.09)	3.7	(1.68)
21/2"	(63.50)	5/8"	(15.88)	3.9	(.77)	5.3	(2.40)	5.5	(2.49)	4.1	(1.86)
		1"	(25.40)	4.5	(2.04)	5.9	(2.68)	6.1	(2.77)	4.7	(2.13)
31/4"	(82.55)	1"	(25.40)	7.3	(3.31)	10.8	(4.90)	11.1	(5.03)	7.7	(3.49)
		13/8"	(34.93)	8.2	(3.72)	11.5	(5.22)	12.1	(5.49)	8.7	(3.95)
4"	(101.60)	1"	(25.40)	9.8	(4.45)	14.8	(6.71)	15.1	(6.85)	10.2	(4.63)
		13/8"	(34.93)	10.8	(4.90)	15.5	(7.03)	16.1	(7.30)	11.2	(5.08)
5"	(127.00)	1"	(25.40)	15.1	(6.85)	22.7	(10.30)	23.1	(10.48)	16.1	(7.30)
		13/8"	(34.93)	16.2	(7.35)	23.5	(10.66)	24.1	(10.93)	17.2	(7.80)
6"	(152.40)	13/8"	(34.93)	23.5	(16.19)	35.6	(16.15)	36.3	(16.47)	24.5	(11.11)
		13/4"	(44.45)	24.8	(11.27)	36.9	(16.77)	37.6	(17.09)	25.8	(11.73)
7"	(177.80)	13/8"	(34.93)	32.1	(14.56)	32.1	(14.56)	32.1	(14.56)	33.4	(15.15)
		13/4"	(44.45)	33.4	(15.18)	33.4	(15.18)	33.4	(15.18)	34.7	(15.77)
8"	(203.20)	13/8"	(34.93)	40.0	(18.14)	40.0	(18.14)	40.0	(18.14)	41.3	(18.73)
		13/4"	(44.45)	47.3	(21.50)	41.3	(18.77)	41.3	(18.77)	42.6	(19.36)

All dimensions in inches (mm). All weights in pounds (kilograms).

Listed are the average breakaway pressures in psi for all Series VN/VP Cylinders.

If your application requires a lower breakaway pressure than indicated for a particular bore size, consult the factory.

Breakaway Pressures in PSI (bar)

BORE	A SEALS		T SEALS	
	EXTEND	RETRACT	EXTEND	RETRACT
3/4"	9 (.62)	10 (.69)	5 (.35)	6 (.41)
11/8"	6 (.41)	7 (.48)	3 (.21)	4 (.28)
11/2", 2", 21/2"	6 (.41)	7 (.48)	3 (.21)	4 (.28)
31/4", 4"	4 (.28)	5 (.35)	2 (.14)	3 (.21)
5", 6", 8"	3 (.21)	4 (.28)	1 (.07)	2 (.14)

Note: Breakaway pressures were established with the cylinders mounted horizontally and no load on the piston rod.

MOUNTING CODE																ADD PER INCH OF STROKE	
01, 16, 17		45		10		03		08, 13, 50, 47		15, 48, 11							
2.5	(1.13)	2.3	(1.04)	2.8	(1.27)	2.5	(1.13)	3.0	(1.36)	2.8	(1.27)	0.18	(.08)				
3.5	(1.59)	3.3	(1.50)	4.0	(1.81)	3.8	(1.72)	4.2	(1.91)	3.9	(1.77)	0.21	(.10)				
4.1	(1.86)	3.9	(1.77)	4.6	(2.09)	4.4	(2.00)	4.8	(2.18)	4.5	(2.04)	0.35	(.16)				
4.6	(2.09)	4.4	(2.00)	5.3	(2.40)	5.3	(2.40)	5.5	(2.49)	5.3	(2.40)	0.23	(.10)				
5.2	(2.36)	5.1	(2.31)	5.9	(2.68)	6.0	(2.72)	6.1	(2.77)	5.9	(2.68)	0.38	(.17)				
8.9	(4.04)	8.2	(3.72)	11.1	(5.03)	9.7	(4.40)	11.8	(5.35)	11.4	(5.17)	0.42	(.19)				
9.9	(4.50)	9.2	(4.17)	12.1	(5.49)	10.7	(4.85)	12.8	(5.80)	12.4	(5.62)	0.63	(.29)				
11.5	(5.22)	10.9	(4.94)	14.8	(6.71)	13.3	(6.03)	15.5	(7.03)	15.2	(6.89)	0.45	(.20)				
12.5	(5.67)	11.9	(5.40)	15.8	(7.17)	14.3	(6.49)	16.5	(7.48)	16.2	(7.35)	0.66	(.30)				
18.7	(8.48)	17.6	(7.98)	22.2	(10.07)	20.8	(9.43)	22.8	(10.34)	22.5	(10.21)	0.51	(.23)				
19.7	(8.94)	18.6	(8.44)	23.2	(10.52)	21.9	(9.93)	23.9	(10.84)	23.5	(10.70)	0.73	(.33)				
27.3	(12.38)	26.6	(12.07)	35.7	(10.66)	32.1	(14.56)	37.0	(16.78)	36.3	(16.47)	0.77	(.35)				
28.3	(12.86)	27.9	(12.68)	35.2	(15.97)	33.4	(15.18)	38.3	(17.41)	37.6	(17.09)	1.03	(.47)				
33.5	(15.20)	36.8	(16.69)	36.5	(16.59)	32.1	(14.56)	48.9	(22.18)	48.2	(21.86)	1.00	(.45)				
34.8	(15.82)	38.1	(17.32)	37.0	(16.82)	33.4	(15.18)	50.2	(22.82)	49.5	(22.50)	1.26	(.57)				
41.4	(18.78)	45.7	(20.73)	43.0	(19.50)	40.0	(18.14)	60.5	(27.44)	59.7	(27.08)	1.06	(.48)				
42.7	(19.41)	47.0	(21.36)	44.3	(20.14)	41.3	(18.77)	61.8	(28.09)	61.0	(27.73)	1.32	(.60)				

All dimensions in inches (mm). All weights in pounds (kilograms).

Piston Rod Diameter Selection:

Applications requiring long extend (push) strokes may require oversize piston rod diameters to prevent buckling. To determine the correct rod diameter for your application, follow these simple steps:

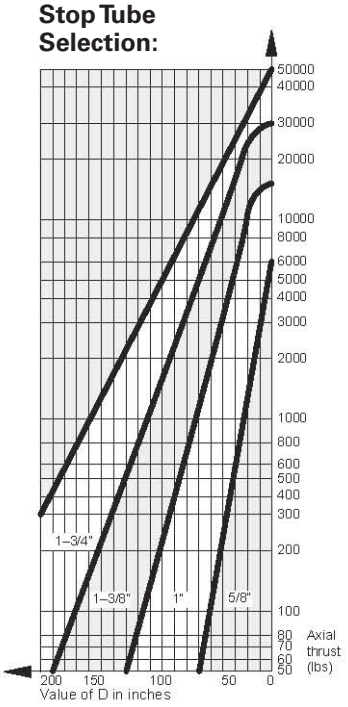
1. Select the force from the **Cylinder Force and Volume Chart** that is required for your application.

   Force = Piston Surface Area x Operating Pressure
2. From the **Cylinder Mounting Diagrams** select the mounting style being used.
3. With the piston rod fully extended, calculate the value of D (in inches) using the formula shown or the cylinder mounting diagram selected in step #2.
4. Locate the value of D (in inches) at the bottom of the **Selection Chart**. Enter the chart at this point and move vertically upward until intersecting with the horizontal line representing the required thrust which was selected in step #1. The band within which these lines intersect represents the minimum recommended piston rod diameter.

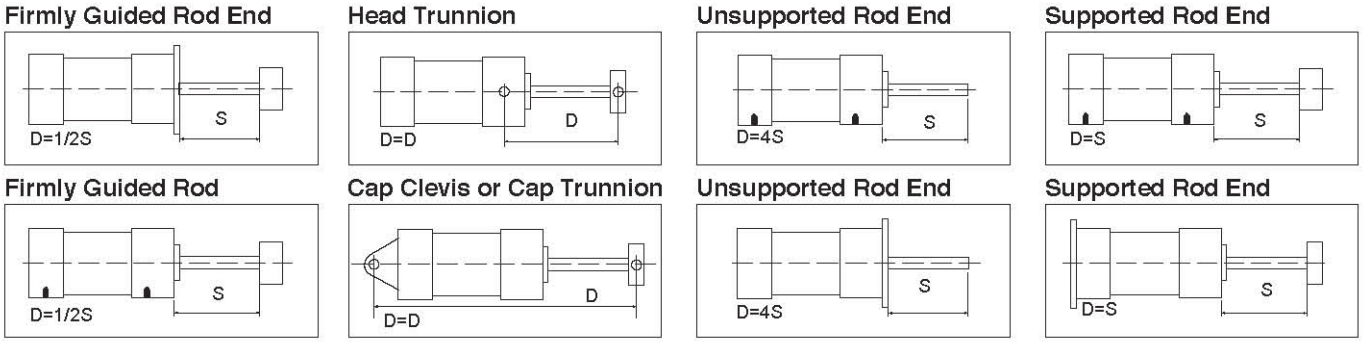
Stop Tube Selection:

Stop tubes enhance the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension. When the value of D (calculated from the piston rod diameter selection instructions above) is less than 40", a stop tube is not required. However, if D is 40" or more, 1" of stop tube is recommended for every 10" (or fraction thereof) over 40".

Stop Tube Selection:



Cylinder Mounting Diagrams



Stop Tubes

As the stroke of a cylinder increases, the resultant loads on the piston rod become greater. To keep these bearing loads from exceeding design limitations and to obtain optimum life from a cylinder, stop tubes should be specified according to the following procedure:

SPECIFY ONE INCH OF STOP TUBE FOR EACH 10 INCHES (OR FRACTION THEREOF) OF STROKE IN EXCESS OF THE MAXIMUM LISTED IN THE FOLLOWING TABLE.

Maximum Stroke Permissible Without Stop Tube

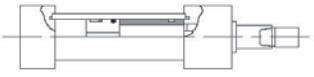
BORE DIAMETER	PIVOT MOUNT CYLINDER (CLEVIS & TRUNNION)	RIGID MOUNT CYLINDER (WITHOUT ROD SUPPORT)	RIGID MOUNT CYLINDER (WITH ROD SUPPORT)
1-1/2" & 2"	24"	30"	48"
2-1/2" to 4"	30"	38"	48"
5" to 8"	36"	40"	48"

Stop Tube Design

Three typical stop tube designs are illustrated below.

Design A

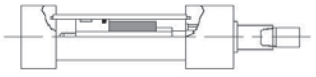
Used for cylinders non-cushioned on the rod.



Stop Tube

Design B

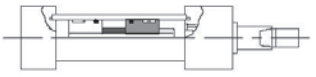
Used for cushioned hydraulic cylinders.



Stop Spacer

Design C

The best choice for a cylinder with an exceptionally long stop tube requirement. Note that the piston's effective bearing area is doubled. In addition to gaining the normal increased minimum distance between bearing points.



Double Piston with Spacer

Cylinder Force and Volume Charts

Extend Forces in pounds (newtons)

BORE	PISTON AREA IN² (CM²)		PSI (BAR) 40 (3)		60 (4)		80 (6)		100 (7)		150 (10)		200 (14)		VOL. CU. FT. (CM³) DISPLACEMENT PER STROKE INCH	
1-1/2"	1.77	(11.40)	71	(315)	106	(472)	142	(629)	177	(786)	266	(1179)	353	(1570)	.00102	(29)
2"	3.14	(20.27)	126	(559)	189	(839)	251	(1119)	314	(1398)	471	(2097)	628	(2793)	.00182	(52)
2-1/2"	4.91	(31.67)	196	(874)	295	(1311)	393	(1748)	491	(2185)	737	(3277)	982	(4368)	.00284	(80)
3-1/4"	8.30	(53.32)	332	(1477)	498	(2215)	664	(2953)	830	(3692)	1245	(5538)	1659	(7379)	.00480	(136)
4"	12.57	(81.07)	503	(2237)	754	(3355)	1005	(4473)	1257	(5592)	1886	(8388)	2513	(11178)	.00727	(206)
5"	19.64	(126.71)	785	(3491)	1178	(5240)	1571	(6988)	1964	(8736)	2946	(13104)	3928	(17472)	.01137	(322)
6"	28.27	(182.39)	1130	(5026)	1696	(7544)	2262	(10061)	2827	(12574)	4240	(18860)	5654	(25149)	.01837	(520)
8"	50.26	(324.26)	2010	(8940)	3015	(13411)	4020	(17881)	5026	(22356)	7539	(33533)	10052	(44711)	.02227	(631)

Deduct these Forces for Retract Strokes

BORE	PISTON AREA IN² (CM²)		PSI (BAR) 40 (3)		60 (4)		80 (6)		100 (7)		150 (10)		200 (14)		VOL. CU. FT. (CM³) DISPLACEMENT PER STROKE INCH	
5/8"	.307	(1.98)	12	(53)	18	(80)	25	(111)	31	(138)	46	(205)	61	(271)	.00018	(5)
1"	.785	(5.06)	31	(138)	47	(209)	63	(280)	70	(351)	118	(525)	157	(698)	.00045	(13)
1-3/8"	1.485	(9.58)	59	(262)	89	(396)	119	(529)	118	(525)	222	(997)	297	(1321)	.00086	(24)
1-3/4"	2.404	(15.51)	95	(423)	144	(641)	192	(854)	240	(1068)	360	(1601)	480	(2135)	.00139	(39)

Series ML Cylinders >125mm Bore

A. Tie Rod Nuts
Heavy duty steel (zinc plated) sleeve nuts.

B. Cushioning
Heavy duty cushioning with fine adjustment is standard.

C. Piston Rod
High performance, high-strength, ground and polished 303 stainless steel, hard-chrome plated for excellent protection against wear.

D. Cushion Sleeves
Smooth operating polyamide cushion sleeves.

E. Tube
Precision aluminum tube ideally suited for air service. Anodized corrosion resistant surface.

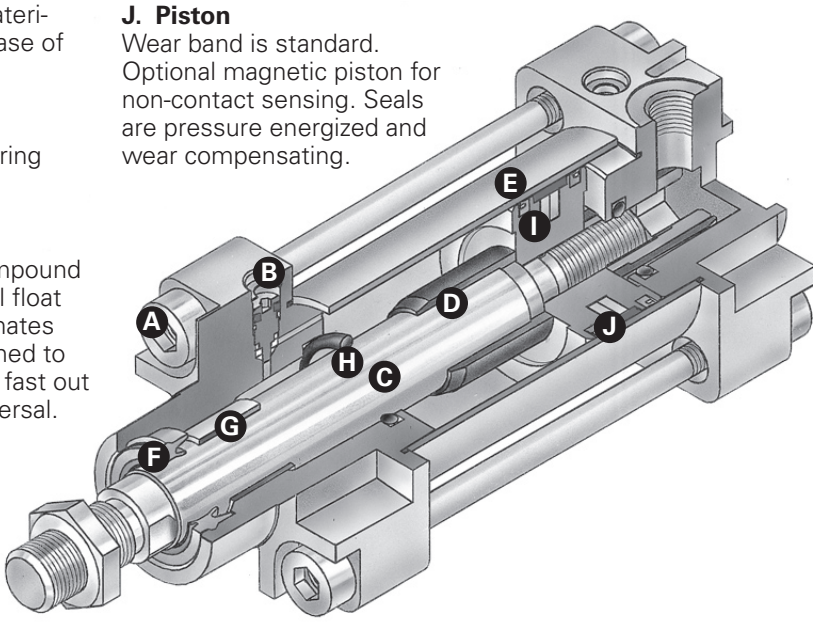
F. Rod Seal Wiper
The combination seal/wiper design is molded from tough abrasion resistant materials for long life and ease of maintenance.

G. Bearing
Heavy duty long wearing nylon rod bearing.

H. Cushion Seal
One piece, nitrile compound seal. Linear and radial float of cushion seal eliminates misalignment. Designed to provide exceptionally fast out of cushion stroke reversal.

I. Piston Seals
Durable lip type

J. Piston
Wear band is standard. Optional magnetic piston for non-contact sensing. Seals are pressure energized and wear compensating.



Series ML Cylinders <125mm Bore

A. Tie Rod Nuts
Heavy duty steel (zinc plated) sleeve nuts.

B. Cushioning
Heavy duty cushioning with fine adjustment is standard.

C. Piston Rod
High performance, high-strength, ground and polished 303 stainless steel, hard-chrome plated for excellent protection against wear.

D. Cushion Sleeves
Smooth operating polyamide cushion sleeves.

E. Tube
Precision aluminum profile tube with enclosed tie rods. Clear coat anodized corrosion resistant surface.

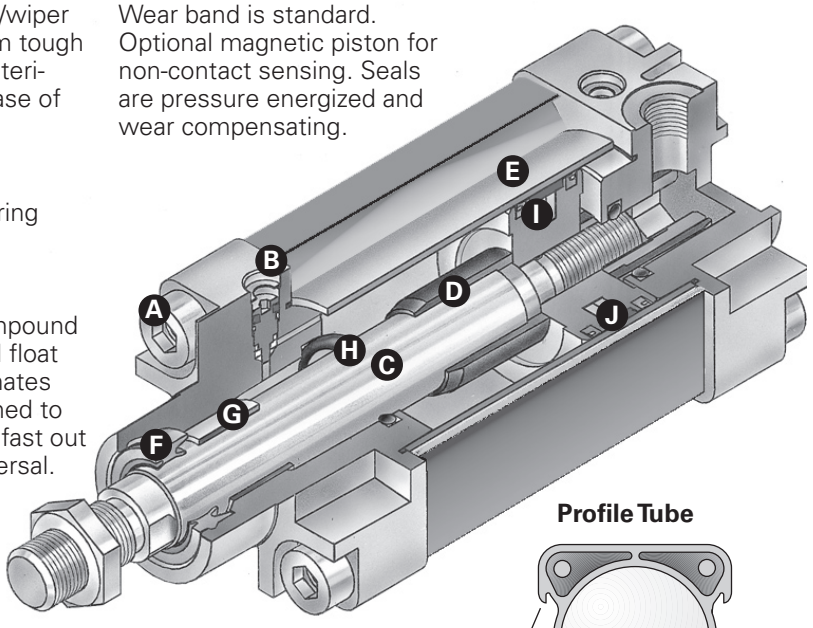
F. Rod Seal Wiper
The combination seal/wiper design is molded from tough abrasion resistant materials for long life and ease of maintenance.

G. Bearing
Heavy duty long wearing nylon rod bearing.

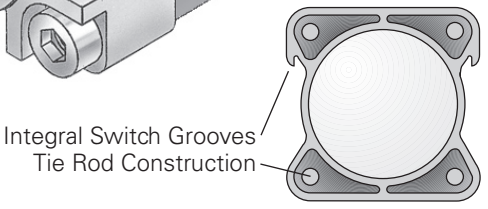
H. Cushion Seal
One piece, nitrile compound seal. Linear and radial float of cushion seal eliminates misalignment. Designed to provide exceptionally fast out of cushion stroke reversal.

I. Piston Seals
Durable lip type

J. Piston
Wear band is standard. Optional magnetic piston for non-contact sensing. Seals are pressure energized and wear compensating.



Profile Tube



Series ML
Model Code

ML	07	2B	0	N	5	K	A	108	00	X
1, 2	3, 4	3, 4	7	8	9	10	11	12, 13, 14	15, 16	17

1, 2 Series
ML* – ISO 6431 / VDMA 24562

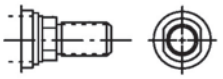
3, 4 Mounting Styles
07 – Head Rectangular Flange MF1
12 – Cap Rectangular Flange MF2
16 – Cap Trunnion MT5/6
17 – Head Trunnion MT1
18 – Sleeve Nut for Tapped Face -
24 – No Mounts -
23 – Both Ends Extended Tie Rod MX1
45 – Angle MS1
48 – Cap Detachable Eye MP4
50 – Cap Detachable Clevis MP2
XX – Custom

5, 6 Bore and Rod Size Combinations

Code	Bore(mm)	Rod(mm)
2B	32	12
CD	40	16
DF	50	20
EF	63	20
GH	80	25
HH	100	25
KK	125	32
LM	160	40
NM	200	40
RP	250	50
8R	320	63

7 Rod End Type

Code	Type
0	Intermediate Male Metric



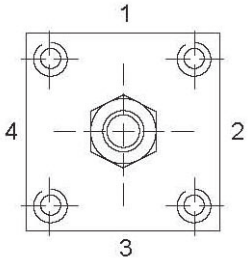
8 Seal Options
N – Normal Hydraulic *
L – Low Friction
T – High Temperature
U – Ultra Cushioning Seal**

* Hydraulic seal option only available through 100mm bore

9 Port Options
5 – NPTF Standard
7 – BSPPL

10 Port Locations
Positions are numbers as shown in picture below.

Code	Head	Cap
K	1	1



11 Cushion Location
Cushions are located as shown below when viewing cylinder from head end

Code	Head	Cap
A	0	0
B	0	1
F	1	0
K	1	1

12, 13, 14 Cylinder Stroke
For stroke length from 001 999mm, indicated number in mm in positions 12-14

For stroke lengths from 1000-3000mm, use the following guidelines. For position 12, you will use the code below. Positions 13, 14 will describe the mm between levels below. For instance, for a stroke length of 1050mm, position 12 would be A, positions 13, 14 would be 50 (Code: A50). For a stroke length of 1960mm, position 12 would be K, position 13, 14 would be 60 (Code: K60).

A	1000
B	1100
C	1200
D	1300
E	1400
F	1500
G	1600
H	1700
J	1800
K	1900
L	2000
M	2100
N	2200
P	2300
Q	2400
R	2500
S	2600
T	2700
U	2800
V	2900
W	3000

15, 16 Extra Rod Projection
Positions 15, 16 indicate extra rod projection in millimeters (mm), use 0-99 for this option.

– OR –

Proximity Switch Magnet
PK – Magnet Furnished to operate Hall Effect or Reed Type Switch

– OR –
Rod Boot
MN – Neoprene

– OR –
Rod Material Options
RT – Stainless Steel 300 Series

17 Custom
X – Custom Modification

***** Cylinders <125mm bore have profile design, cylinders >125mm bore have tie rod design.
****** Available in 40, 50, 63, 80mm bore cylinders

Series ML
Mounting Style:
32-320mm Bores

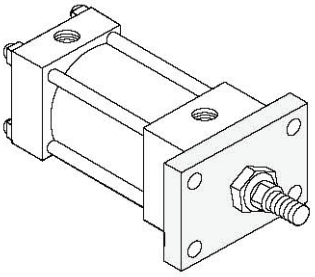
Available Mountings

The variety of standard DIN ISO 6431 / VDMA 24562 mountings available in the ML gives you a broad selection to match the proper mount to your application. Eaton offers rigid mounts (including extended tie rod mounts) and swivel mounts (including clevis and trunnion mounts). A guide to proper mount selection is provided on pages 72 through 88. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series ML cylinders are available in all mounting styles listed.

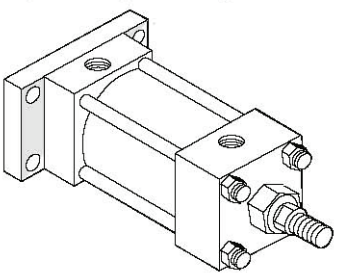
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

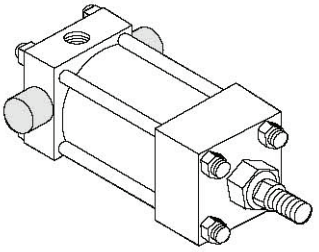
Code 07 Head Rectangular Flange (DIN ISO 6431 / VDMA 24562 Part 2, MF1)



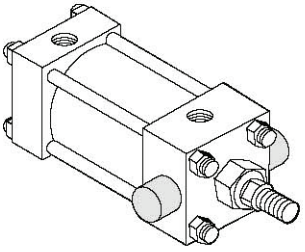
Code 12 Cap Rectangular Flange (DIN ISO 6431 / VDMA 24562 Part 2, MF2)



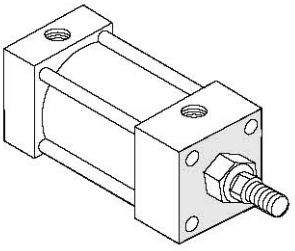
Code 16 Cap Trunnion (VDMA 24562 Part 2, MT5/6)



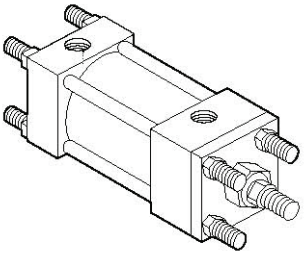
Code 17 Head Trunnion (VDMA 24562 Part 2, MT5/6)



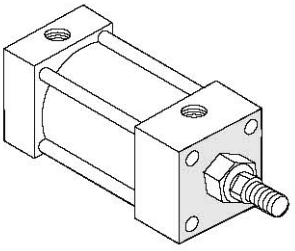
Code 18 Sleeve Nut Construction for Tapped Face



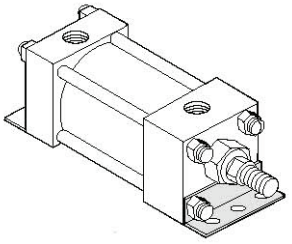
Code 23 Extended Tie Rod (DIN ISO 6431, MX1)



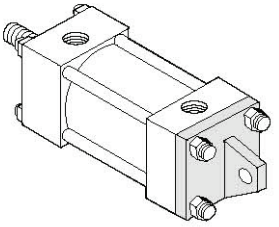
Code 24 No Mounts



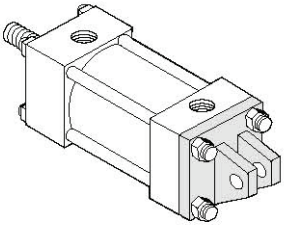
Code 45 Angle (DIN ISO 6431, VDMA 24562 Part 2, MS1)



Code 48 Cap Detachable Eye (DIN ISO 6431, VDMA 24562 Part 2, MP4)



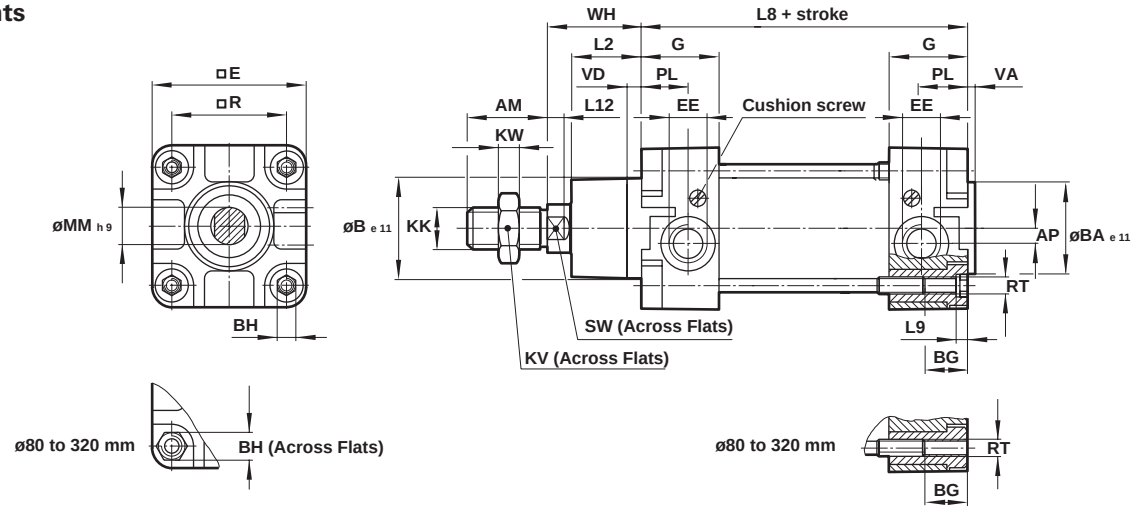
Code 50 Cap Detachable Clevis (DIN ISO 6431, VDMA 24562 Part 2, MP2)



Series ML
Mounting Styles and Installation Dimensions

32-320mm bore sizes

Code 24 – No Mounts



BORE	AM	AP	B	BA	BG	BH	E	EE	G	KK	KV	KW	L2	L8	L9
32	0.87 (22)	0.14 (3.5)	1.18 (30)	1.18 (30)	0.71 (18)	0.24 (6)	1.85 (47)	G 1/8 (1/8"NPT)	1.08 (27.5)	M10x1.25	0.67 (17)	0.20 (5)	0.79 (20)	3.70 (94)	0.16 (4)
40	0.94 (24)	0.18 (4.5)	1.38 (35)	1.38 (35)	0.71 (18)	0.24 (6)	2.09 (53)	G 1/4 (1/4"NPT)	1.26 (32)	M12x1.25	0.75 (19)	0.24 (6)	0.87 (22)	4.13 (105)	0.16 (4)
50	1.26 (32)	0.24 (6)	1.57 (40)	1.57 (40)	0.71 (18)	0.31 (8)	2.56 (65)	G 1/4 (1/4"NPT)	1.22 (31)	M16x1.5	0.94 (24)	0.31 (8)	1.06 (27)	4.17 (106)	0.20 (5)
63	1.26 (32)	0.39 (10)	1.77 (45)	1.77 (45)	0.69 (17.5)	0.31 (8)	2.95 (75)	G 3/8 (3/8"NPT)	1.30 (33)	M16x1.5	0.94 (24)	0.31 (8)	1.14 (29)	4.76 (121)	0.20 (5)
80	1.57 (40)	0.33 (8.5)	1.77 (45)	1.77 (45)	0.85 (21.5)	0.75 (19)	3.74 (95)	G 3/8 (3/8"NPT)	1.30 (33)	M20x1.5	1.18 (30)	0.39 (10)	1.30 (33)	5.04 (128)	–
100	1.57 (40)	0.35 (9)	2.17 (55)	2.17 (55)	0.85 (21.5)	0.75 (19)	4.53 (115)	G 1/2 (1/2"NPT)	1.46 (37)	M20x1.5	1.18 (30)	0.39 (10)	1.42 (36)	5.43 (138)	–
125	2.13 (54)	0.39 (10)	2.36 (60)	2.36 (60)	1.26 (32)	0.94 (24)	5.51 (140)	G 1/2 (1/2"NPT)	1.81 (46)	M27x2	1.61 (41)	0.53 (13.5)	1.77 (45)	6.30 (160)	–
160	2.83 (72)	0.71 (18)	2.56 (65)	2.56 (65)	1.12 (28.5)	1.26 (32)	7.22 (183.5)	G 3/4 (3/4"NPT)	1.97 (50)	M36x2	2.17 (55)	0.71 (18)	2.28 (58)	7.09 (180)	–
200	2.83 (72)	0.71 (18)	2.95 (75)	2.95 (75)	1.12 (28.5)	1.26 (32)	8.82 (224)	G 3/4 (3/4"NPT)	1.97 (50)	M36x2	2.17 (55)	0.71 (18)	2.64 (67)	7.09 (180)	–
250	3.31 (84)	0.89 (22.5)	3.54 (90)	3.54 (90)	1.38 (35)	1.42 (36)	11.02 (280)	G 1 (1"NPT)	2.28 (58)	M42x2	2.56 (65)	0.83 (21)	3.15 (80)	7.87 (200)	–
320	3.78 (96)	0.89 (22.5)	4.33 (110)	4.33 (110)	1.18 (30)	1.81 (46)	13.78 (350)	G 1 (1"NPT)	2.36 (60)	M48x2	2.95 (75)	0.94 (24)	3.54 (90)	8.66 (220)	–

BORE	L12	MM	PL	R	RT	SW	VA	VD	WH	8000 WEIGHT AT ZERO STROKE LBS (KG)	WEIGHT PER 25MM IN LBS (KG)	P/8000 WEIGHT AT ZERO STROKE LBS (KG)	WEIGHT PER 25MM IN LBS (KG)	PV/8000 WEIGHT AT ZERO STROKE LBS (KG)	WEIGHT PER 25MM IN LBS (KG)
32	0.24 (6)	0.47 (12)	0.51 (13)	1.26 (32.5)	M 6	0.39 (10)	0.12 (3)	0.24 (6)	1.02 (26)	1.12 (0.51)	0.13 (0.06)	1.12 (0.51)	0.13 (0.06)	1.41 (0.64)	0.13 (0.06)
40	0.26 (6.5)	0.63 (16)	0.59 (15)	1.50 (38)	M 6	0.51 (13)	0.14 (3.5)	0.24 (6)	1.18 (30)	1.76 (0.80)	0.18 (0.08)	1.76 (0.80)	0.18 (0.08)	2.09 (0.95)	0.18 (0.08)
50	0.31 (8)	0.79 (20)	0.73 (18.5)	1.83 (46.5)	M 8	0.67 (17)	0.14 (3.5)	0.24 (6)	1.46 (37)	2.93 (1.33)	0.26 (0.12)	2.93 (1.33)	0.26 (0.12)	3.33 (1.51)	0.26 (0.12)
63	0.31 (8)	0.79 (20)	0.75 (19)	2.22 (56.5)	M 8	0.67 (17)	0.16 (4)	0.24 (6)	1.46 (37)	3.97 (1.80)	0.29 (0.13)	3.97 (1.80)	0.29 (0.13)	4.63 (2.10)	0.29 (0.13)
80	0.39 (10)	0.98 (25)	0.75 (19)	2.83 (72)	M 10	0.87 (22)	0.16 (4)	0.24 (6)	1.81 (46)	7.17 (3.25)	0.44 (0.20)	7.17 (3.25)	0.44 (0.20)	8.27 (3.75)	0.44 (0.20)
100	0.39 (10)	0.98 (25)	0.71 (18)	3.50 (89)	M 10	0.87 (22)	0.16 (4)	0.24 (6)	2.01 (51)	10.61 (4.81)	0.51 (0.23)	10.61 (4.81)	0.51 (0.23)	12.37 (5.61)	0.51 (0.23)
125	0.51 (13)	1.26 (32)	0.79 (20)	4.33 (110)	M 12	1.06 (27)	0.24 (6)	0.61 (15.5)	2.56 (65)	17.64 (8.00)	0.73 (0.33)	17.64 (8.00)	0.73 (0.33)	–	–
160	0.63 (16)	1.57 (40)	0.83 (21)	5.51 (140)	M 16	1.42 (36)	0.16 (4)	0.59 (15)	3.15 (80)	32.85 (14.9)	1.21 (0.55)	–	–	–	–
200	0.63 (16)	1.57 (40)	0.83 (21)	6.89 (175)	M 16	1.42 (36)	0.20 (5)	0.59 (15)	3.74 (95)	47.85 (21.7)	1.32 (0.60)	–	–	–	–
250	0.79 (20)	1.97 (50)	1.14 (29)	8.66 (220)	M 20	1.61 (41)	0.28 (7)	0.51 (13)	4.13 (105)	71.88 (32.6)	2.03 (0.92)	–	–	–	–
320	0.94 (24)	2.48 (63)	1.18 (30)	10.63 (270)	M 24	2.17 (55)	0.28 (7)	0.51 (13)	4.72 (120)	131.86 (59.8)	3.22 (1.46)	–	–	–	–

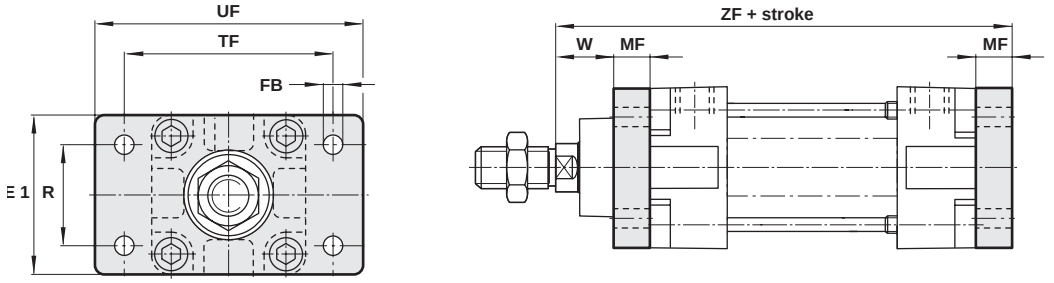
Dimensions in inches (mm)

Series ML Mounting Styles and Installation Dimensions

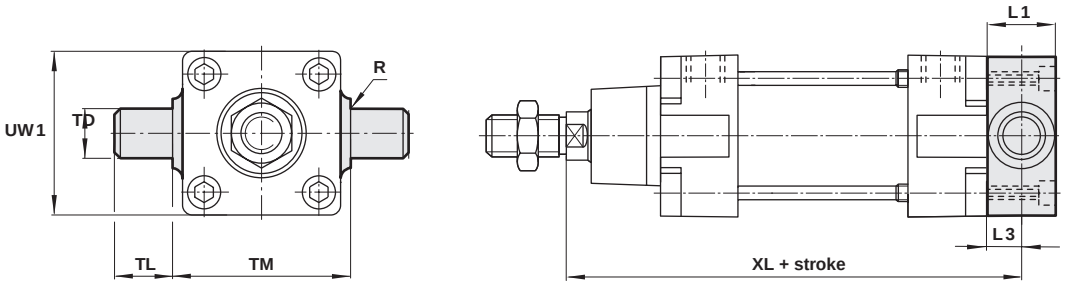
32-320mm bore sizes

Code 07 – Head Rectangular Flange (DIN ISO 6431 / VDMA 24562 Part 2, MF1)

Code 12 – Cap Rectangular Flange (DIN ISO 6431 / VDMA 24562 Part 2, MF2)



Code 16 – Cap Trunnion (VDMA 24562 Part 2, MT5/6)



BORE	E1	FB	MF	R	TF	UF	W	ZF	WEIGHT* CODE 07, 12
32	1.97 (50)	0.28 (7)	0.39 (10)	1.26 (32)	2.52 (64)	3.15 (80)	0.63 (16)	5.12 (130)	0.55 (0.25)
40	2.17 (55)	0.35 (9)	0.39 (10)	1.42 (36)	2.83 (72)	3.54 (90)	0.79 (20)	5.71 (145)	0.77 (0.35)
50	2.56 (65)	0.35 (9)	0.47 (12)	1.77 (45)	3.54 (90)	4.33 (110)	0.98 (25)	6.10 (155)	1.54 (0.70)
63	2.95 (75)	0.35 (9)	0.47 (12)	1.97 (50)	3.94 (100)	4.92 (125)	0.98 (25)	6.69 (170)	1.76 (0.80)
80	3.94 (100)	0.47 (12)	0.63 (16)	2.48 (63)	4.96 (126)	6.06 (154)	1.18 (30)	7.48 (190)	2.98 (1.35)
100	4.72 (120)	0.55 (14)	0.63 (16)	2.95 (75)	5.91 (150)	7.32 (186)	1.38 (35)	8.07 (205)	4.85 (2.20)
125	5.51 (140)	0.63 (16)	0.79 (20)	3.54 (90)	7.09 (180)	8.82 (224)	1.77 (45)	9.65 (245)	3.75 (1.70)
160	7.09 (180)	0.71 (18)	0.79 (20)	4.53 (115)	9.06 (230)	11.02 (280)	2.36 (60)	11.02 (280)	6.84 (3.10)
200	8.66 (220)	0.87 (22)	0.98 (25)	5.31 (135)	10.63 (270)	12.60 (320)	2.76 (70)	11.81 (300)	10.14 (4.60)
250	11.02 (280)	1.02 (26)	0.98 (25)	6.50 (165)	12.99 (330)	15.55 (395)	3.15 (80)	12.99 (330)	16.32 (7.40)
320	13.78 (350)	1.30 (33)	1.18 (30)	7.87 (200)	15.75 (400)	18.70 (475)	3.54 (90)	14.57 (370)	29.99 (13.6)

BORE	L1	L3	R	TD	TL	TM	UW 1	XL	WEIGHT* CODE 16
32	0.63 (16)	0.31 (8)	0.04 (1)	0.47 (12)	0.47 (12)	1.97 (50)	1.97 (50)	5.04 (128)	0.44 (0.20)
40	0.79 (20)	0.39 (10)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.48 (63)	2.17 (55)	5.71 (145)	0.84 (0.38)
50	0.94 (24)	0.47 (12)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.95 (75)	2.56 (65)	6.10 (155)	1.32 (0.60)
63	0.94 (24)	0.47 (12)	0.06 (1.6)	0.79 (20)	0.79 (20)	3.54 (90)	2.95 (75)	6.69 (170)	2.43 (1.10)
80	1.10 (28)	0.55 (14)	0.06 (1.6)	0.79 (20)	0.79 (20)	4.33 (110)	3.94 (100)	7.40 (188)	4.19 (1.90)
100	1.50 (38)	0.75 (19)	0.08 (2)	0.98 (25)	0.98 (25)	5.20 (132)	4.72 (120)	8.19 (208)	7.72 (3.50)
125	1.97 (50)	0.98 (25)	0.08 (2)	0.98 (25)	0.98 (25)	6.30 (160)	5.71 (145)	9.84 (250)	14.33 (6.50)
160	—	—	0.10 (2.5)	1.26 (32)	1.26 (32)	7.87 (200)	—	—	—
200	—	—	0.10 (2.5)	1.26 (32)	1.26 (32)	9.84 (250)	—	—	—
250	—	—	0.13 (3.2)	1.57 (40)	1.57 (40)	12.60 (320)	—	—	—
320	—	—	0.13 (3.2)	1.97 (50)	1.97 (50)	15.75 (400)	—	—	—

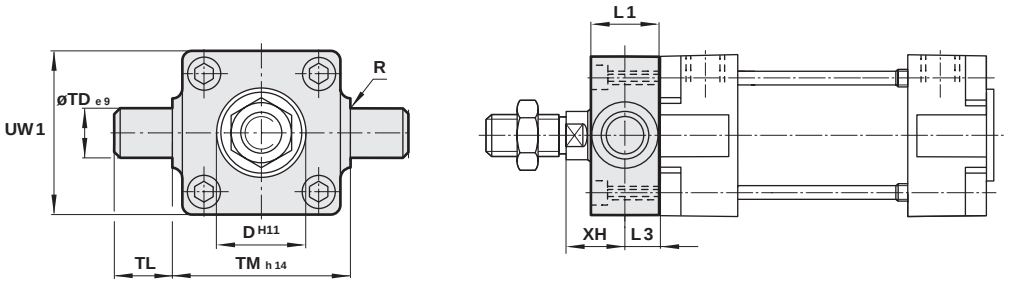
*All weights in pounds (Kilograms)

Dimensions in inches (mm)

Series ML Mounting Styles and Installation Dimensions

32-320mm bore sizes

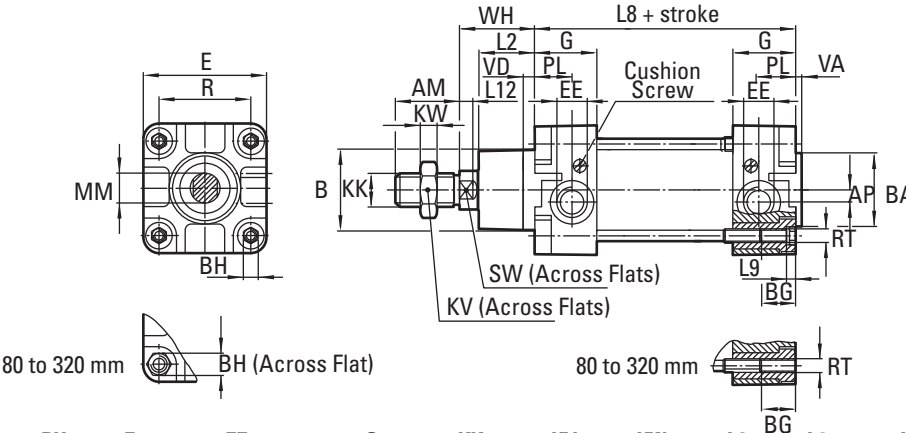
Code 17 – Head Trunnion (VDMA 24562 Part 2, Style MT5/6)



BORE	D	L1	L3	R	TD	TL	TM	UW 1	XH	WEIGHT* CODE 17
32	1.18 (30)	0.63 (16)	0.31 (8)	0.04 (1)	0.47 (12)	0.47 (12)	1.97 (50)	1.97 (50)	0.71 (18)	0.44 (0.20)
40	1.38 (35)	0.79 (20)	0.39 (10)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.48 (63)	2.17 (55)	0.79 (20)	0.84 (0.38)
50	1.57 (40)	0.94 (24)	0.47 (12)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.95 (75)	2.56 (65)	0.98 (25)	1.32 (0.60)
63	1.77 (45)	0.94 (24)	0.47 (12)	0.06 (1.6)	0.79 (20)	0.79 (20)	3.54 (90)	2.95 (75)	0.98 (25)	2.43 (1.10)
80	1.77 (45)	1.10 (28)	0.55 (14)	0.06 (1.6)	0.79 (20)	0.79 (20)	4.33 (110)	3.94 (100)	1.26 (32)	4.19 (1.90)
100	2.17 (55)	1.50 (38)	0.75 (19)	0.08 (2)	0.98 (25)	0.98 (25)	5.20 (132)	4.72 (120)	1.26 (32)	7.72 (3.50)
125	2.36 (60)	1.97 (50)	0.98 (25)	0.08 (2)	0.98 (25)	0.98 (25)	6.30 (160)	5.71 (145)	1.57 (40)	14.33 (6.50)
160	—	—	—	0.10 (2.5)	1.26 (32)	1.26 (32)	7.87 (200)	—	—	—
200	—	—	—	0.10 (2.5)	1.26 (32)	1.26 (32)	9.84 (250)	—	—	—
250	—	—	—	0.13 (3.2)	1.57 (40)	1.57 (40)	12.60 (320)	—	—	—
320	—	—	—	0.13 (3.2)	1.97 (50)	1.97 (50)	15.75 (400)	—	—	—

*All Weights in Pounds (Kilograms)

Code 18 – Sleeve Nut Construction for Tapped Face



BORE	AM	AP	B	BA	BG	BH	E	EE	G	KK	KV	KW	L2	L8	L9
32	0.87 (22)	0.14 (3.5)	1.18 (30)	1.18 (30)	0.71 (18)	0.24 (6)	1.85 (47)	G 1/8 (1/8"NPT)	1.08 (27.5)	M10x1.25	0.67 (17)	0.20 (5)	0.79 (20)	3.70 (94)	0.16 (4)
40	0.94 (24)	0.18 (4.5)	1.38 (35)	1.38 (35)	0.71 (18)	0.24 (6)	2.09 (53)	G 1/4 (1/4"NPT)	1.26 (32)	M12x1.25	0.75 (19)	0.24 (6)	0.87 (22)	4.13 (105)	0.16 (4)
50	1.26 (32)	0.24 (6)	1.57 (40)	1.57 (40)	0.71 (18)	0.31 (8)	2.56 (65)	G 1/4 (1/4"NPT)	1.22 (31)	M16x1.5	0.94 (24)	0.31 (8)	1.06 (27)	4.17 (106)	0.20 (5)
63	1.26 (32)	0.39 (10)	1.77 (45)	1.77 (45)	0.69 (17.5)	0.31 (8)	2.95 (75)	G 3/8 (3/8"NPT)	1.30 (33)	M16x1.5	0.94 (24)	0.31 (8)	1.14 (29)	4.76 (121)	0.20 (5)
80	1.57 (40)	0.33 (8.5)	1.77 (45)	1.77 (45)	0.85 (21.5)	0.75 (19)	3.74 (95)	G 3/8 (3/8"NPT)	1.30 (33)	M20x1.5	1.18 (30)	0.39 (10)	1.30 (33)	5.04 (128)	–
100	1.57 (40)	0.35 (9)	2.17 (55)	2.17 (55)	0.85 (21.5)	0.75 (19)	4.53 (115)	G 1/2 (1/2"NPT)	1.46 (37)	M20x1.5	1.18 (30)	0.39 (10)	1.42 (36)	5.43 (138)	–
125	2.13 (54)	0.39 (10)	2.36 (60)	2.36 (60)	1.26 (32)	0.94 (24)	5.51 (140)	G 1/2 (1/2"NPT)	1.81 (46)	M27x2	1.61 (41)	0.53 (13.5)	1.77 (45)	6.30 (160)	–
160	2.83 (72)	0.71 (18)	2.56 (65)	2.56 (65)	1.12 (28.5)	1.26 (32)	7.22 (183.5)	G 3/4 (3/4"NPT)	1.97 (50)	M36x2	2.17 (55)	0.71 (18)	2.28 (58)	7.09 (180)	–
200	2.83 (72)	0.71 (18)	2.95 (75)	2.95 (75)	1.12 (28.5)	1.26 (32)	8.82 (224)	G 3/4 (3/4"NPT)	1.97 (50)	M36x2	2.17 (55)	0.71 (18)	2.64 (67)	7.09 (180)	–
250	3.31 (84)	0.89 (22.5)	3.54 (90)	3.54 (90)	1.38 (35)	1.42 (36)	11.02 (280)	G 1 (1"NPT)	2.28 (58)	M42x2	2.56 (65)	0.83 (21)	3.15 (80)	7.87 (200)	–
320	3.78 (96)	0.89 (22.5)	4.33 (110)	4.33 (110)	1.18 (30)	1.81 (46)	13.78 (350)	G 1 (1"NPT)	2.36 (60)	M48x2	2.95 (75)	0.94 (24)	3.54 (90)	8.66 (220)	–

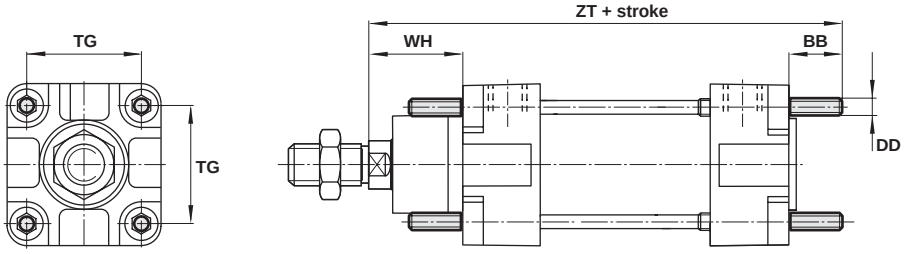
BORE	L12	MM	PL	R	RT	SW	VA	VD	WH	8000 WEIGHT AT ZERO STROKE LBS(KG)	WEIGHT PER 25MM IN LBS(KG)	P/8000 WEIGHT AT ZERO STROKE LBS(KG)	WEIGHT PER 25MM IN LBS(KG)	PV/8000 WEIGHT AT ZERO STROKE LBS(KG)	WEIGHT PER 25MM IN LBS(KG)
32	0.24 (6)	0.47 (12)	0.51 (13)	1.26 (32.5)	M 6	0.39 (10)	0.12 (3)	0.24 (6)	1.02 (26)	1.12 (0.51)	0.13 (0.06)	1.12 (0.51)	0.13 (0.06)	1.41 (0.64)	0.13 (0.06)
40	0.26 (6.5)	0.63 (16)	0.59 (15)	1.50 (38)	M 6	0.51 (13)	0.14 (3.5)	0.24 (6)	1.18 (30)	1.76 (0.80)	0.18 (0.08)	1.76 (0.80)	0.18 (0.08)	2.09 (0.95)	0.18 (0.08)
50	0.31 (8)	0.79 (20)	0.73 (18.5)	1.83 (46.5)	M 8	0.67 (17)	0.14 (3.5)	0.24 (6)	1.46 (37)	2.93 (1.33)	0.26 (0.12)	2.93 (1.33)	0.26 (0.12)	3.33 (1.51)	0.26 (0.12)
63	0.31 (8)	0.79 (20)	0.75 (19)	2.22 (56.5)	M 8	0.67 (17)	0.16 (4)	0.24 (6)	1.46 (37)	3.97 (1.80)	0.29 (0.13)	3.97 (1.80)	0.29 (0.13)	4.63 (2.10)	0.29 (0.13)
80	0.39 (10)	0.98 (25)	0.75 (19)	2.83 (72)	M 10	0.87 (22)	0.16 (4)	0.24 (6)	1.81 (46)	7.17 (3.25)	0.44 (0.20)	7.17 (3.25)	0.44 (0.20)	8.27 (3.75)	0.44 (0.20)
100	0.39 (10)	0.98 (25)	0.71 (18)	3.50 (89)	M 10	0.87 (22)	0.16 (4)	0.24 (6)	2.01 (51)	10.61 (4.81)	0.51 (0.23)	10.61 (4.81)	0.51 (0.23)	12.37 (5.61)	0.51 (0.23)
125	0.51 (13)	1.26 (32)	0.79 (20)	4.33 (110)	M 12	1.06 (27)	0.24 (6)	0.61 (15.5)	2.56 (65)	17.64 (8.00)	0.73 (0.33)	17.64 (8.00)	0.73 (0.33)	–	–
160	0.63 (16)	1.57 (40)	0.83 (21)	5.51 (140)	M 16	1.42 (36)	0.16 (4)	0.59 (15)	3.15 (80)	32.85 (14.9)	1.21 (0.55)	–	–	–	–
200	0.63 (16)	1.57 (40)	0.83 (21)	6.89 (175)	M 16	1.42 (36)	0.20 (5)	0.59 (15)	3.74 (95)	47.85 (21.7)	1.32 (0.60)	–	–	–	–
250	0.79 (20)	1.97 (50)	1.14 (29)	8.66 (220)	M 20	1.61 (41)	0.28 (7)	0.51 (13)	4.13 (105)	71.88 (32.6)	2.03 (0.92)	–	–	–	–
320	0.94 (24)	2.48 (63)	1.18 (30)	10.63 (270)	M 24	2.17 (55)	0.28 (7)	0.51 (13)	4.72 (120)	131.86 (59.8)	3.22 (1.46)	–	–	–	–

Dimensions in inches (mm)

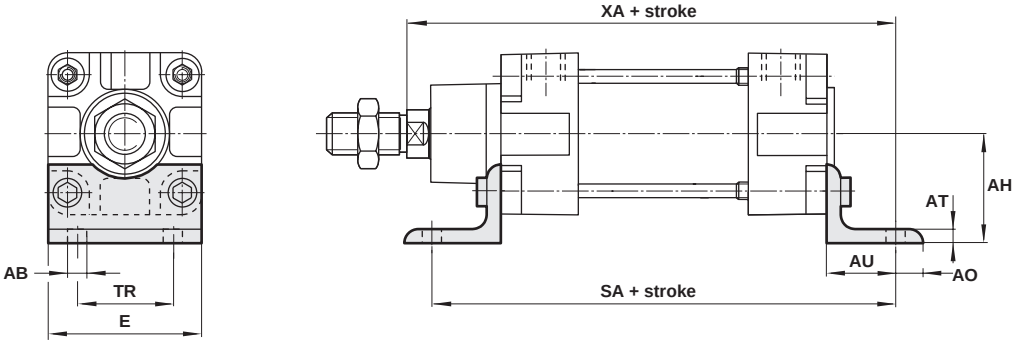
Series ML Mounting Styles and Installation Dimensions

32-320mm bore sizes

Code 23 – Extended Tie Rod (DIN ISO 6431, MX1)



Code 45 – Angle (DIN ISO 6431, VDMA 24562 Part 2, MS1)



BORE	AB	AH	AO	AT	AU	BB	DD	E	SA
32	0.28 (7)	1.26 (32)	0.31 (8)	0.16 (4)	0.94 (24)	0.67 (17)	M 6	1.89 (48)	5.59 (142)
40	0.35 (9)	1.42 (36)	0.35 (9)	0.16 (4)	1.10 (28)	0.67 (17)	M 6	2.09 (53)	6.34 (161)
50	0.35 (9)	1.77 (45)	0.39 (10)	0.20 (5)	1.26 (32)	0.91 (23)	M 8	2.52 (64)	6.69 (170)
63	0.35 (9)	1.97 (50)	0.47 (12)	0.20 (5)	1.26 (32)	0.91 (23)	M 8	2.91 (74)	7.28 (185)
80	0.47 (12)	2.48 (63)	0.75 (19)	0.20 (5)	1.61 (41)	1.10 (28)	M 10	3.86 (98)	8.27 (210)
100	0.55 (14)	2.80 (71)	0.75 (19)	0.20 (5)	1.61 (41)	1.10 (28)	M 10	4.53 (115)	8.66 (220)
125	0.63 (16)	3.54 (90)	0.79 (20)	0.35 (9)	1.77 (45)	1.34 (34)	M 12	5.51 (140)	9.84 (250)
160	0.71 (18)	4.53 (115)	0.79 (20)	0.31 (8)	2.36 (60)	1.65 (42)	M 16	7.09 (180)	11.81 (300)
200	0.87 (22)	5.31 (135)	1.18 (30)	0.35 (9)	2.76 (70)	1.65 (42)	M 16	8.66 (220)	12.60 (320)
250	1.02 (26)	6.50 (165)	1.38 (35)	0.39 (10)	2.95 (75)	1.97 (50)	M 20	11.02 (280)	13.78 (350)
320	1.30 (33)	7.87 (200)	1.77 (45)	0.63 (16)	3.35 (85)	2.36 (60)	M 24	13.78 (350)	15.35 (390)

BORE	TG	TR	WH	XA	ZT	WEIGHT* CODE 23	WEIGHT* CODE 45
32	1.28 (32.5)	1.26 (32)	1.02 (26)	5.67 (144)	5.39 (137)	0.04 (0.02)	0.33 (0.15)
40	1.50 (38)	1.42 (36)	1.18 (30)	6.42 (163)	5.98 (152)	0.04 (0.02)	0.40 (0.18)
50	1.83 (46.5)	1.77 (45)	1.46 (37)	6.89 (175)	6.54 (166)	0.11 (0.05)	0.66 (0.30)
63	2.22 (56.5)	1.97 (50)	1.46 (37)	7.48 (190)	7.13 (181)	0.11 (0.05)	0.86 (0.39)
80	2.83 (72)	2.48 (63)	1.81 (46)	8.46 (215)	7.95 (202)	0.18 (0.08)	1.76 (0.80)
100	3.50 (89)	2.95 (75)	2.01 (51)	9.06 (230)	8.54 (217)	0.18 (0.08)	2.09 (0.95)
125	4.33 (110)	3.54 (90)	2.56 (65)	10.63 (270)	10.20 (259)	0.31 (0.14)	5.29 (2.40)
160	5.51 (140)	4.53 (115)	3.15 (80)	12.60 (320)	11.89 (302)	0.68 (0.31)	7.72 (3.50)
200	6.89 (175)	5.31 (135)	3.74 (95)	13.58 (345)	12.48 (317)	0.68 (0.31)	11.58 (5.25)
250	8.66 (220)	6.50 (165)	4.13 (105)	14.96 (380)	13.98 (355)	2.03 (0.92)	20.95 (9.50)
320	10.63 (270)	7.87 (200)	4.72 (120)	16.73 (425)	15.75 (400)	3.22 (1.46)	48.51 (22.0)

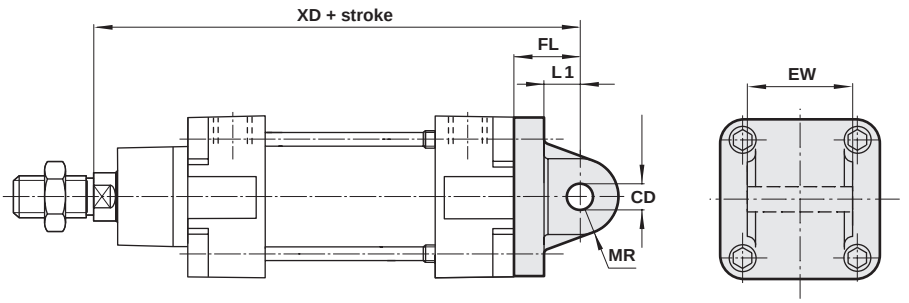
*All weights in pounds (Kilograms)

Dimensions in inches (mm)

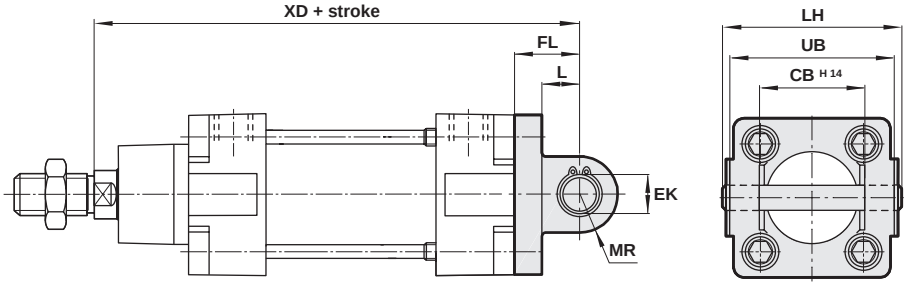
Series ML Mounting Styles and Installation Dimensions

32-320mm bore sizes

Code 48 – Cap Detachable Eye (DIN ISO 6431, VDMA 24562 Part 2, MP4)



Code 50 – Cap Detachable Clevis (DIN ISO 6431, VDMA 24562 Part 2, MP2)



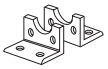
BORE	CD	EW	FL	L1	MR	XD	WEIGHT* CODE 48
32	0.39 (10)	1.02 (25.8)	0.87 (22)	0.51 (13)	0.35 (9)	5.59 (142)	0.20 (0.09)
40	0.47 (12)	1.09 (27.8)	0.98 (25)	0.63 (16)	0.47 (12)	6.30 (160)	0.24 (0.11)
50	0.47 (12)	1.25 (31.7)	1.06 (27)	0.67 (17)	0.47 (12)	6.69 (170)	0.37 (0.17)
63	0.63 (16)	1.56 (39.7)	1.26 (32)	0.87 (22)	0.59 (15)	7.48 (190)	0.53 (0.24)
80	0.63 (16)	1.96 (49.7)	1.42 (36)	0.87 (22)	0.59 (15)	8.27 (210)	0.82 (0.37)
100	0.79 (20)	2.35 (59.7)	1.61 (41)	1.06 (27)	0.79 (20)	9.06 (230)	1.30 (0.59)
125	0.98 (25)	2.74 (69.7)	1.97 (50)	1.30 (33)	0.98 (25)	10.83 (275)	7.06 (3.20)
160	1.18 (30)	3.53 (89.7)	2.17 (55)	1.40 (35.5)	1.18 (30)	12.40 (315)	13.45 (6.10)
200	1.18 (30)	3.53 (89.7)	2.36 (60)	1.46 (37)	1.18 (30)	13.19 (335)	14.99 (6.80)

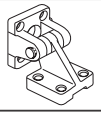
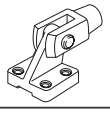
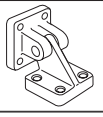
BORE	CB	EK	FL	L	LH	MR	UB	XD	WEIGHT* CODE 50
32	1.02 (26)	0.39 (10)	0.87 (22)	0.51 (13)	2.05 (52)	0.35 (9)	1.77 (45)	5.59 (142)	0.24 (0.11)
40	1.10 (28)	0.47 (12)	0.98 (25)	0.63 (16)	2.36 (60)	0.47 (12)	2.05 (52)	6.30 (160)	0.35 (0.16)
50	1.26 (32)	0.47 (12)	1.06 (27)	0.67 (17)	2.68 (68)	0.47 (12)	2.36 (60)	6.69 (170)	0.49 (0.22)
63	1.57 (40)	0.63 (16)	1.26 (32)	0.87 (22)	3.11 (79)	0.59 (15)	2.76 (70)	7.48 (190)	0.75 (0.34)
80	1.97 (50)	0.63 (16)	1.42 (36)	0.87 (22)	3.90 (99)	0.59 (15)	3.54 (90)	8.27 (210)	1.19 (0.54)
100	2.36 (60)	0.79 (20)	1.61 (41)	1.06 (27)	4.69 (119)	0.79 (20)	4.33 (110)	9.06 (230)	1.98 (0.90)
125	2.76 (70)	0.98 (25)	1.97 (50)	1.22 (31)	5.47 (139)	0.98 (25)	5.12 (130)	10.83 (275)	5.95 (2.70)
160	3.54 (90)	1.18 (30)	2.17 (55)	1.40 (35.5)	7.13 (181)	1.18 (30)	6.69 (170)	12.40 (315)	9.48 (4.30)
200	3.54 (90)	1.18 (30)	2.36 (60)	1.41 (36)	7.13 (181)	1.18 (30)	6.69 (170)	13.19 (335)	13.45 (6.10)
250	4.33 (110)	1.57 (40)	2.76 (70)	1.77 (45)	8.60 (218)	1.57 (40)	7.87 (200)	14.76 (375)	41.90 (19.0)
320	4.72 (120)	1.77 (45)	3.15 (80)	1.97 (50)	9.37 (238)	1.77 (45)	8.66 (220)	16.54 (420)	67.25 (30.5)

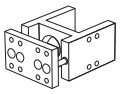
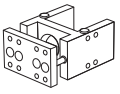
*All weights in pounds (Kilograms)

Dimensions in inches (mm)

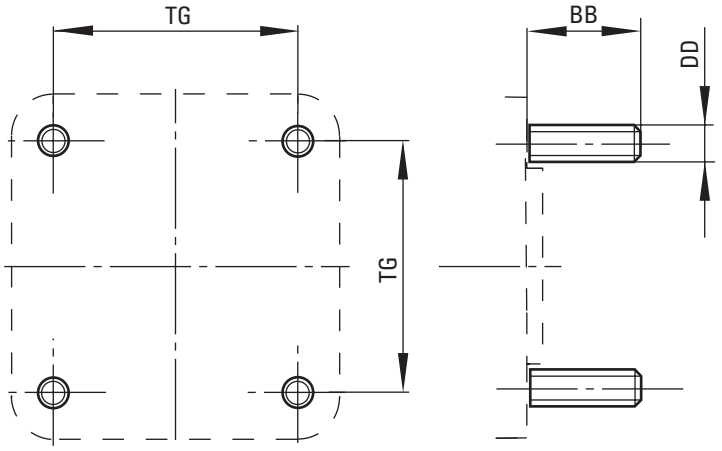
Series ML Cylinder Accessories

	TIE ROD STUDS	PISTON ROD SWIVEL	FLANGE MOUNTING PLATE	FOOT MOUNTING	REAR CLEVIS MOUNT TYPE 1	REAR CLEVIS MOUNT TYPE 2	PISTON ROD CLEVIS MOUNTING	FRONT OR REAR DETACHABLE TRUNNION MOUNTING	CENTER TRUNNION MOUNTING
									
32	ML/8032/35	ML/8025/38	ML/86012A	ML/8032/21	ML/61012A	ML/61M012A	ML62012A	ML/84012A	ML84M012A
40	ML/8032/35	ML/8040/38	ML/86016A	ML/8040/21	ML/61016A	ML/61M016A	ML62016A	ML/84016A	ML84M016A
50	ML/8050/35	ML/8050/38	ML/86020A	ML/8050/21	ML/61020A	ML/61M020A	ML62020A	ML/84020A	ML84M020A
63	ML/8050/35	ML/8050/38	ML/86025A	ML/8063/21	ML/61025A	ML/61M025A	ML62025A	ML/84025A	ML84M032A
80	ML/8080/35	ML/8080/38	ML/86032A	ML/8080/21	ML/61032A	ML/61M032A	ML62032A	ML/84032A	ML84M032A
100	ML/8080/35	ML/8080/38	ML/86040A	ML/8100/21	ML/61040A	ML/61M040A	ML62040A	ML/84040A	ML84M040A
125	ML/8125/35	ML/8125/38	ML/86050A	ML/8125/21	ML/61050A	ML/61M050A	ML62050A	ML/84050A	ML84M050A
160	ML/8160/35	ML/8160/38	ML/86064A	ML/8160/21	ML/61064A	ML/61M064A	ML62064A	–	ML84M064A
200	ML/8160/35	ML/8160/38	ML/86080A	ML/8200/21	ML/61080A	ML/61M080A	ML62080A	–	ML84M080A
250	ML/8250/35	–	ML/86100A	ML/8250/21	ML/61100A	ML/61M100A	ML62100A	–	ML84M100A
320	ML/8320/35	–	ML/86128A	ML/8320/21	ML/61128A	ML/61M128A	ML62128A	–	ML84M128A

	REAR HINGE MOUNT TYPE 1	FRONT HINGE MOUNTING	REAR EYE MOUNTING	TRUNNION SUPPORT MOUNTING	NARROW HINGE	WIDE HINGE	UNIVERSAL PISTON ROD-EYE	ADJUSTABLE CENTER TRUNNION	REAR HINGE MOUNT TYPE 2
									
32	ML/8032/24	ML/8032/26	ML/78012A	ML/8032/26	ML/P19931	ML/P19493	ML/60010A	ML/84N012A	ML/8032/43
40	ML/8040/24	ML/8040/26	ML/78016A	ML/8040/26	ML/P19932	ML/P19494	ML/60016A	ML/84N016A	ML/8040/43
50	ML/8050/24	ML/8050/26	ML/78020A	ML/8040/26	ML/P19933	ML/P19495	ML/60020A	ML/84N020A	ML/8050/43
63	ML/8063/24	ML/8063/26	ML/78025A	ML/8063/26	ML/P19934	ML/P19496	ML/60020A	ML/84N025A	ML/8063/43
80	ML/8080/24	ML/8080/26	ML/78032A	ML/8063/26	ML/P19935	ML/P19497	ML/60032A	ML/84N032A	ML/8080/43
100	ML/8100/24	ML/8100/26	ML/78040A	ML/8100/26	ML/P19936	ML/P19498	ML/60032A	ML/84N040A	ML/8100/43
125	ML/8125/24	ML/8125/26	ML/78050A	ML/8100/26	ML/P19937	ML/P19499	ML/60050A	ML/84N050A	ML/8125/43
160	ML/8160/24	ML/8160/26	ML/78064A	ML/8160/26	ML/P19938	ML/P19679	ML/60064A	ML/84N064A	ML/8160/43
200	ML/8200/24	ML/8200/26	ML/78080A	ML/8160/26	ML/P19939	ML/P19683	ML/60064A	ML/84N080A	ML/8200/43
250	ML/8250/24	–	–	–	–	ML/P19446	ML/60100A	–	–
320	ML/8320/24	–	–	–	–	ML/P19447	ML/60128A	–	–

	UNIVERSAL REAR-EYE	SWIVEL HINGE	GUIDE BLOCKS	GUIDE BLOCKS	LOCKING UNIT (PASSIVE)
					
32	ML/8032/33	ML/P40310	ML/8032/51/*	ML/8032/61/*	ML/8032/59
40	ML/8040/33	ML/P40311	ML/8040/51/*	ML/8040/61/*	ML/8040/59
50	ML/8050/33	ML/P40312	ML/8050/51/*	ML/8050/61/*	ML/8050/59
63	ML/8063/33	ML/P40313	ML/8063/51/*	ML/8063/61/*	ML/8063/59
80	ML/8080/33	ML/P40314	ML/8080/51/*	ML/8080/61/*	ML/8080/59
100	ML/8100/33	ML/P40315	ML/8100/51/*	ML/8100/61/*	ML/8100/59
125	ML/8125/33	ML/P71355	–	–	ML/8125/59
160	ML/8160/33	ML/P71356	–	–	–
200	ML/8200/33	ML/P71357	–	–	–
250	–	–	–	–	–
320	–	–	–	–	–

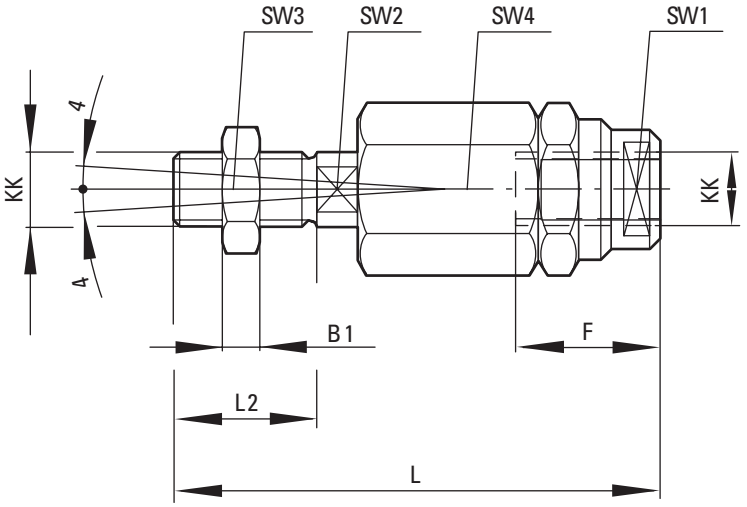
Tie Rod Studs mounting – A ISO 6431



BORE	BB	DD	TG
32	.67 (17)	M6	1.28 (32.5)
40	.67 (17)	M6	1.50 (38)
50	.91 (23)	M8	1.83 (46.5)
63	.91 (23)	M8	2.22 (56.5)
80	1.10 (28)	M10	2.83 (72)
100	1.10 (28)	M10	3.50 (89)
125	1.34 (34)	M12	4.33 (110)
160	1.65 (42)	M16	5.51 (140)
200	1.65 (42)	M16	6.89 (175)
250	1.97 (50)	M20	8.66 (220)
320	2.36 (60)	M24	10.63 (270)

Dimensions in inches (mm)

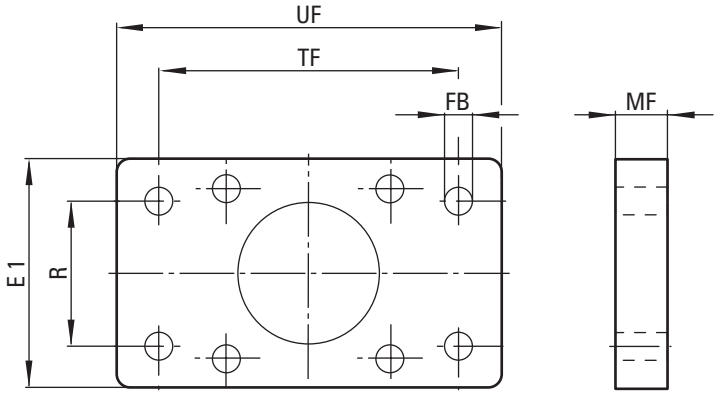
Piston rod swivel mounting



BORE	B1	F	KK	L2	SW 1	SW 2	SW 3	SW 4
32	0.20 (5)	1.02 (26)	M 10 x 1.25	0.79 (20)	0.75 (19)	0.47 (12)	0.67 (17)	1.18 (30)
40	0.24 (6)	1.02 (26)	M 12 x 1.25	0.94 (24)	0.75 (19)	0.47 (12)	0.75 (19)	1.18 (30)
50	0.31 (8)	1.34 (34)	M 16 x 1.5	1.26 (32)	1.18 (30)	0.75 (19)	0.94 (24)	1.65 (42)
63	0.31 (8)	1.34 (34)	M 16 x 1.5	1.26 (32)	1.18 (30)	0.75 (19)	0.94 (24)	1.65 (42)
80	0.39 (10)	1.65 (42)	M 20 x 1.5	1.57 (40)	1.18 (30)	0.75 (19)	1.18 (30)	1.65 (42)
100	0.39 (10)	1.65 (42)	M 20 x 1.5	1.57 (40)	1.18 (30)	0.75 (19)	1.18 (30)	1.65 (42)
125	0.53 (13.5)	1.57 (40)	M 27 x 2	2.13 (54)	1.57 (40)	0.94 (24)	1.61 (41)	2.17 (55)
160	0.71 (18)	3.07 (78)	M 36 x 2	2.83 (72)	1.97 (50)	1.42 (36)	2.17 (55)	2.95 (75)
200	0.71 (18)	3.07 (78)	M 36 x 2	2.83 (72)	1.97 (50)	1.42 (36)	2.17 (55)	2.95 (75)
250	—	—	M 42 x 2	—	—	—	—	—
320	—	—	M 48 x 2	—	—	—	—	—

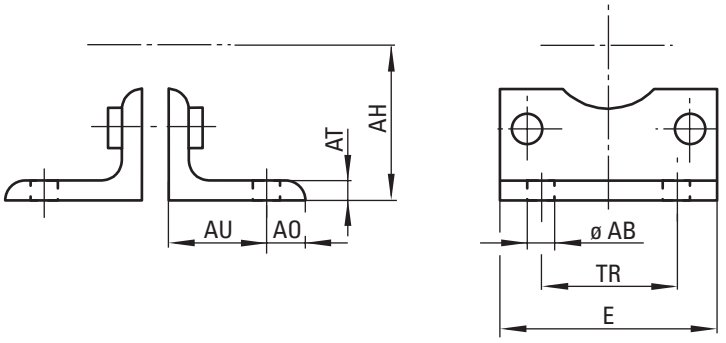
Dimensions in inches (mm)

Rear or Front flange Mounting – ISO 6431 and VDMA 24562 Part 2



BORE	E1	FB	MF	R	TF	UF
32	1.97 (50)	0.28 (7)	0.39 (10)	1.26 (32)	2.52 (64)	3.15 (80)
40	2.17 (55)	0.35 (9)	0.39 (10)	1.42 (36)	2.83 (72)	3.54 (90)
50	2.56 (65)	0.35 (9)	0.47 (12)	1.77 (45)	3.54 (90)	4.33 (110)
63	2.95 (75)	0.35 (9)	0.47 (12)	1.97 (50)	3.94 (100)	4.92 (125)
80	03.94 (100)	0.47 (12)	0.63 (16)	2.48 (63)	4.96 (126)	6.06 (154)
100	4.72 (120)	0.55 (14)	0.63 (16)	2.95 (75)	5.91 (150)	7.32 (186)
125	5.51 (140)	0.63 (16)	0.79 (20)	3.54 (90)	7.09 (180)	8.82 (224)
160	7.09 (180)	0.71 (18)	0.79 (20)	4.53 (115)	9.06 (230)	11.02 (280)
200	08.66 (220)	0.87 (22)	0.98 (25)	5.31 (135)	10.63 (270)	12.60 (320)
250	11.02 (280)	1.02 (26)	0.98 (25)	6.50 (165)	12.99 (330)	15.55 (395)
320	13.78 (350)	1.30 (33)	1.18 (30)	7.87 (200)	15.75 (400)	18.70 (475)

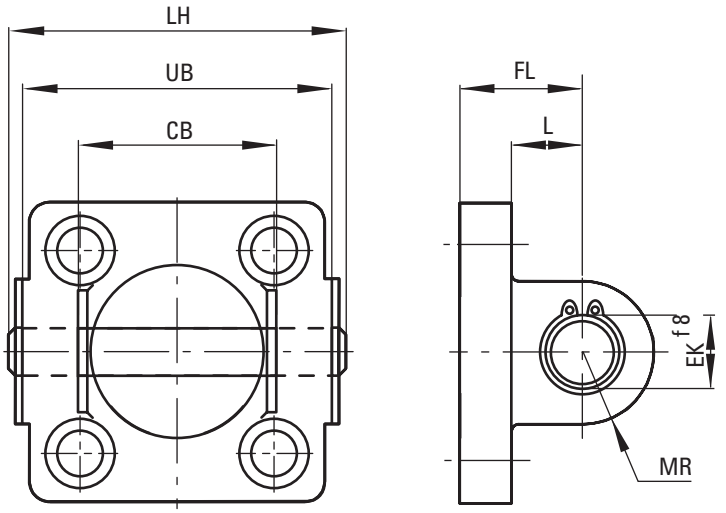
Foot mounting – ISO 6431 and VDMA 24562 Part 2



BORE	AB	AH	AO	AT	AU	E	TR
32	.28 (7)	1.26 (32)	.31 (8) [11]	.16 (4)	.94 (24)	1.89 (48)	1.26 (32)
40	.35 (9)	1.42 (36)	.35 (9) [12]	.16 (4) [5]	1.1 (28)	2.09 (53)	1.42 (36)
50	.35 (9)	1.77 (45)	.39 (10) [13]	.2 (5)	1.26 (32)	2.52 (64)	1.77 (45)
63	.35 (9)	1.97 (50)	.47 (12) [13]	.2 (5)	1.26 (32)	2.91 (74)	1.97 (50)
80	.47 (12)	2.48 (63)	.75 (19)	.2 (5) [6]	1.61 (41)	3.86 (98)	2.48 (63)
100	.55 (14)	2.8 (71)	.75 (19)	.2 (5) [6]	1.61 (41)	4.53 (115)	2.95 (75)
125	.63 (16)	3.54 (90)	.79 (20) [25]	.35 (9) [7]	1.77 (45)	5.51 (140)	3.54 (90)
160	.71 (18)	4.53 (115)	.79 (20)	.31 (8)	2.36 (60)	7.09 (180)	4.53 (115)
200	.87 (22)	5.31 (135)	1.18 (30)	.35 (9)	2.76 (70)	8.66 (220)	5.31 (135)
250	1.02 (26)	6.5 (165)	1.38 (35)	.39 (10)	2.95 (75)	11.02 (280)	6.5 (165)
320	1.30 (33)	7.87 (200)	1.77 (45)	.63 (16)	3.25 (85)	13.78 (350)	7.87 (200)

Dimensions in inches (mm)

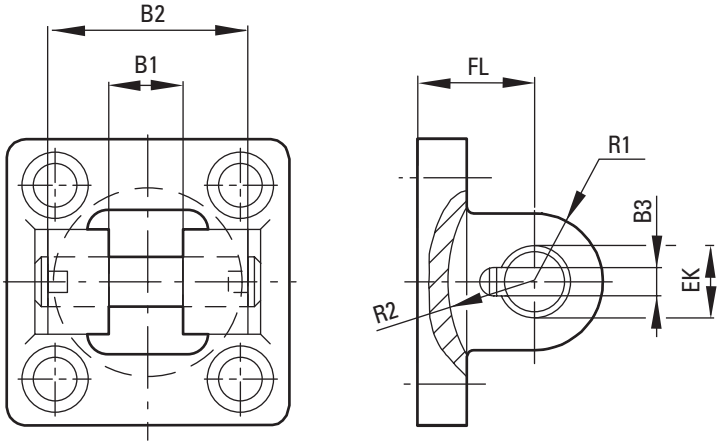
Rear Clevis Mount – Type 1 ISO 6431 and VDMA 24562



BORE	CB	EK	FL	L	LH	MR	UB
32	1.02 (26)	.39 (10)	.87 (22)	.51 (13)	2.05 (52)	.35 (9)	1.77 (45)
40	1.10 (28)	.47 (12)	.98 (25)	.63 (16)	2.36 (60)	.47 (12)	2.05 (52)
50	1.26 (32)	.47 (12)	1.06 (27)	.67 (17)	2.68 (68)	.47 (12)	2.36 (60)
63	1.57 (40)	.63 (16)	1.26 (32)	.87 (22)	3.12 (79)	.59 (15)	2.76 (70)
80	1.97 (50)	.63 (16)	1.42 (36)	.87 (22)	3.9 (99)	.59 (15)	3.54 (90)
100	2.36 (60)	.79 (20)	1.61 (41)	1.06 (27)	4.69 (119)	.79 (20)	4.31 (110)
125	2.76 (70)	.98 (25)	1.97 (50)	1.22 (31)	*5.47 (139)	.98 (25)	5.12 (130)
160	3.54 (90)	1.18 (30)	2.17 (55)	1.4 (35.5)	7.13 (181)	1.18 (30)	6.69 (170)
200	3.54 (90)	1.18 (30)	2.36 (60)	1.42 (36)	7.13 (181)	1.18 (30)	6.69 (170)
250	4.31 (110)	1.57 (40)	2.76 (70)	1.77 (45)	8.58 (218)	1.57 (40)	7.87 (200)
320	4.72 (120)	1.77 (45)	3.15 (80)	1.97 (50)	9.37 (238)	1.77 (45)	8.66 (220)

Dimensions in inches (mm)

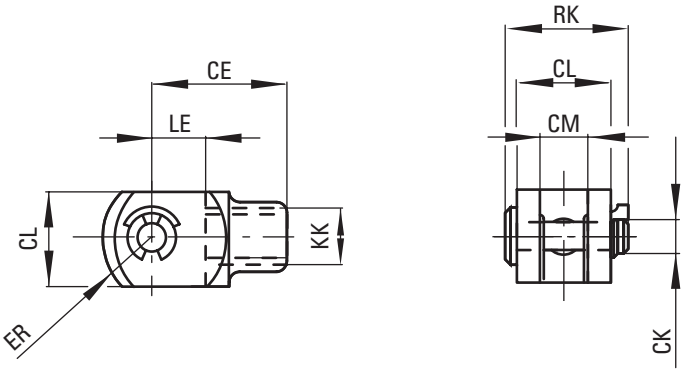
Rear Clevis Mount – Type 2 VDMA 24562



BORE	B1	B2	B3	EK	FL	R1	R2
32	.55 (14)	1.34 (34)	.14 (3.3)	.39 (10)	.87 (22)	.43 (11)	.67 (17)
40	.63 (16)	1.57 (40)	.18 (4.3)	.47 (12)	.98 (25)	.47 (12)	.79 (20)
50	.83 (21)	1.77 (45)	.18 (4.3)	.63 (16)	1.06 (27)	.57 (14.5)	.87 (22)
63	.83 (21)	2.01 (51)	.18 (4.3)	.63 (16)	1.26 (32)	.71 (18)	.98 (25)
80	.98 (25)	2.56 (65)	.18 (4.3)	.79 (20)	1.42 (36)	.87 (22)	1.18 (30)
100	.98 (25)	2.95 (75)	.26 (6.3)	.79 (20)	1.61 (41)	.87 (22)	1.26 (32)
125	1.46 (37)	3.82 (97)	.26 (6.3)	1.18 (30)	1.97 (50)	1.18 (30)	1.65 (42)
160	1.69 (43)	4.8 (122)	.26 (6.3)	1.38 (35)	2.17 (55)	1.42 (36)	1.81 (46)
200	1.69 (43)	4.8 (122)	.26 (6.3)	1.38 (35)	2.36 (60)	1.5 (38)	1.93 (49)

Dimensions in inches (mm)

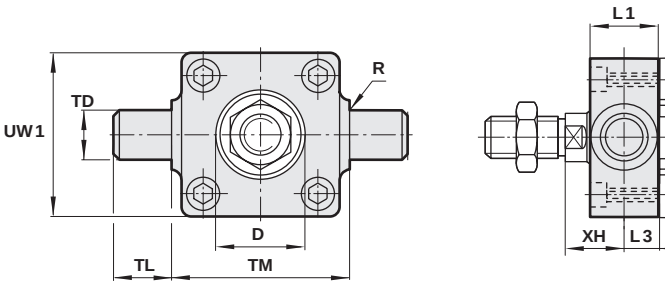
Piston rod clevis mounting ISO 8140



BORE	CE	CK	CL	CM	ER	KK	LE	RK
32	1.57 (40)	0.39 (10)	0.79 (20)	0.39 (10)	0.63 (16)	M10x1.25	0.79 (20)	1.10 (28)
40	1.89 (48)	0.47 (12)	0.94 (24)	0.47 (12)	0.75 (19)	M12x1.25	0.94 (24)	1.26 (32)
50	2.52 (64)	0.63 (16)	1.26 (32)	0.63 (16)	0.98 (25)	M16x1.5	1.26 (32)	1.63 (41.5)
63	2.52 (64)	0.63 (16)	1.26 (32)	0.63 (16)	0.98 (25)	M16x1.5	1.26 (32)	1.63 (41.5)
80	3.15 (80)	0.79 (20)	1.57 (40)	0.79 (20)	1.26 (32)	M20x1.5	1.57 (40)	1.97 (50)
100	3.15 (80)	0.79 (20)	1.57 (40)	0.79 (20)	1.26 (32)	M20x1.5	1.57 (40)	1.97 (50)
125	4.33 (110)	1.18 (30)	2.17 (55)	1.18 (30)	1.77 (45)	M27x2	2.13 (54)	2.44 (62)
160	5.67 (144)	1.38 (35)	2.76 (70)	1.38 (35)	2.24 (57)	M36x2	2.83 (72)	3.74 (95)
200	5.67 (144)	1.38 (35)	2.76 (70)	1.38 (35)	2.24 (57)	M36x2	2.83 (72)	3.74 (95)
250	6.61 (168)	1.57 (40)	3.35 (85)	1.57 (40)	2.68 (68)	M42x2	3.31 (84)	4.17 (106)
320	7.56 (192)	1.97 (50)	3.78 (96)	1.97 (50)	3.35 (85)	M48x2	3.78 (96)	4.76 (121)

Dimensions in inches (mm)

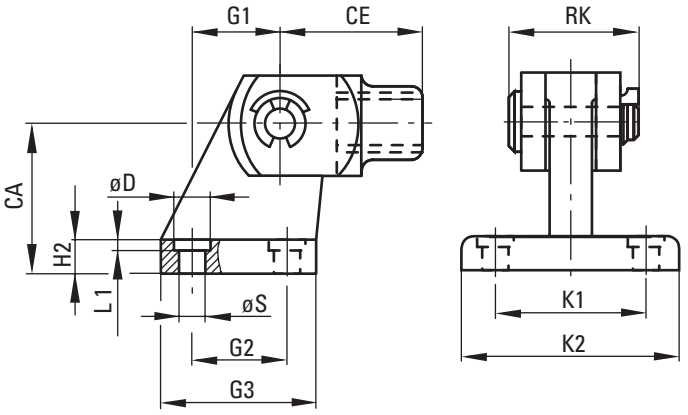
Front or rear detachable trunnion mounting VDMA 24562 Part 2



BORE	D	L1	L3	R	TD	TL	TM	UW	XH
32	1.18 (30)	0.63 (16)	0.31 (8)	0.04 (1)	0.47 (12)	0.47 (12)	1.97 (50)	1.97 (50)	0.71 (18)
40	1.38 (35)	0.79 (20)	0.39 (10)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.48 (63)	2.17 (55)	0.79 (20)
50	1.57 (40)	0.94 (24)	0.47 (12)	0.06 (1.6)	0.63 (16)	0.63 (16)	2.95 (75)	2.56 (65)	0.98 (25)
63	1.77 (45)	0.94 (24)	0.47 (12)	0.06 (1.6)	0.79 (20)	0.79 (20)	3.54 (90)	2.95 (75)	0.98 (25)
80	1.77 (45)	1.10 (28)	0.55 (14)	0.06 (1.6)	0.79 (20)	0.79 (20)	4.33 (110)	3.94 (100)	1.26 (32)
100	2.17 (55)	1.50 (38)	0.75 (19)	0.08 (2)	0.98 (25)	0.98 (25)	5.20 (132)	4.72 (120)	1.26 (32)
125	2.36 (60)	1.97 (50)	0.98 (25)	0.08 (2)	0.98 (25)	0.98 (25)	6.30 (160)	5.71 (145)	1.57 (40)
160	—	—	—	0.10 (2.5)	1.26 (32)	1.26 (32)	7.87 (200)	—	—
200	—	—	—	0.10 (2.5)	1.26 (32)	1.26 (32)	9.84 (250)	—	—
250	—	—	—	0.13 (3.2)	1.57 (40)	1.57 (40)	12.60 (320)	—	—
320	—	—	—	0.13 (3.2)	1.97 (50)	1.97 (50)	15.75 (400)	—	—

Dimensions in inches (mm)

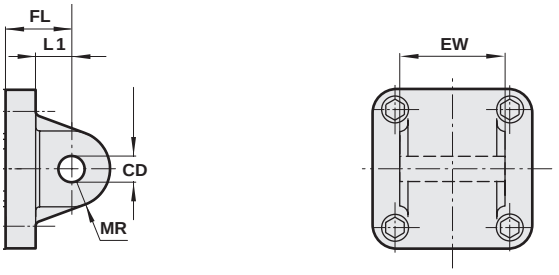
Front hinge mounting



BORE	CA	CE	D	G1	G2	G3	H2	K1	K2	L1	RK	S
32	1.26 (32)	1.57 (40)	0.43 (11)	0.83 (21)	0.71 (18)	1.22 (31)	0.31 (8)	1.50 (38)	2.01 (51)	0.06 (1.6)	1.10 (28)	0.26 (6.6)
40	1.42 (36)	1.89 (48)	0.43 (11)	0.94 (24)	0.87 (22)	1.38 (35)	0.39 (10)	1.61 (41)	2.13 (54)	0.06 (1.6)	1.26 (32)	0.26 (6.6)
50	1.77 (45)	2.52 (64)	0.59 (15)	1.30 (33)	1.18 (30)	1.77 (45)	0.47 (12)	1.97 (50)	2.56 (65)	0.06 (1.6)	1.63 (41.5)	0.35 (9)
63	1.97 (50)	2.52 (64)	0.59 (15)	1.46 (37)	1.38 (35)	1.97 (50)	0.47 (12)	2.05 (52)	2.64 (67)	0.06 (1.6)	1.63 (41.5)	0.35 (9)
80	2.48 (63)	3.15 (80)	0.71 (18)	1.85 (47)	1.57 (40)	2.36 (60)	0.55 (14)	2.60 (66)	3.39 (86)	0.10 (2.5)	1.97 (50)	0.43 (11)
100	2.80 (71)	3.15 (80)	0.71 (18)	2.17 (55)	1.97 (50)	2.76 (70)	0.59 (15)	2.99 (76)	3.78 (96)	0.10 (2.5)	1.97 (50)	0.43 (11)
125	3.54 (90)	4.33 (110)	0.79 (20)	2.76 (70)	2.36 (60)	3.54 (90)	0.79 (20)	3.70 (94)	4.88 (124)	0.13 (3.2)	2.44 (62)	0.55 (14)
160	4.53 (115)	5.67 (144)	0.79 (20)	3.82 (97)	3.46 (88)	4.96 (126)	0.98 (25)	4.65 (118)	6.14 (156)	0.16 (4)	3.74 (95)	0.55 (14)
200	5.31 (135)	5.67 (144)	0.94 (24)	4.13 (105)	3.54 (90)	5.12 (130)	1.18 (30)	4.80 (122)	6.38 (162)	0.16 (4)	3.74 (95)	0.71 (18)
250	—	6.61 (168)	—	—	—	—	—	—	—	—	4.17 (106)	—
320	—	7.56 (192)	—	—	—	—	—	—	—	—	4.76 (121)	—

Dimensions in inches (mm)

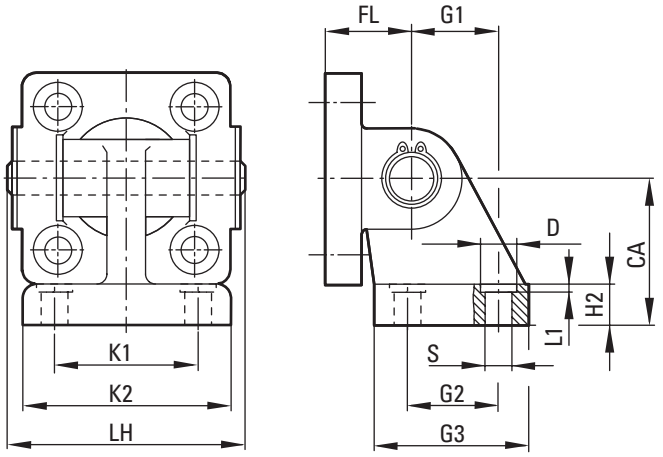
Rear eye mounting – ISO 6431 and VDMA 24562 Part 2



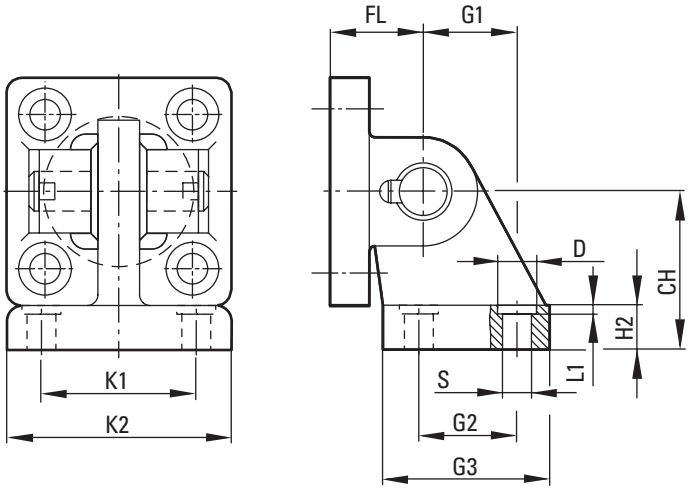
BORE	CD	EW	FL	L1	MR
32	0.39 (10)	1.02 (25.8)	0.87 (22)	0.51 (13)	0.35 (9)
40	0.47 (12)	1.09 (27.8)	0.98 (25)	0.63 (16)	0.47 (12)
50	0.47 (12)	1.25 (31.7)	1.06 (27)	0.67 (17)	0.47 (12)
63	0.63 (16)	1.56 (39.7)	1.26 (32)	0.87 (22)	0.59 (15)
80	0.63 (16)	1.96 (49.7)	1.42 (36)	0.87 (22)	0.59 (15)
100	0.79 (20)	2.35 (59.7)	1.61 (41)	1.06 (27)	0.79 (20)
125	0.98 (25)	2.74 (69.7)	1.97 (50)	1.30 (33)	0.98 (25)
160	1.18 (30)	3.53 (89.7)	2.17 (55)	1.40 (35.5)	1.18 (30)
200	1.18 (30)	3.53 (89.7)	2.36 (60)	1.46 (37)	1.18 (30)

Dimensions in inches (mm)

Rear Hinge Mount – Type 1
VDMA 24562 Part 2



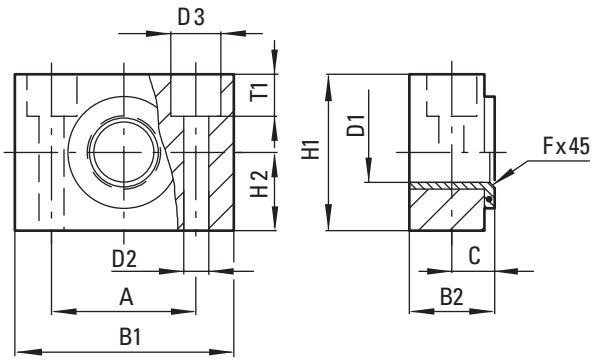
Rear Hinge Mount – Type 2
VDMA 24562 Part 2



BORE	CA	CH	D	FL	G1	G2	G3	H2	K1	K2	L1	LH	S
32	1.26 (32)	1.26 (32)	.43 (11)	.87 (22)	.83 (21)	.71 (18)	1.22 (31)	.31 (8)	1.5 (38)	2.01 (51)	.06 (1.6)	2.05 (52)	.26 (6.6)
40	1.42 (36)	1.42 (36)	.43 (11)	.98 (25)	.94 (24)	.87 (22)	1.38 (35)	.39 (10)	1.61 (41)	2.13 (54)	.06 (1.6)	2.36 (60)	.26 (6.6)
50	1.77 (45)	1.77 (45)	.59 (15)	1.06 (27)	1.3 (33)	1.18 (30)	1.77 (45)	.47 (12)	1.97 (50)	2.56 (65)	.06 (1.6)	2.68 (68)	.35 (9)
63	1.97 (50)	1.97 (50)	.59 (15)	1.26 (32)	1.46 (37)	1.38 (35)	1.97 (50)	.47 (12)	2.05 (52)	2.64 (67)	.06 (1.6)	3.11 (79)	.35 (9)
80	2.48 (63)	2.48 (63)	.71 (18)	1.42 (36)	1.85 (47)	1.57 (40)	2.36 (60)	.55 (14)	2.6 (66)	3.39 (86)	.1 (2.5)	3.9 (99)	.43 (11)1
100	2.8 (71)	2.8 (71)	.71 (18)	1.61 (41)	2.17 (55)	1.97 (50)	2.76 (70)	.59 (15)	2.99 (76)	3.78 (96)	.1 (2.5)	4.69 (119)	.43 (11)
125	3.54 (90)	3.54 (90)	.79 (20)	1.97 (50)	2.76 (70)	2.36 (60)	3.54 (90)	.79 (20)	3.7 (94)	4.88 (124)	.12 (3.2)	5.47 (139)	.55 (14)
160	4.53 (115)	4.53 (115)	.79 (20)	2.17 (55)	3.82 (97)	3.46 (88)	4.96 (126)	.98 (25)	4.65 (118)	6.14 (156)	.16 (4)	7.13 (181)	.55 (14)
200	5.31 (135)	5.31 (135)	.94 (24)	2.36 (60)	4.13 (105)	3.54 (90)	5.12 (130)	1.18 (30)	4.8 (122)	6.38 (162)	.16 (4)	7.13 (181)	.71 (18)
250*	6.50 (165)	–	1.3 (3)3	2.76 (70)	5.04 (128)	4.33 (110)	6.3 (160)	1.38 (35)	5.91 (150)	7.87 (200)	.08 (2)	8.58 (218)	.87 (22)
320*	7.87 (200)	–	1.57 (40)	3.15 (80)	5.91 (150)	4.8 (122)	7.31 (186)	1.57 (40)	6.69 (170)	9.21 (234)	.08 (2)	9.37 (238)	1.02 (26)

Dimensions in inches (mm)

Trunnion support mounting (Swivel bearing)

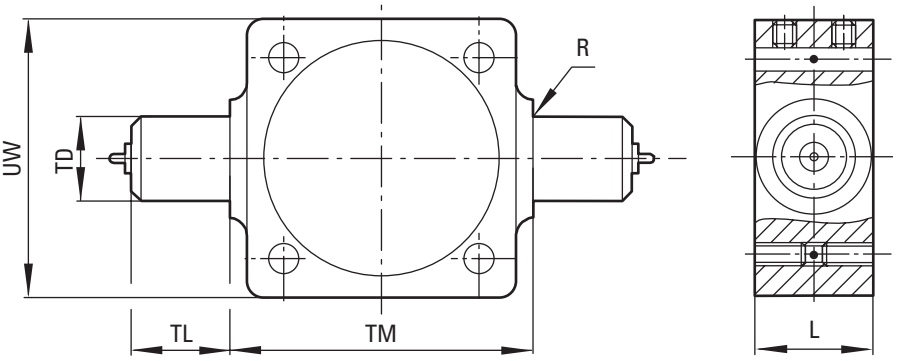


BORE	A	B1	B2	C	D2	D3	FX45°	H1	H2	T1
32	1.26	1.81	.71	.41	.26	.43	.04	1.18	.59	.27
	(32)	(46)	(18)	(10.5)	(6.6)	(11)	(1)	(30)	(15)	(6.8)
40	1.42	2.17	.83	.47	.35	.59	.06	1.42	.71	.35
	(36)	(55)	(21)	(12)	(9)	(15)	(1.6)	(36)	(18)	(9)
50	1.42	2.17	.83	.47	.35	.59	.06	1.42	.71	.35
	(36)	(55)	(21)	(12)	(9)	(15)	(1.6)	(36)	(18)	(9)
63	1.65	2.56	.91	.51	.43	.71	.06	1.57	.79	.43
	(42)	(65)	(23)	(13)	(11)	(18)	(1.6)	(40)	(20)	(11)
80	1.65	2.56	.91	.51	.43	.71	.06	1.57	.79	.43
	(42)	(65)	(23)	(13)	(11)	(18)	(1.6)	(40)	(20)	(11)
100	1.97	2.95	1.12	.63	.55	.79	.08	1.97	.98	.51
	(50)	(75)	(28.5)	(16)	(14)	(20)	(2)	(50)	(25)	(13)
125	1.97	2.95	1.12	.63	.55	.79	.08	1.97	.98	.51
	(50)	(75)	(28.5)	(16)	(14)	(20)	(2)	(50)	(25)	(13)
160	2.36	3.62	1.54	.85	.71	1.02	.10	2.36	.98	.61
	(60)	(92)	(39)	(21.5)	(18)	(26)	(2.5)	(60)	(25)	(15.5)
200	2.36	3.62	1.54	.85	.71	1.02	.10	2.36	.98	.61
	(60)	(92)	(39)	(21.5)	(18)	(26)	(2.5)	(60)	(25)	(15.5)

Dimensions in inches (mm)

Center trunnion mounting – (for tie rod types)

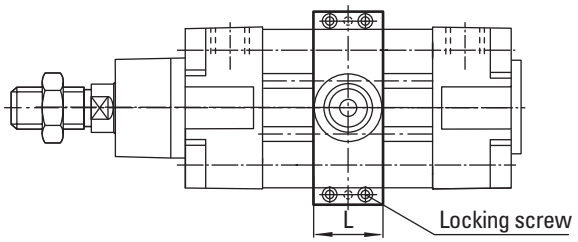
ISO 6431 and VDMA 24562 Part 2

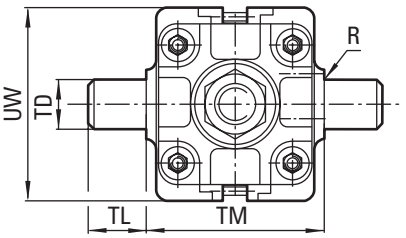


BORE	L	R	TD	TL	TM	UW	TORQUE IN. LB.
32	.79	.04	.47	.47	1.97	1.97	53.1
	(20)	(1)	(12)	(12)	(50)	(50)	
40	.94	.06	.63	.63	2.48	2.28	53.1
	(24)	(1.6)	(16)	(16)	(63)	(58)	
50	1.10	.06	.63	.63	2.95	2.76	53.1
	(28)	(1.6)	(16)	(16)	(75)	(70)	
63	1.10	.06	.79	.79	3.54	3.15	88.5
	(28)	(1.6)	(20)	(20)	(90)	(80)	
80	1.10	.06	.79	.79	4.33	3.94	88.5
	(28)	(1.6)	(20)	(20)	(110)	(100)	
100	1.50	.08	.98	.98	5.20	4.96	132.75
	(38)	(2)	(25)	(25)	(132)	(126)	
125	1.97	.08	.98	.98	6.30	5.99	221.25
	(50)	(2)	(25)	(25)	(160)	(152)	
160	1.97	.10	1.26	1.26	7.87	7.56	354
	(50)	(2.5)	(32)	(32)	(200)	(192)	
200	1.97	.10	1.26	1.26	9.84	9.45	354
	(50)	(2.5)	(32)	(32)	(250)	(240)	
250	2.36	.12	1.57	1.57	12.60	12.52	–
	(60)	(3.2)	(40)	(40)	(320)	(318)	
320	2.76	.12	1.97	1.97	15.75	15.75	–
	(70)	(3.2)	(50)	(50)	(400)	(400)	

Dimensions in inches (mm)

Series ML Cylinder Accessories

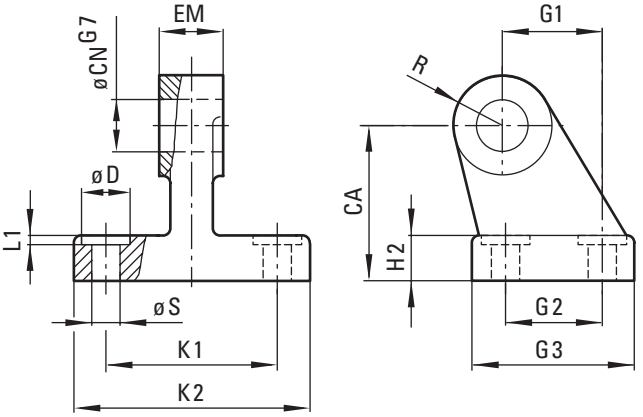




Adjustable center trunnion mounting – (for profile types) ISO 6431, VDMA 24562 Part 2

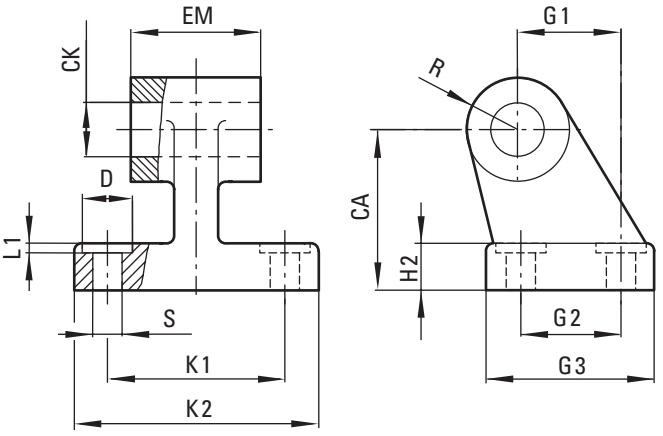
BORE	L	R	TD	TL	TM	UW	TORQUE IN. LB.
32	.79	.04	.47	.47	1.97	1.97	53.1
	(20)	(1)	(12)	(12)	(50)	(50)	
40	.94	.06	.63	.63	2.48	2.28	53.1
	(24)	(1.6)	(16)	(16)	(63)	(58)	
50	1.10	.06	.63	.63	2.95	2.76	53.1
	(28)	(1.6)	(16)	(16)	(75)	(70)	
63	1.10	.06	.79	.79	3.54	3.15	88.5
	(28)	(1.6)	(20)	(20)	(90)	(80)	
80	1.10	.06	.79	.79	4.33	3.94	88.5
	(28)	(1.6)	(20)	(20)	(110)	(100)	
100	1.50	.08	.98	.98	5.20	4.96	132.75
	(38)	(2)	(25)	(25)	(132)	(126)	
125	1.97	.08	.98	.98	6.30	5.99	221.25
	(50)	(2)	(25)	(25)	(160)	(152)	
160	1.97	.10	1.26	1.26	7.87	7.56	354
	(50)	(2.5)	(32)	(32)	(200)	(192)	
200	1.97	.10	1.26	1.26	9.84	9.45	354
	(50)	(2.5)	(32)	(32)	(250)	(240)	
250	2.36	.12	1.57	1.57	12.60	12.52	–
	(60)	(3.2)	(40)	(40)	(320)	(318)	
320	2.76	.12	1.97	1.97	15.75	15.75	–
	(70)	(3.2)	(50)	(50)	(400)	(400)	

Narrow hinge mounting



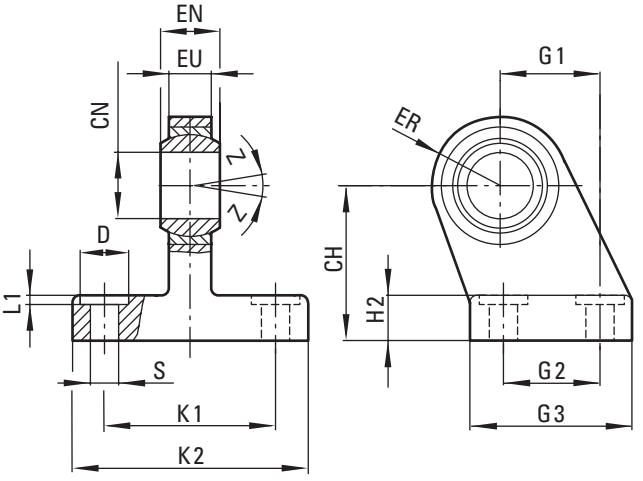
BORE	CA	CK	D	EM	G1	G2	G3	H2	K1	K2	S
32	1.26 (32)	0.39 (10)	0.43 (11)	1.02 (26)	0.83 (21)	0.71 (18)	1.22 (31)	0.31 (8)	1.50 (38)	2.01 (51)	0.26 (6.6)
40	1.42 (36)	0.47 (12)	0.43 (11)	1.10 (28)	0.94 (24)	0.87 (22)	1.38 (35)	0.39 (10)	1.61 (41)	2.13 (54)	0.26 (6.6)
50	1.77 (45)	0.47 (12)	0.59 (15)	1.26 (32)	1.30 (33)	1.18 (30)	1.77 (45)	0.47 (12)	1.97 (50)	2.56 (65)	0.35 (9)
63	1.97 (50)	0.63 (16)	0.59 (15)	1.57 (40)	1.46 (37)	1.38 (35)	1.97 (50)	0.47 (12)	2.05 (52)	2.64 (67)	0.35 (9)
80	2.48 (63)	0.63 (16)	0.71 (18)	1.97 (50)	1.85 (47)	1.57 (40)	2.36 (60)	0.55 (14)	2.60 (66)	3.39 (86)	0.43 (11)
100	2.80 (71)	0.79 (20)	0.71 (18)	2.36 (60)	2.17 (55)	1.97 (50)	2.76 (70)	0.59 (15)	3.00 (76)	3.78 (96)	0.43 (11)
125	3.54 (90)	0.98 (25)	0.79 (20)	2.76 (70)	2.76 (70)	2.36 (60)	3.54 (90)	0.79 (20)	3.70 (94)	4.88 (124)	0.55 (14)
160	4.53 (115)	1.18 (30)	0.79 (20)	3.54 (90)	3.82 (97)	3.46 (88)	4.96 (126)	0.98 (25)	4.65 (118)	6.14 (156)	0.55 (14)
200	5.31 (135)	1.18 (30)	0.94 (24)	3.54 (90)	4.13 (105)	3.54 (90)	5.12 (130)	1.18 (30)	4.80 (122)	6.38 (162)	0.71 (18)
250	6.50 (165)	1.57 (40)	1.30 (33)	4.33 (110)	5.04 (128)	4.33 (110)	6.30 (160)	1.38 (35)	5.91 (150)	7.87 (200)	0.87 (22)
320	7.87 (200)	1.77 (45)	1.57 (40)	4.72 (120)	5.91 (150)	4.80 (122)	7.32 (186)	1.57 (40)	6.69 (170)	9.21 (234)	1.02 (26)

Wide hinge mounting
VDMA 24562 Part 2



BORE	CA	CK	EM	G1	G2	G3	H2	K1	K2	L1	R	S
32	1.26 (32)	0.39 (10)	1.02 (26)	0.83 (21)	0.71 (18)	1.22 (31)	0.31 (8)	1.50 (38)	2.01 (51)	0.06 (1.6)	0.39 (10)	0.26 (6.6)
40	1.42 (36)	0.47 (12)	1.10 (28)	0.94 (24)	0.87 (22)	1.38 (35)	0.39 (10)	1.61 (41)	2.13 (54)	0.06 (1.6)	0.43 (11)	0.26 (6.6)
50	1.77 (45)	0.47 (12)	1.26 (32)	1.30 (33)	1.18 (30)	1.77 (45)	0.47 (12)	1.97 (50)	2.56 (65)	0.06 (1.6)	0.51 (13)	0.35 (9)
63	1.97 (50)	0.63 (16)	1.57 (40)	1.46 (37)	1.38 (35)	1.97 (50)	0.47 (12)	2.05 (52)	2.64 (67)	0.06 (1.6)	0.59 (15)	0.35 (9)
80	2.48 (63)	0.63 (16)	1.97 (50)	1.85 (47)	1.57 (40)	2.36 (60)	0.55 (14)	2.60 (66)	3.39 (86)	0.10 (2.5)	0.59 (15)	0.43 (11)
100	2.80 (71)	0.79 (20)	2.36 (60)	2.17 (55)	1.97 (50)	2.76 (70)	0.59 (15)	3.00 (76)	3.78 (96)	0.10 (2.5)	0.75 (19)	0.43 (11)
125	3.54 (90)	0.98 (25)	2.76 (70)	2.76 (70)	2.36 (60)	3.54 (90)	0.79 (20)	3.70 (94)	4.88 (124)	0.13 (3.2)	0.87 (22)	0.55 (14)
160	4.53 (115)	1.18 (30)	3.54 (90)	3.82 (97)	3.46 (88)	4.96 (126)	0.98 (25)	4.65 (118)	6.14 (156)	0.16 (4)	1.22 (31)	0.55 (14)
200	5.31 (135)	1.18 (30)	3.54 (90)	4.13 (105)	3.54 (90)	5.12 (130)	1.18 (30)	4.80 (122)	6.38 (162)	0.16 (4)	1.22 (31)	0.71 (18)
250	6.50 (165)	1.57 (40)	4.33 (110)	5.04 (128)	4.33 (110)	6.30 (160)	1.38 (35)	5.91 (150)	7.87 (200)	0.08 (2)	1.57 (40)	0.87 (22)
320	7.87 (200)	1.77 (45)	4.72 (120)	5.91 (150)	4.80 (122)	7.32 (186)	1.57 (40)	6.69 (170)	9.21 (234)	0.08 (2)	1.77 (45)	1.02 (26)

Swivel hinge mounting
VDMA 24562 Part 2

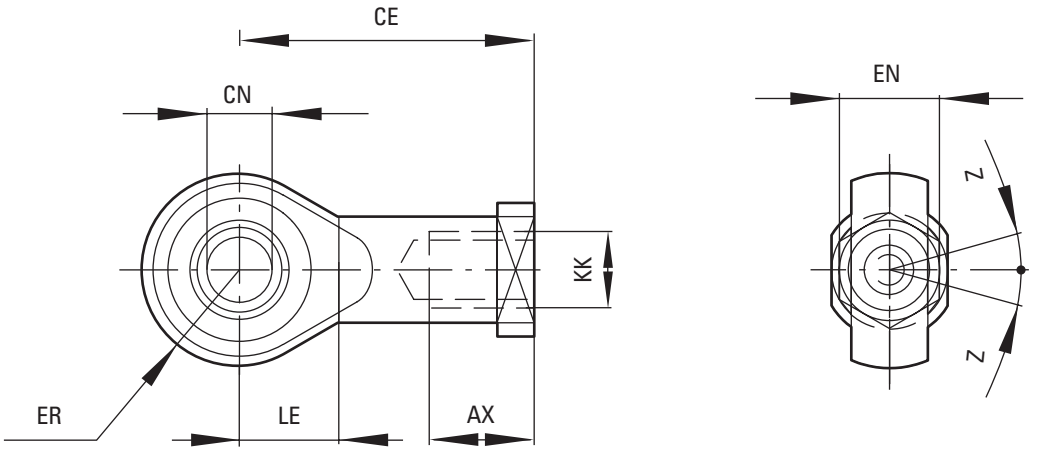


BORE	CH	CN	D	EN	ER	EU	G 1	G 2	G 3	H 2	K1	K 2	L1	S
32	1.26 (32)	0.39 (10)	0.43 (11)	0.55 (14)	0.63 (16)	0.41 (10.5)	0.83 (21)	0.71 (18)	1.22 (31)	0.31 (8)	1.50 (38)	2.01 (51)	0.06 (1.6)	0.26 (6.6)
40	1.42 (36)	0.47 (12)	0.43 (11)	0.63 (16)	0.75 (19)	0.47 (12)	0.94 (24)	0.87 (22)	1.38 (35)	0.39 (10)	1.61 (41)	2.13 (54)	0.06 (1.6)	0.26 (6.6)
50	1.77 (45)	0.63 (16)	0.59 (15)	0.83 (21)	0.83 (21)	0.59 (15)	1.30 (33)	1.18 (30)	1.77 (45)	0.47 (12)	1.97 (50)	2.56 (65)	0.06 (1.6)	0.35 (9)
63	1.97 (50)	0.63 (16)	0.59 (15)	0.83 (21)	0.94 (24)	0.59 (15)	1.46 (37)	1.38 (35)	1.97 (50)	0.47 (12)	2.05 (52)	2.64 (67)	0.06 (1.6)	0.35 (9)
80	2.48 (63)	0.79 (20)	0.71 (18)	0.98 (25)	1.10 (28)	0.71 (18)	1.85 (47)	1.57 (40)	2.36 (60)	0.55 (14)	2.60 (66)	3.39 (86)	0.10 (2.5)	0.43 (11)
100	2.80 (71)	0.79 (20)	0.71 (18)	0.98 (25)	1.18 (30)	0.71 (18)	2.17 (55)	1.97 (50)	2.76 (70)	0.59 (15)	2.99 (76)	3.78 (96)	0.10 (2.5)	0.43 (11)
125	3.54 (90)	1.18 (30)	0.79 (20)	1.46 (37)	1.57 (40)	0.98 (25)	2.76 (70)	2.36 (60)	3.54 (90)	0.79 (20)	3.70 (94)	4.88 (124)	0.13 (3.2)	0.55 (14)
160	4.53 (115)	1.38 (35)	0.79 (20)	1.69 (43)	1.73 (44)	1.10 (28)	3.82 (97)	3.46 (88)	4.96 (126)	0.98 (25)	4.65 (118)	6.14 (156)	0.16 (4)	0.55 (14)
200	5.31 (135)	1.38 (35)	0.94 (24)	1.69 (43)	1.89 (48)	1.10 (28)	4.13 (105)	3.54 (90)	5.12 (130)	1.18 (30)	4.80 (122)	6.38 (162)	0.16 (4)	0.71 (18)

Dimensions in inches (mm)

Universal piston rod eye mounting –

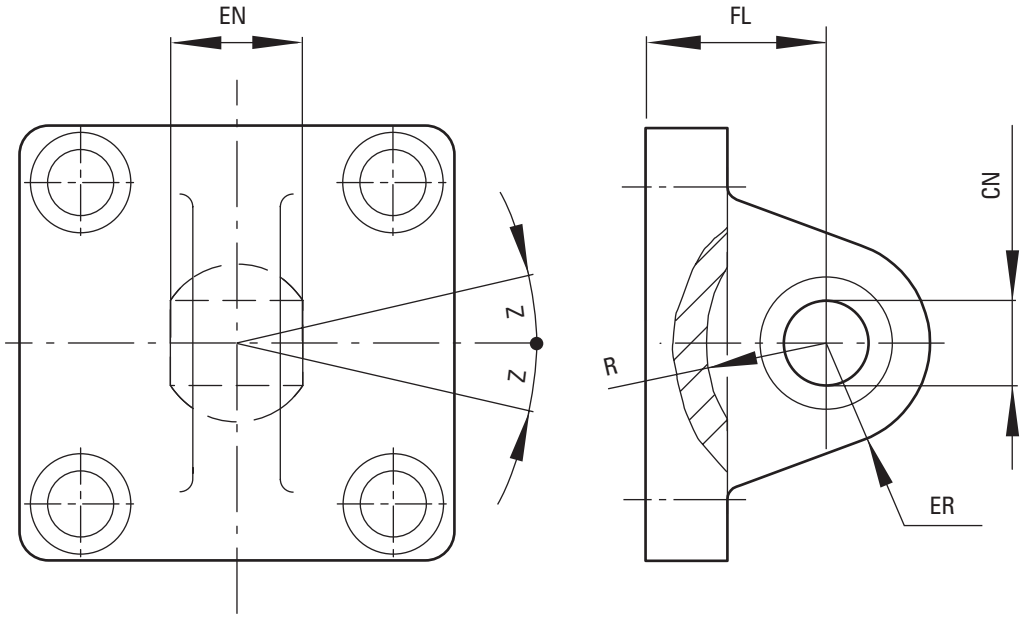
DIN ISO 8139



BORE	AX	CE	CN	EN	ER	KK	LE
32	0.79 (20)	1.69 (43)	0.39 (10)	0.55 (14)	0.55 (14)	M 10 x 1.25	0.59 (15)
40	0.87 (22)	1.97 (50)	0.47 (12)	0.63 (16)	0.63 (16)	M 12 x 1.25	0.67 (17)
50	1.10 (28)	2.52 (64)	0.63 (16)	0.83 (21)	0.83 (21)	M 16 x 1.5	0.87 (22)
63	1.10 (28)	2.52 (64)	0.63 (16)	0.83 (21)	0.83 (21)	M 16 x 1.5	0.87 (22)
80	1.30 (33)	3.03 (77)	0.79 (20)	0.98 (25)	0.98 (25)	M 20 x 1.5	1.02 (26)
100	1.30 (33)	3.03 (77)	0.79 (20)	0.98 (25)	0.98 (25)	M 20 x 1.5	1.02 (26)
125	2.01 (51)	4.33 (110)	1.18 (30)	1.46 (37)	1.38 (35)	M 27 x 2	1.42 (36)
160	2.20 (56)	4.92 (125)	1.38 (35)	1.69 (43)	1.57 (40)	M 36 x 2	1.61 (41)
200	2.20 (56)	4.92 (125)	1.38 (35)	1.69 (43)	1.57 (40)	M 36 x 2	1.61 (41)
250	2.36 (60)	5.59 (142)	1.57 (40)	1.93 (49)	1.77 (45)	M 42 x 2	1.81 (46)
320	2.56 (65)	6.30 (160)	1.97 (50)	2.36 (60)	2.28 (58)	M 48 x 2	2.32 (59)

Dimensions in inches (mm)

Universal rear eye mounting
VDMA 24562 Part 2



BORE	CN	EN	ER	FL	R	Z	LB
32	.39 (10)	.55 (14)	.63 (16)	.87 (22)	.57 (14.5)	55° (13°)	0.33
40	.47 (12)	.63 (16)	.75 (19)	.98 (25)	.71 (18)	55° (13°)	0.55
50	.63 (16)	.83 (21)	.83 (21)	1.06 (27)	.75 (19)	55° (13°)	0.88
63	.63 (16)	.83 (21)	.94 (24)	1.26 (32)	.94 (24)	59° (15°)	1.21
80	.79 (20)	.98 (25)	1.1 (28)	1.42 (36)	.94 (24)	59° (15°)	1.98
100	.79 (20)	.98 (25)	1.18 (30)	1.61 (41)	1.14 (29)	59° (15°)	3.31
125	1.18 (30)	1.46 (37)	1.57 (40)	1.97 (50)	1.42 (36)	59° (15°)	5.95
160	1.38 (35)	1.69 (43)	1.73 (44)	2.17 (55)	1.61 (41)	61° (16°)	10.14
200	1.38 (35)	1.69 (43)	1.89 (48)	2.36 (60)	1.65 (42)	61° (16°)	16.10

Dimensions in inches (mm)

Operating Pressure

1 to 16 bar (14.5 to 232 psi)

1 to 10 bar (14.5 to 145 psig) for ø250 mm and ø320 mm

Operating Temperature

-20°C to +80°C max (-4°F to +176°F max)

[Consult Factory for use below +2°C (35°F)]

Cylinder Diameters

32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320 mm

Materials for <125mm Bore

Anodized aluminum profile tube

Materials for >125mm Bore

Anodized aluminum tube

Pressure diecast aluminum end covers:

32 to 160 mm (gravity cast aluminum 200 to 320 mm)

Chrome plated stainless steel piston rod

Polyurethane piston rod seals: 32 to 100 mm (nitrile rubber 125 to 320 mm)

Polyurethane piston seals: 32 to 100 mm (nitrile rubber 125 to 320 mm)

Nitrile rubber O-rings

Tie Rod: High strength steel

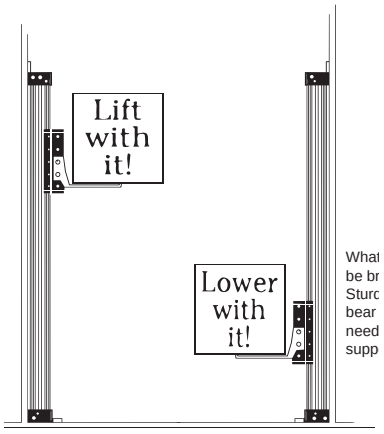
ML Series Pneumatic Cylinders

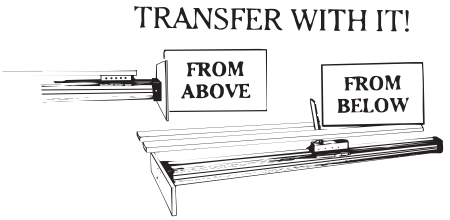
Theoretical Forces I Cushioning I Air Consumption

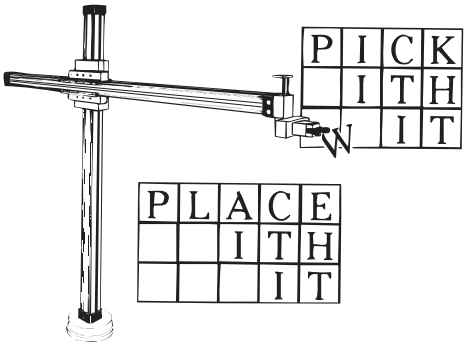
	THEORETICAL FORCES AT 6 BAR (LBS. AT 87 PSI)								AIR CONSUMPTION – LITERS/CM OF STROKE (CUBIC INCHES/INCH)			
BORE	EXTEND LBS. FORCE	(NEWTONS)	RETRACT LBS. FORCE	(NEWTONS)	CUSHION LENGTH INCH	(MM)	INITIAL CUSHION VOLUME INCHES³	(CM³)	EXTEND INCH³	(LITERS)	RETRACT INCH³	(LITERS)
32	108	(482)	93	(414)	.75	(19)	.75	(12.3)	8.7	(0.056)	7.5	(0.048)
40	169	(754)	142	(633)	.87	(22)	1.26	(20.7)	13.7	(0.088)	11.5	(0.074)
50	265	(1178)	222	(990)	.94	(24)	2.20	(36)	21.3	(0.137)	17.7	(0.114)
63	420	(1870)	378	(1680)	.94	(24)	3.90	(64)	33.9	(0.218)	30.3	(0.195)
80	678	(3016)	612	(2722)	1.06	(27)	7.08	(116)	54.4	(0.35)	49.8	(0.32)
100	1059	(4710)	993	(4416)	1.34	(34)	14.76	(242)	85.5	(0.55)	79.3	(0.51)
125	1656	(7363)	1547	(6882)	1.61	(41)	27.51	(451)	133.7	(0.86)	122.9	(0.79)
160	2713	(12064)	2543	(11310)	1.77	(45)	49.78	(816)	219.3	(1.41)	205.3	(1.32)
200	4236	(18840)	4068	(18090)	1.77	(45)	80.76	(1324)	342.1	(2.20)	326.6	(2.10)
250	6619	(29436)	6349	(28236)	2.36	(60)	176.9	(2900)	534.0	(3.44)	513.2	(3.30)
320	10846	(48228)	10634	(47292)	2.56	(65)	317.2	(5200)	875.6	(5.63)	841.4	(5.41)

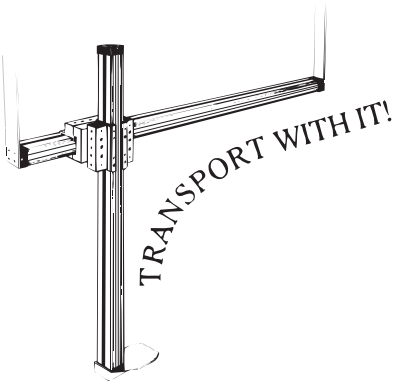
Ultimate Flexibility

Eaton RL Series rodless pneumatic cylinders provide the ultimate in flexibility. Whether you need to lift, pick, stitch, silk screen, mold, or transport, the Series RL provides limitless possibilities.

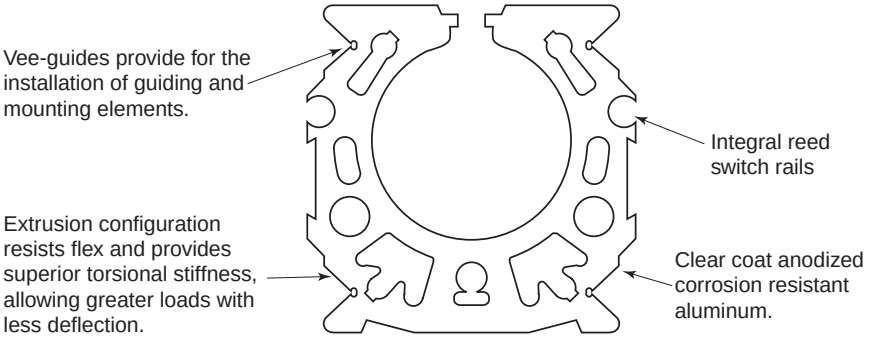








The Extruded Tube of RL Series



Features:

- Eaton RL rodless cylinders feature a sleek, compact design to provide more flexiblity in tight spaces.
- The robust design eliminates the rod (so no buckling possibility) and provides non-rotating load carrying capability without expensive add ons.
- Smoother, consistent performance for precision and high speed applications.

Series RL
Model Code

RL	01	1	A	A	N	1	A	K	0110	0
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14, 15	16

1, 2 Series
RL – Rodless Cylinders

3, 4 Mounting Styles
01 – Side Lug Mount
03 – End Lug Mount
24 – No Mount

5 Bore Size

Code	Bore Size (mm)
1	16
A	20
B	25
2	32
C	40
D	50
E	63
G	80

6 Carriage Type

A Internally Guided Carriage

B Externally Guided Carriage

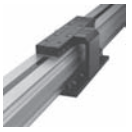
C Roller Guided Carriage

D Right Angle Mounting System (with externally guided carriage)

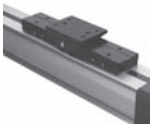
E Carriage Without Top Cover (with internally guided carriage)

F Side Mounting Plate (with externally guided carriage)

G Carriage Mounting Plate (with internally guided carriage)



H Swinging Bridge Mounting (with internally guided carriage)



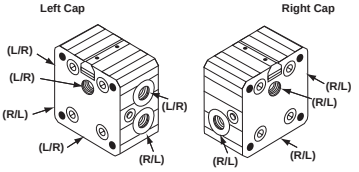
7 Rod End Type

Code	Type
A	Standard

8 Seal Options
N – Normal, Standard

9 Port Options
1 – NPTF Standard
7 – BSPPL

10 Port Locations
A – Standard Option (Multiple Port)



L/R – indicates air
R/L – indicates air

11 Cushion Location
K – Adjustable Cushions (Both Ends)

12, 13, 14, 15 Cylinder Stroke
Specify length in millimeters (mm)

16 Proximity Switch Magnet
P – Magnet Furnished to operate Hall Effect or Reed Type Switch

Series RL
Mounting Style:
16-80 mm Bores

Available Mountings

The variety of standard mountings available in the Series RL gives you a broad selection to match the proper mount to your application. Vickers offers side lug mounts, end lug mounts and no mounts. A guide to proper mount selection is provided on pages 91 through 92. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series RL cylinders are available in all mounting styles listed.

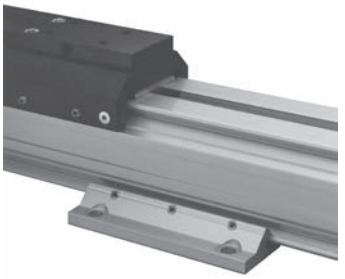
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. The specifics of each application dictate the correct mounting style.

Code 24
No Mount

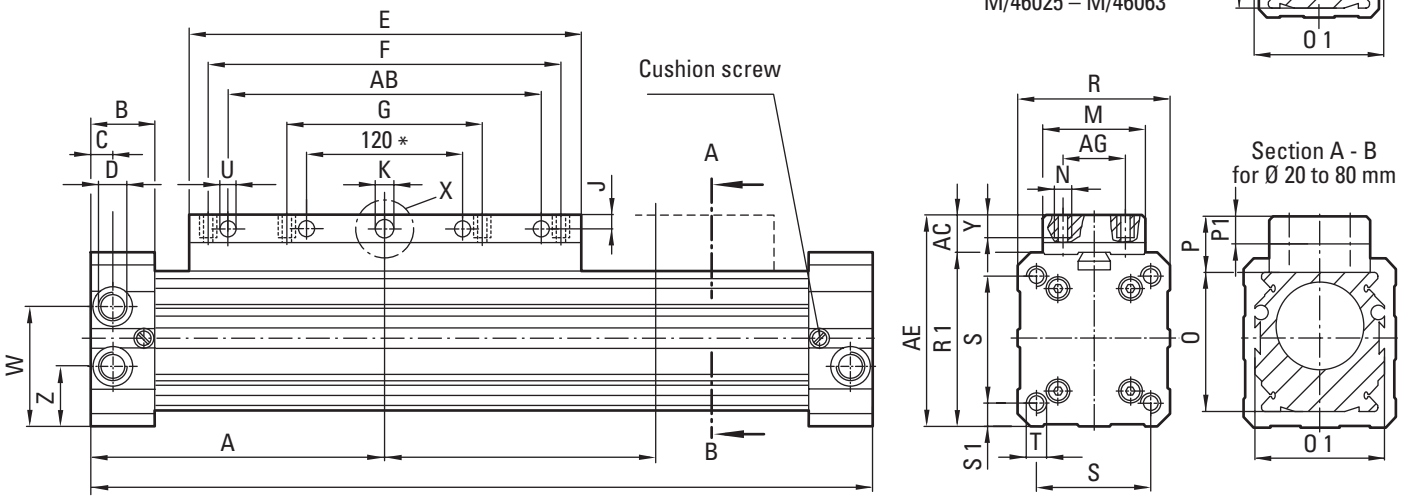
Code 03
End Lug

Code 01
Side Lug



Series RL
Mounting Styles and Installation Dimensions

Code 24 – No Mount
(Standard Cylinder)



*For cylinder 80 mm

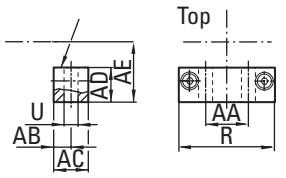
BORE	A	AB	AC	AE	AG	AO	B	C	D	E	F	G	J	K	L
16	2.46	–	0.28	1.50	0.31	/0.30	0.69	0.31	–	3.15	2.36	–	0.10	0.12	1.22
	(62.5)		(7)	(38)	(8)	(7.5)	(18)	(08)	M5	(80)	(60)	–	(2.5)	(3)	(31)
20	3.34	/2.36	0.55	2.13/2.32	0.71	/0.26	0.91	0.31	1/8 NPT	4.33	3.15	1.57	0.14 /0.30	0.17	1.65
	(85)	(60)	(14)	(54/59)	(18)	(6.5)	(23)	(08)	G1/8	(110)	(80)	(40)	(3.5/7.5)	(4.2)	(42)
25	3.93	/2.76	0.47	2.36/2.66	0.79	/0.37	0.91	0.57	1/8 NPT	5.12	3.54	1.77	/0.20	0.18	2.05
	(100)	(70)	(12)	(60/67.5)	(20)	(9.5)	(23)	(14.5)	G1/8	(130)	(90)	(45)	(5)	(4.5)	(52)
32	4.72	/3.54	0.63	3.00/3.23	0.98	/0.61	1.06	0.41	1/4 NPT	6.30	4.72	2.36	/0.20	0.24	2.52
	(120)	(90)	(16)	(76/82)	(25)	(15.5)	(27)	(10.5)	G1/4	(160)	(120)	(60)	(5)	(6)	(64)
40	5.91	/4.72	0.60	3.54/3.84	0.98	/0.65	1.18	0.45	1/4 NPT	8.46	6.30	3.15	/0.20	0.24	3.11
	(150)	(120)	(15)	(90/97.5)	(25)	(16.5)	(30)	(11.5)	G1/4	(215)	(160)	(80)	(5)	(6)	(79)
50	7.09	/6.30	0.79	4.33/4.61	0.98	/0.94	1.38	0.55	3/8 NPT	9.84	7.48	3.74	/0.26	0.32	3.62
	(180)	(160)	(20)	(110/117)	(25)	(24)	(35)	(14)	G3/8	(250)	(190)	(95)	(6.5)	(8)	(92)
63	8.46	/7.48	0.79	4.92/5.39	0.98	/1.00	1.57	0.67	1/2 NPT	12.60	9.45	4.72	/0.30	0.32	4.33
	(215)	(190)	(20)	(125/137)	(25)	(25.5)	(40)	(17)	G1/2	(320)	(240)	(120)	(7.5)	(8)	(110)
80	10.23	9.45	0.94	6.06/6.50	0.98	/1.50	1.77	0.67	1/2 NPT	15.35	11.81	5.91	0.35 /0.39	0.47	5.12
	(260)	(240)	(24)	(154/165)	(25)	(38)	(45)	(17)	G1/2	(390)	(300)	(150)	(9/10)	(12)	(130)

BORE	M	N	O	O1	P	P1	R	R1	S	S1	T	U	W	Y	Z
16	0.71	M3	0.98	1.26	0.47	–	1.06	1.22	0.63	0.22	M3x5 deep	–	–	0.16/0.20	0.63
	(18)		(25)	(32)	(12)		(27)	(31)	(16)	(5.5)				(4/5)	(16.3)
20	1.06/1.06	M5	1.26	1.50	0.73	–	1.57	1.57	1.26	0.16	M5x12 deep	–	–	0.47	0.85
	(27/27)		(32)	(38)	(18.5)		(40)	(40)	(32)	(4)				(12)	(21.5)
25	1.26/1.26	M5	1.57	1.77	0.63	0.30	1.89	1.89	1.46	0.22	M5x13 deep	–	1.30	0.28/0.47	0.67
	(32/32)		(40)	(45)	(16)	(7.5)	(48)	(48)	(37)	(5.5)			(33)	(7/12)	(17)
32	1.77/1.77	M5	2.05	2.05	0.79	0.39	2.36	2.36	1.85	0.26	M6x15 deep	–	1.57	0.31/0.47	0.79
	(45/45)		(52)	(52)	(20)	(10)	(60)	(60)	(47)	(6.5)			(40)	(8/12)	(20)
40	1.77/1.77	M6	2.56	2.56	0.79	0.39	2.95	2.95	2.28	0.33	M8x20 deep	–	1.97	0.31/0.47	0.98
	(45/45)		(65)	(65)	(20)	(10)	(75)	(75)	(58)	(8.5)			(50)	(8/12)	(25)
50	1.97/1.97	M8	3.15	3.15	0.98	0.51	3.54	3.54	2.76	0.39	M8x25 deep	–	2.36	0.43/0.67	1.18
	(50/50)		(80)	(80)	(25)	(13)	(90)	(90)	(70)	(10)			(60)	(11/17)	(30)
63	1.97/1.97	M8	3.74	3.74	0.98	0.55	4.13	4.13	3.31	0.41	M10x25 deep	–	2.76	0.43/0.79	1.38
	(50/50)		(95)	(95)	(25)	(14)	(105)	(105)	(84)	(10.5)			(70)	(11/20)	(35)
80	1.97/1.97	M10	4.72	4.72	0.98	–	5.12	5.12	3.94	0.59	M12x25 deep	0.43	3.54	0.60/0.98	1.57
	(50/50)		(120)	(120)	(29)		(130)	(130)	(100)	(15)		(11)	(90)	(15/25)	(40)

Dimensions in inches (mm)

Series RL
Mounting Styles and Installation Dimensions

Code 03 –
End Lug Mounts

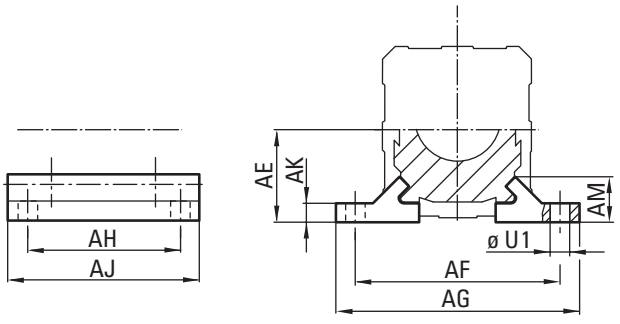


BORE	AA	AB	AC	AD	AE	R	U
16	0.63 (16)	0.39 (10)	0.59 (15)	0.12 (03)	0.63 (16)	1.06 (27)	0.22 (5.5)
20	0.67 (17)	0.20 (05)	0.39 (10)	0.39 (10)	0.85 (21.5)	1.57 (40)	0.22 (5.5)
25	0.71 (18)	0.28 (07)	0.59 (15)	0.53 (13.5)	0.94 (24)	1.89 (48)	0.28 (7)
32	1.02 (26)	0.43 (11)	0.87 (22)	0.65 (16.5)	1.20 (30.5)	2.36 (60)	0.35 (9)
40	1.18 (30)	0.43 (11)	0.87 (22)	0.77 (19.5)	1.48 (37.5)	2.95 (75)	0.35 (9)
50	1.65 (42)	0.47 (12)	0.98 (25)	0.94 (24)	1.77 (45)	3.54 (90)	0.43 (11)
63	1.89 (48)	0.51 (13)	0.98 (25)	1.08 (27.5)	2.13 (54)	4.13 (105)	0.51 (13)
80	2.52 (64)	0.49 (12.5)	0.98 (25)	1.38 (35)	2.76 (70)	5.12 (130)	0.55 (14)

End cover mounts for cylinders 25 to 80mm can be attached to give different distances AE. When used together with a center support mounting the word 'TOP' should be visible on the top face of the mount.

Dimensions in inches (mm)

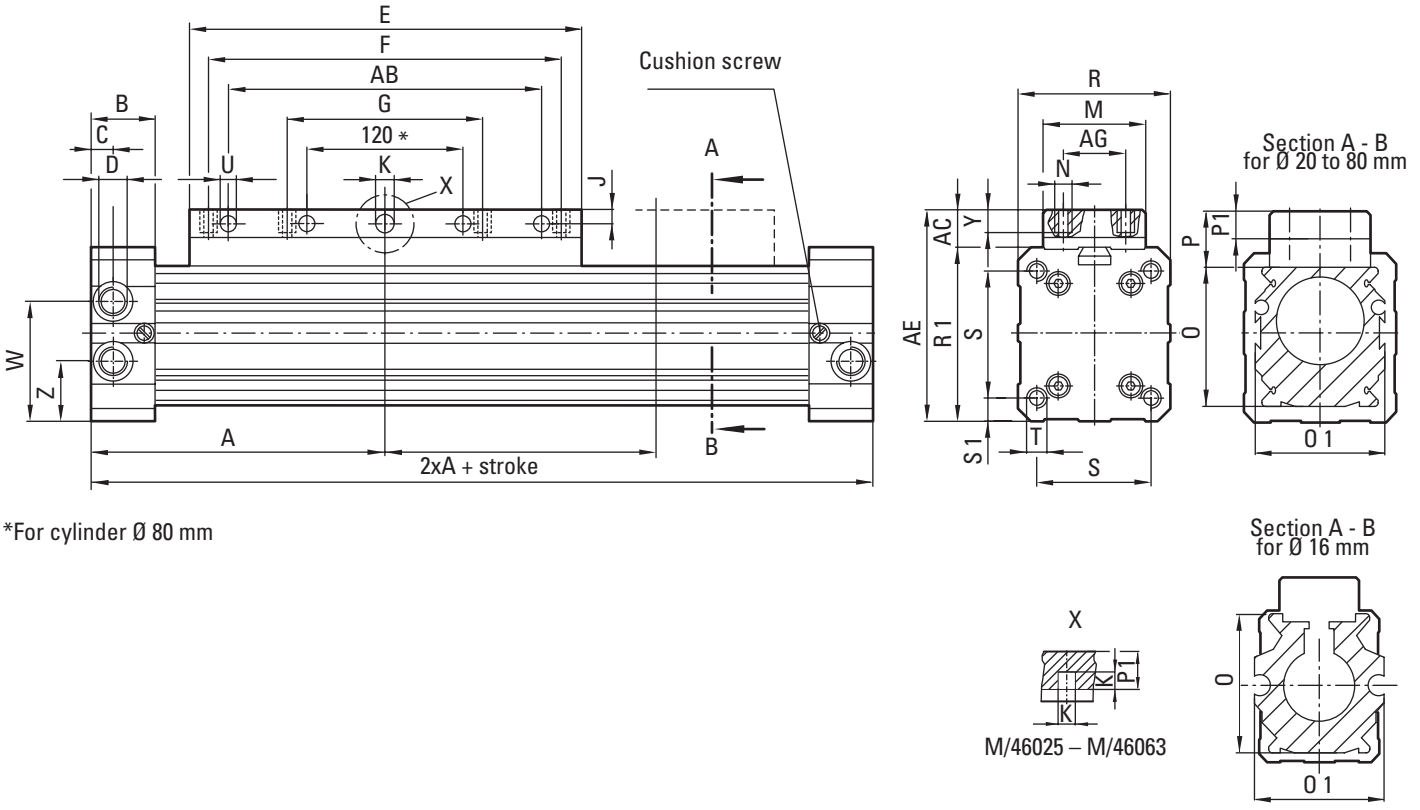
Code 01 –
Side Lug Mounts



BORE	AE	AF	AG	AH	AJ	AK	AM	U
16	0.63	1.57	1.97	0.79	1.18	0.14	0.35	0.22
	(16)	(40)	(50)	(20)	(30)	(3.5)	(9)	(5.5)
20	0.85	2.05	2.44	1.77	2.36	0.18	0.47	0.22
	(21.5)	(52)	(62)	(45)	(60)	(5)	(12)	(5.5)
25	0.94	2.36	2.83	2.36	3.15	0.22	0.51	0.26
	(24)	(60)	(72)	(60)	(80)	(5.5)	(13)	(6.6)
32	1.20	2.99	3.62	2.76	3.94	0.26	0.73	0.35
	(30.5)	(76)	(92)	(70)	(100)	(6.5)	(18.5)	(9)
40	1.48	3.62	4.25	3.54	4.72	0.30	0.73	0.35
	(37.5)	(92)	(108)	(90)	(120)	(7.5)	(18.5)	(9)
50	1.77	4.33	5.04	4.33	5.51	0.30	0.73	0.43
	(45)	(110)	(128)	(110)	(140)	(7.5)	(18.5)	(11)
63	2.13	5.20	6.06	4.72	6.30	0.35	0.98	0.51
	(54)	(132)	(154)	(120)	(160)	(9)	(25)	(13)
80	2.76	6.10	7.09	5.51	7.09	0.47	1.12	0.55
	(70)	(155)	(180)	(140)	(180)	(12)	(28.5)	(14)

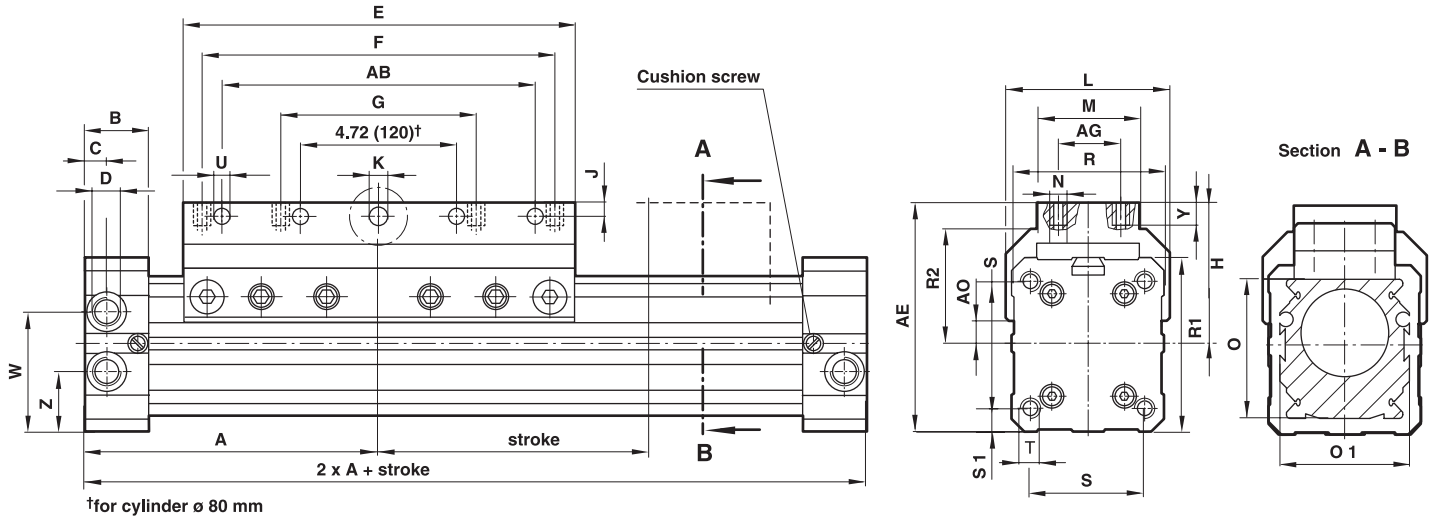
Dimensions in inches (mm)

Code A – Cylinder with Internal guide



*For cylinder Ø 80 mm

Code B – Cylinder with external guide



†for cylinder ø 80 mm

Series RL
Carriage Options

Standard Cylinder, Externally Guided Carriage

internal guiding / external guiding

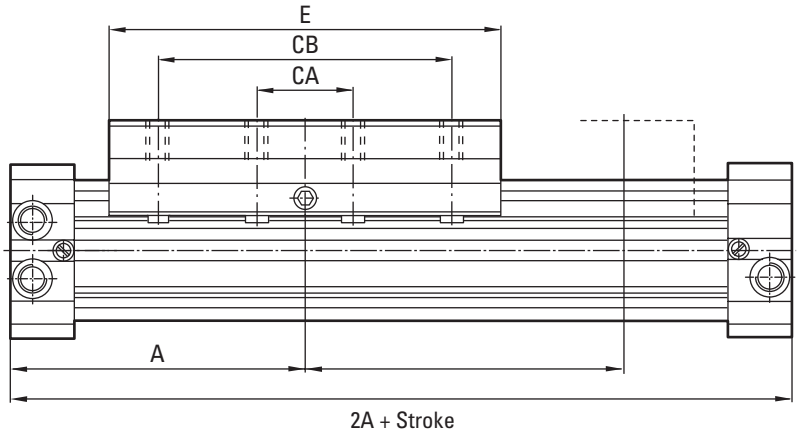
BORE	A	AB	AC	AE	AG	AO	B	C	D	E	F	G	J	K	L
16	2.46	–	0.28	1.50	0.31	/0.30	0.69	0.31	–	3.15	2.36	–	0.10	0.12	1.22
	(62.5)		(7)	(38)	(8)	(7.5)	(18)	(08)	M5	(80)	(60)	–	(2.5)	(3)	(31)
20	3.34	/2.36	0.55	2.13/2.32	0.71	/0.26	0.91	0.31	1/8 NPT	4.33	3.15	1.57	0.14 /0.30	0.17	1.65
	(85)	(60)	(14)	(54/59)	(18)	(6.5)	(23)	(08)	G1/8	(110)	(80)	(40)	(3.5/7.5)	(4.2)	(42)
25	3.93	/2.76	0.47	2.36/2.66	0.79	/0.37	0.91	0.57	1/8 NPT	5.12	3.54	1.77	/0.20	0.18	2.05
	(100)	(70)	(12)	(60/67.5)	(20)	(9.5)	(23)	(14.5)	G1/8	(130)	(90)	(45)	(5)	(4.5)	(52)
32	4.72	/3.54	0.63	3.00/3.23	0.98	/0.61	1.06	0.41	1/4 NPT	6.30	4.72	2.36	/0.20	0.24	2.52
	(120)	(90)	(16)	(76/82)	(25)	(15.5)	(27)	(10.5)	G1/4	(160)	(120)	(60)	(5)	(6)	(64)
40	5.91	/4.72	0.60	3.54/3.84	0.98	/0.65	1.18	0.45	1/4 NPT	8.46	6.30	3.15	/0.20	0.24	3.11
	(150)	(120)	(15)	(90/97.5)	(25)	(16.5)	(30)	(11.5)	G1/4	(215)	(160)	(80)	(5)	(6)	(79)
50	7.09	/6.30	0.79	4.33/4.61	0.98	/0.94	1.38	0.55	3/8 NPT	9.84	7.48	3.74	/0.26	0.32	3.62
	(180)	(160)	(20)	(110/117)	(25)	(24)	(35)	(14)	G3/8	(250)	(190)	(95)	(6.5)	(8)	(92)
63	8.46	/7.48	0.79	4.92/5.39	0.98	/1.00	1.57	0.67	1/2 NPT	12.60	9.45	4.72	/0.30	0.32	4.33
	(215)	(190)	(20)	(125/137)	(25)	(25.5)	(40)	(17)	G1/2	(320)	(240)	(120)	(7.5)	(8)	(110)
80	10.23	9.45	0.94	6.06/6.50	0.98	/1.50	1.77	0.67	1/2 NPT	15.35	11.81	5.91	0.35 /0.39	0.47	5.12
	(260)	(240)	(24)	(154/165)	(25)	(38)	(45)	(17)	G1/2	(390)	(300)	(150)	(9/10)	(12)	(130)

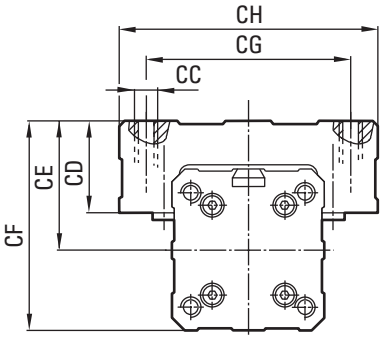
BORE	M	N	O	O1	P	P1	R	R1	R2	S	S1	T	U	W	Y	Z
16	0.71	M3	0.98	1.26	0.47	–	1.06	1.22	/0.73	0.63	0.22	M3x5 deep	–	–	0.16/0.20	0.63
	(18)		(25)	(32)	(12)		(27)	(31)	(18.5)	(16)	(5.5)				(4/5)	(16.3)
20	1.06/1.06	M5	1.26	1.50	0.73	–	1.57	1.57	/0.94	1.26	0.16	M5x12 deep	–	–	0.47	0.85
	(27/27)		(32)	(38)	(18.5)		(40)	(40)	(24)	(32)	(4)				(12)	(21.5)
25	1.26/1.26	M5	1.57	1.77	0.63	0.30	1.89	1.89	/1.34	1.46	0.22	M5x13 deep	–	1.30	0.28/0.47	0.67
	(32/32)		(40)	(45)	(16)	(7.5)	(48)	(48)	(34)	(37)	(5.5)			(33)	(7/12)	(17)
32	1.77/1.77	M5	2.05	2.05	0.79	0.39	2.36	2.36	/1.67	1.85	0.26	M6x15 deep	–	1.57	0.31/0.47	0.79
	(45/45)		(52)	(52)	(20)	(10)	(60)	(60)	(42.5)	(47)	(6.5)			(40)	(8/12)	(20)
40	1.77/1.77	M6	2.56	2.56	0.79	0.39	2.95	2.95	/1.95	2.28	0.33	M8x20 deep	–	1.97	0.31/0.47	0.98
	(45/45)		(65)	(65)	(20)	(10)	(75)	(75)	(49.5)	(58)	(8.5)			(50)	(8/12)	(25)
50	1.97/1.97	M8	3.15	3.15	0.98	0.51	3.54	3.54	/2.30	2.76	0.39	M8x25 deep	–	2.36	0.43/0.67	1.18
	(50/50)		(80)	(80)	(25)	(13)	(90)	(90)	(58.5)	(70)	(10)			(60)	(11/17)	(30)
63	1.97/1.97	M8	3.74	3.74	0.98	0.55	4.13	4.13	/2.68	3.31	0.41	M10x25 deep	–	2.76	0.43/0.79	1.38
	(50/50)		(95)	(95)	(25)	(14)	(105)	(105)	(68)	(84)	(10.5)			(70)	(11/20)	(35)
80	1.97/1.97	M10	4.72	4.72	0.98	–	5.12	5.12	/3.20	3.94	0.59	M12x25 deep	0.43	3.54	0.60/0.98	1.57
	(50/50)		(120)	(120)	(29)		(130)	(130)	(81)	(100)	(15)		(11)	(90)	(15/25)	(40)

Dimensions in inches (mm)

Roller Guided Carriage

Code C – Cylinders with precision roller guide



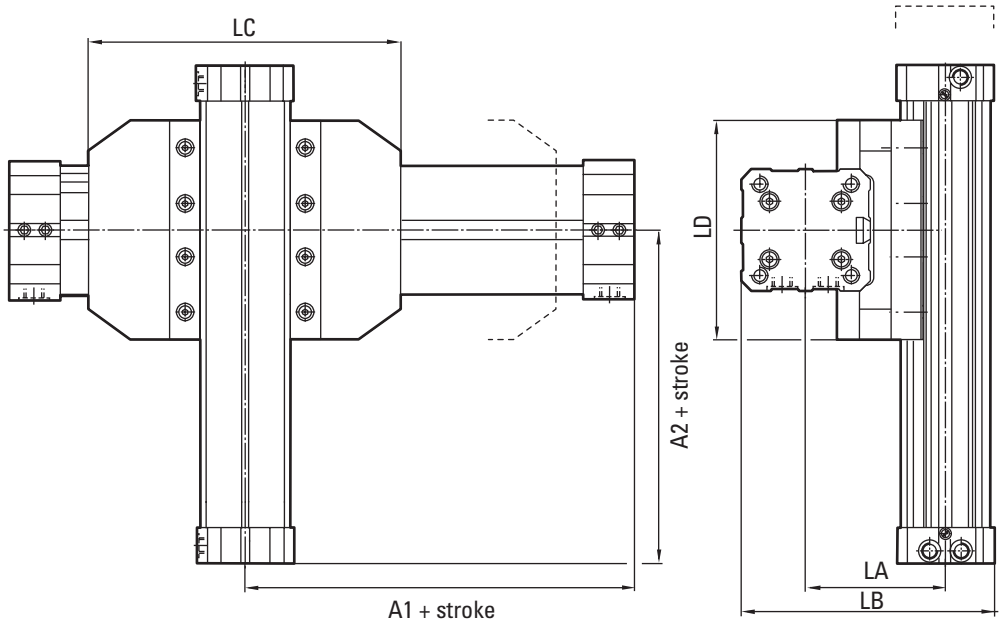


BORE	A	CA	CB	CC	CD	CE	CF	CG	CH	E
25	3.94	1.77	3.54	M6x14 deep	1.42	1.65	2.60	2.36	3.35	5.12
	(100)	(45)	(90)		(36)	(42)	(66)	(60)	(85)	(130)
32	4.72	2.36	4.72	M8x16 deep	1.50	1.97	3.15	2.95	3.86	6.30
	(120)	(60)	(120)		(38)	(50)	(80)	(75)	(98)	(160)
40	5.91	3.15	5.91	M8x16 deep	1.65	2.26	3.74	3.62	4.65	8.46
	(150)	(80)	(150)		(42)	(57.5)	(95)	(92)	(118)	(215)
50	7.09	3.54	7.09	M10x20 deep	1.73	2.64	4.41	3.94	5.20	9.84
	(180)	(90)	(180)		(44)	(67)	(112)	(100)	(132)	(250)
63	8.46	4.72	9.45	M10x20 deep	1.85	2.93	5.00	4.33	5.51	12.60
	(215)	(120)	(240)		(47)	(74.5)	(127)	(110)	(140)	(320)

Dimensions in inches (mm)

Right Angle Mounting System, Swinging Bridge

Code D – Right angle mounting system

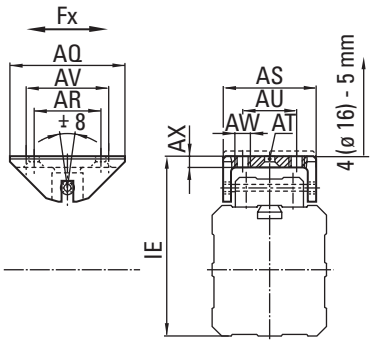


Externally Guided Right Angle Mounting System

BORE	A1	A2	LA	LB	LC	LD
25 25	3.9 (100)	3.9 (100)	2.7 (69)	4.6 (117)	5.1 (130)	5.1 (130)
32 32	4.7 (120)	4.7 (120)	3.3 (84)	5.7 (144)	6.3 (160)	6.3 (160)
40 40	5.9 (150)	5.9 (150)	3.8 (97)	6.8 (172)	8.5 (215)	8.5 (215)
50 50	7.1 (180)	7.1 (180)	4.6 (116)	8.1 (206)	9.8 (250)	9.8 (250)

Dimensions in inches (mm)

Code H – Swinging bridge



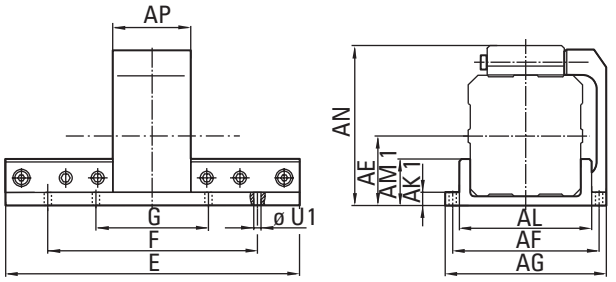
BORE	AQ	AR	AS	AT	AU	AV	AW	AX	IE	FX (N)
16	1.57 (40)	– –	1.02 (26)	– –	0.47 (12)	1.18 (30)	M4	0.16 (4)	1.89 +.16 (48 +4)	3.94 (100)
20	1.97 (50)	1.38 (35)	1.50 (38)	DIN74-Bm5	0.79 (20)	1.57 (40)	M5	0.20 (5)	2.58 +.20 (65.5 +5)	5.91 (150)
25	2.36 (60)	1.57 (40)	1.73 (44)	DIN74-Bm5	0.79 (20)	1.77 (45)	M5	0.20 (5)	2.76 +.20 (70 +5)	9.84 (250)
32	3.15 (80)	1.97 (50)	2.32 (59)	DIN74-Bm6	1.18 (30)	2.36 (60)	M6	0.22 (5.5)	3.48 +.20 (88.5 +5)	16.14 (410)
40	3.15 (80)	1.97 (50)	2.32 (59)	DIN74-Bm6	1.18 (30)	2.36 (60)	M6	0.22 (5.5)	4.04 +.20 (102.5 +5)	25.20 (640)
50	3.94 (100)	2.36 (60)	2.56 (65)	DIN74-Bm8	1.57 (40)	3.15 (80)	M8	0.26 (6.5)	4.88 +.20 (124 +5)	39.37 (1000)
63	3.94 (100)	2.36 (60)	2.56 (65)	DIN74-Bm8	1.57 (40)	3.15 (80)	M8	0.26 (6.5)	5.47 +.20 (139 +5)	59.06 (1500)
80	3.94 (100)	2.36 (60)	2.56 (65)	DIN74-Bm8	1.57 (40)	3.15 (80)	M8	0.26 (6.5)	6.63 +.20 (168.5 +5)	94.49 (2400)

Dimensions in inches (mm)

Note: Additional dimensions available as custom cylinders

Series RL
Carriage Options

Carriage Plate Mounting, Side Mounting Plate

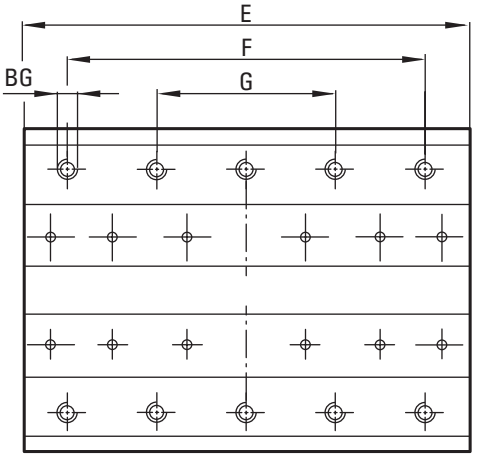


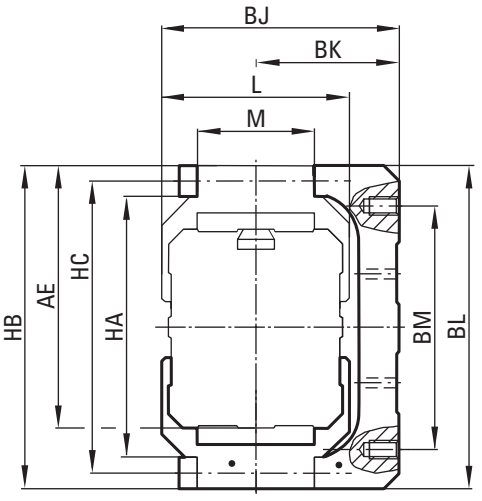
Code G – Carriage plate mounting

BORE	AE	AF	AG	AK1	AL	AM1	AN	AP	E	F	G	U1
16	0.63 (16)	1.57 (40)	1.97 (50)	0.14 (3.5)	1.22 (31)	0.33 (8.5	1.59 (40.5)	1.18 (30)	3.15 (80)	2.36 (60)	- -	0.22 (5.5)
20	0.85 (21.5)	2.05 (52)	2.44 (62)	0.22 (5.5)	1.65 (42)	0.57 (14.5)	2.20 (56)	1.42 (36)	4.33 (110)	3.15 (80)	1.57 (5.5)	0.22 (06)
25	1.04 (26.5)	2.44 (62)	2.95 (75)	0.22 (5.5)	2.05 (52)	0.69 (17.5)	2.46 (62.5)	1.77 (45)	5.12 (130)	3.54 (90)	1.77 (45)	0.26 (6.6)
32	1.30 (33)	3.07 (78)	3.62 (92)	0.26 (6.5)	2.52 (64)	0.71 (18)	3.11 (79)	2.17 (55)	6.30 (160)	4.72 (120)	2.36 (60)	0.35 (09)
40	1.59 (40.5)	3.70 (94)	4.41 (112)	0.30 (7.5)	3.19 (81)	0.94 (24)	3.66 (93)	2.56 (65)	8.46 (215)	6.30 (160)	3.15 (80)	0.35 (09)
50	1.93 (49)	4.41 (112)	5.20 (132)	0.31 (08)	3.70 (94)	0.98 (25)	4.49 (114)	2.95 (75)	9.84 (250)	7.48 (190)	3.74 (95)	0.43 (11)
63	2.26 (57.5)	5.20 (132)	5.91 (150)	0.39 (10)	4.41 (112)	1.26 (32)	5.12 (130)	3.54 (90)	12.60 (320)	9.45 (240)	4.72 (120)	0.51 (13)
80	2.76 (70)	6.10 (155)	7.09 (180)	0.39 (10)	5.20 (132)	1.26 (32)	6.26 (159)	3.94 (100)	15.35 (390)	11.81 (300)	5.91 (150)	0.55 (14)

Dimensions in inches (mm)

Code F – Side mounting plate

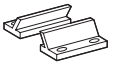




BORE	AE	BG	BJ	BK	BL	BM	E	F	G	HA	HB	HC	L	M
16	1.50 (38)	–	– –	– –	– –	– –	3.15 (80)	– –	– –	– –	1.93 (49)	– –	– –	0.71 (18)
20	2.32 (59)	M5x10 deep	2.13 (54)	1.30 (33)	3.07 (78)	2.17 (55)	4.33 (110)	– –	1.57 (40)	2.52 (64)	3.11 (79)	2.52 (64)	1.65 (42)	1.06 (27)
25	2.66 (67.5)	M5x10 deep	2.48 (63)	1.46 (37)	3.39 (86)	2.56 (65)	5.12 (130)	3.15 (80)	1.77 (45)	3.03 (77)	3.43 (87)	3.03 (77)	2.05 (52)	1.26 (32)
32	3.23 (82)	M5x12 deep	3.03 (77)	1.77 (45)	4.06 (103)	3.15 (80)	6.30 (160)	3.54 (90)	2.36 (60)	3.70 (94)	4.09 (104)	3.70 (94)	2.52 (64)	1.77 (45)
40	3.84 (97.5)	M6x12 deep	3.86 (98)	2.30 (58.5)	4.69 (119)	3.54 (90)	8.46 (215)	4.72 (120)	3.15 (80)	4.33 (110)	4.72 (120)	4.33 (110)	3.11 (79)	1.77 (45)
50	4.61 (117)	M6x15 deep	4.63 (117.5)	2.81 (71.5)	5.63 (143)	4.72 (120)	9.84 (250)	6.30 (160)	3.74 (95)	5.16 (131)	5.67 (144)	5.16 (131)	3.62 (92)	1.97 (50)
63	5.39 (137)	M8x20 deep	5.49 (139.5)	3.33 (84.5)	6.61 (168)	5.51 (140)	12.60 (320)	7.48 (190)	4.72 (120)	6.02 (153)	6.65 (169)	6.06 (154)	4.33 (110)	1.97 (50)
80	6.50 (165)	–	– –	– –	– –	– –	15.35 (390)	9.45 (240)	– –	– –	7.87 (200)	– –	– –	1.97 (50)

Dimensions in inches (mm)

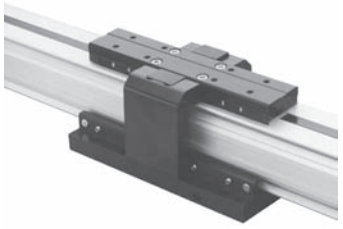
Mountings

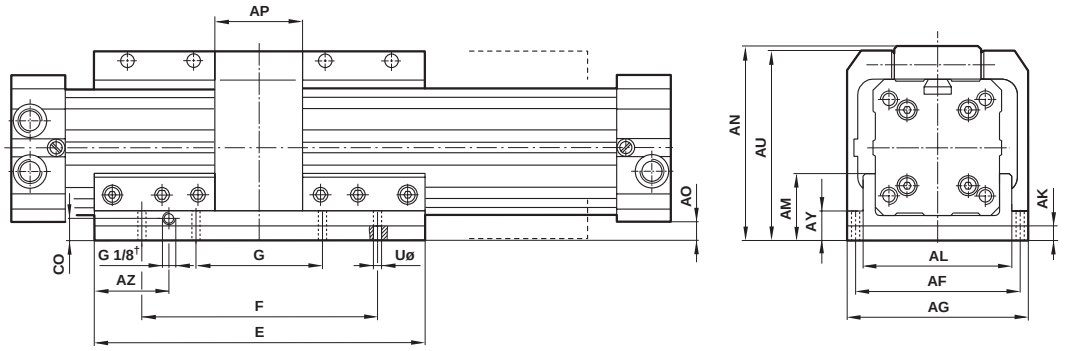
BORE	END LUG MOUNT	SWINGING BRIDGE*	CARRIAGE MOUNTING PLATE*	CENTER SUPPORT	SECONDARY CARRIAGE**	SIDE MOUNTING PLATE**
						
16	RL/46016/21	RL/46016/37	RL/46016/34	RL/46016/32	RL/46016/35	–
20	RL/46020/21	RL/46020/37	RL/46020/34	RL/46020/32	RL/46020/35	RL/46020/36
25	RL/46025/21	RL/46025/37	RL/46025/34	RL/46025/32	RL/46025/35	RL/46025/36
32	RL/46032/21	RL/46032/37	RL/46032/34	RL/46032/32	RL/46032/35	RL/46032/36
40	RL/46040/21	RL/46040/37	RL/46040/34	RL/46040/32	RL/46040/35	RL/46040/36
50	RL/46050/21	RL/46050/37	RL/46050/34	RL/46050/32	RL/46050/35	RL/46050/36
63	RL/46063/21	RL/46063/37	RL/46063/34	RL/46063/32	RL/46063/35	RL/46063/36
80	RL/46080/21	RL/46080/37	RL/46080/34	RL/46080/32	RL/46080/35	–

* Suitable for internally guided models only. ** Suitable for external guided models only.

Dimensions in inches (mm)

Active Holding Brake System

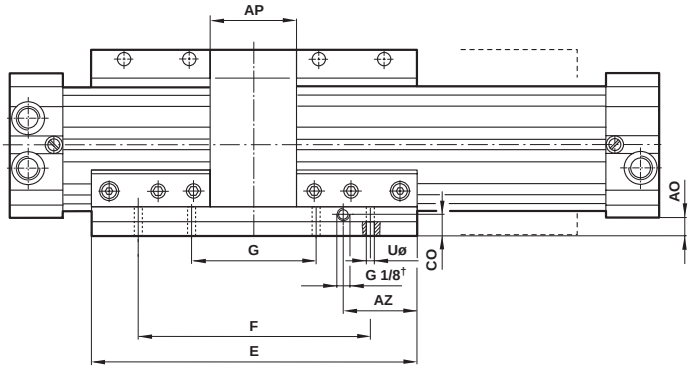


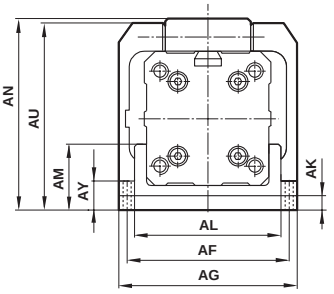


BORE NPT ISO	25 MM RLC/46025B/L3/* RLM/46025B/L3/*	32 MM RLC/46032B/L3/* RLM/46032B/L3/*	40 MM RLC/46040B/L3/* RLM/46040B/L3/*	50 MM RLC/46050B/L3/* RLM/46050B/L3/*	63 MM RLC/46063B/L3/* RLM/46063B/L3/*
AF	2.44 (62)	3.07 (78)	3.70 (94)	4.41 (112)	5.20 (132)
AG	2.95 (75)	3.62 (92)	4.41 (112)	5.20 (132)	5.91 (150)
AK	0.48 (12)	0.48 (12)	0.48 (12)	0.48 (12)	0.48 (12)
AL	2.05 (52)	2.52 (64)	3.19 (81)	3.70 (94)	4.41 (112)
AM	1.12 (28.5)	1.14 (29)	1.36 (34.5)	1.40 (35.5)	1.67 (42.5)
AN	2.89 (73.5)	3.54 (90)	4.07 (103.5)	4.90 (124.5)	5.53 (140.5)
AO	0.53 (13.5)	0.55 (14)	0.53 (13.5)	0.57 (14.5)	0.61 (15.5)
AP	1.77 (45)	2.17 (55)	2.56 (65)	2.95 (75)	3.54 (90)
AU	2.87 (73)	3.52 (89.5)	4.06 (103)	4.88 (124)	5.51 (140)
AY	0.65 (16.5)	0.69 (17.5)	0.71 (18)	0.73 (18.5)	0.81 (20.5)
AZ	1.18 (30)	1.28 (32.5)	2.07 (52.5)	2.56 (65)	4.53 (115)
CO	0.63 (16)	0.71 (18)	0.71 (18)	0.94 (24)	0.94 (24)
E	5.12 (130)	6.30 (160)	8.46 (215)	9.84 (250)	12.60 (320)
F	3.54 (90)	4.72 (120)	6.30 (160)	7.48 (190)	9.45 (240)
G	—	2.36 (60)	3.15 (80)	3.74 (95)	4.72 (120)
UØ	0.26 (6.6)	0.35 (9)	0.35 (9)	0.43 (11)	0.51 (13)

* Stroke length (inches)
Dimensions in inches (mm)

Passive Holding Brake System





BORE NPT ISO	25 MM RLC/46025B/L4/* RLM/46025B/L4/*		32 MM RLC/46032B/L4/* RLM/46032B/L4/*		40 MM RLC/46040B/L4/* RLM/46040B/L4/*		50 MM RLC/46050B/L4/* RLM/46050B/L4/*		63 MM RLC/46063B/L4/* RLM/46063B/L4/*	
AF	2.44	(62)	3.07	(78)	3.70	(94)	4.41	(112)	5.20	(132)
AG	2.95	(75)	3.62	(92)	4.41	(112)	5.20	(132)	5.91	(150)
AK	0.39	(10)	0.47	(12)	0.47	(12)	0.71	(18)	0.71	(18)
AL	2.05	(52)	2.52	(64)	3.19	(81)	3.31	(84)	4.41	(112)
AM	1.52	(38.5)	1.61	(41)	1.83	(46.5)	2.11	(53.5)	2.38	(60.5)
AN	3.29	(83.5)	4.02	(102)	4.55	(115.5)	5.61	(142.5)	6.24	(158.5)
AO	0.93	(23.5)	1.02	(26)	1.00	(25.5)	1.28	(32.5)	1.32	(33.5)
AP	1.77	(45)	2.17	(55)	2.56	(65)	2.95	(75)	3.54	(90)
AU	3.27	(83)	4.00	(101.5)	4.53	(115)	5.59	(142)	6.22	(158)
AY	1.04	(26.5)	1.16	(29.5)	1.18	(30)	1.44	(36.5)	1.52	(38.5)
AZ	1.18	(30)	1.28	(32.5)	2.07	(52.5)	2.56	(65)	4.53	(115)
CO	0.63	(16)	0.71	(18)	0.71	(18)	0.94	(24)	0.94	(24)
E	5.12	(130)	6.30	(160)	8.46	(215)	9.84	(250)	12.60	(320)
F	3.54	(90)	4.72	(120)	6.30	(160)	7.48	(190)	9.45	(240)
G	—		2.36	(60)	3.15	(80)	3.74	(95)	4.72	(120)
UØ	0.26	(6.6)	0.35	(9)	0.35	(9)	0.43	(11)	0.51	(13)

* Stroke length (inches)
Dimensions in inches (mm)

Operating Temperature

-22° to 180°F* (-30°C to 80°C)

*With dewpoint of supply air less than ambient air temperature.

Operating Pressure

16 mm: 22 to 150 psi (1.5 to 10 bar)

20 mm to 80 mm: 15 to 150 psi (1 to 10 bar)

BORE SIZES:	AREA (SQ. IN.)
16 mm bore — 0.63″	.31
20 mm bore — 0.79″	.49
25 mm bore — 0.98″	.75
32 mm bore — 1.26″	1.25
40 mm bore — 1.57″	1.94
50 mm bore — 1.97″	3.05
63 mm bore — 2.48″	4.83
80 mm bore — 3.15″	7.79

Stroke lengths:

16 mm to 40 mm bore - to 28 ft. (8500 mm)

50 mm and 63 mm bore - to 23 ft. (7000)

80 mm bore - to 18 ft. (5500 mm)

Supply Fluid: Compressed air filtered to 50-microns and lubricated.

Materials of Construction

Tube and Carriage: Anodized aluminum

End Caps: 16 mm - molded plastic end caps and yoke.
20 mm - anodized aluminum end covers, molded plastic yoke.
25 to 80 mm - anodized aluminum end caps and yoke.

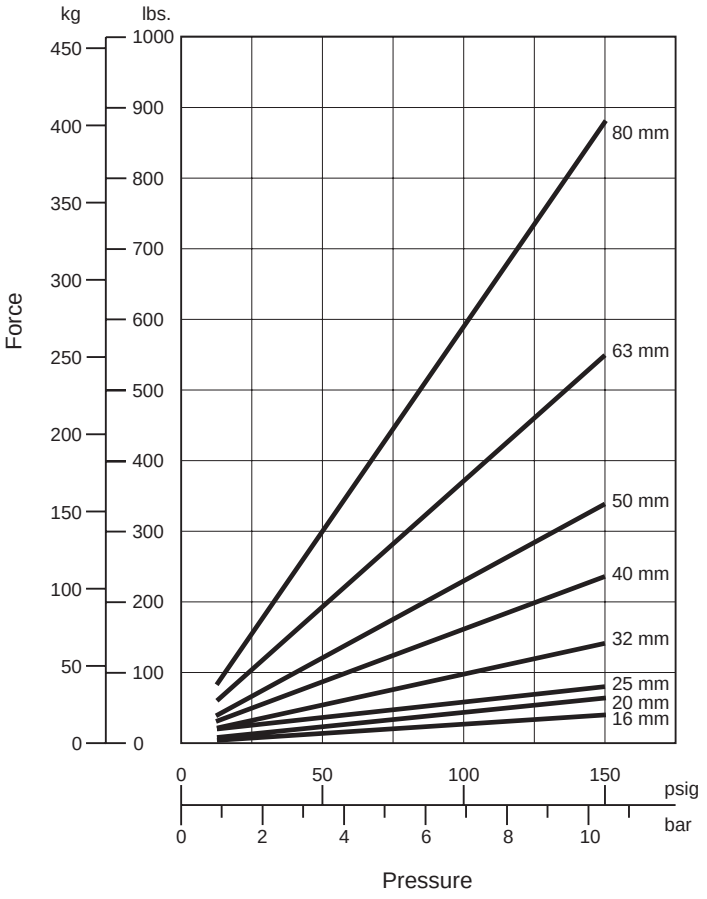
Seal Strips and Piston Seals: Polyurethane

Cover Strips: Polyamide

Guide Rails: UHMW Polymer

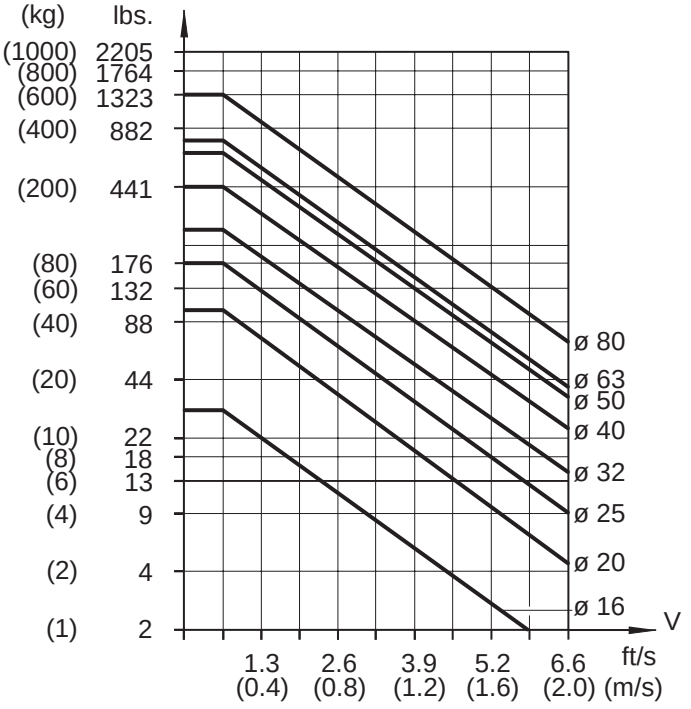
Seals: Nitrile rubber or Polyurethane

THRUST – Based on 75% of Maximum Thrust



Cushioning Performance

The dynamic energy of a RL cylinder is caused by direct or partial external loads which must be absorbed by pneumatic cushioning.The cushioning ability depends to a large extent on the pneumatic circuit (e. g. counter pressure, pre-exhaust). The values given in the diagram were tested with an operation pressure of 87 psi (6 bar) using a 5/2 control valve. When installed horizontally, depending upon the speed, dynamic energy can be absorbed by the cylinder. Whenever the values given in the diagram are exceeded, the transported mass must be cushioned by additional shock absorbers. These have to be located at the center of gravity of the mass.



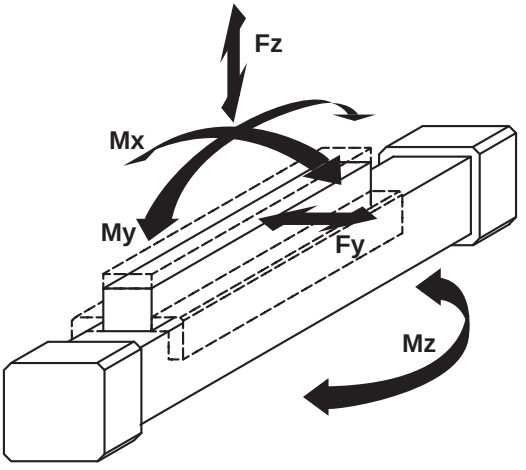
Loading values for RL cylinders

The values given in the table below show the single forces in the directions Fy and Fz and the maximum moments Mx, My and Mz. All values are applicable only for speeds of max. 0.66 ft/s (0.2 m/s). A requirement for using these values is a constant movement (no jerking) of the mass over the whole stroke length of the cylinder. The reference point from which the moments for all cylinders should be calculated is the centerline of the piston.

Total loads

When a Lintra cylinder has to take several loads and moments, an additional calculation is necessary using this formula:

$$\frac{Mx}{Mx\ max} + \frac{My}{My\ max} + \frac{Mz}{Mz\ max} + \frac{Fy}{Fy\ max} + \frac{Fz}{Fz\ max} \leq 1$$



Cylinder Weights

Cylinder with Internal Guide

	MOUNTING CODES:		
BORE	01 SIDE LUG	03 END LUG	24 NO MOUNT
16	.37 (0.17)	.37 (0.17)	.35 (0.16)
20	1.17 (0.53)	1.17 (0.53)	1.10 (0.50)
25	1.75 (0.81)	1.85 (2.74)	1.76 (0.80)
32	3.75 (1.70)	3.68 (1.67)	3.53 (1.60)
40	6.39 (2.90)	6.39 (2.90)	5.95 (2.70)
50	11.24 (5.10)	6.39 (2.90)	10.58 (4.80)
63	16.76 (7.60)	11.24 (5.10)	15.88 (7.20)
80	29.99 (13.60)	29.99 (13.60)	29.11 (13.20)

Cylinder with Roller Carriage:

	MOUNTING CODES:		
BORE	01 SIDE LUG	03 END LUG	24 NO MOUNT
16	—	—	—
20	—	—	—
25	3.77 (1.71)	3.84 (1.74)	3.75 (1.70)
32	7.06 (3.20)	6.99 (3.17)	6.84 (3.10)
40	11.47 (5.20)	11.47 (5.20)	11.03 (5.00)
50	20.73 (9.40)	20.73 (9.40)	20.07 (9.10)
63	31.53 (14.30)	31.53 (14.30)	30.65 (13.90)
80	—	—	—

Cylinder with External Guide

	MOUNTING CODES:		
BORE	01 SIDE LUG	03 END LUG	24 NO MOUNT
16	.42 (0.19)	.42 (0.19)	.40 (0.18)
20	1.39 (0.63)	1.39 (0.63)	1.32 (0.60)
25	2.00 (0.91)	2.07 (0.94)	1.98 (0.90)
32	3.97 (1.80)	3.90 (1.77)	3.75 (1.70)
40	6.83 (3.10)	6.83 (3.10)	6.39 (2.90)
50	11.46 (5.20)	11.46 (5.20)	10.80 (4.90)
63	17.86 (8.10)	17.86 (8.10)	16.98 (7.70)
80	30.43 (13.80)	30.43 (13.80)	29.55 (13.40)

Cylinder weights lbs (kgs)

Cylinder with Right Angle Mounting

	MOUNTING CODES:		
BORE	01 SIDE LUG	03 END LUG	24 NO MOUNT
16	—	—	—
20	—	—	—
25	4.21 (1.91)	4.28 (1.94)	4.19 (1.90)
32	7.06 (3.20)	6.99 (3.17)	6.84 (3.10)
40	12.34 (5.60)	12.34 (5.60)	11.90 (5.40)
50	24.48 (8.70)	24.48 (8.70)	23.82 (8.40)
63	—	—	—

Series BL Features / Benefits

A. Piston Seals

Lip-type carboxylated nitrile incorporating Teflon® and other non-lube additives as integral parts of the compound. Extremely smooth stroke performance and "no lube added" operation results from reduced friction.

B. Piston

Solid aluminum alloy, light-weight for low inertia, yet strong.

C. Head/Cap

Precision machined from (6061-T6) solid aluminum bar, anodized for corrosion resistance

D. Rod Wiper

Lip-type urethane aggressively wipes foreign material from piston rod.

E. Rod Seals

Rounded lip-type carboxylated nitrile incorporating Teflon® and other non-lube additives as integral parts of the compound. Extremely smooth stroke performance and "no lube added" operation results from reduced friction. Rod Seal is pressure-energized and wear-compensating.

F. Piston Rods

High-strength, hard-chrome plated, ground and polished steel.

G. Ultra Cushion®

State-of-the-art design features a unique, one-piece, nitrile compound seal, captured within a precision machined groove. Linear and radial "float" of cushion seal eliminates misalignment. Ultra Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional.)

H. Adjustable Captive Cushion Needle

I. Wear Strip

Teflon® and graphite composition for minimum friction, maximum wear and side load resistance. (Magnetic band under wear strip optional.)

J. Tube

6063-T832 aluminum alloy ideally suited for air service. Tube is clear anodized on the O.D. and "hard anodic coated" on the I.D. resulting in a smooth, file-hard (60RC), corrosion-resistant and score-resistant surface finish.

K. Tie Rods

High-strength steel maintains compression on tube end seals.

L. Retainer

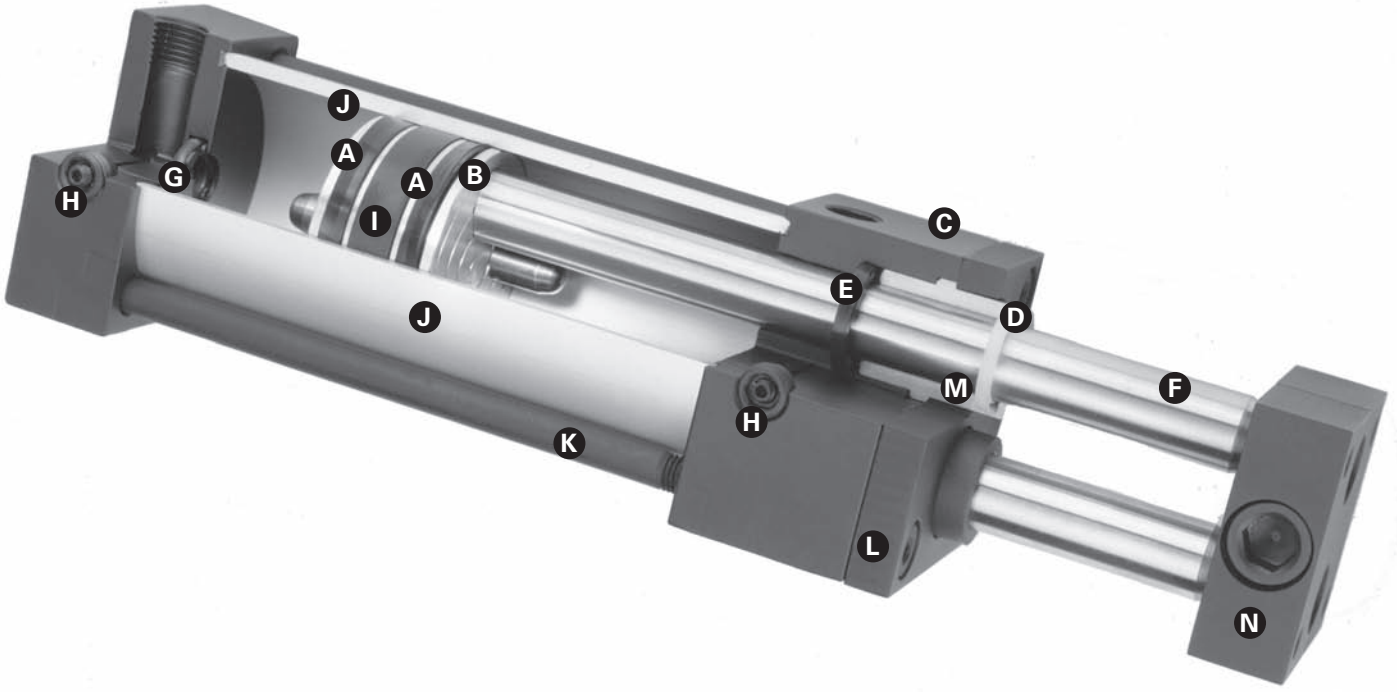
High-strength steel is used to retain rod bearings.

M. Rod Bearings

Machined from durable, close-grained cast iron, then completely coated with Teflon® to insure permanent lubrication and corrosion resistance.

N. Tooling Plate

Machined from solid steel and notched for secure attachment. Modular and pilot adaptor plates are available to add to the tooling plate mounting. (Use of modular and pilot adapter plates adds to overall length.)



Series BL
Model Code

BL	01	IT	G	N	1	K	A	508	00	0
1, 2	3, 4	5, 6	7	8	9	10	11	12, 13, 14	15, 16	17

1, 2 Series
BL – Non-Rotating Cylinders

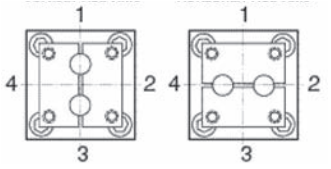
3, 4 Mounting Styles
01 – Side Lug -
02 – Side Tapped MS4
07 – Head Rectangular Flange MF1
12 – Cap Rectangular Flange MF2
24 – No Mount MX0
25 – Double Rod, Side Lug -
26 – Double Rod, Tapped -
31 – Double Rod, Rectangular Flange -
41 – Double Rod, No Mount -
48 – Detachable Eye MP4
50 – Detachable Clevis MP2
XX – Custom

5, 6 Bore and Rod Size Combinations

Code	Bore(in)	Rod(in)
IT	1-1/8	5/16
CA	1-1/2	3/8
DC	2	5/8
EC	2-1/2	5/8
GE	3-1/4	1
HE	4	1

7 Rod End Type

Code	Type
G	Grooved Rod End Horizontal
V	Grooved Rod End Vertical



8 Seal Options
N – Normal, Standard
T – High Temperature

9 Port Options
1 – NPTF Standard

10 Port Locations

Code	Head	Cap
K	1	1
R	2	2
W	3	3
4	4	4

11 Cushion Location
Cushions are located as shown in Rod end type section when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no cushion.

Code	Head	Cap
A	–	–
B	–	1
C	–	2
D	–	3
E	–	4
F	1	–
G	2	–
H	3	–
J	4	–
K	1	1
R	2	2
S	2	3
T	2	4
V	3	2
W	3	3
Y	3	4
4	4	4

Double Rod Cylinders:
"Head" = "Mounting End"
"Cap" = Non-mounting End
* Cushions not available on 1-1/8" bore

12, 13, 14 Cylinder Stroke
Items 12 and 13 indicate stroke length from 00 inches through 99 inches.
Item 14 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	5/16

15, 16 Extra Rod Projection
Item 15 indicates inches from 0 thru 9.
Item 16 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	15/16

– OR –
Proximity Switch Magnet
PK – Magnet Furnished to operate Hall Effect or Reed Type Switch

– OR –
Rod Material Options
RT – Stainless Steel 300 Series

– OR –
Bronze Option
BS – Bronze Scraper

17 Custom
X – Custom Modification

Series BL Mounting Styles and Installation Dimensions

Available Mountings

The variety of NFPA mountings available in the Series BL gives you a broad selection to match the proper mount to your application. Eaton offers rigid mounts (including side lug mounts and flange mounts) and swivel mounts (including clevis mounts). A guide to proper mount selection is provided on pages 106 through 111. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series BL cylinders are available in all mounting styles listed.

Selecting the Proper Mounting

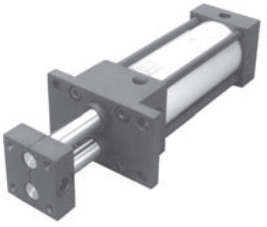
Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

Code 24 – No Mount (MXO)

Code 01 – Side Lug

Code 02 – Side Tapped (MS4)

Code 07 – Head Rectangular Flange (MF1)



Code 12 – Cap Rectangular Flange (MF2)

Code 48 – Detachable Eye (MP4)

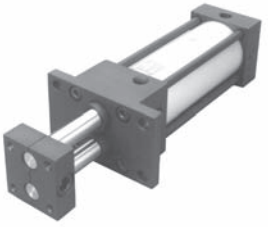
Code 50 – Detachable Clevis (MP2)

Code 41 – Double Rod, No Mount

Code 26 Double Rod, Tapped with Side Tap (MS4)

Code 25 Double Rod, Side Lug

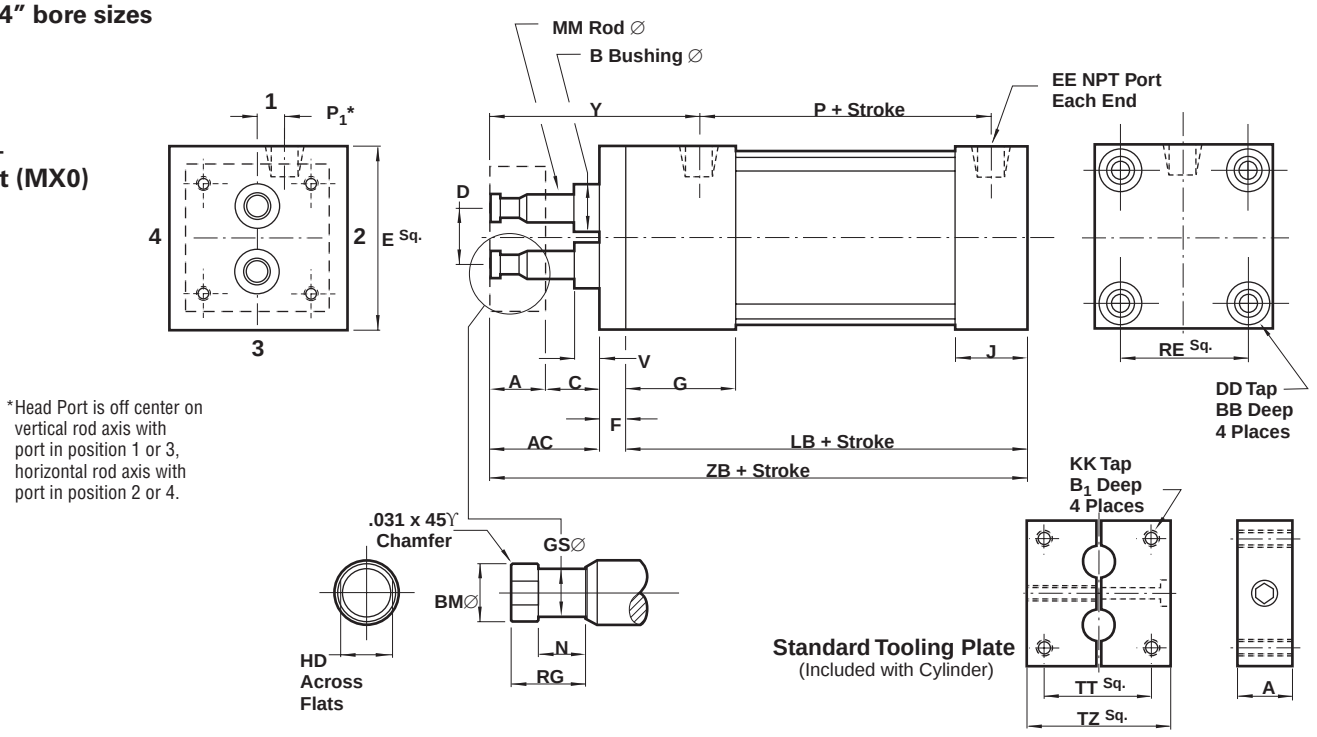
Code 31 – Double Rod, Rectangular Flange with Code 12 Flange (MF1)



Series BL
Mounting Styles and Installation Dimensions

1-1/8" to 4" bore sizes

**Code 24 –
No Mount (MX0)**



*Head Port is off center on vertical rod axis with port in position 1 or 3, horizontal rod axis with port in position 2 or 4.

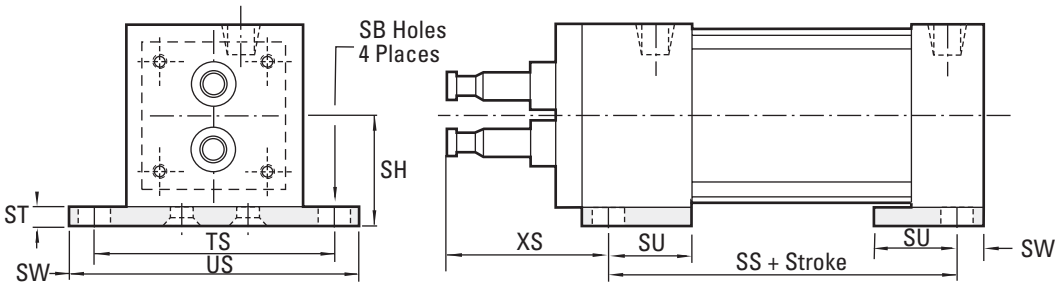
Standard Tooling Plate
(Included with Cylinder)

DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
A	.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	1.250	(31.75)	1.250	(31.75)
AC	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
B	N/A		.590	(14.99)	.900	(22.86)	.900	(22.86)	1.498	(38.05)	1.498	(38.05)
B1	.500	(12.70)	Thru		Thru		Thru		Thru		Thru	
BB	.188	(4.78)	.312	(7.92)	.312	(7.92)	.312	(7.92)	.437	(11.10)	.437	(11.10)
BM	.270	(6.86)	.330	(8.38)	.550	(13.97)	.550	(13.97)	.900	(22.86)	.900	(22.86)
C	.625	(15.88)	.875	(22.23)	.750	(19.05)	1.000	(25.40)	.500	(12.70)	.500	(12.70)
D	.627	(15.93)	.750	(19.05)	1.052	(26.72)	1.398	(35.51)	2.000	(50.80)	2.360	(59.94)
DD	10 – 32		1/4 – 28		5/16 – 24		5/16 – 24		3/8 – 24		3/8 – 24	
E	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)	4.500	(114.30)
EE	1/8		1/4		1/4		1/4		3/8		3/8	
F	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)
G	1.000	(25.4)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)
GS	.190	(4.83)	.250	(6.35)	.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)
HD	.250	(6.35)	.312	(7.92)	.500	(12.70)	.500	(12.70)	.812	(20.62)	.812	(20.62)
J	.625	(15.88)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)	1.250	(31.75)
KK	6 – 32		10 – 32		1/4 – 28		5/16 – 24		3/8 – 24		3/8 – 24	
LB	2.250	(57.15)	3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)	4.250	(107.95)
MM	.312	(7.92)	.375	(9.53)	.625	(15.88)	.625	(15.88)	1.000	(25.40)	1.000	(25.40)
N	.400	(10.16)	.400	(10.16)	.526	(13.36)	.526	(13.36)	.784	(19.81)	.784	(19.81)
P	1.469	(37.31)	2.125	(53.98)	2.125	(53.98)	2.250	(57.15)	2.625	(66.68)	2.625	(66.68)
P1	.241	(6.12)	.303	(7.70)	.480	(12.19)	.635	(16.13)	.845	(21.46)	.875	(22.23)
RE	1.125	(28.58)	1.428	(36.27)	1.840	(46.74)	2.192	(55.68)	2.758	(70.05)	3.323	(84.40)
RG	.580	(14.73)	.580	(14.73)	.705	(17.91)	.705	(17.91)	1.205	(30.61)	1.205	(30.61)
TT	.750	(19.05)	1.125	(28.58)	1.430	(36.32)	1.840	(46.74)	1.790	(45.47)	3.440	(87.38)
TZ	1.250	(31.75)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.250	(82.55)	4.000	(101.60)
V	N/A		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
Y	2.031	(51.59)	2.875	(73.03)	2.875	(73.03)	3.125	(79.38)	3.437	(87.30)	3.437	(87.30)
ZB	3.750	(95.25)	5.500	(139.70)	5.500	(139.70)	5.875	(149.23)	6.625	(168.28)	6.625	(168.28)

Series BL Mounting Styles and Installation Dimensions

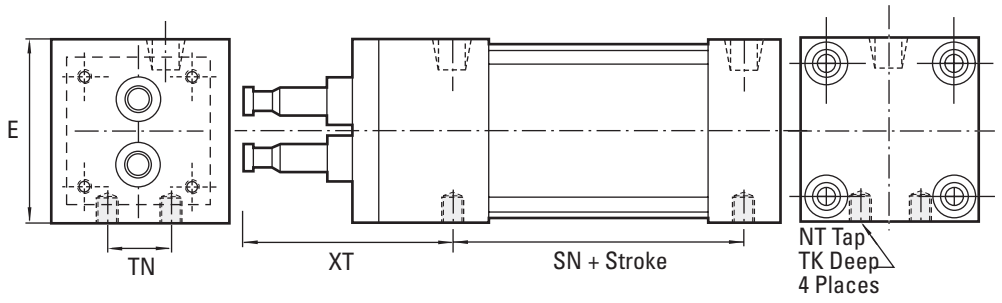
1-1/8" to 4" bore sizes

Code 01 –
Side Lug (not NFPA)



DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE(63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
SH	1.000	(25.40)	1.250	(31.75)	1.500	(38.10)	1.875	(47.63)	2.375	(60.33)	2.750	(69.85)
SS	1.750	(44.45)	2.875	(73.03)	2.875	(73.03)	3.000	(76.20)	3.250	(82.55)	3.250	(82.55)
ST	.250	(6.35)	.250	(6.35)	.250	(6.35)	.375	(9.53)	.500	(12.70)	.500	(12.70)
SU	.750	(19.05)	1.125	(25.58)	1.125	(25.58)	1.125	(25.58)	1.250	(31.75)	1.250	(31.75)
SW	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)	.500	(12.70)
TS	1.875	(47.63)	2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.750	(120.65)	5.500	(139.70)
US	2.375	(60.33)	3.500	(88.90)	4.000	(101.60)	4.500	(114.30)	5.750	(146.05)	6.500	(165.10)
XS	1.750	(44.45)	2.250	(57.15)	2.250	(57.15)	2.500	(63.50)	2.875	(73.03)	2.875	(73.03)

Code 02 –
Side Tapped (MS4)

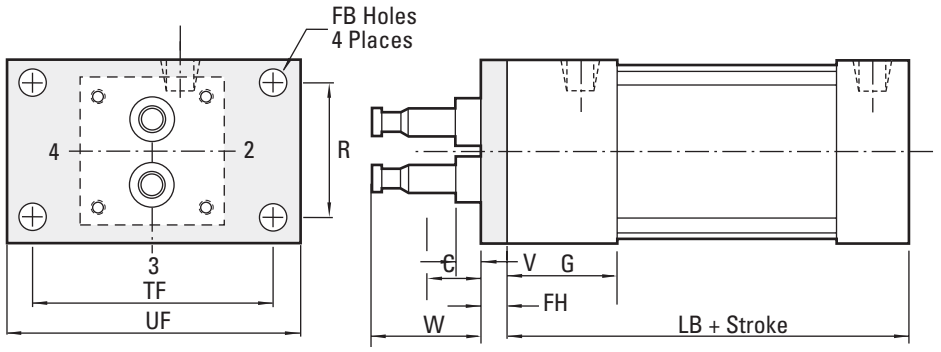


DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
E	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)	4.500	(114.30)
NT	10 – 32		1/4 – 20		5/16 – 18		3/8 – 16		1/2 – 13		1/2 – 13	
SN	1.500	(38.10)	2.250	(57.15)	2.250	(57.15)	2.375	(60.33)	2.625	(66.68)	2.625	(66.68)
TK	.250	(6.35)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)	.750	(19.05)
TN	.500	(12.70)	.625	(15.88)	.875	(22.23)	1.250	(31.75)	1.500	(38.10)	2.063	(52.40)
XT	2.000	(50.80)	2.812	(71.42)	2.812	(71.42)	3.063	(77.80)	3.437	(87.30)	3.437	(87.30)

Series BL Mounting Styles and Installation Dimensions

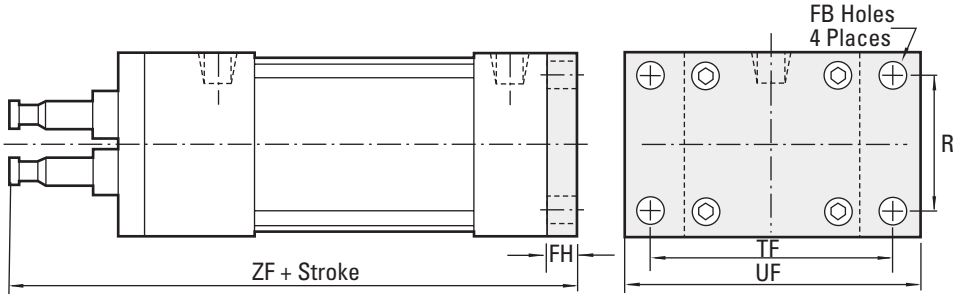
1-1/8" to 4" bore sizes

Code 07 –
Head Rectangular Flange
(MF1)



DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
C	.625	(15.88)	.875	(22.23)	.750	(19.05)	1.000	(25.40)	.500	(12.70)	.500	(12.70)
FB	.219	(5.56)	.312	(7.92)	.375	(9.53)	.375	(9.53)	.437	(11.10)	.437	(11.10)
FH	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)
G	1.000	(25.4)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)
LB	2.250	(57.15)	3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)	4.250	(107.95)
R	1.000	(25.40)	1.430	(36.32)	1.840	(46.74)	2.190	(55.63)	2.760	(70.10)	3.320	(84.33)
TF	2.000	(50.80)	2.750	(69.85)	3.375	(85.73)	3.875	(98.43)	4.688	(119.08)	5.437	(138.10)
UF	2.500	(63.50)	3.750	(95.25)	4.125	(104.78)	4.625	(117.48)	5.500	(139.70)	6.250	(158.75)
V	N/A		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
W	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)

Code 12 –
Cap Rectangular Flange
(MF2)

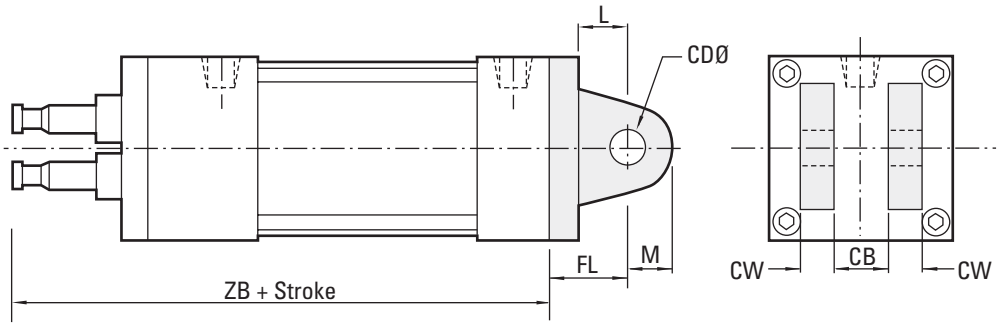


DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
FB	.219	(5.56)	.312	(7.92)	.375	(9.53)	.375	(9.53)	.437	(11.10)	.437	(11.10)
FH	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)
R	1.000	(25.40)	1.430	(36.32)	1.840	(46.74)	2.190	(55.63)	2.760	(70.10)	3.320	(84.33)
TF	2.000	(50.80)	2.750	(69.85)	3.375	(85.73)	3.875	(98.43)	4.688	(119.08)	5.437	(138.10)
UF	2.500	(63.50)	3.750	(95.25)	4.125	(104.78)	4.625	(117.48)	5.500	(139.70)	6.250	(158.75)
ZB	3.750	(95.25)	5.500	(139.70)	5.500	(139.70)	5.875	(149.23)	6.625	(168.28)	6.625	(168.28)
ZF	4.000	(101.60)	5.875	(149.23)	5.875	(149.23)	6.250	(158.75)	7.250	(184.15)	7.250	(184.15)

Series BL Mounting Styles and Installation Dimensions

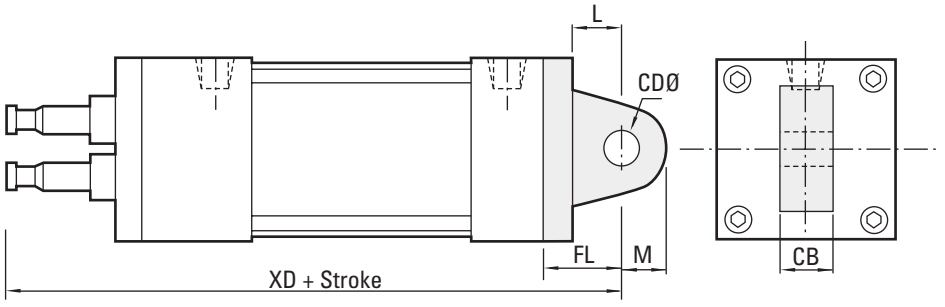
1-1/8" to 4" bore sizes

Code 50 –
Detachable Clevis (MP2)



DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
CB	.375	(9.53)	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)	1.250	(31.75)
CD	.375	(9.53)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)
CW	.250	(6.35)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)
FL	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.875	(47.63)	1.875	(47.63)
L	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)	1.250	(31.75)
M	.375	(9.53)	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)	.875	(22.23)
ZB	3.750	(95.25)	5.500	(139.70)	5.500	(139.70)	5.875	(149.23)	6.625	(168.28)	6.625	(168.28)

Code 48 –
Detachable Eye (MP4)

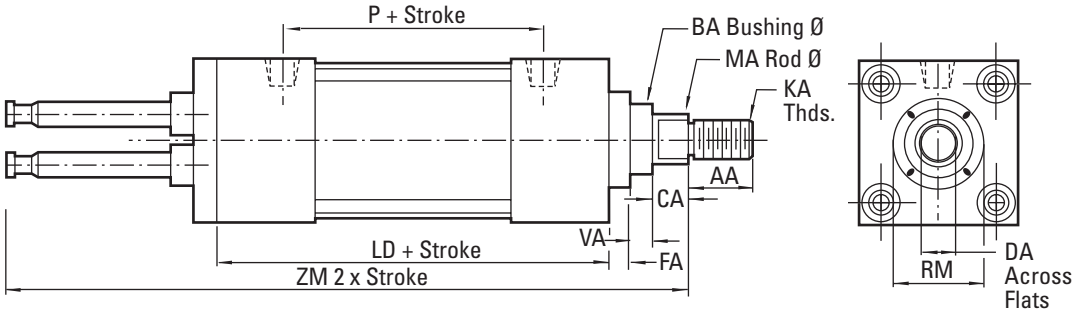


DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
CB	.375	(9.53)	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)	1.250	(31.75)
CD	.375	(9.53)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)
FL	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.875	(47.63)	1.875	(47.63)
L	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.250	(31.75)	1.250	(31.75)
M	.375	(9.53)	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)	.875	(22.23)
XD	4.875	(123.83)	6.625	(168.28)	6.625	(168.28)	7.000	(177.80)	8.375	(212.73)	8.375	(212.73)

Series BL Mounting Styles and Installation Dimensions

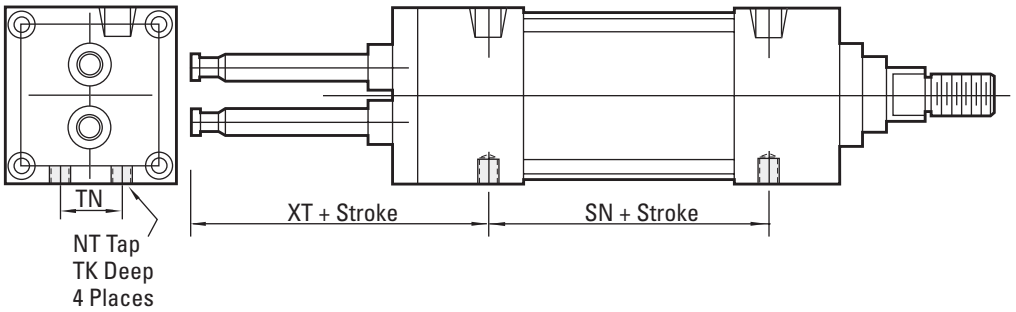
1-1/8" to 4" bore sizes

Code 41 –
Double Rod, No Mounts



DIMENSION		.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
AA	Standard	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)	1.125	(28.58)
	Oversize	.750	(19.05)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)
BA	Standard	N/A		1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)
	Oversize	N/A		1.400	(35.56)	1.500	(38.10)	1.500	(38.10)	2.000	(50.80)	2.000	(50.80)
CA	Standard	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)	.500	(12.70)
	Oversize	.250	(6.35)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)
DA	Standard	.312	(7.92)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.812	(20.62)	.812	(20.62)
	Oversize	.437	(11.10)	.812	(20.62)	.812	(20.62)	.812	(20.62)	1.125	(28.58)	1.125	(28.58)
FA		.125	(3.18)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)
KA	Standard	3/8 – 24		1/2 – 20		1/2 – 20		1/2 – 20		3/4 – 16		3/4 – 16	
	Oversize		1/2 – 20	3/4 – 16		3/4 – 16		3/4 – 16		1 – 14		1 – 14	
LD		†2.875	†(73.03)	4.125	(104.78)	4.125	(104.78)	4.250	(107.95)	4.750	(120.65)	4.750	(120.65)
MA	Standard	.375	(9.53)	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)	1.000	(25.40)
	Oversize	.500	(12.70)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)
P		†1.844	†(46.84)	2.125	(53.98)	2.125	(53.98)	2.250	(57.15)	2.625	(66.68)	2.625	(66.68)
RM	Standard	.750	(19.05)	2.000sq	(50.80)	2.000	(50.80)	2.000	(50.80)	2.625	(66.68)	2.625	(66.68)
	Oversize	1.000	(25.40)	2.000sq	(50.80)	2.500sq	(63.50)	3.000sq	(76.20)	3.375	(85.73)	3.375	(85.73)
VA	Standard	N/A		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
	Oversize	N/A		.500	(12.70)	.500	(12.70)	.500	(12.70)	.375	(9.53)	.375	(9.53)
ZM		4.625	(117.48)	7.000	(177.80)	7.000	(177.80)	7.375	(187.33)	8.500	(215.90)	8.500	(215.90)

Code 26 –
Double Rod, Tapped (MS4)

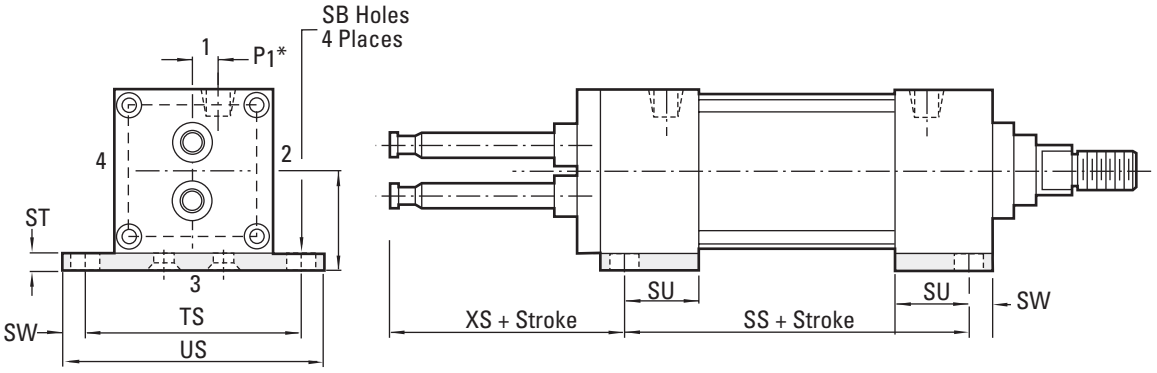


DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
NT	10 – 32		1/4 – 20		5/16 – 18		3/8 – 16		1/2 – 13		1/2 – 13	
SN	1.875	(47.63)	2.250	(57.15)	2.250	(57.15)	2.375	(60.33)	2.625	(66.68)	2.625	(66.68)
TK	.250	(6.35)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)	.750	(19.05)
TN	.500	(12.70)	.625	(15.88)	.875	22.23	1.250	(31.75)	1.500	(38.10)	2.063	(52.40)
XT	2.000	(50.80)	2.812	(71.42)	2.812	(71.42)	3.063	(77.80)	3.437	(87.30)	3.437	(87.30)

Series BL Mounting Styles and Installation Dimensions

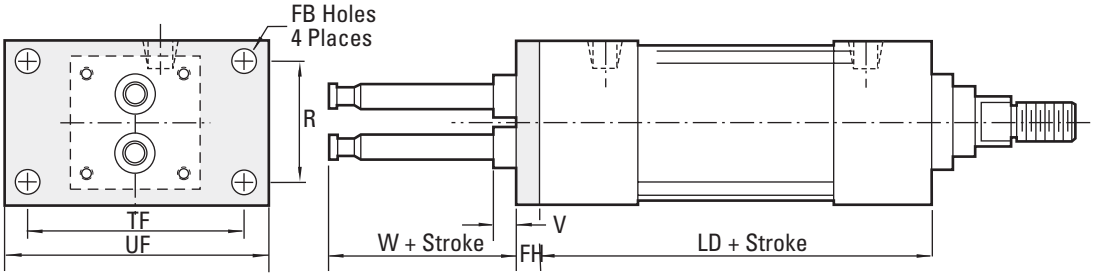
1-1/8" to 4" bore sizes

Code 25 –
Double Rod, Side Lug



DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.3-1/4" BORE (82.55)		.4" BORE (101.60)	
SB	.203	(5.16)	.437	(11.10)	.437	(11.10)	.437	(11.10)	.563	(14.30)	.563	(14.30)
SS	2.250	(57.15)	3.375	(85.73)	3.375	(85.73)	3.500	(88.90)	3.750	(95.25)	3.750	(95.25)
ST	.250	(6.35)	.250	(6.35)	.250	(6.35)	.375	(9.53)	.500	(12.70)	.500	(12.70)
SU	.750	(19.05)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)	1.250	(31.75)
SW	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)	.500	(12.70)
TS	1.875	(47.63)	2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.750	(120.65)	5.500	(139.70)
US	2.375	(60.33)	3.500	(88.90)	4.000	(101.60)	4.500	(114.30)	5.750	(146.05)	6.500	(165.10)
XS	1.750	(44.50)	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.875	(73.03)	2.875	(73.03)

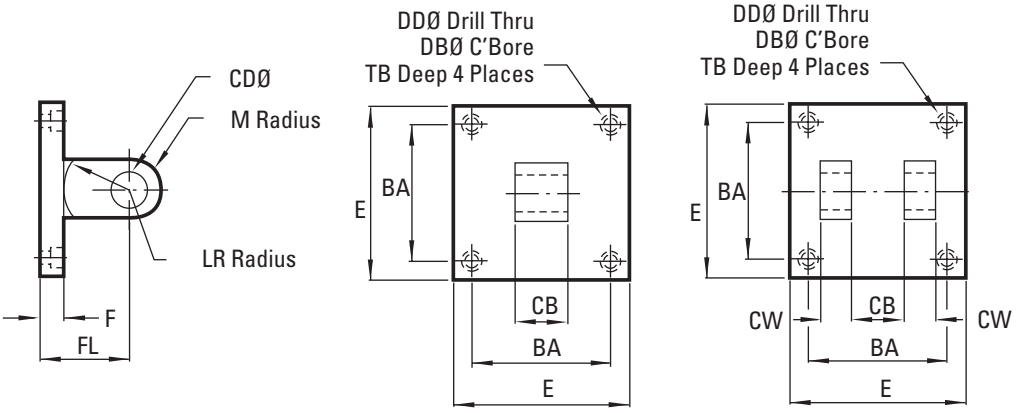
Code 31 –
Double Rod, Rectangular Flange (MF1)



DIMENSION	.1-1/8" BORE (28.58)		.1-1/2" BORE (38.10)		.2" BORE (50.80)		.2-1/2" BORE (63.50)		.31/4" BORE (82.55)		.4" BORE (101.60)	
FB	.219	(5.56)	.312	(7.92)	.375	(9.53)	.375	(9.53)	.437	(11.10)	.437	(11.10)
FH	.250	(6.35)	.375	(9.53)	.375	(9.53)	.375	(9.53)	.625	(15.88)	.625	(15.88)
LD	2.875	(73.03)	4.125	(104.78)	4.125	(104.78)	4.250	(107.95)	4.750	(120.65)	4.750	(120.65)
R	1.000	(25.40)	1.430	(36.32)	1.840	(46.74)	2.190	(55.63)	2.760	(70.10)	3.320	(84.33)
TF	2.000	(50.80)	2.750	(69.85)	3.375	(85.73)	3.875	(98.43)	4.688	(119.08)	5.437	(138.10)
TZ	1.250	(31.75)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.250	(82.55)	4.000	(101.60)
UF	2.500	(63.50)	3.750	(95.25)	4.125	(104.78)	4.625	(117.48)	5.500	(139.70)	6.250	(158.75)
V	N/A		.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)	.250	(6.35)
W	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)

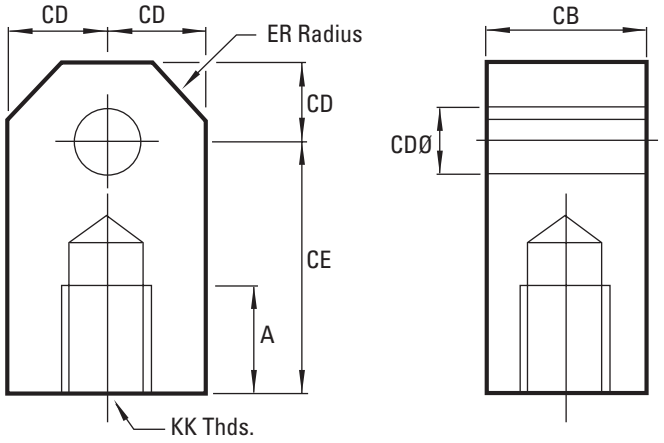
1-1/8" to 4" bore sizes

1-1/8" Bore Eye & Clevis Bracket



	BL78006A		BL610006A	
BA	1.125	(28.58)	1.150	(29.21)
CB	.375	(9.53)	.375	(9.53)
CD	.375	(9.53)	.375	(9.53)
CW	–		.250	(6.35)
DB	.328	(8.33)	.328	(8.33)
DD	.203	(5.16)	.203	(5.16)
E	1.500	(38.10)	1.500	(38.10)
F	.500	(12.70)	.500	(12.70)
FL	1.125	(28.58)	1.125	(28.58)
LR	.625	(15.88)	.625	(15.88)
M	.375	(9.53)	.375	(9.53)
TB	.312	(7.92)	.312	(7.92)

Rod Eye

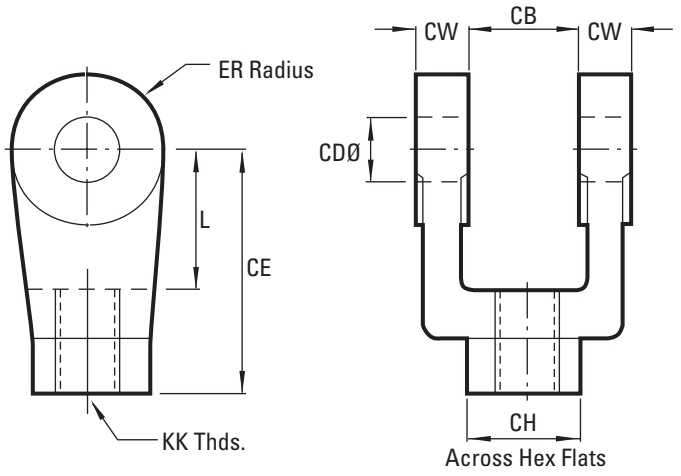


	BL60008C		BL6000CA		BL600010A	
CB	.750	(19.05)	1.250	(31.75)	1.500	(38.10)
CD	.500	(12.70)	.750	(19.05)	1.000	(25.40)
CE	1.500	(38.10)	2.062	(52.37)	2.812	(71.42)
ER	.562	(14.27)	.937	(23.80)	1.125	(28.58)
KK	1/2-20		3/4-16		1-14	

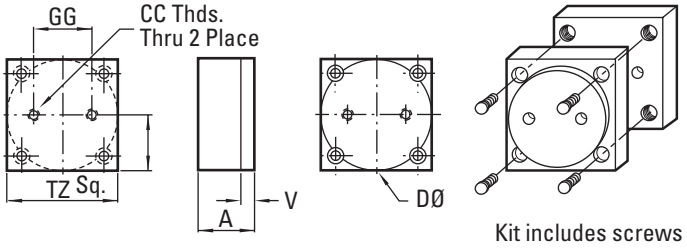
1-1/8" to 4" bore sizes

Rod Clevis

	BL62008B		BL6200CA		BL62010A	
CB	.750	(19.05)	1.250	(31.75)	1.500	(38.10)
CD	.500	(12.70)	.750	(19.05)	1.000	(25.40)
CE	1.500	(38.10)	2.375	(60.33)	3.125	(79.38)
CH	1.000	(25.40)	1.250	(31.75)	1.500	(38.10)
CW	.500	(12.70)	.625	(15.88)	.750	(19.05)
ER	.500	(12.70)	.750	(19.05)	1.000	(25.40)
KK	1/2-20		3/4-16		1-14	
L	.750	(19.05)	1.250	(31.75)	1.500	(38.10)



Pilot Adaptor Plate

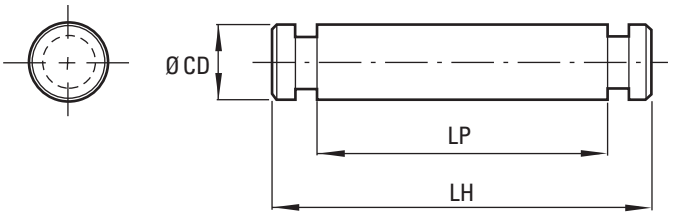


Kit includes screws

BORE	1-1/8" BL-171-225K		1-1/2" BL-171-03K		2" BL-171-04K		2-1/2" BL-171-05K		3/4" BL-171-065K		4" BL-171-08K	
A	.625	(15.88)	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)	.875	(22.23)
CC	1/4-20	5/16-18	5/16-18	3/8-16	1/2-13	1/2-13						
D	1.260	(32.00)	1.575	(40.01)	1.969	(50.01)	2.480	(62.99)	3.150	(80.01)	3.937	(99.99)
GG	.750	(19.05)	.860	(21.84)	1.180	(29.97)	1.500	(38.10)	1.970	(50.04)	2.760	(70.10)
TZ	1.250	(31.75)	1.500	(38.10)	2.000	(50.80)	2.500	(63.50)	3.250	(82.55)	4.000	(101.60)
V	.160	(4.06)	.160	(4.06)	.200	(5.08)	.200	(5.08)	.200	(5.08)	.200	(5.08)
Y	.625	(15.88)	.750	(19.05)	1.000	(25.40)	1.250	(31.75)	1.625	(41.28)	2.000	(50.80)

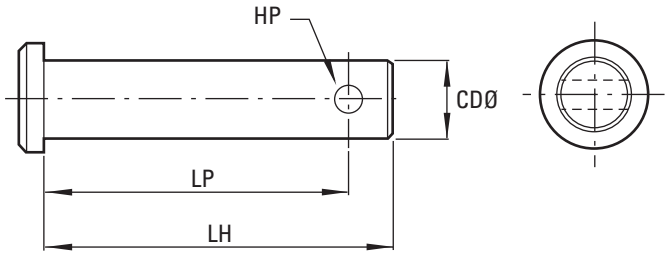
1-1/8" to 4" bore sizes

NFPA Pin



	BL83008A		BL8300CA		BL83010A	
CD	.500	(12.70)	.750	(19.05)	1.000	(25.40)
LH	2.219	(56.36)	3.125	(79.38)	3.750	(95.25)
LP	1.875	(47.63)	2.750	(69.85)	3.250	(82.55)

Standard Pin



	BL83006C		BL83008C		BL8300CC		BL83010B	
CD	.375	(9.53)	.500	(12.70)	.750	(19.05)	1.000	(25.40)
HP	.156	(3.96)	.156	(3.96)	.156	(3.96)	.203	(5.18)
LH	1.250	(31.75)	2.250	(57.15)	3.000	(76.20)	3.500	(88.90)
LP	1.032	(26.21)	2.093	(53.16)	2.843	(72.21)	3.297	(83.74)

Switches

SWITCH MODEL	PS8-2-04 REED	PS8-2-31 HALL	PS8-2-32 HALL	PS7-04 REED	PS7-24 REED	PS7-31 HALL	PS7-32 HALL
Bore Sizes	1-1/8" – 2-1/2"	1-1/8" – 2-1/2"	1-1/8" – 2-1/2"	2" - 4"	2" - 4"	2" - 4"	2" - 4"
Switch Type	Reed Switch *MOV & Light	Hall Effect/Light, Sourcing PNP	Hall Effect/Light, Sinking NPN	Reed Switch *MOV & Light	Reed Switch *MOV & Light, 3 Wire	Hall Effect/Light, Sourcing PNP	Hall Effect/Light, Sinking NPN
Function	SPST NO	Normally Open	Normally Open	Normally Open	Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC	5-240 VDC/VAC 50/60 Hz	24-240 VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	.5 Amp Max	.5 Amp Max	.5 Amp Max	1 Amp Max	4 Amp Max 50 Amp Inrush	1 Amp Max	1 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max	30 Watts Max	100 Watts Max	24 Watts Max	24 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts	3 Volts	N/A	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss	85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel
Enclosure Class	NEMA 6/CSA	NEMA 6/CSA	NEMA 6/CSA	NEMA 6/CSA	NEMA 6/CSA	NEMA 6/CSA	NEMA 6/CSA
Temperature Range	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F

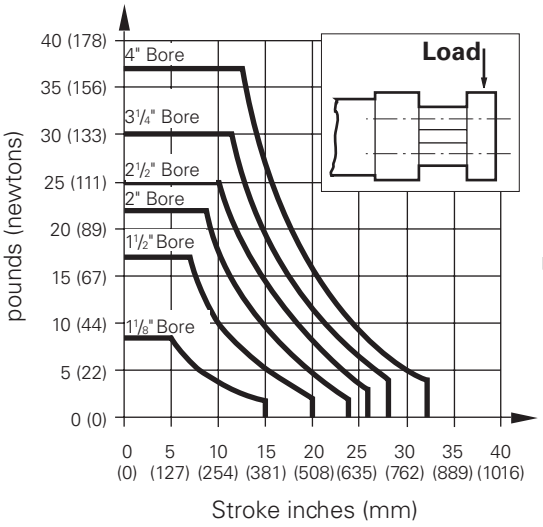
Series BL Technical Information

The transverse and torsional load graphs shown are to be utilized as a guideline with respect to the maximum load and stroke of each bore size.

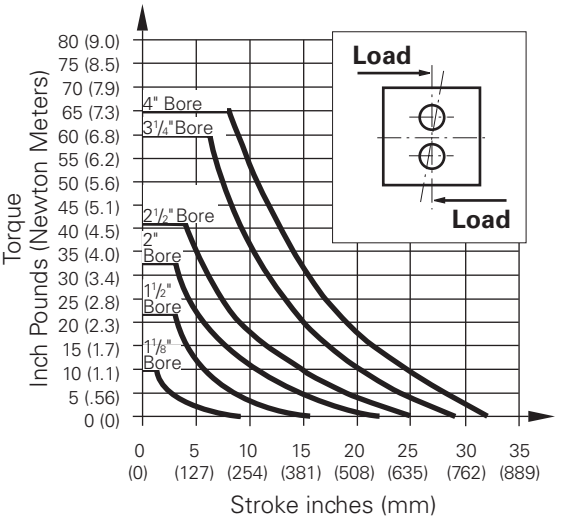
NOTE: For strokes or loads not listed consult factory.

Transverse or torsional loads placed on the cylinder will cause some deflection of the piston rods. Excessive deflection will adversely affect cylinder life and should be considered at the time of initial application design.

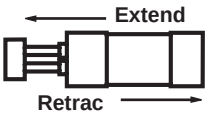
Transverse Loads

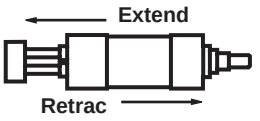


Torsional Loads



Theoretical Extend and Retract Forces in pounds (newtons)





BORE	MOVEMENT	EFFECTIVE PISTON AREA IN² (CM²)	PSI (BAR) 20	(1)	40	(3)	50	(3)	60	(4)	80	(6)	100	(7)	125	(9)	150	(10)	CU FT (CM³) DISPLACEMENT PER IN OF STROKE
	Extend	.99 (6.41)	20	(88)	40	(177)	50	(221)	60	(265)	80	(354)	99	(442)	124	(553)	149	(664)	.00058 (16)
1-1/8"	Retract	.84 (5.43)	17	(75)	34	(150)	42	(187)	50	(225)	67	(299)	84	(374)	105	(468)	126	(561)	.00049 (14)
	Extend	1.77 (11.40)	35	(157)	71	(315)	88	(393)	106	(472)	141	(629)	177	(786)	221	(983)	265	(1179)	.00102 (29)
1-1/2"	Retract	1.55 (9.97)	31	(138)	62	(275)	77	(344)	93	(413)	124	(550)	155	(688)	193	(860)	232	(1032)	.00089 (25)
	Extend	3.14 (20.27)	63	(280)	126	(559)	157	(699)	189	(839)	251	(1119)	314	(1398)	393	(1748)	471	(2097)	.00182 (52)
2"	Retract	2.53 (16.31)	51	(225)	101	(450)	126	(562)	152	(675)	202	(900)	253	(1125)	316	(1406)	379	(1687)	.00146 (41)
	Extend	4.91 (31.67)	98	(437)	196	(874)	245	(1092)	295	(1311)	393	(1748)	491	(2185)	614	(2731)	736	(3277)	.00284 (80)
2-1/2"	Retract	4.30 (27.71)	86	(382)	172	(765)	215	(956)	258	(1147)	344	(1529)	430	(1911)	537	(2389)	644	(2867)	.00249 (71)
	Extend	8.30 (53.32)	166	(738)	332	(1477)	415	(1846)	498	(2215)	664	(2953)	830	(3692)	1037	(4615)	1244	(5538)	.00480 (136)
3-1/4"	Retract	7.51 (48.45)	150	(668)	300	(1337)	376	(1671)	451	(2005)	601	(2674)	751	(3342)	939	(4177)	1127	(5013)	.00435 (123)
	Extend	12.57 (81.07)	251	(1118)	503	(2237)	628	(2796)	754	(3355)	1005	(4473)	1257	(5592)	1571	(6990)	1885	(8388)	.00727 (206)
4"	Retract	11.78 (76.01)	236	(1049)	471	(2097)	589	(2621)	707	(3146)	943	(4194)	1178	(5243)	1473	(6553)	1767	(7864)	.00682 (193)
Extend Double Rod Forces																			
1-1/8"	Standard	.88 (5.69)	18	(79)	35	(157)	44	(196)	53	(235)	71	(314)	88	(392)	110	(491)	132	(589)	.00051 (14)
	Oversize	.80 (5.15)	16	(71)	32	(142)	40	(178)	48	(213)	64	(284)	80	(355)	100	(444)	120	(533)	.00047 (13)
1-1/2"	Standard	1.46 (9.42)	29	(130)	58	(260)	73	(325)	88	(390)	117	(520)	146	(650)	183	(812)	219	(975)	.00084 (24)
	Oversize	.98 (6.34)	20	(87)	39	(175)	49	(218)	59	(262)	79	(350)	98	(437)	123	(546)	147	(655)	.00057 (16)
2"	Standard	2.84 (18.29)	57	(252)	113	(505)	142	(631)	170	(757)	227	(1009)	284	(1262)	354	(1577)	425	(1892)	.00164 (46)
	Oversize	2.36 (15.21)	47	(210)	94	(420)	118	(524)	141	(629)	189	(839)	236	(1049)	295	(1311)	354	(1573)	.00137 (39)
2-1/2"	Standard	4.60 (29.69)	92	(410)	184	(819)	230	(1024)	276	(1229)	368	(1638)	460	(2048)	575	(2560)	690	(3072)	.00266 (75)
	Oversize	4.12 (26.61)	82	(367)	165	(734)	206	(918)	247	(1101)	330	(1468)	412	(1835)	516	(2294)	619	(2753)	.00239 (68)
3-1/4"	Standard	7.51 (48.46)	150	(668)	300	(1337)	376	(1671)	451	(2005)	601	(2674)	751	(3342)	939	(4178)	1127	(5014)	.00435 (123)
	Oversize	6.81 (43.94)	136	(606)	272	(1212)	341	(1515)	409	(1819)	545	(2425)	681	(3031)	851	(3789)	1022	(4546)	.00394 (112)
4"	Standard	11.78 (76.01)	236	(1049)	471	(2097)	589	(2621)	707	(3146)	942	(4194)	1178	(5243)	1473	(6553)	1767	(7864)	.00682 (193)
	Oversize	11.08 (71.49)	222	(986)	443	(1972)	554	(2466)	665	(2959)	886	(3945)	1108	(4931)	1385	(6164)	1662	(7397)	.00641 (181)

Operating Temperatures:
-20°F to 200°F
(-29°C to 93°C)

Operating Pressure:
250 psig (17.2 bar)

1-1/8" Bore pressure rating
150 psi

Bore Sizes:
1-1/8", 1-1/2", 2", 2-1/2", 3-1/4", 4"

Supply:
Filtered compressed air to 250 psi (for hydraulic service consult factory.)

Materials:
Head and end caps - anodized 6061-T6 aluminum

Tube: 6063-T832 aluminum, clear anodized O.D., hard coat anodized I.D.

Piston Rod: C1141 hard chrome plated steel

Piston: 2011-T451aluminum

Rod Bearings: G2 Durabar cast iron, teflon coated

Seals: carboxylated nitrile

Tie Rods: 12L14 steel

Series SL Features / Benefits

A. Piston Seals

Lip-type nitrile seals are pressure energized and wear compensating. Their excellent lubrication retention characteristics lower seal friction and ensure long life.

B. Piston

Solid aluminum alloy, light-weight for low inertia, yet strong.

C. Head/Cap

Precision machined from solid corrosion-resistant 304 stainless steel bar.

D. Rod Wiper

Lip-type urethane aggressively wipes foreign material from piston rod and enhances rod seal life.

E. Rod Seals

Rounded lip-type urethane is pressure energized and wear compensating.

F. Piston Rod

303 stainless steel, 40,000 PSI minimum yield, hard chrome plated, ground and polished.

G. Ultra Cushion®

State-of-the-art design features a unique, one-piece, nitrile compound seal, captured within a precision machined groove. Linear and radial "float" of cushion seal eliminates misalignment. Ultra Cushions provide exceptionally fast "out of cushion" stroke reversal. (Head and Cap Cushions are optional.)

H. Adjustable Captive Cushion Needle

Allows for safe and precise adjustment under pressure.

I. Wear Strip

Teflon® and graphite composition for minimum friction, maximum wear and side load resistance. (Magnetic band under wear strip optional.)

J. Tube

Corrosion-resistant 304 stainless steel.

K. Tie Rods

High-strength 303 stainless steel maintains compression on tube end seals.

L. Retainer

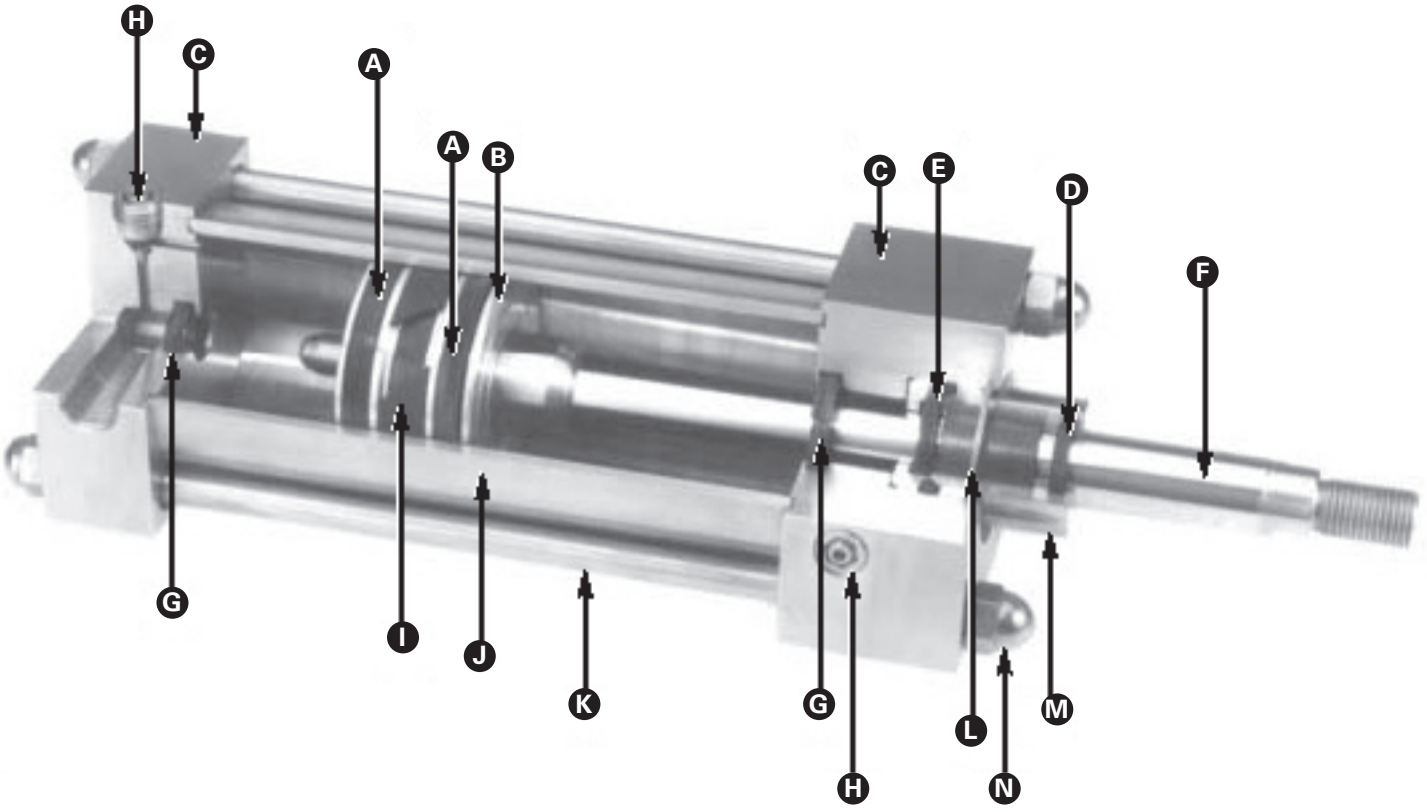
Stainless steel snap ring securely retains bushing in head.

M. Rod Bearings

Machined from 304 stainless steel, with a Teflon® composite wear band insert that eliminates metal-tometal contact.

N. Acorn Nut

Tie rod threads are covered by stainless steel acorn nuts which eliminate another bacteria hiding place.



Series SL
Model Code

SL	02	1A	2	N	1	K	A	50C	00	0
1, 2	3, 4	5, 6	7	8	9	10	11	12, 13, 14	15, 16	17

1, 2 Series

SL – Stainless Steel Pneumatic Cylinders

3, 4 Mounting Styles

1-1/2" thru 8" Bore

02 –	Side Tapped	**MS4**
07 –	Head Rectangular Flange	**MF1**
08 –	Head Square*	**ME3***
10 –	Cap Fixed Clevis	**MP1**
12 –	Cap Rectangular Flange	**MF2**
13 –	Cap Square*	**ME4**
16 –	Cap Trunnion	**MT2**
17 –	Head Trunnion	**MT1**
24 –	No mounts	**MX0**
XX –	Custom	

* 8" bore only

1-1/8" Bore

24 –	No mounts	**MX0**
01 –	Bolt Thru	**MS8**
12 –	Cap Rectangular Flange	**MF2**
47 –	Fixed Eye	**MP3**
02 –	Tapped	**MS9**
18 –	Head Tapped Face	**MR1**
41 –	Double Rod, No Mounts	**MX0**

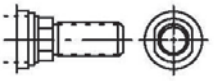
5, 6 Bore and Rod Size Combinations

Code	Bore	Rod
1A	1-1/8"	3/8"
1B	1-1/8"	1/2"
CC	1-1/2"	5/8"
CE	1-1/2"	1"
DC	2"	5/8"
DE	2"	1"
EC	2-1/2"	5/8"
EE	2-1/2"	1"
GE	3-1/4"	1"
GH	3-1/4"	1-3/8"
HE	4"	1"
HH	4"	1-3/8"
KE	5"	1"
KH	5"	1-3/8"
LH	6"	1-3/8"
LL	6"	1-3/4"
NH	8"	1-3/8"
NL	8"	1-3/4"

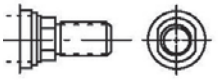
7 Rod End Type

Type 2
Female
UN Thread

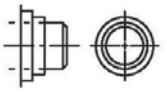
Type 9
Intermediate
Male
UN Thread



Type 5
Small Male
UN Thread



Type 6
Plain
No Attachment



8 Seal Options

N – Standard (Nitrile)

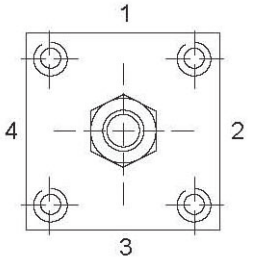
9 Port Options

1 – Standard
2 – Oversized (NFPA)

10 Port Locations

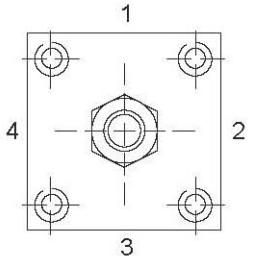
Positions are numbers as shown in picture below.

Code	Head	Cap
K	1	1
R	2	2
W	3	3
4	4	4



11 Cushion Location*

Cushions are located as shown below when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no cushion.



Code	Head	Cap
A	–	–
B	–	1
C	–	2
D	–	3
E	–	4
F	1	–
G	2	–
H	3	–
J	4	–
K	1	1
R	2	2
S	2	3
T	2	4
V	3	2
W	3	3
Y	3	4
4	4	4

* Not available in 1-1/8" Bore

12, 13, 14 Cylinder Stroke

Items 12 and 13 indicate stroke length from 00 inches through 99 inches.
Item 14 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	5/16

15, 16 Extra Rod Projection

Item 15 indicates inches from 0 thru 9.
Item 16 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	15/16

– OR –

PK – Magnet Furnished to operate Hall Effect or Read Type Switch

17 Custom

X – Custom Modification

Series SL
Mounting Styles:
1-1/2" – 8" Bore

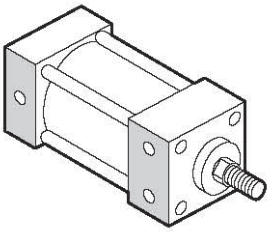
Available Mountings

The variety of standard NFPA mountings available in the 1 1/2"-8" bore Series SL gives you a broad selection to match the proper mount to your application. Eaton offers rigid mounts (including flange mounts) and swivel mounts (including clevis mounts). A guide to proper mount selection is provided on pages 122 through 126. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series SL cylinders are available in all mounting styles listed.

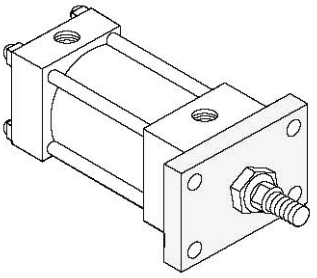
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

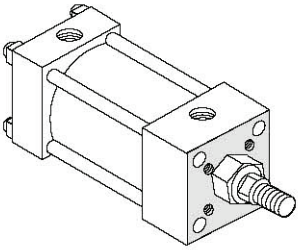
Code 02 (MS4)
Side Tap



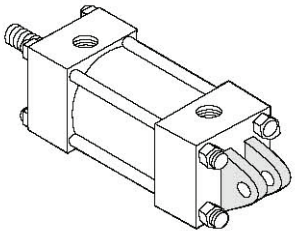
Code 07 (MF1)
Head Rectangular Flange



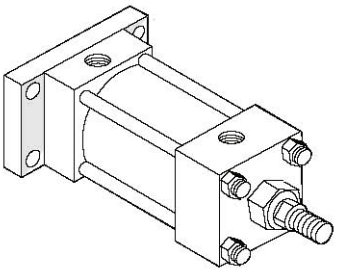
Code 08 (ME3)
Head Square



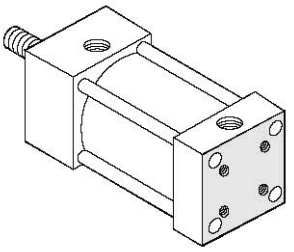
Code 10 (MP1)
Cap Fixed Clevis



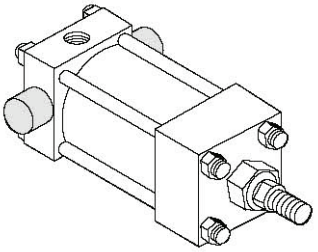
Code 12 (MF2)
Cap Rectangular Flange



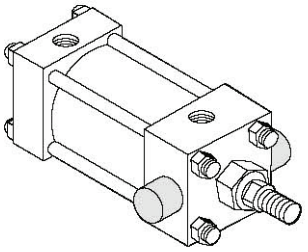
Code 13 (ME4)
Cap Square



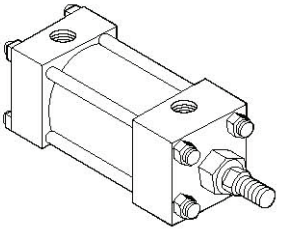
Code 16 (MT2)
Cap Trunnion



Code 17 (MT2)
Head Trunnion



Code 24 (MX0)
No Mounts



Series SL
Mounting Styles:
1-1/8" Bore

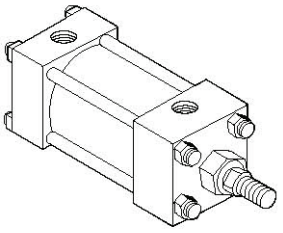
Available Mountings

The variety of standard NFPA mountings available in the 1 1/8" bore Series SL gives you a broad selection to match the proper mount to your application. Eaton offers ridig mounts (including bolt-thru mounts and flange mounts). A guide to proper mount selection is provided on pages 122 through 126. For custom mounts, enter "XX" for model code positions 3 and 4, and give a detailed description with drawings. Series SL cylinders are available in all mounting styles listed.

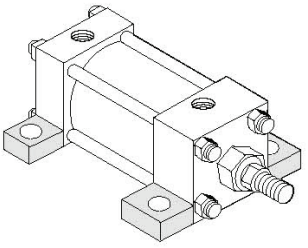
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

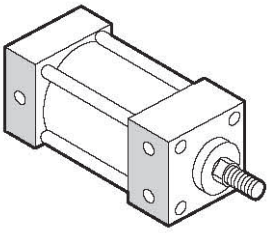
Code 24 (MX0)
No Mounts



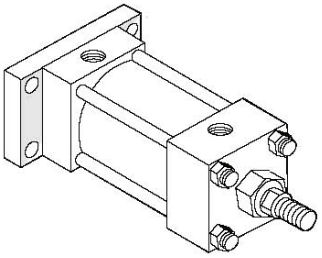
Code 01 (MS8)
Bolt Thru



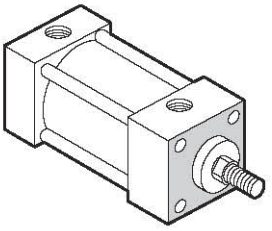
Code 02 (MS9)
Tapped



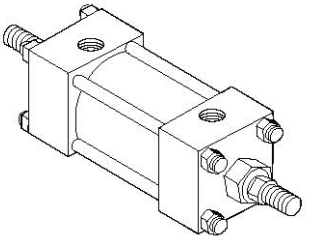
Code 12 (MF2)
Cap Rectangular Flange



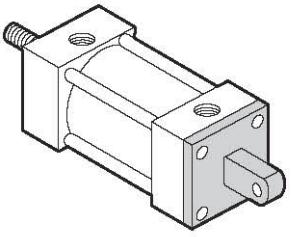
Code 18 (MR1)
Head Tapped Face



Code 41 (MX0)
Double Rod, No Mounts



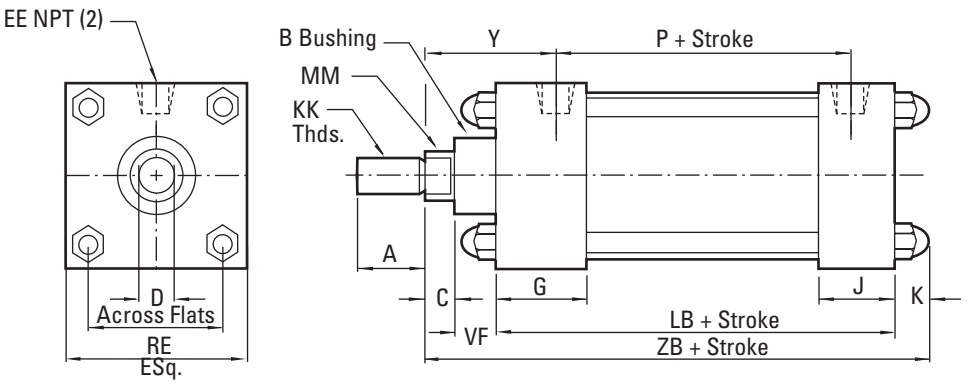
Code 47 (MP3)
Fixed Eye



Series SL
Standard Cylinder

1-1/8" to 8" bore

Standard Cylinder Dimensions



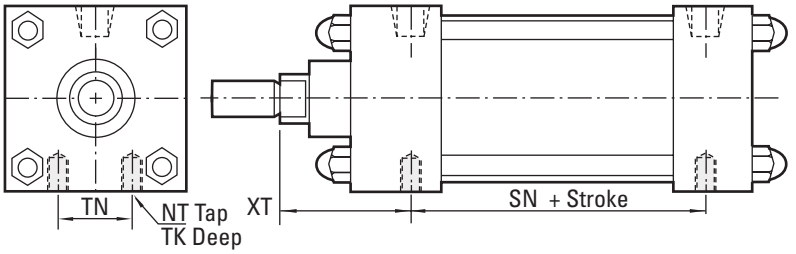
BORE		1–1/8"	1–1/2"	2"	2–1/2"	3–1/4"	4"	5"	6"	8"
ø Rod	Std.	3/8"	5/8"	5/8"	5/8"	1"	1"	1"	1-3/8"	1-3/8"
(MM)	O.S.	1/2"	1"	1"	1"	1-3/8"	1-3/8"	1-3/8"	1-3/4"	1-3/4"
A	Std.	.625	0.75	0.75	0.75	1.125	1.125	1.125	1.625	1.625
	O.S.	.750	1.125	1.125	1.125	1.625	1.625	1.625	2.000	2.000
B +.000	Std.		1.125	1.125	1.125	1.500	1.500	1.500	2.000	2.000
-.002	O.S.		1.500	1.500	1.500	2.000	2.000	2.000	2.375	2.375
C	Std.	.25	0.375	0.375	0.375	0.5	0.5	0.5	0.625	0.625
	O.S.	–	0.5	0.5	0.5	0.625	0.625	0.625	0.75	0.75
D	Std.	.312	0.5	0.5	0.5	0.812	0.812	0.812	1.125	1.125
	O.S.	.437	0.812	0.812	0.812	1.125	1.125	1.125	1.5	1.5
E		1.5	2	2.5	3	3.75	4.5	5.5	6.5	8.5
EE	Std.	.125	0.25	0.25	0.25	0.375	0.375	0.375	0.5	0.5
	O.S.	–	0.375	0.375	0.375	0.5	0.5	0.5	0.75	0.75
G		.875	1.5	1.5	1.5	1.75	1.75	1.75	2	2
J		.625	1	1	1	1.25	1.25	1.5	1.5	1.5
K		.400	0.469	0.531	0.531	0.625	0.625	0.83	0.83	1
KK	Std.	5/16-24	1/2 – 20	1/2 – 20	1/2 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14
	O.S.	7/16-20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 –12
LB		2.25	3.625	3.625	3.75	4.25	4.25	4.5	5	5.125
P		1.375	2.125	2.125	2.25	2.625	2.625	2.875	3	3.125
RE		.750	1.43	1.84	2.19	2.76	3.32	4.1	4.88	6.435
VF	Std.	.125	0.625	0.625	0.625	0.875	0.875	0.875	1	1
	O.S.	–	0.875	0.875	0.875	1	1	1	1.125	1.125
Y	Std.	.938	2	2	2	2.437	2.437	2.437	2.875	2.875
	O.S.	–	2.375	2.375	2.375	2.687	2.687	2.687	3.125	3.125
ZB	Std.	2.625	5.094	5.156	5.281	6.25	6.25	6.705	7.455	7.75
	O.S.	–	5.469	5.531	5.656	6.5	6.5	6.955	7.705	8

Dimensions in inches (mm)

Series SL Mounting Styles and Installation Dimensions

1-1/2" to 8" bore sizes

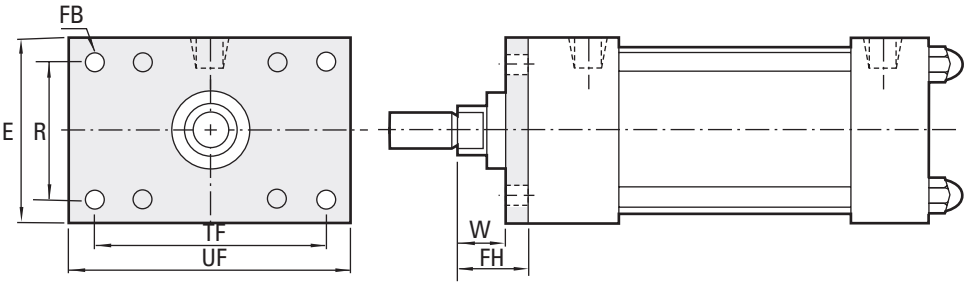
Code 02 – Side Tapped (MS4)



BORE	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
NT	1/4-20	5/16-18	3/8-16	1/2-13	1/2-13	5/8-11	3/4-10	3/4-10
SN	2.250	2.250	2.375	2.625	2.625	2.875	3.125	3.250
TK	.375	.500	.625	.750	.750	1.000	1.125	1.125
TN	.625	.875	1.250	1.500	2.062	2.687	3.250	4.500
XT Std.	1.937	1.937	1.937	2.437	2.437	2.437	2.812	2.812
O.S.	2.312	2.312	2.312	2.687	2.687	2.687	3.062	3.062

Dimensions in inches (mm)

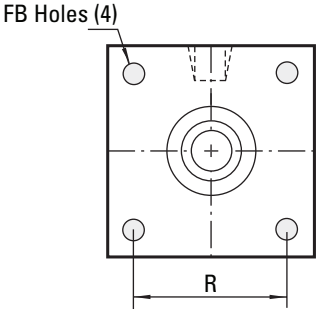
Code 07 – Head Rectangular Flange (MF1)



BORE	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"
E	2.000	2.500	3.000	3.750	4.500	5.500	6.500
FB	.312	.375	.375	.437	.437	.562	.562
G	1.500	1.500	1.500	1.750	1.750	1.750	2.000
FH	.375	.375	.375	.625	.625	.625	.750
R	1.430	1.840	2.190	2.760	3.320	4.100	4.880
TF	2.750	3.375	3.875	4.687	5.437	6.625	7.625
UF	3.375	4.125	4.625	5.500	6.250	7.625	8.625
W Std.	.625	.625	.625	.750	.750	.750	.875
O.S.	1.000	1.000	1.000	1.000	1.000	1.000	1.125

Dinensions in inches (mm)

Code 08 – Head Square Mount (ME3)



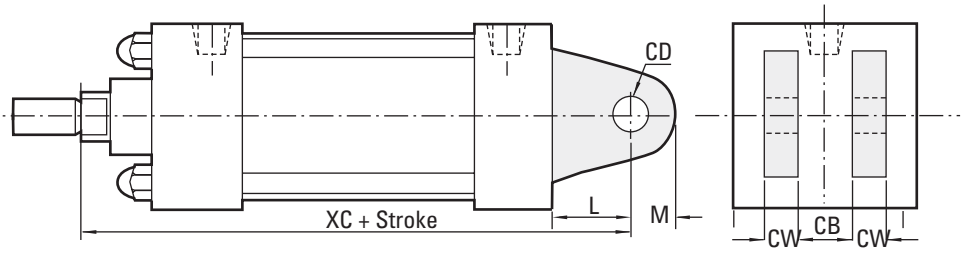
BORE	8"
FB	.687
R	7.570

Dimensions in inches (mm)

Series SL Mounting Styles and Installation Dimensions

1-1/2" to 8" bore sizes

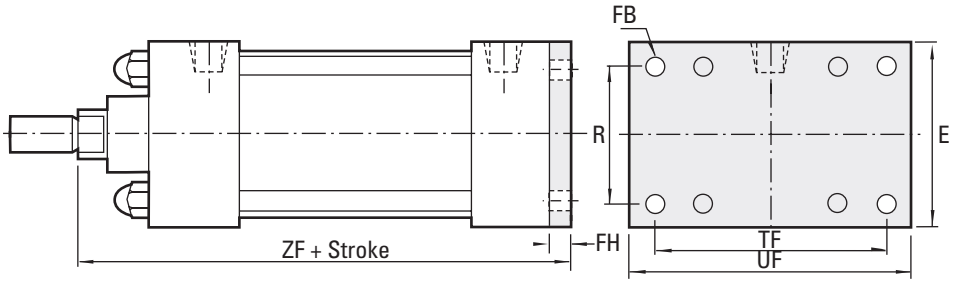
Code 10 – Cap Fixed Clevis (MP1)



BORE	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
CB	.750	.750	.750	1.250	1.250	1.250	1.500	1.500
CD	.500	.500	.500	.750	.750	.750	1.000	1.000
CW	.500	.500	.500	.625	.625	.625	.750	.750
L	.750	.750	.750	1.250	1.250	1.250	1.500	1.500
M	.625	.625	.625	.875	.875	.875	1.000	1.000
XC Std.	5.375	5.375	5.500	6.875	6.875	7.125	8.125	8.250
O.S.	5.750	5.750	5.875	7.125	7.125	7.375	8.375	8.500

Dimensions in inches (mm)

Code 12 – Rectangular Flange (MF2)



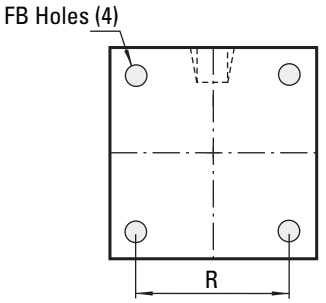
BORE	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"
E	2.000	2.500	3.000	3.750	4.500	5.500	6.500
FB	.312	.375	.375	.437	.437	.562	.562
G	1.500	1.500	1.500	1.750	1.750	1.750	2.000
FH	.375	.375	.375	.625	.625	.625	.750
R	1.430	1.840	2.190	2.760	3.320	4.100	4.880
TF	2.750	3.375	3.875	4.687	5.437	6.625	7.625
UF	3.375	4.125	4.625	5.500	6.250	7.625	8.625
W Std.	.625	.625	.625	.750	.750	.750	.875
O.S.	1.000	1.000	1.000	1.000	1.000	1.000	1.125
ZF Std.	5.000	5.000	5.125	6.250	6.250	6.500	7.375
O.S.	5.375	5.375	5.500	6.500	6.500	6.750	7.625

Dimensions in inches (mm)

Series SL Mounting Styles and Installation Dimensions

1-1/2" to 8" bore sizes

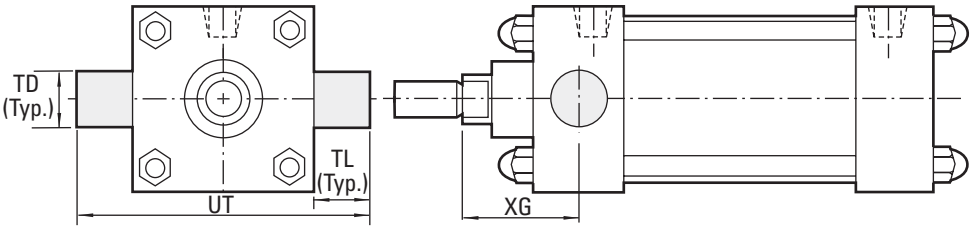
Code 13 – Cap Square (ME4)



BORE	8"
FB	.687
R	7.570

Dimensions in inches (mm)

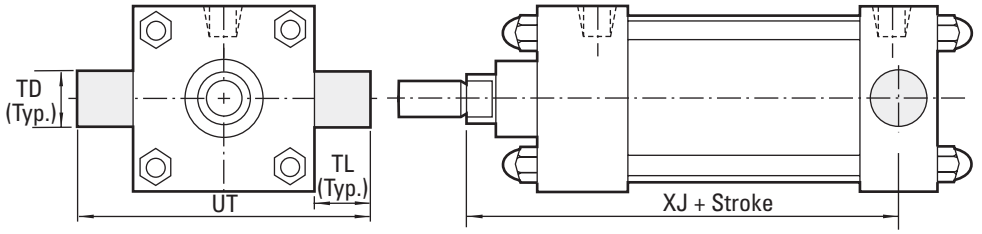
Code 17 – Head Trunnion (MT1)



BORE	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
TD	1.000	1.000	1.000	1.000	1.000	1.000	1.375	1.375
TL	1.000	1.000	1.000	1.000	1.000	1.000	1.375	1.375
UT	4.000	4.500	5.000	5.750	6.500	7.500	9.250	11.250
XG Std.	1.750	1.750	1.750	2.250	2.250	2.250	2.625	2.625
O.S.	2.125	2.125	2.125	2.500	2.500	2.500	2.875	2.875

Dimensions in inches (mm)

Code 16 – Cap Trunnion (MT2)



BORE	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
TD	1.000	1.000	1.000	1.000	1.000	1.000	1.375	1.375
TL	1.000	1.000	1.000	1.000	1.000	1.000	1.375	1.375
UT	4.000	4.500	5.000	5.750	6.500	7.500	9.250	11.250
XJ Std.	4.125	4.125	4.250	5.000	5.000	5.250	5.875	6.000
O.S.	4.500	4.500	4.625	5.250	5.250	5.500	6.125	6.250

Dimensions in inches (mm)

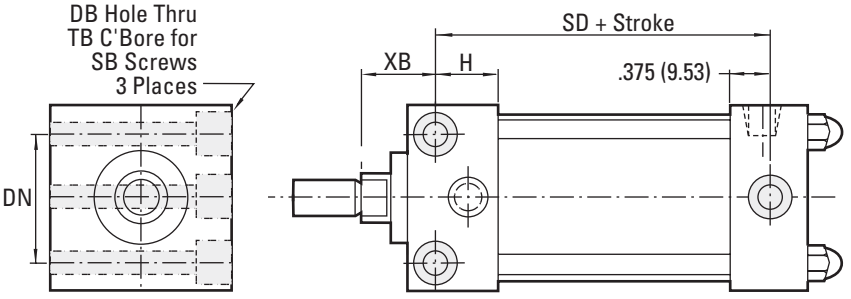
Series SL Mounting Styles and Installation Dimensions

1-1/8" bore

Code 01 – Bolt Thru (MS8)

BOLT THRU	
DB	.203
DN	1.000
SB	#10
SD	1.750
XB	.625

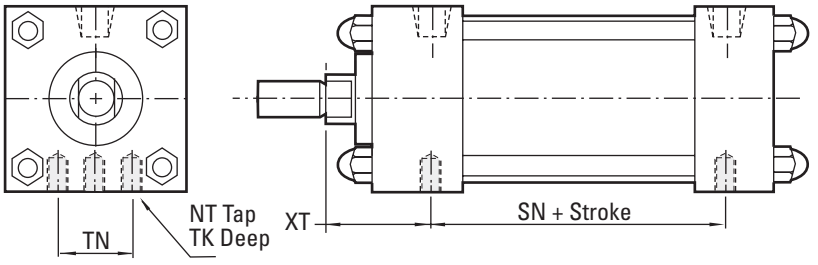
Dimensions in inches (mm)



Code 02 – Tapped (MS9)

SIDE TAP	
NT	10-32
SN	1.750
TK deep	.250
TN	1.000
XT	.625

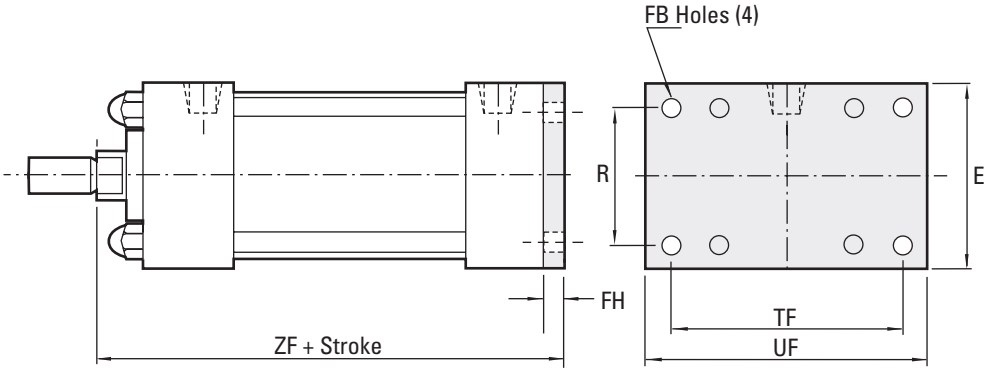
Dimensions in inches (mm)



Code 12 – Cap Rectangular Flange (MF2)

REAR FLANGE	
E	1.500
FB	.219
FH	.250
R	1.000
TF	2.000
UF	2.500
ZF	2.875

Dimensions in inches (mm)



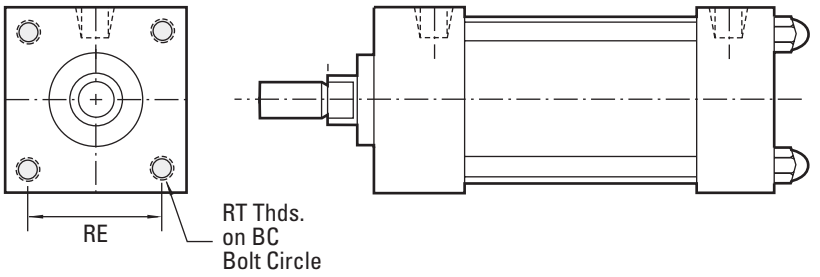
Series SL Mounting Styles and Installation Dimensions

1-1/8" bore

Code 18 – Head Tapped Face (MR1)

30 (MR1)	HEAD FACE
BC	1.593
RE	1.125
RT	10-32

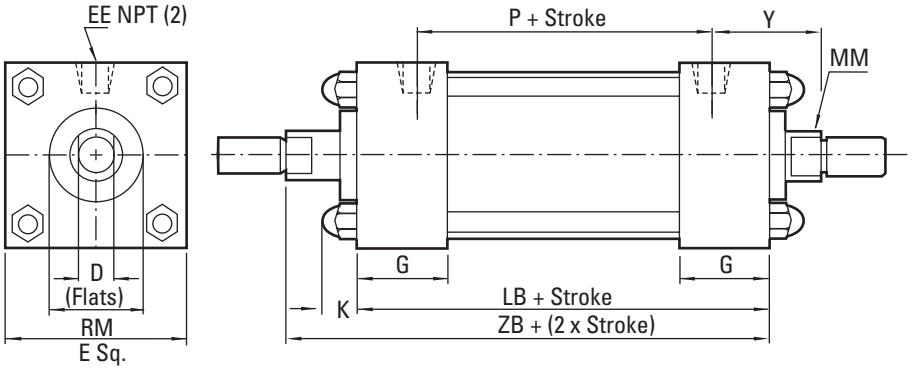
Dimensions in inches (mm)



Code 41 – Double Rod, No Mounts (MX0)

DOUBLE ROD END CYLINDER WITH 01 (MX0) BASIC		
D	Std.	.312
	O.S.	.437
E		1.500
EE		.125
G		.875
K		.400
LB		2.250
MM	Std.	.370
	O.S.	.495
P		1.375
RM	Std.	.750
	O.S.	1.000
Y		.938
ZB		3.250

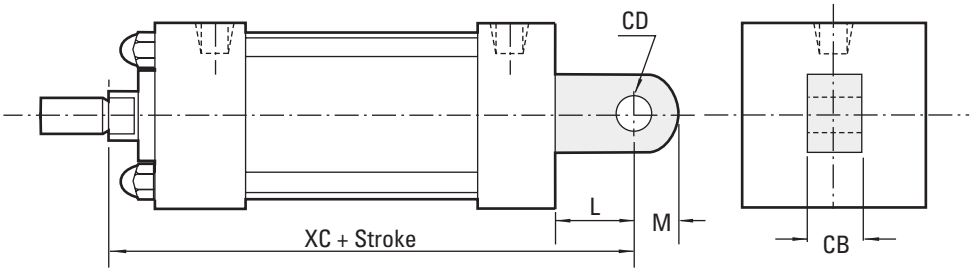
Dimensions in inches (mm)



Code 47 – Fixed Eye (MP3)

17 (MP3)	FIXED EYE
CB	.375
CD	.375
L	.437
M	.375
XC	3.062

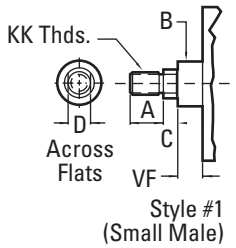
Dimensions in inches (mm)



Series SL
Rod End Types

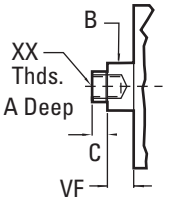
Standard & Optional Rod Ends

Type 5: Small Male UN Thread



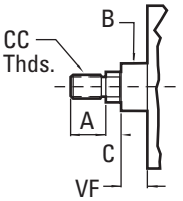
Style #1 (Small Male)

Type 2: Female UN Thread



Style #3 (Small Female)

Type 9: Intermediate Male UN Thread



Type 9 Intermediate Male UN Thread

BORE		1–1/8"	1–1/2"	2"	2–1/2"	3–1/4"	4"	5"	6"	8"
ø Rod	Std.	3/8"	5/8"	5/8"	5/8"	1"	1"	1"	1-3/8"	1-3/8"
(MM)	O.S.	1/2"	1"	1"	1"	1-3/8"	1-3/8"	1-3/8"	1-3/4"	1-3/4"
A	Std.	.625	0.750	0.750	0.750	1.125	1.125	1.125	1.625	1.625
	O.S.	.750	1.125	1.125	1.125	1.625	1.625	1.625	2.000	2.000
B +.000 -.002	Std.	–	1.125	1.125	1.125	1.500	1.500	1.500	2.000	2.000
	O.S.	–	1.500	1.500	1.500	2.000	2.000	2.000	2.375	2.375
C	Std.	.250	0.375	0.375	0.375	0.500	0.500	0.500	0.625	0.625
	O.S.	–	0.500	0.500	0.500	0.625	0.625	0.625	0.750	0.750
CC	Std.	3/8 – 24	7/16 – 20	7/16 – 20	7/16 – 20	7/8 –14	7/8 –14	7/8 –14	1-1/4 – 12	1-1/4 – 12
	O.S.	1/2 – 20	7/8 –14	7/8 –14	7/8 –14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.312	0.500	0.500	0.500	0.812	0.812	0.812	1.125	1.125
	O.S.	.437	0.812	0.812	0.812	1.125	1.125	1.125	1.500	1.500
E			2	2.5	3	3.750	4.500	5.500	6.500	8.500
EE	Std.		0.250	0.250	0.250	0.375	0.375	0.375	0.500	0.500
	O.S.		0.375	0.375	0.375	0.500	0.500	0.500	0.750	0.750
FF	Std.		5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12
	O.S.		1 –14	1 –14	1 –14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12
G			1.500	1.500	1.500	1.750	1.750	1.750	2	2
J			1	1	1	1.250	1.250	1.500	1.500	1.500
K			0.469	0.531	0.531	0.625	0.625	0.830	0.830	1
KK	Std.		1/2 – 20	1/2 – 20	1/2 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14
	O.S.		3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 –12
LB			3.625	3.625	3.750	4.250	4.250	4.50	5	5.125
P			2.125	2.125	2.250	2.625	2.625	2.875	3	3.125
RE			1.430	1.840	2.190	2.760	3.320	4.100	4.880	6.435
VF	Std.	.125	0.625	0.625	0.625	0.875	0.875	0.875	1	1
	O.S.	–	0.875	0.875	0.875	1	1	1	1.125	1.125
XX	Std.	1/4 – 28	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14
	O.S.	3/8 – 24	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12
Y	Std.		2.000	2	2	2.437	2.437	2.437	2.875	2.875
	O.S.		2.375	2.375	2.375	2.687	2.687	2.687	3.125	3.125
ZB	Std.		5.094	5.156	5.281	6.250	6.250	6.705	7.455	7.750
	O.S.		5.469	5.531	5.656	6.500	6.500	6.955	7.705	8

Dimensions in inches (mm)

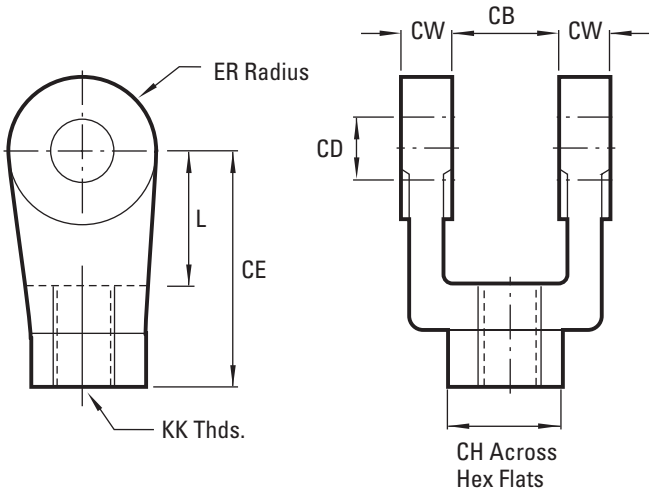
Accessories for SL Cylinders

1-1/2" to 8" bore sizes

Rod Clevis
303 Stainless Steel

	SL62008A	SL6200CA	SL62010A	SL62016A
CB	.750	1.250	1.500	2.000
CD	.500	.750	1.000	1.375
CE	1.500	2.375	3.125	4.125
CH	1.000	1.250	1.500	2.000
CW	.500	.625	.750	1.000
ER	.500	.750	1.000	1.375
KK	1/2-20	3/4-16	1-14	1-1/4 - 12
L	.750	1.250	1.500	2.125

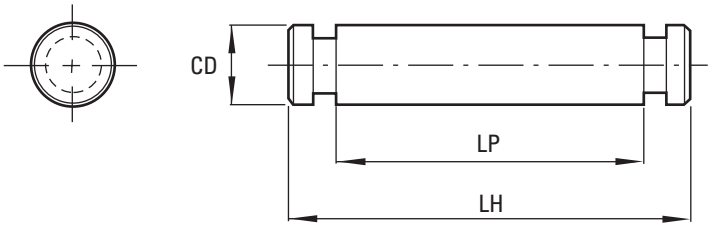
Dimensions in inches (mm)



NFPA Pin
303 Stainless Steel

	SL83008A	SL8300CA	SL83010A	SL83016A
CD	500	.750	1.000	1.375
LH	2.219	3.125	3.750	5.625
LP	1.875	2.750	3.250	4.375

Dimensions in inches (mm)



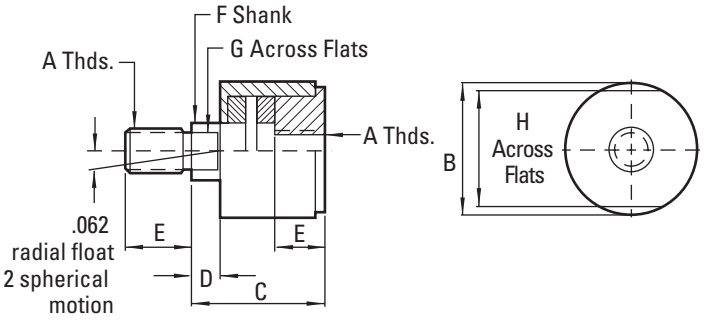
Accessories for SL Cylinders

1-1/2" to 8" bore sizes

Rod Alignment Coupler

	SL7756A-7/16-20	SL7756A-1/2-20	SL7756A-3/4-16	SL7756A-1-14
A	7/16-20	1/2 – 20	3/4 – 16	1-14
B	1.250	1.250	1.750	2.500
C	2.000	2.000	2.312	2.937
D	.500	.500	.500	.500
E	.750	.750	1.125	1.625
F	.625	.625	.969	1.375
G	.563	.563	.812	1.156
H	1.125	1.125	1.500	2.250
Max Pull (lbs)	2.250	3.150	7.750	12.250

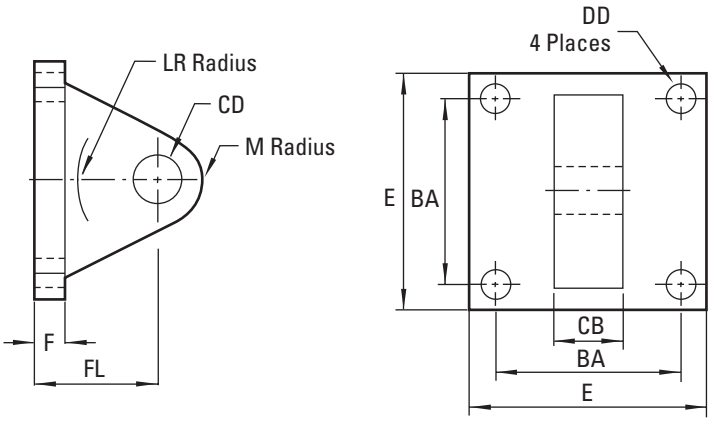
Made of 303 Stainless Steel, the Rod Alignment Coupler allows 1/16" of radial float and 2° of spherical movement.
Dimensions in inches (mm)



Eye Bracket
303 Stainless Steel

	SL78008A	SL7800CA	SL78010A
BA	1.625	2.562	3.250
CB	.750	1.250	1.500
CD	.500	.750	1.000
DD	.406	.531	.656
E	2.500	3.500	4.500
F	.375	.625	.750
FL	1.125	1.875	2.250
LR	.750	1.250	1.500
M	.500	.750	1.000

Dimensions in inches (mm)



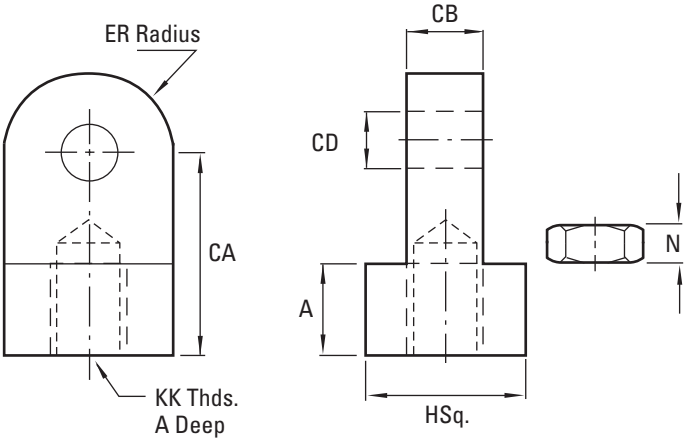
Accessories for SL Cylinders

1-1/8" bore

Rod eye 303 stainless steel w/jam nut

	SL60006A*	SL60006B**
A	.437	.437
CA	.875	.875
CB	.375	.375
CD	.375	.375
ER	.375	.375
H	.750	.750
KK	3/8-24	1/2-20
N	.219	.312

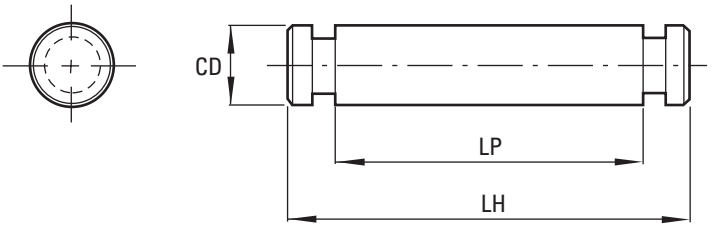
* Includes jam nut (3/8-24)
** Includes jam nut (1/2-20)
Dimensions in inches (mm)



Pivot pin 303 stainless steel

PIVOT PIN	SL83006A
CD	.375
LH	1.250
LP	1.032

Dimensions in inches (mm)



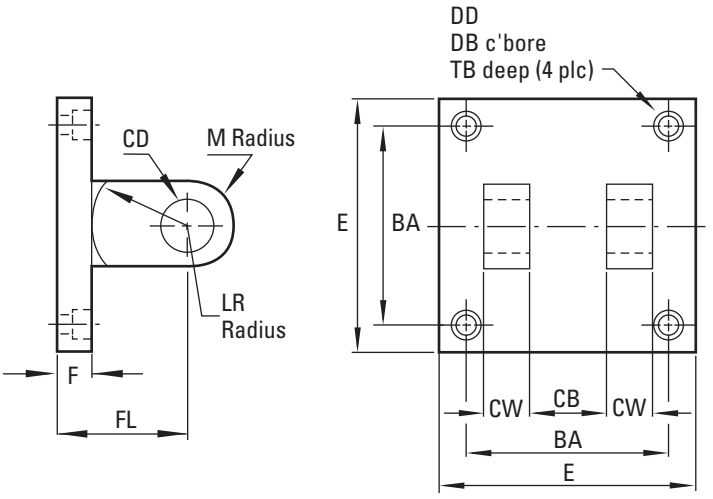
Accessories for SL Cylinders

1-1/8" bore

Clevis bracket 304 stainless steel

	SL61006A
BA	1.125
CB	.375
CD	.375
CW	.250
DB	.328
DD	.203
E	1.50
F	.500
FL	1.125
LR	.625
M	.375
TB	.260

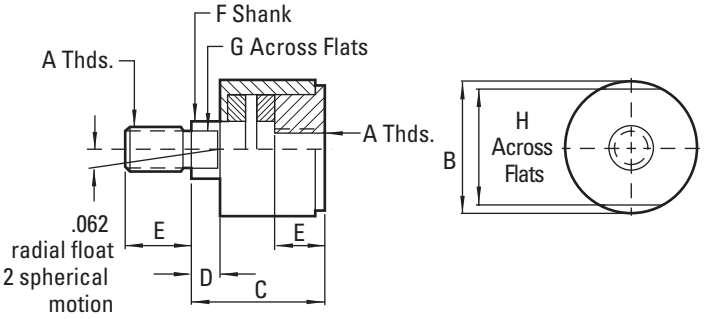
Dimensions in inches (mm)



NFPA Rod alignment coupler

	SL7756A-3/8-24
A	3/8 – 24
B	.875
C	1.250
D	.250
E	.625
F	.375
G	.312
H	.750
Maximum pull	1,375

Dimensions in inches (mm)



Made of 303 Stainless Steel, the Rod Alignment Coupler allows 1/16" of radial float and 2° of spherical movement.

This prevents cylinder binding due to misalignment thus extending bearing and seal life, and permits greater tolerance between the center line of the cylinder and mating part for simplified installation.

Series SL Technical Information

Operating Temperatures

Series SS -40°F to 200°F

(-40°C to 93°C)

Operating Pressure

250 psig Air (17.2 Bar)

400 psig Hydraulic (27.6 Bar)

Bore Sizes: 1-1/8", 1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6", 8"

Lubrication

None required

Eaton's Vickers™ pneumatic cylinders are rated for "no lube added" service. All internal components are lubricated at time of assembly with a Teflon® based grease.

Materials

Head and End Caps: 304 stainless steel

Tube: 304 stainless steel

Piston Rod: hard chrome plated 303 stainless steel

Piston: 2011-T451 aluminum with Teflon® composite wearband

Rod Bearings: 304 stainless steel with Teflon® composite wearband

Seals: urethane rod seal and wiper, nitrile piston seals

Tie Rods: 303 stainless steel

Side Loading

Cylinders are specifically designed to push and pull. Side loading of the piston rod should be avoided to ensure maximum operating performance and life.

Care should be taken during installation to properly align the load to be moved with the center line of the cylinder. The use of a rod alignment coupler is strongly recommended whenever possible.

Cylinder Weights

In pounds (kilograms)

BORE		ROD		MOUNTING CODE 24, 02, 01, 08, 13, 18		07 & 12		*10 & 47		17, 16, 47		ADD PER INCH OF STROKE	
1-1/8"	(28.58)	3/8"	(9.53)	1.1	(.49)	1.5	(.68)	1.3	(.58)	–	–	.13	(.05)
		1/2"	(12.70)	1.2	(.54)	1.6	(.72)	1.4	(.63)	–	–	.15	(.06)
1-1/2"	(38.10)	5/8"	(15.88)	3.3	(1.49)	4.0	(1.81)	3.8	(1.72)	3.8	(1.72)	.3	(.13)
		1"	(25.40)	4.1	(1.85)	4.8	(2.17)	4.6	(2.08)	4.6	(2.08)	.4	(.18)
2"	(50.80)	5/8"	(15.88)	5.9	(2.67)	7.0	(3.17)	6.4	(2.90)	6.4	(2.90)	.5	(.22)
		1"	(25.40)	6.3	(2.85)	7.4	(3.35)	6.8	(2.94)	6.8	(3.08)	.6	(.27)
2-1/2"	(63.50)	5/8"	(15.88)	8.0	(3.62)	9.5	(4.30)	8.7	(3.94)	8.5	(3.85)	.6	(.27)
		1"	(25.40)	8.5	(3.85)	10.0	(4.53)	9.2	(4.17)	9.0	(4.08)	.7	(.31)
31/4"	(82.55)	1"	(25.40)	15.0	(6.80)	18.7	(8.48)	16.0	(7.25)	15.5	(7.03)	.8	(.36)
		13/8"	(34.93)	15.5	(7.03)	19.2	(8.70)	16.5	(7.48)	16.0	(7.25)	1.0	(.45)
4"	(101.60)	1"	(25.40)	23.0	(10.43)	28.0	(12.70)	27.0	(12.24)	23.5	(10.65)	1.0	(.45)
		13/8"	(34.93)	23.5	(10.65)	28.5	(12.92)	27.5	(12.47)	24.0	(10.88)	1.2	(.54)
5"	(127.00)	1"	(25.40)	34.5	(15.64)	42.0	(19.05)	41.0	(18.59)	35.0	(15.87)	1.1	(.49)
		13/8"	(34.93)	35.0	(15.87)	42.5	(19.27)	41.5	(18.82)	35.5	(16.10)	1.3	(.58)
6"	(152.40)	13/8"	(34.93)	60.0	(27.21)	71.9	(32.61)	69.0	(31.29)	61.2	(27.76)	1.5	(.68)
		13/4"	(44.45)	62.0	(28.12)	73.9	(33.52)	71.0	(32.20)	63.2	(28.66)	1.7	(.77)
8"	(203.20)	13/8"	(34.93)	79.0	(35.83)	–	–	88.0	(39.91)	80.2	(36.37)	2.0	(.90)
		13/4"	(44.45)	82.0	(37.19)	–	–	91.0	(41.27)	83.2	(37.73)	2.3	(1.04)

*Weight includes pivot pin

Piston Rod Diameter Selection

Applications requiring long extend (push) strokes may require oversize piston rod diameters to prevent buckling. To determine the correct rod diameter for your application follow these simple steps:

1. Select the thrust from the **Cylinder Force and Volume Chart** that is required for your application.

Thrust = Piston Surface Area x Operating Pressure

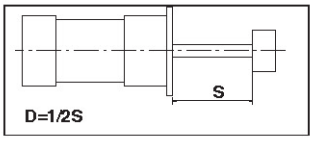
2. From the **Cylinder Mounting Diagrams** select the mounting style being used.
3. With the piston rod fully extended, calculate the value of **D** (in inches) using the formula shown or the cylinder mounting diagram selected in step #2.
4. Locate the value of **D** (in inches) at the bottom of the **Selection Chart**. Enter the chart at this point and move vertically upward until intersecting with the horizontal line representing the required thrust which was selected in step #1. The band within which these lines intersect represents the minimum recommended piston rod diameter.

Stop Tube Selection

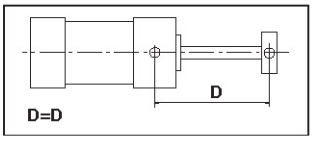
Stop tubes enhance the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension. When the value of **D** (calculated from the piston rod diameter selection instructions above) is less than 40", a stop tube is **not** required. However, if **D** is 40" or more, 1" of stop tube is recommended for every 10" (or fraction thereof) over 40".

Cylinder Mounting Diagrams

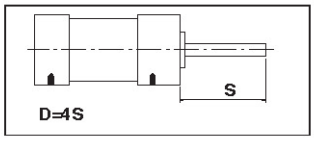
Firmly Guided Rod End



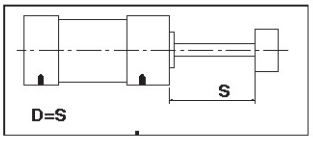
Head Trunnion



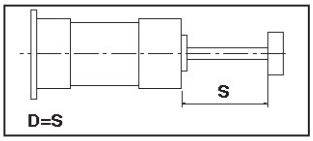
Unsupported Rod End



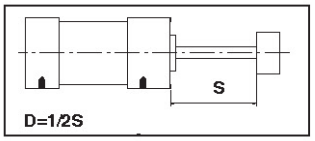
Supported Rod End



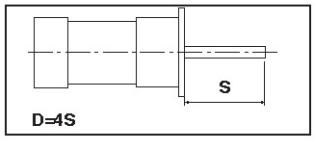
Supported Rod End



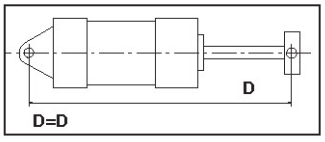
Firmly Guided Rod End



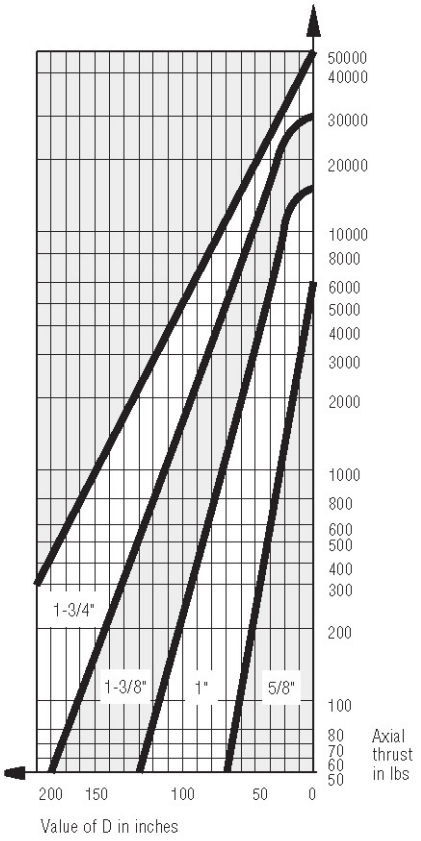
Unsupported Rod End



Cap Clevis or Cap Trunnion



Selection Chart



Cylinder Force and Volume Charts

Extend Forces in pounds (newtons)

BORE	PISTON AREA		PSI (BAR) 40	(3)	60	(4)	80	(6)	100	(7)	150	(10)	200	(14)	VOLUME CU FT (CM3) DISPLACEMENT PER INCH	
1-1/8"	.99	(6.41)	40	(177)	60	(265)	80	(354)	99	(442)	149	(664)	200	(890)	.00057	(16)
1-1/2"	1.77	(11.40)	71	(315)	106	(472)	142	(629)	177	(786)	266	(1179)	353	(1570)	.00102	(29)
2"	3.14	(20.27)	126	(559)	189	(839)	251	(1119)	314	(1398)	471	(2097)	628	(2793)	.00182	(52)
2-1/2"	4.91	(31.67)	196	(874)	295	(1311)	393	(1748)	491	(2185)	737	(3277)	982	(4368)	.00284	(80)
3-1/4"	8.30	(53.32)	332	(1477)	498	(2215)	664	(2953)	830	(3692)	1245	(5538)	1659	(7379)	.00480	(136)
4"	12.57	(81.07)	503	(2237)	754	(3355)	1005	(4473)	1257	(5592)	1886	(8388)	2513	(11178)	.00727	(206)
5"	19.64	(126.71)	785	(3491)	1178	(5240)	1571	(6988)	1964	(8736)	2946	(13104)	3928	(17472)	.01137	(322)
6"	28.27	(182.39)	1130	(5026)	1696	(7544)	2262	(10061)	2827	(12574)	4240	(18860)	5654	(25149)	.01837	(520)
8"	50.26	(324.26)	2010	(8940)	3015	(13411)	4020	(17881)	5026	(22356)	7539	(33533)	10052	(44711)	.02227	(631)

Deduct these Forces for Retract Strokes

BORE	ROD AREA		PSI (BAR) 40	(3)	60	(4)	80	(6)	100	(7)	150	(10)	200	(14)	VOLUME CU FT (CM3) DISPLACEMENT PER INCH	
3/8"	.112	(.72)	5	(20)	7	(30)	9	(40)	11	(50)	17	(75)	22	(100)	.0007	(2)
1/2"	.196	(1.26)	8	(35)	12	(52)	16	(70)	20	(87)	30	(131)	39	(174)	.00011	(3)
5/8"	.307	(1.98)	12	(53)	18	(80)	25	(111)	31	(138)	46	(205)	61	(271)	.00 18	(5)
1"	.785	(5.06)	31	(138)	47	(209)	63	(280)	70	(351)	118	(525)	157	(698)	.00045	(13)
1-3/8"	1.485	(9.58)	59	(262)	89	(396)	119	(529)	149	(663)	222	(997)	297	(1321)	.00086	(24)
1-3/4"	2.404	(15.51)	95	(423)	144	(641)	192	(854)	240	(1068)	360	(1601)	480	(2135)	.00139	(39)

Eaton
Hydraulics Operations USA
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
Tel: 952-937-9800
Fax: 952-294-7722
www.hydraulics.eaton.com

Eaton
Hydraulics Operations Europe
Route de la Longeraie 7
1110 Morges
Switzerland
Tel: +41 (0) 21 811 4600
Fax: +41 (0) 21 811 4601

Eaton
Hydraulics Operations Asia Pacific
11th Floor Hong Kong New World
Tower
300 Huaihai Zhong Road
Shanghai 200021
China
Tel: 86-21-6387-9988
Fax: 86-21-6335-3912

Printed in USA
Document No. V-CYPN-MC001-E
September 2007

EATON | Vickers

Hydraulic Cylinders
Heavy-Duty Small Bore

Catalog

Series NZ

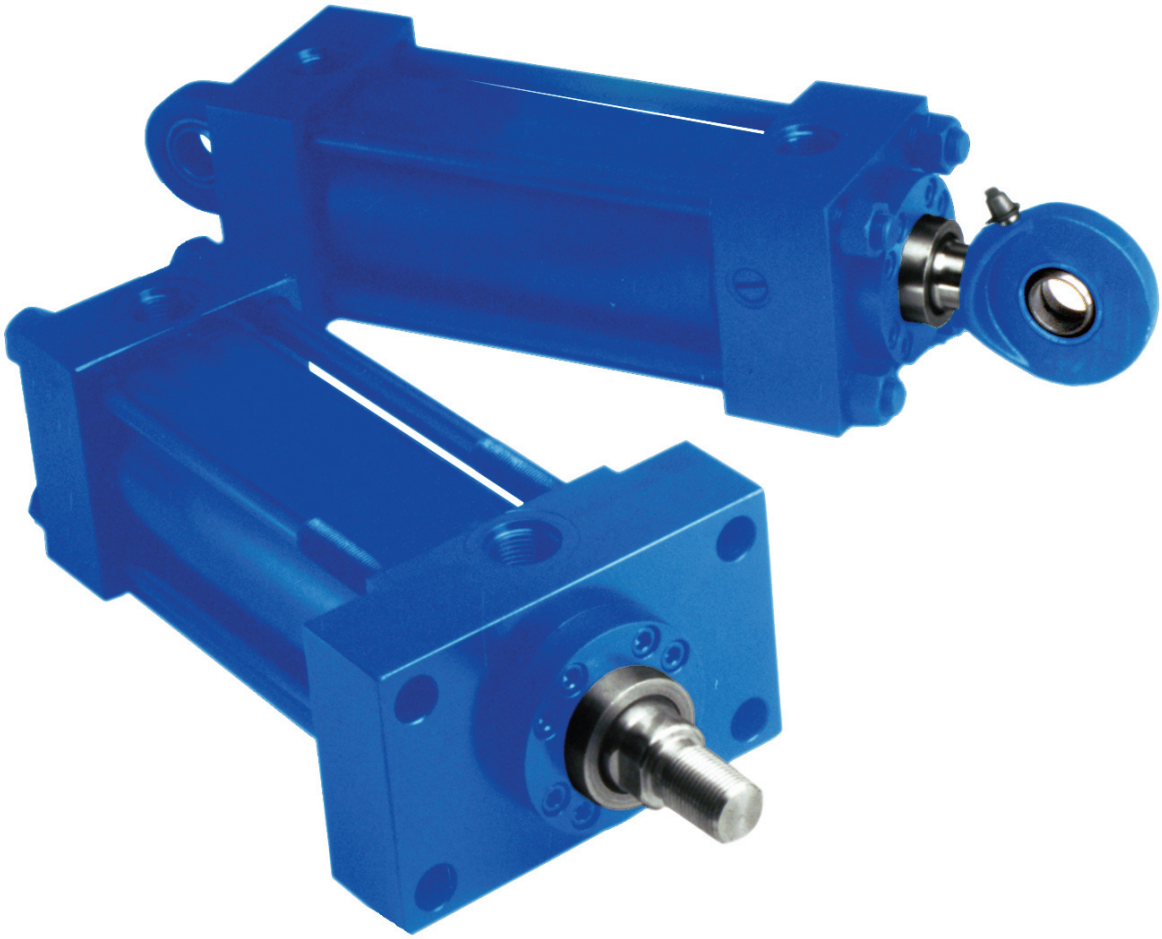


Table of Contents

Features

1. Rod Cartridge Assembly:
Machined to maximum bearing support and wear resistance.
Unitized, threadless assembly is pilot-fitted into the head on a precision bored diameter to assure true concentricity.

2. Special Wearbands:
Metal-to-metal contact is eliminated, providing superior wearability, increased load carrying capability, and prolonged cylinder life.

3. Piston Sealing System:
This system offers not only a selection of highly efficient seal materials, but also an extra wide wearband that rides smoothly within the precision-honed cylinder body to provide extended piston seal life.

4. Square Head Tie-Rod Design:
Suitable for nominal working pressure up to 3000 psi.

5. Piston Rod:
Case hardened, hard chrome plated piston rod in a variety of diameters between 1 and 5 1/2 inches provides maximum durability and extends seal life. Several different rod end types are available.

6. Captive Screws:
Inadvertent removal of cushion screws is prevented, while still allowing a full range of adjustment.

7. Fully Adjustable Cushioning System:
This design has been engineered to provide the ability to tune the cushion performance for an optimized deceleration profile. Our patented floating ring cushion seal or an alternate ball check design allows maximum acceleration. This excellent acceleration profile translates into faster cycle times and increased machine production.

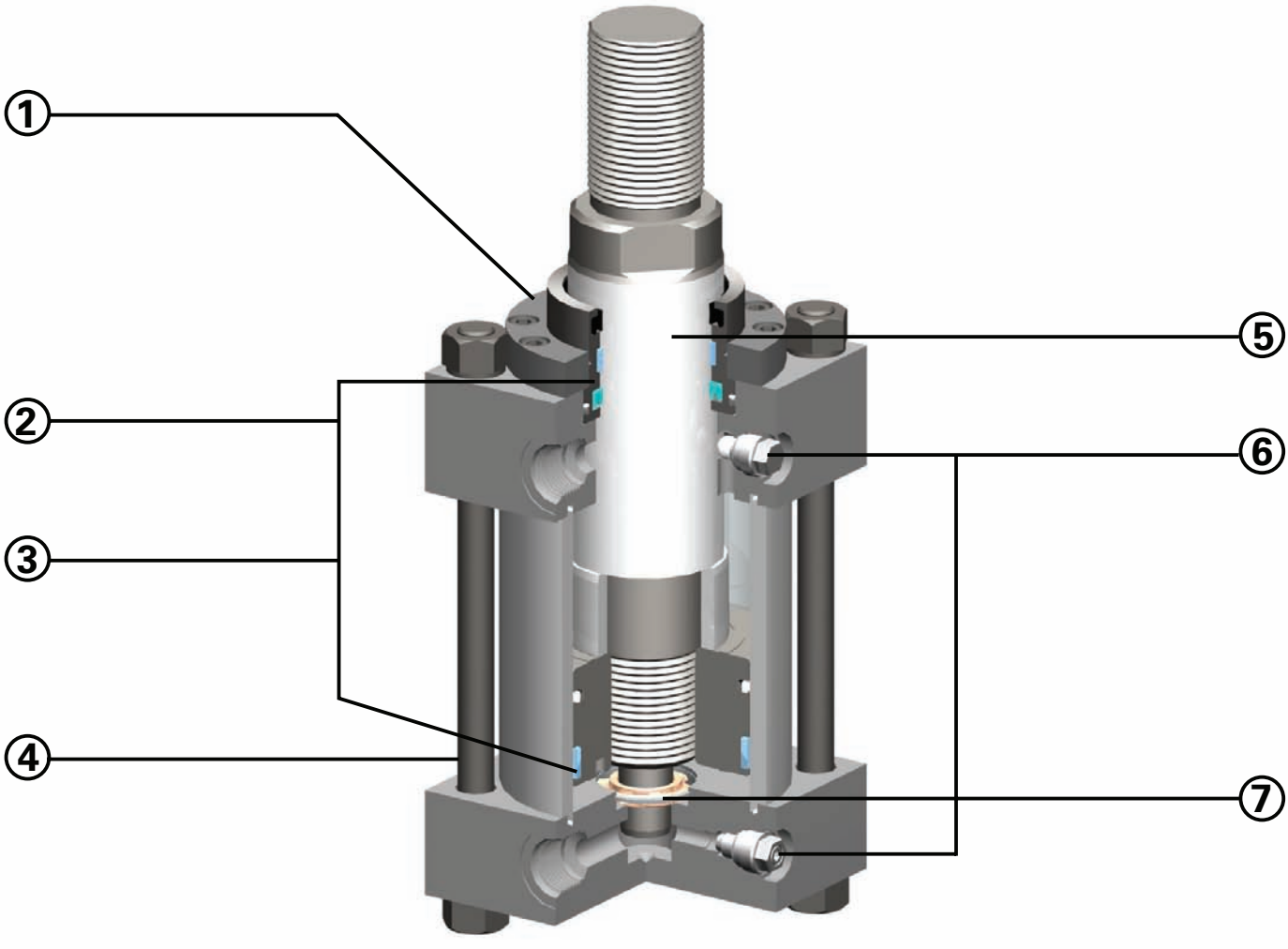
8. Global Design:
Engineered for ANSI B93.15/ NFPA interchangeability with the durability required for heavy-duty applications.

9. SureSeal Sealing System:
Carefully selected wiper and seal combinations are mated with a hard chrome plated piston rod to deliver exceptional all-around performance and durability.

10. Full Range of Ports:
Including SAE, BSPP, and metric to ISO 6149 and DIN standard 3852 to provide the broadest piping flexibility.

11. Teflon Tube Seals:
Superior design to prevent leakage
Compatible with virtually all fluids
Operating temperatures to 500°F

12. Bore Size Range:
Cylinder bores available between 1-1/2 and 8 inches.



Standard Cylinders

Eaton has created an easy system for ordering Vickers™ Series NZ cylinders, developed to improve our service to you. The Standard model code consists of sixteen alpha-numeric digits which fully describe the most common standard options offered on Series NZ cylinders.

To specify your Series NZ cylinder, review the following pages for a full description of each option available and select the desired code.

This model code system will:

- **Simplify the re-order process.** Each Vickers™ Series NZ cylinder is assigned a sixteen digit model code. That code is unique to a particular cylinder description. That way, when you re-order your Series NZ cylinder, you're assured of exactly the same top quality cylinder design.
- **Improve identification.** Every Series NZ cylinder has its sixteen digit model code clearly marked on the product, impression stamped in the metal head or cap. Each sixteen digit code completely describes a specific cylinder. This allows seals and replacement components to be easily identified in the field.
- **Facilitate communications.** This fully descriptive model code system allows you to work directly with your local Eaton sales engineer to identify and service your Vickers cylinder.

NOTE
See pages 6 and 7 for a summary of model code options.

Custom Cylinders

New Cylinders
Although the model code has been arranged to cover the vast majority of available options, there will be occasions when you require an option which cannot be coded.

When specifying such an option, enter an "X" for the appropriate item in the sixteen digit model code, then describe your requirements. For example, if you have an application which requires a custom thread on the end of the piston rod, enter an "X" for item 7. Then add a full description at the end of the model code, such as "With 3.25 inch total rod projection and M22 x 1,5 thread 1.375 inches long." The cylinder will then be given a unique six digit design number on receipt of order (as explained below).

If more than one of the available options represented in items 15 and 16 are required, add the appropriate codes as a suffix. The cylinder will then be given a unique six digit design number on receipt of order (as explained below).

Replacement Cylinders
Every custom Eaton cylinder is assigned a unique design number. A Custom cylinder will have 22 digits vs. 16 for the standard cylinder. The design number is contained in the last six digits of the model code, and position 17 is always an alpha character. In other words, the design number begins after position 16. When ordering a replacement cylinder, simply give the model code or the six digit design number to your local Eaton Cylinder Sales representative.

Replacement Parts
Each design number is stored in a quick retrieval computerized storage system. This gives our field sales representatives rapid access to assist you in identifying and specifying genuine Eaton replacement parts.

Model Codes

NZ 09 KM 1 N 1 K W 99A PR

1, 2 | 3, 4 | 5, 6 | 7 | 8 | 9 | 10 | 11 | 12, 13, 14 | 15, 16

1, 2 Series

NZ – ANSI B93.15/NFPA Interchageable Hydraulic cylinder

3, 4 Mounting Styles

01 – Side Lug	MS2
02 – Side Tapped	MS4
03 – End Lug Mount	MS7
04 – Keyed Side Lug	
05 – Keyed Tapped	
07 – Head Rectangular Flange	MF1
08 – Head Square Flange	MF5
09 – Head Rectangular	ME5
10 – Clevis	MP1
11 – Spherical Bushing	MP5
12 – Cap Rectangular Flange	MF2
13 – Cap Square Flange	MF6
14 – Cap Rectangular	ME6
15 – Intermediate Trunnion	MT4
16 – Cap Trunnion	MT2
17 – Head Trunnion	MT1
19 – Centerline Lug	MS3
21 – Cap End Extended Tie Rod	MX2
22 – Head End Extended Tie Rod	MX3
23 – Both Ends Extended Tie Rod	MX1
24 – No Mount	-
25 – Double Rod, Side Lug	-
26 – Double Rod, Tapped	-
27 – Double Rod, End Lug	-
28 – Double Rod, Keyed Side Lug	-
29 – Double Rod, Keyed Tapped	-
31 – Double Rod, Rectangular Flange	-
32 – Double Rod, Square Flange	-
33 – Double Rod, Head Rectangular	-
34 – Double Rod, Intermediate Trunnion	-
35 – Double Rod, Head Trunnion	-
37 – Double Rod, Centerline Lug	-
39 – Double Rod, Extended Tie Rod	-
40 – Double Rod, Both Ends Extended Tie Rod	-
41 – Double Rod, No Mount	-
47 – Cap Fixed Eye	MP3
48 – Detachable Eye	MP4
50 – Detachable Clevis	MP2

5, 6 Bore and Rod Size Combinations

Code	Bore(in)	Rod(in)
CC	1-1/2	5/8
CE	1-1/2	1
DE	2	1
DH	2	1-3/8
EE	2-1/2	1
EH	2-1/2	1-3/8
EL	2-1/2	1-3/4
GH	3-1/4	1-3/8
GL	3-1/4	1-3/4
GM	3-1/4	2
HL	4	1-3/4
HM	4	2
HP	4	2-1/2
KM	5	2
KP	5	2-1/2
KU	5	3
KV	5	3-1/2
LP	6	2-1/2
LU	6	3
LV	6	3-1/2
LW	6	4
MU	7	3
MV	7	3-1/2
MW	7	4
MY	7	4-1/2
MZ	7	5
NV	8	3-1/2
NW	8	4
NY	8	4-1/2
NZ	8	5
N1	8	5-1/2

7 Rod End Type

Code	Type
1	Short Female Metric Thd.
2	Short Female UN Thd.
5	Small Male UN Thd.
6	Plain No Attachment
7	Small Male Metric Thd.
9	Intermediate Male UN Thd.
0	Intermediate Male Metric
G	Grooved End
K	Extended Small Male UN Thd.
L	Extended Small Male Metric Thd.
M	Extended Intermediate Male UN Thd.
N	Extended Intermediate Male Metric Thd.
R	Studded Small Male UN Thd.

8 Seal Options

N – Normal
L – Low Friction
T – High Temperature
C – Normal with Cast Iron Piston Rings

9 Port Options

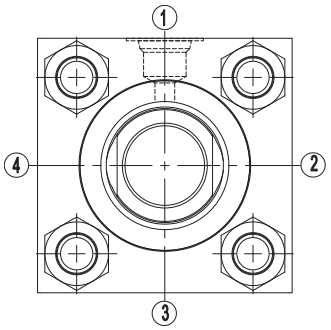
1 – Standard NPTF*
2 – Oversize NPTF*
3 – SAE/UN O-ring
4 – Oversize SAE/UN
5 – NFPA Standard SAE/UN
6 – SAE 4-Bolt Flange
7 – BSPP
8 – Oversize BSPP
9 – Metric
0 – Oversize Metric
A – ISO 6149
B – Oversize ISO 6149
K – Undersize ISO 6149
C – Undersize 4-Bolt Flange
D – Undersize NPTF*
G – Undersize Metric
M – Standard Manifold

* Not recommended for maximum reliabilty on new applications.

10 Port Locations

Ports are located as shown in Rod end type section when viewing cylinder from head end (mounting end of double rod cylinders).

Code	Head	Cap
K	1	1
L	1	2
M	1	3
N	1	4
P	2	1
R	2	2
S	2	3
T	2	4
U	3	1
V	3	2
W	3	3
Y	3	4
1	4	1
2	4	2
3	4	3
4	4	4
5	1	5
6	2	5
7	3	5
8	4	5



Model Codes

NZ 09 KM 1 N 1 K W 99A PR

1, 2 | 3, 4 | 5, 6 | 7 | 8 | 9 | 10 | 11 | 12, 13, 14 | 15, 16

11 Cushion Location

Cushions are located as shown in Rod end type section when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no cushion.

Code	Head	Cap
A	–	–
B	–	1
C	–	2
D	–	3
E	–	4
F	1	–
G	2	–
H	3	–
J	4	–
K	1	1
L	1	2
M	1	3
N	1	4
P	2	1
R	2	2
S	2	3
T	2	4
U	3	1
V	3	2
W	3	3
Y	3	4
1	4	1
2	4	2
3	4	3
4	4	4

Double Rod Cylinders:
"Head" = "Mounting End"
"Cap" = Non-mounting End

12, 13, 14 Cylinder Stroke

Items 12 and 13 indicate stroke length from 00 inches through 99 inches.
Item 14 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	15/16

15, 16 Extra Rod Projection

Item 15 indicates inches from 0 thru 9.
Item 16 indicates fraction of an inch per the following codes:

————OR————

Proximity Switch, Gland Drain, Air Bleeder / flats / rod material / Limit switch / stop tube / keyed piston

Code	No. of A/C Flat*
F4	4
F6	6

* Only upto 3.5" Rod.

Gland Drain

Code	Head	Cap
*** GB**	-	1
*** GC**	-	2
*** GD**	-	3
*** GE**	-	4
GF	1	-
GG	2	-
GH	3	-
GJ	4	-
*** GK**	1	1
*** GG**	1	2
*** GM**	1	3
*** GN**	1	4
*** GP**	2	1
*** GR**	2	2
*** GS**	2	3
*** GT**	2	4
*** GU**	3	1
*** GV**	3	2
*** GW**	3	3
*** GY**	3	4
*** G1**	4	1
*** G2**	4	2
*** G3**	4	3
*** G4**	4	4

* Codes applicable to Double Rods only

Proximity/Positions

Code	Head	Cap
PB	-	1
PC	-	2
PD	-	3
PE	-	4
PF	1	-
PG	2	-
PH	3	-
PJ	4	-
PK	1	1
PL	1	2
PM	1	3
PN	1	4
PP	2	1
PR	2	2
PS	2	3
PT	2	4
PU	3	1
PV	3	2
PW	3	3
PY	3	4
P1	4	1
P2	4	2
P3	4	3
P4	4	4
**** P5**	1	5
**** P6**	2	5
**** P7**	3	5
**** P8**	4	5

** Applicable for Single rods, Except 1.50" Bore Cushioned option

Air Bleed/Positions

Code	Head	Cap
HB	-	1
HC	-	2
HD	-	3
HE	-	4
HF	1	-
HG	2	-
HH	3	-
HJ	4	-
HK	1	1
HL	1	2
HM	1	3
HN	1	4
HP	2	1
HR	2	2
HS	2	3
HT	2	4
HU	3	1
HV	3	2
HW	3	3
HY	3	4
H1	4	1
H2	4	2
H3	4	3
H4	4	4

Double Rod Cylinders:
"Head" = "Mounting End"
"Cap" = Non-mounting End

Stop Tube/Positions

Code	Length in inches
S1	1
S2	2
S3	3
S4	4
S5	5
S6	6
S7	7
S8	8
S9	9
S0	10
SA	11
SB	12
SC	13
SD	14
SE	15
SF	16
SG	17
SH	18
SJ	19
SK	20

Keyed Piston to Rod

Code	Type
KG	Grub Screw
KS	Weld Piston to rod

Rod Material Options

Code	Type
*** RP**	Thick Chrome Plate
RS	Stainless Steel 17-4
**** RT**	Stainless Steel 303

* .002 Chrome thickness

** Consult factory for pressure Rating

Mounting Styles

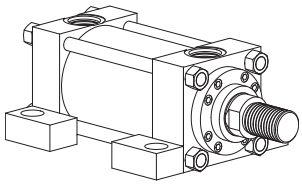
Available Mountings

The variety of standard ANSI/ NFPA mountings available in the Series NZ gives you a broad selection to match the proper mount to your application. Eaton offers rigid mounts (including side lug mounts, flange mounts, and extended tie rod mounts) and swivel mounts (including clevis mounts and trunnion mounts). For custom mounts, enter "XX" for model code item 2, and give a detailed description with drawings. Series NZ cylinders are available in all mounting styles listed.

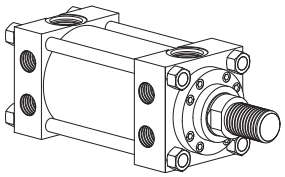
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

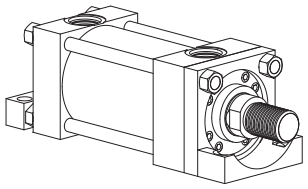
NZ01
Side lug
ANSI MS2



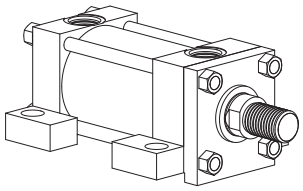
NZ02
Side Tapped
ANSI MS4



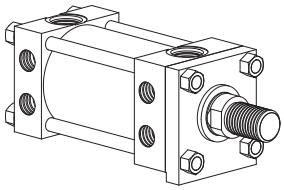
NZ03
End lug
ANSI MS7



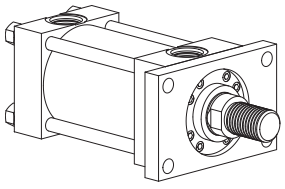
NZ04
Keyed Side Lug



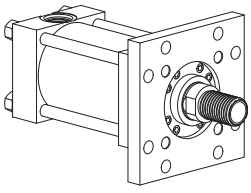
NZ05
Keyed Side Tapped



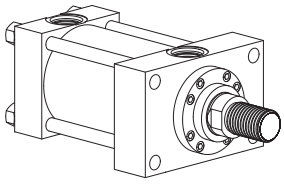
NZ07
Head Rectangular flange
ANSI MF1
(Maximum working pressure 800 PSI)



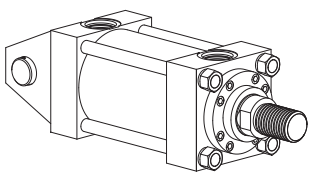
NZ08
Head Square flange
ANSI MF5
(Maximum working pressure 1500 PSI)



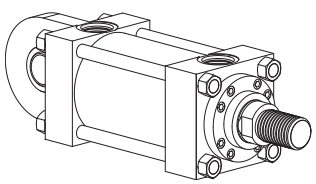
NZ09
Head Rectangular
ANSI ME5



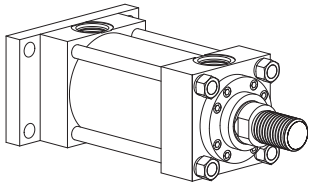
NZ10
Cap Clevis
ANSI MP1



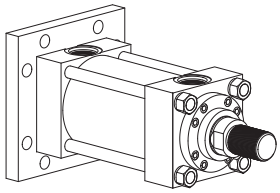
NZ11
Cap Spherical bearing
(Maximum working presure per Bore on page 28.)



NZ12
Cap Rectangular flange
ANSI MF2
(Maximum working pressure 800 PSI)

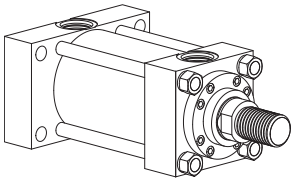


NZ13
Cap Square flange
ANSI MF6
(Maximum working pressure 1500 PSI)

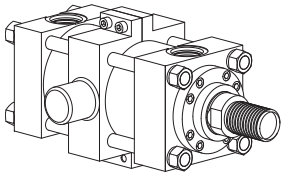


Mounting Styles

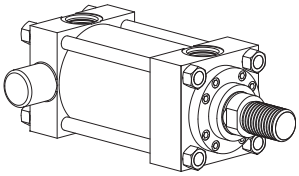
NZ14
Cap Rectangular
ANSI ME6



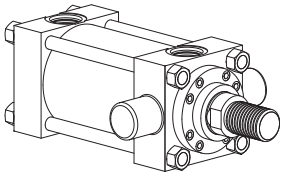
NZ15
Intermediate Trunnion
ANSI MT4



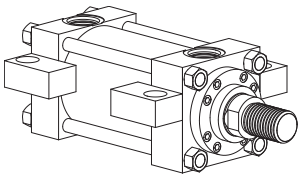
NZ16
Cap Trunnion
ANSI MT2



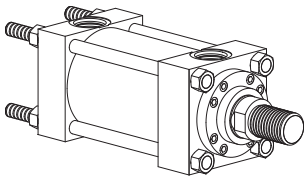
NZ17
Head Trunnion
ANSI MT1



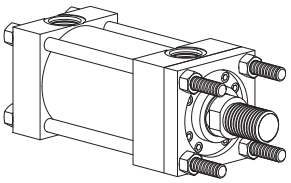
NZ19
Center Lug
ANSI MS3



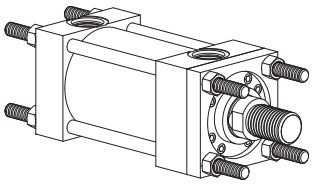
NZ21
Cap Extended Tie rod
ANSI MX2



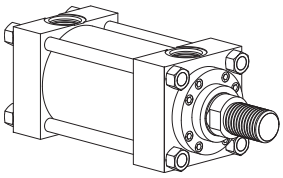
NZ22
Head Extended Tie rod
ANSI MX3



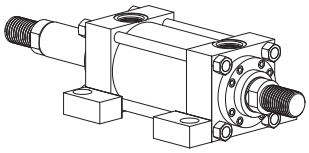
NZ23
Both Ends Extended Tie rod
ANSI MX1



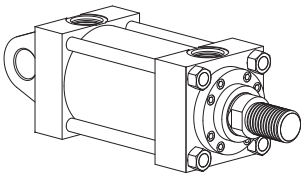
NZ24
No Mount



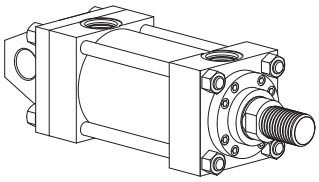
NZ25
Double rod, Side Lug



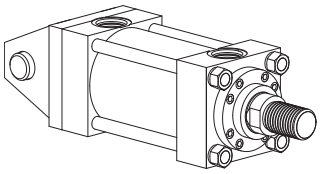
NZ47
Cap Fixed Eye
ANSI MP3



NZ48
Cap Detachable Eye
ANSI MP4

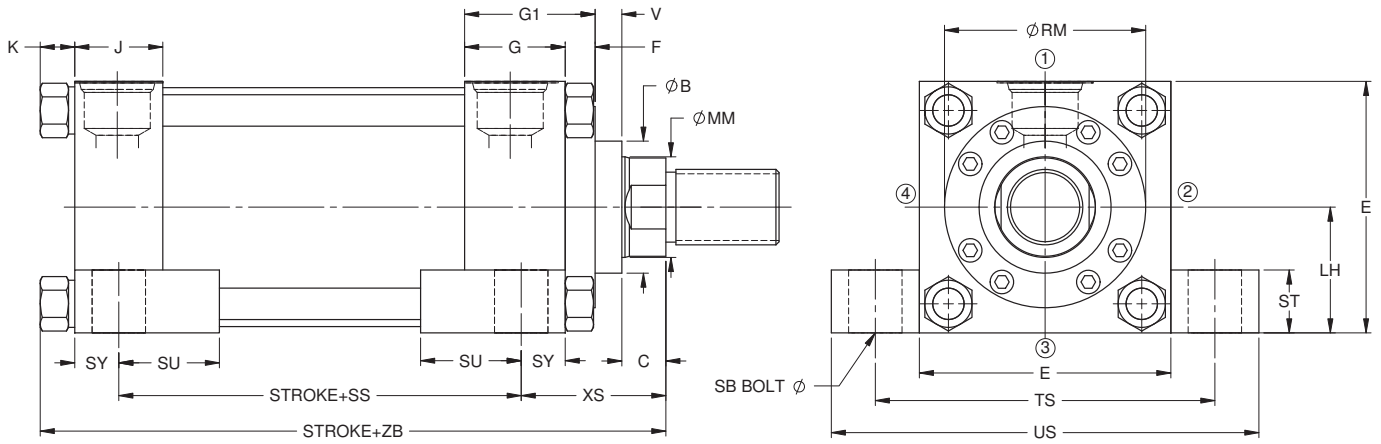


NZ50
Cap Detachable Clevis
ANSI MP2



Mounting Style and Installation Dimensions

NZ01 Side Lug Mount



Bore	Rod Dia MM	B +.000/- .002	C	E	G	J	F	V	RM	LH ±.002	SB
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	1.243	0.38
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-	1.243	0.38
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	1.493	0.50
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-	1.493	0.50
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	1.743	0.75
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	1.743	0.75
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50		1.743	0.75
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	2.243	0.75
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	2.243	0.75
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-	2.243	0.75
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	2.493	1.00
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	2.493	1.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	2.493	1.00
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	3.243	1.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	3.243	1.00
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	3.243	1.00
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	3.243	1.00
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	3.743	1.25
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	3.743	1.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	3.743	1.25
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	3.743	1.25
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	4.243	1.50
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	4.243	1.50
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	4.243	1.50
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	4.243	1.50
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	4.243	1.50
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	4.743	1.50
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	4.743	1.50
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	4.743	1.50
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	4.743	1.50
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	4.743	1.50

+ Plus Stroke

† For Port and Switch at position 2 & 4 please refer page 68, Mounting Holes requires counter Bore

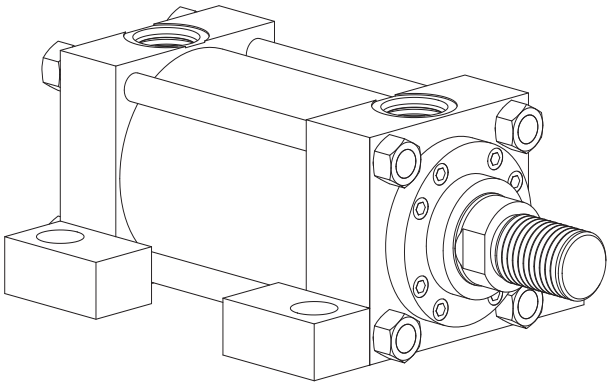
Mounting Style and Installation Dimensions

NZ01 Side Lug Mount

Side lug mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod. The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
Limit operating pressure to 2320 psi for minimum deflection on 6, 7 and 8 inch bores. For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.
For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount, NZ04.

For severe side load applications, consult your local Eaton sales engineer.



Bore	Rod Dia MM	SS+	ST	SU	SY	TS	US	XS	ZB+ Max	Piston Thick.	K Max
1.50	0.63	3.88	0.50	0.91	0.38	3.25	4.00	1.38	6.13	1.38	0.41
	1.00	3.88	0.50	0.91	0.38	3.25	4.00	1.75	6.50	1.38	0.41
2.00	1.00	3.63	0.75	1.24	0.50	4.00	5.00	1.88	6.66	1.38	0.55
	1.38	3.63	0.75	1.24	0.50	4.00	5.00	2.13	6.92	1.38	0.55
2.50	1.00	3.38	1.00	1.56	0.69	4.88	6.25	2.06	6.78	1.50	0.55
	1.38	3.38	1.00	1.56	0.69	4.88	6.25	2.31	7.04	1.50	0.55
	1.75	3.38	1.00	1.56	0.69	4.88	6.25	2.56	7.28	1.50	0.55
3.25	1.38	4.13	1.00	1.55	0.69	5.88	7.25	2.31	7.91	1.75	0.67
	1.75	4.13	1.00	1.55	0.69	5.88	7.25	2.56	8.16	1.75	0.67
	2.00	4.13	1.00	1.55	0.69	5.88	7.25	2.69	8.29	1.75	0.67
4.00	1.75	4.00	1.25	2.00	0.88	6.75	8.50	2.75	8.40	2.00	0.78
	2.00	4.00	1.25	2.00	0.88	6.75	8.50	2.88	8.53	2.00	0.78
	2.50	4.00	1.25	2.00	0.88	6.75	8.50	3.13	8.78	2.00	0.78
5.00	2.00	4.50	1.25	2.00	0.88	8.25	10.00	2.88	9.32	2.50	0.92
	2.50	4.50	1.25	2.00	0.88	8.25	10.00	3.13	9.57	2.50	0.92
	3.00	4.50	1.25	2.00	0.88	8.25	10.00	3.13	9.56	2.50	0.92
	3.50	4.50	1.25	2.00	0.88	8.25	10.00	3.13	9.56	2.50	0.92
6.00	2.50	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.80	2.88	1.03
	3.00	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.80	2.88	1.03
	3.50	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.80	2.88	1.03
	4.00	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.80	2.88	1.03
7.00	3.00	5.75	1.75	2.88	1.38	11.25	14.00	3.63	12.09	3.00	1.17
	3.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	12.09	3.00	1.17
	4.00	5.75	1.75	2.88	1.38	11.25	14.00	3.63	12.09	3.00	1.17
	4.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	12.09	3.00	1.17
	5.00	5.75	1.75	2.88	1.38	11.25	14.00	3.63	12.09	3.00	1.17
8.00	3.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.18	3.50	1.26
	4.00	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.18	3.50	1.26
	4.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.18	3.50	1.26
	5.00	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.18	3.50	1.26
	5.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.18	3.50	1.26

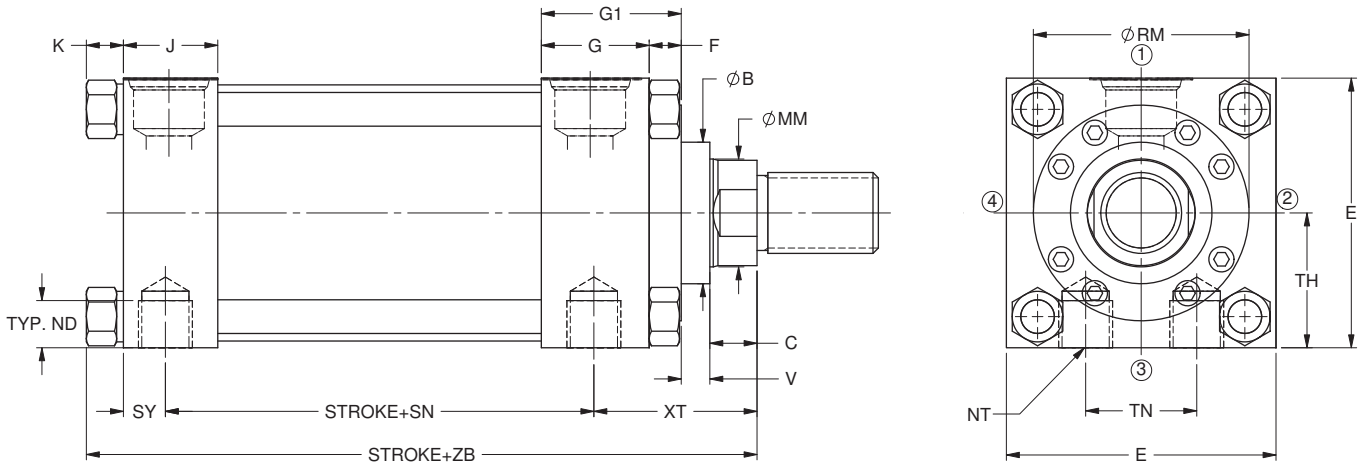
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ02 Side Tapped Mounts

ANSI MS4



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM	TH ±.002
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	1.243
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50		1.243
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	1.493
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38		1.493
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	1.743
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	1.743
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50		1.743
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	2.243
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	2.243
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38		2.243
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	2.493
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	2.493
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	2.493
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	3.243
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	3.243
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	3.243
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	3.243
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	3.743
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	3.743
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	3.743
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	3.743
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	4.243
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	4.243
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	4.243
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	4.243
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	4.243
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	4.743
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	4.743
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	4.743
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	4.743
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	4.743

+ Plus Stroke

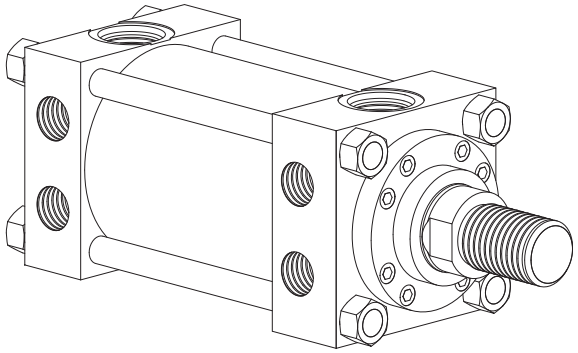
Mounting Style and Installation Dimensions

NZ02 Side Tapped Mounts

ANSI MS4

Tapped mounts are for moving loads along a flat guided surface as in a carriage along rails.
The mounting surface should be flat and parallel to the centerline of the piston rod.
The load should be guided to traverse along the centerline of the piston rod.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.
For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount, NZ04.
For severe side load applications, consult your local Eaton sales engineer.



Bore	Rod Dia MM	ND	NT (Tap)	SN+	TN	SY	XT	ZB+ Max	Piston Thick.	K
1.50	0.63	0.56	0.375-16	2.88	0.75	0.75	2.00	6.04	1.38	0.41
	1.00	0.50	0.375-16	2.88	0.75	0.75	2.38	6.41	1.38	0.41
2.00	1.00	0.50	0.500-13	2.88	0.94	0.75	2.38	6.56	1.38	0.55
	1.38	0.50	0.500-13	2.88	0.94	0.75	2.63	6.82	1.38	0.55
2.50	1.00	0.81	0.625-11	3.00	1.31	0.75	2.38	6.68	1.50	0.55
	1.38	0.61	0.625-11	3.00	1.31	0.75	2.63	6.94	1.50	0.55
	1.75	0.61	0.625-11	3.00	1.31	0.75	2.88	7.18	1.50	0.55
3.25	1.38	0.75	0.750-10	3.50	1.50	0.88	2.75	7.80	1.75	0.67
	1.75	0.75	0.750-10	3.50	1.50	0.88	3.00	8.05	1.75	0.67
	2.00	0.75	0.750-10	3.50	1.50	0.88	3.13	8.18	1.75	0.67
4.00	1.75	1.00	1.000-8	3.75	2.06	0.88	3.00	8.40	2.00	0.78
	2.00	0.75	1.000-8	3.75	2.06	0.88	3.13	8.53	2.00	0.78
	2.50	0.69	1.000-8	3.75	2.06	0.88	3.38	8.78	2.00	0.78
5.00	2.00	1.13	1.000-8	4.25	2.94	0.88	3.13	9.18	2.50	0.92
	2.50	1.13	1.000-8	4.25	2.94	0.88	3.38	9.43	2.50	0.92
	3.00	1.13	1.000-8	4.25	2.94	0.88	3.38	9.42	2.50	0.92
	3.50	1.00	1.000-8	4.25	2.94	0.88	3.38	9.42	2.50	0.92
6.00	2.50	1.31	1.250-7	5.13	3.31	1.13	3.50	10.66	2.88	1.03
	3.00	1.31	1.250-7	5.13	3.31	1.13	3.50	10.80	2.88	1.03
	3.50	1.31	1.250-7	5.13	3.31	1.13	3.50	10.80	2.88	1.03
	4.00	1.25	1.250-7	5.13	3.31	1.13	3.50	10.81	2.88	1.03
7.00	3.00	2.13	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	3.50	2.13	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	4.00	1.75	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	4.50	1.50	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	5.00	1.13	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
8.00	3.50	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	4.00	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	4.50	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	5.00	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	5.50	1.38	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26

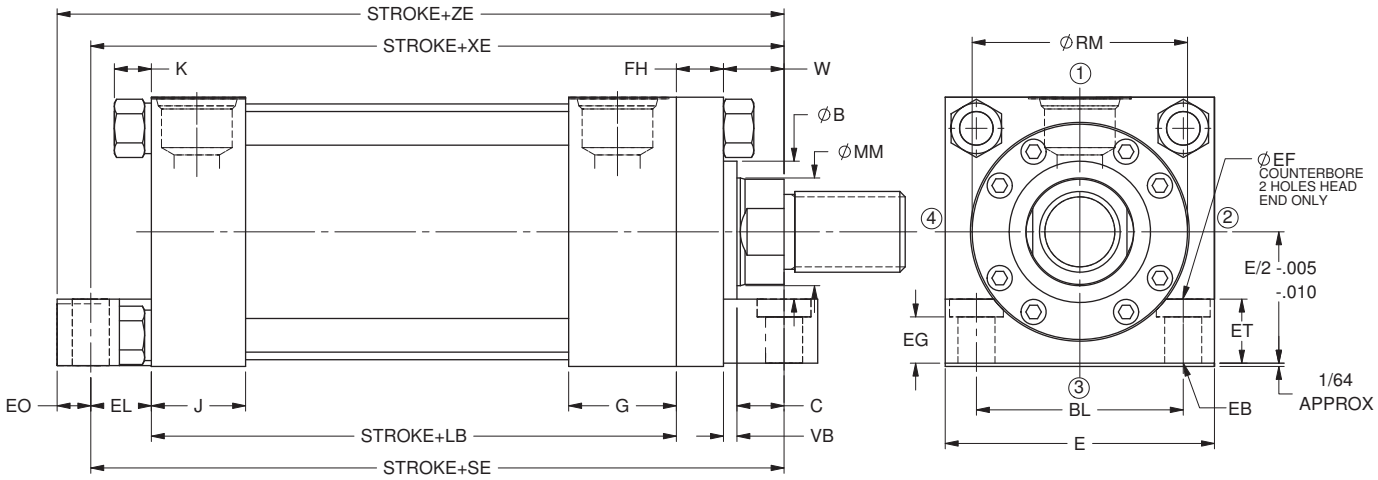
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ03 End Lug Mounts

ANSI MS7



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	FH	VB	W	EB	SE+
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	0.63	0.38	6.75
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	1.00	0.38	6.75
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	0.75	0.50	7.13
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	1.01	0.50	7.13
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.63	0.25	0.75	0.50	7.25
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	1.01	0.50	7.25
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	1.25	0.50	7.25
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.75	0.25	0.88	0.63	8.50
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	1.13	0.63	8.50
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	1.26	0.63	8.50
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.88	0.25	1.00	0.63	8.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.88	0.25	1.13	0.63	8.88
	2.50	3.124	1.00	5.00	2.00	1.75	0.88	0.38	1.38	0.63	8.88
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.88	0.25	1.13	0.88	10.13
	2.50	3.124	1.00	6.50	2.00	1.75	0.88	0.38	1.38	0.88	10.13
	3.00	3.749	1.00	6.50	2.00	1.75	0.88	0.38	1.38	0.88	10.13
	3.50	4.249	1.00	6.50	2.00	1.75	0.88	0.38	1.38	0.88	10.13
6.00	2.50	3.124	1.00	7.50	2.25	2.25	1.00	0.25	1.25	1.00	11.75
	3.00	3.749	1.00	7.50	2.25	2.25	1.00	0.25	1.25	1.00	11.75
	3.50	4.249	1.00	7.50	2.25	2.25	1.00	0.25	1.25	1.00	11.75
	4.00	4.749	1.00	7.50	2.25	2.25	1.00	0.25	1.25	1.00	11.75
7.00	3.00	3.749	1.00	8.50	2.75	2.75	1.00	0.25	1.25	1.13	13.13
	3.50	4.249	1.00	8.50	2.75	2.75	1.00	0.25	1.25	1.13	13.13
	4.00	4.749	1.00	8.50	2.75	2.75	1.00	0.25	1.25	1.13	13.13
	4.50	5.249	1.00	8.50	2.75	2.75	1.00	0.25	1.25	1.13	13.13
	5.00	5.749	1.00	8.50	2.75	2.75	1.00	0.25	1.25	1.13	13.13
8.00	3.50	4.249	1.00	9.50	3.00	3.00	1.00	0.25	1.25	1.25	14.50
	4.00	4.749	1.00	9.50	3.00	3.00	1.00	0.25	1.25	1.25	14.50
	4.50	5.249	1.00	9.50	3.00	3.00	1.00	0.25	1.25	1.25	14.50
	5.00	5.749	1.00	9.50	3.00	3.00	1.00	0.25	1.25	1.25	14.50
	5.50	6.249	1.00	9.50	3.00	3.00	1.00	0.25	1.25	1.25	14.50

+ Plus Stroke

† Port at Position 3 not availabe on 1.50", 2.00", 2.50", 3.25" and 4.00"

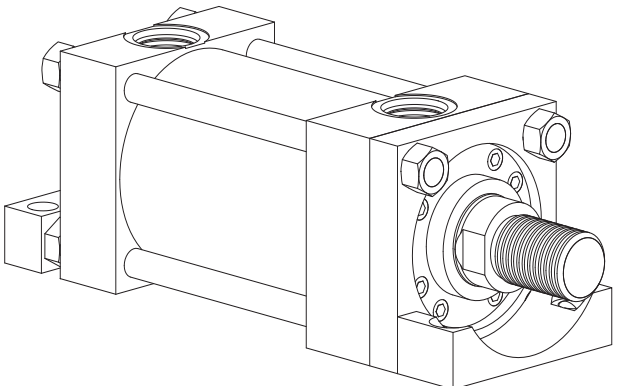
Mounting Style and Installation Dimensions

NZ03 End Lug Mounts

ANSI MS7

End lug mounts are for moving loads along a flat guided surface as in a carriage along rails.
The mounting surface should be flat and parallel to the centerline of the piston rod.
The load should be guided to traverse along the centerline of the piston rod.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
Port at position 3 not available on 1.50", 2.00", 2.50", 3.25" and 4.00" diameter bores.
With unsupported loads, the bearing must absorb more force.
For these applications, the larger available rod is recommended, and stop tubes should be considered.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.
For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount, NZ04.
For severe side load applications, consult your local Eaton sales engineer.



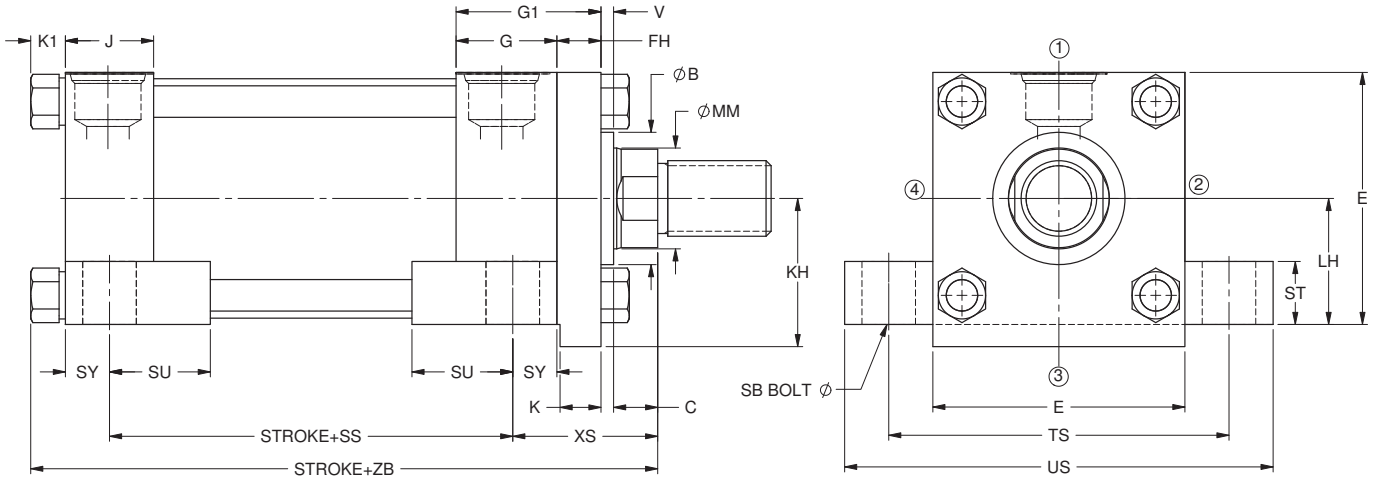
Bore	Rod Dia MM	ET	EG	EL	EF	BL	XE+	LB+	E0	ZE+ Max	Piston Thick.	K
1.50	0.63	0.88	0.69	0.88	0.63	1.63	6.51	4.63	0.38	6.89	1.38	0.41
	1.00	0.88	0.69	0.88	0.63	1.63	6.88	4.63	0.38	7.26	1.38	0.41
2.00	1.00	1.00	0.75	0.94	0.81	2.07	6.94	4.63	0.50	7.44	1.38	0.55
	1.38	1.00	0.75	0.94	0.81	2.07	7.20	4.63	0.50	7.70	1.38	0.55
2.50	1.00	1.00	0.75	0.94	0.81	2.56	7.07	4.75	0.50	7.57	1.50	0.55
	1.38	1.00	0.75	0.94	0.81	2.56	7.33	4.75	0.50	7.83	1.50	0.55
	1.75	1.00	0.75	0.94	0.81	2.56	7.57	4.75	0.50	8.07	1.50	0.55
3.25	1.38	1.25	1.06	1.13	1.00	3.27	8.26	5.50	0.63	8.88	1.75	0.67
	1.75	1.25	1.06	1.13	1.00	3.27	8.51	5.50	0.63	9.13	1.75	0.67
	2.00	1.25	1.06	1.13	1.00	3.27	8.64	5.50	0.63	9.26	1.75	0.67
4.00	1.75	1.25	0.88	1.13	1.00	3.84	8.75	5.75	0.63	9.38	2.00	0.78
	2.00	1.25	0.88	1.13	1.00	3.84	8.88	5.75	0.63	9.51	2.00	0.78
	2.50	1.25	0.88	1.13	1.00	3.84	9.13	5.75	0.63	9.76	2.00	0.78
5.00	2.00	1.50	1.25	1.50	1.38	4.95	9.76	6.25	0.75	10.51	2.50	0.92
	2.50	1.50	1.25	1.50	1.38	4.95	10.01	6.25	0.75	10.76	2.50	0.92
	3.00	1.50	1.25	1.50	1.38	4.95	10.01	6.25	0.75	10.76	2.50	0.92
	3.50	1.50	1.25	1.50	1.38	4.95	10.01	6.25	0.75	10.76	2.50	0.92
6.00	2.50	1.75	1.50	1.69	1.63	5.74	11.31	7.38	0.88	12.19	2.88	1.03
	3.00	1.75	1.50	1.69	1.63	5.74	11.31	7.38	0.88	12.19	2.88	1.03
	3.50	1.75	1.50	1.69	1.63	5.74	11.31	7.38	0.88	12.19	2.88	1.03
	4.00	1.75	1.50	1.69	1.63	5.74	11.31	7.38	0.88	12.19	2.88	1.03
7.00	3.00	2.00	1.50	1.81	1.63	6.58	12.56	8.50	1.00	13.56	3.00	1.17
	3.50	2.00	1.50	1.81	1.63	6.58	12.56	8.50	1.00	13.56	3.00	1.17
	4.00	2.00	1.50	1.81	1.63	6.58	12.56	8.50	1.00	13.56	3.00	1.17
	4.50	2.00	1.50	1.81	1.63	6.58	12.56	8.50	1.00	13.56	3.00	1.17
	5.00	2.00	1.50	1.81	1.63	6.58	12.56	8.50	1.00	13.56	3.00	1.17
8.00	3.50	2.00	1.75	2.00	2.09	7.51	13.75	9.50	1.13	14.88	3.50	1.26
	4.00	2.00	1.75	2.00	2.09	7.51	13.75	9.50	1.13	14.88	3.50	1.26
	4.50	2.00	1.75	2.00	2.09	7.51	13.75	9.50	1.13	14.88	3.50	1.26
	5.00	2.00	1.75	2.00	2.09	7.51	13.75	9.50	1.13	14.88	3.50	1.26
	5.50	2.00	1.75	2.00	2.09	7.51	13.75	9.50	1.13	14.88	3.50	1.26

+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ04 Keyed Side Lug Mounts



Bore	Rod Dia MM	B +.000/-.002	C	E	G1	J	FH	K +.000 /-.002	Max KH	LH ±.002	V
1.50	0.63	1.124	0.38	2.50	2.13	1.50	0.38	0.362	1.44	1.243	0.25
	1.00	1.499	0.50	2.50	2.13	1.50	0.38	0.362	1.43	1.243	0.50
2.00	1.00	1.499	0.50	3.00	2.38	1.50	0.63	0.612	1.81	1.493	0.25
	1.38	1.999	0.63	3.00	2.38	1.50	0.63	0.612	1.81	1.493	0.38
2.50	1.00	1.499	0.50	3.50	2.38	1.50	0.63	0.612	2.06	1.743	0.25
	1.38	1.999	0.63	3.50	2.38	1.50	0.63	0.612	2.06	1.743	0.38
	1.75	2.374	0.75	3.50	2.38	1.50	0.63	0.612	2.06	1.743	0.50
3.25	1.38	1.999	0.63	4.50	2.75	1.75	0.75	0.737	2.63	2.243	0.25
	1.75	2.374	0.75	4.50	2.75	1.75	0.75	0.737	2.63	2.243	0.38
	2.00	2.624	0.88	4.50	2.75	1.75	0.75	0.737	2.63	2.243	0.38
4.00	1.75	2.374	0.75	5.00	2.88	1.75	0.88	0.862	2.94	2.493	0.25
	2.00	2.624	0.88	5.00	2.88	1.75	0.88	0.862	2.94	2.493	0.25
	2.50	3.124	1.00	5.00	2.88	1.75	0.88	0.862	2.94	2.493	0.38
5.00	2.00	2.624	0.88	6.50	2.88	1.75	0.88	0.862	3.68	3.243	0.25
	2.50	3.124	1.00	6.50	2.88	1.75	0.88	0.862	3.68	3.243	0.38
	3.00	3.749	1.00	6.50	2.88	1.75	0.88	0.862	3.68	3.243	0.38
	3.50	4.249	1.00	6.50	2.88	1.75	0.88	0.862	3.68	3.243	0.38
6.00	2.50	3.124	1.00	7.50	3.25	2.25	1.00	0.987	4.25	3.743	0.25
	3.00	3.749	1.00	7.50	3.25	2.25	1.00	0.987	4.25	3.743	0.25
	3.50	4.249	1.00	7.50	3.25	2.25	1.00	0.987	4.25	3.743	0.25
	4.00	4.749	1.00	7.50	3.25	2.25	1.00	0.987	4.25	3.743	0.25
7.00	3.00	3.749	1.00	8.50	3.75	2.75	1.00	0.987	4.75	4.243	0.25
	3.50	4.249	1.00	8.50	3.75	2.75	1.00	0.987	4.75	4.243	0.25
	4.00	4.749	1.00	8.50	3.75	2.75	1.00	0.987	4.75	4.243	0.25
	4.50	5.249	1.00	8.50	3.75	2.75	1.00	0.987	4.75	4.243	0.25
	5.00	5.749	1.00	8.50	3.75	2.75	1.00	0.987	4.75	4.243	0.25
8.00	3.50	4.249	1.00	9.50	4.00	3.00	1.00	0.987	5.25	4.743	0.25
	4.00	4.749	1.00	9.50	4.00	3.00	1.00	0.987	5.25	4.743	0.25
	4.50	5.249	1.00	9.50	4.00	3.00	1.00	0.987	5.25	4.743	0.25
	5.00	5.749	1.00	9.50	4.00	3.00	1.00	0.987	5.25	4.743	0.25
	5.50	6.249	1.00	9.50	4.00	3.00	1.00	0.987	5.25	4.743	0.25

+ Plus Stroke

† For Port and Switch at position 2 & 4 please refer page 68, Mounting Holes requires counter Bore

Mounting Style and Installation Dimensions

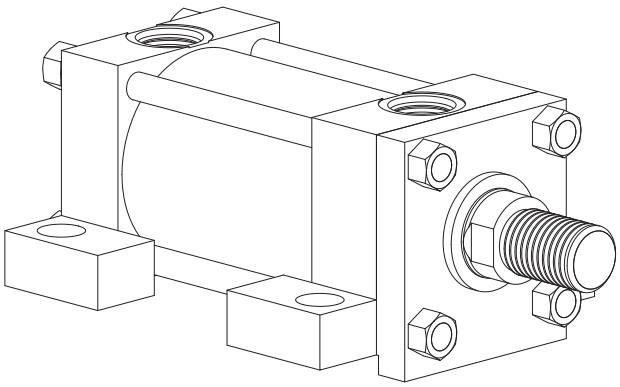
NZ04 Keyed Side Lug Mounts

Keyed side lug mounts are for moving loads along a flat guided surface as in a carriage along rails.
The mounting surface should be flat and parallel to the centerline of the piston rod.
The load should be guided to traverse along the centerline of the piston rod.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
With unsupported loads, the bearing must absorb more force.
For these applications, the larger available rod is recommended, and stop tubes should be considered.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

For severe side load applications, consult your local Eaton sales engineer.



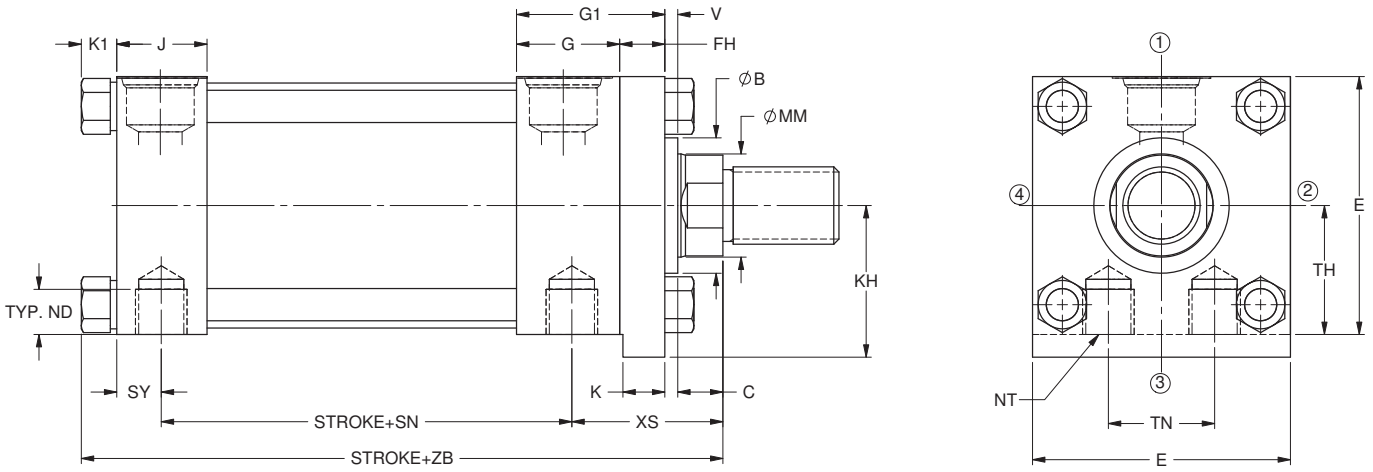
Bore	Rod Dia MM	SB	SS+	ST	SU	SY	TS	US	XS	ZB+ Max	Piston Thick.	K1
1.50	0.63	0.38	3.88	0.50	0.91	0.38	3.25	4.00	1.38	6.04	1.38	0.41
	1.00	0.38	3.88	0.50	0.91	0.38	3.25	4.00	1.75	6.41	1.38	0.41
2.00	1.00	0.50	3.63	0.75	1.24	0.50	4.00	5.00	1.88	6.56	1.38	0.55
	1.38	0.50	3.63	0.75	1.24	0.50	4.00	5.00	2.13	6.82	1.38	0.55
2.50	1.00	0.75	3.38	1.00	1.56	0.69	4.88	6.25	2.06	6.68	1.50	0.55
	1.38	0.75	3.38	1.00	1.56	0.69	4.88	6.25	2.31	6.94	1.50	0.55
	1.75	0.75	3.38	1.00	1.56	0.69	4.88	6.25	2.56	7.18	1.50	0.55
3.25	1.38	0.75	4.13	1.00	1.55	0.69	5.88	7.25	2.31	7.80	1.75	0.67
	1.75	0.75	4.13	1.00	1.55	0.69	5.88	7.25	2.56	8.05	1.75	0.67
	2.00	0.75	4.13	1.00	1.55	0.69	5.88	7.25	2.69	8.18	1.75	0.67
4.00	1.75	1.00	4.00	1.25	2.00	0.88	6.75	8.50	2.75	8.40	2.00	0.78
	2.00	1.00	4.00	1.25	2.00	0.88	6.75	8.50	2.88	8.53	2.00	0.78
	2.50	1.00	4.00	1.25	2.00	0.88	6.75	8.50	3.13	8.78	2.00	0.78
5.00	2.00	1.00	4.50	1.25	2.00	0.88	8.25	10.00	2.88	9.18	2.50	0.92
	2.50	1.00	4.50	1.25	2.00	0.88	8.25	10.00	3.13	9.43	2.50	0.92
	3.00	1.00	4.50	1.25	2.00	0.88	8.25	10.00	3.13	9.43	2.50	0.92
	3.50	1.00	4.50	1.25	2.00	0.88	8.25	10.00	3.13	9.43	2.50	0.92
6.00	2.50	1.25	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
	3.00	1.25	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
	3.50	1.25	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
	4.00	1.25	5.13	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
7.00	3.00	1.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	3.50	1.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	4.00	1.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	4.50	1.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	5.00	1.50	5.75	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
8.00	3.50	1.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	4.00	1.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	4.50	1.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	5.00	1.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	5.50	1.50	6.75	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26

+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ05 Keyed Tapped Lug Mounts



Bore	Rod MM	B +.000/-.002	C	E	G1	J	FH	K +.000/-.002	Max KH	V	TH ±.002
1.50	0.63	1.124	0.38	2.50	2.13	1.50	0.38	0.362	1.44	0.25	1.243
	1.00	1.499	0.50	2.50	2.13	1.50	0.38	0.362	1.44	0.50	1.243
2.00	1.00	1.499	0.50	3.00	2.38	1.50	0.63	0.612	1.81	0.25	1.493
	1.38	1.999	0.63	3.00	2.38	1.50	0.63	0.612	1.81	0.38	1.493
2.50	1.00	1.499	0.50	3.50	2.38	1.50	0.63	0.612	2.06	0.25	1.743
	1.38	1.999	0.63	3.50	2.38	1.50	0.63	0.612	2.06	0.38	1.743
	1.75	2.374	0.75	3.50	2.38	1.50	0.63	0.612	2.06	0.50	1.743
3.25	1.38	1.999	0.63	4.50	2.75	1.75	0.75	0.737	2.63	0.25	2.243
	1.75	2.374	0.75	4.50	2.75	1.75	0.75	0.737	2.63	0.38	2.243
	2.00	2.624	0.88	4.50	2.75	1.75	0.75	0.737	2.63	0.38	2.243
4.00	1.75	2.374	0.75	5.00	2.88	1.75	0.88	0.862	2.94	0.25	2.493
	2.00	2.624	0.88	5.00	2.88	1.75	0.88	0.862	2.94	0.25	2.493
	2.50	3.124	1.00	5.00	2.88	1.75	0.88	0.862	2.94	0.38	2.493
5.00	2.00	2.624	0.88	6.50	2.88	1.75	0.88	0.862	3.68	0.25	3.243
	2.50	3.124	1.00	6.50	2.88	1.75	0.88	0.862	3.68	0.38	3.243
	3.00	3.749	1.00	6.50	2.88	1.75	0.88	0.862	3.68	0.38	3.243
	3.50	4.249	1.00	6.50	2.88	1.75	0.88	0.862	3.68	0.38	3.243
6.00	2.50	3.124	1.00	7.50	3.25	2.25	1.00	0.987	4.25	0.25	3.743
	3.00	3.749	1.00	7.50	3.25	2.25	1.00	0.987	4.25	0.25	3.743
	3.50	4.249	1.00	7.50	3.25	2.25	1.00	0.987	4.25	0.25	3.743
	4.00	4.749	1.00	7.50	3.25	2.25	1.00	0.987	4.25	0.25	3.743
7.00	3.00	3.749	1.00	8.50	3.75	2.75	1.00	0.987	4.75	0.25	4.243
	3.50	4.249	1.00	8.50	3.75	2.75	1.00	0.987	4.75	0.25	4.243
	4.00	4.749	1.00	8.50	3.75	2.75	1.00	0.987	4.75	0.25	4.243
	4.50	5.249	1.00	8.50	3.75	2.75	1.00	0.987	4.75	0.25	4.243
	5.00	5.749	1.00	8.50	3.75	2.75	1.00	0.987	4.75	0.25	4.243
8.00	3.50	4.249	1.00	9.50	4.00	3.00	1.00	0.987	5.25	0.25	4.743
	4.00	4.749	1.00	9.50	4.00	3.00	1.00	0.987	5.25	0.38	4.743
	4.50	5.249	1.00	9.50	4.00	3.00	1.00	0.987	5.25	0.38	4.743
	5.00	5.749	1.00	9.50	4.00	3.00	1.00	0.987	5.25	0.38	4.743
	5.50	6.249	1.00	9.50	4.00	3.00	1.00	0.987	5.25	0.38	4.743

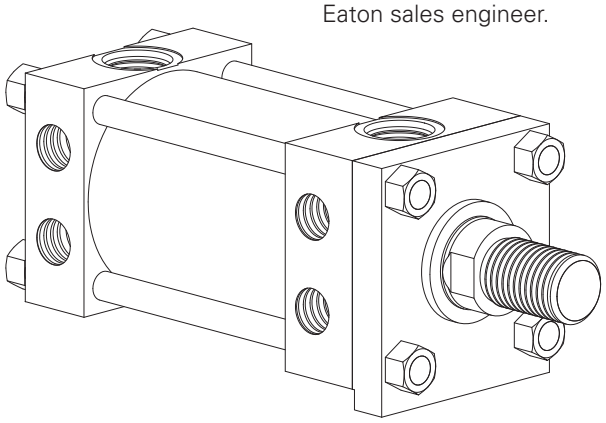
+ Plus Stroke

Mounting Style and Installation Dimensions

NZ05 Keyed Tapped Lug Mounts

Tapped mounts are for moving loads along a flat guided surface as in a carriage along rails.
The mounting surface should be flat and parallel to the centerline of the piston rod.
The load should be guided to traverse along the centerline of the piston rod.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
With unsupported loads, the bearing must absorb more force.
For these applications, the larger available rod is recommended, and stop tubes should be considered.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.
For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount, NZ04.
For severe side load applications, consult your local Eaton sales engineer.



Bore	Rod MM	ND	NT (Tap)	SN+	TN	SY	XS	ZB+ Max	Piston Thick.	K1
1.50	0.63	0.56	0.375-16	2.88	0.75	0.75	2.00	6.04	1.38	0.41
	1.00	0.50	0.375-16	2.88	0.75	0.75	2.38	6.41	1.38	0.41
2.00	1.00	0.50	0.500-13	2.88	0.94	0.75	2.38	6.56	1.38	0.55
	1.38	0.50	0.500-13	2.88	0.94	0.75	2.63	6.82	1.38	0.55
2.50	1.00	0.81	0.625-11	3.00	1.31	0.75	2.38	6.68	1.50	0.55
	1.38	0.61	0.625-11	3.00	1.31	0.75	2.63	6.94	1.50	0.55
	1.75	0.61	0.625-11	3.00	1.31	0.75	2.88	7.18	1.50	0.55
3.25	1.38	0.75	0.750-10	3.50	1.50	0.88	2.75	7.80	1.75	0.67
	1.75	0.75	0.750-10	3.50	1.50	0.88	3.00	8.05	1.75	0.67
	2.00	0.75	0.750-10	3.50	1.50	0.88	3.13	8.18	1.75	0.67
4.00	1.75	1.00	1.000-8	3.75	2.06	0.88	3.00	8.40	2.00	0.78
	2.00	0.75	1.000-8	3.75	2.06	0.88	3.13	8.53	2.00	0.78
	2.50	0.69	1.000-8	3.75	2.06	0.88	3.38	8.78	2.00	0.78
5.00	2.00	1.13	1.000-8	4.25	2.94	0.88	3.13	9.18	2.50	0.92
	2.50	1.13	1.000-8	4.25	2.94	0.88	3.38	9.43	2.50	0.92
	3.00	1.13	1.000-8	4.25	2.94	0.88	3.38	9.43	2.50	0.92
	3.50	1.00	1.000-8	4.25	2.94	0.88	3.38	9.43	2.50	0.92
6.00	2.50	1.31	1.250-7	5.13	3.31	1.13	3.50	10.66	2.88	1.03
	3.00	1.31	1.250-7	5.13	3.31	1.13	3.50	10.66	2.88	1.03
	3.50	1.31	1.250-7	5.13	3.31	1.13	3.50	10.66	2.88	1.03
	4.00	1.25	1.250-7	5.13	3.31	1.13	3.50	10.66	2.88	1.03
7.00	3.00	2.13	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	3.50	2.13	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	4.00	1.75	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	4.50	1.50	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
	5.00	1.13	1.500-6	5.88	3.75	1.06	3.81	11.92	3.00	1.17
8.00	3.50	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	4.00	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	4.50	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	5.00	1.56	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26
	5.50	1.38	1.500-6	6.63	4.25	1.19	3.94	13.00	3.50	1.26

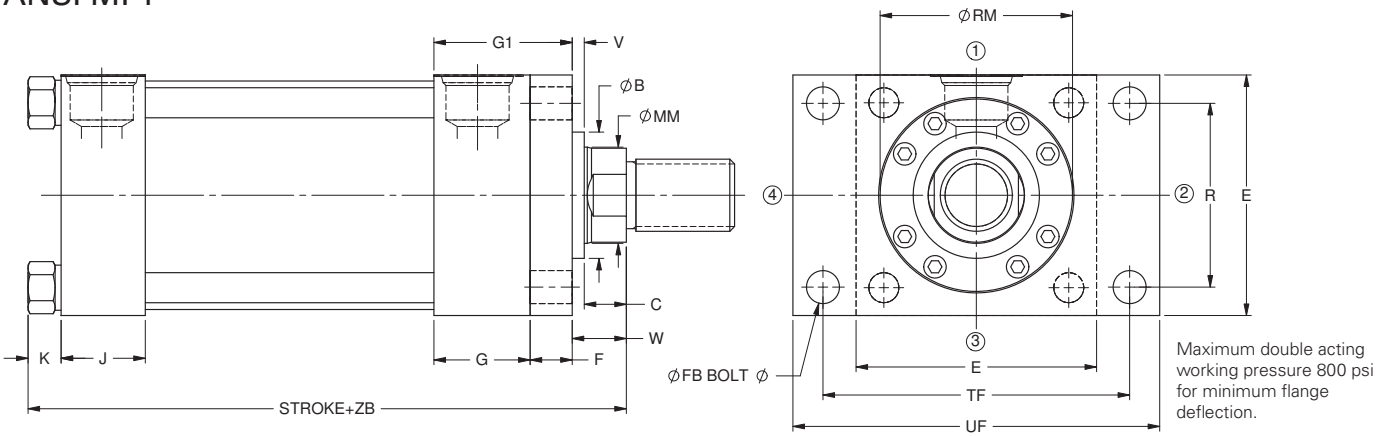
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ07 Head Rectangular Flange Mount

ANSI MF1



Bore	Rod Dia MM	B +.000/ -.002	C	E	G1	J	F	V	RM	W
1.50	0.63	1.124	0.38	2.50	2.13	1.50	0.38	0.25	-	0.63
	1.00	1.499	0.50	2.50	2.13	1.50	0.38	0.50	-	1.00
2.00	1.00	1.499	0.50	3.00	2.38	1.50	0.63	0.25	-	0.75
	1.38	1.999	0.63	3.00	2.38	1.50	0.63	0.38	-	1.00
2.50	1.00	1.499	0.50	3.50	2.38	1.50	0.63	0.25	2.63	0.75
	1.38	1.999	0.63	3.50	2.38	1.50	0.63	0.38	-	1.00
	1.75	2.374	0.75	3.50	2.38	1.50	0.63	0.50	-	1.25
3.25	1.38	1.999	0.63	4.50	2.75	1.75	0.75	0.25	3.25	0.88
	1.75	2.374	0.75	4.50	2.75	1.75	0.75	0.38	-	1.13
	2.00	2.624	0.88	4.50	2.75	1.75	0.75	0.38	-	1.25
4.00	1.75	2.374	0.75	5.00	2.88	1.75	0.88	0.25	3.88	1.00
	2.00	2.624	0.88	5.00	2.88	1.75	0.88	0.25	4.00	1.13
	2.50	3.124	1.00	5.00	2.88	1.75	0.88	0.38	4.44	1.38
5.00	2.00	2.624	0.88	6.50	2.88	1.75	0.88	0.25	4.00	1.13
	2.50	3.124	1.00	6.50	2.88	1.75	0.88	0.38	4.44	1.38
	3.00	3.749	1.00	6.50	2.88	1.75	0.88	0.38	5.25	1.38
	3.50	4.249	1.00	6.50	2.88	1.75	0.88	0.38	5.63	1.38
6.00	2.50	3.124	1.00	7.50	3.25	2.25	1.00	0.25	4.44	1.25
	3.00	3.749	1.00	7.50	3.25	2.25	1.00	0.25	5.25	1.25
	3.50	4.249	1.00	7.50	3.25	2.25	1.00	0.25	5.63	1.25
	4.00	4.749	1.00	7.50	3.25	2.25	1.00	0.25	6.44	1.25
7.00	3.00	3.749	1.00	8.50	3.75	2.75	1.00	0.25	5.25	1.25
	3.50	4.249	1.00	8.50	3.75	2.75	1.00	0.25	5.63	1.25
	4.00	4.749	1.00	8.50	3.75	2.75	1.00	0.25	6.44	1.25
	4.50	5.249	1.00	8.50	3.75	2.75	1.00	0.25	7.13	1.25
	5.00	5.749	1.00	8.50	3.75	2.75	1.00	0.25	7.56	1.25
8.00	3.50	4.249	1.00	9.50	4.00	3.00	1.00	0.25	5.63	1.25
	4.00	4.749	1.00	9.50	4.00	3.00	1.00	0.25	6.44	1.25
	4.50	5.249	1.00	9.50	4.00	3.00	1.00	0.25	7.13	1.25
	5.00	5.749	1.00	9.50	4.00	3.00	1.00	0.25	7.56	1.25
	5.50	6.249	1.00	9.50	4.00	3.00	1.00	0.25	8.38	1.25

+ Plus Stroke

Mounting Style and Installation Dimensions

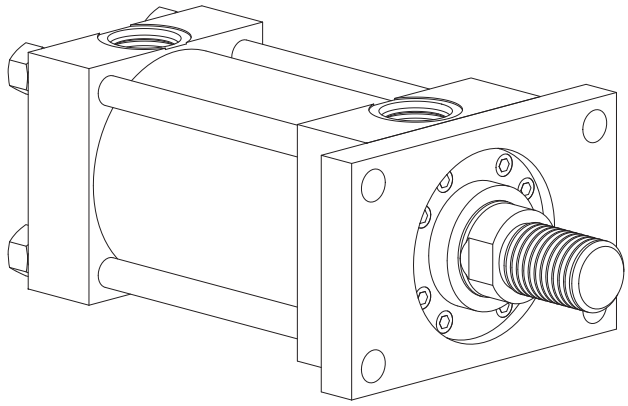
NZ07 Head Rectangular Flange Mount

ANSI MF1

These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat, and the rod end cartridge should be piloted into it.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.
The head rectangular mounts (NZ09) is recommended for heavy duty applications. NZ07 mounts are only rated for a maximum of 800 psi (55 bar) on the push stroke.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.



Bore	Rod Dia MM	FB	R	TF	UF	ZB+ Max	Piston Thick.	K
1.50	0.63	0.38	1.63	3.44	4.25	6.04	1.38	0.41
	1.00	0.38	1.63	3.44	4.25	6.41	1.38	0.41
2.00	1.00	0.50	2.05	4.13	5.13	6.56	1.38	0.55
	1.38	0.50	2.05	4.13	5.13	6.82	1.38	0.55
2.50	1.00	0.50	2.55	4.63	5.63	6.68	1.50	0.55
	1.38	0.50	2.55	4.63	5.63	6.94	1.50	0.55
	1.75	0.50	2.55	4.63	5.63	7.18	1.50	0.55
3.25	1.38	0.63	3.25	5.88	7.13	7.80	1.75	0.67
	1.75	0.63	3.25	5.88	7.13	8.05	1.75	0.67
	2.00	0.63	3.25	5.88	7.13	8.18	1.75	0.67
4.00	1.75	0.63	3.82	6.38	7.63	8.40	2.00	0.78
	2.00	0.63	3.82	6.38	7.63	8.53	2.00	0.78
	2.50	0.63	3.82	6.38	7.63	8.78	2.00	0.78
5.00	2.00	0.88	4.95	8.19	9.75	9.18	2.50	0.92
	2.50	0.88	4.95	8.19	9.75	9.43	2.50	0.92
	3.00	0.88	4.95	8.19	9.75	9.43	2.50	0.92
	3.50	0.88	4.95	8.19	9.75	9.43	2.50	0.92
6.00	2.50	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	3.00	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	3.50	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	4.00	1.00	5.73	9.44	11.25	10.66	2.88	1.03
7.00	3.00	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	3.50	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	4.00	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	4.50	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	5.00	1.13	6.58	10.63	12.63	11.92	3.00	1.17
8.00	3.50	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	4.00	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	4.50	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	5.00	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	5.50	1.25	7.50	11.81	14.00	13.00	3.50	1.26

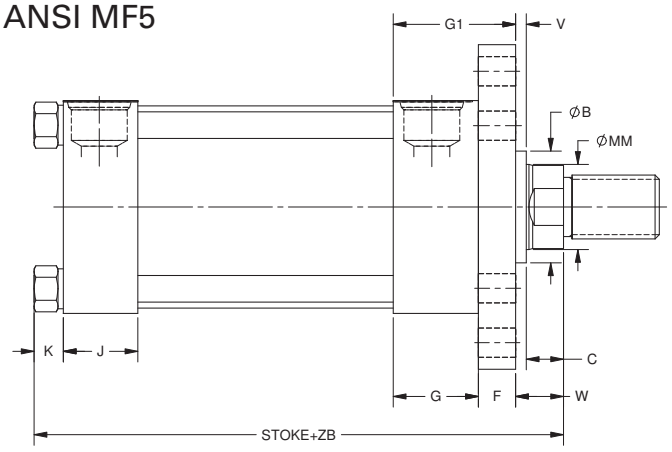
+ Plus Stroke

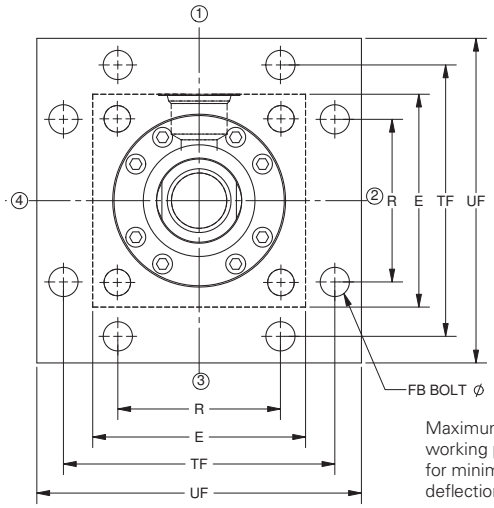
See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ08 Head Square Flange Mount

ANSI MF5





Maximum double acting working pressure 1500 psi for minimum flange deflection.

Bore	Rod Dia MM	B +.000/-.002	C	E	G1	J	F	V
1.50	0.63	1.124	0.38	2.50	2.13	1.50	0.38	0.25
	1.00	1.499	0.50	2.50	2.13	1.50	0.38	0.50
2.00	1.00	1.499	0.50	3.00	2.38	1.50	0.63	0.25
	1.38	1.999	0.63	3.00	2.38	1.50	0.63	0.38
2.50	1.00	1.499	0.50	3.50	2.38	1.50	0.63	0.25
	1.38	1.999	0.63	3.50	2.38	1.50	0.63	0.38
	1.75	2.374	0.75	3.50	2.38	1.50	0.63	0.50
3.25	1.38	1.999	0.63	4.50	2.75	1.75	0.75	0.25
	1.75	2.374	0.75	4.50	2.75	1.75	0.75	0.38
	2.00	2.624	0.88	4.50	2.75	1.75	0.75	0.38
4.00	1.75	2.374	0.75	5.00	2.88	1.75	0.88	0.25
	2.00	2.624	0.88	5.00	2.88	1.75	0.88	0.25
	2.50	3.124	1.00	5.00	2.88	1.75	0.88	0.38
5.00	2.00	2.624	0.88	6.50	2.88	1.75	0.88	0.25
	2.50	3.124	1.00	6.50	2.88	1.75	0.88	0.38
	3.00	3.749	1.00	6.50	2.88	1.75	0.88	0.38
	3.50	4.249	1.00	6.50	2.88	1.75	0.88	0.38
6.00	2.50	3.124	1.00	7.50	3.25	2.25	1.00	0.25
	3.00	3.749	1.00	7.50	3.25	2.25	1.00	0.25
	3.50	4.249	1.00	7.50	3.25	2.25	1.00	0.25
	4.00	4.749	1.00	7.50	3.25	2.25	1.00	0.25
7.00	3.00	3.749	1.00	8.50	3.75	2.75	1.00	0.25
	3.50	4.249	1.00	8.50	3.75	2.75	1.00	0.25
	4.00	4.749	1.00	8.50	3.75	2.75	1.00	0.25
	4.50	5.249	1.00	8.50	3.75	2.75	1.00	0.25
	5.00	5.749	1.00	8.50	3.75	2.75	1.00	0.25
8.00	3.50	4.249	1.00	9.50	4.00	3.00	1.00	0.25
	4.00	4.749	1.00	9.50	4.00	3.00	1.00	0.25
	4.50	5.249	1.00	9.50	4.00	3.00	1.00	0.25
	5.00	5.749	1.00	9.50	4.00	3.00	1.00	0.25
	5.50	6.249	1.00	9.50	4.00	3.00	1.00	0.25

+ Plus Stroke

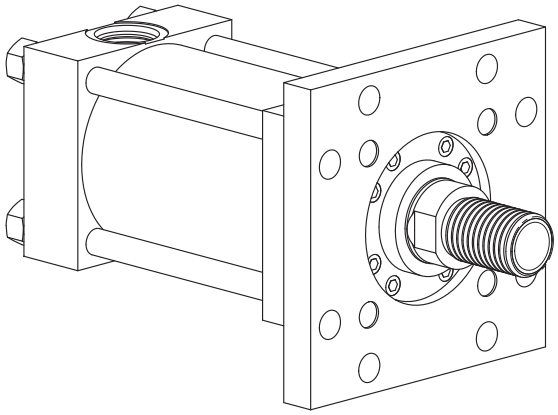
Mounting Style and Installation Dimensions

NZ08 Head Square Flange Mount

ANSI MF5

These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling).
The mounting surface should be flat, and the rod end cartridge should be piloted into it.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
The force of the load should be perpendicular to the ounting surface and parallel to the centerline of the piston rod.
For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.
The head rectangular mounts (NZ09) is recommended for heavy duty applications.
Seven and eight inch bore NZ08 mounts are only rated for a maximum of 1500 psi (105 bar) on the push stroke.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.



Bore	Rod Dia MM	W	FB	R	TF	UF	ZB+ Max	Piston Thick.	K
1.50	0.63	0.63	0.38	1.63	3.44	4.25	6.04	1.38	0.41
	1.00	1.00	0.38	1.63	3.44	4.25	6.41	1.38	0.41
2.00	1.00	0.75	0.50	2.05	4.13	5.13	6.56	1.38	0.55
	1.38	1.00	0.50	2.05	4.13	5.13	6.82	1.38	0.55
2.50	1.00	0.75	0.50	2.55	4.63	5.63	6.68	1.50	0.55
	1.38	1.00	0.50	2.55	4.63	5.63	6.94	1.50	0.55
	1.75	1.25	0.50	2.55	4.63	5.63	7.18	1.50	0.55
3.25	1.38	0.88	0.63	3.25	5.88	7.13	7.80	1.75	0.67
	1.75	1.13	0.63	3.25	5.88	7.13	8.05	1.75	0.67
	2.00	1.25	0.63	3.25	5.88	7.13	8.18	1.75	0.67
4.00	1.75	1.00	0.63	3.82	6.38	7.63	8.40	2.00	0.78
	2.00	1.13	0.63	3.82	6.38	7.63	8.53	2.00	0.78
	2.50	1.38	0.63	3.82	6.38	7.63	8.78	2.00	0.78
5.00	2.00	1.13	0.88	4.95	8.19	9.75	9.18	2.50	0.92
	2.50	1.38	0.88	4.95	8.19	9.75	9.43	2.50	0.92
	3.00	1.38	0.88	4.95	8.19	9.75	9.43	2.50	0.92
	3.50	1.38	0.88	4.95	8.19	9.75	9.43	2.50	0.92
6.00	2.50	1.25	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	3.00	1.25	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	3.50	1.25	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	4.00	1.25	1.00	5.73	9.44	11.25	10.66	2.88	1.03
7.00	3.00	1.25	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	3.50	1.25	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	4.00	1.25	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	4.50	1.25	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	5.00	1.25	1.13	6.58	10.63	12.63	11.92	3.00	1.17
8.00	3.50	1.25	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	4.00	1.25	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	4.50	1.25	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	5.00	1.25	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	5.50	1.25	1.25	7.50	11.81	14.00	13.00	3.50	1.26

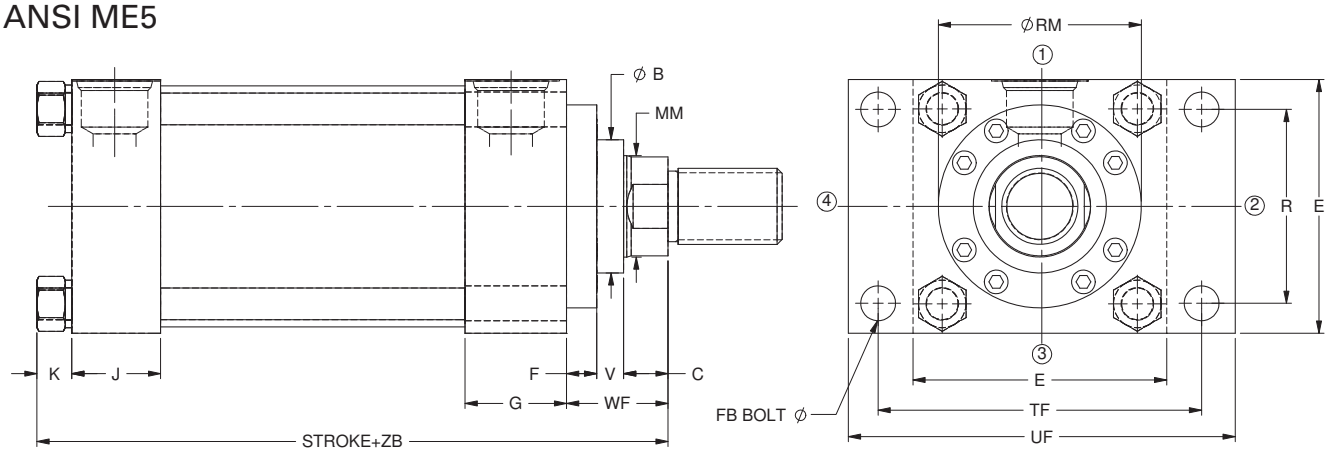
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ09 Head Rectangular Mount

ANSI ME5



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F Max	V	WF
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.34	0.28	1.00
	1.00	1.499	0.50	2.50	1.75	1.50	0.50	0.38	1.38
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.50	0.38	1.38
	1.38	1.999	0.63	3.00	1.75	1.50	0.59	0.41	1.63
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	1.38
	1.38	1.999	0.63	3.50	1.75	1.50	0.59	0.41	1.63
	1.75	2.374	0.75	3.50	1.75	1.50	0.59	0.54	1.88
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	1.63
	1.75	2.374	0.75	4.50	2.00	1.75	0.59	0.54	1.88
	2.00	2.624	0.88	4.50	2.00	1.75	0.59	0.53	2.00
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.54	1.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	2.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	2.25
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	2.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	2.25
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	2.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	2.25
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	2.25
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	2.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	2.25
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	2.25
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	2.25
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	2.25
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	2.25
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	2.25
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	2.25
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	2.25
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	2.25
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	2.25
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	2.25
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	2.25

+ Plus Stroke

Mounting Style and Installation Dimensions

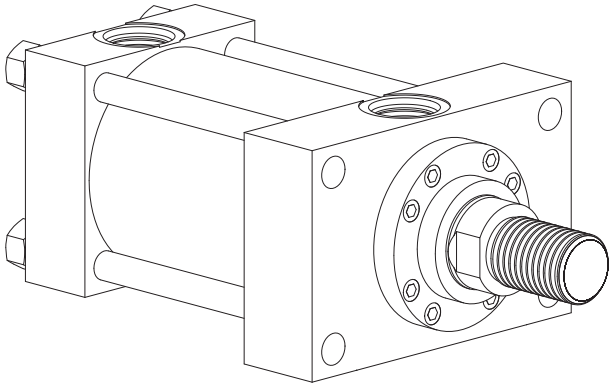
NZ09 Head Rectangular Mount

ANSI ME5

These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat, and the rod end cartridge should be piloted into it.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
The force of the load should be perpendicular to the ounting surface and parallel to the centerline of the piston rod.
For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.
The head rectangular mounts (NZ09) is recommended for heavy duty applications.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.



Bore	Rod Dia MM	RM	FB	R	TF	UF	ZB+ Max	Piston Thick.	K
1.50	0.63	2.38	0.38	1.63	3.44	4.25	6.04	1.38	0.41
	1.00	2.63	0.38	1.63	3.44	4.25	6.41	1.38	0.41
2.00	1.00	2.63	0.50	2.05	4.13	5.13	6.56	1.38	0.55
	1.38	3.25	0.50	2.05	4.13	5.13	6.82	1.38	0.55
2.50	1.00	2.63	0.50	2.55	4.63	5.63	6.68	1.50	0.55
	1.38	3.25	0.50	2.55	4.63	5.63	6.94	1.50	0.55
	1.75	3.88	0.50	2.55	4.63	5.63	7.18	1.50	0.55
3.25	1.38	3.25	0.63	3.25	5.88	7.13	7.80	1.75	0.67
	1.75	3.88	0.63	3.25	5.88	7.13	8.05	1.75	0.67
	2.00	4.00	0.63	3.25	5.88	7.13	8.18	1.75	0.67
4.00	1.75	3.88	0.63	3.82	6.38	7.63	8.40	2.00	0.78
	2.00	4.00	0.63	3.82	6.38	7.63	8.53	2.00	0.78
	2.50	4.44	0.63	3.82	6.38	7.63	8.78	2.00	0.78
5.00	2.00	4.00	0.88	4.95	8.19	9.75	9.18	2.50	0.92
	2.50	4.44	0.88	4.95	8.19	9.75	9.43	2.50	0.92
	3.00	5.25	0.88	4.95	8.19	9.75	9.43	2.50	0.92
	3.50	5.63	0.88	4.95	8.19	9.75	9.43	2.50	0.92
6.00	2.50	4.44	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	3.00	5.25	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	3.50	5.63	1.00	5.73	9.44	11.25	10.66	2.88	1.03
	4.00	6.44	1.00	5.73	9.44	11.25	10.66	2.88	1.03
7.00	3.00	5.25	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	3.50	5.63	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	4.00	6.44	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	4.50	7.13	1.13	6.58	10.63	12.63	11.92	3.00	1.17
	5.00	7.56	1.13	6.58	10.63	12.63	11.92	3.00	1.17
8.00	3.50	5.63	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	4.00	6.44	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	4.50	7.13	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	5.00	7.56	1.25	7.50	11.81	14.00	13.00	3.50	1.26
	5.50	8.38	1.25	7.50	11.81	14.00	13.00	3.50	1.26

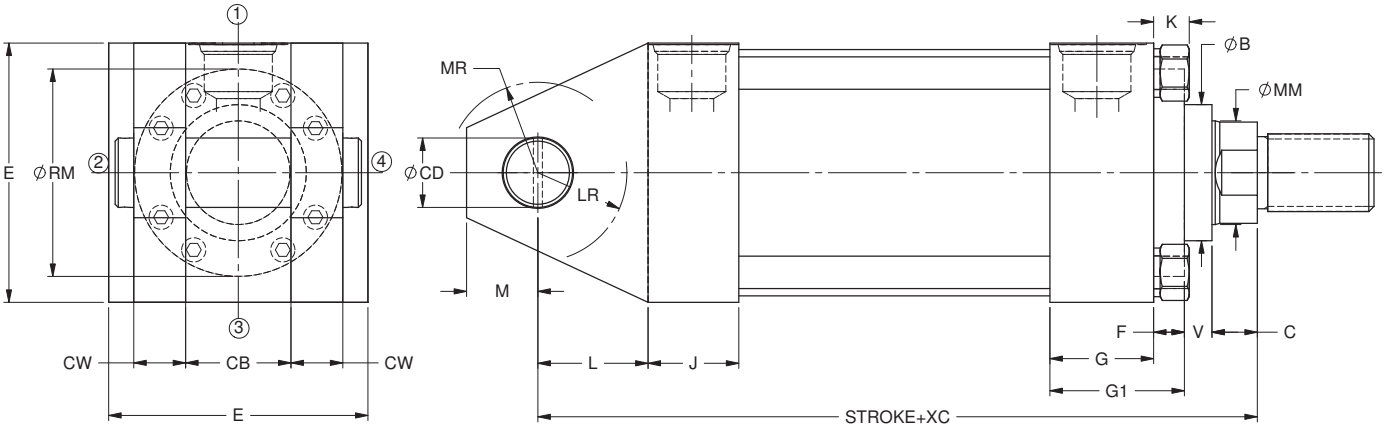
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ10 Cap Fixed Clevis Mount

ANSI MP1



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM	L
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	0.75
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-	0.75
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	1.25
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-	1.25
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	1.25
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	1.25
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-	1.25
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	1.50
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	1.50
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-	1.50
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	2.13
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	2.13
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	2.13
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	2.25
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	2.25
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	2.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	2.25
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	2.50
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	2.50
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	2.50
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	2.50
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	3.00
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	3.00
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	3.00
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	3.00
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	3.00
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	3.25
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	3.25
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	3.25
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	3.25
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	3.25

+ Plus Stroke

Mounting Style and Installation Dimensions

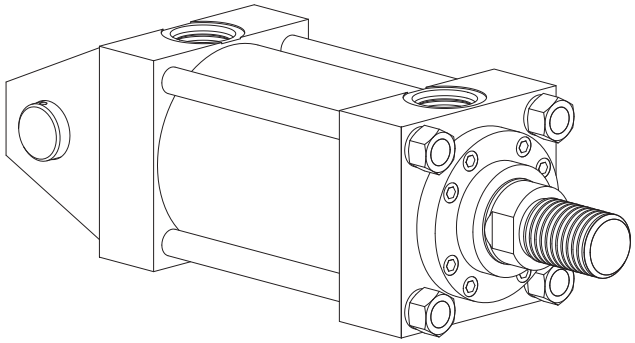
NZ10 Cap Fixed Clevis Mount

ANSI MP1

These mounts are for applications in which the machine member travels in a curved path within one plane.
These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See page 75 for stroke limitations.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excess side loading on the bearing and piston. This will lead to premature failure.

For applications with small amounts of misalignment, consider the spherical bearing mount, as shown in theNZ11



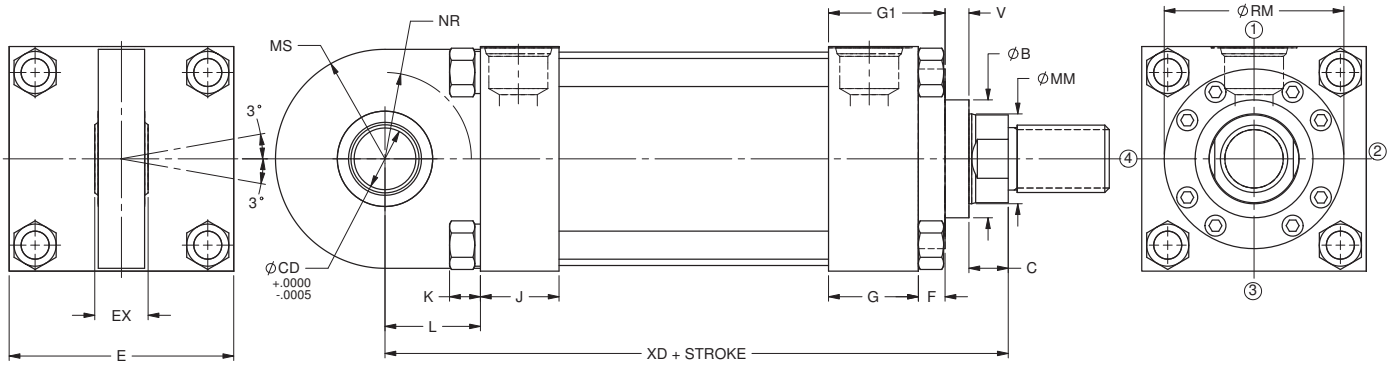
Bore	Rod Dia MM	M	CB	CD	CW	LR	MR	XC+	Piston Thick.	K
1.50	0.63	0.50	0.75	0.50	0.50	0.56	0.56	6.38	1.38	0.41
	1.00	0.50	0.75	0.50	0.50	0.56	0.56	6.75	1.38	0.41
2.00	1.00	0.75	1.25	0.75	0.63	1.06	1.06	7.25	1.38	0.55
	1.38	0.75	1.25	0.75	0.63	1.06	1.06	7.50	1.38	0.55
2.50	1.00	0.75	1.25	0.75	0.63	1.06	1.06	7.38	1.50	0.55
	1.38	0.75	1.25	0.75	0.63	1.06	1.06	7.63	1.50	0.55
	1.75	0.75	1.25	0.75	0.63	1.06	1.06	7.88	1.50	0.55
3.25	1.38	1.00	1.50	1.00	0.75	1.25	1.13	8.63	1.75	0.67
	1.75	1.00	1.50	1.00	0.75	1.25	1.13	8.88	1.75	0.67
	2.00	1.00	1.50	1.00	0.75	1.25	1.13	9.00	1.75	0.67
4.00	1.75	1.38	2.00	1.38	1.00	1.88	1.75	9.75	2.00	0.78
	2.00	1.38	2.00	1.38	1.00	1.88	1.75	9.88	2.00	0.78
	2.50	1.38	2.00	1.38	1.00	1.88	1.75	10.13	2.00	0.78
5.00	2.00	1.75	2.50	1.75	1.25	1.94	1.88	10.50	2.50	0.92
	2.50	1.75	2.50	1.75	1.25	1.94	1.88	10.75	2.50	0.92
	3.00	1.75	2.50	1.75	1.25	1.94	1.88	10.75	2.50	0.92
	3.50	1.75	2.50	1.75	1.25	1.94	1.88	10.75	2.50	0.92
6.00	2.50	2.00	2.50	2.00	1.25	2.06	2.13	12.13	2.88	1.03
	3.00	2.00	2.50	2.00	1.25	2.06	2.13	12.13	2.88	1.03
	3.50	2.00	2.50	2.00	1.25	2.06	2.13	12.13	2.88	1.03
	4.00	2.00	2.50	2.00	1.25	2.06	2.13	12.13	2.88	1.03
7.00	3.00	2.50	3.00	2.50	1.50	2.56	2.50	13.75	3.00	1.17
	3.50	2.50	3.00	2.50	1.50	2.56	2.50	13.75	3.00	1.17
	4.00	2.50	3.00	2.50	1.50	2.56	2.50	13.75	3.00	1.17
	4.50	2.50	3.00	2.50	1.50	2.56	2.50	13.75	3.00	1.17
	5.00	2.50	3.00	2.50	1.50	2.56	2.50	13.75	3.00	1.17
8.00	3.50	2.75	3.00	3.00	1.50	2.69	2.75	15.00	3.50	1.26
	4.00	2.75	3.00	3.00	1.50	2.69	2.75	15.00	3.50	1.26
	4.50	2.75	3.00	3.00	1.50	2.69	2.75	15.00	3.50	1.26
	5.00	2.75	3.00	3.00	1.50	2.69	2.75	15.00	3.50	1.26
	5.50	2.75	3.00	3.00	1.50	2.69	2.75	15.00	3.50	1.26

+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ11 Cap Spherical Bearing Mount



Max. operating pressure

Bore	PSI
1.50	1650
2.00	2000
2.50	1400
3.25	1500
4.00	1750
5.00	1900
6.00	1700

Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38

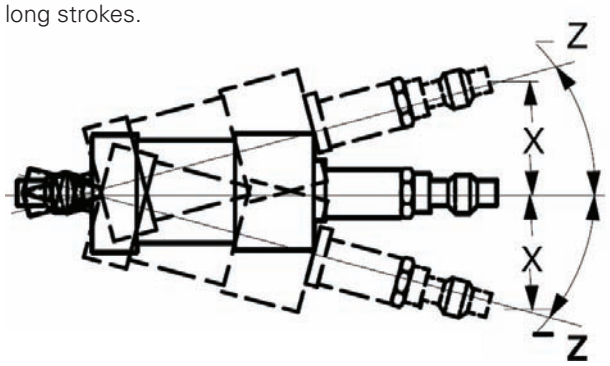
+ Plus Stroke

Mounting Style and Installation Dimensions

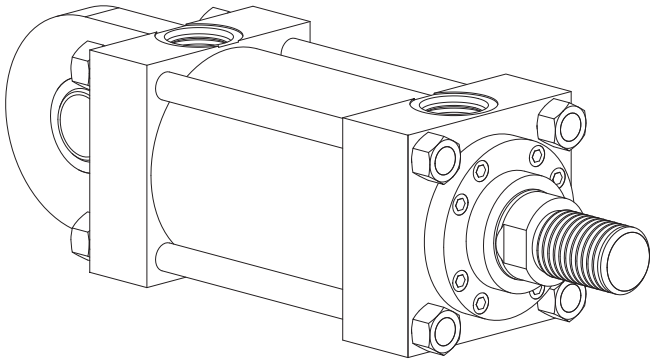
NZ11 Cap Spherical Bearing Mount

This mount is for applications in which the machine member travels in a curved path in one plane where some misalignment is unavoidable. The amount of allowable misalignment can be calculated. This mount can be used both in compression (push) and tension (pull) applications. Care must be exercised to prevent rod buckling in compression applications with long strokes.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72. Maximum radial static and dynamic bearing loads must not exceed the recommended ratings shown in the following table. Angle Z is the recommended maximum angle of misalignment.



To find the maximum recommended X distance, multiply the distance between pivot mounting holes (see NZ11 dimensional drawing) by the tangent of angle Z.



Bore	Rod Dia	Mtg. Hole Dia	Angle "Z"	Tangent of "Z"	Static Load Ratings	
					Radial	Thrust
1.50	0.63	0.50	1.5	.026	8,100	3,200
2.00	1.00	2.00	2	.035	18,800	7,500
2.50	1.00	2.00	2	.035	18,800	7,500
3.25	1.38	2.00	2	.035	33,300	13,300
4.00	1.75	2.00	2	.035	59,800	24,000
5.00	2.00	2.50	2.5	.044	102,000	40,700
6.00	2.50	2.50	2.5	.044	132,000	53,000

Bore	Rod Dia MM	RM	L	CD +.0000 -.0005	EX	NR	MS	XD+	Piston Thick.	K
1.50	0.63	-	0.75	0.5000	0.44	0.63	0.94	6.38	1.38	0.41
	1.00	-	0.75	0.5000	0.44	0.63	0.94	6.75	1.38	0.41
2.00	1.00	-	1.25	0.7500	0.66	1.00	1.38	7.25	1.38	0.55
	1.38	-	1.25	0.7500	0.66	1.00	1.38	7.50	1.38	0.55
2.50	1.00	2.63	1.25	0.7500	0.66	1.00	1.38	7.38	1.50	0.55
	1.38	-	1.25	0.7500	0.66	1.00	1.38	7.63	1.50	0.55
	1.75	-	1.25	0.7500	0.66	1.00	1.38	7.88	1.50	0.55
3.25	1.38	3.25	1.50	1.0000	0.88	1.25	1.69	8.63	1.75	0.67
	1.75	-	1.50	1.0000	0.88	1.25	1.69	8.88	1.75	0.67
	2.00	-	1.50	1.0000	0.88	1.25	1.69	9.00	1.75	0.67
4.00	1.75	3.88	2.13	1.3750	1.19	1.63	2.44	9.75	2.00	0.78
	2.00	4.00	2.13	1.3750	1.19	1.63	2.44	9.88	2.00	0.78
	2.50	4.44	2.13	1.3750	1.19	1.63	2.44	10.13	2.00	0.78
5.00	2.00	4.00	2.25	1.7500	1.53	2.06	2.88	10.50	2.50	0.92
	2.50	4.44	2.25	1.7500	1.53	2.06	2.88	10.75	2.50	0.92
	3.00	5.25	2.25	1.7500	1.53	2.06	2.88	10.75	2.50	0.92
	3.50	5.63	2.25	1.7500	1.53	2.06	2.88	10.75	2.50	0.92
6.00	2.50	4.44	2.50	2.0000	1.75	2.38	3.31	12.13	2.88	1.03
	3.00	5.25	2.50	2.0000	1.75	2.38	3.31	12.13	2.88	1.03
	3.50	5.63	2.50	2.0000	1.75	2.38	3.31	12.13	2.88	1.03
	4.00	6.44	2.50	2.0000	1.75	2.38	3.31	12.13	2.88	1.03

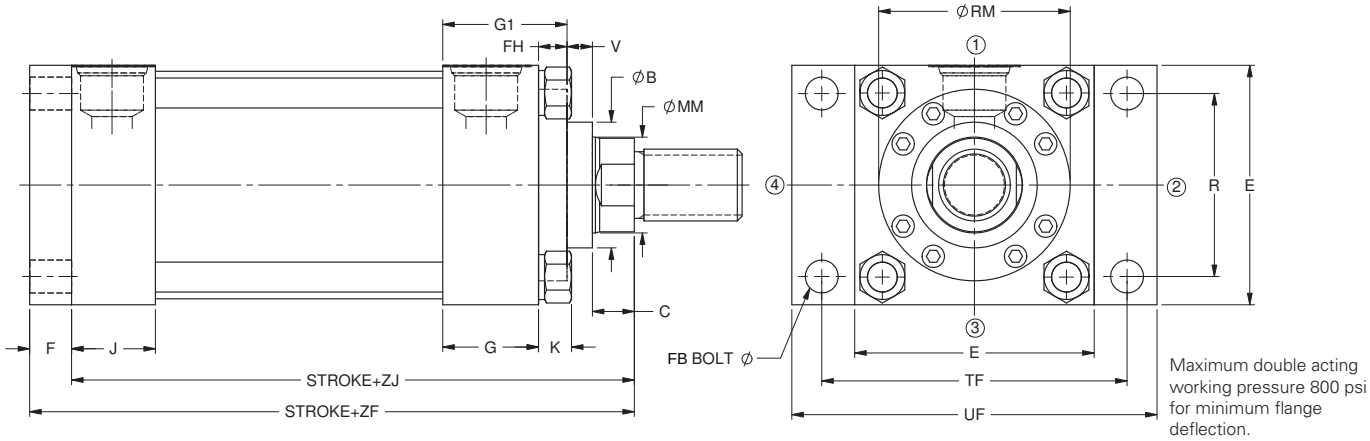
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ12 Cap Rectangular Flange Mount

ANSI MF2



Maximum double acting working pressure 800 psi for minimum flange deflection.

Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	FH	RM	V	F
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	-	0.25	0.38
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	-	0.50	0.38
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	-	0.25	0.63
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	-	0.38	0.63
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	2.63	0.38	0.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	-	0.38	0.63
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	-	0.50	0.63
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	3.25	0.41	0.75
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	-	0.38	0.75
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	-	0.38	0.75
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	3.88	0.53	0.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	4.00	0.53	0.88
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	4.44	0.66	0.88
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	4.00	0.53	0.88
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	4.44	0.66	0.88
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	5.25	0.53	0.88
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	5.63	0.53	0.88
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	4.44	0.66	1.00
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	5.25	0.53	1.00
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	5.63	0.53	1.00
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	6.44	0.38	1.00
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	5.25	0.53	1.00
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	5.63	0.53	1.00
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	6.44	0.38	1.00
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	7.13	0.38	1.00
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	7.56	0.38	1.00
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	5.63	0.53	1.00
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	6.44	0.38	1.00
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	7.13	0.38	1.00
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	7.56	0.38	1.00
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	8.38	0.38	1.00

+ Plus Stroke

Mounting Style and Installation Dimensions

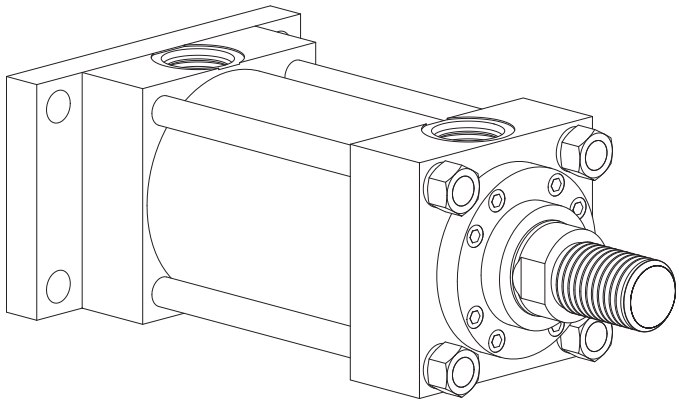
NZ12 Cap Rectangular Flange Mount

ANSI MF2

These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing), as in push presses.
For tension applications (pulling), a head rectangular mount is more appropriate.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.
The cap rectangular mounts (NZ14) is recommended for heavy duty applications. NZ12 mounts are only rated for a maximum of 800 psi (55 bar) on the pull stroke.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.



Bore	Rod Dia MM	FB	R	TF	UF	ZF+ Max	ZJ+ Max	Piston Thick.	K
1.50	0.63	0.38	1.63	3.44	4.25	6.00	5.63	1.38	0.41
	1.00	0.38	1.63	3.44	4.25	6.38	6.00	1.38	0.41
2.00	1.00	0.50	2.05	4.13	5.13	6.63	6.00	1.38	0.55
	1.38	0.50	2.05	4.13	5.13	6.88	6.26	1.38	0.55
2.50	1.00	0.50	2.55	4.63	5.63	6.75	6.13	1.50	0.55
	1.38	0.50	2.55	4.63	5.63	7.00	6.38	1.50	0.55
	1.75	0.50	2.55	4.63	5.63	7.25	6.63	1.50	0.55
3.25	1.38	0.63	3.25	5.88	7.13	7.88	7.13	1.75	0.67
	1.75	0.63	3.25	5.88	7.13	8.13	7.38	1.75	0.67
	2.00	0.63	3.25	5.88	7.13	8.25	7.50	1.75	0.67
4.00	1.75	0.63	3.82	6.38	7.63	8.50	7.63	2.00	0.78
	2.00	0.63	3.82	6.38	7.63	8.63	7.75	2.00	0.78
	2.50	0.63	3.82	6.38	7.63	8.88	8.00	2.00	0.78
5.00	2.00	0.88	4.95	8.19	9.75	9.13	8.25	2.50	0.92
	2.50	0.88	4.95	8.19	9.75	9.38	8.50	2.50	0.92
	3.00	0.88	4.95	8.19	9.75	9.38	8.50	2.50	0.92
	3.50	0.88	4.95	8.19	9.75	9.38	8.50	2.50	0.92
6.00	2.50	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
	3.00	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
	3.50	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
	4.00	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
7.00	3.00	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	3.50	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	4.00	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	4.50	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	5.00	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
8.00	3.50	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	4.00	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	4.50	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	5.00	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	5.50	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26

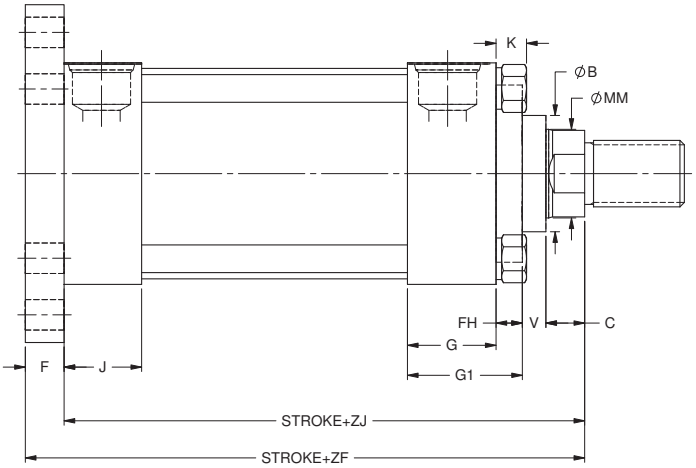
+ Plus Stroke

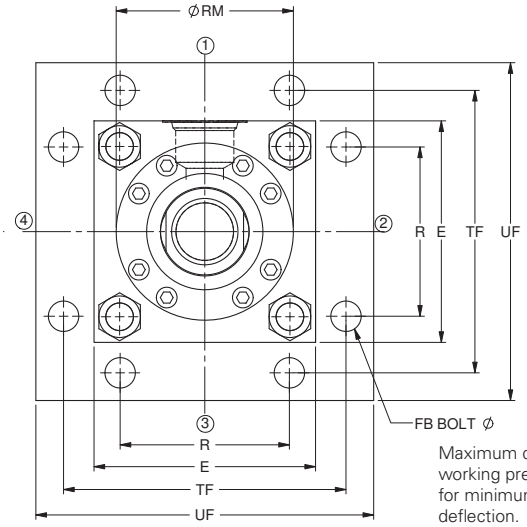
See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ13 Cap Square Flange Mount

ANSI MF6





Maximum double acting working pressure 1500 psi for minimum flange deflection.

Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	FH	RM	V	F
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	-	0.25	0.38
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	-	0.50	0.38
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	-	0.25	0.63
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	-	0.38	0.63
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	2.63	0.38	0.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	-	0.38	0.63
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	-	0.50	0.63
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	3.25	0.41	0.75
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	-	0.38	0.75
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	-	0.38	0.75
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	3.88	0.53	0.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	4.00	0.53	0.88
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	4.44	0.66	0.88
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	4.00	0.53	0.88
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	4.44	0.66	0.88
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	5.25	0.53	0.88
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	5.63	0.53	0.88
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	4.44	0.66	1.00
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	5.25	0.53	1.00
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	5.63	0.53	1.00
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	6.44	0.38	1.00
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	5.25	0.53	1.00
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	5.63	0.53	1.00
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	6.44	0.38	1.00
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	7.13	0.38	1.00
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	7.56	0.38	1.00
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	5.63	0.53	1.00
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	6.44	0.38	1.00
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	7.13	0.38	1.00
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	7.56	0.38	1.00
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	8.38	0.38	1.00

+ Plus Stroke

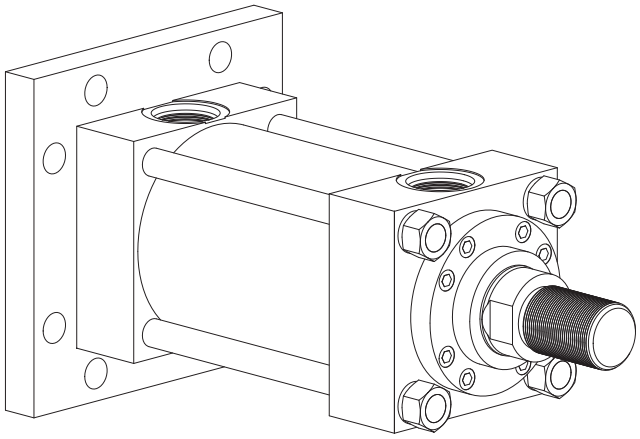
Mounting Style and Installation Dimensions

NZ13 Cap Square Flange Mount

ANSI MF6

These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing), as in push presses.
For tension applications (pulling), a head rectangular mount is more appropriate.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.The cap rectangular mounts (NZ14) is recommended for heavy duty applications. Seven and eight inch bore NZ13 mounts are only rated for a maximum of 1500 psi (105 bar) pull stroke.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.



Bore	Rod Dia MM	FB	R	TF	UF	ZF+ Max	ZJ+ Max	Piston Thick.	K
1.50	0.63	0.38	1.63	3.44	4.25	6.00	5.63	1.38	0.41
	1.00	0.38	1.63	3.44	4.25	6.38	6.00	1.38	0.41
2.00	1.00	0.50	2.05	4.13	5.13	6.63	6.00	1.38	0.55
	1.38	0.50	2.05	4.13	5.13	6.88	6.26	1.38	0.55
2.50	1.00	0.50	2.55	4.63	5.63	6.75	6.13	1.50	0.55
	1.38	0.50	2.55	4.63	5.63	7.00	6.38	1.50	0.55
	1.75	0.50	2.55	4.63	5.63	7.25	6.63	1.50	0.55
3.25	1.38	0.63	3.25	5.88	7.13	7.88	7.13	1.75	0.67
	1.75	0.63	3.25	5.88	7.13	8.13	7.38	1.75	0.67
	2.00	0.63	3.25	5.88	7.13	8.25	7.50	1.75	0.67
4.00	1.75	0.63	3.82	6.38	7.63	8.50	7.63	2.00	0.78
	2.00	0.63	3.82	6.38	7.63	8.63	7.75	2.00	0.78
	2.50	0.63	3.82	6.38	7.63	8.88	8.00	2.00	0.78
5.00	2.00	0.88	4.95	8.19	9.75	9.13	8.25	2.50	0.92
	2.50	0.88	4.95	8.19	9.75	9.38	8.50	2.50	0.92
	3.00	0.88	4.95	8.19	9.75	9.38	8.50	2.50	0.92
	3.50	0.88	4.95	8.19	9.75	9.38	8.50	2.50	0.92
6.00	2.50	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
	3.00	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
	3.50	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
	4.00	1.00	5.73	9.44	11.25	10.63	9.63	2.88	1.03
7.00	3.00	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	3.50	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	4.00	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	4.50	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
	5.00	1.13	6.58	10.63	12.63	11.75	10.75	3.00	1.17
8.00	3.50	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	4.00	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	4.50	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	5.00	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26
	5.50	1.25	7.50	11.81	14.00	12.75	11.75	3.50	1.26

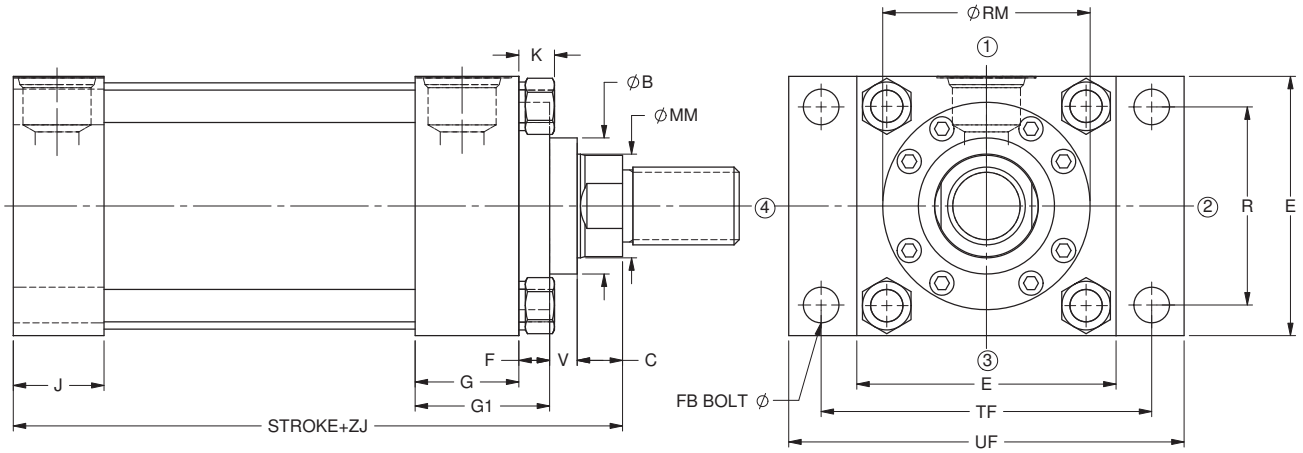
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ14 Cap Rectangle Mount

ANSI ME6



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38

+ Plus Stroke

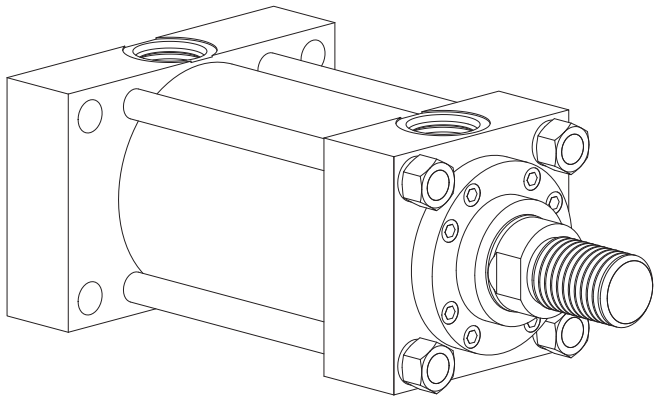
Mounting Style and Installation Dimensions

NZ14 Cap Rectangle Mount

ANSI ME6

These mounts are for straight line force transfer applications in which the cylinder is used in compression (pushing) and tension (pulling) applications.
The mounting surface should be flat and perpendicular to the force of the load.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.
The cap rectangular mount (NZ14) is recommended for heavy duty applications.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque value.



Bore	Rod Dia MM	FB	R	TF	UF	ZJ+ Max	Piston Thick.	K
1.50	0.63	0.38	1.63	3.44	4.25	5.63	1.38	0.41
	1.00	0.38	1.63	3.44	4.25	6.00	1.38	0.41
2.00	1.00	0.50	2.05	4.13	5.13	6.00	1.38	0.55
	1.38	0.50	2.05	4.13	5.13	6.25	1.38	0.55
2.50	1.00	0.50	2.55	4.63	5.63	6.13	1.50	0.55
	1.38	0.50	2.55	4.63	5.63	6.38	1.50	0.55
	1.75	0.50	2.55	4.63	5.63	6.63	1.50	0.55
3.25	1.38	0.63	3.25	5.88	7.13	7.13	1.75	0.67
	1.75	0.63	3.25	5.88	7.13	7.38	1.75	0.67
	2.00	0.63	3.25	5.88	7.13	7.50	1.75	0.67
4.00	1.75	0.63	3.82	6.38	7.63	7.63	2.00	0.78
	2.00	0.63	3.82	6.38	7.63	7.75	2.00	0.78
	2.50	0.63	3.82	6.38	7.63	8.00	2.00	0.78
5.00	2.00	0.88	4.95	8.19	9.75	8.25	2.50	0.92
	2.50	0.88	4.95	8.19	9.75	8.50	2.50	0.92
	3.00	0.88	4.95	8.19	9.75	8.50	2.50	0.92
	3.50	0.88	4.95	8.19	9.75	8.50	2.50	0.92
6.00	2.50	1.00	5.73	9.44	11.25	9.63	2.88	1.03
	3.00	1.00	5.73	9.44	11.25	9.63	2.88	1.03
	3.50	1.00	5.73	9.44	11.25	9.63	2.88	1.03
	4.00	1.00	5.73	9.44	11.25	9.63	2.88	1.03
7.00	3.00	1.13	6.58	10.63	12.63	10.75	3.00	1.17
	3.50	1.13	6.58	10.63	12.63	10.75	3.00	1.17
	4.00	1.13	6.58	10.63	12.63	10.75	3.00	1.17
	4.50	1.13	6.58	10.63	12.63	10.75	3.00	1.17
	5.00	1.13	6.58	10.63	12.63	10.75	3.00	1.17
8.00	3.50	1.25	7.50	11.81	14.00	11.75	3.50	1.26
	4.00	1.25	7.50	11.81	14.00	11.75	3.50	1.26
	4.50	1.25	7.50	11.81	14.00	11.75	3.50	1.26
	5.00	1.25	7.50	11.81	14.00	11.75	3.50	1.26
	5.50	1.25	7.50	11.81	14.00	11.75	3.50	1.26

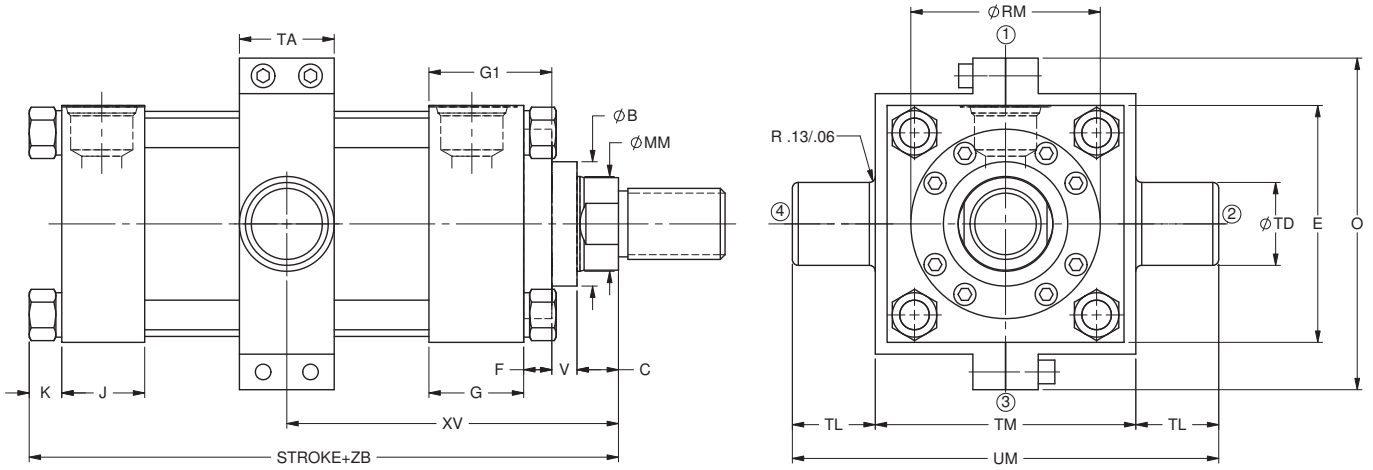
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ15 Intermediate Trunnion Mounts

NFPA MT4 Mount



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM	TD +.000/-.001	TL
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	1.000	1.00
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-	1.000	1.00
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	1.375	1.38
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-	1.375	1.38
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	1.375	1.38
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	1.375	1.38
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-	1.375	1.38
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	1.750	1.75
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	1.750	1.75
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-	1.750	1.75
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	1.750	1.75
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	1.750	1.75
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	1.750	1.75
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	1.750	1.75
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	1.750	1.75
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	1.750	1.75
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	1.750	1.75
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	2.000	2.00
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	2.000	2.00
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	2.000	2.00
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	2.000	2.00
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	2.500	2.50
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	2.500	2.50
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	2.500	2.50
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	2.500	2.50
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	2.500	2.50
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	3.000	3.00
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	3.000	3.00
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	3.000	3.00
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	3.000	3.00
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	3.000	3.00

+ Plus Stroke

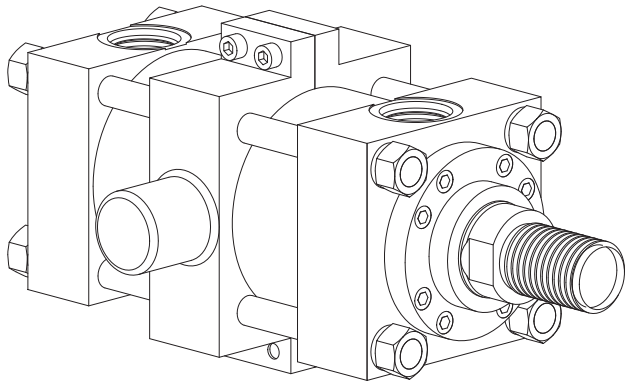
Mounting Style and Installation Dimensions

NZ15 Intermediate Trunnion Mounts

NFPA MT4 Mount

The Intermediate Trunnion Mount is for longer stroke applications in which the machine member travels in a curved path in one plane.
On special orders, the trunnion can be located anywhere along the body.
This mount can be used both in compression (push) and tension (pull) applications.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used.
The pillow blocks should be installed as close to the shoulder of the trunnion as possible.



Bore	Rod Dia MM	UM	TM	TA	Max. O	XV Std *	ZB+ Max	Piston Thick.	K	Minimum stroke Required
1.50	0.63	5.00	3.00	1.50	-	3.44	6.04	1.38	0.41	0.25
	1.00	5.00	3.00	1.50	-	3.81	6.41	1.38	0.41	0.25
2.00	1.00	6.25	3.50	1.50	-	3.81	6.56	1.38	0.55	0.25
	1.38	6.25	3.50	1.50	-	4.19	6.82	1.38	0.55	0.25
2.50	1.00	6.75	4.00	1.50	-	3.88	6.68	1.50	0.55	0.13
	1.38	6.75	4.00	1.50	-	4.14	6.94	1.50	0.55	0.13
	1.75	6.75	4.00	1.50	-	4.38	7.18	1.50	0.55	0.13
3.25	1.38	8.50	5.00	2.00	-	4.50	7.80	1.75	0.67	0.38
	1.75	8.50	5.00	2.00	-	4.76	8.05	1.75	0.67	0.38
	2.00	8.50	5.00	2.00	-	4.89	8.18	1.75	0.67	0.38
4.00	1.75	9.00	5.50	2.00	-	4.88	8.40	2.00	0.78	0.13
	2.00	9.00	5.50	2.00	-	5.00	8.53	2.00	0.78	0.13
	2.50	9.00	5.50	2.00	-	5.25	8.78	2.00	0.78	0.13
5.00	2.00	10.50	7.00	2.50	-	5.25	9.18	2.50	0.92	0.13
	2.50	10.50	7.00	2.50	-	5.50	9.43	2.50	0.92	0.13
	3.00	10.50	7.00	2.50	-	5.50	9.43	2.50	0.92	0.13
	3.50	10.50	7.00	2.50	-	5.50	9.43	2.50	0.92	0.13
6.00	2.50	12.50	8.50	3.00	9.50	5.94	10.66	2.88	1.03	0.25
	3.00	12.50	8.50	3.00	9.50	5.94	10.66	2.88	1.03	0.25
	3.50	12.50	8.50	3.00	9.50	5.94	10.66	2.88	1.03	0.25
	4.00	12.50	8.50	3.00	9.50	5.94	10.66	2.88	1.03	0.25
7.00	3.00	14.75	9.75	3.00	11.50	6.50	11.92	3.00	1.17	0.13
	3.50	14.75	9.75	3.00	11.50	6.50	11.92	3.00	1.17	0.13
	4.00	14.75	9.75	3.00	11.50	6.50	11.92	3.00	1.17	0.13
	4.50	14.75	9.75	3.00	11.50	6.50	11.92	3.00	1.17	0.13
	5.00	14.75	9.75	3.00	11.50	6.50	11.92	3.00	1.17	0.13
8.00	3.50	17.00	11.00	3.50	13.25	7.13	13.00	3.50	1.26	-
	4.00	17.00	11.00	3.50	13.25	7.13	13.00	3.50	1.26	-
	4.50	17.00	11.00	3.50	13.25	7.13	13.00	3.50	1.26	-
	5.00	17.00	11.00	3.50	13.25	7.13	13.00	3.50	1.26	-
	5.50	17.00	11.00	3.50	13.25	7.13	13.00	3.50	1.26	-

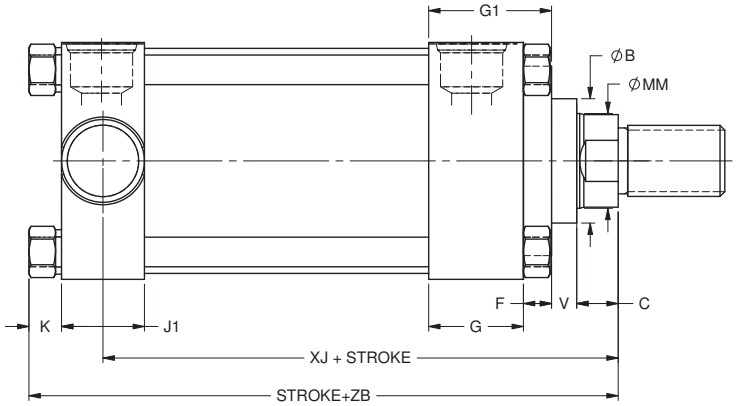
+ Plus Stroke
*XV = XV std + 1/2 Stroke

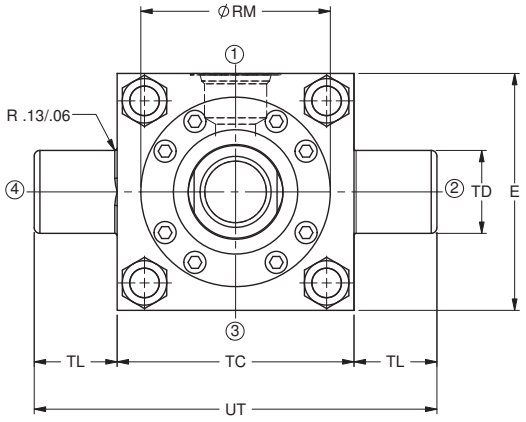
See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ16 Trunnion Mounts

NFPA MT2 Mount





Bore	Rod Dia MM	B +.000/-.002	C	E	G	J1	F	V	RM
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38

+ Plus Stroke

Mounting Style and Installation Dimensions

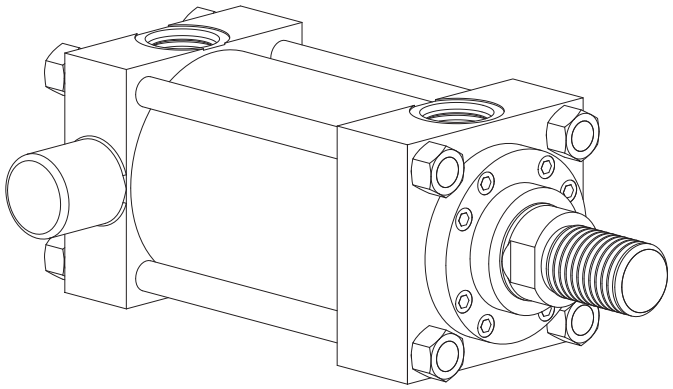
NZ16 Trunnion Mounts

NFPA MT2 Mount

These mounts are for applications in which the machine member travels in a curved path in one plane.
Either mount can be used both in compression (push) and tension (pull) applications.
When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used.

The pillow blocks should be installed as close to the shoulder of the trunnion as possible.



Bore	Rod Dia MM	TD +.000/-.001	TL	TC	UT	XJ+	ZB+ Max	Piston Thick.	K
1.50	0.63	1.000	1.00	2.50	4.50	4.88	6.04	1.38	0.41
	1.00	1.000	1.00	2.50	4.50	5.25	6.41	1.38	0.41
2.00	1.00	1.375	1.38	3.00	5.75	5.25	6.56	1.38	0.55
	1.38	1.375	1.38	3.00	5.75	5.50	6.82	1.38	0.55
2.50	1.00	1.375	1.38	3.50	6.25	5.38	6.68	1.50	0.55
	1.38	1.375	1.38	3.50	6.25	5.63	6.94	1.50	0.55
	1.75	1.375	1.38	3.50	6.25	5.88	7.18	1.50	0.55
3.25	1.38	1.750	1.75	4.50	8.00	6.25	7.80	1.75	0.67
	1.75	1.750	1.75	4.50	8.00	6.50	8.05	1.75	0.67
	2.00	1.750	1.75	4.50	8.00	6.63	8.18	1.75	0.67
4.00	1.75	1.750	1.75	5.00	8.50	6.75	8.40	2.00	0.78
	2.00	1.750	1.75	5.00	8.50	6.88	8.53	2.00	0.78
	2.50	1.750	1.75	5.00	8.50	7.13	8.78	2.00	0.78
5.00	2.00	1.750	1.75	6.50	10.00	7.38	9.18	2.50	0.92
	2.50	1.750	1.75	6.50	10.00	7.63	9.43	2.50	0.92
	3.00	1.750	1.75	6.50	10.00	7.63	9.43	2.50	0.92
	3.50	1.750	1.75	6.50	10.00	7.63	9.43	2.50	0.92
6.00	2.50	2.000	2.00	7.50	11.50	8.38	10.66	2.88	1.03
	3.00	2.000	2.00	7.50	11.50	8.38	10.66	2.88	1.03
	3.50	2.000	2.00	7.50	11.50	8.38	10.66	2.88	1.03
	4.00	2.000	2.00	7.50	11.50	8.38	10.66	2.88	1.03
7.00	3.00	2.500	2.50	8.50	13.50	9.38	11.92	3.00	1.17
	3.50	2.500	2.50	8.50	13.50	9.38	11.92	3.00	1.17
	4.00	2.500	2.50	8.50	13.50	9.38	11.92	3.00	1.17
	4.50	2.500	2.50	8.50	13.50	9.38	11.92	3.00	1.17
	5.00	2.500	2.50	8.50	13.50	9.38	11.92	3.00	1.17
8.00	3.50	3.000	3.00	9.50	15.50	10.25	13.00	3.50	1.26
	4.00	3.000	3.00	9.50	15.50	10.25	13.00	3.50	1.26
	4.50	3.000	3.00	9.50	15.50	10.25	13.00	3.50	1.26
	5.00	3.000	3.00	9.50	15.50	10.25	13.00	3.50	1.26
	5.50	3.000	3.00	9.50	15.50	10.25	13.00	3.50	1.26

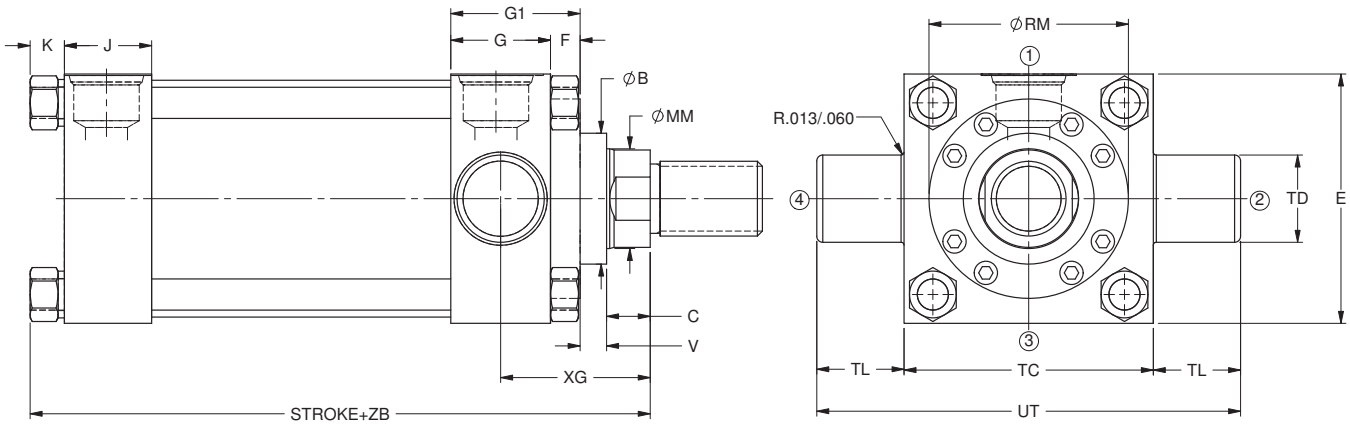
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ17 Head Trunnion Mounts

NFPA MT1 Mount



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	2.38
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	2.63
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	2.63
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	3.25
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	3.25
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	3.88
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	3.88
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	4.00
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38

+ Plus Stroke

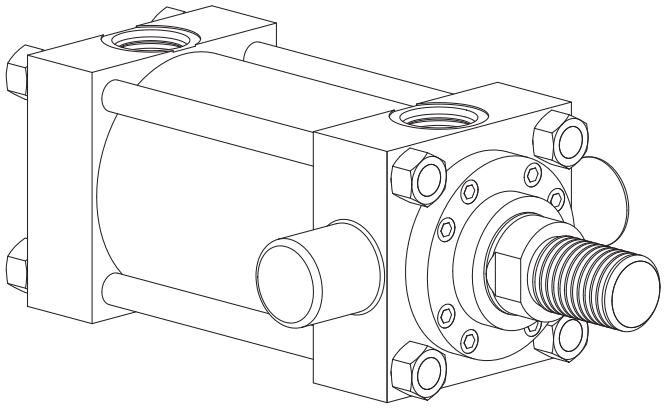
Mounting Style and Installation Dimensions

NZ17 Head Trunnion Mounts

NFPA MT1 Mount

These mounts are for applications in which the machine member travels in a curved path in one plane.
Either mount can be used both in compression (push) and tension (pull) applications.
When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used.
The pillow blocks should be installed as close to the shoulder of the trunnion as possible.



Bore	Rod DIA MM	TD +.000/-.001	TL	TC	UT	XG+	ZB+ Max	Piston Thick.	K
1.50	0.63	1.000	1.00	2.50	4.50	1.88	6.04	1.38	0.41
	1.00	1.000	1.00	2.50	4.50	2.25	6.41	1.38	0.41
2.00	1.00	1.375	1.38	3.00	5.75	2.25	6.56	1.38	0.55
	1.38	1.375	1.38	3.00	5.75	2.50	6.82	1.38	0.55
2.50	1.00	1.375	1.38	3.50	6.25	2.25	6.68	1.50	0.55
	1.38	1.375	1.38	3.50	6.25	2.50	6.94	1.50	0.55
	1.75	1.375	1.38	3.50	6.25	2.75	7.18	1.50	0.55
3.25	1.38	1.750	1.75	4.50	8.00	2.63	7.80	1.75	0.67
	1.75	1.750	1.75	4.50	8.00	2.88	8.05	1.75	0.67
	2.00	1.750	1.75	4.50	8.00	3.00	8.18	1.75	0.67
4.00	1.75	1.750	1.75	5.00	8.50	2.88	8.40	2.00	0.78
	2.00	1.750	1.75	5.00	8.50	3.00	8.53	2.00	0.78
	2.50	1.750	1.75	5.00	8.50	3.25	8.78	2.00	0.78
5.00	2.00	1.750	1.75	6.50	10.00	3.00	9.18	2.50	0.92
	2.50	1.750	1.75	6.50	10.00	3.25	9.43	2.50	0.92
	3.00	1.750	1.75	6.50	10.00	3.25	9.43	2.50	0.92
	3.50	1.750	1.75	6.50	10.00	3.25	9.43	2.50	0.92
6.00	2.50	2.000	2.00	7.50	11.50	3.38	10.66	2.88	1.03
	3.00	2.000	2.00	7.50	11.50	3.38	10.66	2.88	1.03
	3.50	2.000	2.00	7.50	11.50	3.38	10.66	2.88	1.03
	4.00	2.000	2.00	7.50	11.50	3.38	10.66	2.88	1.03
7.00	3.00	2.500	2.50	8.50	13.50	3.63	11.92	3.00	1.17
	3.50	2.500	2.50	8.50	13.50	3.63	11.92	3.00	1.17
	4.00	2.500	2.50	8.50	13.50	3.63	11.92	3.00	1.17
	4.50	2.500	2.50	8.50	13.50	3.63	11.92	3.00	1.17
	5.00	2.500	2.50	8.50	13.50	3.63	11.92	3.00	1.17
8.00	3.50	3.000	3.00	9.50	15.50	3.75	13.00	3.50	1.26
	4.00	3.000	3.00	9.50	15.50	3.75	13.00	3.50	1.26
	4.50	3.000	3.00	9.50	15.50	3.75	13.00	3.50	1.26
	5.00	3.000	3.00	9.50	15.50	3.75	13.00	3.50	1.26
	5.50	3.000	3.00	9.50	15.50	3.75	13.00	3.50	1.26

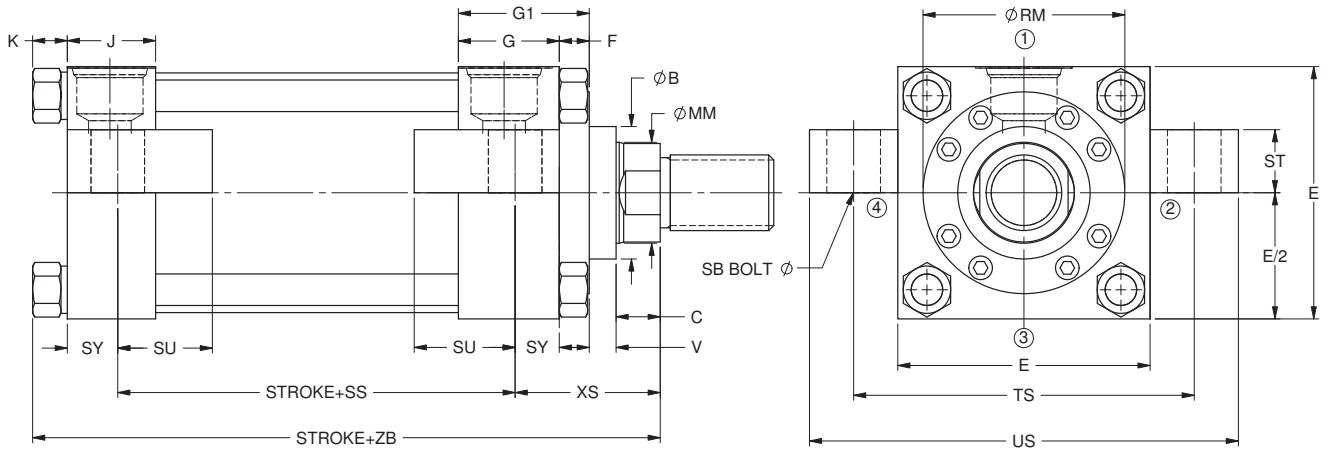
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ19 Center Lug Mounts

ANSI MS3



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM	SB	SS+
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	0.38	3.88
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-	0.38	3.88
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	0.50	3.63
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-	0.50	3.63
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	0.75	3.38
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	0.75	3.38
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-	0.75	3.38
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	0.75	4.13
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	0.75	4.13
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-	0.75	4.13
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	1.00	4.00
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	1.00	4.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	1.00	4.00
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	1.00	4.50
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	1.00	4.50
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	1.00	4.50
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	1.00	4.50
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	1.25	5.13
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	1.25	5.13
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	1.25	5.13
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	1.25	5.13
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	1.50	5.75
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	1.50	5.75
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	1.50	5.75
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	1.50	5.75
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	1.50	5.75
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	1.50	6.75
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	1.50	6.75
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	1.50	6.75
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	1.50	6.75
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	1.50	6.75

+ Plus Stroke

Mounting Style and Installation Dimensions

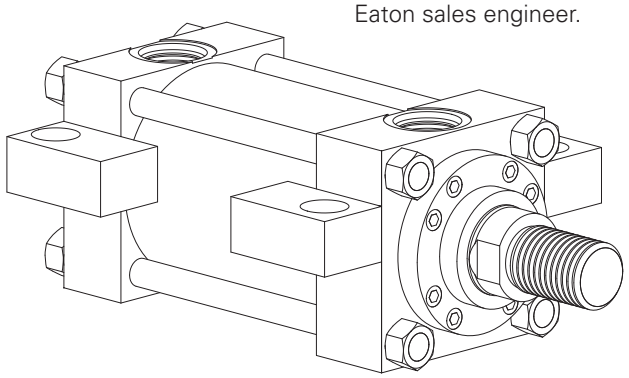
NZ19 Center Lug Mounts

ANSI MS3

Centerline lug mounts are for moving loads along a flat guided surface as in a carriage along rails.
The mounting surface should be flat and parallel to the centerline of the piston rod.
The load should be guided to traverse along the centerline of the piston rod.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
Limit operating pressure to 1500 psi for minimum deflection. For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.
For high shock applications, dowel pins or shear keys should be incorporated in the mounting design.

For severe side load applications, consult your local Eaton sales engineer.



Bore	Rod Dia MM	ST	SU	SY	TS	US	XS	ZB+ Max	Piston Thick.	K
1.50	0.63	0.50	0.91	0.38	3.25	4.00	1.38	6.04	1.38	0.41
	1.00	0.50	0.91	0.38	3.25	4.00	1.75	6.41	1.38	0.41
2.00	1.00	0.75	1.24	0.50	4.00	5.00	1.88	6.56	1.38	0.55
	1.38	0.75	1.24	0.50	4.00	5.00	2.13	6.82	1.38	0.55
2.50	1.00	1.00	1.56	0.69	4.88	6.25	2.06	6.68	1.50	0.55
	1.38	1.00	1.56	0.69	4.88	6.25	2.31	6.94	1.50	0.55
	1.75	1.00	1.56	0.69	4.88	6.25	2.56	7.18	1.50	0.55
3.25	1.38	1.00	1.55	0.69	5.88	7.25	2.31	7.80	1.75	0.67
	1.75	1.00	1.55	0.69	5.88	7.25	2.56	8.05	1.75	0.67
	2.00	1.00	1.55	0.69	5.88	7.25	2.69	8.18	1.75	0.67
4.00	1.75	1.25	2.00	0.88	6.75	8.50	2.75	8.40	2.00	0.78
	2.00	1.25	2.00	0.88	6.75	8.50	2.88	8.53	2.00	0.78
	2.50	1.25	2.00	0.88	6.75	8.50	3.13	8.78	2.00	0.78
5.00	2.00	1.25	2.00	0.88	8.25	10.00	2.88	9.18	2.50	0.92
	2.50	1.25	2.00	0.88	8.25	10.00	3.13	9.43	2.50	0.92
	3.00	1.25	2.00	0.88	8.25	10.00	3.13	9.43	2.50	0.92
	3.50	1.25	2.00	0.88	8.25	10.00	3.13	9.43	2.50	0.92
6.00	2.50	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
	3.00	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
	3.50	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
	4.00	1.50	2.50	1.13	9.75	12.00	3.38	10.66	2.88	1.03
7.00	3.00	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	3.50	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	4.00	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	4.50	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
	5.00	1.75	2.88	1.38	11.25	14.00	3.63	11.92	3.00	1.17
8.00	3.50	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	4.00	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	4.50	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	5.00	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26
	5.50	1.75	2.88	1.38	12.25	15.00	3.63	13.00	3.50	1.26

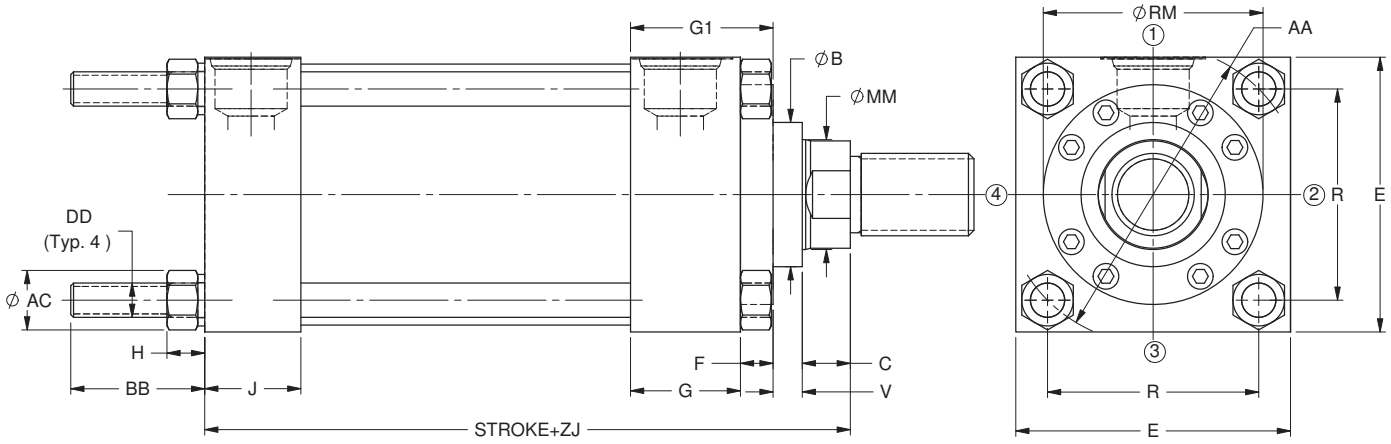
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ21 Cap End Extended Tie Rod Mounts

NFPA MX2 Mount



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38

+ Plus Stroke

Mounting Style and Installation Dimensions

NZ21 Cap End Extended Tie Rod Mounts

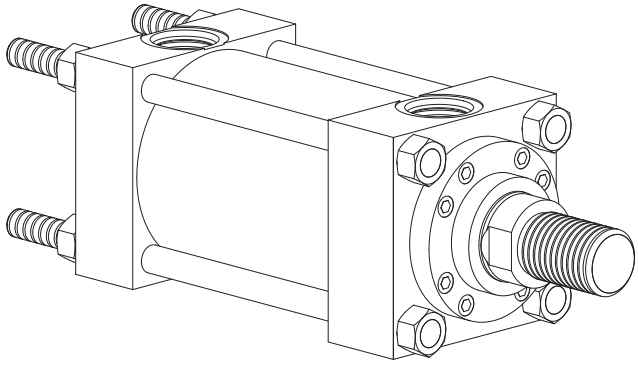
NFPA MX2 Mount

These mounts are for straight line force transfer applications. The cap extended tie rod mount is recommended for compression (pushing) applications.
The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments. Once fitted into the application framework, tmounting nuts should be torqued to the values listed in the table (right).

Tie Rod Torque Values
Torque values in the following table apply to all mounting styles.

	Tie Rod Torque	
Bore	**Ft-Lb**	**Nm**
1.50	30	41
2.00	40	54
2.50	80	108
3.25	190	258
4.00	190	258
5.00	550	746
6.00	700	949
7.00	750	1017
8.00	1250	1695

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.



Bore	Rod Dia MM	R	AA	Max AC	BB	(UN) DD	ZJ+	Piston Thick.	Max H
1.50	0.63	1.63	2.30	0.69	1.38	.375-24	5.63	1.38	0.38
	1.00	1.63	2.30	0.69	1.38	.375-24	6.00	1.38	0.38
2.00	1.00	2.05	2.90	0.88	1.81	.500-20	6.00	1.38	0.50
	1.38	2.05	2.90	0.88	1.81	.500-20	6.26	1.38	0.50
2.50	1.00	2.55	3.60	0.88	1.81	.500-20	6.13	1.50	0.50
	1.38	2.55	3.60	0.88	1.81	.500-20	6.38	1.50	0.50
	1.75	2.55	3.60	0.88	1.81	.500-20	6.63	1.50	0.50
3.25	1.38	3.25	4.60	1.12	2.31	.625-18	7.13	1.75	0.63
	1.75	3.25	4.60	1.12	2.31	.625-18	7.38	1.75	0.63
	2.00	3.25	4.60	1.12	2.31	.625-18	7.51	1.75	0.63
4.00	1.75	3.82	5.40	1.12	2.31	.625-18	7.63	2.00	0.63
	2.00	3.82	5.40	1.12	2.31	.625-18	7.75	2.00	0.63
	2.50	3.82	5.40	1.12	2.31	.625-18	8.00	2.00	0.63
5.00	2.00	4.95	7.00	1.56	3.19	.875-14	8.26	2.50	0.81
	2.50	4.95	7.00	1.56	3.19	.875-14	8.50	2.50	0.81
	3.00	4.95	7.00	1.56	3.19	.875-14	8.50	2.50	0.81
	3.50	4.95	7.00	1.56	3.19	.875-14	8.50	2.50	0.81
6.00	2.50	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.94
	3.00	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.94
	3.50	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.94
	4.00	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.94
7.00	3.00	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.06
	3.50	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.06
	4.00	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.06
	4.50	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.06
	5.00	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.06
8.00	3.50	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.12
	4.00	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.12
	4.50	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.12
	5.00	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.12
	5.50	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.12

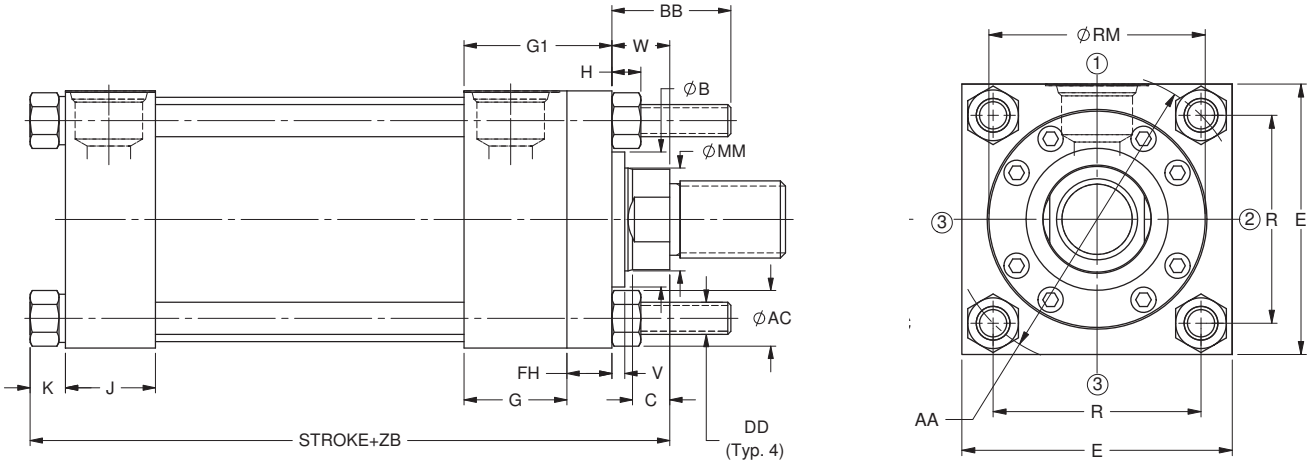
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ22 Head End Extended Tie Rod Mounts

NFPA MX3 Mount



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	FH	V	R
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	1.63
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	1.63
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	2.05
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	2.05
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.63	0.25	2.55
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	2.55
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	2.55
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.75	0.25	3.25
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	3.25
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	3.25
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.88	0.25	3.82
	2.00	2.624	0.88	5.00	2.00	1.75	0.88	0.25	3.82
	2.50	3.124	1.00	5.00	2.00	1.75	0.88	0.38	3.82
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.88	0.25	4.95
	2.50	3.124	1.00	6.50	2.00	1.75	0.88	0.38	4.95
	3.00	3.749	1.00	6.50	2.00	1.75	0.88	0.38	4.95
	3.50	4.249	1.00	6.50	2.00	1.75	0.88	0.38	4.95
6.00	2.50	3.124	1.00	7.50	2.25	2.25	1.00	0.25	5.73
	3.00	3.749	1.00	7.50	2.25	2.25	1.00	0.25	5.73
	3.50	4.249	1.00	7.50	2.25	2.25	1.00	0.25	5.73
	4.00	4.749	1.00	7.50	2.25	2.25	1.00	0.25	5.73
7.00	3.00	3.749	1.00	8.50	2.75	2.75	1.00	0.25	6.58
	3.50	4.249	1.00	8.50	2.75	2.75	1.00	0.25	6.58
	4.00	4.749	1.00	8.50	2.75	2.75	1.00	0.25	6.58
	4.50	5.249	1.00	8.50	2.75	2.75	1.00	0.25	6.58
	5.00	5.749	1.00	8.50	2.75	2.75	1.00	0.25	6.58
8.00	3.50	4.249	1.00	9.50	3.00	3.00	1.00	0.25	7.50
	4.00	4.749	1.00	9.50	3.00	3.00	1.00	0.25	7.50
	4.50	5.249	1.00	9.50	3.00	3.00	1.00	0.25	7.50
	5.00	5.749	1.00	9.50	3.00	3.00	1.00	0.25	7.50
	5.50	6.249	1.00	9.50	3.00	3.00	1.00	0.25	7.50

+ Plus Stroke

Mounting Style and Installation Dimensions

NZ22 Head End Extended Tie Rod Mounts

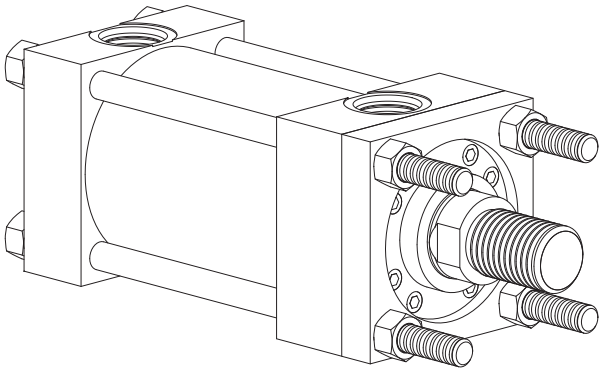
NFPA MX3 Mount

These mounts are for straight line force transfer applications.The head extended tie rod mount is recommended for tension (pulling) applications.
The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.
On head mount applications, the cartridge provides a pilot diameter to align the rod in the mounting frame.

Once fitted into the application framework, mounting nuts should be torqued to the values listed in the table on page 45.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended.

Stop tubes should also be considered.



Bore	Rod Dia MM	AA	Max AC	BB	(UN) DD	Max H	ZB+ Max	Piston Thick.	K
1.50	0.63	2.30	0.69	1.38	.375-24	0.34	6.04	1.38	0.41
	1.00	2.30	0.69	1.38	.375-24	0.34	6.41	1.38	0.41
2.00	1.00	2.90	0.88	1.81	.500-20	0.45	6.56	1.38	0.55
	1.38	2.90	0.88	1.81	.500-20	0.45	6.82	1.38	0.55
2.50	1.00	3.60	0.88	1.81	.500-20	0.45	6.68	1.50	0.55
	1.38	3.60	0.88	1.81	.500-20	0.45	6.94	1.50	0.55
	1.75	3.60	0.88	1.81	.500-20	0.45	7.18	1.50	0.55
3.25	1.38	4.60	1.12	2.31	.625-18	0.56	7.80	1.75	0.67
	1.75	4.60	1.12	2.31	.625-18	0.56	8.05	1.75	0.67
	2.00	4.60	1.12	2.31	.625-18	0.56	8.18	1.75	0.67
4.00	1.75	5.40	1.12	2.31	.625-18	0.56	8.40	2.00	0.78
	2.00	5.40	1.12	2.31	.625-18	0.56	8.53	2.00	0.78
	2.50	5.40	1.12	2.31	.625-18	0.56	8.78	2.00	0.78
5.00	2.00	7.00	1.56	3.19	.875-14	0.78	9.18	2.50	0.92
	2.50	7.00	1.56	3.19	.875-14	0.78	9.43	2.50	0.92
	3.00	7.00	1.56	3.19	.875-14	0.78	9.43	2.50	0.92
	3.50	7.00	1.56	3.19	.875-14	0.78	9.43	2.50	0.92
6.00	2.50	8.10	1.75	3.63	1.000-14	0.89	10.66	2.88	1.03
	3.00	8.10	1.75	3.63	1.000-14	0.89	10.66	2.88	1.03
	3.50	8.10	1.75	3.63	1.000-14	0.89	10.66	2.88	1.03
	4.00	8.10	1.75	3.63	1.000-14	0.89	10.66	2.88	1.03
7.00	3.00	9.30	2.00	4.13	1.125-12	1.00	11.92	3.00	1.17
	3.50	9.30	2.00	4.13	1.125-12	1.00	11.92	3.00	1.17
	4.00	9.30	2.00	4.13	1.125-12	1.00	11.92	3.00	1.17
	4.50	9.30	2.00	4.13	1.125-12	1.00	11.92	3.00	1.17
	5.00	9.30	2.00	4.13	1.125-12	1.00	11.92	3.00	1.17
8.00	3.50	10.60	2.19	4.50	1.250-12	1.09	13.00	3.50	1.26
	4.00	10.60	2.19	4.50	1.250-12	1.09	13.00	3.50	1.26
	4.50	10.60	2.19	4.50	1.250-12	1.09	13.00	3.50	1.26
	5.00	10.60	2.19	4.50	1.250-12	1.09	13.00	3.50	1.26
	5.50	10.60	2.19	4.50	1.250-12	1.09	13.00	3.50	1.26

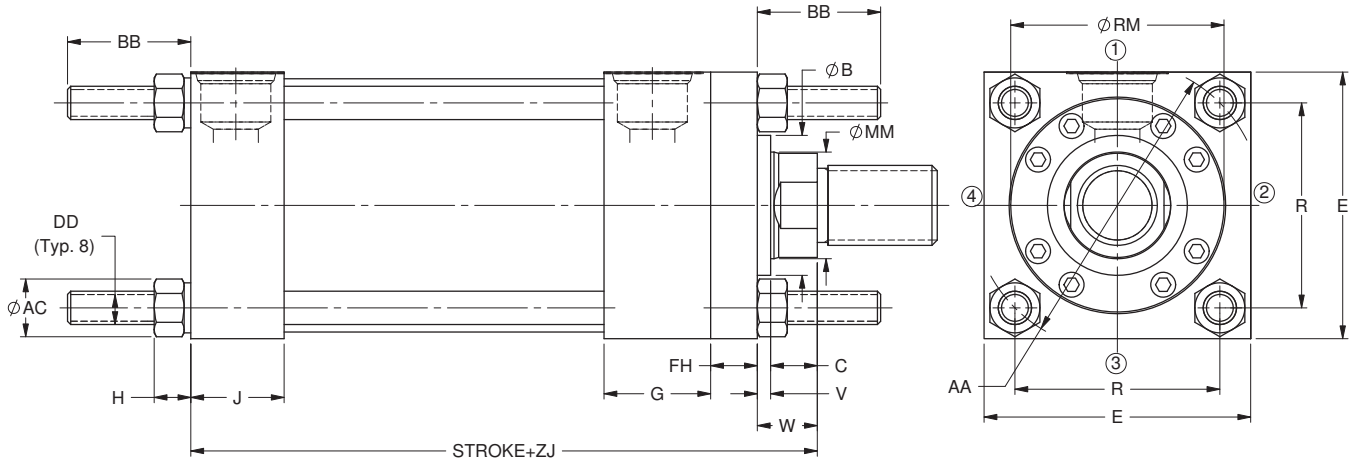
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ23 Both End Extended Tie Rod Mounts

NFPA MX1 Mount



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	FH	V	W
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	0.63
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	1.00
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	0.75
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	1.01
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.63	0.25	0.75
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	1.01
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	1.25
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.75	0.25	0.88
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	1.13
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	1.26
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.88	0.25	1.00
	2.00	2.624	0.88	5.00	2.00	1.75	0.88	0.25	1.13
	2.50	3.124	1.00	5.00	2.00	1.75	0.88	0.38	1.38
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.88	0.25	1.13
	2.50	3.124	1.00	6.50	2.00	1.75	0.88	0.38	1.38
	3.00	3.749	1.00	6.50	2.00	1.75	0.88	0.38	1.38
	3.50	4.249	1.00	6.50	2.00	1.75	0.88	0.38	1.38
6.00	2.50	3.124	1.00	7.50	2.25	2.25	1.00	0.25	1.25
	3.00	3.749	1.00	7.50	2.25	2.25	1.00	0.25	1.25
	3.50	4.249	1.00	7.50	2.25	2.25	1.00	0.25	1.25
	4.00	4.749	1.00	7.50	2.25	2.25	1.00	0.25	1.25
7.00	3.00	3.749	1.00	8.50	2.75	2.75	1.00	0.25	1.25
	3.50	4.249	1.00	8.50	2.75	2.75	1.00	0.25	1.25
	4.00	4.749	1.00	8.50	2.75	2.75	1.00	0.25	1.25
	4.50	5.249	1.00	8.50	2.75	2.75	1.00	0.25	1.25
	5.00	5.749	1.00	8.50	2.75	2.75	1.00	0.25	1.25
8.00	3.50	4.249	1.00	9.50	3.00	3.00	1.00	0.25	1.25
	4.00	4.749	1.00	9.50	3.00	3.00	1.00	0.25	1.25
	4.50	5.249	1.00	9.50	3.00	3.00	1.00	0.25	1.25
	5.00	5.749	1.00	9.50	3.00	3.00	1.00	0.25	1.25
	5.50	6.249	1.00	9.50	3.00	3.00	1.00	0.25	1.25

+ Plus Stroke

Mounting Style and Installation Dimensions

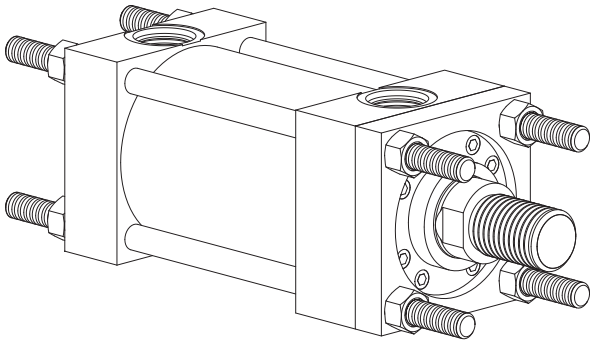
NZ23 Both End Extended Tie Rod Mounts

NFPA MX1 Mount

These mounts are for straight line force transfer applications. Both ends extended tie rod mounts are suited for tension and compression applications or applications where additional hardware is to be attached to cylinders. The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, mounting nuts should be torqued to the values listed in the table on page 45.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.



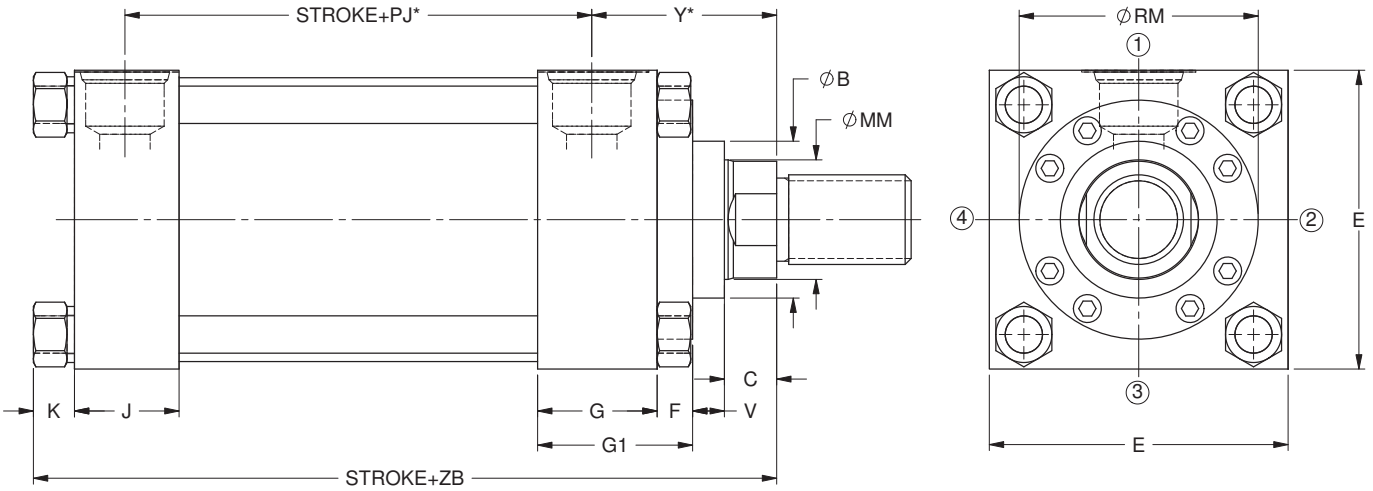
Bore	Rod Dia MM	R	AA	Max AC	BB	(UN) DD	ZJ+ Max	Piston Thick.	Max H
1.50	0.63	1.63	2.30	0.69	1.38	.375-24	5.63	1.38	0.34
	1.00	1.63	2.30	0.69	1.38	.375-24	6.00	1.38	0.34
2.00	1.00	2.05	2.90	0.88	1.81	.500-20	6.00	1.38	0.45
	1.38	2.05	2.90	0.88	1.81	.500-20	6.26	1.38	0.45
2.50	1.00	2.55	3.60	0.88	1.81	.500-20	6.13	1.50	0.45
	1.38	2.55	3.60	0.88	1.81	.500-20	6.38	1.50	0.45
	1.75	2.55	3.60	0.88	1.81	.500-20	6.63	1.50	0.45
3.25	1.38	3.25	4.60	1.12	2.31	.625-18	7.13	1.75	0.56
	1.75	3.25	4.60	1.12	2.31	.625-18	7.38	1.75	0.56
	2.00	3.25	4.60	1.12	2.31	.625-18	7.51	1.75	0.56
4.00	1.75	3.82	5.40	1.12	2.31	.625-18	7.63	2.00	0.56
	2.00	3.82	5.40	1.12	2.31	.625-18	7.76	2.00	0.56
	2.50	3.82	5.40	1.12	2.31	.625-18	8.00	2.00	0.56
5.00	2.00	4.95	7.00	1.56	3.19	.875-14	8.26	2.50	0.78
	2.50	4.95	7.00	1.56	3.19	.875-14	8.50	2.50	0.78
	3.00	4.95	7.00	1.56	3.19	.875-14	8.50	2.50	0.78
	3.50	4.95	7.00	1.56	3.19	.875-14	8.50	2.50	0.78
6.00	2.50	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.89
	3.00	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.89
	3.50	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.89
	4.00	5.73	8.10	1.75	3.63	1.000-14	9.63	2.88	0.89
7.00	3.00	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.00
	3.50	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.00
	4.00	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.00
	4.50	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.00
	5.00	6.58	9.30	2.00	4.13	1.125-12	10.75	3.00	1.00
8.00	3.50	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.09
	4.00	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.09
	4.50	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.09
	5.00	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.09
	5.50	7.50	10.60	2.19	4.50	1.250-12	11.75	3.50	1.09

+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ24 No Mounts



Bore	Rod Dia MM	B +.000/ -.002	C	E	G	J	F	V	Y	PJ+	RM	ZB+ Max	Piston Thick.	K
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	2.47	2.69	-	6.04	1.38	0.41
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	2.47	2.69	-	6.41	1.38	0.41
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	2.47	2.69	-	6.56	1.38	0.55
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	2.72	2.69	-	6.82	1.38	0.55
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.47	2.81	2.63	6.68	1.50	0.55
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	2.72	2.81	-	6.94	1.50	0.55
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	2.97	2.81	-	7.18	1.50	0.55
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	2.72	3.56	3.25	7.80	1.75	0.67
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	2.97	3.56	-	8.05	1.75	0.67
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	3.09	3.56	-	8.18	1.75	0.67
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	2.97	3.81	3.88	8.40	2.00	0.78
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	3.09	3.81	4.00	8.53	2.00	0.78
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	3.34	3.81	4.44	8.78	2.00	0.78
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	3.09	4.31	4.00	9.18	2.50	0.92
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	3.34	4.31	4.44	9.43	2.50	0.92
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	3.34	4.31	5.25	9.43	2.50	0.92
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	3.34	4.31	5.63	9.43	2.50	0.92
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	3.59	4.69	4.44	10.66	2.88	1.03
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	3.59	4.69	5.25	10.66	2.88	1.03
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	3.59	4.69	5.63	10.66	2.88	1.03
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	3.59	4.69	6.44	10.66	2.88	1.03
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	3.94	5.13	5.25	11.92	3.00	1.17
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	3.94	5.13	5.63	11.92	3.00	1.17
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	3.94	5.13	6.44	11.92	3.00	1.17
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	3.94	5.13	7.13	11.92	3.00	1.17
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	3.94	5.13	7.56	11.92	3.00	1.17
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	4.06	5.88	5.63	13.00	3.50	1.26
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	4.06	5.88	6.44	13.00	3.50	1.26
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	4.06	5.88	7.13	13.00	3.50	1.26
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	4.06	5.88	7.56	13.00	3.50	1.26
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	4.06	5.88	8.38	13.00	3.50	1.26

+ Plus Stroke

* Port dimensions for standard ports only. Consult Eaton for flange, manifold and special ports.

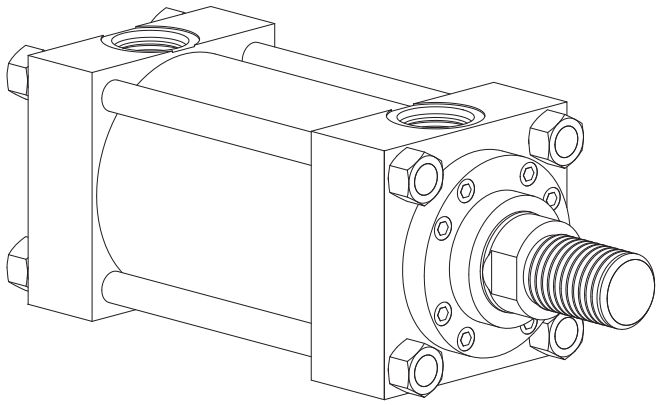
Mounting Style and Installation Dimensions

NZ24 No Mounts

No mounts are for moving loads on a flat guided surface such as carriage rails.
Mounting surface should be flat and parallel to centerline of the piston rod.
The load should be guided to traverse along the centerline of the piston rod.
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE
For strokes in excess of 30 inches, see "Stop tube selection" on page 72.
With unsupported loads, the bearing must absorb more force.

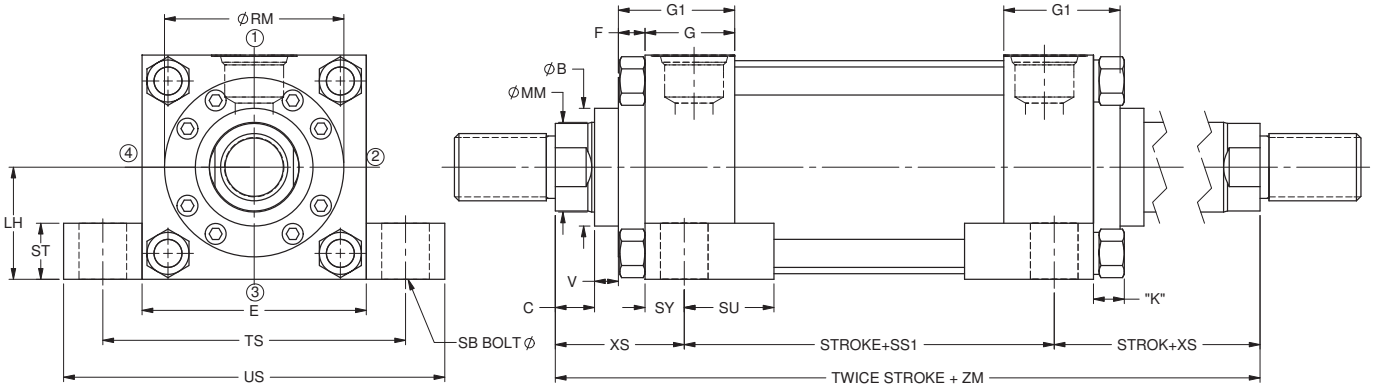
For these applications, the larger available rod is recommended, and stop tubes should be considered.
External clamping mechanism on head and cap is required to hold cylinder in place during operation.
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque in clamping.
For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount, NZ04.
For severe side load applications, consult your local Eaton sales engineer.



Mounting Style and Installation Dimensions

NZ25 Double Rod Side Lug Mount

NFPA MS7 Mount



Bore	Rod Dia MM	B +.000/-.002	C	E	G	F	V	RM	LH ±.002	SS1+
1.50	0.63	1.124	0.38	2.50	1.75	0.38	0.25	-	1.243	4.13
	1.00	1.499	0.50	2.50	1.75	0.38	0.50	-	1.243	4.13
2.00	1.00	1.499	0.50	3.00	1.75	0.63	0.25	-	1.493	3.88
	1.38	1.999	0.63	3.00	1.75	0.63	0.38	-	1.493	3.88
2.50	1.00	1.499	0.50	3.50	1.75	0.50	0.38	2.63	1.743	3.63
	1.38	1.999	0.63	3.50	1.75	0.63	0.38	-	1.743	3.63
	1.75	2.374	0.75	3.50	1.75	0.63	0.50	-	1.743	3.63
3.25	1.38	1.999	0.63	4.50	2.00	0.59	0.41	3.25	2.243	4.38
	1.75	2.374	0.75	4.50	2.00	0.75	0.38	-	2.243	4.38
	2.00	2.624	0.88	4.50	2.00	0.75	0.38	-	2.243	4.38
4.00	1.75	2.374	0.75	5.00	2.00	0.59	0.53	3.88	2.493	4.25
	2.00	2.624	0.88	5.00	2.00	0.59	0.53	4.00	2.493	4.25
	2.50	3.124	1.00	5.00	2.00	0.59	0.66	4.44	2.493	4.25
5.00	2.00	2.624	0.88	6.50	2.00	0.59	0.53	4.00	3.243	4.75
	2.50	3.124	1.00	6.50	2.00	0.59	0.66	4.44	3.243	4.75
	3.00	3.749	1.00	6.50	2.00	0.72	0.53	5.25	3.243	4.75
	3.50	4.249	1.00	6.50	2.00	0.72	0.53	5.63	3.243	4.75
6.00	2.50	3.124	1.00	7.50	2.25	0.59	0.66	4.44	3.743	5.13
	3.00	3.749	1.00	7.50	2.25	0.72	0.53	5.25	3.743	5.13
	3.50	4.249	1.00	7.50	2.25	0.72	0.53	5.63	3.743	5.13
	4.00	4.749	1.00	7.50	2.25	0.88	0.38	6.44	3.743	5.13
7.00	3.00	3.749	1.00	8.50	2.75	0.72	0.53	5.25	4.243	5.75
	3.50	4.249	1.00	8.50	2.75	0.72	0.53	5.63	4.243	5.75
	4.00	4.749	1.00	8.50	2.75	0.88	0.38	6.44	4.243	5.75
	4.50	5.249	1.00	8.50	2.75	0.88	0.38	7.13	4.243	5.75
	5.00	5.749	1.00	8.50	2.75	0.88	0.38	7.56	4.243	5.75
8.00	3.50	4.249	1.00	9.50	3.00	0.72	0.53	5.63	4.743	6.75
	4.00	4.749	1.00	9.50	3.00	0.88	0.38	6.44	4.743	6.75
	4.50	5.249	1.00	9.50	3.00	0.88	0.38	7.13	4.743	6.75
	5.00	5.749	1.00	9.50	3.00	0.88	0.38	7.56	4.743	6.75
	5.50	6.249	1.00	9.50	3.00	0.88	0.38	8.38	4.743	6.75

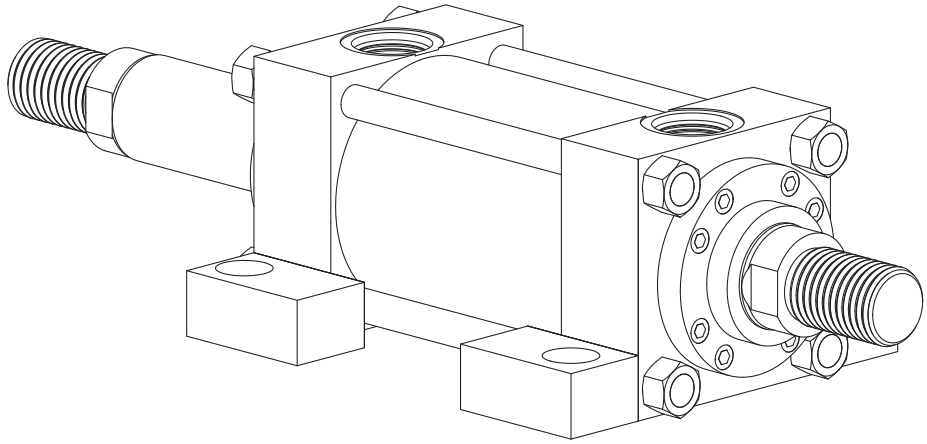
+ Plus Stroke

Mounting Style and Installation Dimensions

NZ25 Double Rod Side Lug Mount

NFPA MS7 Mount

Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod. The single rod mount application data is also applicable to double rod cylinders. Rod and pilot related dimensions are typical for both ends.



Bore	Rod Dia MM	ST	SU	SY	TS	US	SB	XS	ZM+	Piston Thick.	K
1.50	0.63	0.50	0.91	0.38	3.25	4.00	0.38	1.38	6.88	1.38	0.41
	1.00	0.50	0.91	0.38	3.25	4.00	0.38	1.75	7.63	1.38	0.41
2.00	1.00	0.75	1.24	0.50	4.00	5.00	0.50	1.88	7.63	1.38	0.55
	1.38	0.75	1.24	0.50	4.00	5.00	0.50	2.13	8.13	1.38	0.55
2.50	1.00	1.00	1.56	0.69	4.88	6.25	0.75	2.06	7.75	1.50	0.55
	1.38	1.00	1.56	0.69	4.88	6.25	0.75	2.31	8.25	1.50	0.55
	1.75	1.00	1.56	0.69	4.88	6.25	0.75	2.56	8.75	1.50	0.55
3.25	1.38	1.00	1.55	0.69	5.88	7.25	0.75	2.31	9.00	1.75	0.67
	1.75	1.00	1.55	0.69	5.88	7.25	0.75	2.56	9.50	1.75	0.67
	2.00	1.00	1.55	0.69	5.88	7.25	0.75	2.69	9.75	1.75	0.67
4.00	1.75	1.25	2.00	0.88	6.75	8.50	1.00	2.75	9.75	2.00	0.78
	2.00	1.25	2.00	0.88	6.75	8.50	1.00	2.88	10.00	2.00	0.78
	2.50	1.25	2.00	0.88	6.75	8.50	1.00	3.13	10.50	2.00	0.78
5.00	2.00	1.25	2.00	0.88	8.25	10.00	1.00	2.88	10.50	2.50	0.92
	2.50	1.25	2.00	0.88	8.25	10.00	1.00	3.13	11.00	2.50	0.92
	3.00	1.25	2.00	0.88	8.25	10.00	1.00	3.13	11.00	2.50	0.92
	3.50	1.25	2.00	0.88	8.25	10.00	1.00	3.13	11.00	2.50	0.92
6.00	2.50	1.50	2.50	1.13	9.75	12.00	1.25	3.38	11.88	2.88	1.03
	3.00	1.50	2.50	1.13	9.75	12.00	1.25	3.38	11.88	2.88	1.03
	3.50	1.50	2.50	1.13	9.75	12.00	1.25	3.38	11.88	2.88	1.03
	4.00	1.50	2.50	1.13	9.75	12.00	1.25	3.38	11.88	2.88	1.03
7.00	3.00	1.75	2.88	1.38	11.25	14.00	1.50	3.63	13.00	3.00	1.17
	3.50	1.75	2.88	1.38	11.25	14.00	1.50	3.63	13.00	3.00	1.17
	4.00	1.75	2.88	1.38	11.25	14.00	1.50	3.63	13.00	3.00	1.17
	4.50	1.75	2.88	1.38	11.25	14.00	1.50	3.63	13.00	3.00	1.17
	5.00	1.75	2.88	1.38	11.25	14.00	1.50	3.63	13.00	3.00	1.17
8.00	3.50	1.75	2.88	1.38	12.25	15.00	1.50	3.63	14.00	3.50	1.26
	4.00	1.75	2.88	1.38	12.25	15.00	1.50	3.63	14.00	3.50	1.26
	4.50	1.75	2.88	1.38	12.25	15.00	1.50	3.63	14.00	3.50	1.26
	5.00	1.75	2.88	1.38	12.25	15.00	1.50	3.63	14.00	3.50	1.26
	5.50	1.75	2.88	1.38	12.25	15.00	1.50	3.63	14.00	3.50	1.26

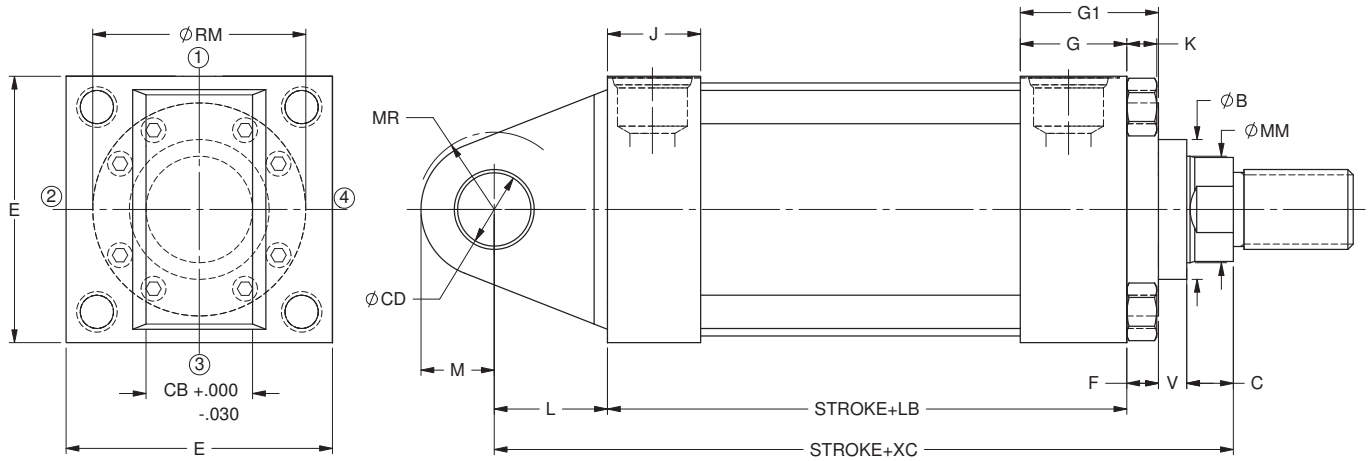
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ47 Cap Fixed Eye Mount

ANSI MP3



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38

+ Plus Stroke

Mounting Style and Installation Dimensions

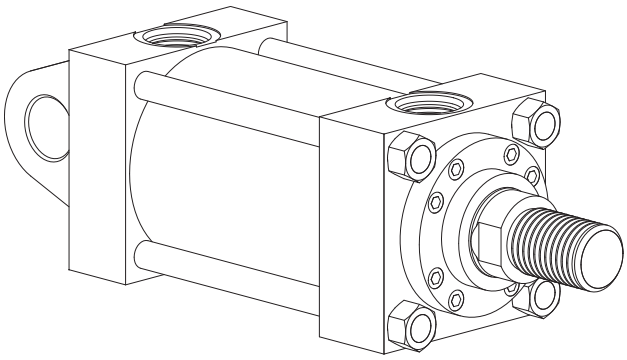
NZ47 Cap Fixed Eye Mount

ANSI MP3

These mounts are for applications in which the machine member travels in a curved path within one plane.
These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See page 75 for stroke limitations.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excess side loading on the bearing and piston. This will lead to premature failure.

For applications with small amounts of misalignment, consider the spherical bearing mount NZ11.



Bore	Rod Dia MM	L	M	CB	CD	MR	LB+	XC+	Piston Thick.	K
1.50	0.63	0.75	0.50	0.75	0.500	0.56	4.63	6.38	1.38	0.41
	1.00	0.75	0.50	0.75	0.500	0.56	4.63	6.75	1.38	0.41
2.00	1.00	1.25	0.75	1.25	0.750	1.06	4.63	7.25	1.38	0.55
	1.38	1.25	0.75	1.25	0.750	1.06	4.63	7.50	1.38	0.55
2.50	1.00	1.25	0.75	1.25	0.750	1.06	4.75	7.38	1.50	0.55
	1.38	1.25	0.75	1.25	0.750	1.06	4.75	7.63	1.50	0.55
	1.75	1.25	0.75	1.25	0.750	1.06	4.75	7.88	1.50	0.55
3.25	1.38	1.50	1.00	1.50	1.000	1.13	5.50	8.63	1.75	0.67
	1.75	1.50	1.00	1.50	1.000	1.13	5.50	8.88	1.75	0.67
	2.00	1.50	1.00	1.50	1.000	1.13	5.50	9.00	1.75	0.67
4.00	1.75	2.13	1.38	2.00	1.375	1.75	5.75	9.75	2.00	0.78
	2.00	2.13	1.38	2.00	1.375	1.75	5.75	9.88	2.00	0.78
	2.50	2.13	1.38	2.00	1.375	1.75	5.75	10.13	2.00	0.78
5.00	2.00	2.25	1.75	2.50	1.750	1.88	6.25	10.50	2.50	0.92
	2.50	2.25	1.75	2.50	1.750	1.88	6.25	10.75	2.50	0.92
	3.00	2.25	1.75	2.50	1.750	1.88	6.25	10.75	2.50	0.92
	3.50	2.25	1.75	2.50	1.750	1.88	6.25	10.75	2.50	0.92
6.00	2.50	2.50	2.00	2.50	2.000	2.13	7.38	12.13	2.88	1.03
	3.00	2.50	2.00	2.50	2.000	2.13	7.38	12.13	2.88	1.03
	3.50	2.50	2.00	2.50	2.000	2.13	7.38	12.13	2.88	1.03
	4.00	2.50	2.00	2.50	2.000	2.13	7.38	12.13	2.88	1.03
7.00	3.00	3.00	2.50	3.00	2.500	2.50	8.50	13.75	3.00	1.17
	3.50	3.00	2.50	3.00	2.500	2.50	8.50	13.75	3.00	1.17
	4.00	3.00	2.50	3.00	2.500	2.50	8.50	13.75	3.00	1.17
	4.50	3.00	2.50	3.00	2.500	2.50	8.50	13.75	3.00	1.17
	5.00	3.00	2.50	3.00	2.500	2.50	8.50	13.75	3.00	1.17
8.00	3.50	3.25	2.75	3.00	3.000	2.75	9.50	15.00	3.50	1.26
	4.00	3.25	2.75	3.00	3.000	2.75	9.50	15.00	3.50	1.26
	4.50	3.25	2.75	3.00	3.000	2.75	9.50	15.00	3.50	1.26
	5.00	3.25	2.75	3.00	3.000	2.75	9.50	15.00	3.50	1.26
	5.50	3.25	2.75	3.00	3.000	2.75	9.50	15.00	3.50	1.26

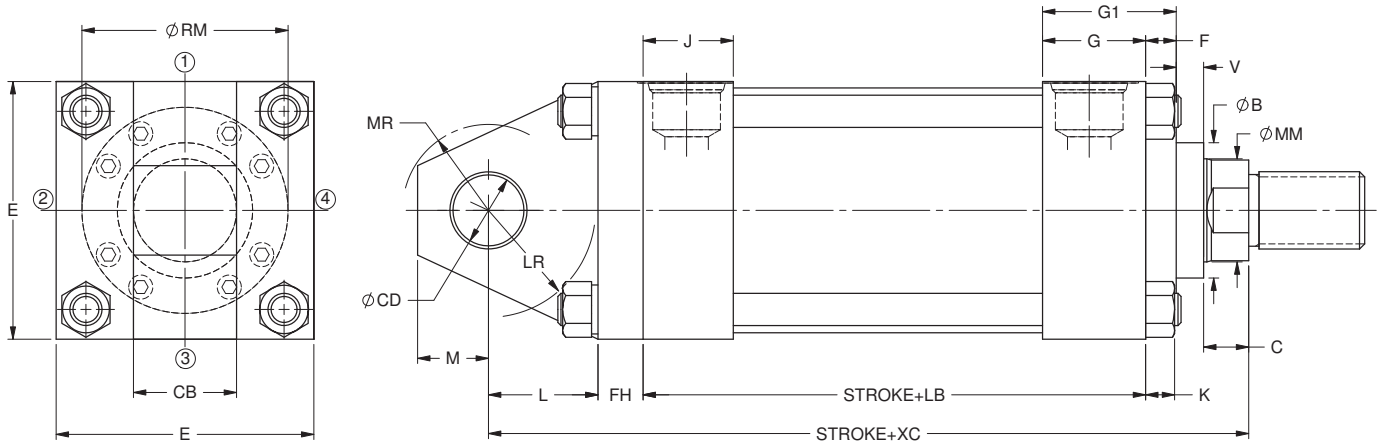
+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ48 Cap Detachable Eye Mount

ANSI MP4



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM	L
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	0.75
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-	0.75
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	1.25
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-	1.25
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	1.25
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	1.25
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-	1.25
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	1.50
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	1.50
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-	1.50
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	2.13
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	2.13
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	2.13
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	2.25
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	2.25
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	2.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	2.25
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	2.50
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	2.50
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	2.50
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	2.50
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	3.00
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	3.00
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	3.00
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	3.00
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	3.00
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	3.25
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	3.25
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	3.25
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	3.25
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	3.25

+ Plus Stroke

Mounting Style and Installation Dimensions

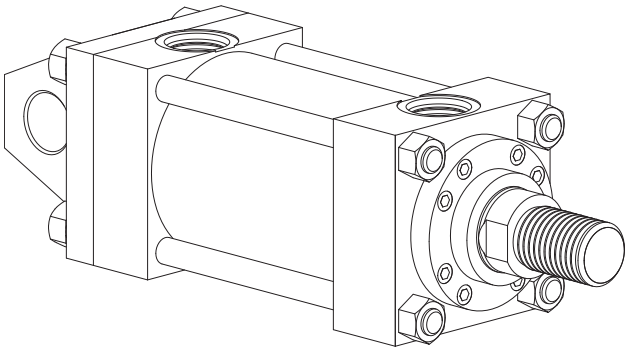
NZ48 Cap Detachable Eye Mount

ANSI MP4

These mounts are for applications in which the machine member travels in a curved path within one plane.
These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See page 75 for stroke limitations.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excess side loading on the bearing and piston. This will lead to premature failure.

For applications with small amounts of misalignment, consider the spherical bearing mount NZ11.



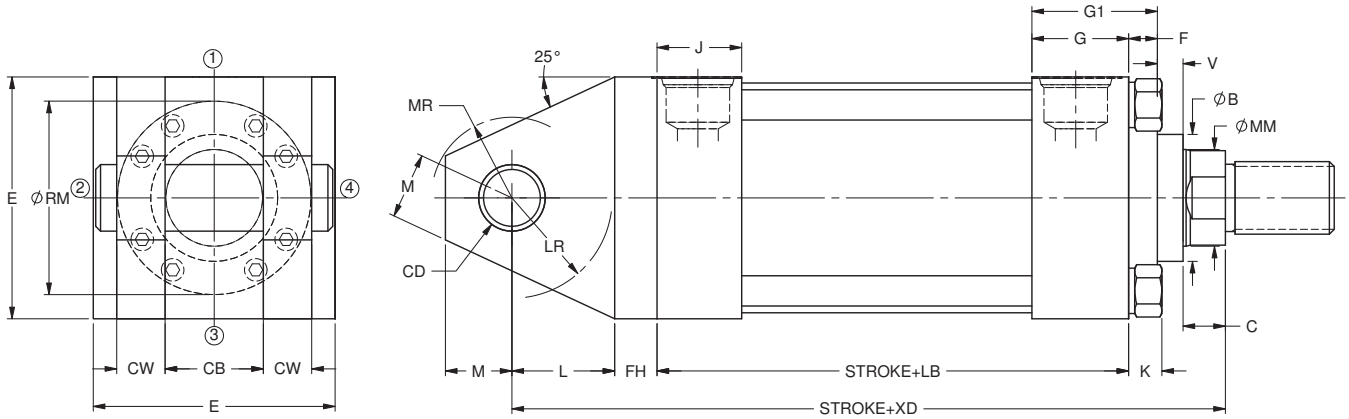
Bore	Rod Dia MM	M	CB	CD	MR	LB+	FH	XC+	Piston Thick.	K
1.50	0.63	0.50	0.75	0.500	0.56	4.63	0.38	6.75	1.38	0.41
	1.00	0.50	0.75	0.500	0.56	4.63	0.38	7.13	1.38	0.41
2.00	1.00	0.75	1.25	0.750	1.06	4.63	0.63	7.88	1.38	0.55
	1.38	0.75	1.25	0.750	1.06	4.63	0.63	8.13	1.38	0.55
2.50	1.00	0.75	1.25	0.750	1.06	4.75	0.63	8.00	1.50	0.55
	1.38	0.75	1.25	0.750	1.06	4.75	0.63	8.25	1.50	0.55
	1.75	0.75	1.25	0.750	1.06	4.75	0.63	8.50	1.50	0.55
3.25	1.38	1.00	1.50	1.000	1.13	5.50	0.75	9.38	1.75	0.67
	1.75	1.00	1.50	1.000	1.13	5.50	0.75	9.63	1.75	0.67
	2.00	1.00	1.50	1.000	1.13	5.50	0.75	9.75	1.75	0.67
4.00	1.75	1.38	2.00	1.375	1.75	5.75	0.88	10.63	2.00	0.78
	2.00	1.38	2.00	1.375	1.75	5.75	0.88	10.75	2.00	0.78
	2.50	1.38	2.00	1.375	1.75	5.75	0.88	11.00	2.00	0.78
5.00	2.00	1.75	2.50	1.750	1.88	6.25	0.88	11.38	2.50	0.92
	2.50	1.75	2.50	1.750	1.88	6.25	0.88	11.63	2.50	0.92
	3.00	1.75	2.50	1.750	1.88	6.25	0.88	11.63	2.50	0.92
	3.50	1.75	2.50	1.750	1.88	6.25	0.88	11.63	2.50	0.92
6.00	2.50	2.00	2.50	2.000	2.13	7.38	1.00	13.13	2.88	1.03
	3.00	2.00	2.50	2.000	2.13	7.38	1.00	13.13	2.88	1.03
	3.50	2.00	2.50	2.000	2.13	7.38	1.00	13.13	2.88	1.03
	4.00	2.00	2.50	2.000	2.13	7.38	1.00	13.13	2.88	1.03
7.00	3.00	2.50	3.00	2.500	2.50	8.50	1.00	14.75	3.00	1.17
	3.50	2.50	3.00	2.500	2.50	8.50	1.00	14.75	3.00	1.17
	4.00	2.50	3.00	2.500	2.50	8.50	1.00	14.75	3.00	1.17
	4.50	2.50	3.00	2.500	2.50	8.50	1.00	14.75	3.00	1.17
	5.00	2.50	3.00	2.500	2.50	8.50	1.00	14.75	3.00	1.17
8.00	3.50	2.75	3.00	3.000	2.75	9.50	1.00	16.00	3.50	1.26
	4.00	2.75	3.00	3.000	2.75	9.50	1.00	16.00	3.50	1.26
	4.50	2.75	3.00	3.000	2.75	9.50	1.00	16.00	3.50	1.26
	5.00	2.75	3.00	3.000	2.75	9.50	1.00	16.00	3.50	1.26
	5.50	2.75	3.00	3.000	2.75	9.50	1.00	16.00	3.50	1.26

+ Plus Stroke

See Mount 24 on page 50 for Port Dimensions

Mounting Style and Installation Dimensions

NZ50 Cap Detachable
Clevis Mount
ANSI MP2



Bore	Rod Dia MM	B +.000/-.002	C	E	G	J	F	V	RM	FH	L
1.50	0.63	1.124	0.38	2.50	1.75	1.50	0.38	0.25	-	0.38	0.75
	1.00	1.499	0.50	2.50	1.75	1.50	0.38	0.50	-	0.38	0.75
2.00	1.00	1.499	0.50	3.00	1.75	1.50	0.63	0.25	-	0.63	1.25
	1.38	1.999	0.63	3.00	1.75	1.50	0.63	0.38	-	0.63	1.25
2.50	1.00	1.499	0.50	3.50	1.75	1.50	0.50	0.38	2.63	0.63	1.25
	1.38	1.999	0.63	3.50	1.75	1.50	0.63	0.38	-	0.63	1.25
	1.75	2.374	0.75	3.50	1.75	1.50	0.63	0.50	-	0.63	1.25
3.25	1.38	1.999	0.63	4.50	2.00	1.75	0.59	0.41	3.25	0.75	1.50
	1.75	2.374	0.75	4.50	2.00	1.75	0.75	0.38	-	0.75	1.50
	2.00	2.624	0.88	4.50	2.00	1.75	0.75	0.38	-	0.75	1.50
4.00	1.75	2.374	0.75	5.00	2.00	1.75	0.59	0.53	3.88	0.88	2.13
	2.00	2.624	0.88	5.00	2.00	1.75	0.59	0.53	4.00	0.88	2.13
	2.50	3.124	1.00	5.00	2.00	1.75	0.59	0.66	4.44	0.88	2.13
5.00	2.00	2.624	0.88	6.50	2.00	1.75	0.59	0.53	4.00	0.88	2.25
	2.50	3.124	1.00	6.50	2.00	1.75	0.59	0.66	4.44	0.88	2.25
	3.00	3.749	1.00	6.50	2.00	1.75	0.72	0.53	5.25	0.88	2.25
	3.50	4.249	1.00	6.50	2.00	1.75	0.72	0.53	5.63	0.88	2.25
6.00	2.50	3.124	1.00	7.50	2.25	2.25	0.59	0.66	4.44	1.00	2.50
	3.00	3.749	1.00	7.50	2.25	2.25	0.72	0.53	5.25	1.00	2.50
	3.50	4.249	1.00	7.50	2.25	2.25	0.72	0.53	5.63	1.00	2.50
	4.00	4.749	1.00	7.50	2.25	2.25	0.88	0.38	6.44	1.00	2.50
7.00	3.00	3.749	1.00	8.50	2.75	2.75	0.72	0.53	5.25	1.00	3.00
	3.50	4.249	1.00	8.50	2.75	2.75	0.72	0.53	5.63	1.00	3.00
	4.00	4.749	1.00	8.50	2.75	2.75	0.88	0.38	6.44	1.00	3.00
	4.50	5.249	1.00	8.50	2.75	2.75	0.88	0.38	7.13	1.00	3.00
	5.00	5.749	1.00	8.50	2.75	2.75	0.88	0.38	7.56	1.00	3.00
8.00	3.50	4.249	1.00	9.50	3.00	3.00	0.72	0.53	5.63	1.00	3.25
	4.00	4.749	1.00	9.50	3.00	3.00	0.88	0.38	6.44	1.00	3.25
	4.50	5.249	1.00	9.50	3.00	3.00	0.88	0.38	7.13	1.00	3.25
	5.00	5.749	1.00	9.50	3.00	3.00	0.88	0.38	7.56	1.00	3.25
	5.50	6.249	1.00	9.50	3.00	3.00	0.88	0.38	8.38	1.00	3.25

+ Plus Stroke

Mounting Style and Installation Dimensions

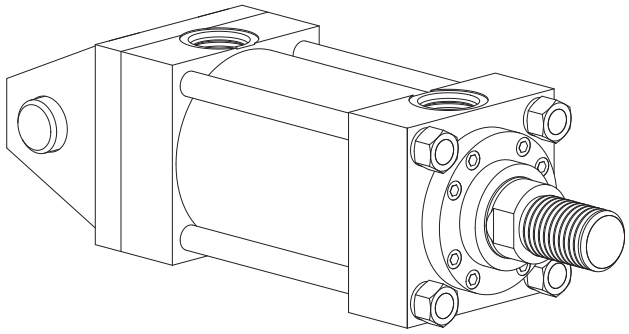
NZ50 Cap Detachable Clevis Mount

ANSI MP2

These mounts are for applications in which the machine member travels in a curved path within one plane.
These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See page 75 for stroke limitations.

NOTE
For strokes in excess of 24 inches, see "Stop tube selection" on page 72.
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excess side loading on the bearing and piston. This will lead to premature failure.

For applications with small amounts of misalignment, consider the spherical bearing mount NZ11.



Bore	Rod Dia MM	M	CB	CD+.000/ -.002	CW	LR	MR	LB+	XD+	Piston Thick.	K
1.50	0.63	0.50	0.75	0.500	0.50	0.56	0.56	4.63	6.75	1.38	0.41
	1.00	0.50	0.75	0.500	0.50	0.56	0.56	4.63	7.13	1.38	0.41
2.00	1.00	0.75	1.25	0.750	0.63	1.06	1.06	4.63	7.88	1.38	0.55
	1.38	0.75	1.25	0.750	0.63	1.06	1.06	4.63	8.13	1.38	0.55
2.50	1.00	0.75	1.25	0.750	0.63	1.06	1.06	4.75	8.00	1.50	0.55
	1.38	0.75	1.25	0.750	0.63	1.06	1.06	4.75	8.25	1.50	0.55
	1.75	0.75	1.25	0.750	0.63	1.06	1.06	4.75	8.50	1.50	0.55
3.25	1.38	1.00	1.50	1.000	0.75	1.25	1.13	5.50	9.38	1.75	0.67
	1.75	1.00	1.50	1.000	0.75	1.25	1.13	5.50	9.63	1.75	0.67
	2.00	1.00	1.50	1.000	0.75	1.25	1.13	5.50	9.75	1.75	0.67
4.00	1.75	1.38	2.00	1.375	1.00	1.88	1.75	5.75	10.63	2.00	0.78
	2.00	1.38	2.00	1.375	1.00	1.88	1.75	5.75	10.75	2.00	0.78
	2.50	1.38	2.00	1.375	1.00	1.88	1.75	5.75	11.00	2.00	0.78
5.00	2.00	1.75	2.50	1.750	1.25	1.94	1.88	6.25	11.38	2.50	0.92
	2.50	1.75	2.50	1.750	1.25	1.94	1.88	6.25	11.63	2.50	0.92
	3.00	1.75	2.50	1.750	1.25	1.94	1.88	6.25	11.63	2.50	0.92
	3.50	1.75	2.50	1.750	1.25	1.94	1.88	6.25	11.63	2.50	0.92
6.00	2.50	2.00	2.50	2.000	1.25	2.06	2.13	7.38	13.13	2.88	1.03
	3.00	2.00	2.50	2.000	1.25	2.06	2.13	7.38	13.13	2.88	1.03
	3.50	2.00	2.50	2.000	1.25	2.06	2.13	7.38	13.13	2.88	1.03
	4.00	2.00	2.50	2.000	1.25	2.06	2.13	7.38	13.13	2.88	1.03
7.00	3.00	2.50	3.00	2.500	1.50	2.56	2.50	8.50	14.75	3.00	1.17
	3.50	2.50	3.00	2.500	1.50	2.56	2.50	8.50	14.75	3.00	1.17
	4.00	2.50	3.00	2.500	1.50	2.56	2.50	8.50	14.75	3.00	1.17
	4.50	2.50	3.00	2.500	1.50	2.56	2.50	8.50	14.75	3.00	1.17
	5.00	2.50	3.00	2.500	1.50	2.56	2.50	8.50	14.75	3.00	1.17
8.00	3.50	2.75	3.00	3.000	1.50	2.69	2.75	9.50	16.00	3.50	1.26
	4.00	2.75	3.00	3.000	1.50	2.69	2.75	9.50	16.00	3.50	1.26
	4.50	2.75	3.00	3.000	1.50	2.69	2.75	9.50	16.00	3.50	1.26
	5.00	2.75	3.00	3.000	1.50	2.69	2.75	9.50	16.00	3.50	1.26
	5.50	2.75	3.00	3.000	1.50	2.69	2.75	9.50	16.00	3.50	1.26

+ Plus Stroke

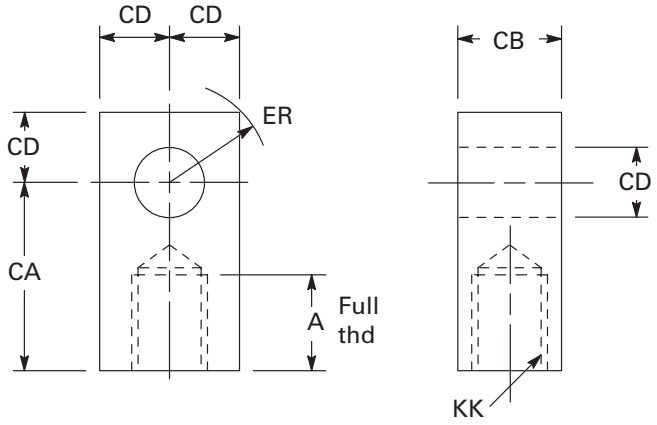
See Mount 24 on page 50 for Port Dimensions

Accessories

All rod accessories must be torqued against the rod shoulder.

Mounting brackets, rod clevises, and rod eyes for all NZ cylinders are available from Eaton. These accessories are detailed below showing part numbers and all pertinent dimensional data. Make sure the rod end type selected has threads that match the threads of any required accessory. Dimensions are in inches unless otherwise noted. When ordering, please specify the part name and part number.

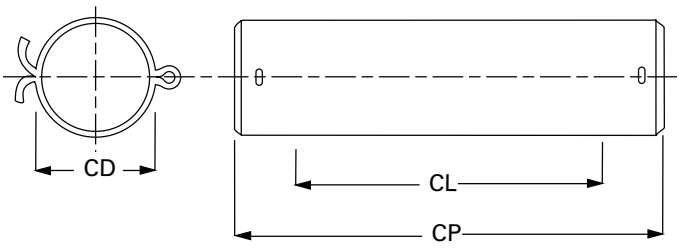
Rod Eye



* Recommended torque values using MoS_2 lubricant with 0.12 co-efficient of friction.

Bore	KK	Torque* (ft-lb)	Part Number	Weight (lbs)	A	CA	CB	CD	ER
1.50	7/16–20 UNF–2B	36	NZ-160	0.38	0.75	1.50	0.75	0.50	0.63
2.00	3/4–16 UNF–2B	125	NZ-260	1.25	1.13	2.06	1.25	0.75	0.88
2.50	3/4–16 UNF–2B	125	NZ-260	1.25	1.13	2.06	1.25	0.75	0.88
3.25	1–14 NS–2B	250	NZ-360	2.5	1.63	2.81	1.50	1.00	1.18
4.00	1 1/4–12 UNF–2B	460	NZ-460	5.94	2.00	3.44	2.00	1.38	1.56
5.00	1 1/2–12 UNF–2B	663	NZ-560	11.4	2.25	4.00	2.50	1.75	2.00
6.00	1 7/8–12 UNF–2B	944	NZ-660	15.1	3.00	5.00	2.50	2.00	2.25
7.00	2 1/4–12 UNF–2B	1315	NZ-760	27	3.50	5.81	3.00	2.50	2.81
8.00	2 1/2–12 UNF–2B	5050	NZ-860	35	3.50	6.12	3.00	3.00	3.25

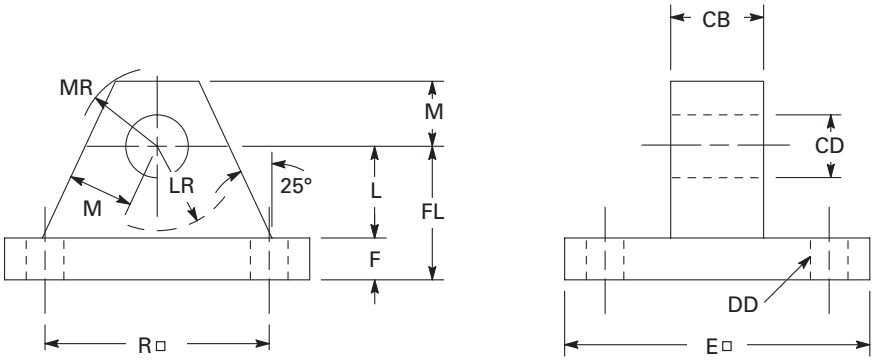
Pivot Pin



1. Pivot pins are furnished with clevis mounted cylinders.
2. CL = (2 x CW) + CB

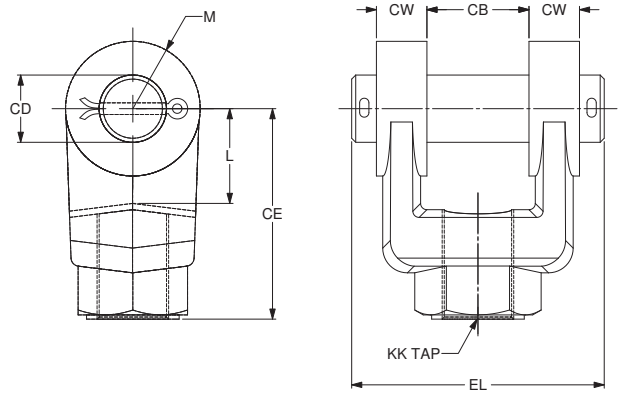
Bore	Part Number	CD	CL	CP
1.50	NZ83050A	0.50	1.75	2.38
2.00	NZ83075A	0.75	2.50	3.13
2.50	NZ83075A	0.75	2.50	3.13
3.25	NZ83100A	1.00	3.00	3.75
4.00	NZ83137A	1.38	4.00	4.75
5.00	NZ83175A	1.75	5.00	6.03
6.00	NZ83200A	2.00	5.00	6.03
7.00	NZ83250A	2.50	6.00	7.03
8.00	NZ83300A	3.00	6.00	7.13

Mounting Eye Bracket



Bore	Part Number	Weight (lbs)	E	F	L	M	R	CB	CD	DD	FL	LR	MR
1.50	NZ-152	0.94	2.50	0.38	0.75	0.50	1.63	0.75	0.50	0.38	1.13	0.50	0.56
2.00	NZ-252	3.19	3.50	0.63	1.25	0.75	2.55	1.25	0.75	0.50	1.88	1.00	1.06
2.50	NZ-252	3.19	3.50	0.63	1.25	0.75	2.55	1.25	0.75	0.50	1.88	1.00	1.06
3.25	NZ-352	7.17	4.50	0.88	1.50	1.00	3.25	1.50	1.00	0.63	2.38	1.00	1.13
4.00	NZ-452	11.7	5.00	0.88	2.13	1.38	3.82	2.00	1.38	0.63	3.00	1.13	1.75
5.00	NZ-552	22	6.50	1.13	2.25	1.75	4.95	2.50	1.75	0.88	3.38	1.75	1.88
6.00	NZ-652	34.5	7.50	1.50	2.50	2.00	5.73	2.50	2.00	1.00	4.00	2.00	2.13
7.00	NZ-752	55.4	8.50	1.75	3.00	2.50	6.58	3.00	2.50	1.13	4.75	2.50	2.50
8.00	NZ-852	72.5	9.50	2.00	3.25	2.75	7.50	3.00	3.00	1.25	5.25	2.75	2.75

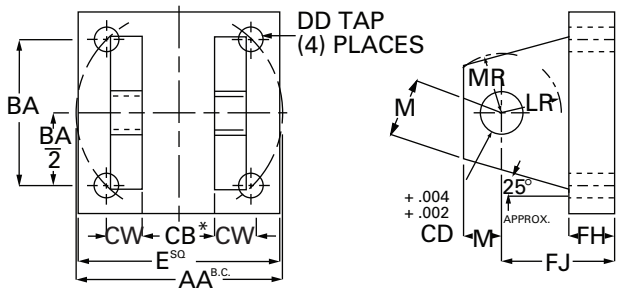
Rod Clevis



Bore	KK	Part Number	Weight (lbs)	L	M	CB	CD	CE	CW	EL
1.50	7/16–20 UNF–2B	NZ-162-10	0.56	0.75	0.50	0.75	0.50	1.50	0.50	2.38
2.00	3/4–16 UNF–2B	NZ-262-10	1.56	1.25	0.75	1.25	0.75	2.38	0.63	3.13
2.50	3/4–16 UNF–2B	NZ-262-10	1.56	1.25	0.75	1.25	0.75	2.38	0.63	3.13
3.25	1–14 NS–2B	NZ-362-10	3.31	1.50	1.00	1.50	1.00	3.13	0.75	3.75
4.00	1 1/4–12 UNF–2B	NZ-462-10	9.25	2.13	1.38	2.00	1.38	4.13	1.00	4.75
5.00	1 1/2–12 UNF–2B	NZ-562-10	14.62	2.25	1.75	2.50	1.75	4.50	1.25	6.03
6.00	1 7/8–12 UNF–2B	NZ-662-10	21	2.50	2.00	2.50	2.00	5.50	1.25	6.03
7.00	2 1/4–12 UNF–2B	NZ-762-10	36	3.00	2.50	3.00	2.50	6.50	1.50	7.03
8.00	2 1/2–12 UNF–2B	NZ-862-10	43	3.25	2.75	3.00	3.00	6.75	1.50	7.13

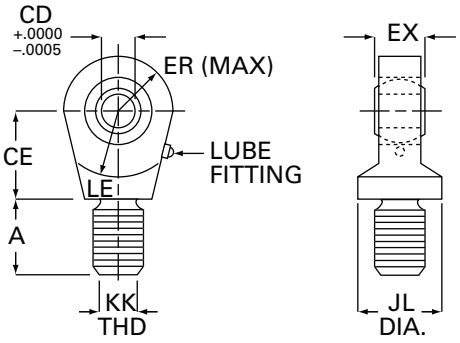
Accessories
(Continued...)

Clevis Bracket



Bore	Part No.	AA	BA	CB	CD	CW	DD	E	FH	FJ	LR	M	MR
1.50	NZ-133-03	2.30	1.63	0.78	0.500	0.50	3/8-24	2.50	0.38	1.38	0.50	0.50	0.56
2.00	NZ-133-04	2.90	2.06	0.59	0.750	0.63	1/2-20	3.00	0.63	1.88	1.00	0.75	0.69
2.50	NZ-133-05	3.60	2.56	0.59	0.750	0.63	1/2-20	3.50	0.63	1.88	1.06	0.75	0.69
3.25	NZ-133-065	4.60	3.25	1.53	1.000	0.75	5/8-18	4.50	0.75	2.25	1.25	1.00	1.13
4.00	NZ-133-08	5.40	3.81	2.03	1.375	1.00	5/8-18	5.00	0.88	3.00	1.88	1.38	1.75
5.00	NZ-133-10	7.00	4.94	2.53	1.750	1.25	7/8-14	6.50	0.88	3.13	2.00	1.75	1.88
6.00	NZ-133-12	8.10	5.75	2.53	2.000	1.25	1-14	7.50	1.00	3.50	2.13	2.00	2.13
7.00	NZ-133-14	9.30	6.59	3.03	2.500	1.50	1 1/8-12	8.50	1.00	4.00	2.63	2.50	2.50
8.00	NZ-133-16	10.60	7.50	3.03	3.000	1.50	1 1/4-12	9.50	1.00	4.25	2.88	2.75	2.75

Spherical Rod Eye

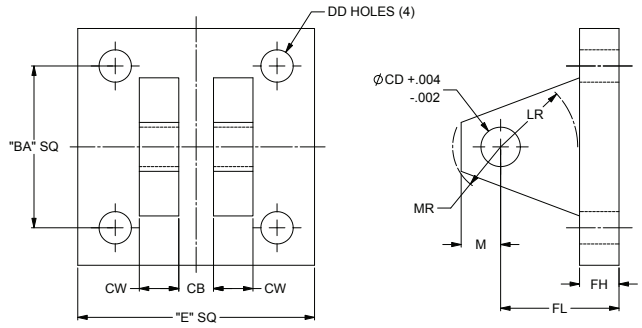


Bore	KK	Part Number	A	CD +.0000 -.0005	CE	EX	ER	JL	LE	Load Capacity (lbs)
1.50	7/16-20	NZ-160-SAB	0.69	0.5000	0.88	0.44	0.88	0.88	0.75	2600
2.00	3/4-16	NZ-260-SAB	1.00	0.7500	1.25	0.66	1.25	1.31	1.06	9400
2.50	3/4-16	NZ-260-SAB	1.00	0.7500	1.25	0.66	1.25	1.31	1.06	9400
3.25	1-14	NZ-360-SAB	1.50	1.0000	1.88	0.88	1.38	1.50	1.44	16800
4.00	1 1/4-12	NZ-460-SAB	2.00	1.3750	2.13	1.19	1.19	2.00	1.88	28600
5.00	1 1/2-12	NZ-560-SAB	2.13	1.7500	2.50	1.22	2.19	2.25	2.13	43000
6.00	1 7/8-12	NZ-660-SAB	2.88	2.0000	2.75	1.75	2.63	2.75	2.50	70000

Accessories - For Spherical Bushing Mounted Cylinder

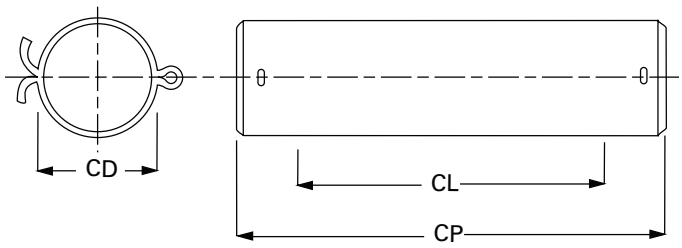
(Continued...)

Clevis Bracket



Bore	Part No.	BA	CB	CD	CW	DD	E	FH	FL	LR	M	MR
1.50	6000422-01	2.05	0.44	0.500	0.50	0.41	3.00	0.50	1.50	0.94	0.50	0.62
2.00	6000422-02	2.76	0.66	0.750	0.62	0.53	3.75	0.62	2.00	1.38	0.88	1.00
2.50	6000422-02	2.76	0.66	0.750	0.62	0.53	3.75	0.62	2.00	1.38	0.88	1.00
3.25	6000422-03	4.10	0.88	1.000	0.75	0.53	5.50	0.75	2.50	1.69	1.00	1.19
4.00	6000422-04	4.95	1.19	1.375	1.00	0.66	6.50	0.88	3.50	2.44	1.38	1.62
5.00	6000422-05	6.58	1.53	1.750	1.25	0.91	8.50	1.25	4.50	2.88	1.75	2.06
6.00	6000422-06	7.92	1.75	2.000	1.50	0.91	10.62	1.50	5.00	3.31	2.00	2.38

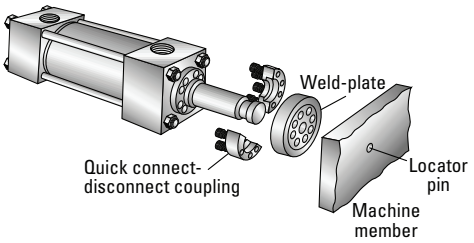
Pivot Pin

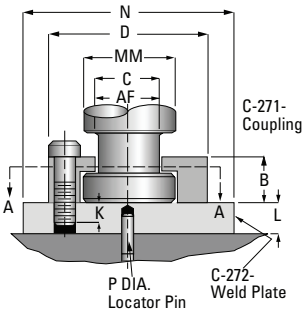


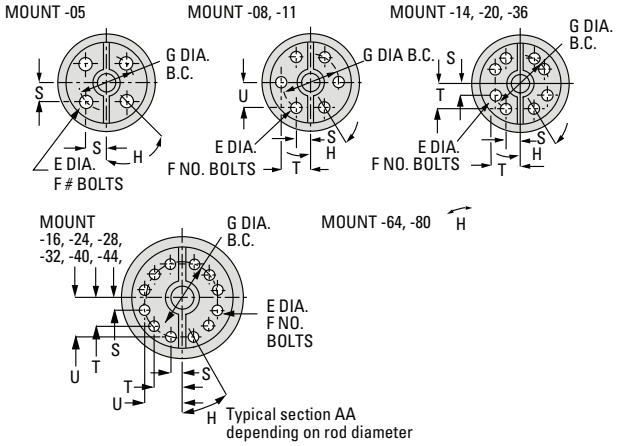
Bore	Part Number	CD	CL	CP
1.50	6856A-1-10	2.05	0.44	0.500
2.00	6856A-2-10	2.76	0.66	0.750
2.50	6856A-2-10	2.76	0.66	0.750
3.25	6856A-3-10	4.10	0.88	1.000
4.00	6856A-4-10	4.95	1.19	1.375
5.00	6856A-5-10	6.58	1.53	1.750
6.00	NZ83200A	7.92	1.75	2.000

Rod End Couplings

Used with the Hydro-Line style 10 Rod End, the Hydro-Line Rod End Coupling provides for close lateral alignment between the rod end and machine member. The two-piece steel coupling features high tensile strength socket head cap screws (with safety factor designed to take full load), permits quick assembly/disassembly for fast and easy installation and servicing.





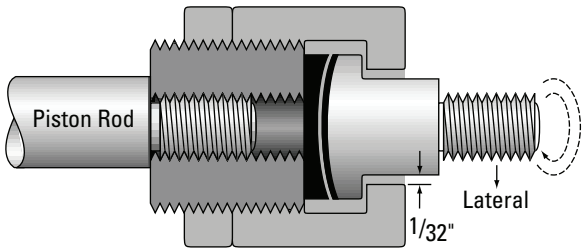


Coupling and Weld plate Assembly	Coupling NZ-271-	Rod Dia (MM)	AF	B	C	D	E	F	G	H	K
NZ-275-05	NZ-271-05	0.63	0.38	0.44	0.41	1.50	0.22	4.00	1.12	45°	0.44
NZ-275-08	NZ-271-08	1.00	0.69	0.62	0.75	2.00	0.28	6.00	1.50	30°	0.38
NZ-275-11	NZ-271-11	1.38	0.88	0.69	0.94	2.50	0.34	6.00	2.00	30°	0.56
NZ-275-14	NZ-271-14	1.75	1.12	0.88	1.18	3.00	0.41	8.00	2.38	22° 30′	0.62
NZ-275-16	NZ-271-16	2.00	1.38	1.25	1.44	3.50	0.41	12.00	2.69	15°	0.75
NZ-275-20	NZ-271-20	2.50	1.75	1.38	1.88	4.25	0.53	8.00	3.44	22° 30′	0.88
NZ-275-24	NZ-271-24	3.00	2.25	1.88	2.38	5.00	0.53	12.00	4.00	15°	0.88
NZ-275-28	NZ-271-28	3.50	2.50	2.00	2.62	5.88	0.66	12.00	4.69	15°	1.00
NZ-275-32	NZ-271-32	4.00	3.00	2.00	3.12	6.38	0.66	12.00	5.18	15°	1.00
NZ-275-36	NZ-271-36	4.50	3.50	2.38	3.62	6.88	0.78	8.00	5.69	22° 30′	1.12
NZ-275-40	NZ-271-40	5.00	3.88	2.50	4.00	7.38	0.66	12.00	6.18	15°	1.25
NZ-275-44	NZ-271-44	5.50	4.38	3.12	4.50	8.25	0.78	12.00	6.88	15°	1.38

Weld Plate NZ-272-	L	N	P	Sco. Hd. Cap Screws	Bolt Torq. Ft. lb.	S	T	U	X
NZ-272-05	0.50	2.00	0.25	#10-24x.88	5	0.40	–	–	–
NZ-272-08	0.50	2.50	0.25	1/4″-20x1.0	14	0.38	0.75	0.65	–
NZ-272-11	0.62	3.00	0.25	5/16″-18x1.25	30	0.50	1.00	0.87	–
NZ-272-14	0.75	3.50	0.25	3/8″-16x1.5	52	0.45	1.10	–	–
NZ-272-16	0.88	4.00	0.38	3/8″-16x2.0	52	0.35	0.95	1.30	–
NZ-272-20	1.00	5.00	0.38	1/2″-13x2.25	128	0.66	1.59	–	–
NZ-272-24	1.00	5.50	0.38	1/2″-13x2.75	128	0.52	1.41	1.93	–
NZ-272-28	1.12	6.50	0.38	5/8″-11x3.0	255	0.61	1.66	2.26	–
NZ-272-32	1.12	7.00	0.38	5/8″-11x3.0	255	0.67	1.83	2.51	–
NZ-272-36	1.25	7.50	0.38	3/4″-10x3.5	450	1.09	2.63	–	–
NZ-272-40	1.38	8.00	0.38	5/8″-11x3.75	255	0.80	2.19	2.99	–
NZ-272-44	1.50	9.00	0.38	3/4″-10x4.5	450	0.89	2.43	3.32	–

Self-Aligning Coupler

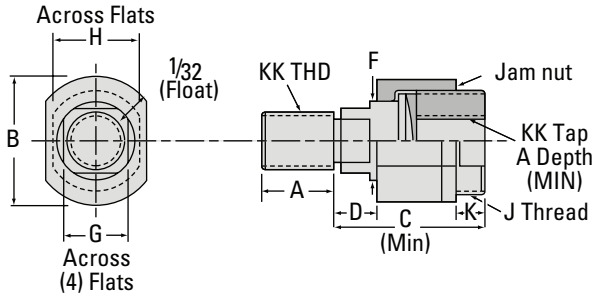
Lateral movement (on push only) and radial movement provide precision alignment between cylinder and machine. Couplers preset with proper clearances and completely lubricated at factory before shipping.



Self-aligning Coupler

Note

When ordering oversize and 2:1 rod cylinders, specify modification to suit standard rod diameter's coupler.



Self-aligning Rod End Coupler

Part Number	Rod Diameter	A	B	C	D	F	G	H	J	K	KK	Max. Pull at Yield
AC-2-05	0.63	0.75	1.25	2.00	0.50	0.63	0.50	0.81	1-14	0.31	7/16-20	8,320
AC-2-08	1.00	1.13	1.69	2.31	0.50	0.97	0.81	1.13	1 3/8-12	0.50	3/4-16	35,000
AC-2-11	1.38	1.63	2.38	2.91	0.50	3.47	1.16	1.63	1 7/8-12	0.69	1-14	64500
AC-2-14	1.75	2.00	2.63	3.59	0.75	1.72	1.44	2.00	2 1/4-12	0.84	1 1/4-12	82,550
AC-2-16	2.00	2.25	3.00	4.16	0.88	1.97	1.75	2.38	2 5/8-12	0.91	1 1/2-12	128,340
AC-2-20	2.50	3.00	3.75	5.44	1.00	2.47	2.13	3.00	3 1/4-12	1.31	1 7/8-12	231,000
AC-2-24	3.00	3.50	4.25	6.19	1.00	2.97	*	3.38	3 3/4-12	1.19	2 1/4-12	289,200
AC-2-28	3.50	3.50	5.00	6.44	1.00	3.47	*	4.00	4 1/2-12	1.50	2 1/2-12	342,400
AC-2-36	4.50	4.50	6.00	7.88	1.00	4.47	*	4.75	5 1/4-12	1.63	3 1/4-12	475,500
AC-2-44	5.50	5.50	7.25	9.38	1.00	5.47	*	5.75	6 1/2-12	1.88	4-12	750,010

* Four 1/2" diameter x 1/2" deep spanner holes instead of flats.

Rod End Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod ends configuration for your application.

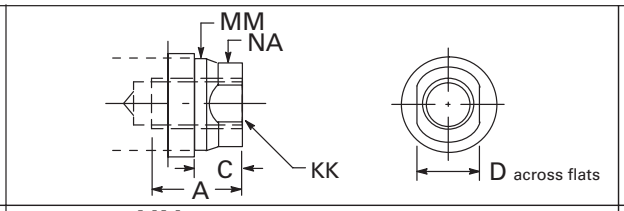
Twelve different inch and Metric rod ends configurations are available. If a custom design is required contact your local Eaton sales engineer and we will build to your requirements.

Table on page 75 gives maximum allowable push length at various operating pressures for available rod diameters. Rod ends on rigid mount should be supported. Longer strokes allowable for pull only applications.
Contact your local Eaton sales engineer for application assistance if necessary

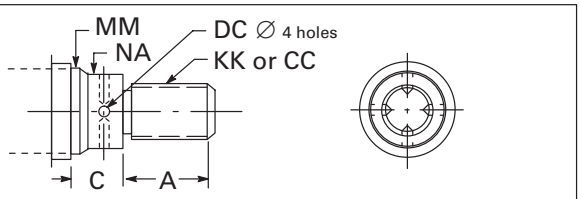
Note: Code 0 , 1, and N threads are to ISO 4395 and are based on the metric fine pitch series. Rod end accessories locknuts, tooling and guages are available. These threads are also specified in ISO 6020-2 (160 Bar compact) cylinder series. Code 7 and L threads are based on the closest metric threads to the UN series and are recommended for replacement only.

Inch Rod Ends

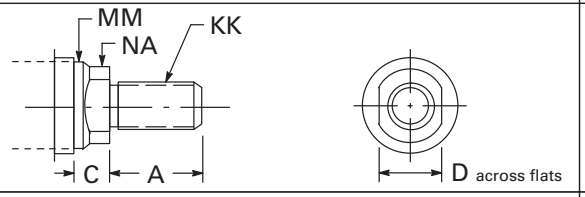
Code 2



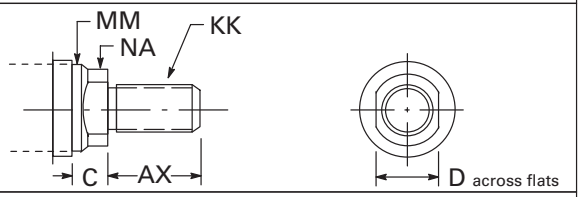
For rod sizes $3^1/_2$" thru $5^1/_2$"



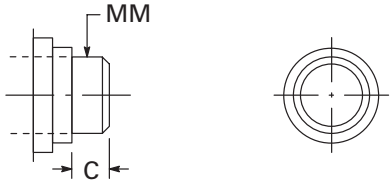
Code 5



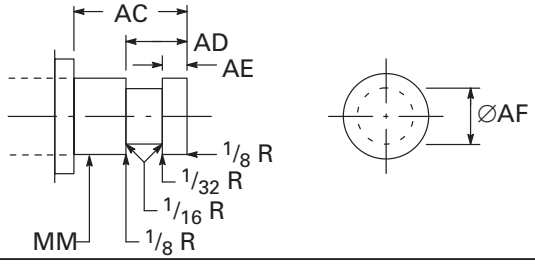
Code K



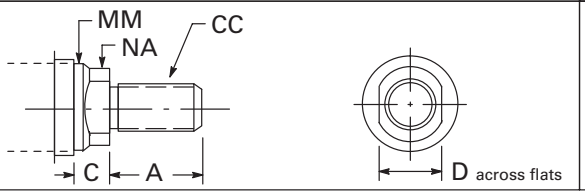
Code 6



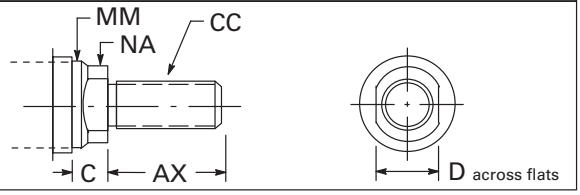
Code G



Code 9



Code M

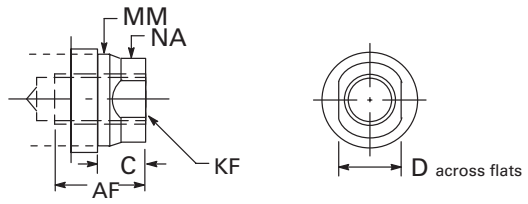
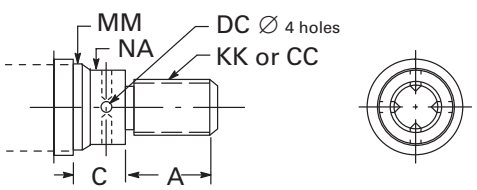
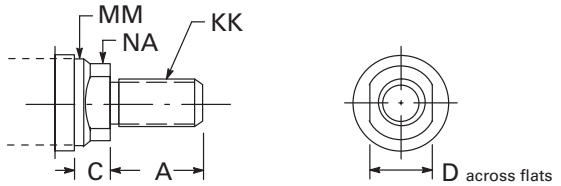
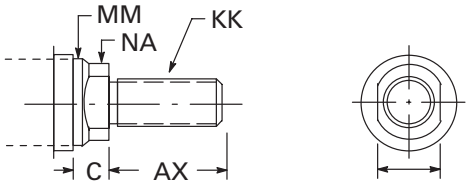
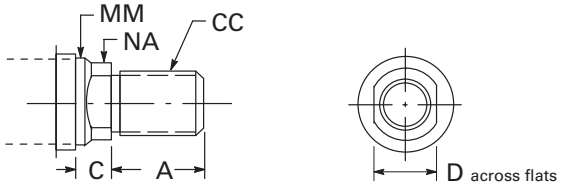
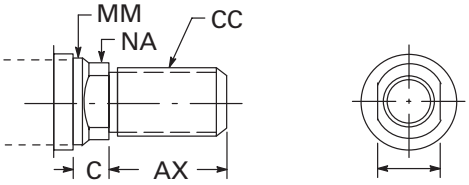


Rod Φ										UN(F) Thread		
MM	**A**	**C**	**D**	**AC**	**AD**	**AF**	**AE**	**AX**	**DC**	**CC**	**KK**	**NA**
0.625	0.75	0.38	0.50	1.13	0.63	0.38	0.25	1.13	-	1/2-10	7/16-20	0.585
1.000	1.13	0.50	0.88	1.50	0.94	0.69	0.38	1.69	-	7/8-14	3/4-16	0.968
1.375	1.63	0.63	1.13	1.75	1.06	0.88	0.38	2.44	-	1 1/4-12	1-14	1.343
1.750	2.00	0.75	1.50	2.00	1.31	1.13	0.50	3.00	-	1 1/2-12	1 1/4-12	1.718
2.000	2.25	0.88	1.75	2.63	1.69	1.38	0.63	3.38	-	1 3/4-12	1 1/2-12	1.953
2.500	3.00	1.00	2.13	3.25	1.94	1.75	0.75	4.50	-	2 1/4-12	1 7/8-12	2.437
3.000	3.50	1.00	2.63	3.63	2.44	2.25	0.88	5.25	-	2 3/4-12	2 1/4-12	2.937
3.500	3.50	1.00	3.00	4.38	2.69	2.50	1.00	5.25	-	3 1/4-12	2 1/2-12	3.437
4.000	4.00	1.00	-	4.50	2.69	3.00	1.00	6.00	0.50	3 3/4-12	3-12	3.906
4.500	4.50	1.00	-	5.25	3.19	3.50	1.50	6.75	0.50	4 1/2-12	3 1/4-12	4.406
5.000	5.00	1.00	-	5.38	3.19	3.88	1.50	7.50	0.50	4 3/4-12	3 1/2-12	4.906
5.500	5.50	1.00	-	6.25	3.94	4.38	1.88	8.25	0.50	5 1/4-12	4-12	5.406

*** Dimensions are in Inches**

Rod End Types
(Continued...)

Metric Rod Ends

Code 1		For rod sizes $3^1/_2$" thru $5^1/_2$"	
Code 7		L	
Code 0		N	

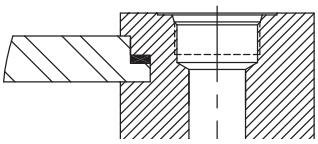
Rod Dia MM (in)	A	C	D	AF	AX	DC	Metric Thread CC (ISO 4395)	Metric Thread KF (ISO 4395)	Metric Thread KK (ISO 261)	NA
0.625	16	9,5	13	19,0	24	–	M12 x 1,25	M10 x 1,25	M10 x 1,5	14.86
1	28	12,7	22	28,6	40	–	*	M20 x 1,5	M20 x 1,5	24.59
1.375	36	15,9	30	41,3	54	–	M27 x 2	M27 x 2	M26 x 1,5	34.11
1.75	45	19,0	36	50,8	66	–	*	M33 x 2	M33 x 2	43.64
2	56	22,2	41	57,1	84	–	M42 x 2	M42 x 2	M39 x 2	49.61
2.5	63	25,4	55	76,2	96	–	*	M48 x 2	M48 x 2	61.90
3	85	25,4	65	88,9	128	–	M64 x 3	M58 x 2	M58 x 2	74.60
3.5	85	25,4	–	88,9	128	9,52	M64 x 3	M64 x 3	M64 x 2	87.30
4	95	25,4	–	101,6	140	11,11	M80 x 3	M80 x 3	M76 x 2	99.21
4.5	106	25,4	–	114,3	158	11,11	M90 x 3	M90 x 3	M80 x 2	111.91
5	112	25,4	–	139,7	168	12,70	M100 x 3	M100 x 3	M90 x 2	124.61
5.5	112	25,4	–	139,7	168	12,70	M100 x 3	M100 x 3	M100 x 2	137.31

*** Intermediate male metric thread not available for 1, 1 3/4, and 2 1/2 inch rod sizes. Use codes 7 or L.**
Note: Dimensions in milimeters.

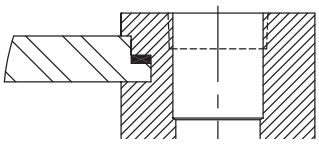
Port Type and Size

Available Ports
Series NZ cylinders are available with SAE straight thread O-ring ports and the alternate ports listed below. The table below lists the port types and sizes available for each bore diameter. The table on the next page lists the maximum piston velocities obtainable with each bore diameter and port type combination. Some mounting styles have port location restrictions. Check the port location table on page 68 for your particular mounting style. Where a port or port boss interferes with cylinder mounting, mounting should take precedence.

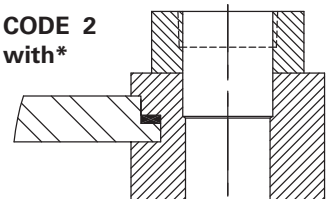
CODE 3 , 4, 5,



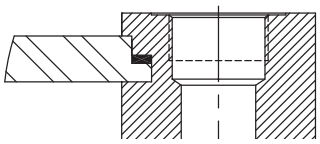
CODE D,1,2



CODE 2 with*



CODE H,7, 8, G, 9, 0, K, A, B

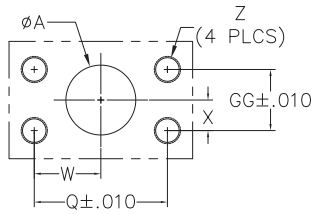


		Port Code												
		3	4	5	D	1		2	H	7		8	C	6
		SAE J1926 / UN O-ring			NPTF ∓ Pipe				BSPP ∓ ISO 228-1				SAE 518 Code 61 Flange	
							Oversize				Oversize			
Bore	Rod	Std	Over size	NFPA Std	Under Size	Std	Head	Cap	Under Size	Std	Head	Cap	Under Size	Std
1.50	0.63	# 6	# 10	# 8	3/8	1/2	3/4	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	NA
	1.00	# 6	# 10	# 8	3/8	1/2	3/4*	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	NA
2.00	1.00	# 6	# 10	# 8	3/8	1/2	3/4	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	NA
	1.38	# 6	# 10	# 8	3/8	1/2	3/4*	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	NA
2.50	1.00	# 6	# 10	# 8	3/8	1/2	3/4	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	0.50 **
	1.38	# 6	# 10	# 8	3/8	1/2	3/4	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	0.50 **
	1.75	# 6	# 10	# 8	3/8	1/2	3/4*	3/4	G 3/8	G 1/2	G 3/4*	G 3/4*	NA	NA
3.25	1.38	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75 **
	1.75	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75 **
	2.00	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75 **
4.00	1.75	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G 1	G 1	.50	0.75 **
	2.00	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75 **
	2.50	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75 **
5.00	2.00	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G 1	G 1	.50	0.75
	2.50	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75
	3.00	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75
	3.50	# 10	# 14	# 12	1/2	3/4	1	1	G 1/2	G 3/4	G1	G 1	.50	0.75
6.00	2.50	# 12	# 20	# 16	3/4	1	1 1/4	1 1/4	G 3/4	G 1	G 1 1/4	G 1 1/4	.75	1.00
	3.00	# 12	# 20	# 16	3/4	1	1 1/4	1 1/4	G 3/4	G 1	G 1 1/4	G 1 1/4	.75	1.00
	3.50	# 12	# 20	# 16	3/4	1	1 1/4	1 1/4	G 3/4	G 1	G 1 1/4*	G 1 1/4	.75	1.00
	4.00	# 12	# 20	# 16	3/4	1	1 1/4	1 1/4	G 3/4	G 1	G 1 1/4*	G 1 1/4	.75	1.00
7.00	3.00	# 16	# 24	# 20	1	1 1/4	1 1/2	1 1/2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.00	1.25
	3.50	# 16	# 24	# 20	1	1 1/4	1 1/2	1 1/2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.00	1.25
	4.00	# 16	# 24	# 20	1	1 1/4	1 1/2	1 1/2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.00	1.25
	4.50	# 16	# 24	# 20	1	1 1/4	1 1/2	1 1/2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.00	1.25
	5.00	# 16	# 24	# 20	1	1 1/4	1 1/2	1 1/2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.00	1.25
8.00	3.50	# 16	# 20	# 24	1 1/4	1 1/2	2	2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.25	1.50
	4.00	# 16	# 20	# 24	1 1/4	1 1/2	2	2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.25	1.50
	4.50	# 16	# 20	# 24	1 1/4	1 1/2	2	2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.25	1.50
	5.00	# 16	# 20	# 24	1 1/4	1 1/2	2	2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.25	1.50
	5.50	# 16	# 20	# 24	1 1/4	1 1/2	2	2	G 1	G 1 1/4	G 1 1/2	G 1 1/2	1.25	1.50

*** With Port Boss**
∓ NPTF and BSPP ports are not recommended for maximum reliability on new application
Following notes applies to 01,04 mounts
* Port Boss required for port position 1 and 3, These ports are not feasible for port position 2 & 4
** Port is not feasible for port position 2 and 4
Port at position 3 not available on 1.50",2.00"2.50", 3.25" and 4.00" for 03 mount

Port Type and Size
(Continued...)

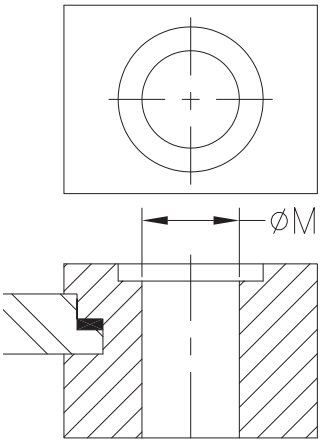
CODE C,6



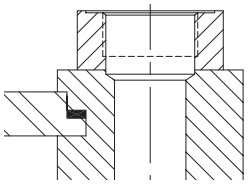
Dimensions in inches

Flange Size	A	Q	W	X	GG	Z
3/4 (-12)	0.75	1.875	0.94	0.44	0.875	3/8 (-16)
1 (-16)	1.00	2.062	1.03	0.52	1.031	3/8 (-16)
11/4 (-20)	1.25	2.312	1.16	0.59	1.118	7/16 (-14)
11/2 (-24)	1.50	2.750	1.38	0.70	1.406	1/2 (-13)

CODE M



CODE H,7, 8, G, 9, 0, K, A, B with*



		Port Code								
		G	9		0	K	A		B	M
		DIN 3852 Form X Metric				ISO 6149-1				Manifold
				Oversize				Oversize		
Bore	Rod	Under Size	Std	Head	Cap	Under Size	Std	Head	Cap	Std Φ M
1.50	0.63	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
	1.00	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
2.00	1.00	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
	1.38	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
2.50	1.00	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
	1.38	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
	1.75	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	M20 x 1.5	M22 x 1.5	M27 x 2*	M27 x 2*	9/16
3.25	1.38	M22 x 1.5	M27 x 2	M33 x 2*	M33 x 2*	M22 x 1.5	M27 x 2	M33 x 2*	M33 x 2*	3/4
	1.75	M22 x 1.5	M27 x 2	M33 x 2*	M33 x 2*	M22 x 1.5	M27 x 2	M33 x 2*	M33 x 2*	3/4
	2.00	M22 x 1.5	M27 x 2	M33 x 2*	M33 x 2*	M22 x 1.5	M27 x 2	M33 x 2*	M33 x 2*	3/4
4.00	1.75	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
	2.00	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
	2.50	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
5.00	2.00	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
	2.50	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
	3.00	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
	3.50	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	M22 x 1.5	M27 x 2	M33 x 2	M33 x 2	3/4
6.00	2.50	M27 x 1.5	M33 x 2	M42 x 2	M42 x 2	M27 x 1.5	M33 x 2	M42 x 2	M42 x 2	1
	3.00	M27 x 1.5	M33 x 2	M42 x 2	M42 x 2	M27 x 1.5	M33 x 2	M42 x 2	M42 x 2	1
	3.50	M27 x 1.5	M33 x 2	M42 x 2	M42 x 2	M27 x 1.5	M33 x 2	M42 x 2	M42 x 2	1
	4.00	M27 x 1.5	M33 x 2	M42 x 2*	M42 x 2	M27 x 1.5	M33 x 2	M42 x 2*	M42 x 2	1
7.00	3.00	M33 x 2	M42 x 2	M48 x 2	M48 x 2	M33 x 2	M42 x 2	M48 x 2	M48 x 2	1 3/8
	3.50	M33 x 2	M42 x 2	M48 x 2	M48 x 2	M33 x 2	M42 x 2	M48 x 2	M48 x 2	1 3/8
	4.00	M33 x 2	M42 x 2	M48 x 2	M48 x 2	M33 x 2	M42 x 2	M48 x 2	M48 x 2	1 3/8
	4.50	M33 x 2	M42 x 2	M48 x 2	M48 x 2	M33 x 2	M42 x 2	M48 x 2	M48 x 2	1 3/8
	5.00	M33 x 2	M42 x 2	M48 x 2	M48 x 2	M33 x 2	M42 x 2	M48 x 2	M48 x 2	1 3/8
8.00	3.50	M42 x 2	M48 x 2	NA	NA	M42 x 2	M48 x 2	NA	NA	1 5/8
	4.00	M42 x 2	M48 x 2	NA	NA	M42 x 2	M48 x 2	NA	NA	1 5/8
	4.50	M42 x 2	M48 x 2	NA	NA	M42 x 2	M48 x 2	NA	NA	1 5/8
	5.00	M42 x 2	M48 x 2	NA	NA	M42 x 2	M48 x 2	NA	NA	1 5/8
	5.50	M42 x 2	M48 x 2	NA	NA	M42 x 2	M48 x 2	NA	NA	1 5/8

Port Selections

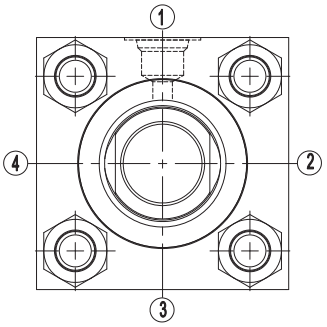
Use this table to determine which bore diameter, rod diameter and port combination will provide the piston velocity required for your application.

Bore ∅ in	Rod ∅ in	Fluid Required per Inch of stroke (gal)	(in³)	Port Codes 1,5,6,9 & A Flow (gpm)	Piston Velocity (In/sec)	Port Codes 2,4,0 & B Flow (gpm)	Piston Velocity (In/sec)	Port Code 3 Flow (gpm)	Piston Velocity (In/sec)	Port Code 7 Flow (gpm)	Piston Velocity (In/sec)	Port Code 8 Flow (gpm)	Piston Velocity (In/sec)
1.50	Cap	0.008	1.767	6.0	13.1	9.2	20.0	6.0	13.1	3.4	7.4	9.2	20.0
	0.63	0.006	1.460	6.0	15.8	9.2	24.3	6.0	15.8	3.4	9.0	9.2	24.3
	1.00	0.004	0.982	6.0	23.5	9.2	36.1	6.0	23.5	3.4	13.3	9.2	36.1
2.00	Cap	0.014	3.142	6.0	7.4	9.2	11.3	6.0	7.4	3.4	4.2	9.2	11.3
	1.00	0.010	2.356	6.0	9.8	9.2	15.0	6.0	9.8	3.4	5.6	9.2	15.0
	1.38	0.007	1.657	6.0	13.9	9.2	21.4	6.0	13.9	3.4	7.9	9.2	21.4
2.50	Cap	0.021	4.909	6.0	4.7	9.2	7.2	6.0	4.7	3.4	2.7	9.2	7.2
	1.00	0.018	4.123	6.0	5.6	9.2	8.6	6.0	5.6	3.4	3.2	9.2	8.6
	1.38	0.015	3.424	6.0	6.7	9.2	10.3	6.0	6.7	3.4	3.8	9.2	10.3
	1.75	0.011	2.503	6.0	9.2	9.2	14.1	6.0	9.2	3.4	5.2	9.2	14.1
3.25	Cap	0.036	8.296	14.5	6.7	20.2	9.4	14.5	6.7	9.2	4.3	27.9	12.9
	1.38	0.029	6.811	14.5	8.2	20.2	11.4	14.5	8.2	9.2	5.2	27.9	15.8
	1.75	0.026	5.891	14.5	9.5	20.2	13.2	14.5	9.5	9.2	6.0	27.9	18.2
	2.00	0.022	5.154	14.5	10.8	20.2	15.1	14.5	10.8	9.2	6.9	27.9	20.8
4.00	Cap	0.054	12.566	14.5	4.4	20.2	6.2	14.5	4.4	9.2	2.8	27.9	8.5
	1.75	0.044	10.161	14.5	5.5	20.2	7.7	14.5	5.5	9.2	3.5	27.9	10.6
	2.00	0.041	9.425	14.5	5.9	20.2	8.3	14.5	5.9	9.2	3.8	27.9	11.4
	2.50	0.033	7.658	14.5	7.3	20.2	10.2	14.5	7.3	9.2	4.6	27.9	14.0
5.00	Cap	0.085	19.635	14.5	2.8	20.2	4.0	14.5	2.8	9.2	1.8	27.9	5.5
	2.00	0.071	16.493	14.5	3.4	20.2	4.7	14.5	3.4	9.2	2.1	27.9	6.5
	2.50	0.064	14.726	14.5	3.8	20.2	5.3	14.5	3.8	9.2	2.4	27.9	7.3
	3.00	0.054	12.566	14.5	4.4	20.2	6.2	14.5	4.4	9.2	2.8	27.9	8.5
	3.50	0.043	10.014	14.5	5.6	20.2	7.8	14.5	5.6	9.2	3.5	27.9	10.7
6.00	Cap	0.122	28.274	27.9	3.8	45.5	6.2	27.9	3.8	14.5	2.0	45.5	6.2
	2.50	0.101	23.366	27.9	4.6	45.5	7.5	27.9	4.6	14.5	2.4	45.5	7.5
	3.00	0.092	21.206	27.9	5.1	45.5	8.3	27.9	5.1	14.5	2.6	45.5	8.3
	3.50	0.081	18.653	27.9	5.8	45.5	9.4	27.9	5.8	14.5	3.0	45.5	9.4
	4.00	0.068	15.708	27.9	6.8	45.5	11.2	27.9	6.8	14.5	3.6	45.5	11.2
7.00	Cap	0.167	38.485	45.5	4.6	67.4	6.7	45.5	4.6	27.9	2.8	67.4	6.7
	3.00	0.136	31.416	45.5	5.6	67.4	8.3	45.5	5.6	27.9	3.4	67.4	8.3
	3.50	0.125	28.863	45.5	6.1	67.4	9.0	45.5	6.1	27.9	3.7	67.4	9.0
	4.00	0.112	25.918	45.5	6.8	67.4	10.0	45.5	6.8	27.9	4.1	67.4	10.0
	4.50	0.098	22.580	45.5	7.8	67.4	11.5	45.5	7.8	27.9	4.8	67.4	11.5
	5.00	0.082	18.850	45.5	9.3	67.4	13.8	45.5	9.3	27.9	5.7	67.4	13.8
8.00	Cap	0.218	50.266	67.4	5.2	45.5	3.5	45.5	3.5	27.9	2.1	67.4	5.2
	3.50	0.176	40.644	67.4	6.4	45.5	4.3	45.5	4.3	27.9	2.6	67.4	6.4
	4.00	0.163	37.699	67.4	6.9	45.5	4.6	45.5	4.6	27.9	2.8	67.4	6.9
	4.50	0.149	34.361	67.4	7.6	45.5	5.1	45.5	5.1	27.9	3.1	67.4	7.6
	5.00	0.133	30.631	67.4	8.5	45.5	5.7	45.5	5.7	27.9	3.5	67.4	8.5
	5.50	0.115	26.507	67.4	9.8	45.5	6.6	45.5	6.6	27.9	4.1	67.4	9.8

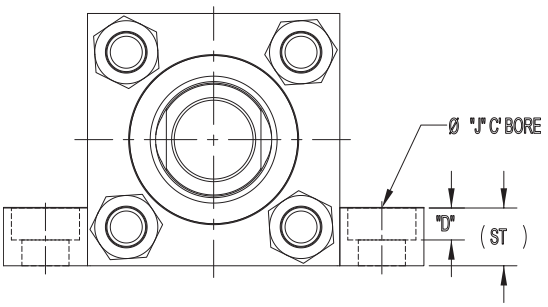
Note : Under size port velocities are not shown

Port Locations

Port locations are identified by viewing the cylinder from the head end (or from the mounting end of double rod cylinders). The location numbers are shown here.



Certain Port locations cannot be specified with some mounting styles. The table below indicates which of the head and cap port locations are available for each Series NZ mounting style.



Bore	J	D
1.50	0.625	0.22
2.00	0.812	0.38
2.50	1.188	0.7
3.25	1.188	0.44
4.00	1.562	0.66
5.00	1.562	0.062
6.00	2.00	-
7.00	2.312	0.31
8.00	2.312	-

Mounting Style code	Description	Head location 1	2	3	4	Cap location 1	2	3	4	5
01	Side Lug	A	W	A	W	A	W	A	W	A
02	Side Tapped	A	A	**N**	A	A	A	**N**	A	A
03	End Lug Mount	A	A	**N**	A	A	A	**N**	A	A
04	Keyed Side Lug	A	W	A	W	A	W	A	W	A
05	Keyed Tapped	A	A	N	A	A	A	**N**	A	A
07	Head Rectangular Flange	A	W	A	W	A	A	A	A	A
08	Head Square Flange	W	W	W	W	A	A	A	A	A
09	Head Rectangular	A	A	A	A	A	A	A	A	A
10	Clevis	A	A	A	A	A	A	A	A	**N**
11	Spherical Bushing	A	A	A	A	A	A	A	A	**N**
12	Cap Rectangular Flange	A	A	A	A	A	W	A	W	**N**
13	Cap Square Flange	A	A	A	A	W	W	W	W	**N**
14	Cap Rectangular	A	A	A	A	A	A	A	A	**N**
15	Intermediate Trunnion	A	A	A	A	A	A	A	A	A
16	Cap Trunnion	A	A	A	A	A	**N**	A	N	A
17	Head Trunnion	A	**N**	A	**N**	A	A	A	A	A
19	Centerline Lug	A	**N**	A	**N**	A	**N**	A	**N**	A
21	Cap End Extended Tie Rod	A	A	A	A	A	A	A	A	A
22	Head End Extended Tie Rod	A	A	A	A	A	A	A	A	A
23	Both Ends Extended Tie Rod	A	A	A	A	A	A	A	A	A
24	No Mount	A	A	A	A	A	A	A	A	A
25	Double Rod, Side Lug	A	A	A	A					
26	Double Rod, Tapped	A	A	**N**	A					
27	Double Rod, End Lug	A	A	**N**	A					
28	Double Rod, Keyed Side Lug	A	W	A	W					
29	Double Rod, Keyed Tapped	A	A	N	A					
31	Double Rod, Rectangular Flange	A	W	A	W					
32	Double Rod, Square Flange	W	W	W	W					
33	Double Rod, Head Rectangular	A	A	A	A					
34	Double Rod, Intermediate Trunnion	A	A	A	A					
35	Double Rod, Head Trunnion	A	**N**	A	**N**					
37	Double Rod, Centerline Lug	A	**N**	A	**N**					
39	Double Rod, Extended Tie Rod	A	A	A	A					
40	Double Rod, Both Ends Extended Tie Rod	A	A	A	A					
41	Double Rod, No Mount	A	A	A	A					
47	Cap Fixed Eye	A	A	A	A	A	A	A	A	**N**
48	Cap Detachable Eye	A	A	A	A	A	A	A	A	**N**
50	Cap Detachable Clevis	A	A	A	A	A	A	A	A	**N**

A - Available
N - Not available
W - Port is available without port Boss only
Refer Page 65 for port Boss requirements, refer Page 71 for switch availability

Sealing system

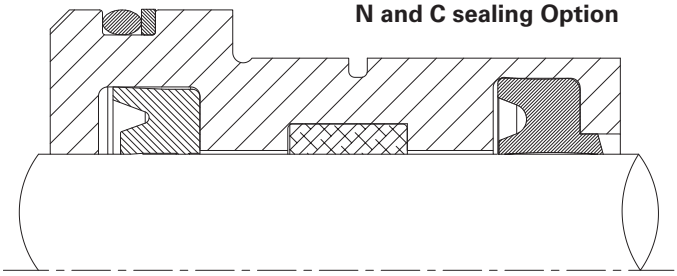
Four different sealing systems are available in Series NZ cylinders.

Determine the correct seal code for your application, then enter it as item 8 in the model code.

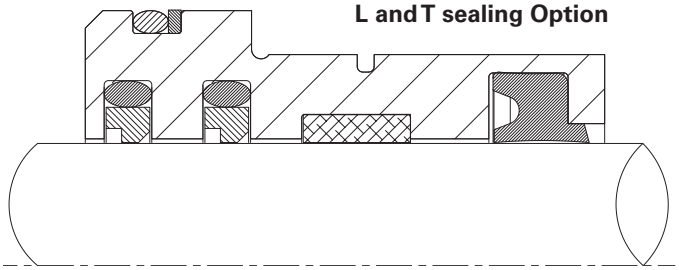
Code	Fluid	Temperature (°F)	Max. Speed (ft/s)	Application
N	Mineral oil, petroleum base	–31 to 176	2.25	Normal, typical industrial
	Automotive transmission fluid			
L	Mineral oil	–31 to 248	15	Low friction servo
	Water glycol (HFC) Oil-in-water emulsions (HFA) Water-in-oil emulsions (HFB)	50 to 158	3	Fire retardant fluids
T	Mineral oil	–13 to 392	15	High temperature
	Phosphate esters, petroleum oil blends Fyrquel 220, 550, 1000 Hought-O-Safe 1340 Pydraul 200, 230C, 280, 312C, 540C, A200	32 to 392	15	Fire retardant fluids
C	Mineral oil, petroleum base	–31 to 176	2.25	Normal, typical industrial
	Automotive transmission fluid			

Rod Seal Configuration

N and C sealing Option

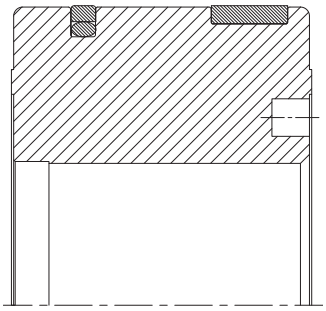


L and T sealing Option

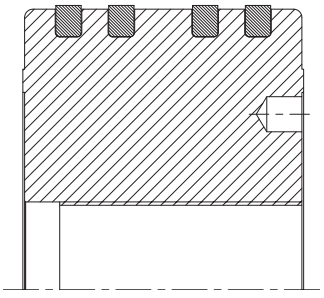


Piston Seal Configuration

N, L and T Seal Option



C Seal Option

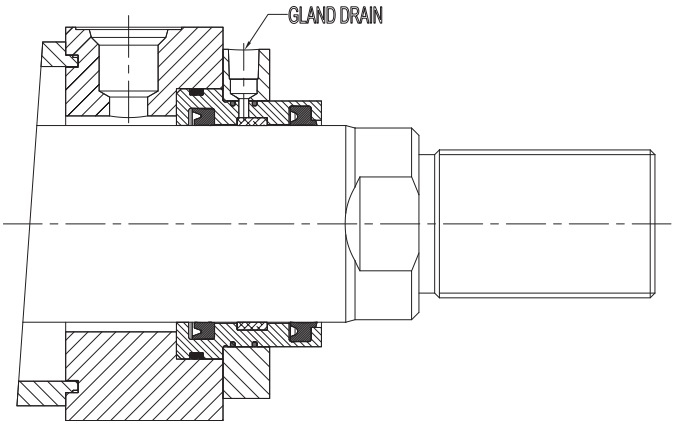


Gland drains /Air bleeds

Gland Drain Option

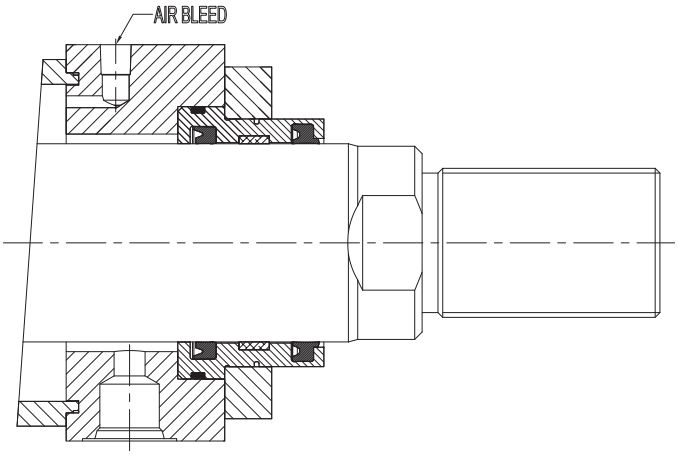
Gland drains are primarily used for long stroke cylinders (over 30 inches) and when extended speed exceeds retract speed.

The gland drain is used to return any accumulated fluid, between the rod seal and wiper, to tank. This is used in servo applications, for ultra-low leakage requirements, or for remote visual monitoring of rod seal leakage for preventive maintenance purposes.



Air Bleed Option

Usually cylinders will bleed themselves of air when ports are vertical, on top. Bleed ports are often desirable to remove entrapped air, when the ports are on the bottom. High performance and high speed or heavy load applications are a few examples where air bleeds are desirable.



Proximity switches for series NZ cylinder are inductive type switches with sensing probe that "looks" at the cushion collar or button to provide extended or retracted indication. Since the probe is inside the cylinder. Harsh external environments don't affect sensing. The 2-wire circuit will operate on AC or DC and works as reliably as a programmable controller. Proximity switches will meet UL requirements for 3000-psi (210 bar) hydraulic cylinder.

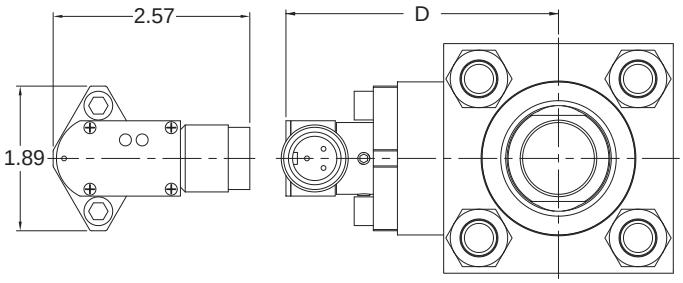
Switch will allow 304° rotations. Short Circuit protection is standard feature on Proximity proximity switch. SCP protects the switch from shorts in load or line. Upon sensing short condition, the switch assumes a non-conducting mode. The fault condition must be removed and power turned off in order to reset the switch.

This feature prevents unintended automatic restarts. The switch indicated when it is in SCP mode by flashing both leads.

Torque ¼-20 mounting screws to 15 ft-lb (20 Nm)

Series PS 200 2-wire AC / DC Proximity Switch

Pressure	3000 PSI
Sensing Range	0.08 in ± 10 %
Sensing distance from End of stroke	0.25" - 0.38" stroke to go
Operating temperature range	-13° to +158° F
Repeatability	0.001 in
Switching differential	≤ 15%
Supply Voltage	20 - 250 V AC / DC
Voltage drop	≤ 6 V
Load Current capacity @ 25° C	5-400 mA
Inrush current	≤ 3A (t ≤ 20ms)
Indicating LED's (Standard)	1 lit:Power on non-conducting 2 lit: Target present (both flashing = SCP mode)



Note : NA - Not available
Proximity switch for 1.50" at postion 2 & 4 is not available
For 07, 08 and 12 , 13 mounts

BORE	ROD	"D" Max.	"D" Max. 09 mounts Pos. 2 & 4	"D" Max. 14 mounts Pos. 2 & 4
1.50	0.63	2.99	4.03	2.99
	1.00	3.12	4.16	3.12
	CAP	2.99	3.80	3.80
2.00	1.00	3.37	5.00	3.37
	1.38	3.30	4.34	3.30
	CAP	3.08	3.92	4.73
2.50	1.00	3.35	5.00	4.19
	1.38	3.53	5.15	3.53
	1.75	3.49	4.53	3.49
	CAP	3.92	3.92	4.73
3.25	1.38	4.40	6.12	4.40
	1.75	4.59	5.40	4.59
	2.00	3.82	5.47	4.65
	CAP	4.03	4.03	5.75
4.00	1.75	4.59	6.30	4.59
	2.00	4.78	5.59	4.78
	2.50	4.07	5.72	4.91
	CAP	4.84	4.84	5.74
5.00	2.00	5.59	7.28	5.59
	2.50	5.03	6.74	5.03
	3.00	5.28	6.99	5.28
	3.50	5.40	7.12	5.40
	CAP	5.03	5.03	6.72
6.00	2.50	5.84	7.53	5.84
	3.00	6.09	7.78	6.09
	3.50	5.38	7.91	6.22
	4.00	5.66	7.37	5.66
	CAP	6.18	6.18	7.41
7.00	3.00	6.09	8.22	6.09
	3.50	6.34	8.47	6.34
	4.00	6.47	8.15	6.47
	4.50	6.03	8.53	6.03
	5.00	6.19	8.68	6.19
	CAP	6.18	6.18	NA
8.00	3.50	7.24	NA	7.24
	4.00	6.47	8.60	6.47
	4.50	6.84	8.97	6.84
	5.00	7.00	8.68	7.00
	5.50	6.47	8.96	6.47
	CAP	6.97	6.97	NA

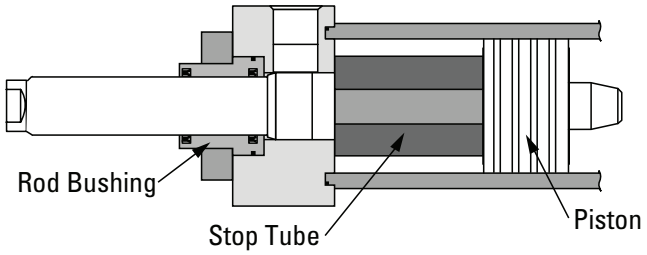
Stop Tubes

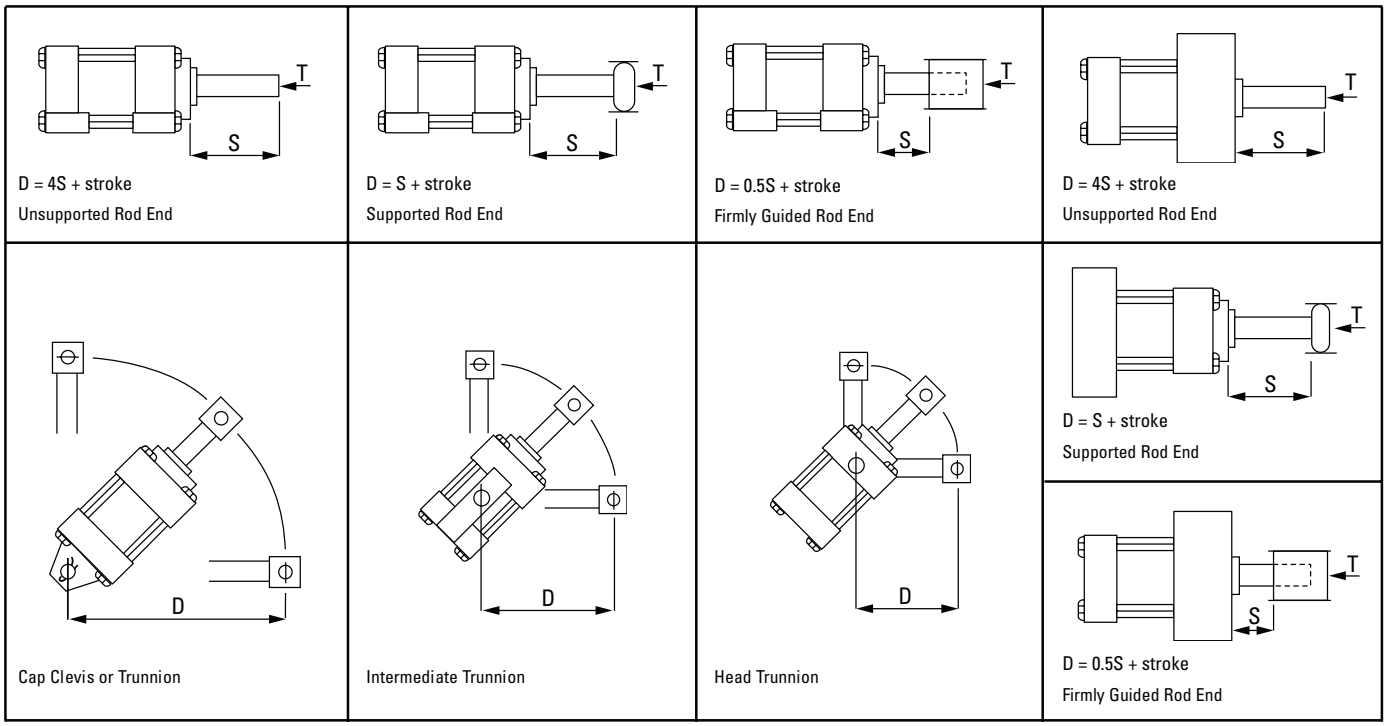
Stop tubes are located between the piston and the rod shoulder on the head end of the cylinder. Bearing loading is reduced by separating the piston and the rod bushing. Bearing wear and tendency to buckle is reduced.

To determine if a stop tube is required and the length ofstop tube needed, use the following procedure: Determine the value of D with the piston rod in the fully extended position. If the value of D is under 40", no stop tube is needed. If D is greater than 40", one inch of stop tube is recommended for each 10", or fraction thereof, beyond 40".

Special Note

When specifying stroke and stop tube lengths, please include net working stroke plus stop tube length.



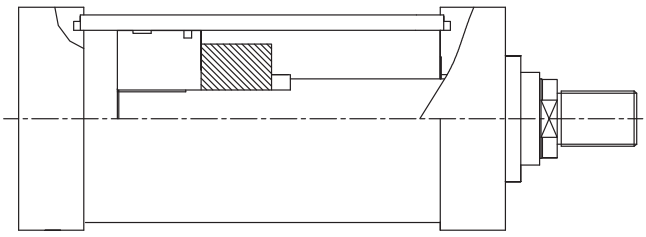


Stop Tubes

There are two stop tube designs depending on the length required.

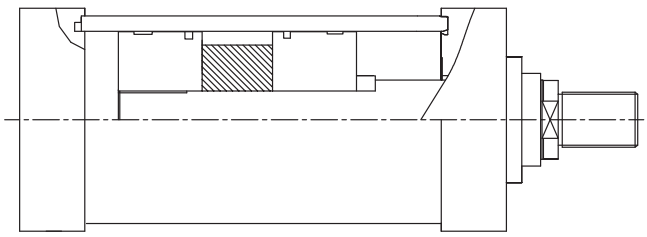
Design A

The standard stop tube design for lengths under 10".



Design B

The standard stop tube design for lengths over 10". Note that the piston's effective bearing area is doubled, in addition to gaining the normal increased minimum distance between bearing points.

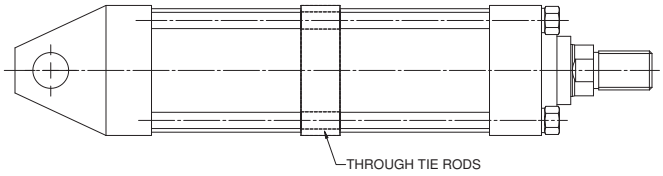


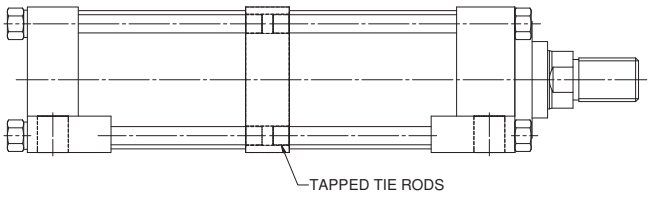
Tie rod Spacers and Center supports

A tie rod spacer or center support should be applied when the stroke length exceeds 20 times the bore diameter.

Tie rod spacer

Tie rod spacers and center supports are used to improve the structural rigidity of long stroke tie rod cylinders. The spacers have through holes for the tie rods and are held in place on the cylinder barrel with a small tack weld or set screw. The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).





Tie rod center support

The center support has side mounting lugs similar to side lug mount heads and serves as an additional mounting location. The tie rods are threaded into the center support and it becomes a load-carrying component of the cylinder assembly.

The exact location of the tie rod center support is generally optional, which greatly increases the flexibility in mounting a long stroke cylinder.

Bore & Rod Diameter

Cylinder Size Selection

To choose the proper size of cylinder for your application, first determine the maximum push or pull force required to do the job. Then use the below table to select the cylinder that will provide that force.

Remember that force capabilities derieved from charts and formulas may be therotically correct, but other factor must be considered. Be sure to allow for pressure drop between pump outlet and cylinder port. Also some of a cylinder force is used up overcoming seal friction and lesser extent the inertia of the piston itself.

Bore ϕ in	Rod ϕ in	Work Area (in²)	Maximum Force (lbf) At working pressure(psi)					
			500 (psi)	750 (psi)	1000 (psi)	1500 (psi)	2000 (psi)	3000 (psi)
1.50	-	1.767	884	1325	1767	2651	3534	5301
	0.625	1.460	730	1095	1460	2191	2921	4381
	1	0.982	491	736	982	1473	1964	2945
2.00	-	3.142	1571	2356	3142	4712	6283	9425
	1	2.356	1178	1767	2356	3534	4712	7069
	1.375	1.657	828	1243	1657	2485	3313	4970
2.50	-	4.909	2454	3682	4909	7363	9817	14726
	1	4.123	2062	3093	4123	6185	8247	12370
	1.375	3.424	1712	2568	3424	5136	6848	10272
	1.75	2.503	1252	1878	2503	3755	5007	7510
3.25	-	8.296	4148	6222	8296	12444	16592	24887
	1.375	6.811	3405	5108	6811	10216	13622	20433
	1.75	5.891	2945	4418	5891	8836	11781	17672
	2	5.154	2577	3866	5154	7731	10308	15463
4.00	-	12.566	6283	9425	12566	18850	25133	37699
	1.75	10.161	5081	7621	10161	15242	20322	30483
	2	9.425	4712	7069	9425	14137	18850	28274
	2.5	7.658	3829	5743	7658	11486	15315	22973
5.00	-	19.635	9817	14726	19635	29452	39270	58905
	2	16.493	8247	12370	16493	24740	32987	49480
	2.5	14.726	7363	11045	14726	22089	29453	44179
	3	12.566	6283	9425	12566	18850	25133	37699
	3.5	10.014	5007	7510	10014	15021	20028	30042
6.00	-	28.274	14137	21206	28274	42412	56549	84823
	2.5	23.366	11683	17524	23366	35048	46731	70097
	3	21.206	10603	15904	21206	31809	42412	63617
	3.5	18.653	9327	13990	18653	27980	37307	55960
	4	15.708	7854	11781	15708	23562	31416	47124
7.00	-	38.485	19242	28863	38485	57727	76969	115454
	3	31.416	15708	23562	31416	47124	62832	94248
	3.5	28.863	14432	21648	28863	43295	57727	86590
	4	25.918	12959	19439	25918	38877	51836	77755
	4.5	22.580	11290	16935	22580	33870	45161	67741
	5	18.850	9425	14137	18850	28274	37699	56549
8.00	-	50.266	25133	37699	50266	75398	100531	150797
	3.5	40.644	20322	30483	40644	60967	81289	121933
	4	37.699	18850	28274	37699	56549	75398	113098
	4.5	34.361	17181	25771	34361	51542	68723	103084
	5	30.631	15315	22973	30631	45946	61261	91892
	5.5	26.507	13254	19880	26507	39761	53015	79522

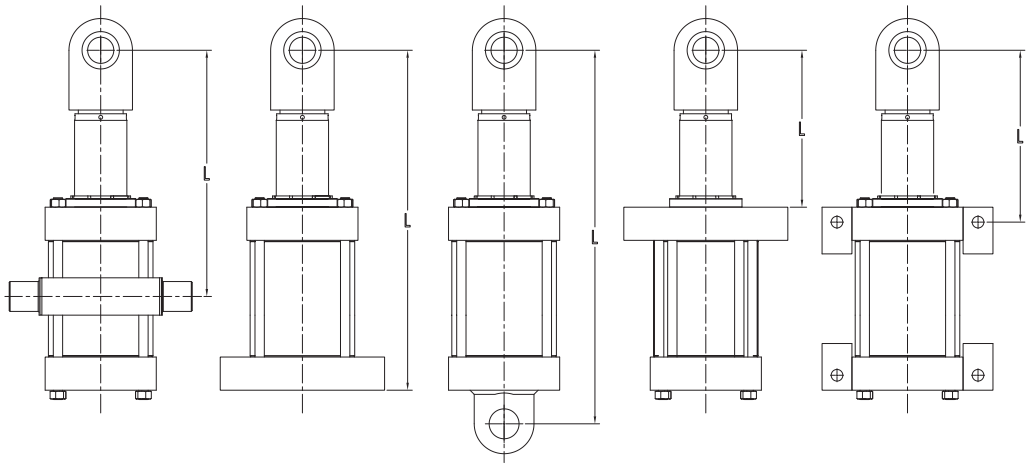
Maximum allowable Push stroke
(Recomended "L")

In Push application, a cylinder acts as loaded column.

To use the side table first go to section for your mounting style. Then locate the column which is closest to, but not below, your application's operating pressure. The intersection of operating pressure and Bore /rod size represents the allowable length (L) in full extended condition.

The maximum allowable length "L" is based on column laoding analysis only and does not consider side loading, stop tube requirments or oter cylinder stroke limitations.

For pressure above 3000 PSI Consult your local Eaton representative.



Maximum Length L (in) at Working Pressure (psi) { Length L in full extend condition}

Bore	Rod	Rigid Mount (01,02,04,05,07,08,09,12, 13,14,19,21,22,23,24)							Swivel Mount (10,11,15,16,17,47,48,50)						
ϕ	ϕ	3000	2000	1500	1000	750	500	250	3000	2000	1500	1000	750	500	250
in	in	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi
1.50	0.63	14	19	22	27	31	38	54	10	13	15	19	22	27	38
	1.00	40	48	56	69	79	97	137	28	34	40	48	56	69	97
2.00	1.00	30	36	42	51	59	73	103	21	26	30	36	42	51	73
	1.38	56	69	79	97	112	137	194	40	49	56	69	79	97	137
2.50	1.00	20	19	34	41	47	58	82	14	13	24	29	34	41	58
	1.38	45	55	63	78	90	110	156	32	39	45	55	63	78	110
	1.75	73	89	103	126	145	178	252	51	63	73	89	103	126	178
3.25	1.38	32	42	49	60	69	85	120	23	30	35	42	49	60	85
	1.75	56	69	79	97	112	137	194	40	48	56	69	79	97	137
	2.00	73	89	103	127	146	179	253	52	63	73	89	103	127	179
4.00	1.75	43	56	64	79	91	111	157	31	39	45	56	64	79	111
	2.00	59	73	84	103	119	145	206	42	51	59	73	84	103	145
	2.50	93	114	131	161	186	227	321	66	80	93	114	131	161	227
5.00	2.00	40	38	67	82	95	116	165	28	27	47	58	67	82	116
	2.50	74	91	105	129	148	182	257	52	64	74	91	105	129	182
	3.00	107	131	151	185	214	262	370	76	93	107	131	151	185	262
	3.50	145	178	206	252	291	356	504	103	126	145	178	206	252	356
6.00	2.50	56	76	87	107	124	151	214	40	54	62	76	87	107	151
	3.00	89	109	126	154	178	218	308	63	77	89	109	126	154	218
	3.50	121	148	171	210	242	297	420	86	105	121	148	171	210	297
	4.00	158	194	224	274	317	388	548	112	137	158	194	224	274	388
7.00	3.00	72	93	108	132	153	187	264	51	66	76	93	108	132	187
	3.50	104	127	147	180	208	254	360	73	90	104	127	147	180	254
	4.00	136	166	192	235	271	332	470	96	118	136	166	192	235	332
	4.50	172	210	243	297	344	421	595	121	149	172	210	243	297	421
	5.00	212	260	300	367	424	519	735	150	184	212	260	300	367	519
8.00	3.50	87	111	129	157	182	223	315	62	79	91	111	129	157	223
	4.00	119	145	168	206	237	291	411	84	103	119	145	168	206	291
	4.50	150	184	213	260	301	368	521	106	130	150	184	213	260	368
	5.00	186	227	262	321	371	454	643	131	161	186	227	262	321	454
	5.50	224	275	317	389	449	550	778	159	194	224	275	317	389	550

Calculation according to Euler

$$P = \frac{C\pi^2 EI}{FL^2} \qquad \frac{L}{k} \triangleright \left[\frac{2C\pi^2 E}{S_y}\right]$$

Calculation according to Jb Johnson

$$P = \frac{AS_y}{F}\left[1 - \frac{S_y L^2}{4C\pi^2 Ek^2}\right] \qquad \frac{L}{k} \leq \left[\frac{2C\pi^2 E}{S_y}\right]$$

End conditions for above chart

Mount	Condition
Rigid Mounts	Fixed-Guided
Swivel Mounts	Pin-Pin

F	Safety factor,	
P	Critical load, Lb	
E	Modulus of elasticity, 30000000 psi	
L	Length, in	
I	Moment of inertia, in^4	
C	End condition	
	Fixed-Guided	2
	Fixed-Fixed	4
	Pin-Pin	1
A	Rod area, in²	
k	Radius of gyration, in	

Cushions are recommended when piston speed is in excess of 20-25 feet per minute. Cushions decelerate the piston and rod assembly at the end of the stroke, lessening the noise and shock and increasing cylinder life.

Heavy loads attached to the piston and rod assembly should be stopped by external means, such as shock absorbers, springs, decelerating valves, etc.

Use the information below, along with the examples on page 77 to determine if standard cushioning is sufficient for your application.

FORCE FACTOR CHART

Force Factors (a = v2 x .001294)

PISTON	VELOCITY
ips	a
1	0.001
2	0.005
3	0.012
4	0.021
5	0.032
6	0.047
7	0.063
8	0.083
9	0.105
10	0.129
11	0.157
12	0.186
13	0.219
14	0.254
15	0.291
16	0.331
17	0.374
18	0.419
19	0.467
20	0.518
21	0.571
22	0.626
23	0.685
24	0.745
25	0.809

(continued)

PISTON	VELOCITY
ips	a
26	0.000
27	0.000
28	0.00
29	0.00
30	0.00
31	0.00
32	0.00
33	0.00
34	0.00
35	0.00
36	0.00
37	0.00
38	0.00
39	0.00
40	0.00
41	0.00
42	0.00
43	0.00
44	0.00
45	0.00
46	0.00
47	0.00
48	0.00
49	0.00
50	0.00

GENERAL FORMULAS

Horizontal motion	F_{acc} or $F_{dec} = W \times {}^{a}/_{s}$
Vertical motion, decelerating downward or accelerating upward	F_{acc} or $F_{dec} = (W \times {}^{a}/_{s}) + W$
Vertical motion, decelerating upward or accelerating downward	F_{acc} or $F_{dec} = (W \times {}^{a}/_{s}) - W$
Frictional force	$F_f = u \times W$
Total cushioning force (+ F_f if load accelerating, — F_f if load decelerating)	$F_t = F_{acc}$ or $F_{dec} + F_p \pm F_f$
Contained pressure	$P_c = F_t/A_{cc}$ or F_t/A_{hc}

FORCE FACTOR TERMINOLOGY

TERMS USED	EXPLANATION	UNITS
W	Weight of load	pounds
Ab	Bore area	square inches
Ah	Ab less rod area	square inches
Acc	Ab less cap plunger cross- sectional area	square inches
Ahc	Ab less head plunger cross- sectional area	square inches
a	Force factor	-
s	Acceleration or deceleration distance	inches
u	Coefficient of friction of laod motions	Horizontal = .15 Vertical = 0
v	Velocity	inches per second (ips)
Facc	Force needed to accelerate a weight	pounds
Fdec	Force needed to decelerate a weight	pounds
Ff	Friction force due to load motion	pounds
Fp	Driving pressure force	pounds
Ft	Total cushioning force	pounds
Pp	Pump pressure	inches per second (ips)
Pc	Contained cushioning pressure	inches per second (ips)

Acceleration and Deceleration Forces

The a force factors shown are used to determine the forces required to accelerate or decelerate a weight through a given distance, s (Refer to **Force Factor Chart**).

- If the motion of the load is horizontal, use the general formula F_{acc} or $F_{dec} = W \times {}^{a}/_{s}$.
- If the motion of the load is vertical and is being decelerated downward or accelerated upward, use the general formula F_{acc} or $F_{dec} = (W \times {}^{a}/_{s}) + W$.
- If the motion of the load is vertical and is being decelerated upward or accelerated downward, use the general formula F_{acc} or $F_{dec} = (W \times {}^{a}/_{s}) - W$.
- Friction due to load motion affects F_t. Add F_f to F_t if the load is accelerating. Subtract F_f from F_t if the load is decelerating.
- Cylinder friction is negligible.

Note

The contained cushioning pressure must not exceed 5000 psi. If the standard cushion results in a too high pressure, then a longer cushion spud must be specified.

HYDRAULIC EXAMPLES

Example A

Horizontal deceleration

NZ series cylinder, 3 1/4" bore, 1 3/8" rod (standard), cushioning at cap.

A weight of 3000 lbs., moving at 25 ips, and driven by a pump pressure of 1000 psi should stopped in 1 1/4". Assume the coefficient of friction to be .15.

1. F_f = **u x W**
   = .15 x 3000 lbs.
   F_f = 450 lbs.
2. F_p = A_h x P_p
   A_h = A_b – rod area
   = 8.45 sq. in.– 1.49 sq. in.
   A_h = 6.96 sq. in.
   F_p = 6.96 sq. in. x 1000 psi
   F_p = 6960 lbs.
3. F_{dec} = **W x** $^a/_s$
   = 3000 lbs. x .809/1.25 in.
   F_{dec} = 1942 lbs.
4. F_t = F_{dec} + F_p – F_f
   = 1942 + 6960 – 450
   F_t = 8452 lbs.
5. P_c = F_t / **Acc**
   = 8452 lbs./7.85 sq. in.
   P_c = 1077 psi

This figure does not exceed the pressure capability of the cylinder, therefore, the standard cushion is acceptable.

Example B

Horizontal deceleration

NZ series cylinder, 6" bore, 2 1/2" rod (standard), cushioning at head. The cylinder is mounted vertical rod down, with a 2000 lb. load attached to the rod end. Pump pressure is 750 psi, the load is moving at 40 ips, and must be stopped in 1 3/8" There is no load friction.

1. F_p = P_p x A_b
   = 750 psi x 28.56 sq. in.
   F_p = 21,420 lbs.
3. F_{dec} = **(W x** $^a/_s$**) + W**
   = (2000 lbs. x 2.07/1.375 in.) + 2000 lbs.
   F_{dec} = 5011 lbs.
4. F_t = F_p + F_{dec}
   = 21,420 + 5011 lbs.
   F_t = 26,431 lbs.
5. P_c = F_t / A_{hc}
   = 26,431 lbs. /22.07 sq. in.
   P_c = 1198 psi

This does not exceed the pressure capability of the cylinder, therefore, the standard cushion is acceptable.

Note

If your calculations show you need a longer cushion than standard, longer cushions are available in 1/4 inch increments.

Bore Size	Rod Dia	Cushion Length (in.)		Effective Cushion Area (in.²)	
		Head	Cap	Head (A_{hc})	Cap (A_{cc})
1.50	0.63	1.13	1.81	1.24	1.70
	1.00	1.13	1.81	0.73	1.70
2.00	1.00	1.13	1.13	2.13	2.91
	1.38	1.13	1.13	1.17	2.90
2.50	1.00	1.13	1.13	3.92	4.77
	1.38	1.13	1.13	2.96	4.77
	1.75	1.13	1.13	1.89	4.77
3.25	1.38	1.38	1.25	6.38	7.85
	1.75	1.38	1.25	5.31	7.85
	2.00	1.38	1.25	4.02	7.85
4.00	1.75	1.38	1.25	9.62	12.16
	2.00	1.38	1.25	8.33	12.16
	2.50	1.38	1.25	6.27	12.16
5.00	2.00	1.38	1.25	15.44	18.64
	2.50	1.38	1.25	13.38	18.64
	3.00	1.31	1.25	10.93	18.64
	3.50	1.31	1.25	8.08	18.64
6.00	2.50	1.38	1.50	22.07	26.16
	3.00	1.31	1.50	19.62	26.16
	3.50	1.31	1.50	16.77	26.16
	4.00	1.50	1.50	15.20	26.16
7.00	3.00	2.00	2.00	29.88	36.42
	3.50	2.00	2.00	27.03	36.42
	4.00	2.00	2.00	25.46	36.42
	4.50	2.00	2.00	19.29	36.42
	5.00	2.00	2.00	17.70	36.42
8.00	3.50	2.00	2.00	38.85	48.24
	4.00	2.00	2.00	37.28	48.24
	4.50	2.00	2.00	31.11	48.24
	5.00	2.00	2.00	29.52	48.24
	5.50	2.00	2.00	29.52	48.24

Eaton
Hydraulics Operations USA
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
Tel: 952-937-9800
Fax: 952-294-7722
www.hydraulics.eaton.com

Eaton
Hydraulics Operations Europe
Route de la Longeraie 7
1110 Morges
Switzerland
Tel: +41 (0) 21 811 4600
Fax: +41 (0) 21 811 4601

Eaton
Hydraulic Operations Asia Pacific
11th Floor Hong Kong New World Tower
300 Huaihai Zhong Road
Shanghai 200021
China
Tel: 86-21-6387-9988
Fax: 86-21-6335-3912

Vickers

Printed in USA
Document No. V-CYTR-MC002-E
November 2007

Vickers®

Cylinders

Series TE/TF/TL Cylinders

Nominal Pressure: 250 psi Air / 1000 psi Hydraulic

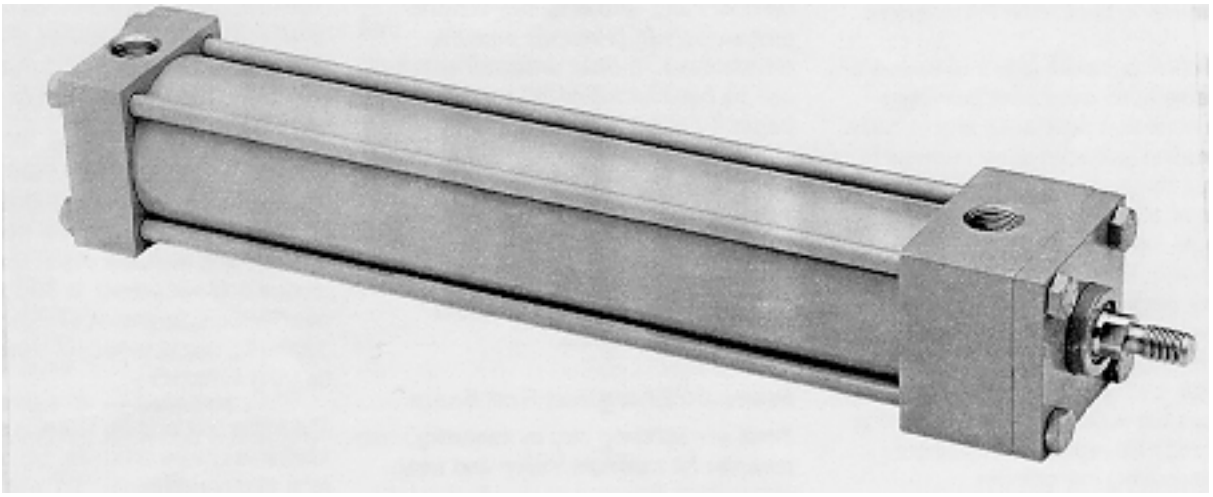


Table of Contents

Features and Benefits

Hard Chrome Plated Piston Rod. 100,000 psi minimum yield strength steel, polished to 8 micro inch finish. Provides extra corrosion resistance and virtually eliminates galling or other damage from normal contaminants.

Urethane Rod Wiper is self compensating for extended wear and is standard on air cylinders. Dual metallic rod scrapers are standard for hydraulic service and optional for air service.

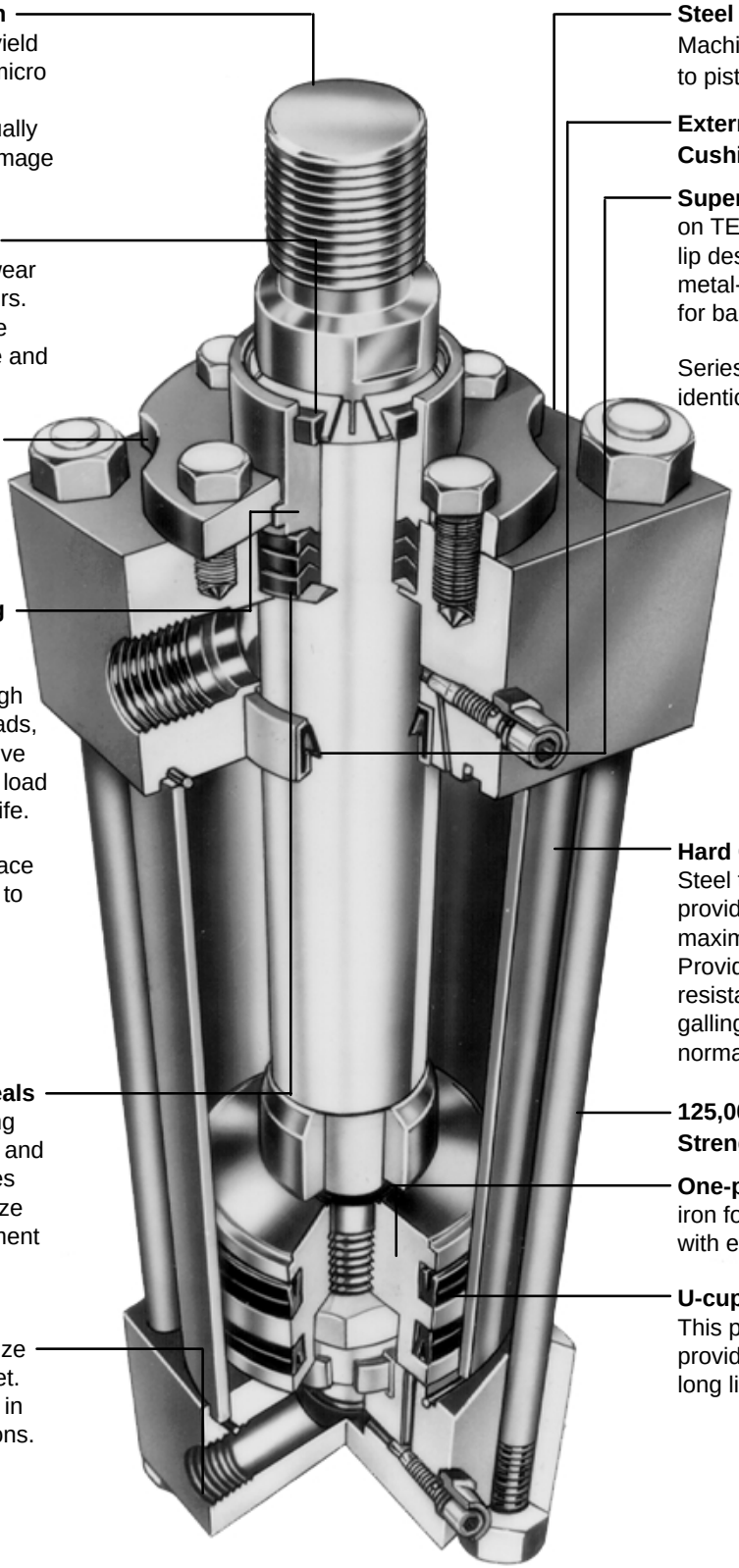
QC-100 Quick-change Rod Bearing Assembly permits easy replacement of rod seals without disassembling cylinder.

Fe_3N Cast Iron Rod Bearing is result of extensive testing and retesting of bearing materials in exceptionally tough applications with high side loads, high temperatures and abrasive contamination. Provides high load capacity and extremely long life.

Special nitriding process surface hardens close-grain cast iron to reduce wear while adding corrosion resistance. FE_3N bearings are up to 98% more durable than typical bronze bearings.

Pressure Energized Rod Seals are activated only by operating pressure for minimum friction and wear. Multiple-lip seal provides three seals in one. Male bronze seal adapter maintains alignment and permits seal response to pressure.

Full-flow NPTF Ports minimize pressure drop on inlet or outlet. SAE ports are recommended in Series TF hydraulic applications.



Steel Heads and Mountings. Machined relief for rapid fluid flow to piston.

Externally Adjustable Cushion Screws

Super Cushion Seals featured on TE/TL air cylinders. Resilient lip design eliminates metal-to-metal contact and need for ball checks.

Series TF hydraulic cylinders are identical to Series TE, except cushioned models have patented floating ring super cushion seal. Floating action of ring permits it to absorb external piston rod side loading without binding.

Both cushion systems provide positive cushion sealing with minimum wear and maximum piston acceleration on return stroke.

Hard Chrome Plated Body. Steel tubing is precision honed to provide optimum surface finish for maximum piston seal life. Provides extra corrosion resistance and virtually eliminates galling or other damage from normal contaminants.

125,000 psi Minimum Yield Strength Steel Tie Rods

One-piece Piston is solid cast iron for maximum bearing surface with easy seal replacement.

U-cup Type Piston Seal. This pressure energized lip seal provides minimum friction and long life.

Built-in Limit Switches

Series TE/TF/TL cylinders can be specified with built-in limit switches or air pilot valves. Three types of electrical limit switches are available. The actuators for these switches and valves are built into the cylinder heads while the switches and valves themselves are housed in an easily accessed protective box which is attached to the head. Conduit connections allow you to fully enclose the wire or air line leads to these switches or valves.

Built-in Proximity Switches

Series TE/TF/TL cylinders can be specified with built-in proximity switches for your logic controlled system. These switches are bolted or threaded into the cylinder head and inductive sensing probes are fully protected from the environment. Built-in proximity switches are available as special options and can be specified for AC or DC service.

TL Nonlube Air Cylinder

The Series TL has been specifically designed and proven to operate for millions of cycles in nonlubricated systems. The Series TL cylinder eliminates the need for internal or external oil supplies for lubrication.

Conventional designs are, for the most part, minor modifications to standard cylinders. The results are a temporary prelubricated cylinder rather than a true nonlubricated one. Most of these modifications entail wicks, oil reservoirs or oil impregnated materials. These forms of lubrication only address a portion of the nonlubricated air operating problem.

Vickers design engineers resolved the specific problems of nonlubricated air operation and designed the Series TL cylinder with features which were both unique and necessary. In addition to new Teflon suspension lubricants, the Series TL has specialized seals and bearing surfaces.

The extremely long-life Teflon suspension lubricants ensure continued performance long after conventional lubricants have been extruded or wiped away. Glass-filled Teflon piston seals, and Teflon with carboxilated nitrile rod seals, add lubrication, reduce friction, and increase long term durability. Also, the lubricants in Vickers Series TL cylinders will not contaminate your nonlubricated air system, as may conventional cylinder lubricants.

Series TL cylinders can be used interchangeably between nonlubricated and lubricated systems. The cylinders are excellent for use in lubricated systems that are irregularly serviced and which may inadvertently become nonlubricated systems. Also, in lubricated systems, the Series TL provides system safety should the lubricator fail.

How To Order

Standard Cylinders

Vickers has created an easy system for ordering cylinders. This system has been developed to improve our service to you. The model code consists of sixteen alpha-numeric digits which fully describe the most common standard options. See pages 5 through 7 for a summary of model code options.

To specify your cylinder, review the following pages for a full description of each option available and select the desired code.

This model code system will:

- **Simplify the re-order process.** Each cylinder is assigned a sixteen digit model code. That code is unique to a particular cylinder description. That way, when you re-order your cylinder, you're assured of exactly the same top quality cylinder design.
- **Improve identification.** Every cylinder has its sixteen digit model code clearly marked on the product...impression-stamped in the metal head or cap. Each sixteen digit code completely describes a specific cylinder. This allows seals and replacement components to be easily identified in the field.
- **Facilitate communications.** This fully descriptive model code system allows you to work directly with your local Vickers sales engineer to identify and service your Vickers cylinder.

Custom Cylinders

New Cylinders

Although the model code has been arranged to cover the vast majority of available options, there will be occasions when you require an option which cannot be coded. When specifying such an option, enter an "X" for the appropriate item in the sixteen digit model code, then describe your requirements. For example, if you have an application which requires a custom thread on the end of the piston rod, enter an "X" for item 7. Then add a full description at the end of the model code, such as "With 1" diameter piston rod with 2" total rod projection and 1"-14 thread 1 1/2" long." The cylinder will then be given a unique five digit design number on receipt of order (as explained below).

Replacement Cylinders

Every Vickers custom cylinder is assigned a unique design number. This number is contained in the last five digits of the sixteen digit model code. In other words, the "Stroke" and "Extra Rod Projection" locations (items 12 through 16) become the "Design Number" items for custom cylinders. When ordering a replacement cylinder, simply give the sixteen digit model code or the five digit design number to your local Vickers Sales Representative.

Replacement Parts

Each design number is stored in a quick retrieval computerized storage system. This gives our field sales representatives rapid access to assist you in identifying and specifying genuine Vickers replacement parts.

Model Codes

TE	01	E	A	C	A	3	A	A	108	00
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

1, 2 Series

TE – ANSI B93.15/NFPA
250 psi air cylinder
TF – ANSI B93.15/NFPA
1000 psi hydraulic cylinder
TL – ANSI B93.15/NFPA
250 psi nonlube air cylinder

3, 4 Mounting style

Vickers Code		ANSI Code
01 –	Side lug	MS2
02 –	Tapped	MS4
04 –	Keyed side lug	–
05 –	Keyed tapped	–
07 –	Head rectangular flange	MF1† ME3‡
08 –	Head square flange	MF5†
10 –	Clevis	MP1
11 –	Spherical bearing	–
12 –	Cap rectangular flange	MF2† ME4‡
13 –	Cap square flange	MF6†
15 –	Intermediate trunnion	MT4
16 –	Cap trunnion	MT2
17 –	Head trunnion	MT1
21 –	Cap extended tie rod	MX2
22 –	Head extended tie rod	MX3
23 –	Both ends extended tie rod	MX1
24 –	No mount	–
25 –	Double rod, side lug	–
26 –	Double rod, tapped	–
28 –	Double rod, keyed side lug	–
29 –	Double rod, keyed tapped	–
31 –	Double rod, rectangular flange	–
32 –	Double rod square flange	–
34 –	Double rod, intermediate trunnion	–
35 –	Double rod, head trunnion	–
39 –	Double rod, head end extended tie rod	–
40 –	Double rod, both ends extended tie rod	–
41 –	Double rod, no mount	–

(See detailed information on page 8.)

† Applies to 1 1/2” through 6” bores only
‡ Applies to 7” through 14” bores only

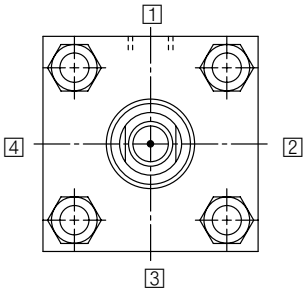
5 Bore size (in inches)

Code	Bore
C –	1 1/2
D –	2
E –	2 1/2
G –	3 1/4
H –	4
K –	5
L –	6
M –	7
N –	8
R –	10
S –	12
T –	14

(See detailed information on page 51.)

6 Cushion & adjustment position

Cushions are located as shown below when viewing cylinder from head end (mounting end of double rod cylinder). “–” in table indicates no cushion.



Code	Head	Cap
A –	–	–
B –	–	1
C –	–	2
D –	–	3
E –	–	4
F –	1	–
G –	2	–
H –	3	–
J –	4	–
K –	1	1
L –	1	2
M –	1	3
N –	1	4
P –	2	1
R –	2	2
S –	2	3
T –	2	4
U –	3	1
V –	3	2
W –	3	3
Y –	3	4
1 –	4	1
2 –	4	2
3 –	4	3
4 –	4	4

Double Rod Cylinders:
“Head” = “Mounting” end
“Cap” = “Non-mounting“ end

Model Codes

TE 01 E A C A 3 A A 108 00

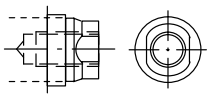
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

7 Rod size and rod end type

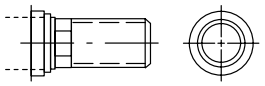
Bore size (inch)	Rod size (inch)	Code (for rod size *and* rod end type) "2" rod end type	"4" rod end type	"5" rod end type	"6" rod end type
1 1/2	5/8	**A**	**B**	**C**	**D**
	1*	**E**	**F**	**G**	**H**
2	5/8	**A**	**B**	**C**	**D**
	1	**E**	**F**	**G**	**H**
	1 3/8	**J**	**K**	**L**	**M**
2 1/2	5/8	**A**	**B**	**C**	**D**
	1	**E**	**F**	**G**	**H**
	1 3/8	**J**	**K**	**L**	**M**
	1 3/4	**N**	**P**	**R**	**S**
3 1/4	1	**A**	**B**	**C**	**D**
	1 3/8	**E**	**F**	**G**	**H**
	1 3/4	**J**	**K**	**L**	**M**
	2	**N**	**P**	**R**	**S**
4	1	**A**	**B**	**C**	**D**
	1 3/8	**E**	**F**	**G**	**H**
	1 3/4	**J**	**K**	**L**	**M**
	2	**N**	**P**	**R**	**S**
	2 1/2	**T**	**U**	**V**	**W**
5	1	**A**	**B**	**C**	**D**
	1 3/8	**E**	**F**	**G**	**H**
	1 3/4	**J**	**K**	**L**	**M**
	2	**N**	**P**	**R**	**S**
	2 1/2	**T**	**U**	**V**	**W**
	3	**Y**	**1**	**2**	**3**
	3 1/2	**4**	**5**	**6**	**7**
6	1 3/8	**A**	**B**	**C**	**D**
	1 3/4	**E**	**F**	**G**	**H**
	2 1/2	**J**	**K**	**L**	**M**
	4	**N**	**P**	**R**	**S**
7	1 3/8	**A**	**B**	**C**	**D**
	1 3/4	**E**	**F**	**G**	**H**
	3	**J**	**K**	**L**	**M**
	5	**N**	**P**	**R**	**S**
8	1 3/8	**A**	**B**	**C**	**D**
	1 3/4	**E**	**F**	**G**	**H**
	3 1/2	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**
10	1 3/4	**A**	**B**	**C**	**D**
	2	**E**	**F**	**G**	**H**
	3 1/2	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**
12	2	**A**	**B**	**C**	**D**
	2 1/2	**E**	**F**	**G**	**H**
	4	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**
14	2 1/2	**A**	**B**	**C**	**D**
	3	**E**	**F**	**G**	**H**
	4	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**

*Cushion cap end only on series TE and TL for this bore/rod combination.

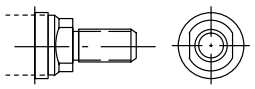
Type 2 rod end
Short female
UN thread



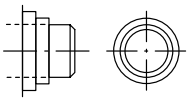
Type 4 rod end
Full male
UN thread



Type 5 rod end
Small male
UN thread



Type 6 rod end
Plain
No attachment



(See detailed rod end information on page 44.)

8 Seal options

Code	Piston Seal	Seal/ Scraper Ret. Compound
A –	U-cups	Nitrile
B –	Cast iron rings	Nitrile
C –	Glass-filled Teflon*	Nitrile
D –	U-cups	Viton-A*
E –	Cast iron rings	Viton-A
F –	Glass-filled Teflon	Viton-A
K –	U-cups	Viton-A/Nitrile
L –	Cast iron rings	Viton-A/Nitrile
M –	Glass-filled Teflon	Viton-A/Nitrile

(See detailed information on page 46.)

*Teflon and Viton are registered trademarks of E. I. DuPont Co.

9 Port type and size

Code	Type
1 –	NPTF
2 –	Oversize NPTF
3 –	SAE/UN O-ring
4 –	Oversize SAE/UN
5 –	NFPA standard SAE/UN

(See detailed information on page 45.)

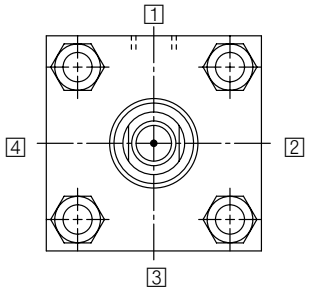
TE 01 E A C A 3 A A 108 00

1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

10 Port location

Ports are located as shown below when viewing cylinder from head end (mounting end of double rod cylinder).

With some mounting styles, certain port locations cannot be selected due to interference with the mounting.



Code	Head	Cap
A –	1	1
B –	1	2
C –	1	3
D –	1	4
E –	2	1
F –	2	2
G –	2	3
H –	2	4
J –	3	1
K –	3	2
L –	3	3
M –	3	4
N –	4	1
P –	4	2
R –	4	3
S –	4	4

11 Limit switch / proximity switch position and type:

Positions are numbered as shown in item10 at left. "–" in table indicates no switch.

Code	Head	Cap	Switch Type
A –	–	–	none req'd
B –	1	–	01
C –	2	–	01
D –	3	–	01
E –	4	–	01
F –	1	1	01
G –	2	2	01
H –	3	3	01
J –	4	4	01
K –	–	1	01
L –	–	2	01
M –	–	3	01
N –	–	4	01
P –	1	–	PS200
R –	2	–	PS200
S –	3	–	PS200
T –	4	–	PS200
U –	1	1	PS200
V –	2	2	PS200
W –	3	3	PS200
Y –	4	4	PS200
1 –	–	1	PS200
2 –	–	2	PS200
3 –	–	3	PS200
4 –	–	4	PS200
5–	1	1	03
6–	2	2	03
7–	3	3	03
8–	4	4	03

(See detailed information on pages 47–49.)

12, 13, 14 Cylinder stroke

Items 12,13 indicate total stroke length from 00 inches to 99 inches.

Item 14 indicates fractions of an inch per the following codes:

Code	Fraction	Code	Fraction
0 –	0	**8** –	1/2
1 –	1/16	**9** –	9/16
2 –	1/8	**A** –	5/8
3 –	3/16	**B** –	11/16
4 –	1/4	**C** –	3/4
5 –	5/16	**D** –	13/16
6 –	3/8	**E** –	7/8
7 –	7/16	**F** –	15/16

15, 16 Extra rod projection

Item 15 indicates inches from 0 through 9.

Item 16 indicates fractions of an inch per codes shown for item 14 above.

Mounting Styles

Selecting the Proper Mounting

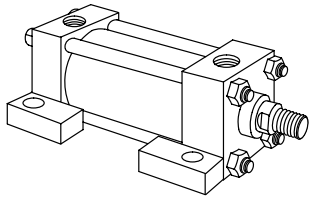
Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. All mounts are designed to absorb the full rated force of the cylinder when properly applied. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

Available Mountings

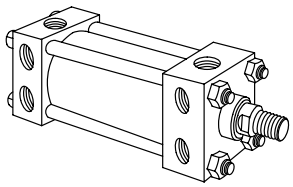
The variety of standard ANSI and NFPA mountings available gives you a broad selection to match the proper mount to your application. Vickers offers rigid mounts (including side lug, flange, and extended tie rod) and swivel mounts (including clevis and trunnion). A guide to proper mount selection is provided on pages 10 through 15. For custom mounts, enter “XX” for model code items 3 and 4 and give a detailed description with drawings. Series TE/TF/TL cylinders are available in all mounting styles listed.

Mounting Styles

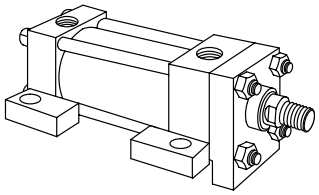
Code 01
Side lug
ANSI MS2



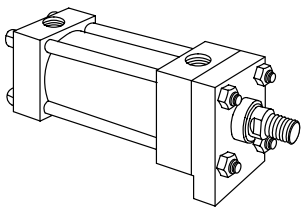
Code 02
Tapped
ANSI MS4



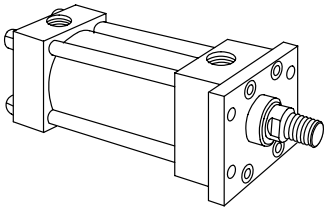
Code 04
Keyed side lug



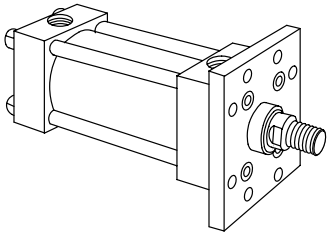
Code 05
Keyed tapped



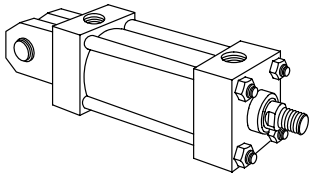
Code 07
Head rectangular flange
ANSI MF1 & ME3



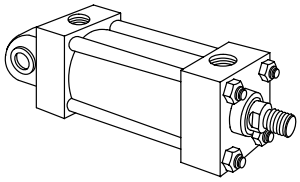
Code 08
Rod end square flanged
ANSI MF5



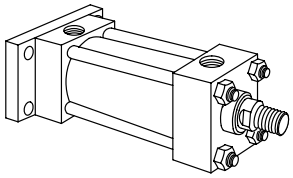
Code 10
Cap clevis
ANSI MP1



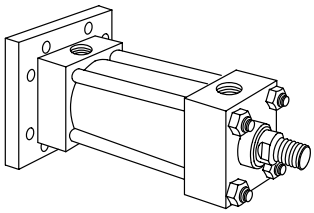
Code 11
Spherical bearing



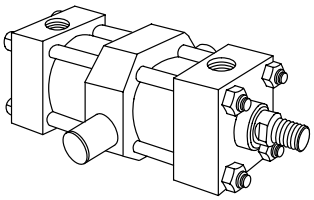
Code 12
Cap rectangular flange
ANSI MF2 & ME4



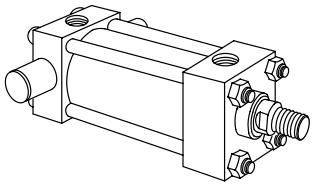
Code 13
Cap square flange
ANSI MF6



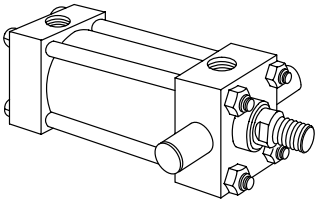
Code 15
Intermediate trunnion
ANSI MT4



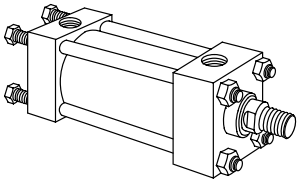
Code 16
Cap trunnion
ANSI MT2



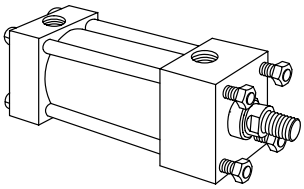
Code 17
Head trunnion
ANSI MT1



Code 21
Cap extended tie rod
ANSI MX2



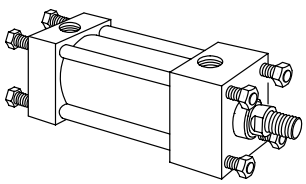
Code 22
Head extended tie rod
ANSI MX3



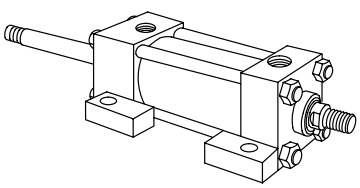
Mounting Styles Not Shown:

Code	Mounting style
24 –	No mount
26 –	Double rod, tapped
28 –	Double rod, keyed side lug
29 –	Double rod, keyed tapped
31 –	Double rod, rectangular flange
32 –	Double rod square flange
34 –	Double rod, intermediate trunnion
35 –	Double rod, head trunnion
39 –	Double rod, head end extended tie rod
40 –	Double rod, both ends extended tie rod
41 –	Double rod, no mount

Code 23
Both ends extended tie rod
ANSI MX1

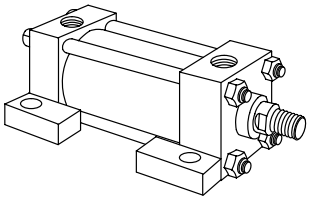


Code 25
Double rod, side lug

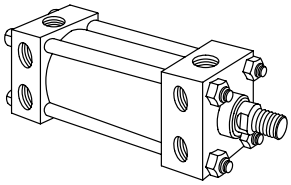


Application Guide for Mountings

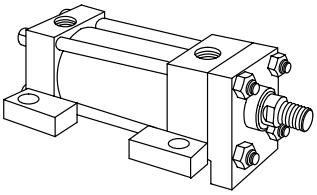
Code 01 Side Lug (ANSI MS2)



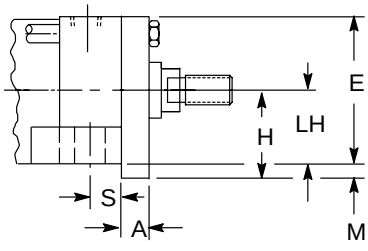
Code 02 Tapped



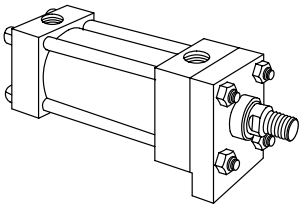
Code 04 Keyed Side Lug



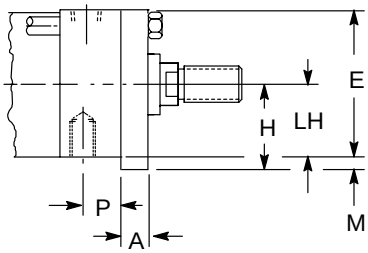
The drawing below shows the modification of a Code 01 mount to convert it to a Code 04. Use drawings for Code 01, pages 16–39, for dimensions not shown.



Code 05 Keyed Tapped



The drawing below shows the modification of a Code 02 mount to convert it to a Code 05. Use drawings for Code 02, pages 16–39, for dimensions not shown.



Dimensions in inches

Bore dia.	E	LH	A	H (Ref.)	P	S	M
1 1/2	2.00	.994 .992	.312 .310	1.188	1.000	.438	.188
2	2.50	1.244 1.242	.312 .310	1.438	1.000	.438	.188
2 1/2	3.00	1.494 1.492	.312 .310	1.688	1.000	.438	.188
3 1/4	3.75	1.869 1.867	.562 .560	2.188	1.125	.562	.313
4	4.50	2.244 2.242	.562 .560	2.563	1.125	.563	.313
5	5.50	2.744 2.742	.562 .560	3.063	1.125	.750	.313
6	6.50	3.244 3.242	.687 .685	3.625	1.250	.750	.375

Side lug and tapped mounts are for moving loads along a flat guided surface as in a carriage along rails.

The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to traverse along the centerline of the piston rod.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount (04) or keyed tapped mount (05).

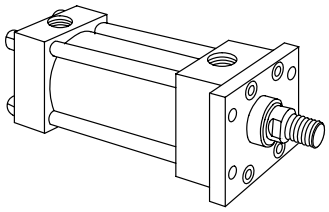
For severe side load applications, consult your local Vickers sales engineer.

See individual bore size drawings for maximum allowable pressure ratings.

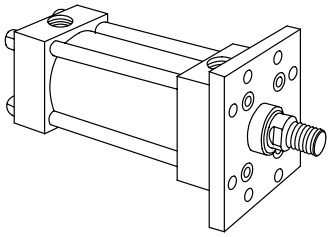
NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 07 Head Rectangular Flange (ANSI MF1 & ME3)



Code 08 Head Square Flange (ANSI MF5)



These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling), as in pull presses. For compression applications (pushing), a cap flange mount is more appropriate.

The mounting surface should be flat, and the rod end bearing should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the oversize alternate rod is recommended. Stop tubes should also be considered.

The square flange mount (08) is recommended for heavy duty applications.

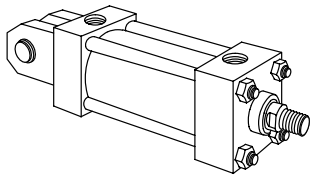
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 10 Clevis

(ANSI MP1)



This mount is for applications in which the machine member travels in a curved path within one plane.

This mount can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See pages 57 and 58 for stroke limitations.

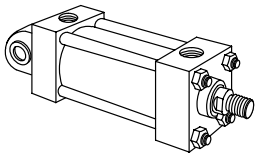
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excessive side loading on the bearing and piston. This will lead to premature failure. For applications with small amounts of misalignment, consider the spherical bearing mount (11).

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Application Guide for Mountings

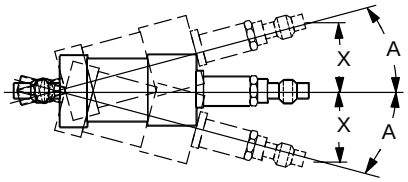
Code 11 Spherical Bearing



This mount is for applications in which the machine member travels in a curved path in one plane where some misalignment is unavoidable. The amount of allowable misalignment can be calculated.

This mount can be used both in compression (push) and tension (pull) applications. Care must be exercised to prevent rod buckling in compression applications with long strokes. See pages 55 through 58 for stroke limitations.

Maximum radial static and dynamic bearing loads must not exceed the recommended ratings shown in the following table.



Angle A is the recommended maximum angle of misalignment.

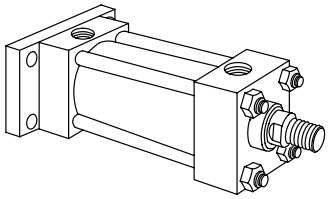
To find the maximum recommended X distance, multiply the distance between pivot mounting holes (see bore size drawing) by the tangent of angle A.

NOTE

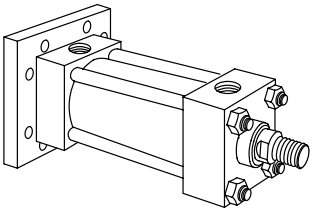
For strokes in excess of 24", see "Stop tube selection" on page 50.

Bore	Rod dia.	Pin dia.	Angle A	Tangent of A	Static load ratings	
					Radial	Thrust
1 1/2	5/8	1/2	1.5	.026	8100	3200
2	5/8	1/2	1.5	.026	8100	3200
2 1/2	5/8	1/2	1.5	.026	8100	3200
3 1/4	3/4	3/4	2	.035	18,800	7500
4	1	3/4	2	.035	18,800	7500
5	1	3/4	2	.035	18,800	7500
6	1 3/8	1	2	.035	33,300	13,300
7	1 3/8	1	2	.035	33,300	13,300
8	1 3/8	1	2	.035	33,300	13,300
10	1 3/4	1 3/8	2	.035	59,800	24,000
12	2	1 3/4	2.5	.044	102,000	40,700
14	2 1/2	2	2.5	.044	132,000	53,000

Code 12 Cap Rectangular Flange
(ANSI MF2 & ME4)



Code 13 Cap Square Flange
(ANSI MF6)



These mounts are for straight line force transfer applications in which the cylinder is used in compression (pushing) applications.

For tension applications (pulling), a head flange mount is recommended.

The mounting surface should be flat and perpendicular to the force of the load.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the oversize alternate rod is recommended. Stop tubes should also be considered.

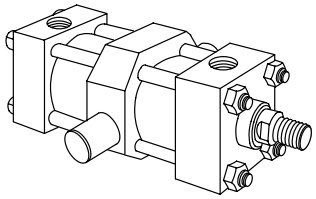
The cap square flange mount (code 13) is recommended for heavy duty applications.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque value.

NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 15 Intermediate Trunnion (ANSI MT4)



The Intermediate Trunnion mount is for longer stroke applications in which the machine member travels in a curved path in one plane.

On special orders, the trunnion can be located anywhere along the body.

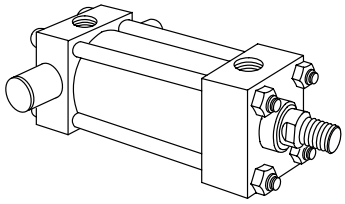
This mount can be used both in compression (push) and tension (pull) applications.

It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Code 16 Cap Trunnion
(ANSI MT2)



Cap Trunnion mounts are for applications in which the machine member travels in a curved path in one plane, and can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

The trunnion pins are an integral part of the cap and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

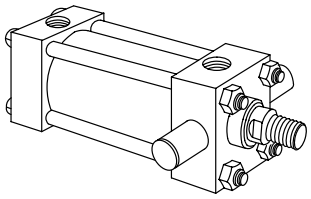
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Application Guide for Mountings

Code 17 Head Trunnion (ANSI MT1)



Head Trunnion mounts are for applications in which the machine member travels in a curved path in one plane.

Either mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

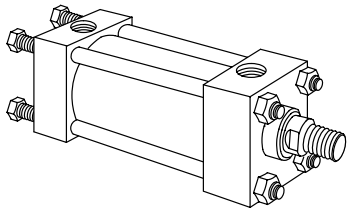
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Code 21 Cap Extended Tie Rod (ANSI MX2)



These mounts are for straight line force transfer applications. The cap extended tie rod mount is recommended for compression (pushing) applications.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table below.

Tie Rod Diameters & Torque Values
Diameters and torque values in the following table apply to all mounting styles.

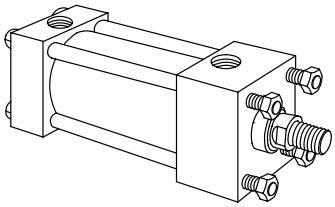
Bore dia. (inch)	**Tie rods** **Dia.** (inch)	**Torque** (ft. lbs.)
1 1/2	1/4	8
2, 2 1/2	5/16	16
3 1/4, 4	3/8	28
5, 6, 7, 8	1/2	66
10, 12	5/8	150
14	3/4	225

Bearing retainer screw torque	
Screw size (inch)	**Torque** (ft. lbs.)
.2500–28	7
.3125–24	12
.3750–24	22
.5000–20	50

NOTE

For strokes in excess of 30" see "Stop tube selection" on page 50.

Code 22 Head Extended Tie Rod (ANSI MX3)



These mounts are for straight line force transfer applications. The head extended tie rod mount is recommended for tension (pulling) applications.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

On head mount applications, the cartridge provides a pilot diameter to align the rod in the mounting frame.

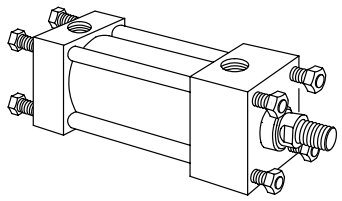
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on the previous page.

The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 23 Both Ends Extended Tie Rod (ANSI MX1)



These mounts are for straight line force transfer applications. Both ends extended tie rod mounts are suited for tension and compression applications or applications where additional hardware is to be attached to cylinders.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

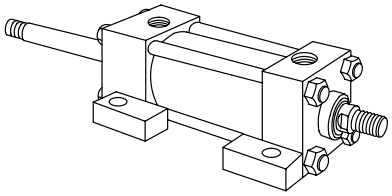
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on page 14.

The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

NOTE

For strokes in excess of 30”, see “Stop tube selection” on page 50.

Code 25 Double Rod, Side Lug (ANSI MX1)

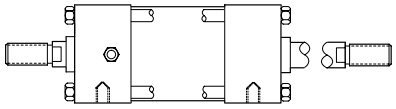


Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod.

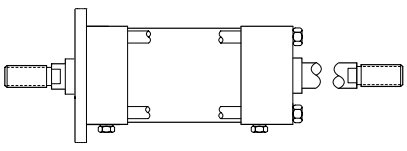
The single rod mount application data is also applicable to double rod cylinders.

In addition to the side lug mount illustrated above, the following mounts are also available for double rod end cylinders.

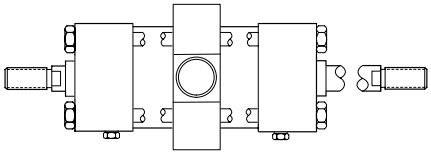
Code 26 Double Rod, Tapped



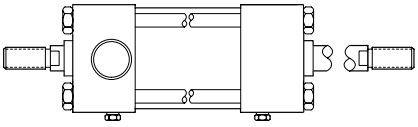
Code 31 Double Rod, Rectangular Flange and Code 32 Double Rod, Square Flange



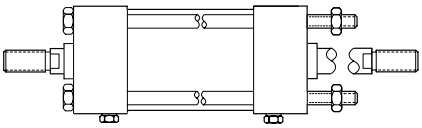
Code 34 Double Rod, Intermediate Trunnion



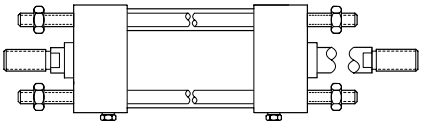
Code 35 Double Rod, Head Trunnion



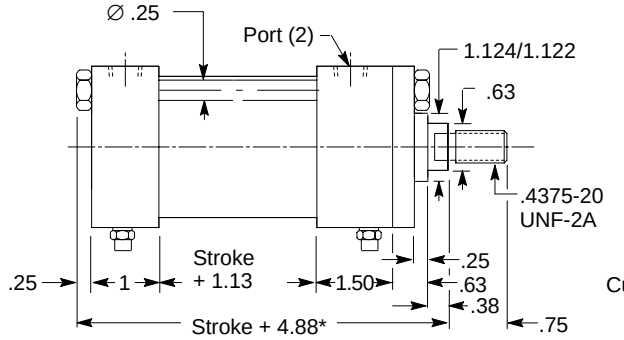
Code 39 Double Rod, Head Extended Tie Rod

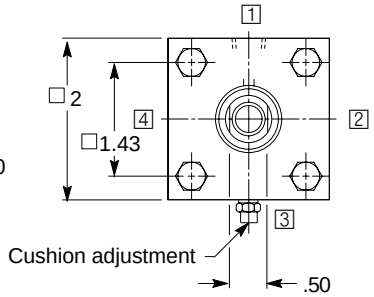


Code 40 Double Rod, Both Ends Extended Tie Rod



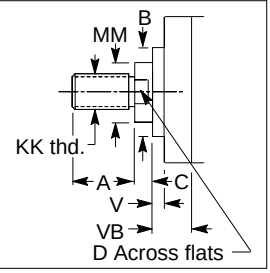
1 1/2 inch Cylinder Bore



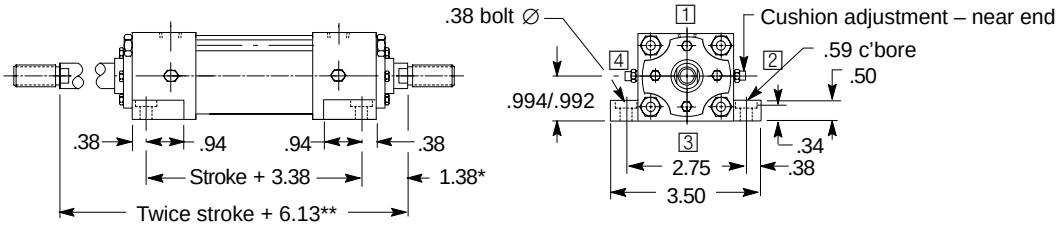


CODE 24 BASIC CYLINDER

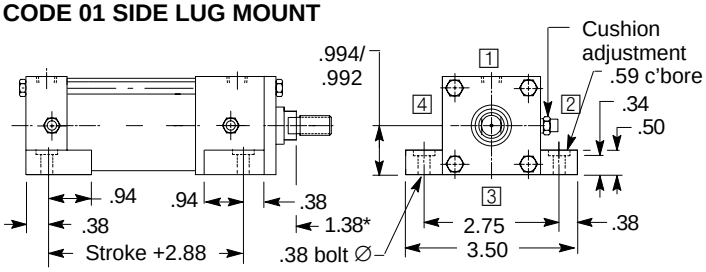
ALTERNATE ROD SIZES AVAILABLE	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
(in inches)	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A



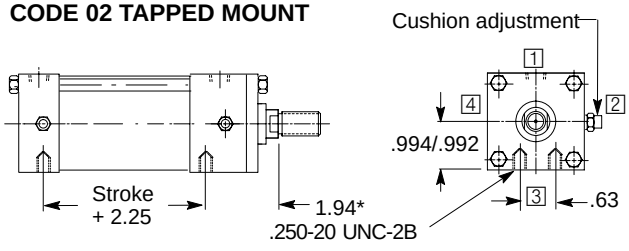
CODE 25 DOUBLE ROD SIDE LUG MOUNT



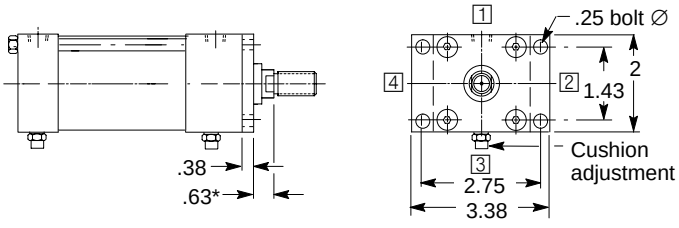
CODE 01 SIDE LUG MOUNT



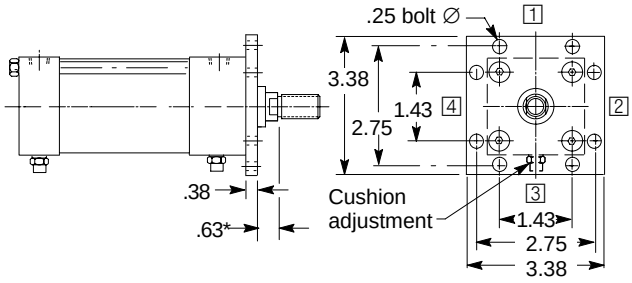
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

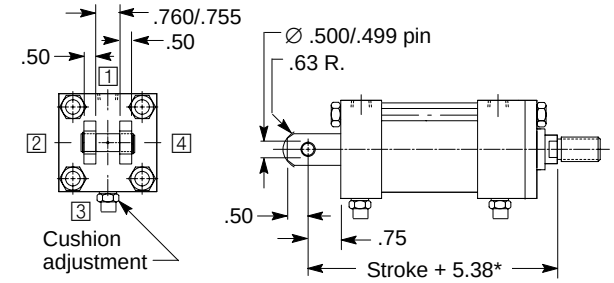


CODE 08 HEAD SQUARE FLANGE MOUNT

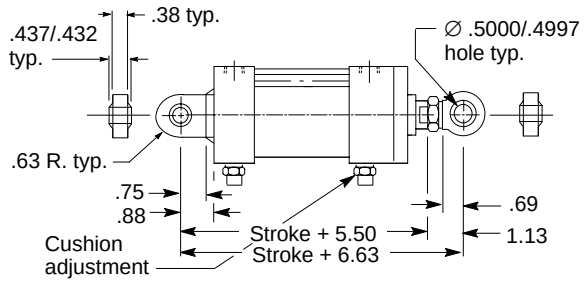


†Maximum working pressure 800 PSI (for minimum flange deflection)

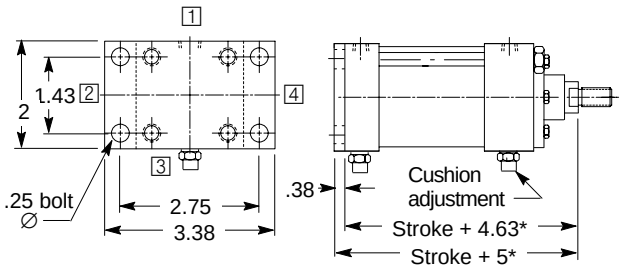
CODE 10 CLEVIS MOUNT



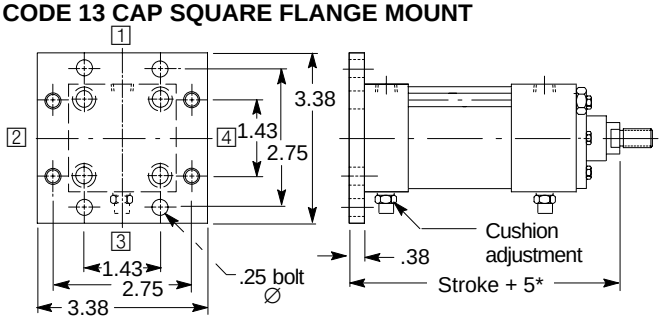
CODE 11 SPHERICAL BEARING MOUNT



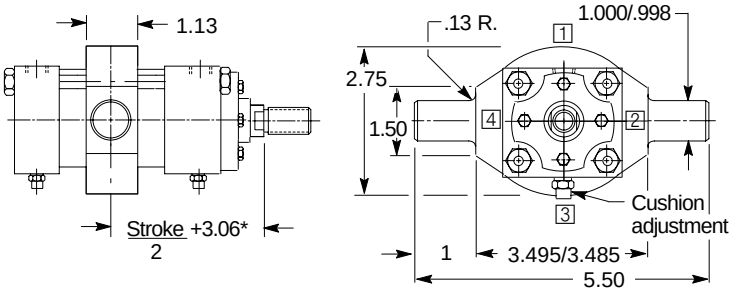
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



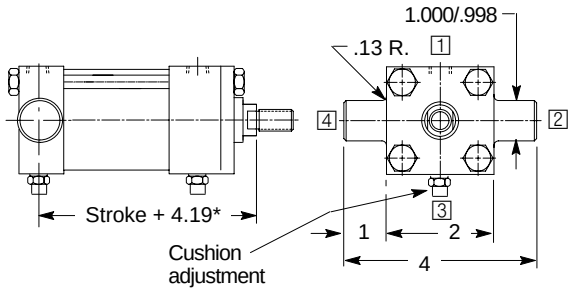
CODE 13 CAP SQUARE FLANGE MOUNT



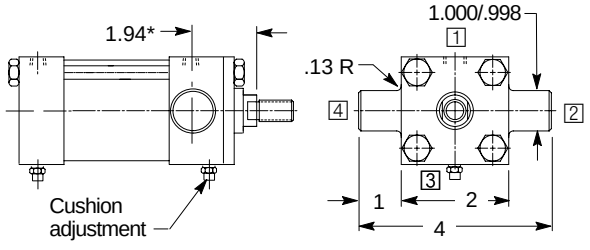
CODE 15 INTERMEDIATE TRUNNION MOUNT



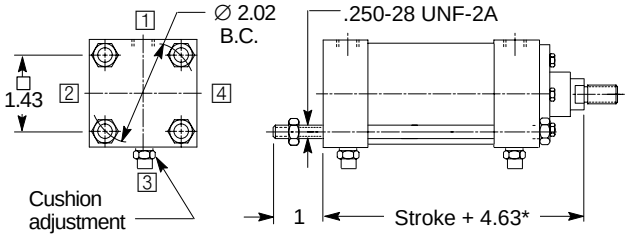
CODE 16 CAP TRUNNION MOUNT



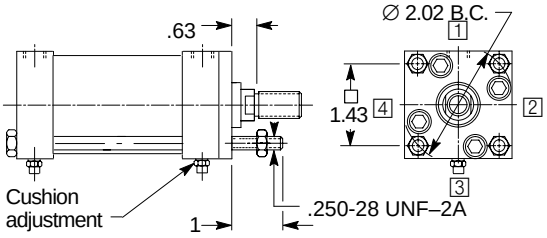
CODE 17 HEAD TRUNNION MOUNT



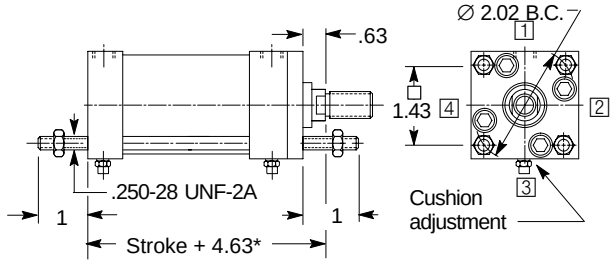
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

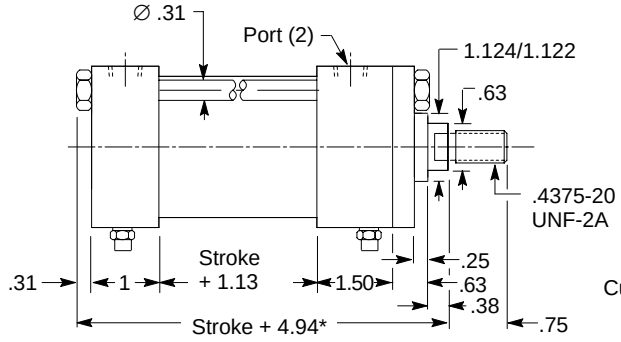


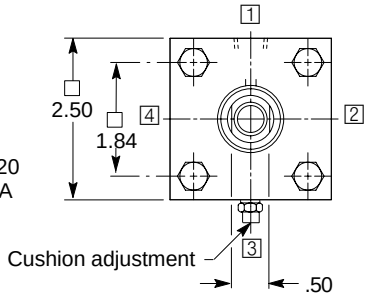
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

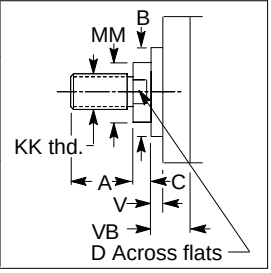
2 inch Cylinder Bore



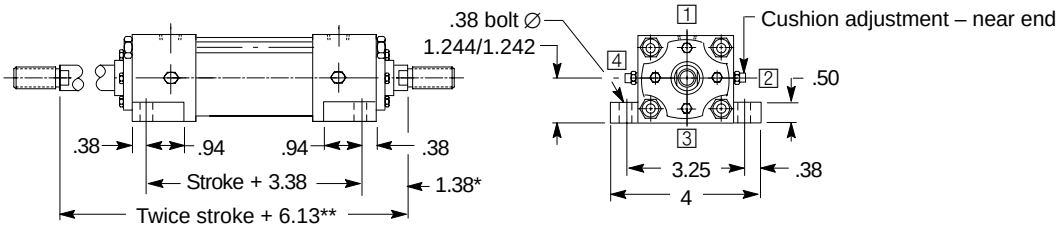


CODE 24 BASIC CYLINDER

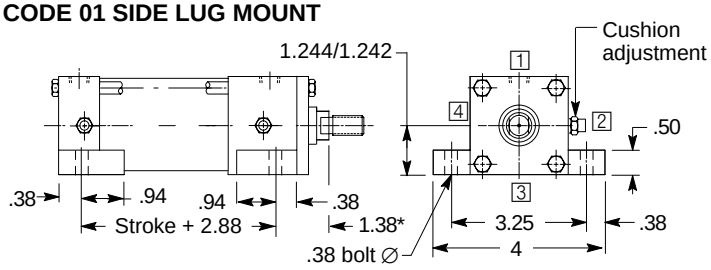
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1 3/8	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A



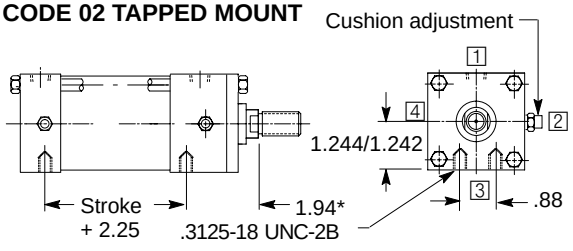
CODE 25 DOUBLE ROD SIDE LUG MOUNT



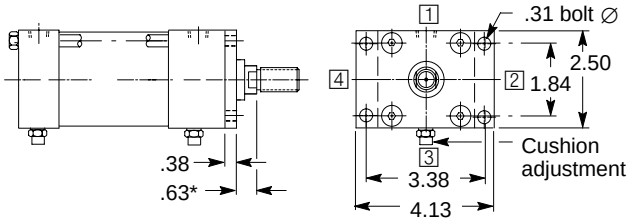
CODE 01 SIDE LUG MOUNT



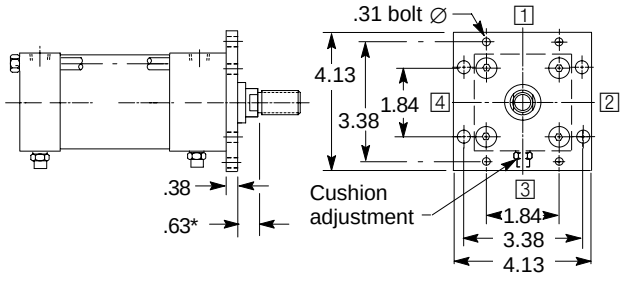
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

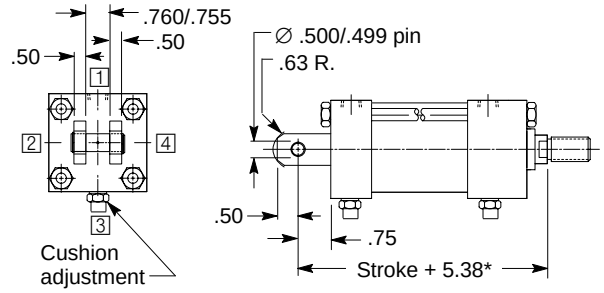


CODE 08 HEAD SQUARE FLANGE MOUNT

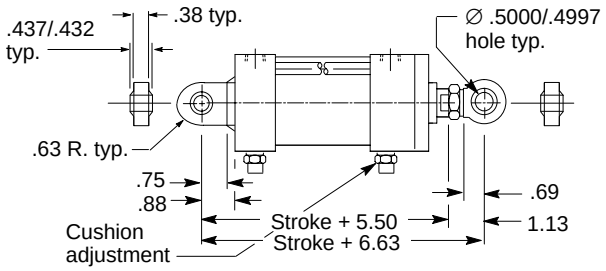


†Maximum working pressure 800 PSI (for minimum flange deflection)

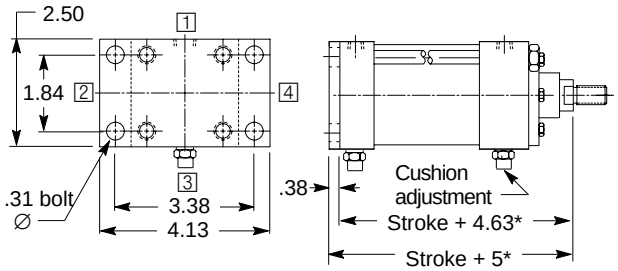
CODE 10 CLEVIS MOUNT



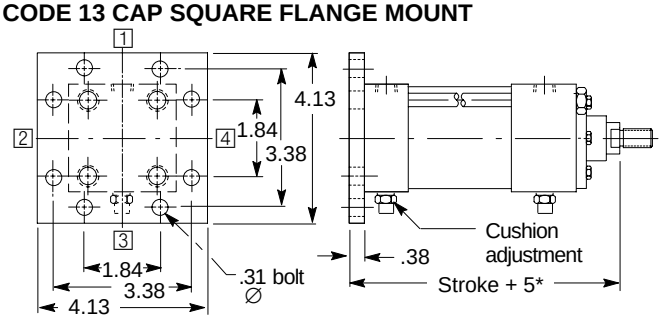
CODE 11 SPHERICAL BEARING MOUNT



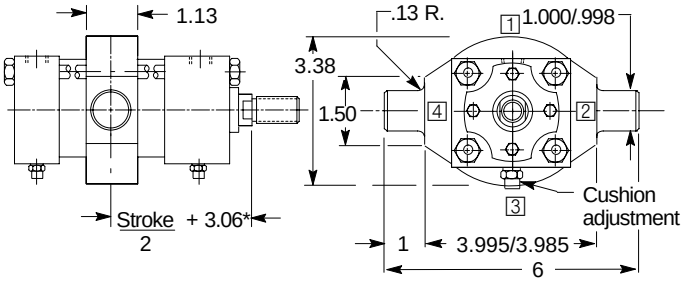
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



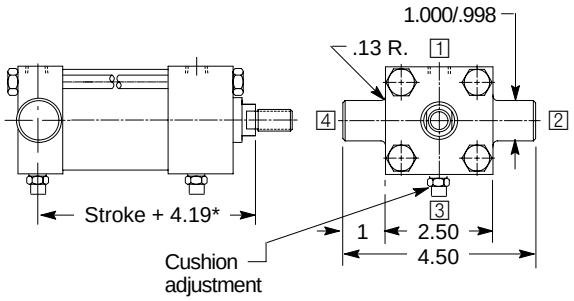
CODE 13 CAP SQUARE FLANGE MOUNT



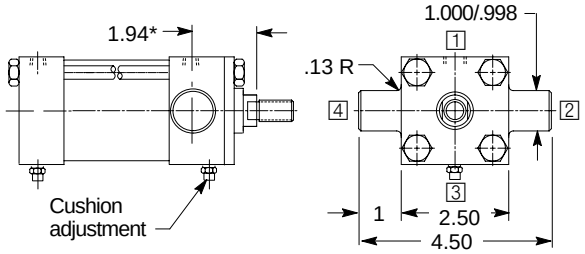
CODE 15 INTERMEDIATE TRUNNION MOUNT



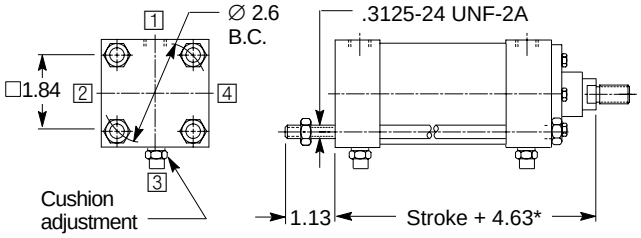
CODE 16 CAP TRUNNION MOUNT



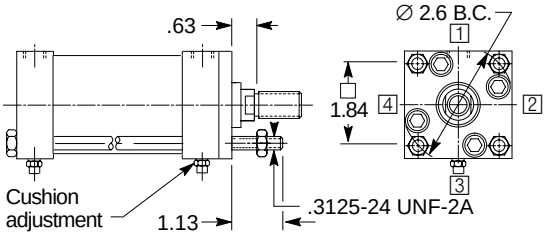
CODE 17 HEAD TRUNNION MOUNT



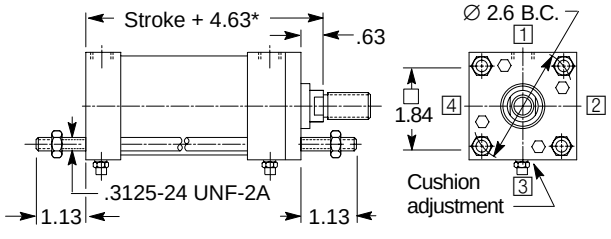
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

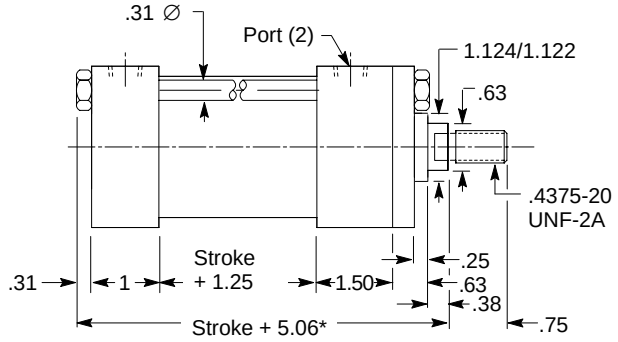


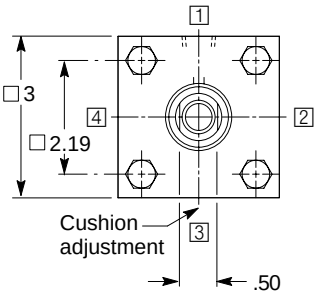
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

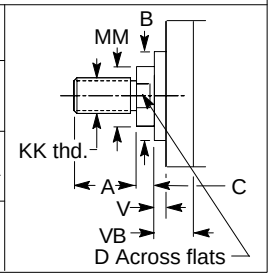
2 1/2 inch Cylinder Bore



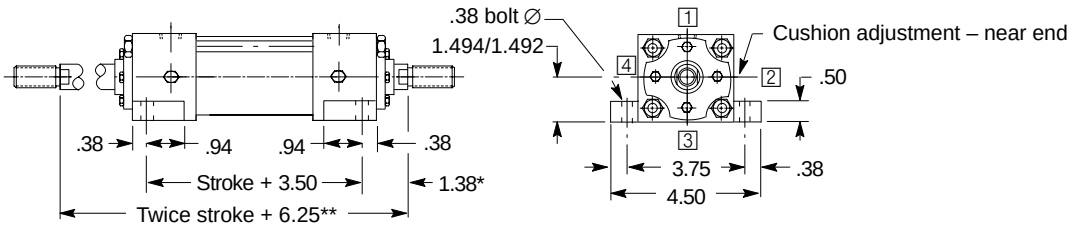


CODE 24 BASIC CYLINDER

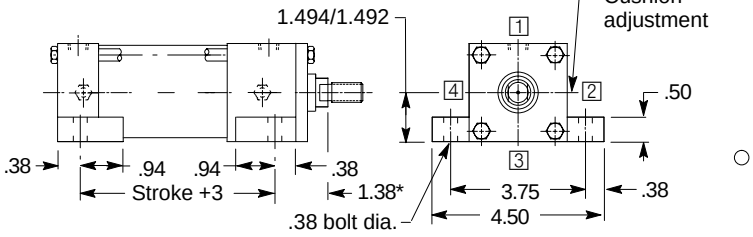
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1.38	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A
	1.75	.88	2	2.374/ 2.372	.75	1.50	1.13	.75	1.250–12 UNF–2A



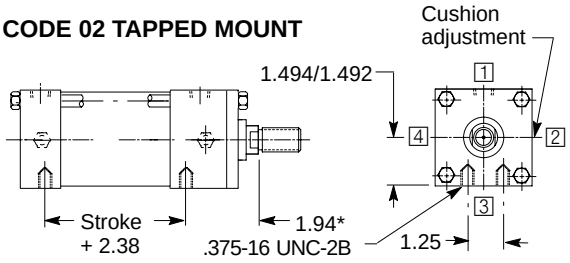
CODE 25 DOUBLE ROD SIDE LUG MOUNT



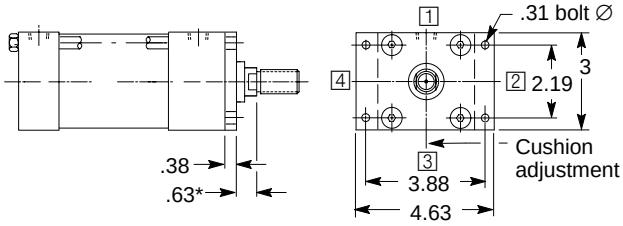
CODE 01 SIDE LUG MOUNT



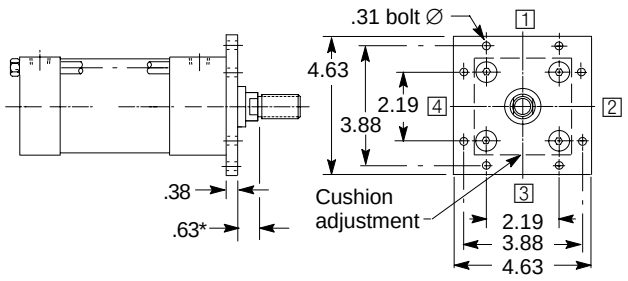
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

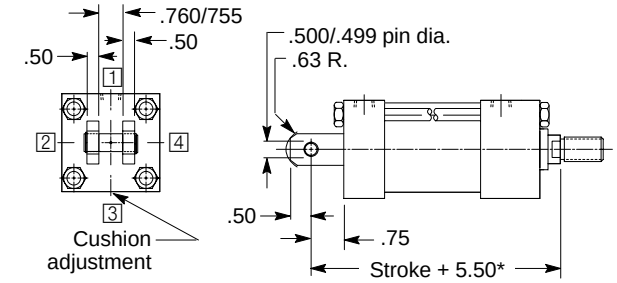


CODE 08 HEAD SQUARE FLANGE MOUNT

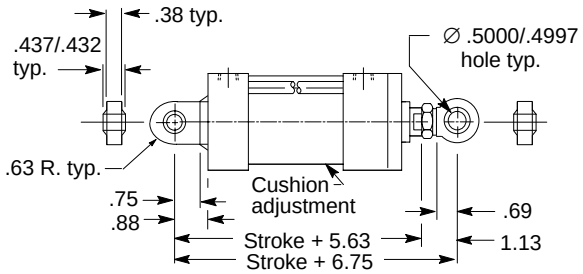


†Maximum working pressure 800 PSI (for minimum flange deflection)

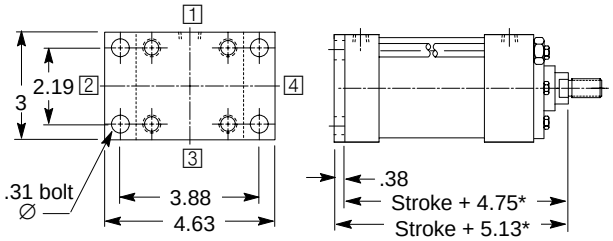
CODE 10 CLEVIS MOUNT



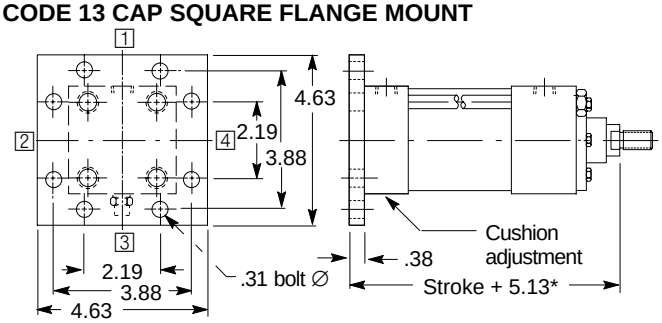
CODE 11 SPHERICAL BEARING MOUNT



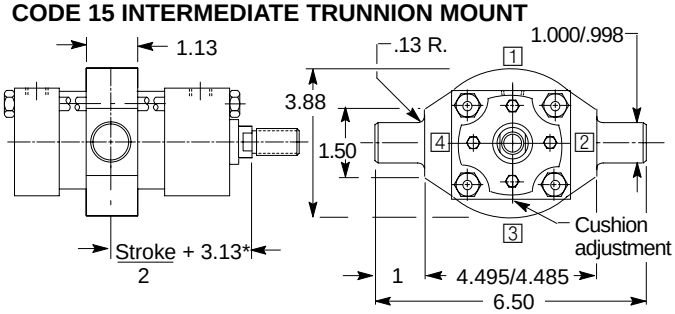
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



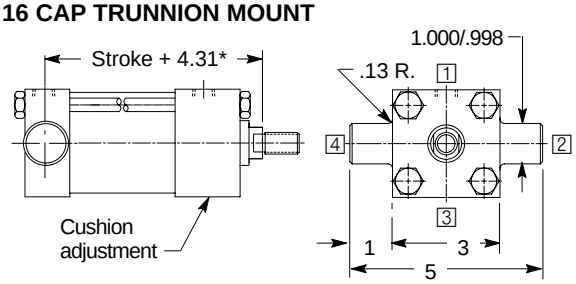
CODE 13 CAP SQUARE FLANGE MOUNT



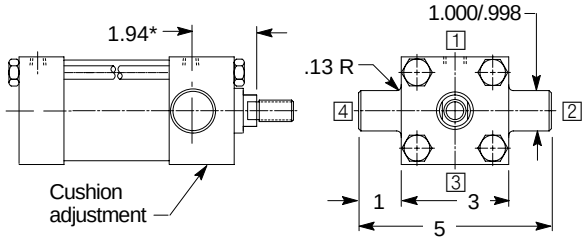
CODE 15 INTERMEDIATE TRUNNION MOUNT



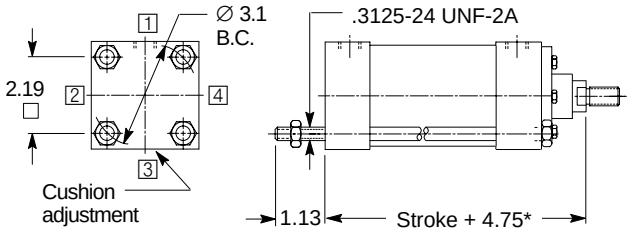
CODE 16 CAP TRUNNION MOUNT



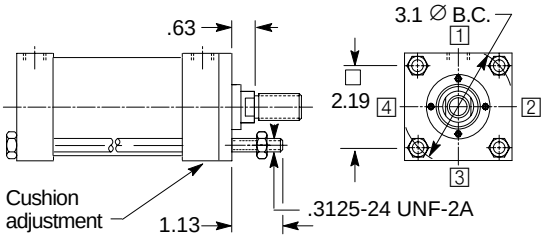
CODE 17 HEAD TRUNNION MOUNT



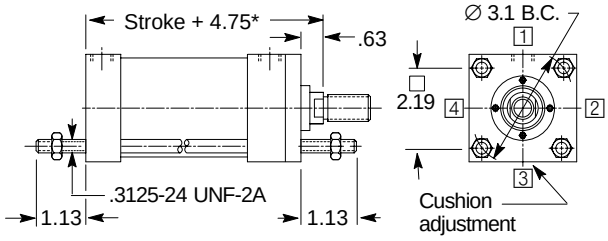
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

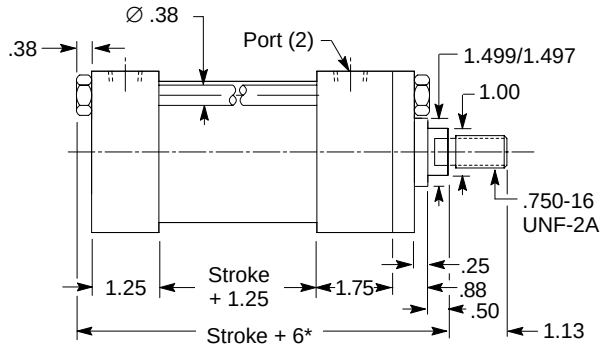


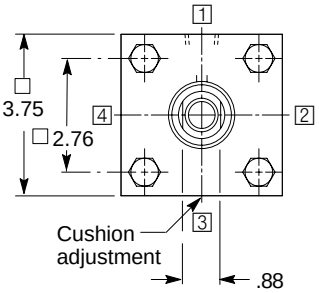
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

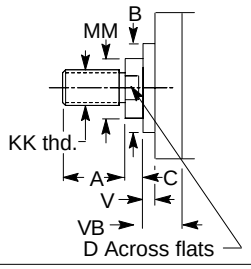
3 1/4 inch Cylinder Bore



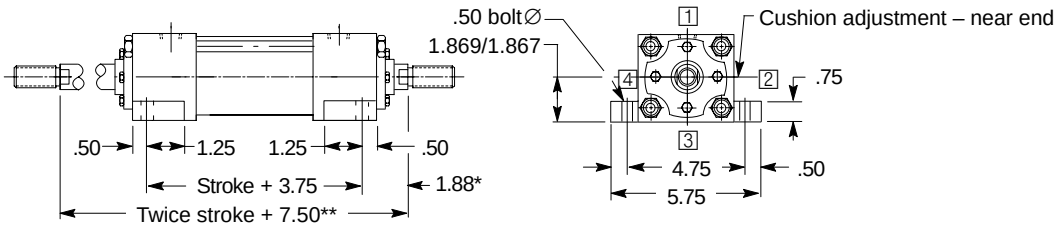


CODE 24 BASIC CYLINDER

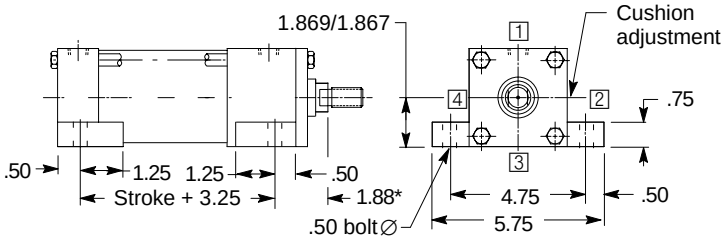
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624/ 2.622	.88	1.69	1.13	.50	1.500–16 UNF–2A



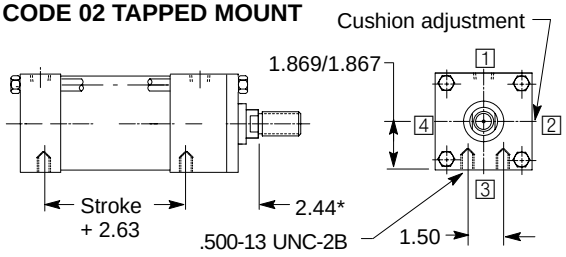
CODE 25 DOUBLE ROD SIDE LUG MOUNT



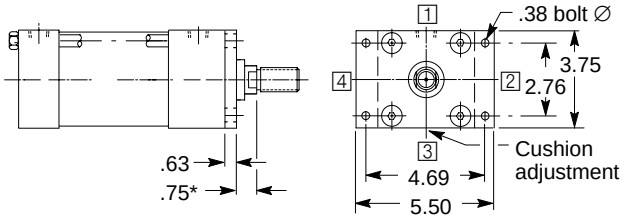
CODE 01 SIDE LUG MOUNT



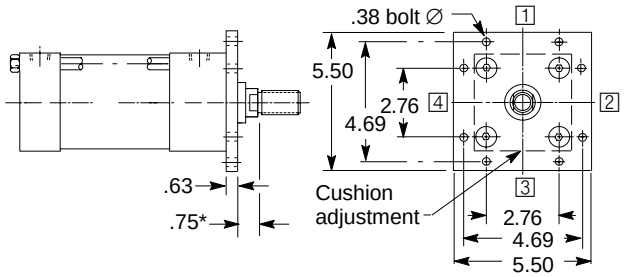
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

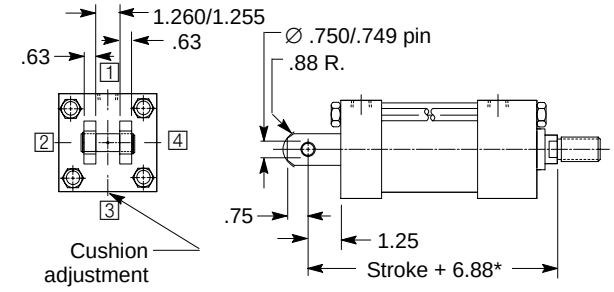


CODE 08 HEAD SQUARE FLANGE MOUNT

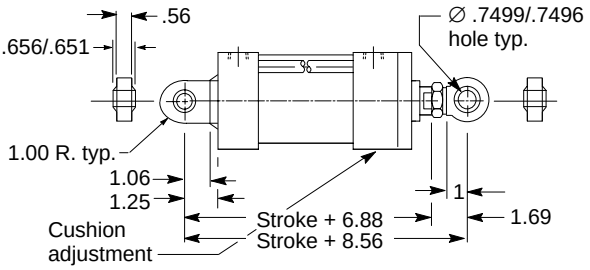


†Maximum working pressure 800 PSI (for minimum flange deflection)

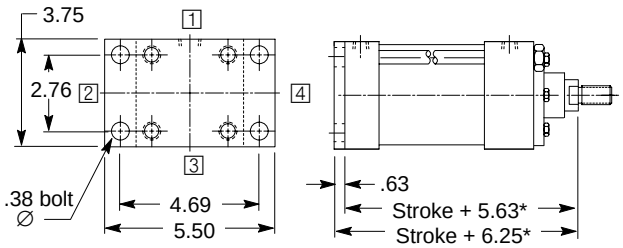
CODE 10 CLEVIS MOUNT



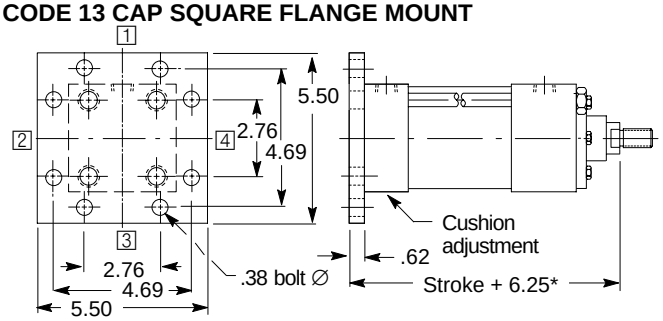
CODE 11 SPHERICAL BEARING MOUNT



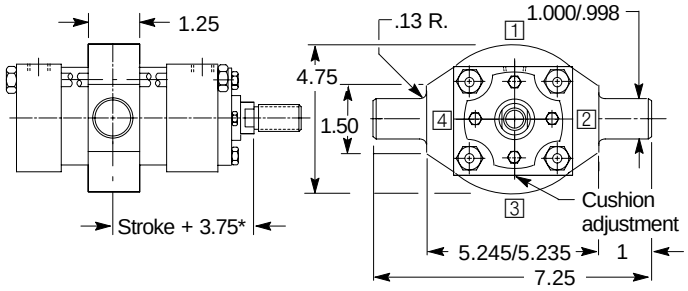
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



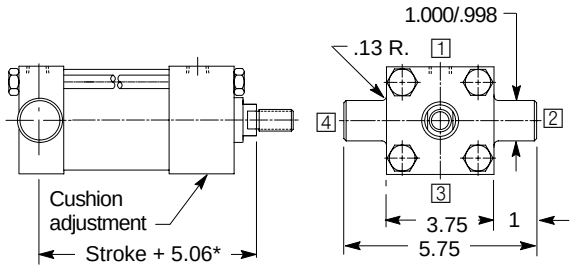
CODE 13 CAP SQUARE FLANGE MOUNT



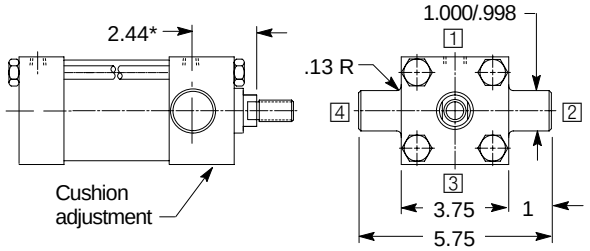
CODE 15 INTERMEDIATE TRUNNION MOUNT



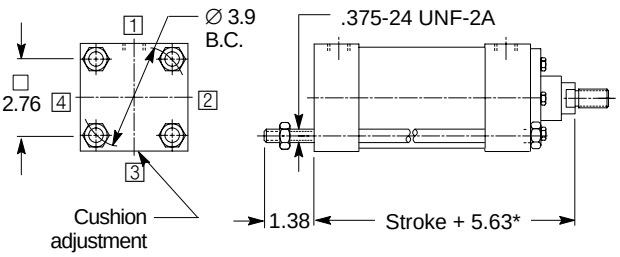
CODE 16 CAP TRUNNION MOUNT



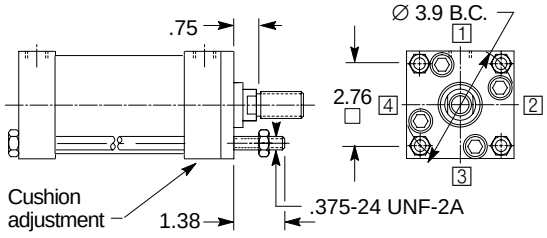
CODE 17 HEAD TRUNNION MOUNT



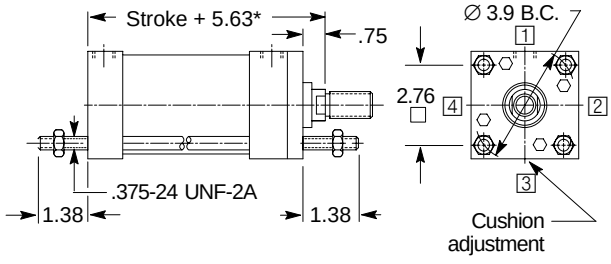
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

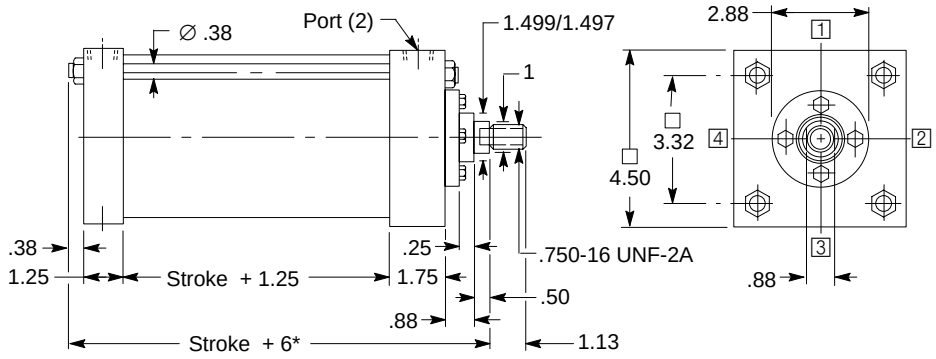


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



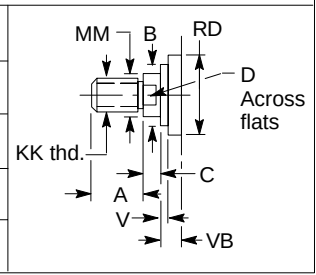
†Maximum working pressure 800 PSI (for minimum flange deflection)

4 inch Cylinder Bore

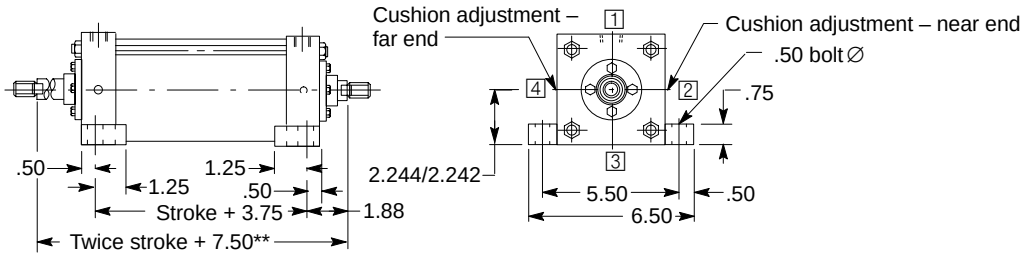


CODE 24 BASIC CYLINDER

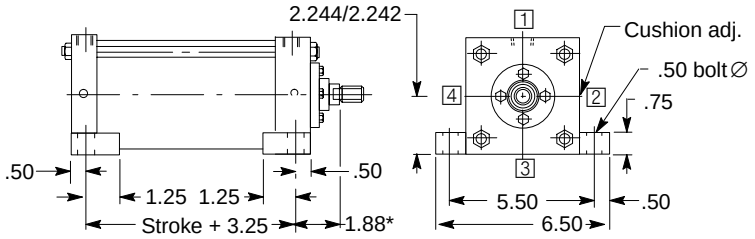
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	3.38	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624/ 2.622	.88	1.69	3.50	1.13	.50	1.500–12 UNF–2A
	2 1/2	.88	3	3.124/ 3.122	1	2.06	4	1.25	.63	1.875–12 UN–2A



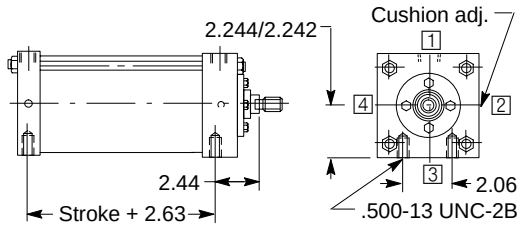
CODE 25 DOUBLE ROD SIDE LUG MOUNT



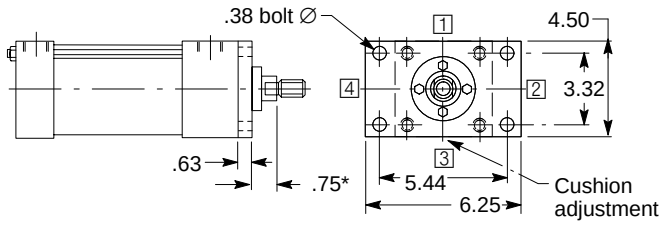
CODE 01 SIDE LUG MOUNT



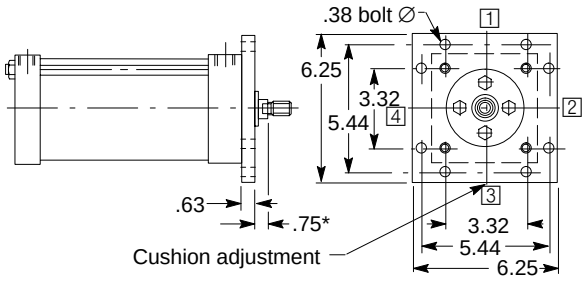
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

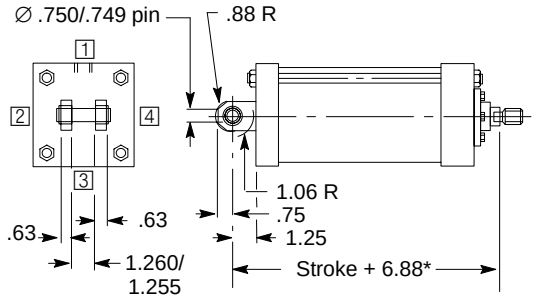


CODE 08 HEAD SQUARE FLANGE MOUNT

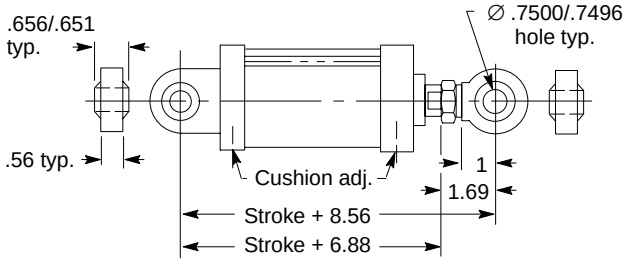


†Maximum working pressure 800 PSI (for minimum flange deflection)

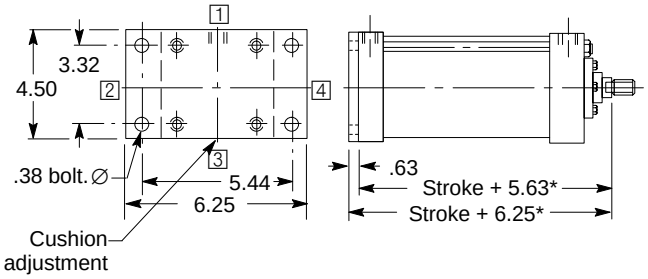
CODE 10 CLEVIS MOUNT



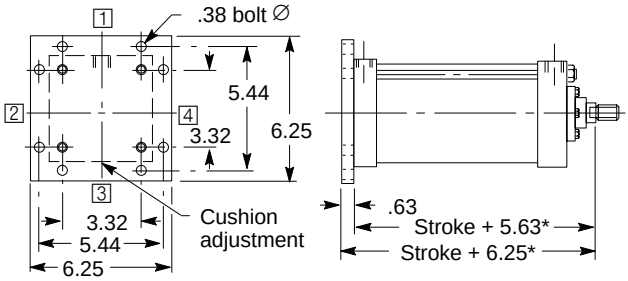
CODE 11 SPHERICAL BEARING MOUNT



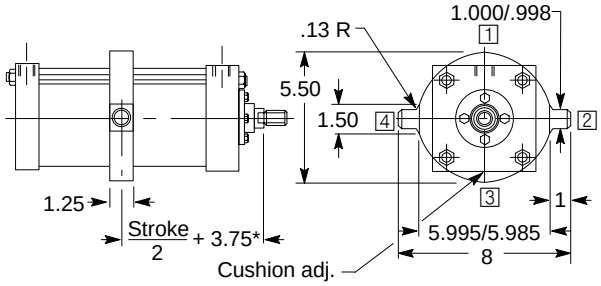
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



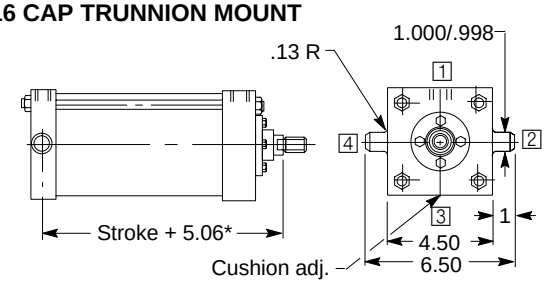
CODE 13 CAP SQUARE FLANGE MOUNT



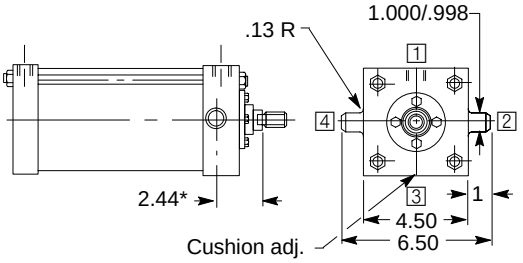
CODE 15 INTERMEDIATE TRUNNION MOUNT



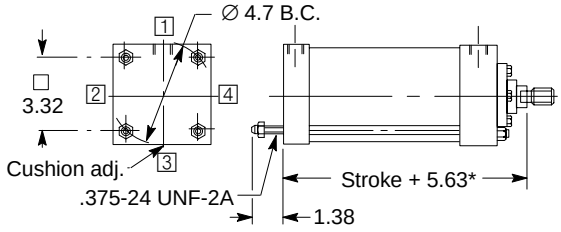
CODE 16 CAP TRUNNION MOUNT



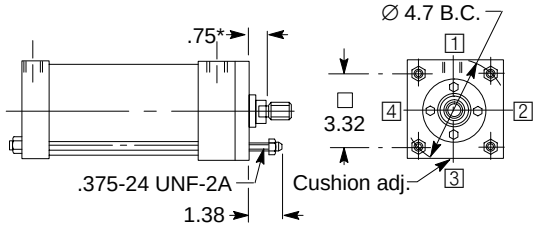
CODE 17 HEAD TRUNNION MOUNT



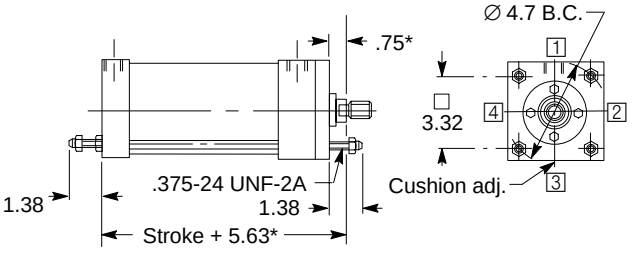
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

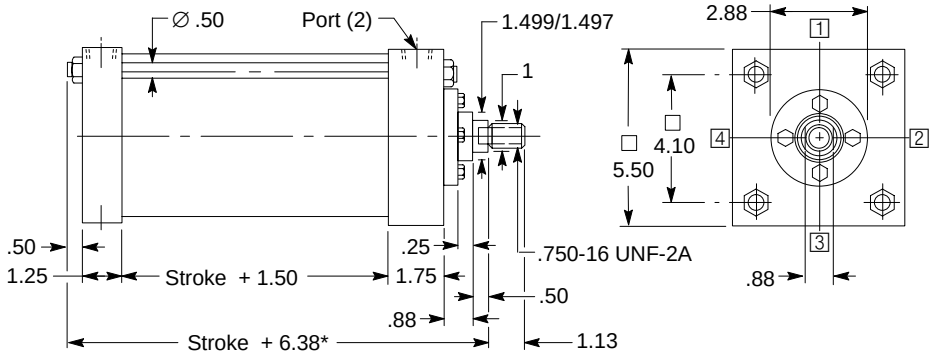


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



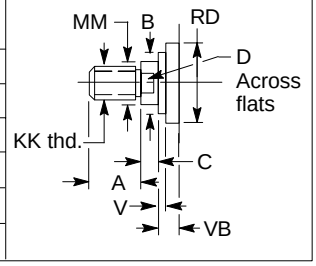
†Maximum working pressure 800 PSI (for minimum flange deflection)

5 inch Cylinder Bore

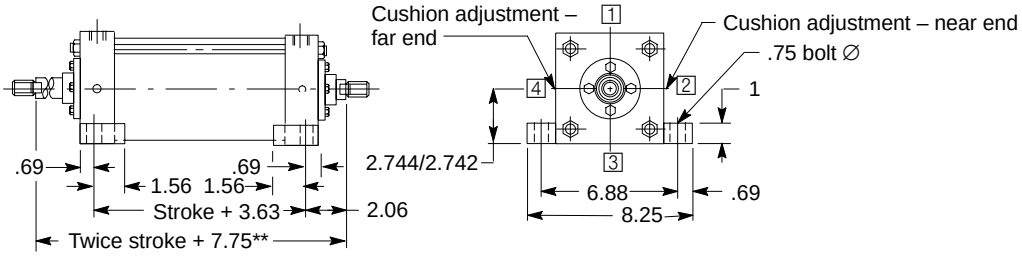


CODE 24 BASIC CYLINDER

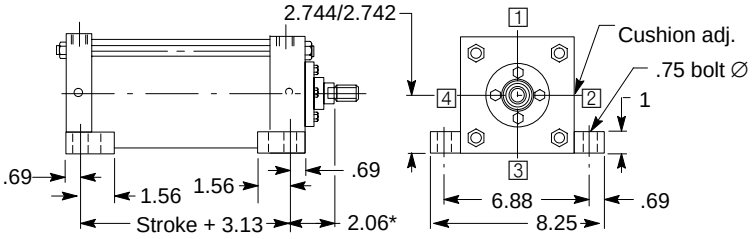
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B +.000 –.002	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374	.75	1.50	3.38	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624	.88	1.69	4	1.13	.50	1.500–12 UNF–2A
	2 1/2	.88	3	3.124	1	2.06	4.50	1.25	.63	1.875–12 UN–2A
	3	.88	3.50	3.749	1	2.63	5	1.25	.63	2.250–12 UN–2A
	3 1/2	.88	3.50	4.249	1	3	5.25	1.25	.63	2.500–12 UN–2A



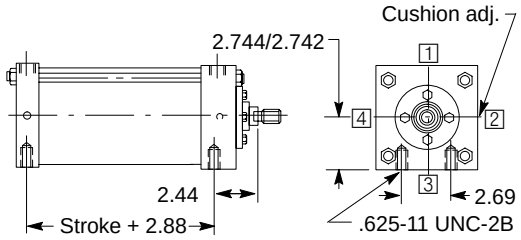
CODE 25 DOUBLE ROD SIDE LUG MOUNT



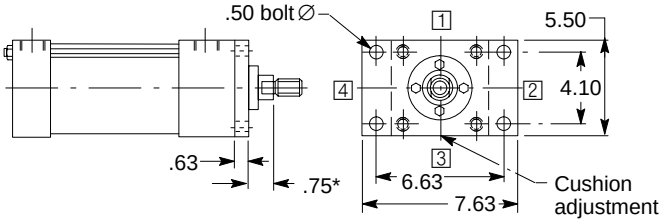
CODE 01 SIDE LUG MOUNT



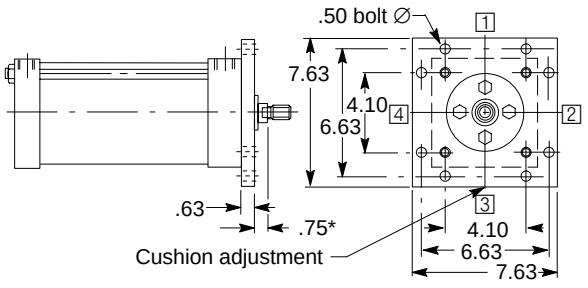
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

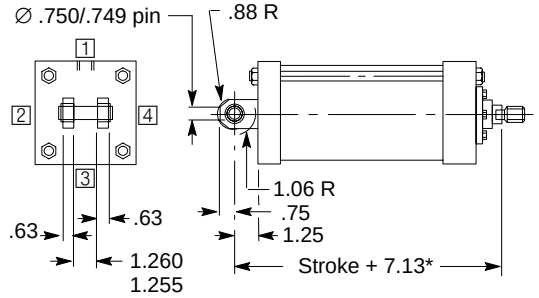


CODE 08 HEAD SQUARE FLANGE MOUNT

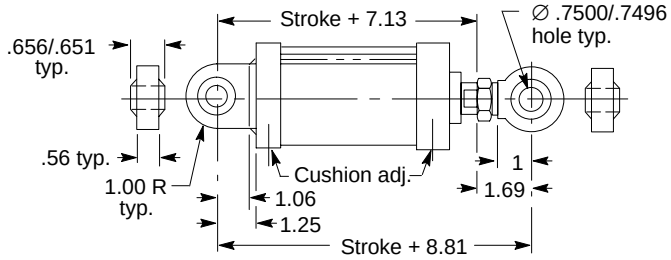


†Maximum working pressure 800 PSI (for minimum flange deflection)

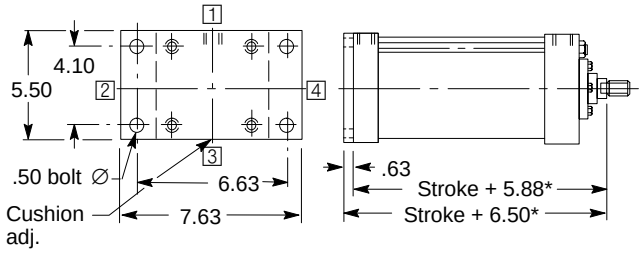
CODE 10 CLEVIS MOUNT



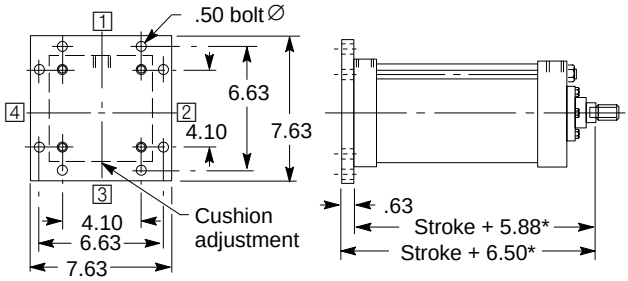
CODE 11 SPHERICAL BEARING MOUNT



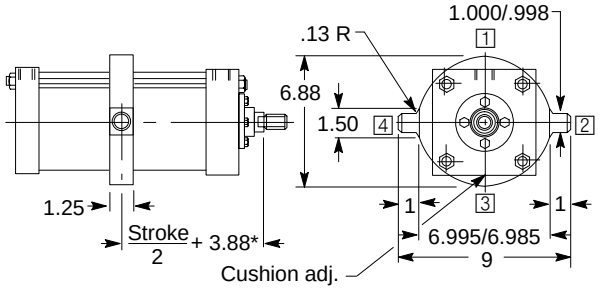
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



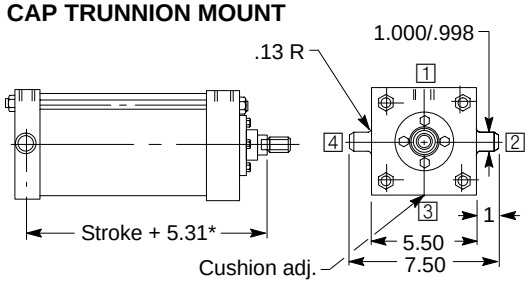
CODE 13 CAP SQUARE FLANGE MOUNT



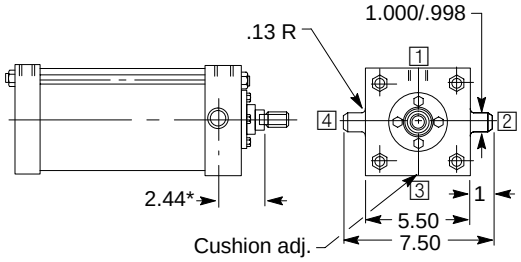
CODE 15 INTERMEDIATE TRUNNION MOUNT



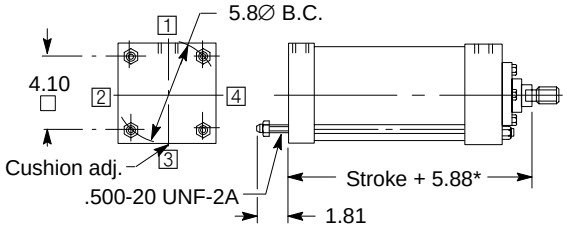
CODE 16 CAP TRUNNION MOUNT



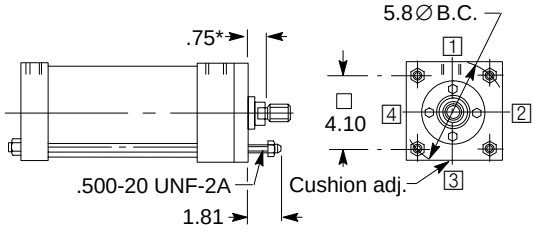
CODE 17 HEAD TRUNNION MOUNT



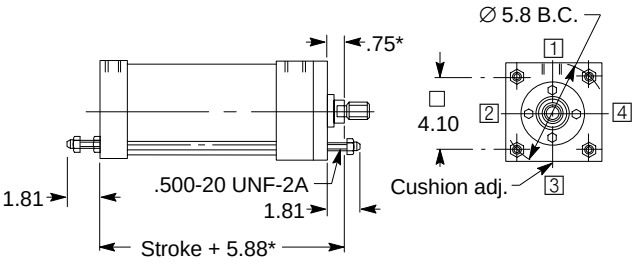
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

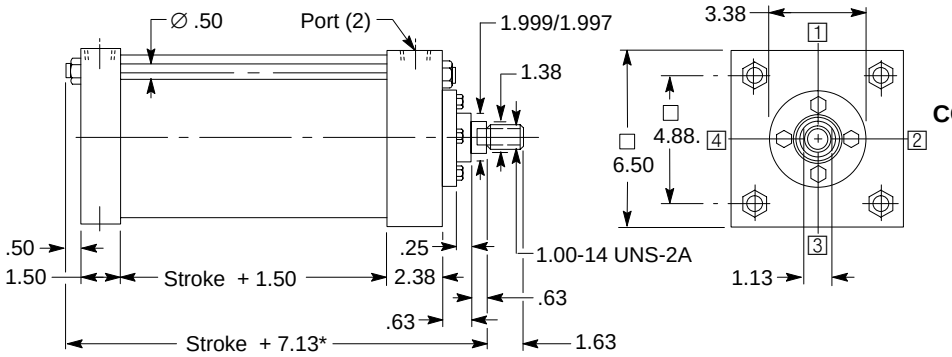


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



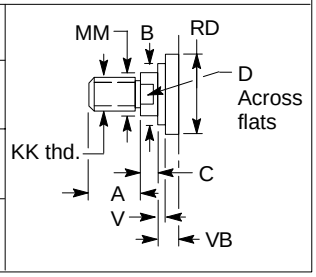
†Maximum working pressure 800 PSI (for minimum flange deflection)

6 inch Cylinder Bore

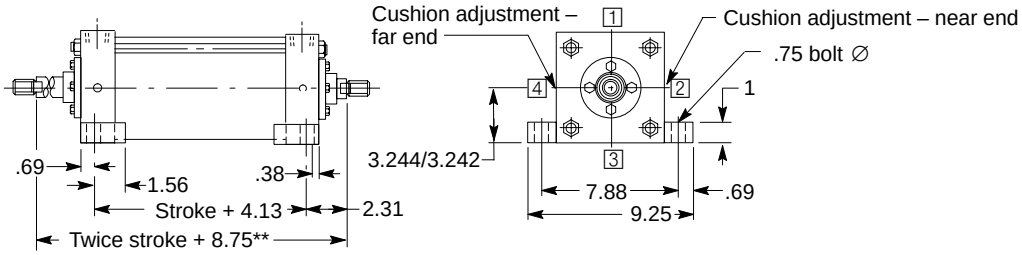


CODE 24 BASIC CYLINDER

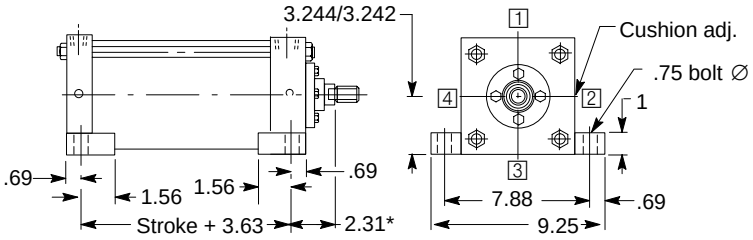
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.38	1.250–12 UNF–2A
	2 1/2	.63	3	3.124/ 3.122	1	2.06	4.50	.88	.50	1.875–12 UN–2A
	4	.63	4	4.749/ 4.746	1	3.38	6	.88	.50	3.000–12 UN–2A



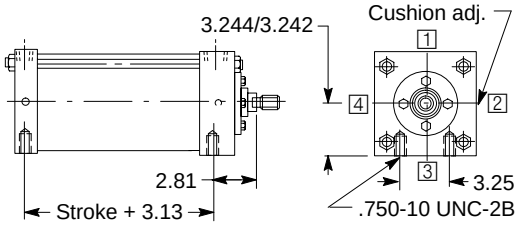
CODE 25 DOUBLE ROD SIDE LUG MOUNT



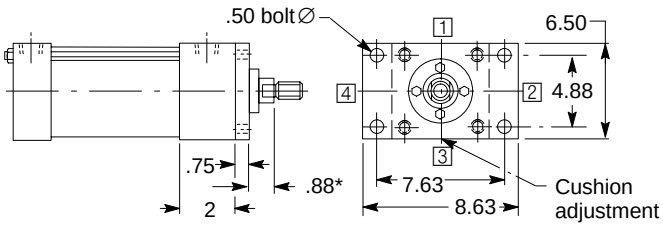
CODE 01 SIDE LUG MOUNT



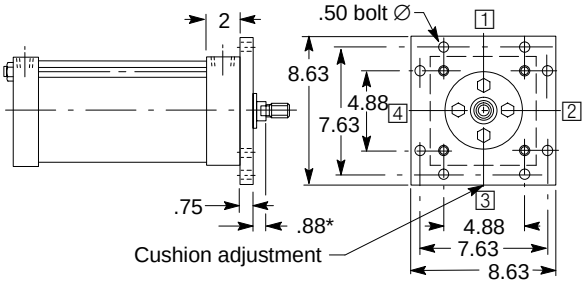
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

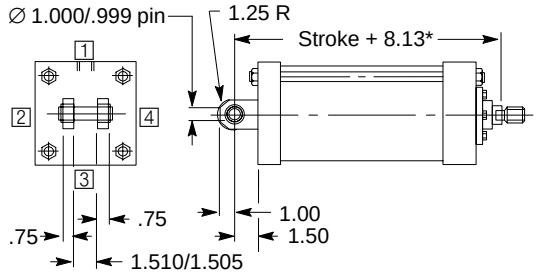


CODE 08 HEAD SQUARE FLANGE MOUNT

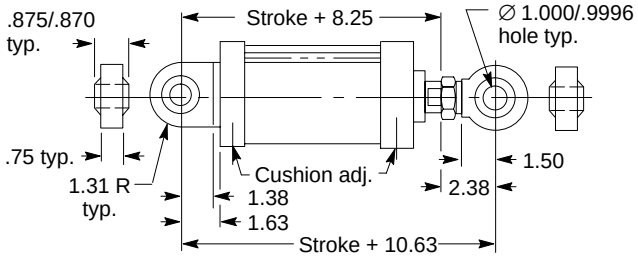


†Maximum working pressure 800 PSI (for minimum flange deflection)

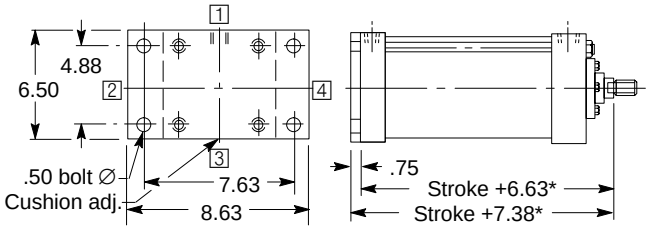
CODE 10 CLEVIS MOUNT



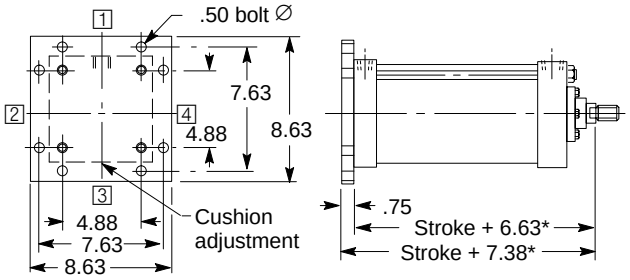
CODE 11 SPHERICAL BEARING MOUNT



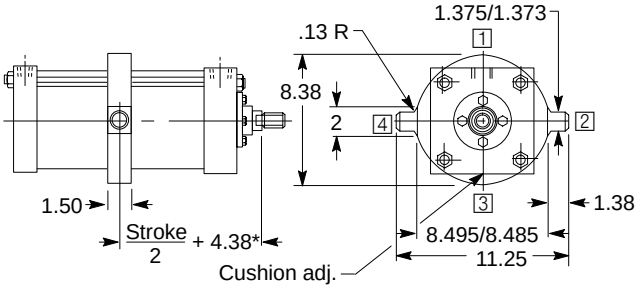
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



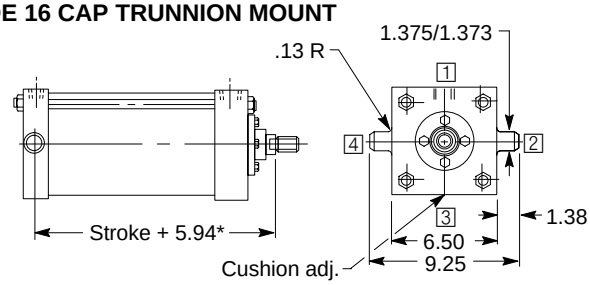
CODE 13 CAP SQUARE FLANGE MOUNT



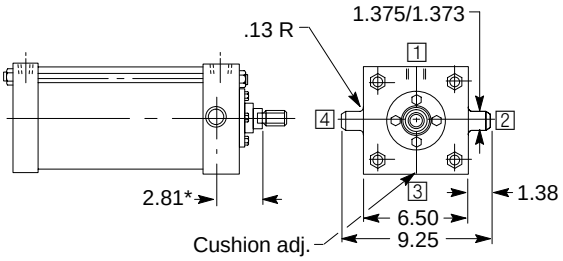
CODE 15 INTERMEDIATE TRUNNION MOUNT



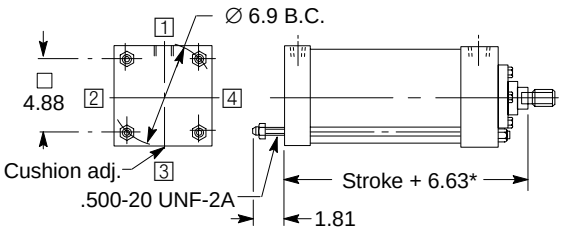
CODE 16 CAP TRUNNION MOUNT



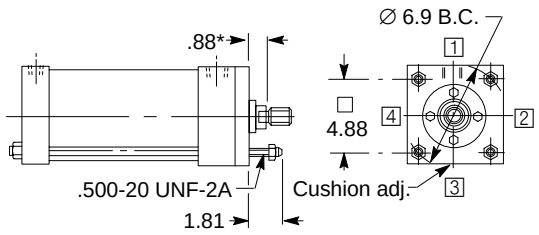
CODE 17 HEAD TRUNNION MOUNT



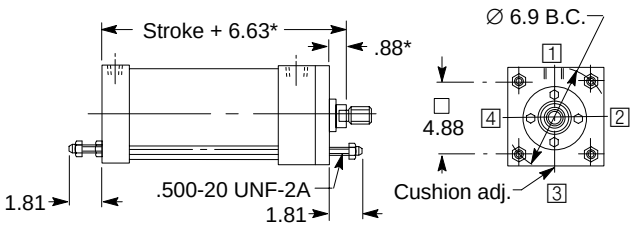
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

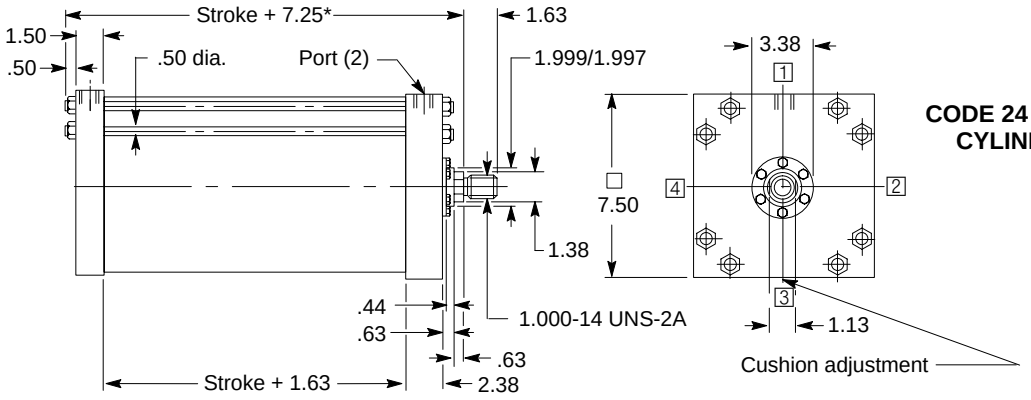


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



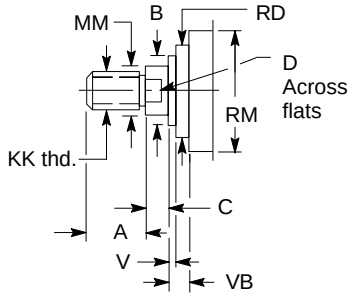
†Maximum working pressure 800 PSI (for minimum flange deflection)

7 inch Cylinder Bore

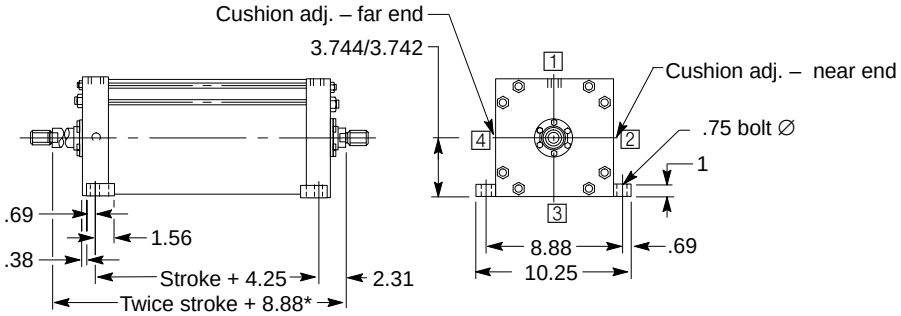


CODE 24 BASIC CYLINDER

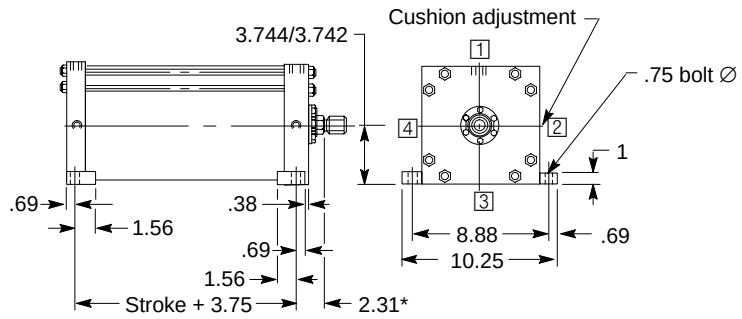
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.63	1.250–12 UNF–2A	4.499
	3	.63	3.50	3.749/ 3.747	1	2.63	5.50	.88	.63	2.250–12 UN–2A	6.249
	5	.63	5	5.749/ 5.746	1	4.25	6.88	.88	.50	3.500–12 UN–2A	6.874



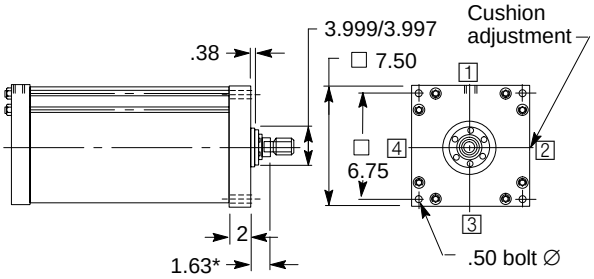
CODE 25 DOUBLE ROD SIDE LUG MOUNT



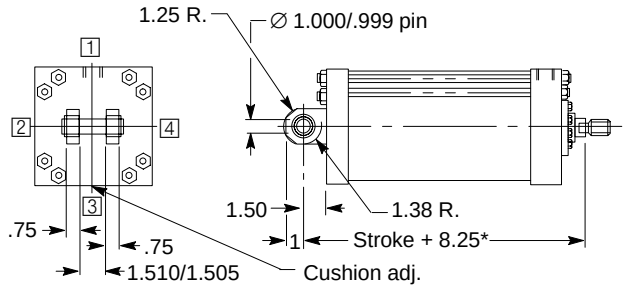
CODE 01 SIDE LUG MOUNT



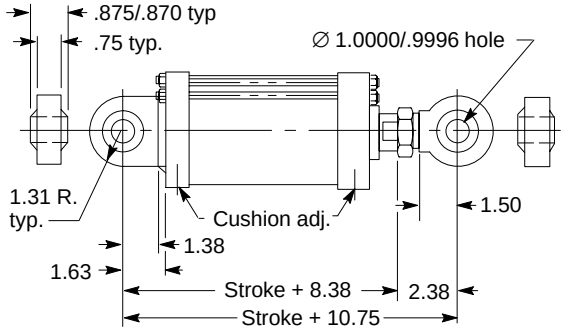
CODE 07 HEAD FLANGE MOUNT



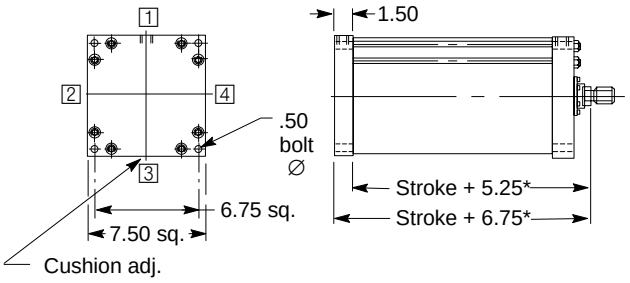
CODE 10 CLEVIS MOUNT



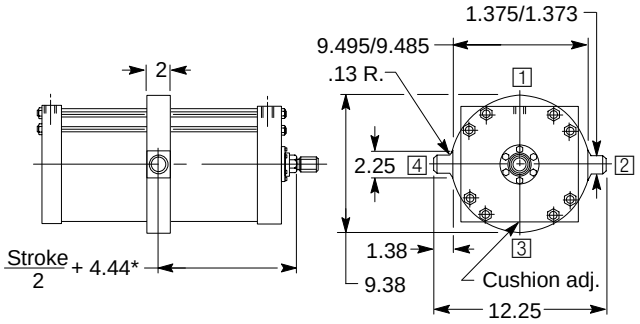
CODE 11 SPHERICAL BEARING MOUNT



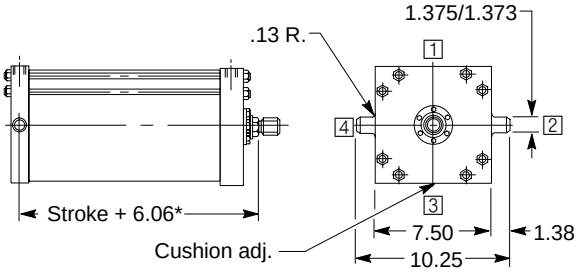
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



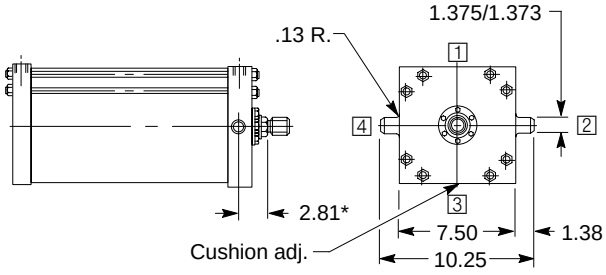
CODE 15 INTERMEDIATE TRUNNION MOUNT



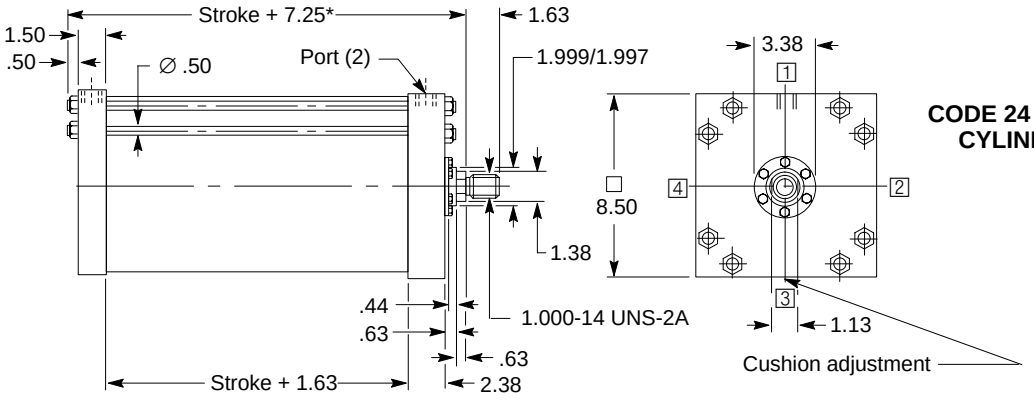
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

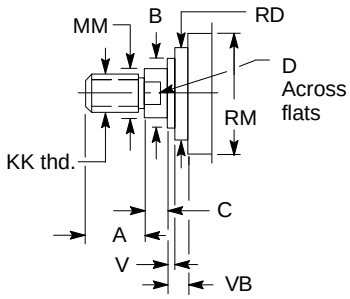


8 inch Cylinder Bore



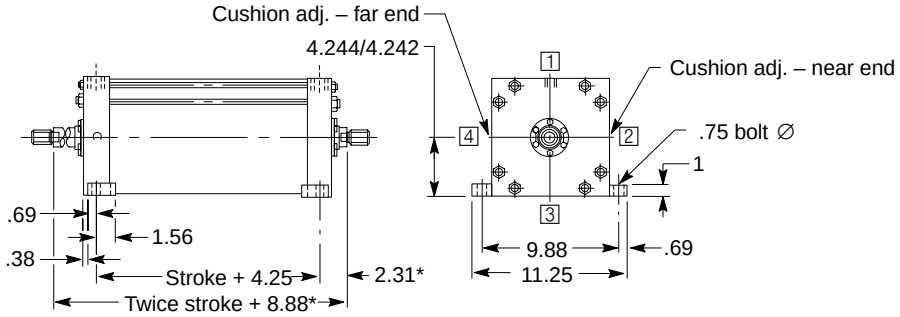
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.56	1.250–12 UNF–2A	4.499
	3 1/2	.63	3.50	4.249/ 4.246	1	3	5.88	.88	.63	2.500–12 UN–2A	6.374
	5 1/2	.63	5.50	6.249/ 6.246	1	4.63	7.38	.88	.50	4.000–12 UN–2A	7.374

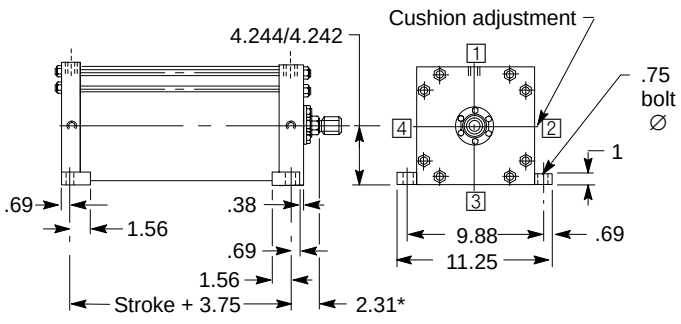


† Applies to Code 07 mount only

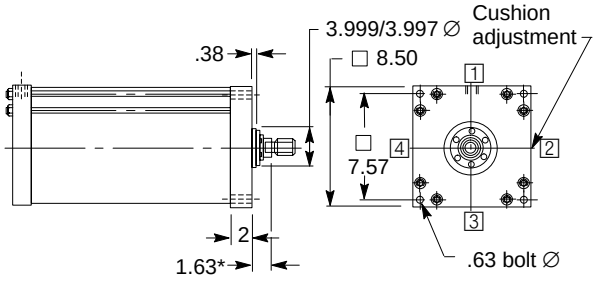
CODE 25 DOUBLE ROD SIDE LUG MOUNT



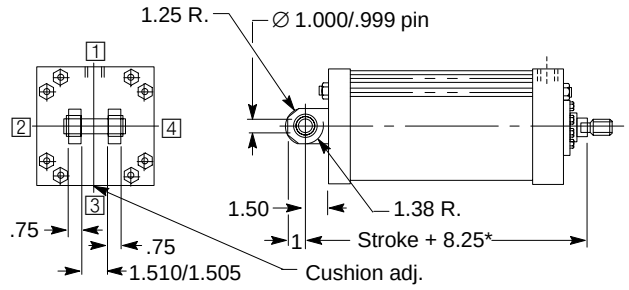
CODE 01 SIDE LUG MOUNT



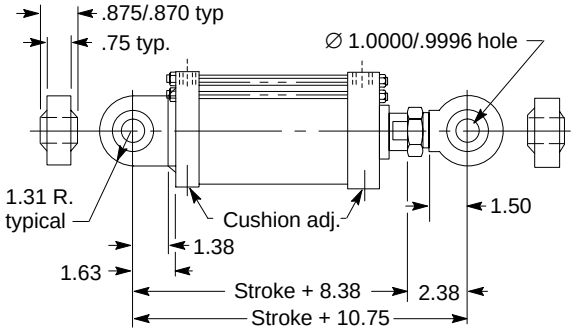
CODE 07 HEAD FLANGE MOUNT



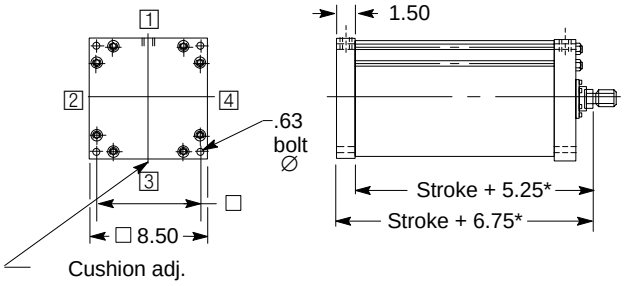
CODE 10 CLEVIS MOUNT



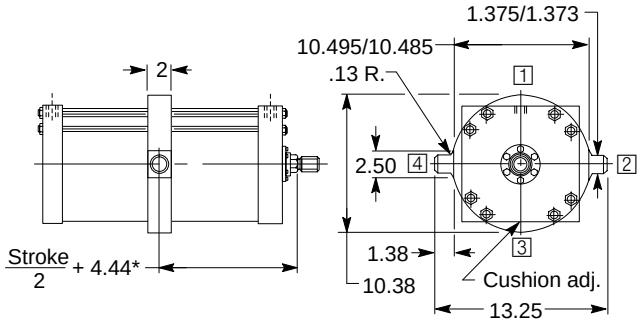
CODE 11 SPHERICAL BEARING MOUNT



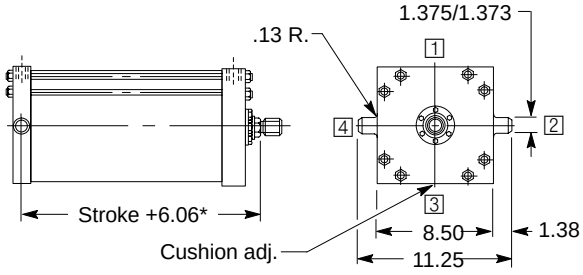
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



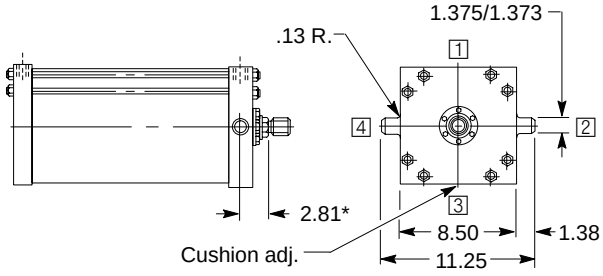
CODE 15 INTERMEDIATE TRUNNION MOUNT



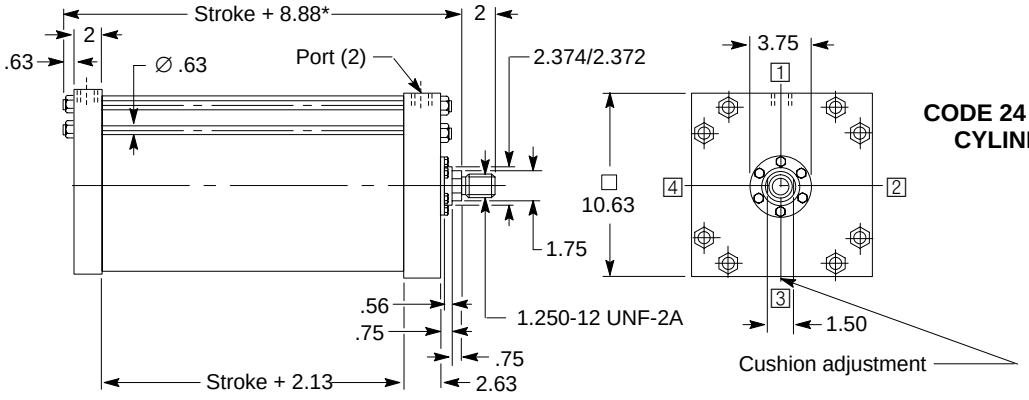
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

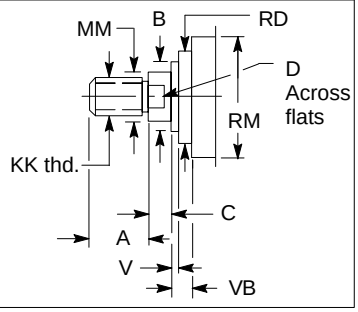


10 inch Cylinder Bore



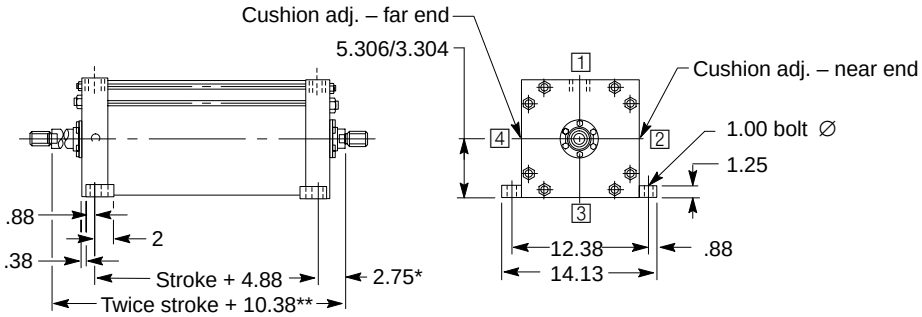
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	2	.13	2.25	2.624/ 2.622	.88	1.69	4	.75	.63	1.500–12 UNF–2A	4.749
	3 1/2	.38	3.50	4.249/ 4.246	1	3	5.88	.88	.63	2.500–12 UN–2A	6.374
	5 1/2	.38	5.50	6.249/ 6.245	1	4.63	7.38	.88	.50	4.000–12 UN–2A	7.374

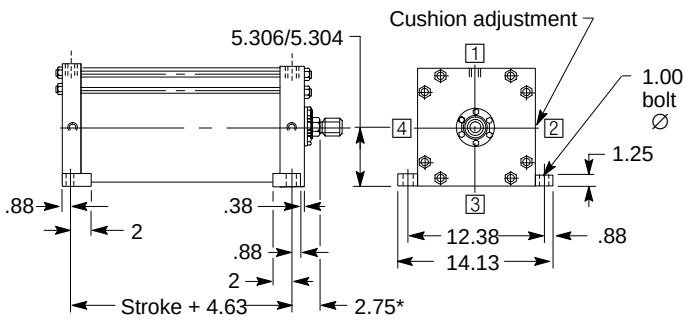


† Applies to Code 07 mount only

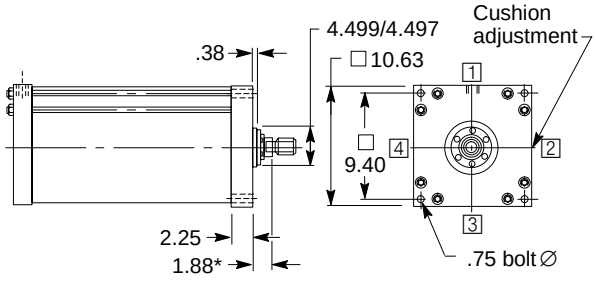
CODE 25 DOUBLE ROD SIDE LUG MOUNT



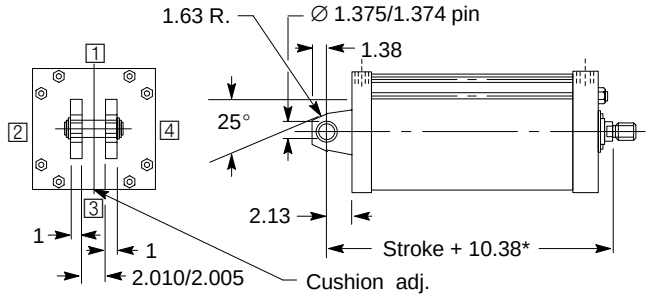
CODE 01 SIDE LUG MOUNT



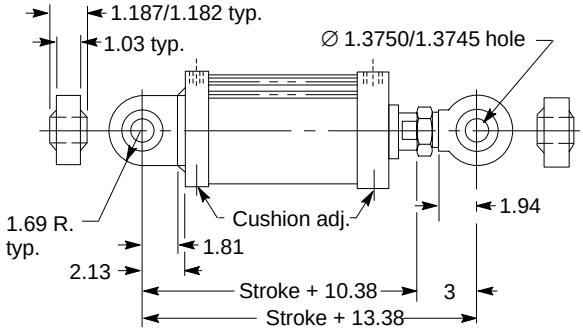
CODE 07 HEAD FLANGE MOUNT



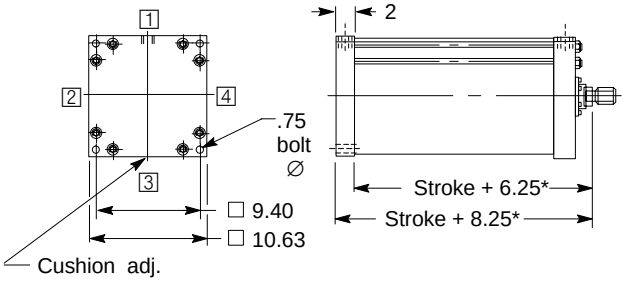
CODE 10 CLEVIS MOUNT



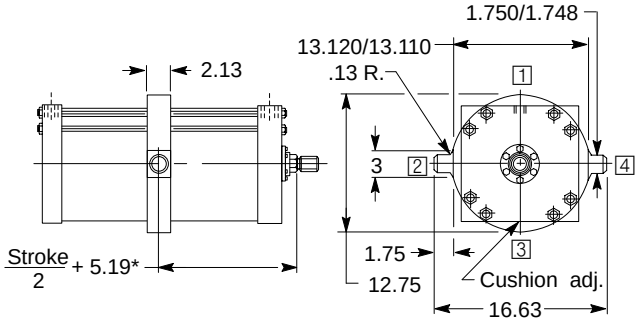
CODE 11 SPHERICAL BEARING MOUNT



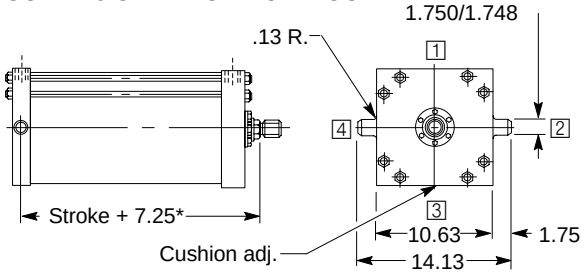
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



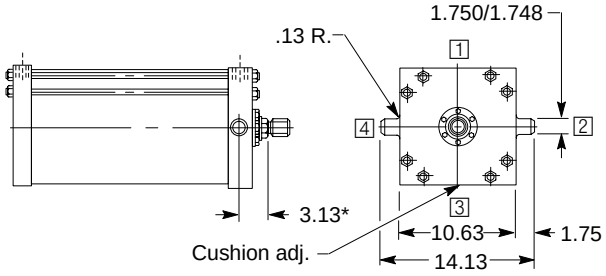
CODE 15 INTERMEDIATE TRUNNION MOUNT



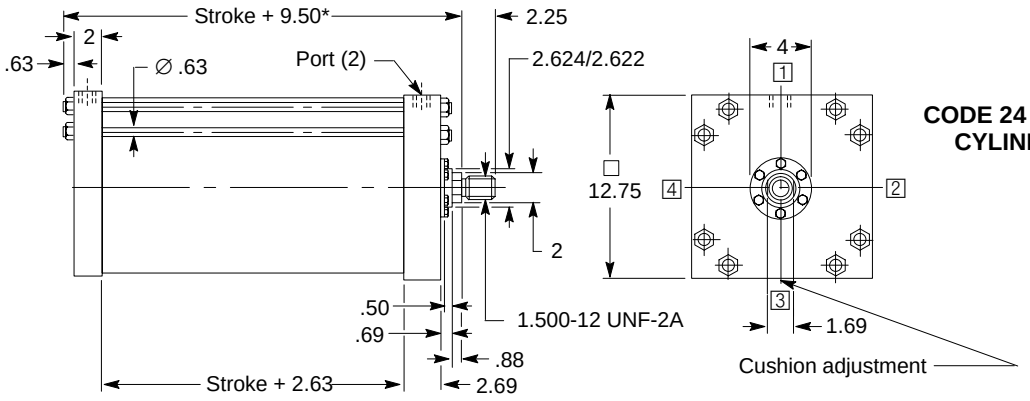
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

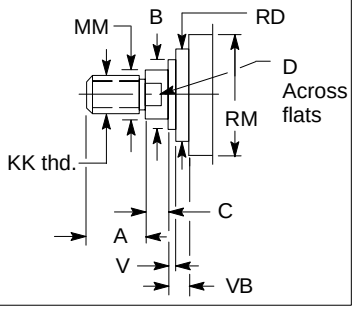


12 inch Cylinder Bore



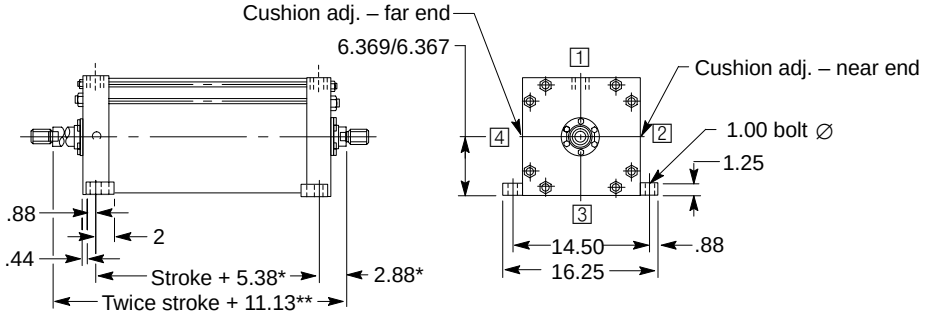
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	2 1/2	.25	3	3.124/ 3.122	1	2.06	4.50	.81	.63	1.875–12 UN–2A	5.249
	4	.25	4	4.749/ 4.746	1	3.38	6.38	.81	.56	3.000–12 UN–2A	6.999
	5 1/2	.25	5.50	6.249/ 6.245	1	4.63	7.38	.81	.50	4.000–12 UN–2A	7.374

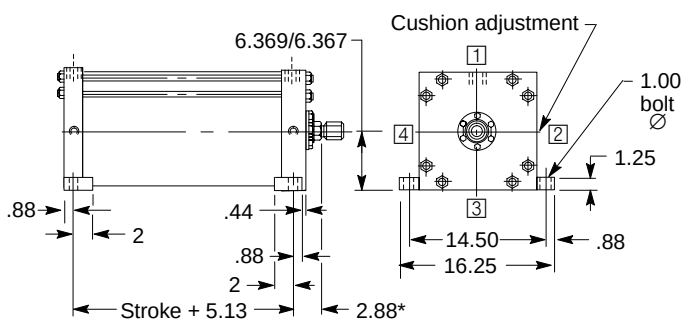


† Applies to Code 07 mount only

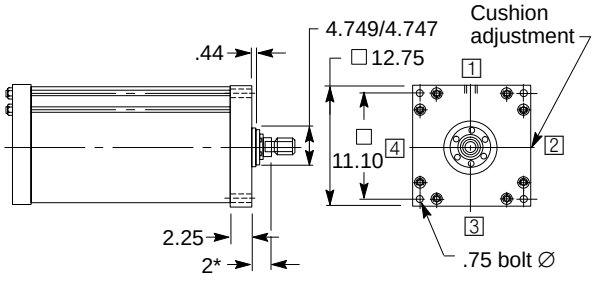
CODE 25 DOUBLE ROD SIDE LUG MOUNT



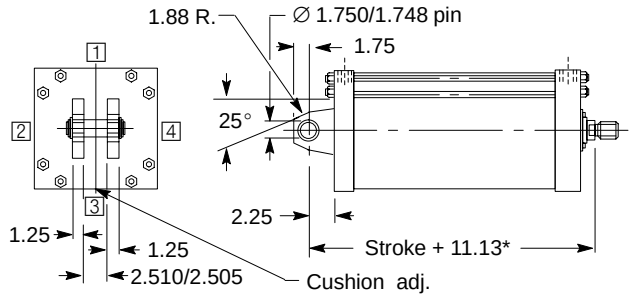
CODE 01 SIDE LUG MOUNT



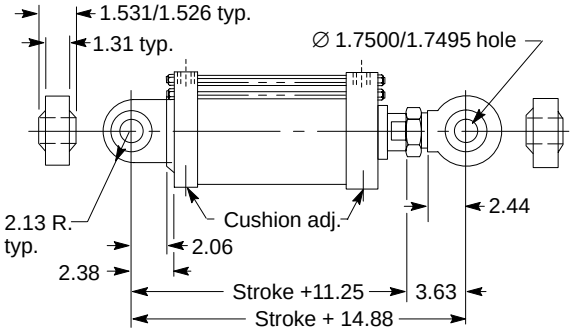
CODE 07 HEAD FLANGE MOUNT



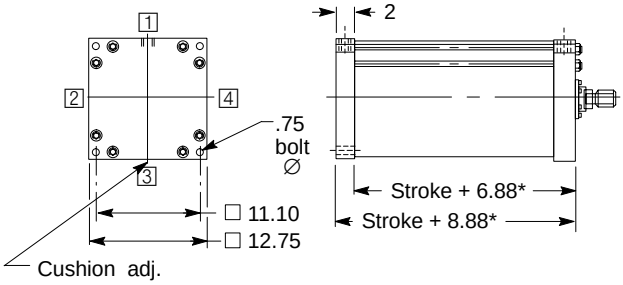
CODE 10 CLEVIS MOUNT



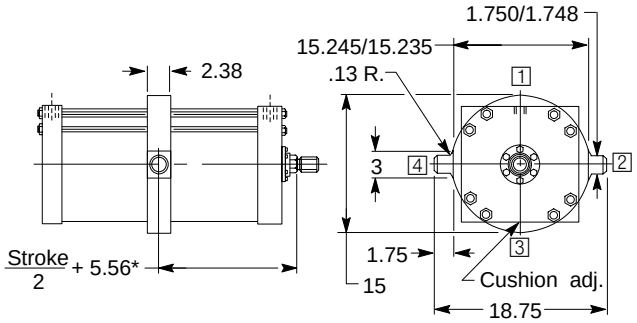
CODE 11 SPHERICAL BEARING MOUNT



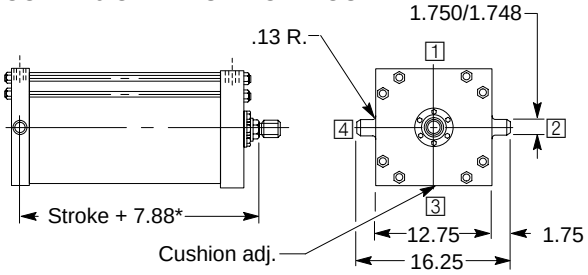
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



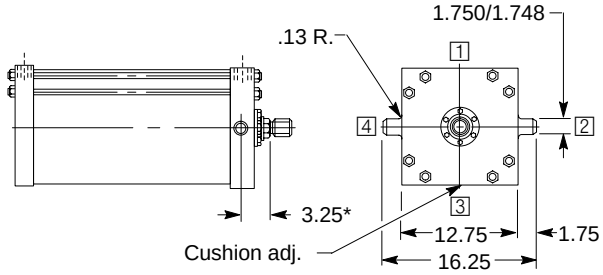
CODE 15 INTERMEDIATE TRUNNION MOUNT



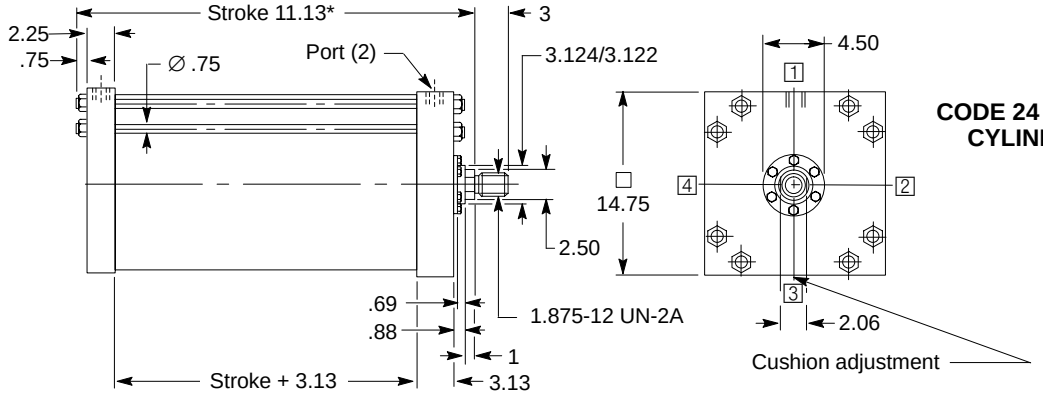
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

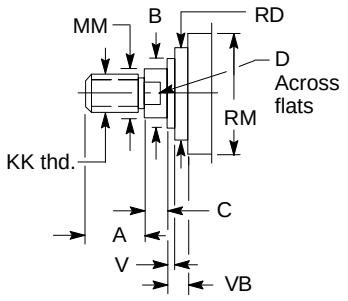


14 inch Cylinder Bore



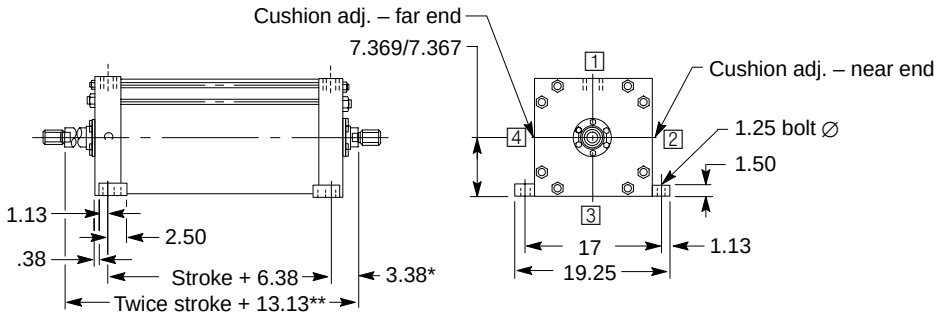
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED. Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	3	–	3.50	3.749/ 3.747	1	2.63	5.50	.88	.63	2.250–12 UN–2A	6.248
	4	–	4	4.749/ 4.746	1	3.38	6.38	.88	.56	3.000–12 UN–2A	6.999
	5 1/2	–	5.50	6.249/ 6.245	1	4.63	7.38	.88	.50	4.000–12 UN–2A	7.374

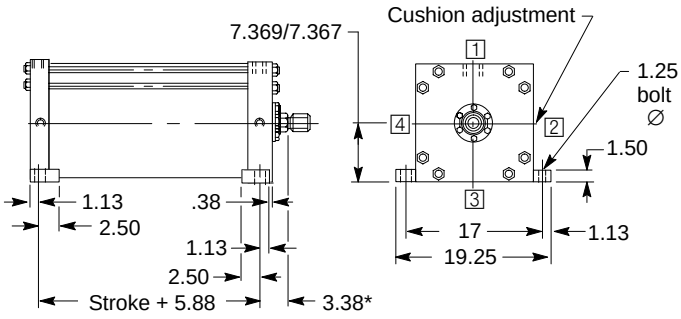


† Applies to Code 07 mount only

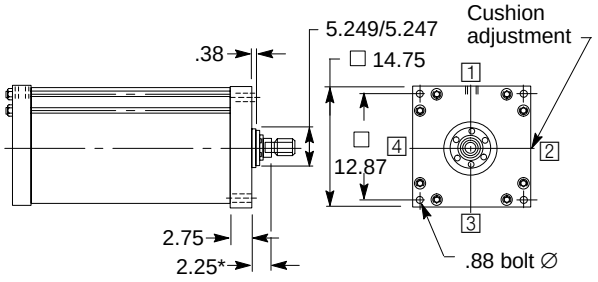
CODE 25 DOUBLE ROD SIDE LUG MOUNT



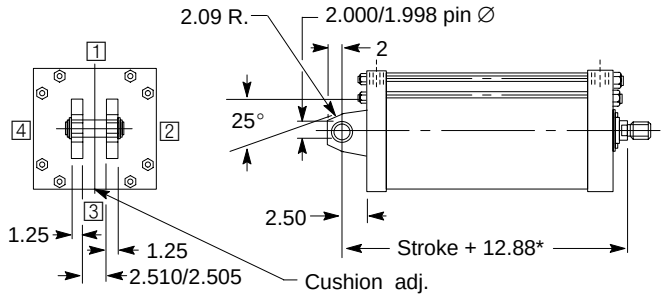
CODE 01 SIDE LUG MOUNT



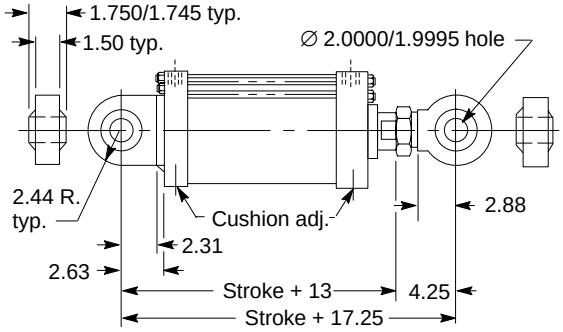
CODE 07 HEAD FLANGE MOUNT



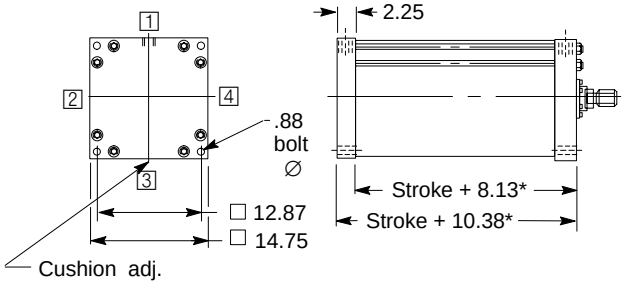
CODE 10 CLEVIS MOUNT



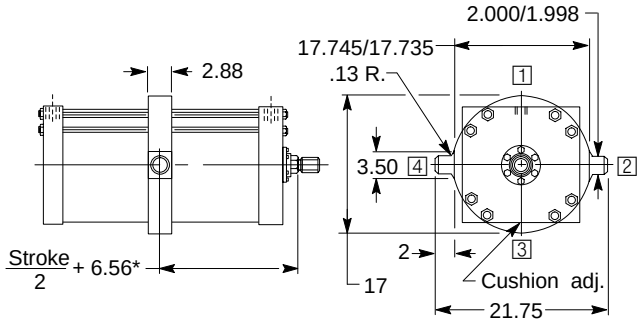
CODE 11 SPHERICAL BEARING MOUNT



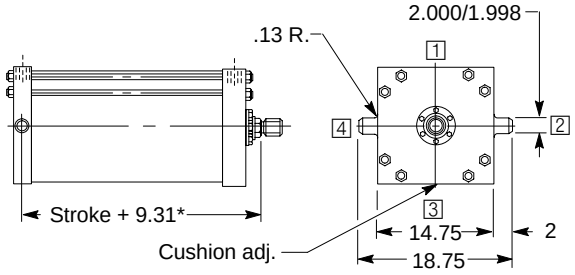
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



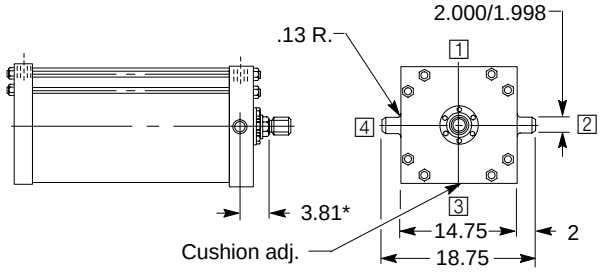
CODE 15 INTERMEDIATE TRUNNION MOUNT



CODE 16 CAP TRUNNION MOUNT



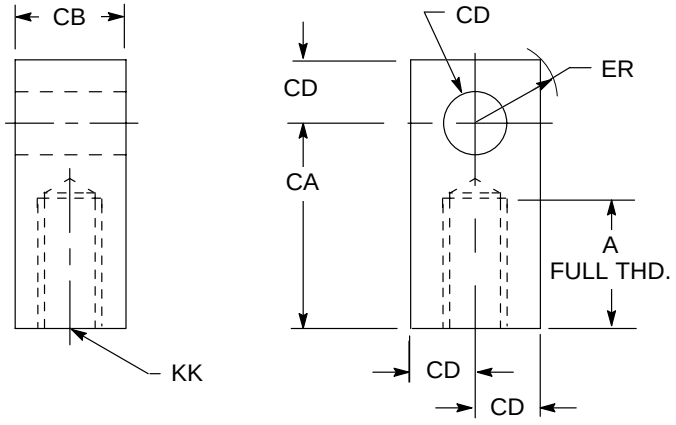
CODE 17 HEAD TRUNNION MOUNT



Accessories

Rod eyes, rod clevises and mounting brackets are available from Vickers. These accessories are detailed on the following pages, showing part numbers and all pertinent dimensional data. When ordering, please specify the part name and part number.

Rod Eye

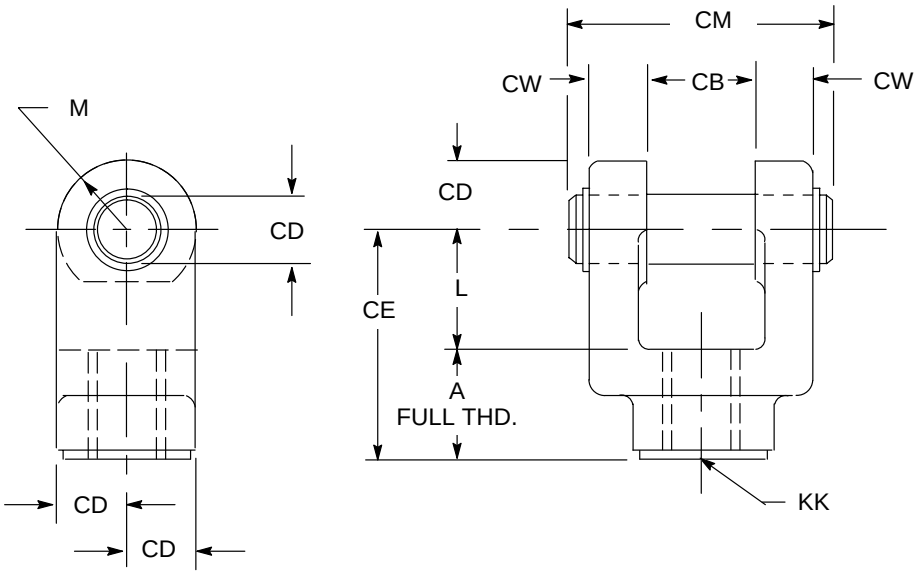


Bore dia.	A	CA	CB	CD	ER	KK thread Size	KK thread Torque (ft. lbs)*	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	1.50	.75	.50	.70	.4375-20 UNF-2B	36	S-1-560	.38
3 1/4, 4, 5	1.13	2.06	1.25	.75	1.06	.750-16 UNF-2B	125	S-460	1.25
6, 7, 8	1.63	2.81	1.50	1.00	1.42	1.000-14 NS-2B	250	S-660	2.50
10	2.00	3.44	2.00	1.38	1.94	1.250-12 UNF-2B	460	S-1060	5.94
12	2.25	4.00	2.50	1.75	2.94	1.500-12 UNF-2B	663	SH-560	11.4
14	3.00	5.00	2.50	2.00	2.81	1.875-12 UN-2B	944	SH-660	15.1

*Recommended values using MoS_2 lubricant or equivalent.
All rod accessories must be torqued against the rod shoulder.

Rod Clevis

(includes swivel pin and retaining rings)



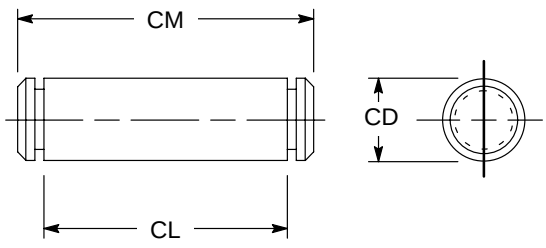
Bore dia.	A	CB	CD	CE	CM	CW
1 1/2, 2, 2 1/2	.75	.75	.50	1.50	2.00	.50
3 1/4, 4, 5	1.13	1.25	.75	2.38	2.75	.63
6, 7, 8	1.63	1.50	1.00	3.13	3.28	.75
10	2.00	2.00	1.38	4.13	4.28	1.00
12	2.25	2.50	1.75	4.50	5.44	1.25
14	3.00	2.50	2.00	5.50	5.44	1.25

Bore dia.	KK thread Size	KK thread Torque (ft. lbs)*	L (ref.)	M	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.4375-20 UNF-2B	36	.75	.50	S-1-562-10	.56
3 1/4, 4, 5	.750-16 UNF-2B	125	1.25	.75	S-462-10	1.56
6, 7, 8	1.000-14 NS-2B	250	1.50	1.00	S-662-10	3.31
10	1.250-12 UNF-2B	460	2.13	1.38	S-1062-10	9.25
12	1.500-12 UNF-2B	663	2.25	1.75	SH-562-10	14.62
14	1.875-12 UN-2B	944	2.50	2.25	SH-662-10	21.00

*Recommended values using MoS_2 lubricant or equivalent. All rod accessories must be torqued against the rod shoulder.

Swivel pin for rod clevis (includes two retaining rings)

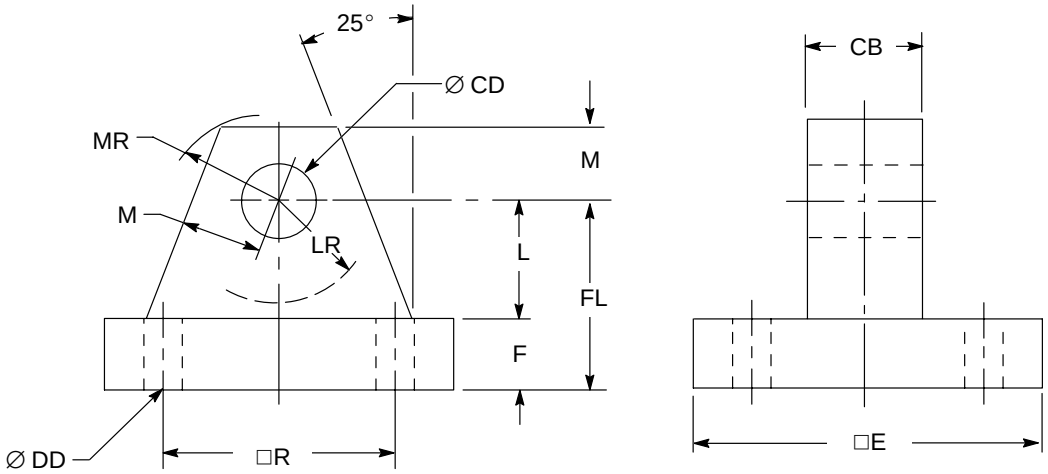
Bore dia.	CD	CL	CM	Part no.
1 1/2, 2, 2 1/2	.500/.499	1.82	2.00	S-1-583-10
3 1/4, 4, 5	.750/.749	2.57	2.75	S-483-10
6, 7, 8	1.000/.999	3.06	3.28	S-683-10
10	1.375/1.374	4.06	4.28	SH-483-10
12	1.750/1.748	5.06	5.44	SH-583-10
14	2.000/1.998	5.06	5.44	SH-683-10



Accessories

Mounting Eye Bracket

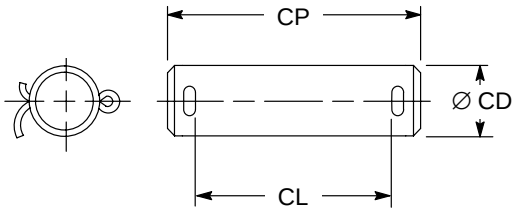
(for clevis mount cylinders)



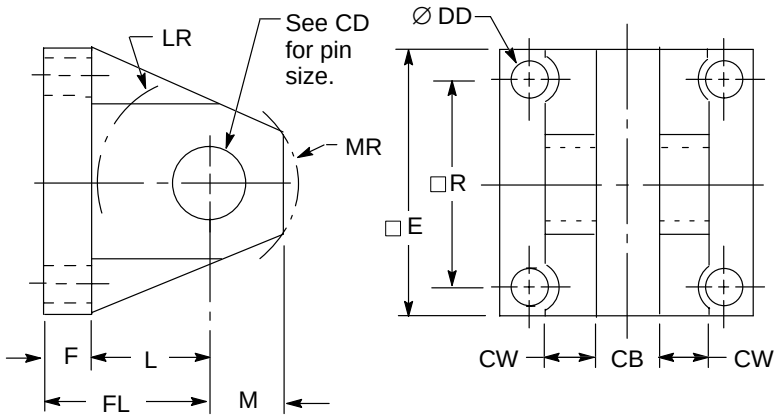
Bore diameter	CB	CD	DD	E	F	FL	L (ref.)	LR	M	MR	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	.50	.38	2.50	.38	1.13	.75	.69	.50	.59	S-1-552-M	.94
3 1/4, 4, 5	1.25	.75	.50	3.50	.63	1.88	1.25	1.13	.75	.88	S-452-M	3.19
6, 7, 8	1.50	1.00	.63	4.50	.75	2.25	1.50	1.38	1.00	1.25	S-652-M	6.50
10	2.00	1.38	.63	5.00	.88	3.00	2.13	1.88	1.38	1.63	S-1052-M	11.7
12	2.50	1.75	.88	6.50	.88	3.13	2.25	2.00	1.75	1.88	SH-552-M	19.2
14	2.50	2.00	1.00	7.50	1.00	3.50	2.50	2.25	2.25	2.09	SH-652-M	27

Accessories for Spherical Bushing Mounted Cylinders 4

Pivot Pin



Clevis Bracket



Bore dia.	CB	CD	CL	CP	CW	DD	E	F	FL	L(Ref)	LR	M	MR	R
1 1/2, 2, 2 1/2	.467 .472	.4997 .4992	1.47	2.19	.50	.38	2.50	.38	1.13	.75	.63	.50	.625	1.63
3 1/4, 4, 5	.686 .691	.7497 .7492	1.94	2.69	.63	.50	3.50	.63	1.88	1.25	1.13	.75	.875	2.55
6, 7, 8	.935 .940	.9996 .9991	2.44	3.19	.75	.63	4.50	.75	2.25	1.50	1.38	1.00	1.250	3.25
10	1.247 1.251	1.3745 1.3739	3.25	4.31	1.00	.63	5.00	.88	3.00	2.13	1.88	1.38	1.625	3.82
12	1.591 1.596	1.7495 1.7489	4.09	5.19	1.25	.88	6.50	.88	3.13	2.25	2.13	1.75	1.875	4.95
14	1.810 1.815	1.9995 1.9989	4.31	5.38	1.25	1.00	7.50	1.00	3.50	2.50	2.44	2.00	2.094	5.73

	Accessory part numbers				
Bore diameter	Spherical rod eye w/bushing*	Replacement bushing only*	SAB clevis bracket†	Pivot pin assembly†	Jam nut part number/size‡
1 1/2, 2, 2 1/2	S-1-560-SAB-10	6803-8	S-1-552-M-SAB	6856A-1-10	5202-008 .4375-20
3 1/4, 4, 5	S-460-SAB-10	6803-12	S-452-M-SAB	6856A-2-10	5202-003 .750-16
6, 7, 8	S-660-SAB-10	6803-16	S-652-M-SAB	6856A-3-10	5202-005 1.000-14
10	S-1060-SAB-10	6803-22	S-1052-M-SAB	6856A-4-10	5202-012 1.250-12
12	SH-560-SAB-10	6803-28	SH-552-M-SAB	6856A-5-10	5202-015 1.500-12
14	SH-660-SAB-10	6803-32	SH-652-M-SAB	6856A-6-10	5202-019 1.875-12

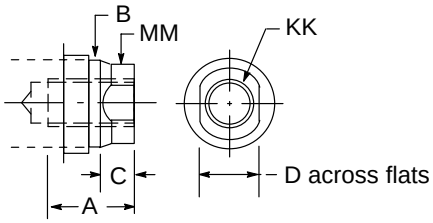
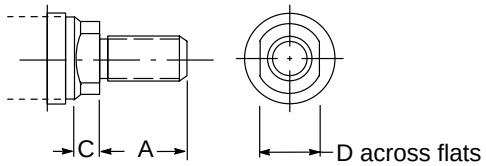
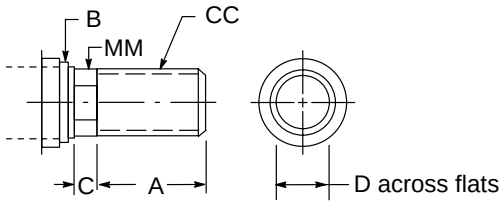
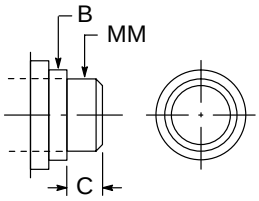
* Included in assembly
† Order separately.
‡ Use jam nut to lock rod eye to piston rod.

Rod Sizes and Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

Four different rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and define your requirements.

The tables on pages 55 through 58 give maximum allowable push strokes at various operating pressures for available rod diameters. Rod ends on rigid mount cylinders should be supported. Longer strokes are allowable for **pull only** applications. The largest available rod size should be specified for maximum fatigue life. Contact your local Vickers sales engineer for application assistance if necessary.

End Type	
2	
5	
4	
6	

Dimensions in inches

MM rod dia.	**C**	**KK** thread	**A**	**B** +.000/–.002	**D**	**CC** thread
5/8	.37	.4375–20	.75	1.124	.50	.625–18
1	.50	.7500–16	1.12	1.499	.87	1.000–14
1 3/8	.62	1.000–14	1.62	1.999	1.12	1.375–12
1 3/4	.75	1.250–12	2.00	2.374	1.50	1.750–12
2	.87	1.500–12	2.25	2.624	1.69	2.000–12
2 1/2	1.00	1.875–12	3.00	3.124	2.06	2.500–12
3	1.00	2.250–12	3.50	3.749	2.62	3.000–12
3 1/2	1.00	2.500–12	3.50	4.249	3.00	3.500–12
4	1.00	3.000–12	4.00	4.749	3.37	4.000–12
5	1.00	3.500–12	5.00	5.749	4.25	5.000–12
5 1/2	1.00	4.000–12	5.50	6.249	4.62	5.500–12

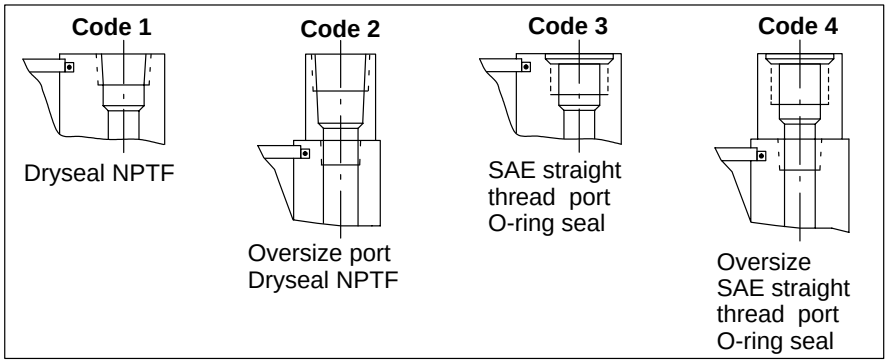
Port Types, Sizes and Locations

Series TE/TL cylinders have the full flow national pipe thread (NPTF) ports as standard. SAE straight thread O-ring ports are recommended for maximum reliability in Series TF hydraulic applications.

The table below, and on the following page, list the port types and sizes available for each bore diameter.

The tables on pages 53 and 54 list the maximum piston velocities obtainable with each bore diameter and standard port combination, for hydraulic service.

Ports may be located as shown on page 7. Some mounting styles have location restrictions. Where a port or port boss interferes with the cylinder mounting, the mounting takes precedence.



Bore dia. inch	Rod dia inch	NPTF		Tube dash number	
		Code 1	Code 2	Code 3	Code 4
1 1/2	5/8	3/8	1/2	–6	N/A
	1			N/A	–6
2	5/8	3/8	1/2	–6	N/A
	1				
	1 3/8				
2 1/2	5/8	3/8	1/2	–6	N/A
	1				
	1 3/8				
	1 3/4				
3 1/4	1	1/2	3/4	–10	N/A
	1 3/8				
	1 3/4			–8	–10
	2				
4	1	1/2	3/4	–10	N/A
	1 3/8				
	1 3/4			–8	–10
	2				
	2 1/2				
5	1	1/2	3/4	–10	N/A
	1 3/8				
	1 3/4				
	2				
	2 1/2				
	3			–8	–10
	3 1/2				

Bore dia. inch	Rod dia inch	NPTF		Tube dash number	
		Code 1	Code 2	Code 3	Code 4
6	1 3/8	3/4	1	–12	–14
	1 3/4				
	2 1/2				
	4				
7	1 3/8	3/4	1	–12	–14
	1 3/4				
	3				
	5				
8	1 3/8	3/4	1	–12	–14
	1 3/4				
	3 1/2				
	5 1/2				
10	1 3/4	1	1 1/4	–16	N/A
	2				
	3 1/2				
	5 1/2				
12	2	1	1 1/4	–16	N/A
	2 1/2				
	4				
	5 1/2				
14	2 1/2	1 1/4	1 1/2	–20	N/A
	3				
	4				
	5 1/2				

N/A – Not available

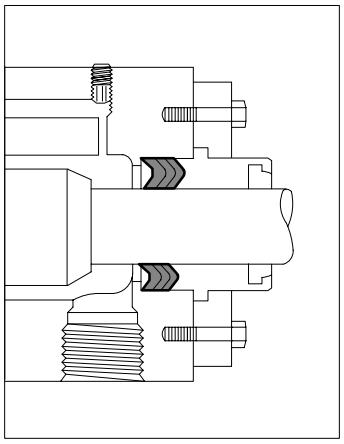
Seal Options

Select the type of piston seal for your application, then select the seal compound from the compatibility chart below.

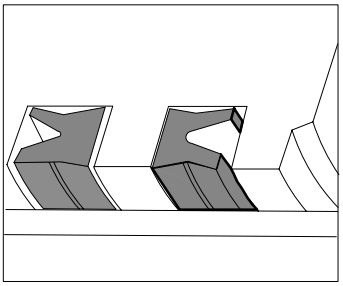
Determine the correct seal code for your application, then enter it as item 8 in the model code.

Code	Piston seal type	Seal material	
		All seals	Scraper retainer
A	U-cup	Nitrile	Nitrile†
B	Cast iron rings		
C	G.F.T.‡		
D	U-cup	Viton	Viton
E	Cast iron rings		
F	G.F.T.‡		
K	U-cup	Viton	Nitrile
L	Cast iron rings		
M	G.F.T.‡		

† Codes A, B, and C indicate a polyurethane rod wiper in Series TE, TL; a metallic rod scraper in Series TF.
‡ Glass filled Teflon.



Pressure energized v-ring rod seal is standard on TE and TF cylinders. A single lip cup seal is standard on series TL.



Pressure energized U-cup piston packings are standard on TE and TF cylinders. Elastomer energized glass filled Teflon rings (standard on TL cylinders) or cast iron rings are available options.

Class of hydraulic fluid	Seal compounds	
	Nitrile (standard)	**Viton** (optional)
Petroleum base	Compatible	Compatible
Phosphate ester	Not compatible	Compatible ●
Silicone	Compatible	Compatible
Water		
Water/oil emulsion		
Water-glycol		
Ethylene glycol		
Auto transmission fluid		
Auto brake fluid	Not compatible	Not compatible
Temperature range ▪	–40° F to +250° F	–20° F to +400° F

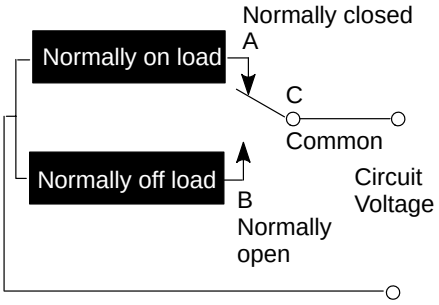
● Except certain aircraft and commercial fluids.
▪ Maximum ratings for continuous exposure of sealing system only.
The above technical data represents generally accepted design parameters.
Consult Vickers Engineering for more specific application data.

Limit Switches

Two different built-in limit switches are available as options. Both come with a $^1/_2$" pipe conduit connection in the enclosure wall.

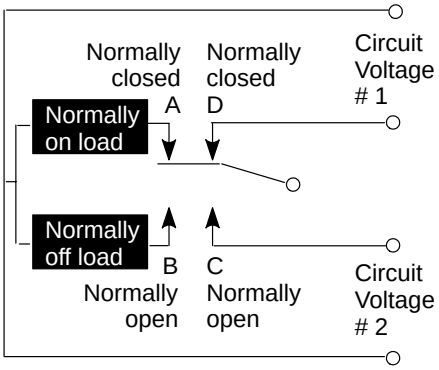
A quick disconnect plug, factory wired to the limit switch, is an option. In addition, air-pilot valves (3-way and 2-way) can be fitted to the cylinders. See Bulletin 4098 for complete information on limit switches and valves.

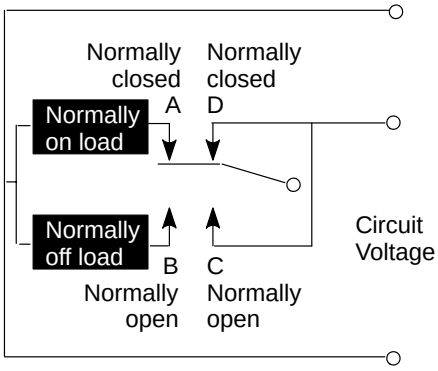
Switch "01" single pole, double throw (standard)



15 Amperes	125 Volts AC
	250 Volts AC
	480 Volts AC
1/8 H.P.	125 Volts AC
1/4 H.P.	250 Volts AC
1/4 Ampere	125 Volts AC
1/2 Ampere	125 Volts AC

Switch "03" single pole, double throw, double break (optional)

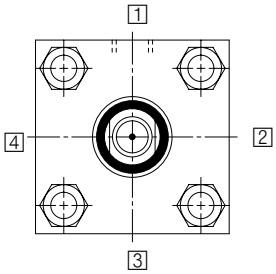




15 Amperes	125 Volts AC
	250 Volts AC
1 Ampere	125 Volts AC
1/2 Ampere	250 Volts AC
1/4 H.P.	125 Volts AC
1/2 H.P.	250 Volts AC

Switch positions

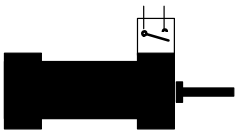
Type 01 and type 03 switches are positioned as shown below when viewing the cylinder from the head end (mounting end of double rod cylinder).



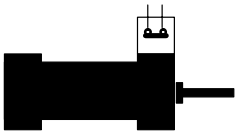
Switch type 01		
Code	Head end position	Cap end position
B	1	–
C	2	–
D	3	–
E	4	–
F	1	1
G	2	2
H	3	3
J	4	4
K	0	1
L	0	2
M	0	3
N	0	4

Switch type 03		
Code	Head end position	Cap end position
5	1	1
6	2	2
7	3	3
8	4	4

Switch mounted on head end only

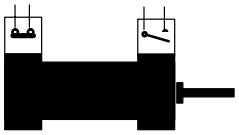


Piston rod retracted or in motion – switch open

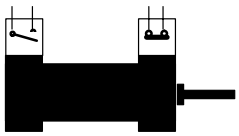


Piston rod fully extended – switch closed

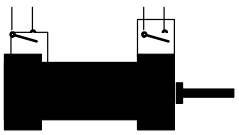
Switches mounted on both head end and cap end



Piston rod fully retracted – cap end switch closed, head end switch open



Piston rod fully extended – head end switch closed, cap end switch open



Piston rod in motion – both switches open

PS 200 Proximity Switches

PS 200 proximity switches are inductive type switches with a sensing probe that “looks” at the cylinder’s cushion collar or button to provide full extend or full retract indication. Since the probe is inside the cylinder, harsh external environments don’t affect sensing. The 2-wire circuit will operate on AC or DC and works as reliably as a programmable controller. PS 200 switches meet UL requirements for 1000 psi hydraulic cylinders. Four mounting holes allow 90° rotation increments.

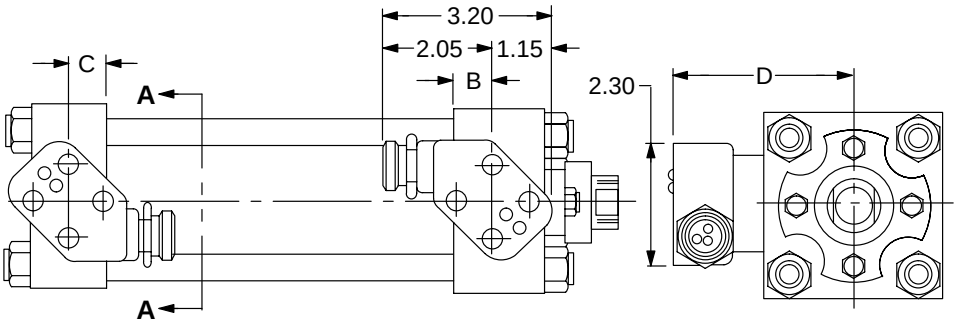
Short circuit protection is a standard feature on the PS 200 proximity switch. It protects the switch from shorts in the load or line. Upon sensing a short condition, the switch assumes a non-conducting mode. The fault condition must be removed and power turned off in order to reset the switch. This feature prevents unintended automatic restarts. The switch indicates when it is in the short circuit protection mode by flashing both LEDs.

Series PS 200 2-wire AC/DC Proximity Switches

Pressure	1000 psi
Sensing range	0.08” ±10%
Operating temperature range	–20° to +70°C
Repeatability	.001”
Switching differential	10%
Supply voltage	20–220 V AC/DC
On-state voltage drop	10V @ 5–500 mA
Load current maximum	0.5 Amp
Inrush current	3 Amp
Quiescent current	1.7 mA maximum
Indicating LEDs (standard)	1 lit: Power on/non-conducting 2 lit: Target present (both flashing = short circuit protection mode)

Cable 13 Pin Plug-in Connectors for PS 200 Proximity Switches

3-foot cable	Part no. 7552–3
6-foot cable	Part no. 7552–6
12-foot cable	Part no. 7552-12



Switch is rotatable in 90° increments from position shown.

Torque .250–20 mounting screws to 12–15 ft-lb.

O-rings required:
Size 115 – One per switch
Size 116 – One per spacer

Bore dia. inch	**Rod dia.** inch	**Switch 7550-**	**Spacer 7551-**	**B**	**C**	**D max**
1 1/2	5/8	1.225	–	.72	–	3.43
	1	1.225	125	.72	–	3.55
	Cap end	1.725	250	–	.63	3.68
2	5/8	1.225	–	.75	–	3.68
	1	1.225	–	.75	–	3.68
	1 3/8	1.225	–	.75	–	3.74
	Cap end	1.725	–	–	.67	3.81
2 1/2	5/8	1.225	281	.72	–	3.50
	1	1.225	375	.62	–	3.61
	1 3/8	1.225	281/250	.81	–	3.77
	1 3/4	1.225	500/219	.62	–	3.95
	Cap end	1.225	–	–	.59	3.34
3 1/4	1	1.225	156	.81	–	3.75
	1 3/8	1.225	156	.81	–	3.77
	1 3/4	1.225	406	.81	–	4.00
	2	1.225	281/250	.81	–	4.13
	Cap end	1.725	219	–	.78	3.81
4	1	1.725	281	.81	–	4.25
	1 3/8	1.725	281	.81	–	4.27
	1 3/4	1.725	281/250	.81	–	4.50
	2	1.225	156	.81	–	4.13
	2 1/2	1.225	406	.81	–	4.38
	Cap end	2.375	500	–	.78	4.47

Bore dia. inch	**Rod dia.** inch	**Switch 7550-**	**Spacer 7551-**	**B**	**C**	**D max**
5	1	2.375	438	.81	–	4.91
	1 3/8	2.375	438	.81	–	4.92
	1 3/4	2.375	500/188	.81	–	5.31
	2	1.725	156	.81	–	4.63
	2 1/2	1.725	406	.81	–	4.88
	3	1.225	156	.81	–	4.63
	3 1/2	1.225	406	.81	–	4.88
	Cap end	2.375	–	–	.78	4.47
6	1 3/8	2.375	188	1.00	–	5.16
	1 3/4	2.375	188	1.00	–	5.16
	2 1/2	2.375	312/250	1.00	–	5.53
	4	1.225	156	.94	–	5.13
	Cap end	2.875	125	–	.97	5.09
7	1 3/8	2.875	188	1.00	–	5.66
	1 3/4	2.875	188	1.00	–	5.66
	3	2.375	312	.94	–	5.78
	5	1.225	156	.94	–	5.63
	Cap end	3.750	500	–	.97	5.97
8	1 3/8	3.750	312/250	1.00	–	6.53
	1 3/4	3.750	312/250	1.00	–	6.53
	3 1/2	2.875	312/250	1.00	–	6.53
	5 1/2	1.725	406	.94	–	6.38
	Cap end	3.750	–	–	.97	5.97
10	1 3/4	4.560	312/250	1.00	–	7.59
	2	4.560	312/250	1.00	–	7.59
	3 1/2	3.750	375	1.00	–	7.41
	5 1/2	2.375	–	.94	–	7.03
	Cap end	4.990	250	–	.97	7.28

Stop Tube, Tie Rod Spacers and Center Supports

Stop Tube Selection

The following table lists the maximum stroke permissible without the use of a stop tube. Strokes are listed for rigid mounting styles as well as clevis and trunnion pivot mounts.

As the stroke length of a cylinder increases, the resultant bearing loads on the piston rod become greater. To keep these bearing loads from exceeding design limitations, and to obtain optimum life from a cylinder, stop tubes should be specified according to the following procedure:

Specify one inch of stop tube for each 10 inches (or fraction thereof) of stroke in excess of the maximums listed in the table.

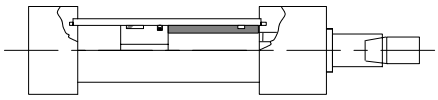
	Type of cylinder mounting		
Bore dia. (inch)	**Pivot** (clevis & trunnion)	**Rigid** (no rod support)	**Rigid** (with rod support)
1 1/2 and 2	24 in.	30 in.	48 in.
2 1/2 to 4	30 in.	38 in.	
5 to 14	36 in.	40 in.	

Stop Tube Designs

Three typical stop tube designs are illustrated below.

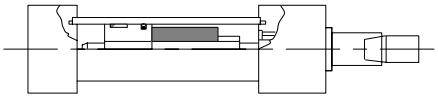
Design A

Used for cylinders not cushioned on the rod end.



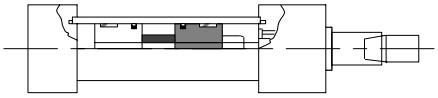
Design B

Used for cushioned hydraulic cylinders.



Design C

The best choice for a cylinder with an exceptionally long stop tube requirement. Note that the piston's effective bearing area is doubled, in addition to gaining the normal increased minimum distance between bearing points.



Tie Rod Spacers and Center Supports

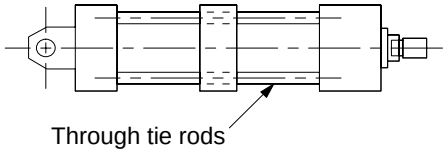
Tie rod spacers and center supports are used to improve the structural rigidity of long stroke tie rod cylinders.

A tie rod spacer or center support should be applied when the stroke length exceeds 20 times the bore diameter.

Tie rod spacer 7

The spacers have through holes for the tie rods and are held in place on the cylinder barrel with a small tack weld or set screw.

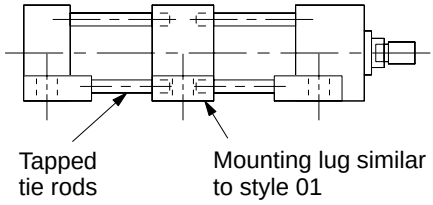
The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).



Tie rod center support

The center support has side mounting lugs similar to side lug mount heads and serves as an additional mounting location. The tie rods are threaded into the center support and it becomes a load-carrying component of the cylinder assembly.

The exact location of the tie rod center support is generally optional, which greatly increases the flexibility in mounting a long stroke cylinder.



Selecting Cylinder Size

To choose the proper size of cylinder for your application, first determine the maximum push and/or pull force required to do the job. Then, use the table below to select the cylinder that will provide that force. Remember that force capabilities derived from charts and formulas may be theoretically correct, but other factors must be considered. Be sure to allow for pressure drop between the pump outlet and the cylinder port. Also, some of a cylinder's force is used up overcoming seal friction and, to a lesser extent, the inertia of the piston itself. In Vickers cylinders, the amount of extra force needed to compensate for these factors has been limited to 5% or less of the cylinder's theoretical power – without sacrificing sealing performance.

For maximum reliability and fatigue life of the piston rod, the largest rod offered in a given bore size should be specified. The smaller rods for a given bore are primarily intended for short stroke push loading or reduced pressure applications.

The chart below lists the theoretical push and pull forces that cylinders will exert when supplied with various working pressures. To calculate the theoretical forces for pressures not listed, multiply the pressure in psi times the work area shown.

Bore dia. inch	**Rod dia.** inch	**Work area** sq. in.	**Air working pressure – psi**					**Hydraulic working pressure – psi**					
			60	**80**	**100**	**200**	**250**	**300**	**400**	**500**	**600**	**750**	**1000**
1 1/2	–	1.767	106	141	177	353	442	530	707	884	1060	1325	1767
	5/8	1.460	88	117	146	292	365	438	584	730	876	1095	1460
	1	.982	59	79	98	196	246	294	393	491	588	737	982
2	–	3.142	189	251	314	628	786	942	1257	1571	1884	2357	3142
	5/8	2.835	170	227	284	567	709	851	1134	1418	1702	2126	2835
	1	2.357	141	189	236	471	590	707	943	1179	1414	1768	2357
	1 3/8	1.657	99	133	166	331	415	497	663	829	994	1243	1657
2 1/2	–	4.909	295	393	491	982	1228	1473	1964	2455	2946	3682	4909
	5/8	4.602	276	368	460	920	1151	1380	1841	2301	2760	3452	4602
	1	4.124	247	330	412	825	1031	1236	1650	2062	2472	3093	4124
	1 3/8	3.424	205	274	342	685	856	1026	1370	1712	2052	2568	3424
	1 3/4	2.504	150	200	250	501	626	750	1002	1252	1500	1878	2504
3 1/4	–	8.296	498	664	830	1659	2074	2490	3318	4148	4980	6222	8296
	1	7.511	451	601	751	1502	1878	2253	3004	3756	4506	5633	7511
	1 3/8	6.811	409	545	681	1362	1703	2043	2724	3406	4086	5108	6811
	1 3/4	5.891	353	471	589	1178	1473	1767	2356	2946	3534	4418	5891
	2	5.154	309	412	515	1031	1289	1545	2062	2577	3090	3866	5154
4	–	12.566	754	1005	1257	2513	3142	3771	5026	6283	7542	9425	12566
	1	11.781	707	942	1178	2356	2946	3534	4712	5891	7068	8836	11781
	1 3/8	11.081	665	886	1108	2216	2771	3324	4432	5541	6648	8311	11081
	1 3/4	10.161	610	813	1016	2032	2541	3048	4064	5081	6096	7621	10161
	2	9.424	565	754	942	1885	2356	2826	3770	4712	5652	7068	9424
	2 1/2	7.657	4594	613	766	1531	1915	2298	3063	3829	4596	5743	7657

(continued)

Bore dia. inch	Rod dia. inch	Work area sq. in.	Air Working Pressure – psi					Hydraulic working pressure – psi					
			60	80	100	200	250	300	400	500	600	750	1000
5	–	19.635	1178	1571	1964	3927	4909	5894	7854	9818	11784	14726	19635
	1	18.850	1131	1508	1885	3770	4713	5655	7540	9425	11310	14138	18850
	1 3/8	18.150	1089	1452	1815	3630	4538	5445	7260	9075	10890	13613	18150
	1 3/4	17.230	1034	1378	1723	3446	4308	5169	6892	8615	10338	12923	17230
	2	16.493	990	1319	1649	3299	4124	4947	6597	8247	9894	12370	16493
	2 1/2	14.726	884	1178	1473	2945	3682	4419	5890	7363	8838	11045	14726
	3	12.566	754	1005	1257	2531	3142	3771	5026	6283	7542	9425	12566
	3 1/2	10.014	601	801	1001	2003	2504	3003	4006	5007	6006	7511	10014
6	–	28.274	1696	2262	2827	5655	7069	8481	11310	14137	16962	21206	28274
	1 3/8	26.789	1607	2144	2679	5358	6698	8037	10716	13395	16074	20092	26789
	1 3/4	25.869	1552	2070	2587	5174	6468	7761	10348	12935	15522	19402	25869
	2 1/2	23.365	1402	1869	2337	4673	5842	7011	9346	11683	14022	17524	23365
	4	15.708	942	1257	1571	3142	3927	4731	6283	7854	9426	11781	15708
7	–	38.485	2309	3079	3849	7697	9622	11547	15394	19243	23091	–	–
	1 3/8	37.000	2220	2960	3700	7400	9250	11100	14800	18500	22200	–	–
	1 3/4	36.080	2165	2886	3608	7216	9020	10824	14432	18040	21648	–	–
	3	31.416	1885	2513	3142	6283	7854	9426	12566	15708	18850	–	–
	5	18.850	1131	1508	1885	3770	4713	5655	7540	9425	11310	–	–
8	–	50.265	3016	4021	5027	10053	12567	15081	20106	25133	30159	–	–
	1 3/8	48.780	2927	3902	4878	9756	12195	14634	19512	24390	29268	–	–
	1 3/4	47.860	2872	3829	4786	9572	11965	14358	19144	23930	28716	–	–
	3 1/2	40.644	2439	3252	4064	8129	10161	12192	16258	20322	24386	–	–
	5 1/2	26.507	1590	2121	2651	5301	6627	7953	10603	13254	15904	–	–
10	–	78.540	4712	6283	7854	15708	19635	23562	31416	39270	–	–	–
	1 3/4	76.135	4568	6091	7614	15227	19034	22842	30454	38068	–	–	–
	2	75.398	4524	6032	7540	15080	18850	22620	30159	37699	–	–	–
	3 1/2	68.919	4135	5514	6892	13784	17230	20676	27568	34460	–	–	–
	5 1/2	54.782	3287	4383	5478	10956	13696	16434	21913	27391	–	–	–
12	–	113.10	6786	9048	11310	22620	28275	33930	45240	56550	–	–	–
	2	109.96	6598	8797	10996	21992	27490	32988	43984	54980	–	–	–
	2 1/2	108.19	6491	8655	10819	21638	27048	32457	43276	54095	–	–	–
	4	100.53	6032	8042	10053	20106	25133	30159	40212	50265	–	–	–
	5 1/2	89.34	5360	7147	8934	17868	22335	26802	35736	44670	–	–	–
14	–	153.94	9236	12315	15394	30788	38485	46182	61576	76970	–	–	–
	2 1/2	149.03	8942	11922	14903	29806	37258	44709	59612	74515	–	–	–
	3	146.87	8812	11750	14687	29374	36718	44061	58748	73435	–	–	–
	4	141.37	8482	11310	14137	28274	35343	42411	56548	70685	–	–	–
	5 1/2	130.18	7811	10414	13018	26036	32545	39054	52072	65090	–	–	–

Piston Velocity

The chart below lists theoretical piston velocities for cylinders supplied with 15 ft./sec. fluid velocity through standard size pipe, in hydraulic applications.

To calculate the piston velocity in inches per minute, divide the flow rate in gallons per minute by the listed fluid required per inch of stroke in gallons.

For piston velocities exceeding 5 in./sec., cushions are recommended for load deceleration.

Bore dia. inch	**Rod dia.** inch	**Fluid required per inch of stroke**		**Std. NPTF port**	**Fluid velocity @ 15 ft./sec.**	
		Gallon	**Cubic foot**		**Flow** gpm	**Piston velocity** in./sec.
1 1/2	–	.00765	.00102	3/8	6.6	14.4
	5/8	.00632	.00084	3/8	6.6	17.4
	1*	.00425	.00057	3/8	6.6	25.9
2	–	.01360	.00182	3/8	6.6	8.2
	5/8	.01227	.00164	3/8	6.6	9.0
	1	.01020	.00136	3/8	6.6	10.8
	1 3/8	.00717	.00096	3/8	6.6	15.3
2 1/2	–	.02125	.00284	3/8	6.6	5.2
	5/8	.01992	.00266	3/8	6.6	5.5
	1	.01785	.00239	3/8	6.6	6.2
	1 3/8	.01482	.00198	3/8	6.6	7.4
	1 3/4	.01084	.00145	3/8	6.6	10.1
3 1/4	–	.0359	.00480	1/2	11.0	5.1
	1	.0325	.00435	1/2	11.0	5.6
	1 3/8	.0295	.00394	1/2	11.0	6.2
	1 3/4	.0255	.00341	1/2	11.0	7.2
	2	.0223	.00298	1/2	11.0	8.2
4	–	.0544	.00727	1/2	11.0	3.4
	1	.0510	.00682	1/2	11.0	3.6
	1 3/8	.0480	.00641	1/2	11.0	3.8
	1 3/4	.0440	.00588	1/2	11.0	4.2
	2	.0408	.00545	1/2	11.0	4.5
	2 1/2	.0331	.00443	1/2	11.0	5.5

(continued)

Piston Velocity

Bore dia. inch	Rod dia. inch	Fluid required per inch of stroke		Std. NPTF port	Fluid velocity @ 15 ft./sec.	
		Gallon	Cubic foot		Flow gpm	Piston velocity in./sec.
5	–	.0850	.01136	1/2	11.0	2.2
	1	.0816	.01091	1/2	11.0	2.2
	1 3/8	.0786	.01050	1/2	11.0	2.3
	1 3/4	.0746	.00997	1/2	11.0	2.4
	2	.0714	.00954	1/2	11.0	2.6
	2 1/2	.0637	.00852	1/2	11.0	2.9
	3	.0544	.00727	1/2	11.0	3.4
	3 1/2	.0434	.00580	1/2	11.0	4.2
6	–	.1224	.01636	3/4	20.3	2.8
	1 3/8	.1160	.01550	3/4	20.3	2.9
	1 3/4	.1120	.01497	3/4	20.3	3.0
	2 1/2	.1011	.01352	3/4	20.3	3.3
	4	.0680	.00909	3/4	20.3	5.0
7	–	.1666	.02227	3/4	20.3	2.0
	1 3/8	.1602	.02141	3/4	20.3	2.1
	1 3/4	.1562	.02088	3/4	20.3	2.2
	3	.1360	.01818	3/4	20.3	2.5
	5	.0816	.01091	3/4	20.3	4.1
8	–	.2176	.02909	3/4	20.3	1.6
	1 3/8	.2112	.02823	3/4	20.3	1.6
	1 3/4	.2072	.02770	3/4	20.3	1.6
	3 1/2	.1759	.02352	3/4	20.3	1.9
	5 1/2	.1147	.01534	3/4	20.3	2.9
10	–	.3400	.04545	1	33.8	1.6
	1 3/4	.3296	.04406	1	33.8	1.7
	2	.3264	.04363	1	33.8	1.7
	3 1/2	.2984	.03988	1	33.8	1.9
	5 1/2	.2372	.03170	1	33.8	2.4
12	–	.4896	.06545	1	33.8	1.2
	2	.4760	.06363	1	33.8	1.2
	2 1/2	.4684	.06261	1	33.8	1.2
	4	.4352	.05818	1	33.8	1.3
	5 1/2	.3868	.05170	1	33.8	1.4
14	–	.6664	.0891	1 1/4	60.2	1.5
	2 1/2	.6452	.0862	1 1/4	60.2	1.6
	3	.6358	.0850	1 1/4	60.2	1.6
	4	.6120	.0818	1 1/4	60.2	1.6
	5 1/2	.5635	.0753	1 1/4	60.2	1.8

Maximum Allowable Push Strokes

In push applications, a cylinder acts as a loaded column. There are two basic ways to measure the column length.

Pivot mounts:
The length is measured from the pivot point to the end of the rod in the fully extended position.

Flange and other rigid mounts:
The exposed piston rod is considered to be the column length with a fixed end at the cylinder which allows longer strokes.

To use the following tables, first go to the section for your mounting style. Then locate the column which is closest to, but not below, your application's operating pressure. The intersection of operating pressure and bore/rod size represents the maximum allowable push stroke in inches. This maximum stroke is based on column loading analysis only and does not consider side loading, stop tube requirements or other cylinder stroke limiters.8

Bore dia. inch	**Rod dia.** inch	**Rigid mounts** (codes 01, 02, 07, 08, 12, 13, 21, 22, 23)							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
1 1/2	5/8	88	74	62	46	41	31	28	20
	1*	255	225	175	135	120	88	79	59
2	5/8	62	55	45	34	30	22	19	12
	1	175	165	135	92	82	62	58	41
	1 3/8	360	320	250	195	165	130	120	81
2 1/2	5/8	50	43	35	27	23	16	14	6
	1	150	135	100	70	65	49	42	31
	1 3/8	275	240	197	145	130	92	85	61
	1 3/4	430	390	320	244	210	160	145	110
3 1/4	1	105	90	70	54	48	35	30	20
	1 3/8	210	180	148	110	98	70	63	45
	1 3/4	345	295	245	180	155	128	110	80
	2	425	390	300	230	205	155	145	110
4	1	80	70	56	43	37	26	21	11
	1 3/8	160	150	120	82	72	55	49	32
	1 3/4	255	245	190	143	130	91	81	61
	2	345	300	247	185	160	130	115	82
	2 1/2	555	495	396	297	252	200	180	145

(continued)

Maximum Allowable Push Strokes

Bore dia. inch	**Rod dia.** inch	**Rigid mounts** (codes 01, 02, 07, 08, 12, 13, 21, 22, 23)							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
5	1	62	55	42	32	27	16	12	7
	1 3/8	130	120	85	64	55	41	35	20
	1 3/4	200	190	145	120	98	71	62	42
	2	265	235	190	145	133	100	84	62
	2 1/2	425	370	300	235	202	155	143	100
	3	620	555	447	420	300	245	210	157
	3 1/2	820	740	600	590	405	310	296	220
6	1 3/8	100	88	70	52	45	30	24	10
	1 3/4	175	150	130	89	79	56	49	30
	2 1/2	350	310	248	195	175	132	120	80
	4	900	800	650	500	445	335	305	245
7	1 3/8	82	75	58	40	37	22	16	–
	1 3/4	145	130	98	72	65	44	38	–
	3	440	390	300	235	210	155	145	–
	5	999	999	895	650	600	450	415	–
8	1 3/8	70	64	48	35	29	13	10	–
	1 3/4	145	120	85	63	55	35	27	–
	3 1/2	550	450	375	278	250	196	180	–
	5 1/2	–	–	900	700	640	495	430	–
10	1 3/4	92	85	65	47	37	18	–	–
	2	130	125	88	62	55	32	–	–
	3 1/2	400	355	295	220	200	147	–	–
	5 1/2	995	900	702	550	500	398	–	–
12	2	105	90	68	46	39	15	–	–
	2 1/2	165	148	120	82	70	45	–	–
	4	435	390	310	240	220	155	–	–
	5 1/2	820	710	600	450	405	310	–	–
14	2 1/2	145	130	92	65	56	26	–	–
	3	200	180	145	100	90	56	–	–
	4	360	325	255	198	185	130	–	–
	5 1/2	700	640	500	380	350	260	–	–

(continued)

Bore dia. inch	Rod dia. inch	Pivot mounts															
		Mounting codes 10, 11, 16								Mounting codes 15, 17							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig	**80** psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
1 1/2	5/8	38	33	27	21	19	14	13	9	42	40	35	25	23	18	16	13
	1*	98	85	68	55	50	39	35	25	140	125	90	70	61	49	42	33
2	5/8	28	25	20	15	13	10	8.5	6	34	30	25	20	18	13	11	7
	1	70	63	51	40	36	28	25	19	190	85	68	51	49	35	31	24
	1 3/8	148	135	105	79	70	54	49	39	240	160	130	100	90	69	60	48
2 1/2	5/8	23	20	16	13	10	7	6	4	28	25	20	15	13	9	8	4
	1	58	51	41	34	29	22	19	14	71	65	55	40	38	28	25	17
	1 3/8	125	105	80	61	56	42	39	29	145	135	100	73	70	52	50	37
	1 3/4	198	180	135	100	90	70	65	49	245	205	175	140	130	90	80	60
3 1/4	1	45	39	33	24	22	15	14	8	55	50	40	30	28	20	17	11
	1 3/8	86	75	61	47	41	31	29	20	110	95	75	59	54	40	36	25
	1 3/4	145	138	100	77	70	51	49	35	180	160	140	99	90	68	60	45
	2	198	175	140	100	90	69	62	49	230	200	160	130	120	90	80	60
4	1	36	32	26	19	17	12	9.5	7	45	40	35	24	22	15	13	7
	1 3/8	69	60	50	37	34	24	21	15	85	78	61	48	42	32	24	20
	1 3/4	120	100	80	61	55	41	37	27	149	140	105	80	70	52	49	35
	2	150	135	110	80	75	58	50	37	180	160	145	100	95	70	65	48
	2 1/2	243	200	185	130	120	88	80	60	300	255	205	165	150	120	100	75
5	1	28	24	20	14	12	7	7	7	35	32	25	18	15	9	7	7
	1 3/8	52	48	40	30	25	18	15	10	69	60	50	36	33	24	20	13
	1 3/4	89	80	61	49	43	33	28	20	125	100	80	60	55	40	36	25
	2	125	104	85	61	58	45	38	26	150	140	105	80	71	55	50	35
	2 1/2	190	165	135	100	90	70	61	46	240	200	160	130	120	90	80	60
	3	255	245	195	145	140	100	90	70	350	300	248	195	160	130	120	90
	3 1/2	350	310	250	200	175	140	135	98	450	400	348	250	240	180	160	120

(continued)

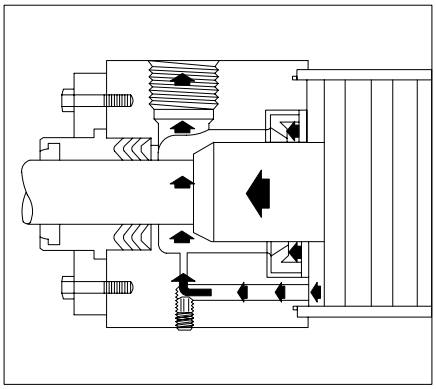
Maximum Allowable Push Strokes

Bore dia. inch	Rod dia. inch	Pivot mounts															
		Mounting codes 10, 11, 16								Mounting codes 15, 17							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig	**80** psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
6	1 3/8	45	39	32	23	20	13	11	10	58	50	40	30	26	18	15	10
	1 3/4	71	62	52	40	35	25	23	14	95	82	65	50	45	31	28	17
	2 1/2	145	140	110	81	75	56	50	36	199	165	140	105	89	70	65	45
	4	375	348	280	210	197	150	140	101	500	450	355	290	250	195	180	135
7	1 3/8	37	33	26	18	16	10	10	–	48	43	35	24	20	13	10	–
	1 3/4	61	55	45	32	29	19	16	–	80	70	55	40	37	25	22	–
	3	175	160	135	100	90	69	61	–	248	215	160	140	130	90	80	–
	5	505	490	385	295	255	200	180	–	650	600	490	360	348	250	240	–
8	1 3/8	33	28	22	15	13	10	10	–	41	38	28	19	16	11	10	–
	1 3/4	55	48	38	27	24	15	13	–	70	60	58	35	30	20	17	–
	3 1/2	230	195	155	135	115	81	72	–	275	250	200	155	145	120	100	–
	5 1/2	510	495	400	300	295	210	198	–	700	640	500	400	350	280	250	–
10	1 3/4	42	36	29	20	16	13	–	–	55	48	36	25	21	13	–	–
	2	58	49	39	27	24	15	–	–	70	62	50	35	30	19	–	–
	3 1/2	183	154	135	97	75	63	–	–	230	200	160	130	120	90	–	–
	5 1/2	430	395	310	250	225	175	–	–	550	500	400	300	280	220	–	–
12	2	45	40	31	21	17	15	–	–	59	50	40	25	23	15	–	–
	2 1/2	71	63	51	36	30	20	–	–	90	80	65	45	40	25	–	–
	4	195	175	145	101	90	69	–	–	248	225	160	135	115	90	–	–
	5 1/2	360	325	260	200	185	145	–	–	480	403	350	250	240	170	–	–
14	2 1/2	60	54	41	28	24	18	–	–	79	69	53	36	30	18	–	–
	3	89	79	61	45	40	25	–	–	125	100	80	60	50	31	–	–
	4	165	145	125	85	75	51	–	–	200	180	150	125	100	70	–	–
	5 1/2	300	275	225	170	155	115	–	–	390	350	280	210	190	145	–	–

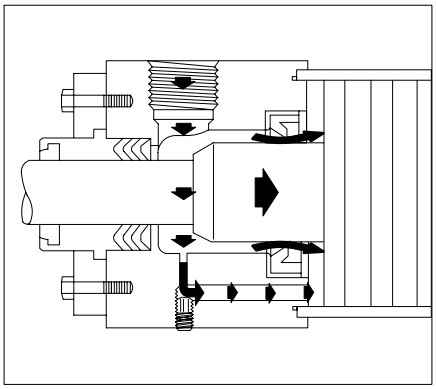
Cushioning System

Vickers patented SUPER CUSHIONS incorporate several design features to permit higher cylinder speeds for increased work output and shorter cycle times. Cylinder cushions are designed to decelerate the piston velocity near the end of each cylinder stroke to prevent excessive mechanical shock.

Air Cushion

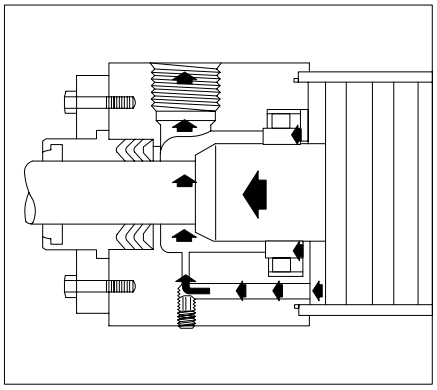


Series TE/TL cylinders employ a *flexible lip ring* at the cushion chamber entrance. As the cushion collar enters the cushion chamber, the flexible lip of the super cushion blocks the direct flow of air to the exhaust port. Exhausting air must now flow through a metered by-pass. Adjustment of the needle valve in the by-pass controls the cushioning action.

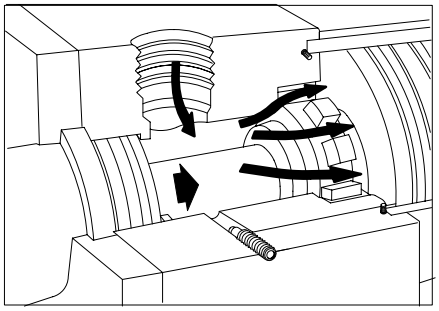


On the return stroke, air pressure blows the flexible lip of the super cushion away from the cushion collar, permitting a large volume of air to immediately reach the piston face. This allows quick acceleration and eliminates ball checks and binding between the cushion collar and cushion chamber.

Hydraulic Cushion



The Series TF cylinder cushion collar contacts a *floating bronze sleeve*. The floating action of the sleeve provides a very close tolerance seal contact without high loading. The sleeve seats against the head and provides a very effective seal to trap the fluid. Consistent performance and long life are provided since the radial loading on the sleeve is minimal. This sleeve can be easily replaced, if required.



The sleeve is also free to move in an *axial* direction, and functions as a built-in fluid check which opens to permit nearly full flow for quick acceleration. When the fluid flow is reversed, the sleeve moves off its seat, and fluid may flow around the slots in the outer diameter of the sleeve.

Cylinder Weights

The following table lists the approximate net weights of TE/TF/TL cylinders.

Weights shown are based on cylinders with standard rod diameter and single rod end. All weights are expressed in pounds.

Double rod cylinder weight is equal to 1.15 times chart weight, plus weight due to stroke.

Bore dia.	Mounting style code										Add per inch of stroke	
	01, 07 & 19	02	08	10	12	13	15	16 & 17	21 & 22	23	Single rod	Double rod
1 1/2	4.6	4.3	4.8	4.4	4.8	5.2	6	4.5	4.1	4.2	.32	.41
2	6.9	6.8	7.5	6.7	7.4	8.1	8.8	6.8	6.5	6.6	.41	.50
2 1/2	10	10	10.7	9.8	10.9	11.7	12.4	9.9	9.6	9.7	.47	.55
3 1/4	19.5	19.2	20.9	19.6	21.7	23.4	21.8	18.5	18.2	18.4	.72	.94
4	27.3	27.2	29.1	27.4	30.8	32.7	29.8	26.3	26	26.2	.81	1.03
5	43.7	42.3	45.2	41.8	47.6	50.5	46.2	40.7	40.6	40.8	1.01	1.24
6	63.3	62.8	66.6	63.3	71.7	75.6	70.6	61	60.2	60.6	1.96	2.38
7	81.3	77.8	–	81.3	77.8	–	93.6	79	78.6	79.4	2.39	2.81
8	106	102	–	106	102	–	120	103	103	104	2.60	3.02
10	191	184	–	193	184	–	213	187	186	188	3.66	4.34
12	288	281	–	297	281	–	321	284	283	285	6.84	7.73
14	462	448	–	467	448	–	504	452	451	453	5.07	6.46

Hydraulic Formulas

Hydraulic work

Work = force x distance
= pressure x area x stroke
= pressure x volume

$= \frac{lb}{in^2} \times in^3 = in\text{-}lb$

Hydraulic power

$Power = \frac{work}{time}$

$= pressure \times \frac{volume}{time}$

= pressure x capacity

Horsepower input to pump

$P = pressure = \frac{lb}{in^2}$

Q = pump capacity = gpm

33,000 ft-lbs of work per minute = 1 hp

E = pump efficiency

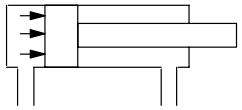
$HP = K \times P \times Q = \frac{lb/in^2 \times gpm \times 231}{12 \times 33000 \times E}$

$= \frac{.000583 \times P \times Q}{E} = \frac{PSI \times GPM}{1714 \times E}$

Hydraulic Cylinder Formulas

Pressure and force

P = psi
A = area
$= in^2$

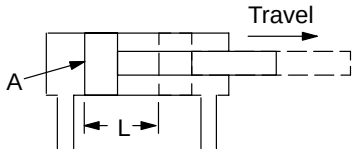


Force = pressure x area

F = P x A

$= \frac{lbs}{in^2} \times in^2 = lbs$

Rate of cylinder travel



$A = cap\ area = in^2$
L = cylinder stroke = in
V = volume traversed = LA

$Q = pump\ capacity = \frac{cu\ in}{sec}$

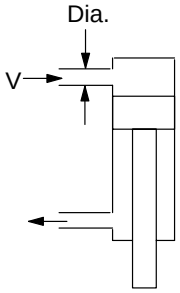
$T = time = \frac{volume\ traversed}{pump\ capacity} = \frac{V}{Q} = \frac{in^3}{in^3/sec} = sec$

$= sec$

$R = rate\ of\ piston\ travel = \frac{in}{sec} = \frac{L}{T}$

$R = \frac{L}{T} = \frac{L}{V/Q} = \frac{QL}{V} = \frac{QL}{LA} = \frac{Q}{A}$

Quantity of flow



V = fluid velocity = ft/sec
D = pipe diameter = inches
Q = quantity of flow = gpm

$\frac{ft}{sec} \times 12 = \frac{inches}{sec}$

$gpm \times \frac{231}{60} = \frac{cu\ in}{sec}$

$\frac{\pi D^2}{4}$ = pipe area $= in^2 = A$

$Q = AV = in^2 \times \frac{in}{sec} = \frac{cu\ in}{sec}$

Vickers®

Cylinders

Series TE/TF/TL Cylinders

Nominal Pressure: 250 psi Air / 1000 psi Hydraulic

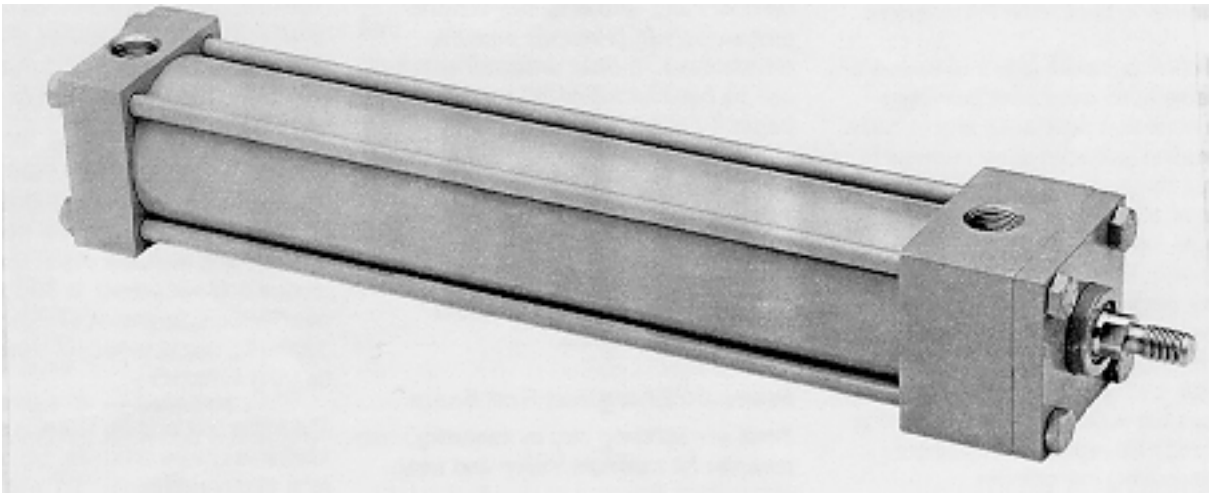


Table of Contents

Features and Benefits

Hard Chrome Plated Piston Rod. 100,000 psi minimum yield strength steel, polished to 8 micro inch finish. Provides extra corrosion resistance and virtually eliminates galling or other damage from normal contaminants.

Urethane Rod Wiper is self compensating for extended wear and is standard on air cylinders. Dual metallic rod scrapers are standard for hydraulic service and optional for air service.

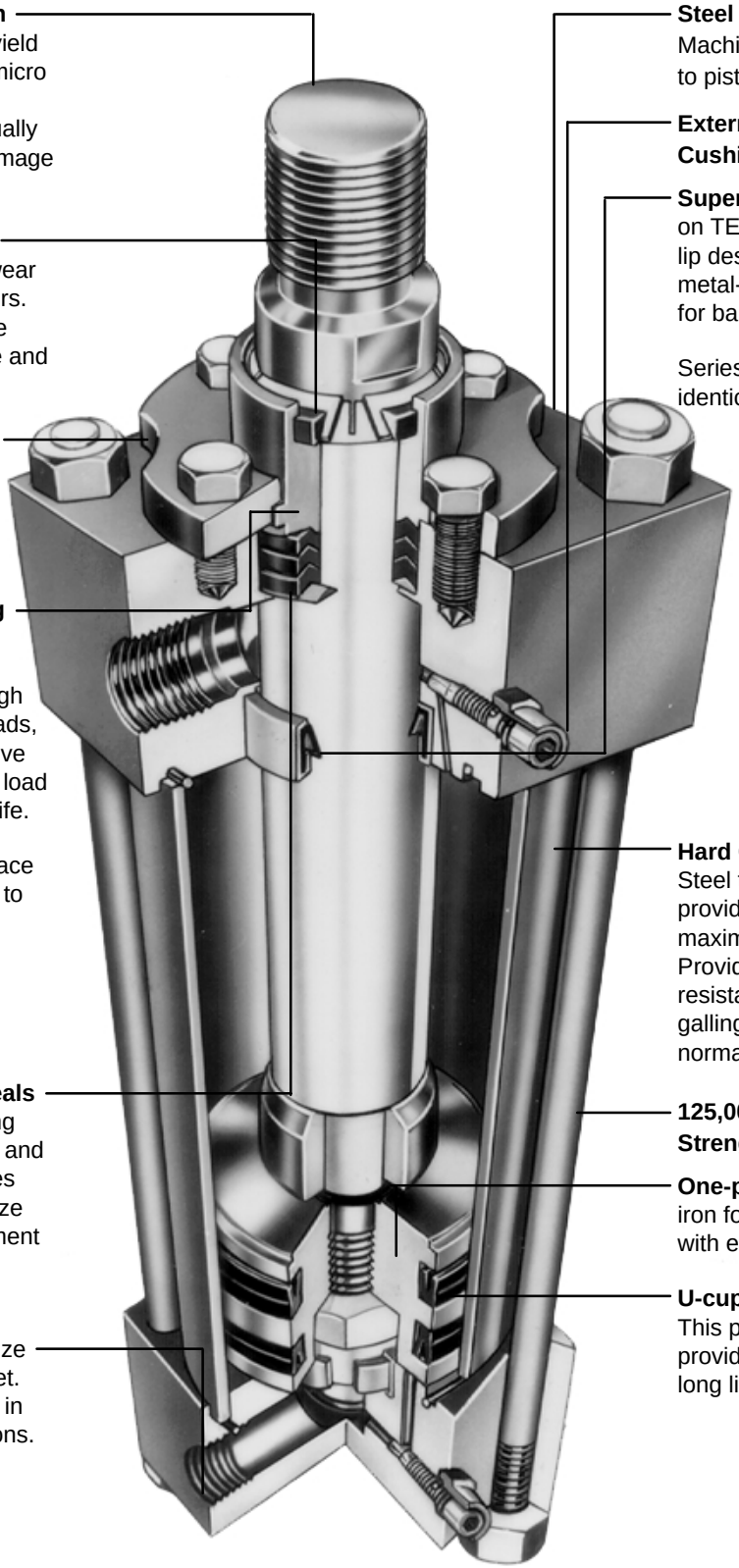
QC-100 Quick-change Rod Bearing Assembly permits easy replacement of rod seals without disassembling cylinder.

Fe_3N Cast Iron Rod Bearing is result of extensive testing and retesting of bearing materials in exceptionally tough applications with high side loads, high temperatures and abrasive contamination. Provides high load capacity and extremely long life.

Special nitriding process surface hardens close-grain cast iron to reduce wear while adding corrosion resistance. FE_3N bearings are up to 98% more durable than typical bronze bearings.

Pressure Energized Rod Seals are activated only by operating pressure for minimum friction and wear. Multiple-lip seal provides three seals in one. Male bronze seal adapter maintains alignment and permits seal response to pressure.

Full-flow NPTF Ports minimize pressure drop on inlet or outlet. SAE ports are recommended in Series TF hydraulic applications.



Steel Heads and Mountings. Machined relief for rapid fluid flow to piston.

Externally Adjustable Cushion Screws

Super Cushion Seals featured on TE/TL air cylinders. Resilient lip design eliminates metal-to-metal contact and need for ball checks.

Series TF hydraulic cylinders are identical to Series TE, except cushioned models have patented floating ring super cushion seal. Floating action of ring permits it to absorb external piston rod side loading without binding.

Both cushion systems provide positive cushion sealing with minimum wear and maximum piston acceleration on return stroke.

Hard Chrome Plated Body. Steel tubing is precision honed to provide optimum surface finish for maximum piston seal life. Provides extra corrosion resistance and virtually eliminates galling or other damage from normal contaminants.

125,000 psi Minimum Yield Strength Steel Tie Rods

One-piece Piston is solid cast iron for maximum bearing surface with easy seal replacement.

U-cup Type Piston Seal. This pressure energized lip seal provides minimum friction and long life.

Built-in Limit Switches

Series TE/TF/TL cylinders can be specified with built-in limit switches or air pilot valves. Three types of electrical limit switches are available. The actuators for these switches and valves are built into the cylinder heads while the switches and valves themselves are housed in an easily accessed protective box which is attached to the head. Conduit connections allow you to fully enclose the wire or air line leads to these switches or valves.

Built-in Proximity Switches

Series TE/TF/TL cylinders can be specified with built-in proximity switches for your logic controlled system. These switches are bolted or threaded into the cylinder head and inductive sensing probes are fully protected from the environment. Built-in proximity switches are available as special options and can be specified for AC or DC service.

TL Nonlube Air Cylinder

The Series TL has been specifically designed and proven to operate for millions of cycles in nonlubricated systems. The Series TL cylinder eliminates the need for internal or external oil supplies for lubrication.

Conventional designs are, for the most part, minor modifications to standard cylinders. The results are a temporary prelubricated cylinder rather than a true nonlubricated one. Most of these modifications entail wicks, oil reservoirs or oil impregnated materials. These forms of lubrication only address a portion of the nonlubricated air operating problem.

Vickers design engineers resolved the specific problems of nonlubricated air operation and designed the Series TL cylinder with features which were both unique and necessary. In addition to new Teflon suspension lubricants, the Series TL has specialized seals and bearing surfaces.

The extremely long-life Teflon suspension lubricants ensure continued performance long after conventional lubricants have been extruded or wiped away. Glass-filled Teflon piston seals, and Teflon with carboxilated nitrile rod seals, add lubrication, reduce friction, and increase long term durability. Also, the lubricants in Vickers Series TL cylinders will not contaminate your nonlubricated air system, as may conventional cylinder lubricants.

Series TL cylinders can be used interchangeably between nonlubricated and lubricated systems. The cylinders are excellent for use in lubricated systems that are irregularly serviced and which may inadvertently become nonlubricated systems. Also, in lubricated systems, the Series TL provides system safety should the lubricator fail.

How To Order

Standard Cylinders

Vickers has created an easy system for ordering cylinders. This system has been developed to improve our service to you. The model code consists of sixteen alpha-numeric digits which fully describe the most common standard options. See pages 5 through 7 for a summary of model code options.

To specify your cylinder, review the following pages for a full description of each option available and select the desired code.

This model code system will:

- **Simplify the re-order process.** Each cylinder is assigned a sixteen digit model code. That code is unique to a particular cylinder description. That way, when you re-order your cylinder, you're assured of exactly the same top quality cylinder design.
- **Improve identification.** Every cylinder has its sixteen digit model code clearly marked on the product...impression-stamped in the metal head or cap. Each sixteen digit code completely describes a specific cylinder. This allows seals and replacement components to be easily identified in the field.
- **Facilitate communications.** This fully descriptive model code system allows you to work directly with your local Vickers sales engineer to identify and service your Vickers cylinder.

Custom Cylinders

New Cylinders

Although the model code has been arranged to cover the vast majority of available options, there will be occasions when you require an option which cannot be coded. When specifying such an option, enter an "X" for the appropriate item in the sixteen digit model code, then describe your requirements. For example, if you have an application which requires a custom thread on the end of the piston rod, enter an "X" for item 7. Then add a full description at the end of the model code, such as "With 1" diameter piston rod with 2" total rod projection and 1"-14 thread 1 1/2" long." The cylinder will then be given a unique five digit design number on receipt of order (as explained below).

Replacement Cylinders

Every Vickers custom cylinder is assigned a unique design number. This number is contained in the last five digits of the sixteen digit model code. In other words, the "Stroke" and "Extra Rod Projection" locations (items 12 through 16) become the "Design Number" items for custom cylinders. When ordering a replacement cylinder, simply give the sixteen digit model code or the five digit design number to your local Vickers Sales Representative.

Replacement Parts

Each design number is stored in a quick retrieval computerized storage system. This gives our field sales representatives rapid access to assist you in identifying and specifying genuine Vickers replacement parts.

Model Codes

TE	01	E	A	C	A	3	A	A	108	00
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

1, 2 Series

TE – ANSI B93.15/NFPA
250 psi air cylinder
TF – ANSI B93.15/NFPA
1000 psi hydraulic cylinder
TL – ANSI B93.15/NFPA
250 psi nonlube air cylinder

3, 4 Mounting style

Vickers Code		ANSI Code
01 –	Side lug	MS2
02 –	Tapped	MS4
04 –	Keyed side lug	–
05 –	Keyed tapped	–
07 –	Head rectangular flange	MF1† ME3‡
08 –	Head square flange	MF5†
10 –	Clevis	MP1
11 –	Spherical bearing	–
12 –	Cap rectangular flange	MF2† ME4‡
13 –	Cap square flange	MF6†
15 –	Intermediate trunnion	MT4
16 –	Cap trunnion	MT2
17 –	Head trunnion	MT1
21 –	Cap extended tie rod	MX2
22 –	Head extended tie rod	MX3
23 –	Both ends extended tie rod	MX1
24 –	No mount	–
25 –	Double rod, side lug	–
26 –	Double rod, tapped	–
28 –	Double rod, keyed side lug	–
29 –	Double rod, keyed tapped	–
31 –	Double rod, rectangular flange	–
32 –	Double rod square flange	–
34 –	Double rod, intermediate trunnion	–
35 –	Double rod, head trunnion	–
39 –	Double rod, head end extended tie rod	–
40 –	Double rod, both ends extended tie rod	–
41 –	Double rod, no mount	–

(See detailed information on page 8.)

† Applies to 1 1/2” through 6” bores only
‡ Applies to 7” through 14” bores only

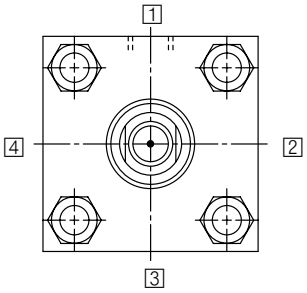
5 Bore size (in inches)

Code	Bore
C –	1 1/2
D –	2
E –	2 1/2
G –	3 1/4
H –	4
K –	5
L –	6
M –	7
N –	8
R –	10
S –	12
T –	14

(See detailed information on page 51.)

6 Cushion & adjustment position

Cushions are located as shown below when viewing cylinder from head end (mounting end of double rod cylinder). “–” in table indicates no cushion.



Code	Head	Cap
A –	–	–
B –	–	1
C –	–	2
D –	–	3
E –	–	4
F –	1	–
G –	2	–
H –	3	–
J –	4	–
K –	1	1
L –	1	2
M –	1	3
N –	1	4
P –	2	1
R –	2	2
S –	2	3
T –	2	4
U –	3	1
V –	3	2
W –	3	3
Y –	3	4
1 –	4	1
2 –	4	2
3 –	4	3
4 –	4	4

Double Rod Cylinders:
“Head” = “Mounting” end
“Cap” = “Non-mounting“ end

Model Codes

TE 01 E A C A 3 A A 108 00

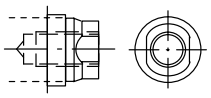
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

7 Rod size and rod end type

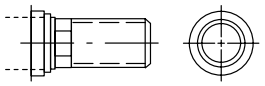
Bore size (inch)	Rod size (inch)	Code (for rod size *and* rod end type) "2" rod end type	"4" rod end type	"5" rod end type	"6" rod end type
1 1/2	5/8	**A**	**B**	**C**	**D**
	1*	**E**	**F**	**G**	**H**
2	5/8	**A**	**B**	**C**	**D**
	1	**E**	**F**	**G**	**H**
	1 3/8	**J**	**K**	**L**	**M**
2 1/2	5/8	**A**	**B**	**C**	**D**
	1	**E**	**F**	**G**	**H**
	1 3/8	**J**	**K**	**L**	**M**
	1 3/4	**N**	**P**	**R**	**S**
3 1/4	1	**A**	**B**	**C**	**D**
	1 3/8	**E**	**F**	**G**	**H**
	1 3/4	**J**	**K**	**L**	**M**
	2	**N**	**P**	**R**	**S**
4	1	**A**	**B**	**C**	**D**
	1 3/8	**E**	**F**	**G**	**H**
	1 3/4	**J**	**K**	**L**	**M**
	2	**N**	**P**	**R**	**S**
	2 1/2	**T**	**U**	**V**	**W**
5	1	**A**	**B**	**C**	**D**
	1 3/8	**E**	**F**	**G**	**H**
	1 3/4	**J**	**K**	**L**	**M**
	2	**N**	**P**	**R**	**S**
	2 1/2	**T**	**U**	**V**	**W**
	3	**Y**	**1**	**2**	**3**
	3 1/2	**4**	**5**	**6**	**7**
6	1 3/8	**A**	**B**	**C**	**D**
	1 3/4	**E**	**F**	**G**	**H**
	2 1/2	**J**	**K**	**L**	**M**
	4	**N**	**P**	**R**	**S**
7	1 3/8	**A**	**B**	**C**	**D**
	1 3/4	**E**	**F**	**G**	**H**
	3	**J**	**K**	**L**	**M**
	5	**N**	**P**	**R**	**S**
8	1 3/8	**A**	**B**	**C**	**D**
	1 3/4	**E**	**F**	**G**	**H**
	3 1/2	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**
10	1 3/4	**A**	**B**	**C**	**D**
	2	**E**	**F**	**G**	**H**
	3 1/2	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**
12	2	**A**	**B**	**C**	**D**
	2 1/2	**E**	**F**	**G**	**H**
	4	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**
14	2 1/2	**A**	**B**	**C**	**D**
	3	**E**	**F**	**G**	**H**
	4	**J**	**K**	**L**	**M**
	5 1/2	**N**	**P**	**R**	**S**

*Cushion cap end only on series TE and TL for this bore/rod combination.

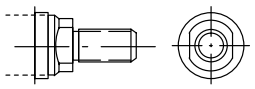
Type 2 rod end
Short female
UN thread



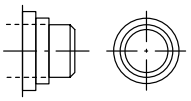
Type 4 rod end
Full male
UN thread



Type 5 rod end
Small male
UN thread



Type 6 rod end
Plain
No attachment



(See detailed rod end information on page 44.)

8 Seal options

Code	Piston Seal	Seal/ Scraper Ret. Compound
A –	U-cups	Nitrile
B –	Cast iron rings	Nitrile
C –	Glass-filled Teflon*	Nitrile
D –	U-cups	Viton-A*
E –	Cast iron rings	Viton-A
F –	Glass-filled Teflon	Viton-A
K –	U-cups	Viton-A/Nitrile
L –	Cast iron rings	Viton-A/Nitrile
M –	Glass-filled Teflon	Viton-A/Nitrile

(See detailed information on page 46.)

*Teflon and Viton are registered trademarks of E. I. DuPont Co.

9 Port type and size

Code	Type
1 –	NPTF
2 –	Oversize NPTF
3 –	SAE/UN O-ring
4 –	Oversize SAE/UN
5 –	NFPA standard SAE/UN

(See detailed information on page 45.)

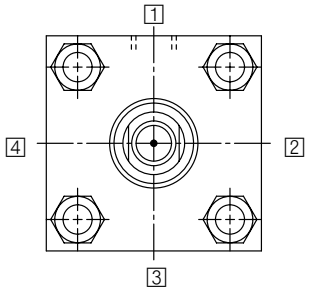
TE 01 E A C A 3 A A 108 00

1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

10 Port location

Ports are located as shown below when viewing cylinder from head end (mounting end of double rod cylinder).

With some mounting styles, certain port locations cannot be selected due to interference with the mounting.



Code	Head	Cap
A –	1	1
B –	1	2
C –	1	3
D –	1	4
E –	2	1
F –	2	2
G –	2	3
H –	2	4
J –	3	1
K –	3	2
L –	3	3
M –	3	4
N –	4	1
P –	4	2
R –	4	3
S –	4	4

11 Limit switch / proximity switch position and type:

Positions are numbered as shown in item10 at left. "–" in table indicates no switch.

Code	Head	Cap	Switch Type
A –	–	–	none req'd
B –	1	–	01
C –	2	–	01
D –	3	–	01
E –	4	–	01
F –	1	1	01
G –	2	2	01
H –	3	3	01
J –	4	4	01
K –	–	1	01
L –	–	2	01
M –	–	3	01
N –	–	4	01
P –	1	–	PS200
R –	2	–	PS200
S –	3	–	PS200
T –	4	–	PS200
U –	1	1	PS200
V –	2	2	PS200
W –	3	3	PS200
Y –	4	4	PS200
1 –	–	1	PS200
2 –	–	2	PS200
3 –	–	3	PS200
4 –	–	4	PS200
5–	1	1	03
6–	2	2	03
7–	3	3	03
8–	4	4	03

(See detailed information on pages 47–49.)

12, 13, 14 Cylinder stroke

Items 12,13 indicate total stroke length from 00 inches to 99 inches.

Item 14 indicates fractions of an inch per the following codes:

Code	Fraction	Code	Fraction
0 –	0	**8** –	1/2
1 –	1/16	**9** –	9/16
2 –	1/8	**A** –	5/8
3 –	3/16	**B** –	11/16
4 –	1/4	**C** –	3/4
5 –	5/16	**D** –	13/16
6 –	3/8	**E** –	7/8
7 –	7/16	**F** –	15/16

15, 16 Extra rod projection

Item 15 indicates inches from 0 through 9.

Item 16 indicates fractions of an inch per codes shown for item 14 above.

Mounting Styles

Selecting the Proper Mounting

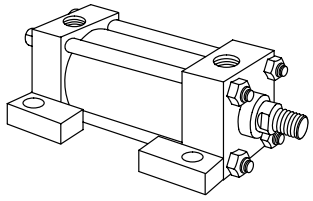
Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. All mounts are designed to absorb the full rated force of the cylinder when properly applied. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

Available Mountings

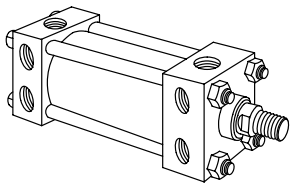
The variety of standard ANSI and NFPA mountings available gives you a broad selection to match the proper mount to your application. Vickers offers rigid mounts (including side lug, flange, and extended tie rod) and swivel mounts (including clevis and trunnion). A guide to proper mount selection is provided on pages 10 through 15. For custom mounts, enter “XX” for model code items 3 and 4 and give a detailed description with drawings. Series TE/TF/TL cylinders are available in all mounting styles listed.

Mounting Styles

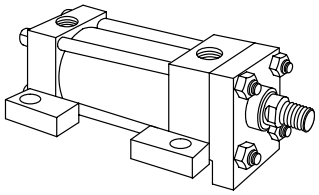
Code 01
Side lug
ANSI MS2



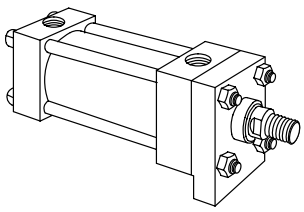
Code 02
Tapped
ANSI MS4



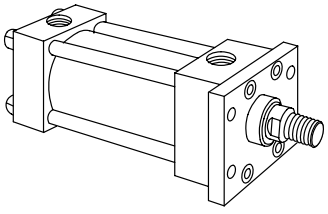
Code 04
Keyed side lug



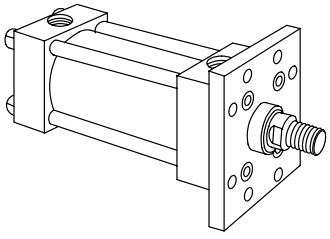
Code 05
Keyed tapped



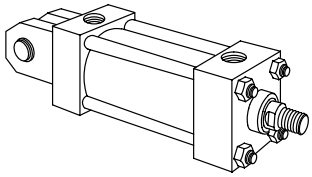
Code 07
Head rectangular flange
ANSI MF1 & ME3



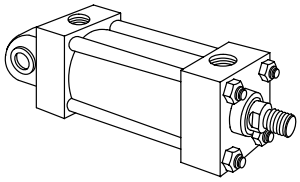
Code 08
Rod end square flanged
ANSI MF5



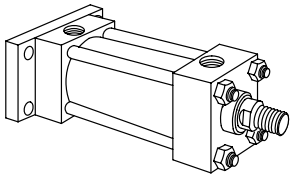
Code 10
Cap clevis
ANSI MP1



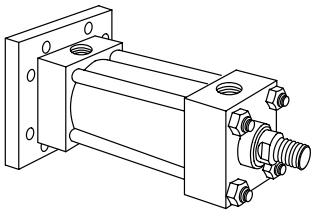
Code 11
Spherical bearing



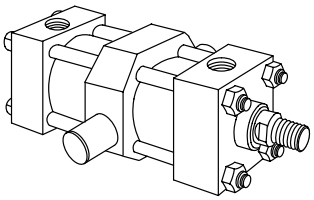
Code 12
Cap rectangular flange
ANSI MF2 & ME4



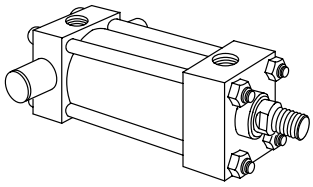
Code 13
Cap square flange
ANSI MF6



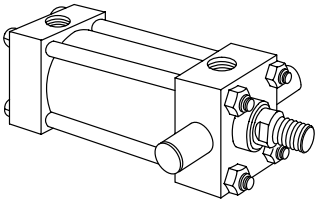
Code 15
Intermediate trunnion
ANSI MT4



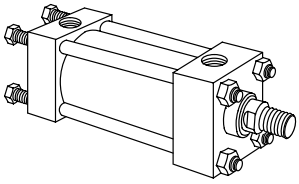
Code 16
Cap trunnion
ANSI MT2



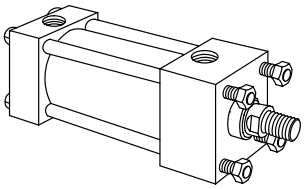
Code 17
Head trunnion
ANSI MT1



Code 21
Cap extended tie rod
ANSI MX2



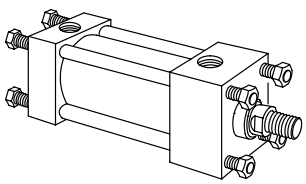
Code 22
Head extended tie rod
ANSI MX3



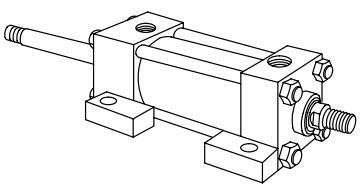
Mounting Styles Not Shown:

Code	Mounting style
24 –	No mount
26 –	Double rod, tapped
28 –	Double rod, keyed side lug
29 –	Double rod, keyed tapped
31 –	Double rod, rectangular flange
32 –	Double rod square flange
34 –	Double rod, intermediate trunnion
35 –	Double rod, head trunnion
39 –	Double rod, head end extended tie rod
40 –	Double rod, both ends extended tie rod
41 –	Double rod, no mount

Code 23
Both ends extended tie rod
ANSI MX1

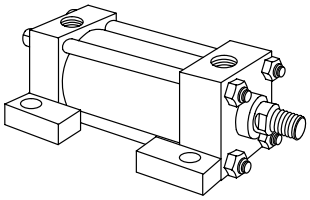


Code 25
Double rod, side lug

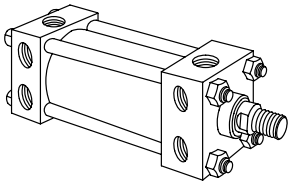


Application Guide for Mountings

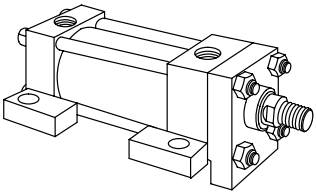
Code 01 Side Lug (ANSI MS2)



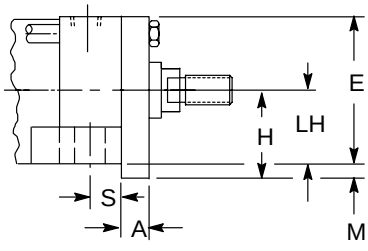
Code 02 Tapped



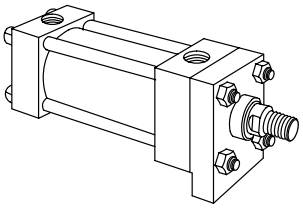
Code 04 Keyed Side Lug



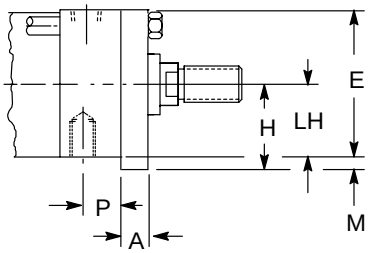
The drawing below shows the modification of a Code 01 mount to convert it to a Code 04. Use drawings for Code 01, pages 16–39, for dimensions not shown.



Code 05 Keyed Tapped



The drawing below shows the modification of a Code 02 mount to convert it to a Code 05. Use drawings for Code 02, pages 16–39, for dimensions not shown.



Dimensions in inches

Bore dia.	E	LH	A	H (Ref.)	P	S	M
1 1/2	2.00	.994 .992	.312 .310	1.188	1.000	.438	.188
2	2.50	1.244 1.242	.312 .310	1.438	1.000	.438	.188
2 1/2	3.00	1.494 1.492	.312 .310	1.688	1.000	.438	.188
3 1/4	3.75	1.869 1.867	.562 .560	2.188	1.125	.562	.313
4	4.50	2.244 2.242	.562 .560	2.563	1.125	.563	.313
5	5.50	2.744 2.742	.562 .560	3.063	1.125	.750	.313
6	6.50	3.244 3.242	.687 .685	3.625	1.250	.750	.375

Side lug and tapped mounts are for moving loads along a flat guided surface as in a carriage along rails.

The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to traverse along the centerline of the piston rod.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

For high shock applications, dowel pins or shear keys should be incorporated in the mounting design. For these applications, consider a keyed side lug mount (04) or keyed tapped mount (05).

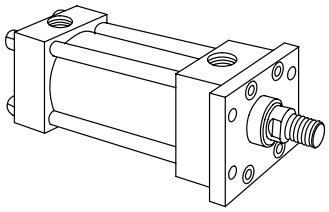
For severe side load applications, consult your local Vickers sales engineer.

See individual bore size drawings for maximum allowable pressure ratings.

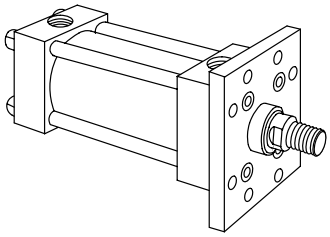
NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 07 Head Rectangular Flange (ANSI MF1 & ME3)



Code 08 Head Square Flange (ANSI MF5)



These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling), as in pull presses. For compression applications (pushing), a cap flange mount is more appropriate.

The mounting surface should be flat, and the rod end bearing should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the oversize alternate rod is recommended. Stop tubes should also be considered.

The square flange mount (08) is recommended for heavy duty applications.

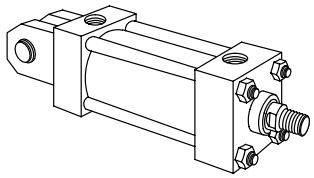
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 10 Clevis

(ANSI MP1)



This mount is for applications in which the machine member travels in a curved path within one plane.

This mount can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See pages 57 and 58 for stroke limitations.

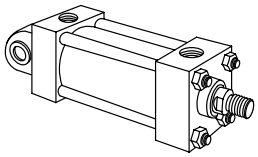
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excessive side loading on the bearing and piston. This will lead to premature failure. For applications with small amounts of misalignment, consider the spherical bearing mount (11).

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Application Guide for Mountings

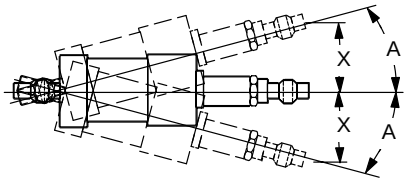
Code 11 Spherical Bearing



This mount is for applications in which the machine member travels in a curved path in one plane where some misalignment is unavoidable. The amount of allowable misalignment can be calculated.

This mount can be used both in compression (push) and tension (pull) applications. Care must be exercised to prevent rod buckling in compression applications with long strokes. See pages 55 through 58 for stroke limitations.

Maximum radial static and dynamic bearing loads must not exceed the recommended ratings shown in the following table.



Angle A is the recommended maximum angle of misalignment.

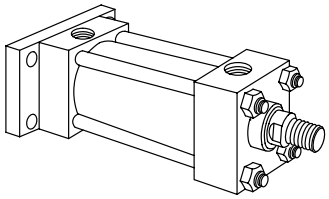
To find the maximum recommended X distance, multiply the distance between pivot mounting holes (see bore size drawing) by the tangent of angle A.

NOTE

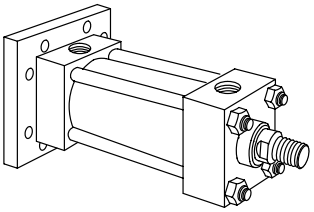
For strokes in excess of 24", see "Stop tube selection" on page 50.

Bore	Rod dia.	Pin dia.	Angle A	Tangent of A	Static load ratings	
					Radial	Thrust
1 1/2	5/8	1/2	1.5	.026	8100	3200
2	5/8	1/2	1.5	.026	8100	3200
2 1/2	5/8	1/2	1.5	.026	8100	3200
3 1/4	3/4	3/4	2	.035	18,800	7500
4	1	3/4	2	.035	18,800	7500
5	1	3/4	2	.035	18,800	7500
6	1 3/8	1	2	.035	33,300	13,300
7	1 3/8	1	2	.035	33,300	13,300
8	1 3/8	1	2	.035	33,300	13,300
10	1 3/4	1 3/8	2	.035	59,800	24,000
12	2	1 3/4	2.5	.044	102,000	40,700
14	2 1/2	2	2.5	.044	132,000	53,000

Code 12 Cap Rectangular Flange
(ANSI MF2 & ME4)



Code 13 Cap Square Flange
(ANSI MF6)



These mounts are for straight line force transfer applications in which the cylinder is used in compression (pushing) applications.

For tension applications (pulling), a head flange mount is recommended.

The mounting surface should be flat and perpendicular to the force of the load.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the oversize alternate rod is recommended. Stop tubes should also be considered.

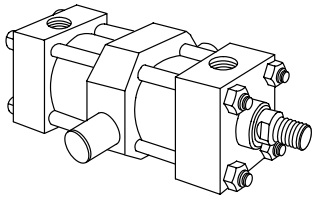
The cap square flange mount (code 13) is recommended for heavy duty applications.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque value.

NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 15 Intermediate Trunnion (ANSI MT4)



The Intermediate Trunnion mount is for longer stroke applications in which the machine member travels in a curved path in one plane.

On special orders, the trunnion can be located anywhere along the body.

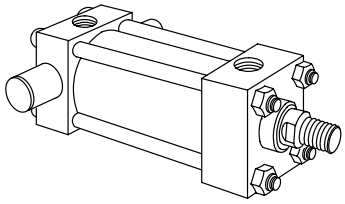
This mount can be used both in compression (push) and tension (pull) applications.

It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Code 16 Cap Trunnion
(ANSI MT2)



Cap Trunnion mounts are for applications in which the machine member travels in a curved path in one plane, and can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

The trunnion pins are an integral part of the cap and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

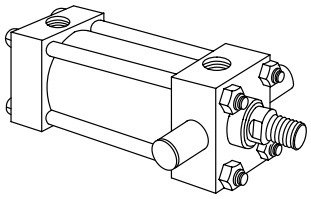
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Application Guide for Mountings

Code 17 Head Trunnion (ANSI MT1)



Head Trunnion mounts are for applications in which the machine member travels in a curved path in one plane.

Either mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

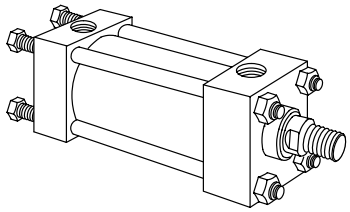
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

NOTE

For strokes in excess of 24", see "Stop tube selection" on page 50.

Code 21 Cap Extended Tie Rod (ANSI MX2)



These mounts are for straight line force transfer applications. The cap extended tie rod mount is recommended for compression (pushing) applications.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table below.

Tie Rod Diameters & Torque Values
Diameters and torque values in the following table apply to all mounting styles.

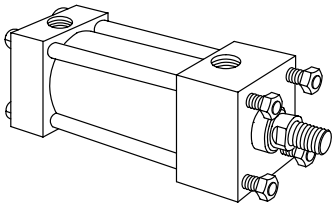
Bore dia. (inch)	**Tie rods** **Dia.** (inch)	**Torque** (ft. lbs.)
1 1/2	1/4	8
2, 2 1/2	5/16	16
3 1/4, 4	3/8	28
5, 6, 7, 8	1/2	66
10, 12	5/8	150
14	3/4	225

Bearing retainer screw torque	
Screw size (inch)	**Torque** (ft. lbs.)
.2500–28	7
.3125–24	12
.3750–24	22
.5000–20	50

NOTE

For strokes in excess of 30" see "Stop tube selection" on page 50.

Code 22 Head Extended Tie Rod (ANSI MX3)



These mounts are for straight line force transfer applications. The head extended tie rod mount is recommended for tension (pulling) applications.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

On head mount applications, the cartridge provides a pilot diameter to align the rod in the mounting frame.

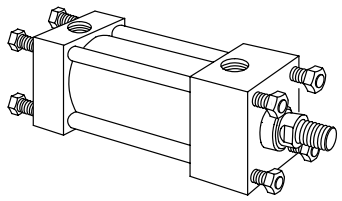
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on the previous page.

The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

NOTE

For strokes in excess of 30", see "Stop tube selection" on page 50.

Code 23 Both Ends Extended Tie Rod (ANSI MX1)



These mounts are for straight line force transfer applications. Both ends extended tie rod mounts are suited for tension and compression applications or applications where additional hardware is to be attached to cylinders.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

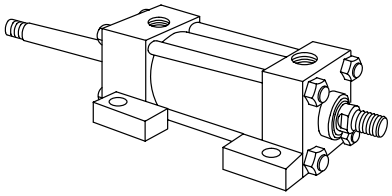
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on page 14.

The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

NOTE

For strokes in excess of 30”, see “Stop tube selection” on page 50.

Code 25 Double Rod, Side Lug (ANSI MX1)

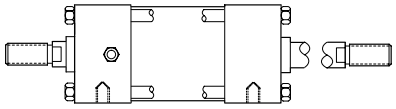


Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod.

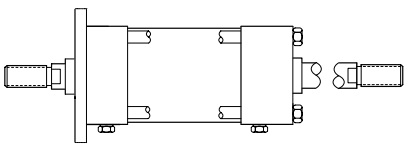
The single rod mount application data is also applicable to double rod cylinders.

In addition to the side lug mount illustrated above, the following mounts are also available for double rod end cylinders.

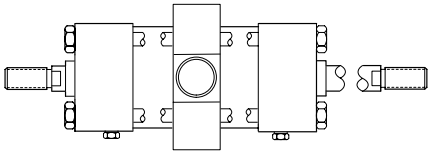
Code 26 Double Rod, Tapped



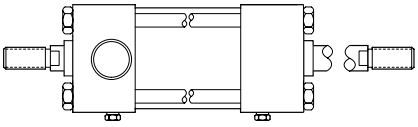
Code 31 Double Rod, Rectangular Flange and Code 32 Double Rod, Square Flange



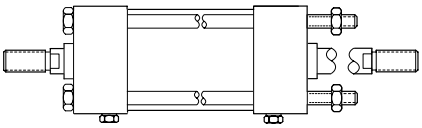
Code 34 Double Rod, Intermediate Trunnion



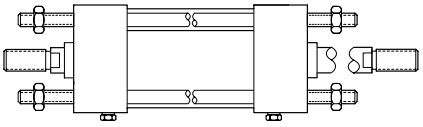
Code 35 Double Rod, Head Trunnion



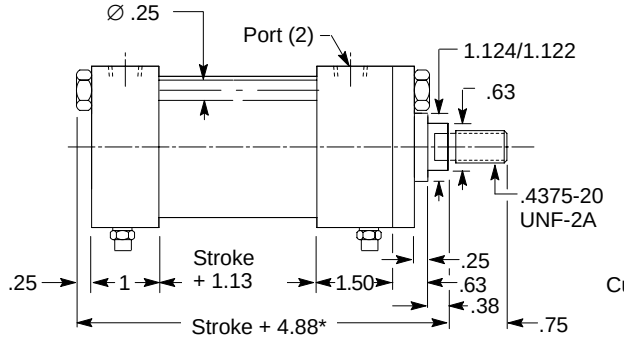
Code 39 Double Rod, Head Extended Tie Rod

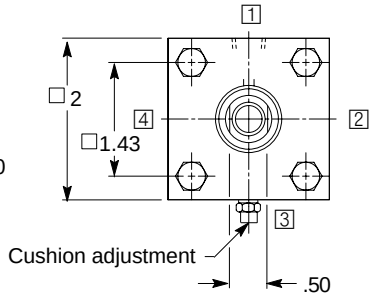


Code 40 Double Rod, Both Ends Extended Tie Rod



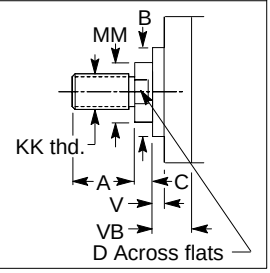
1 1/2 inch Cylinder Bore



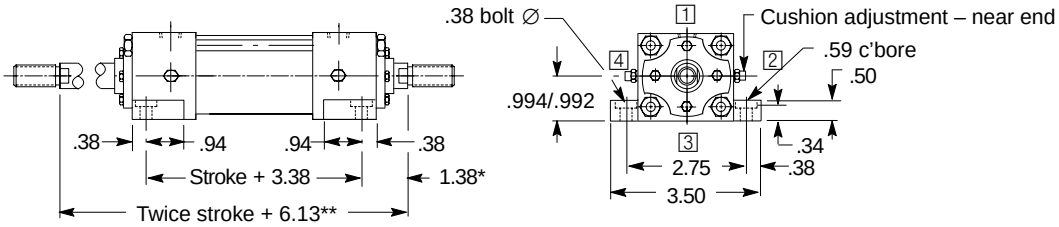


CODE 24 BASIC CYLINDER

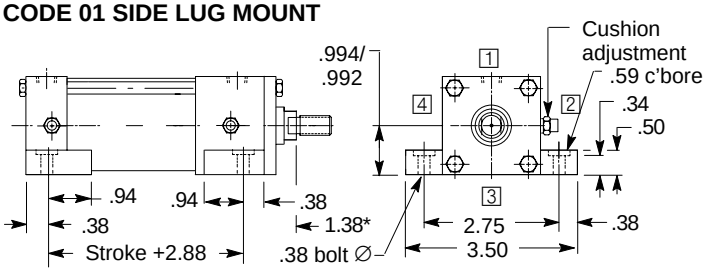
ALTERNATE ROD SIZES AVAILABLE	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
(in inches)	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A



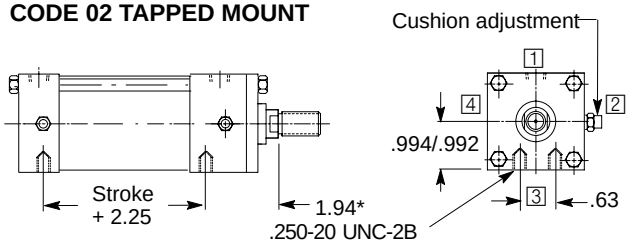
CODE 25 DOUBLE ROD SIDE LUG MOUNT



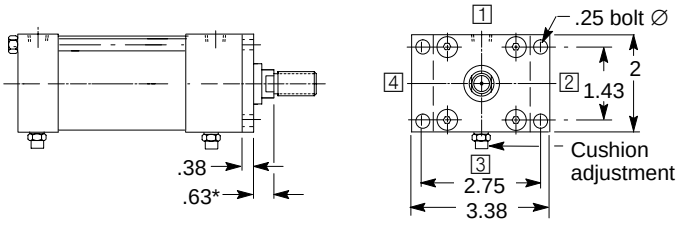
CODE 01 SIDE LUG MOUNT



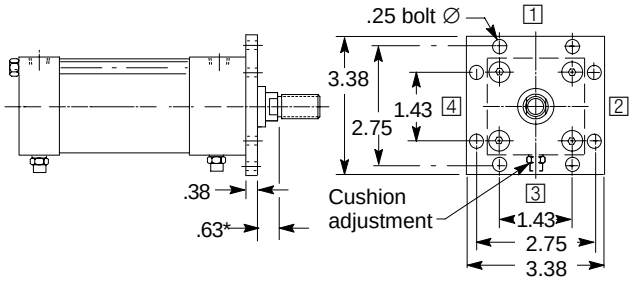
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

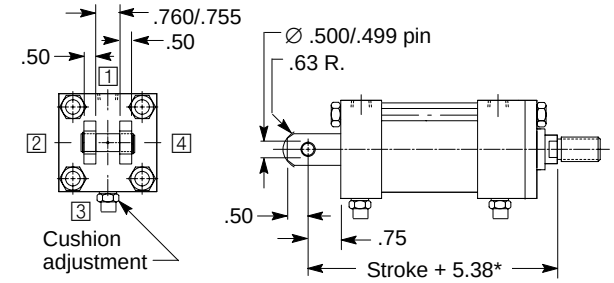


CODE 08 HEAD SQUARE FLANGE MOUNT

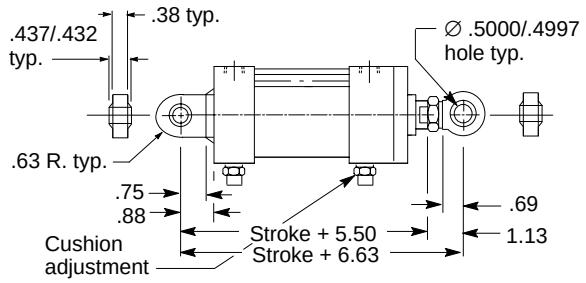


†Maximum working pressure 800 PSI (for minimum flange deflection)

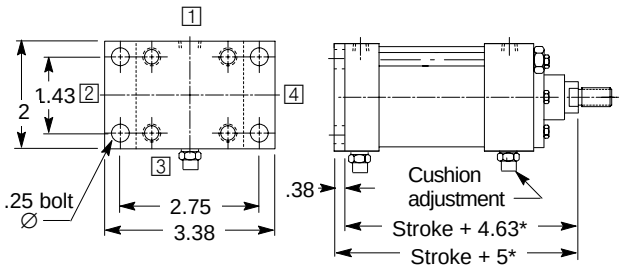
CODE 10 CLEVIS MOUNT



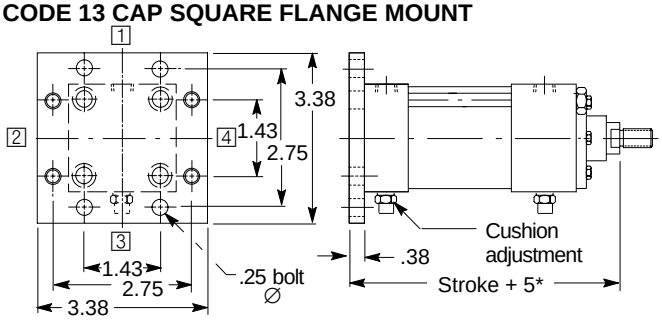
CODE 11 SPHERICAL BEARING MOUNT



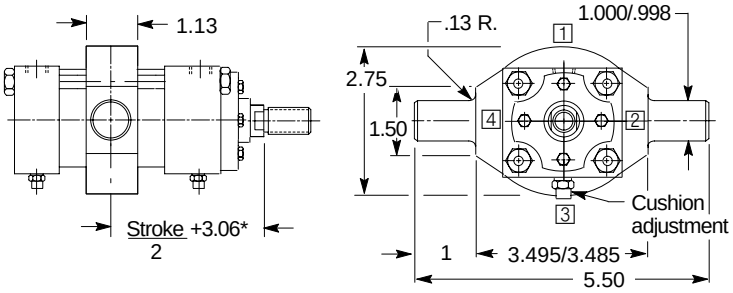
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



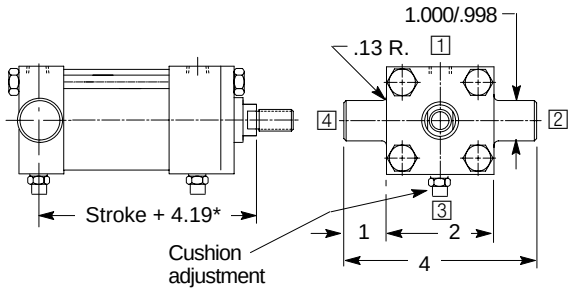
CODE 13 CAP SQUARE FLANGE MOUNT



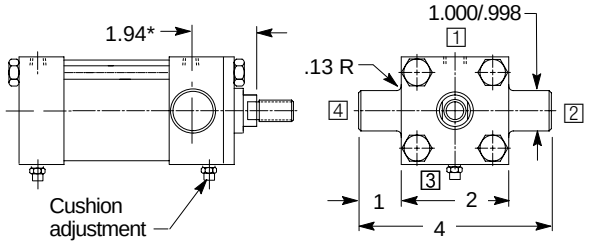
CODE 15 INTERMEDIATE TRUNNION MOUNT



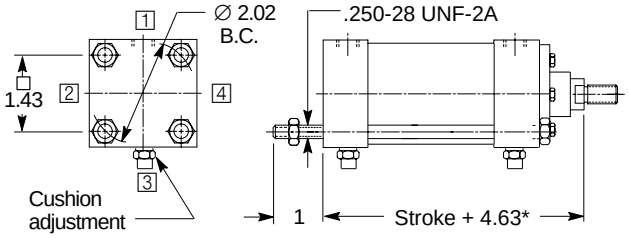
CODE 16 CAP TRUNNION MOUNT



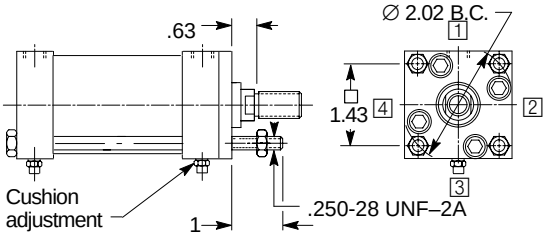
CODE 17 HEAD TRUNNION MOUNT



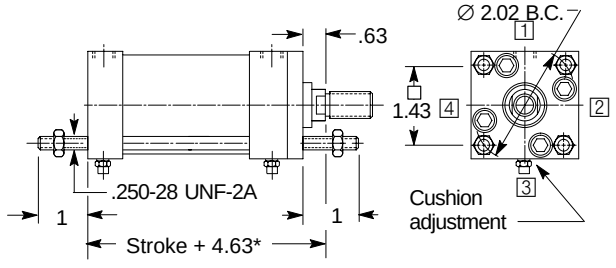
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

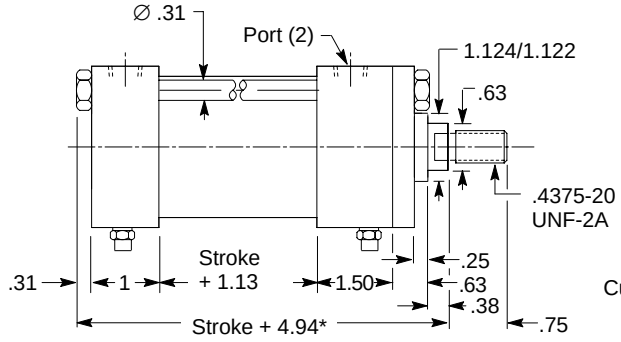


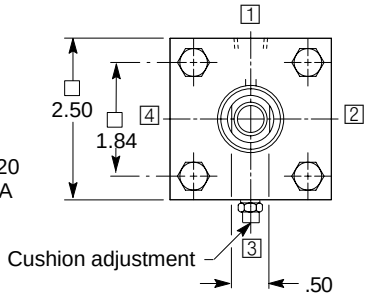
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

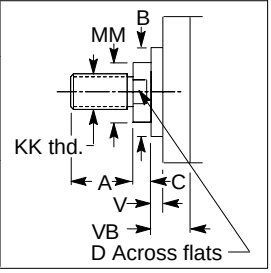
2 inch Cylinder Bore



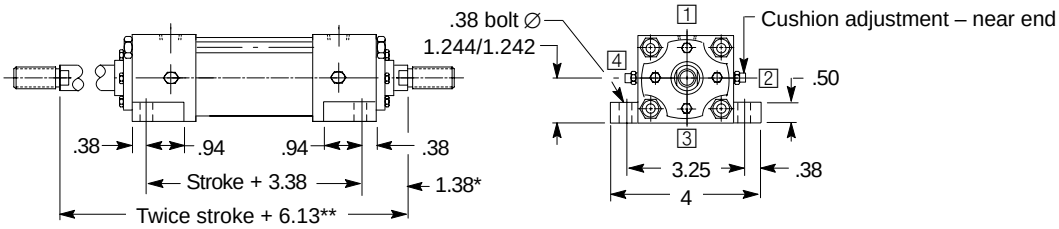


CODE 24 BASIC CYLINDER

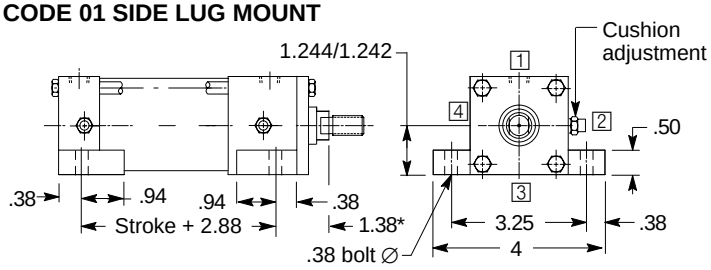
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1 3/8	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A



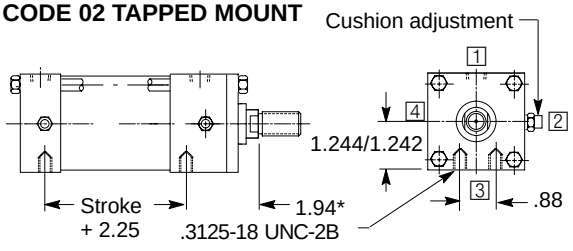
CODE 25 DOUBLE ROD SIDE LUG MOUNT



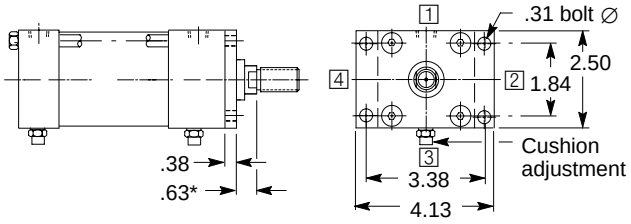
CODE 01 SIDE LUG MOUNT



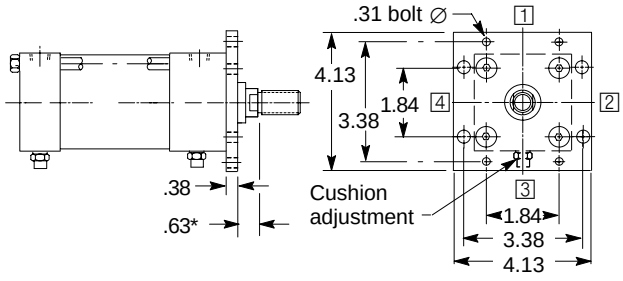
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

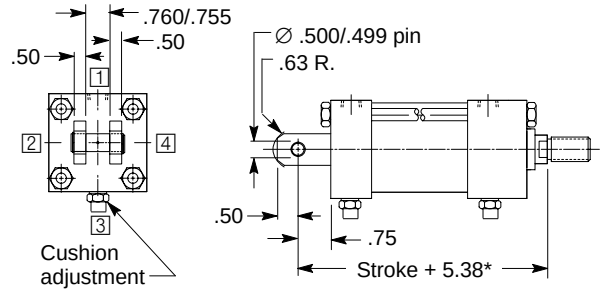


CODE 08 HEAD SQUARE FLANGE MOUNT

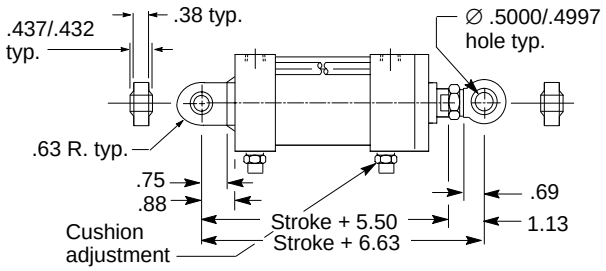


†Maximum working pressure 800 PSI (for minimum flange deflection)

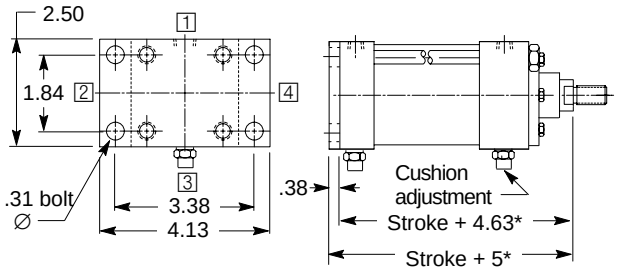
CODE 10 CLEVIS MOUNT



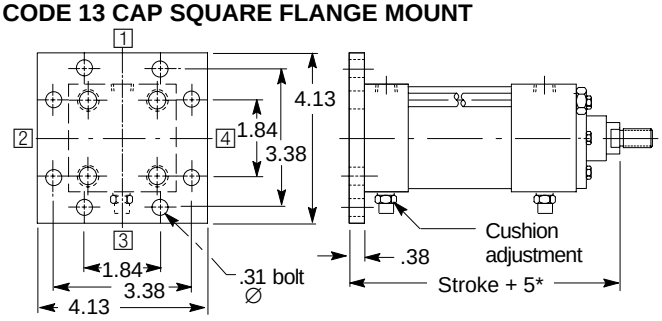
CODE 11 SPHERICAL BEARING MOUNT



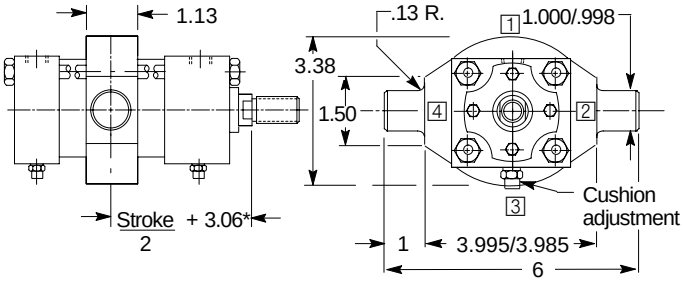
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



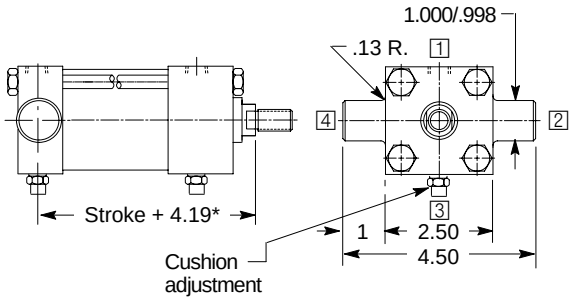
CODE 13 CAP SQUARE FLANGE MOUNT



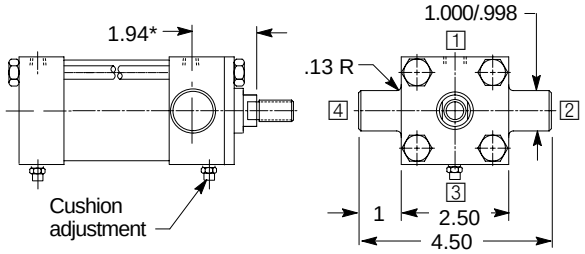
CODE 15 INTERMEDIATE TRUNNION MOUNT



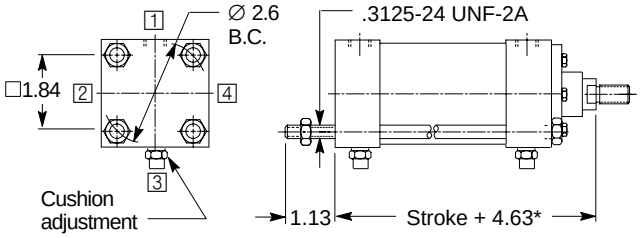
CODE 16 CAP TRUNNION MOUNT



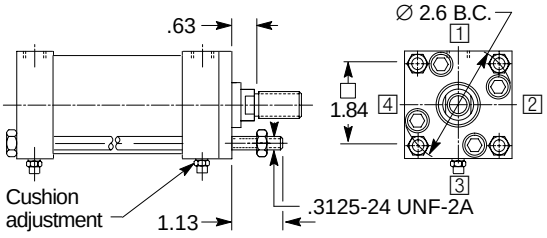
CODE 17 HEAD TRUNNION MOUNT



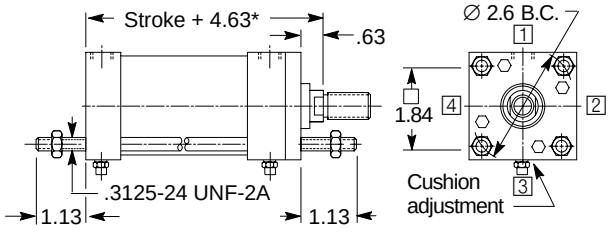
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

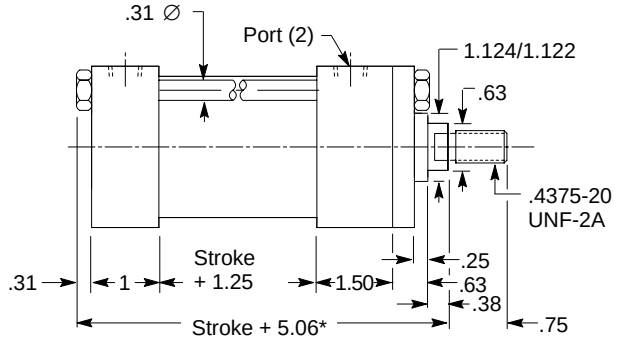


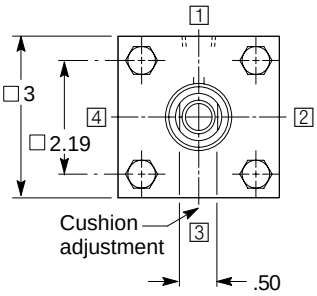
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

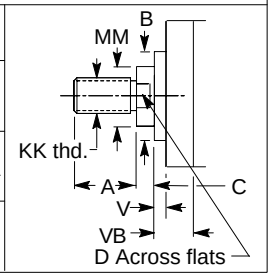
2 1/2 inch Cylinder Bore



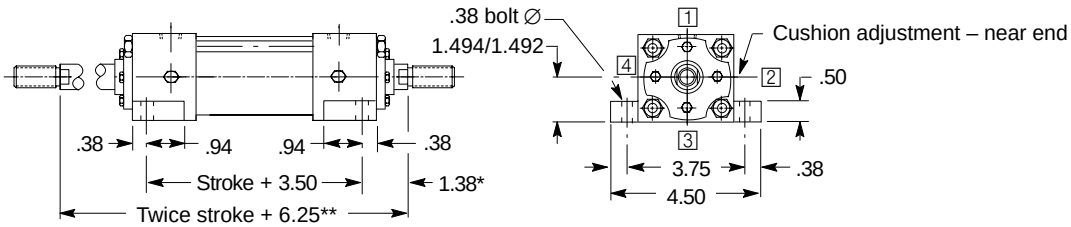


CODE 24 BASIC CYLINDER

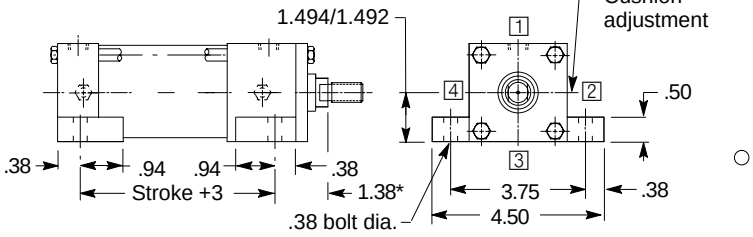
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1.38	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A
	1.75	.88	2	2.374/ 2.372	.75	1.50	1.13	.75	1.250–12 UNF–2A



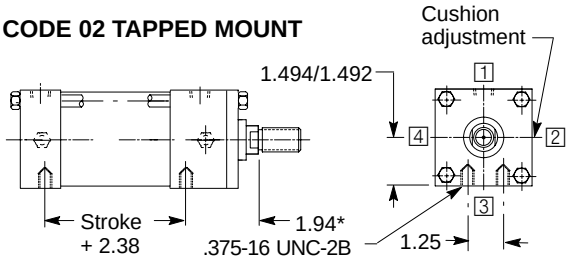
CODE 25 DOUBLE ROD SIDE LUG MOUNT



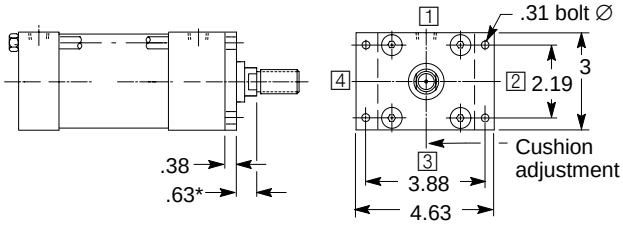
CODE 01 SIDE LUG MOUNT



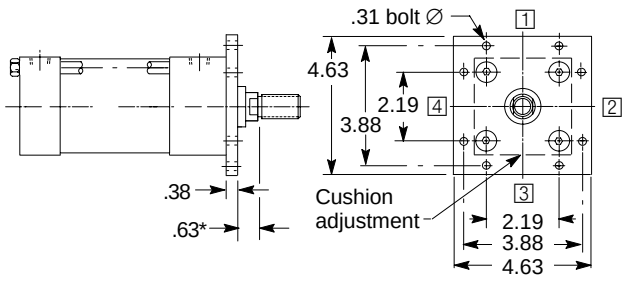
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

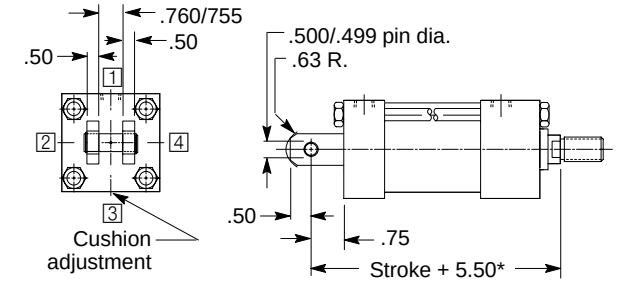


CODE 08 HEAD SQUARE FLANGE MOUNT

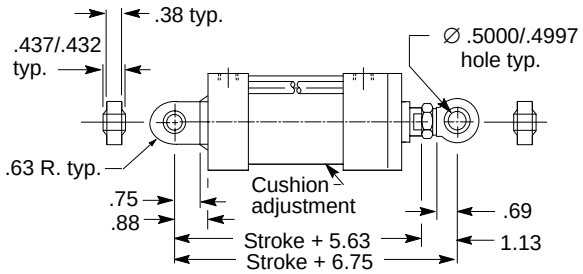


†Maximum working pressure 800 PSI (for minimum flange deflection)

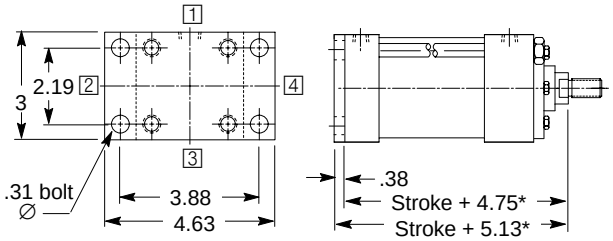
CODE 10 CLEVIS MOUNT



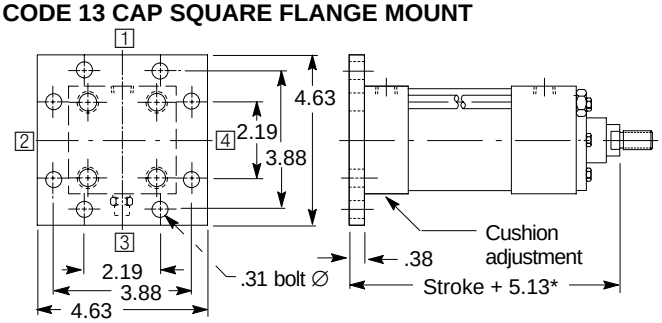
CODE 11 SPHERICAL BEARING MOUNT



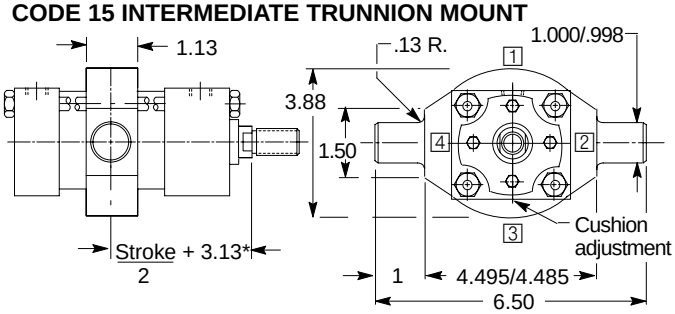
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



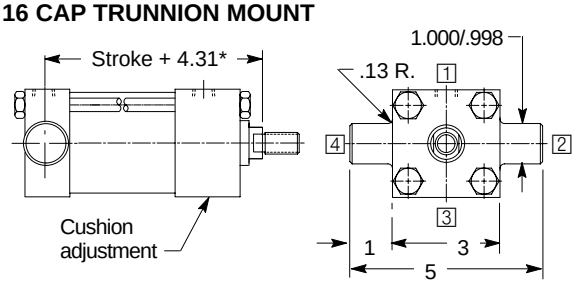
CODE 13 CAP SQUARE FLANGE MOUNT



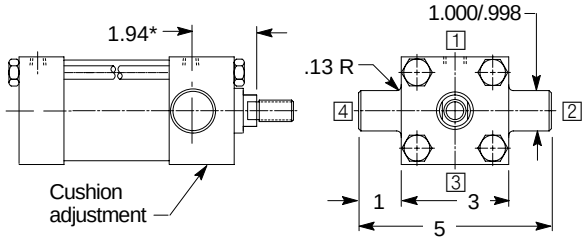
CODE 15 INTERMEDIATE TRUNNION MOUNT



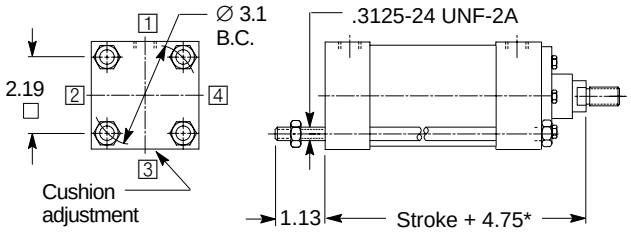
CODE 16 CAP TRUNNION MOUNT



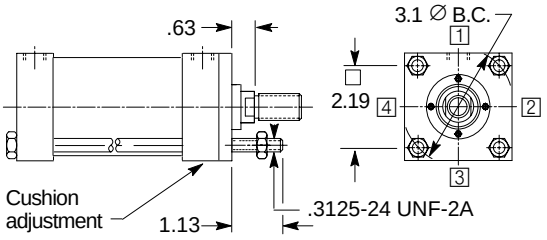
CODE 17 HEAD TRUNNION MOUNT



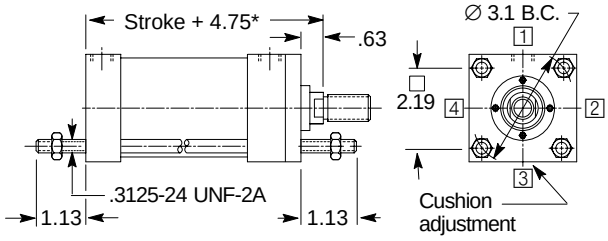
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

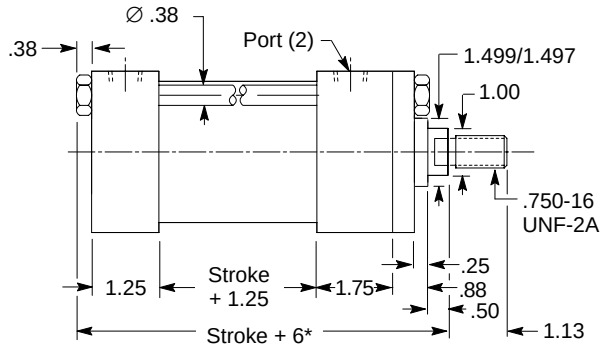


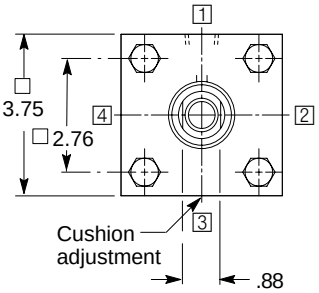
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

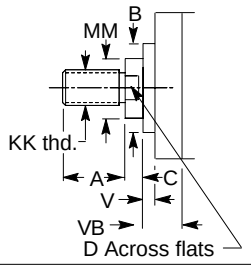
3 1/4 inch Cylinder Bore



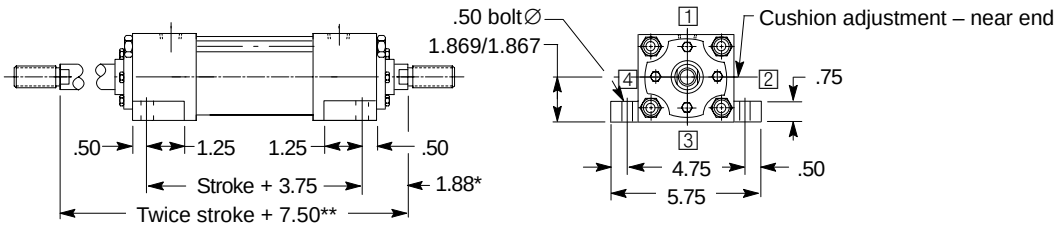


CODE 24 BASIC CYLINDER

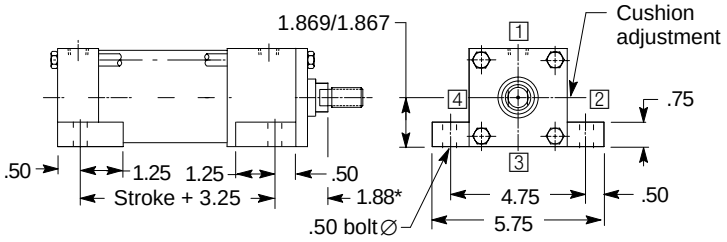
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624/ 2.622	.88	1.69	1.13	.50	1.500–16 UNF–2A



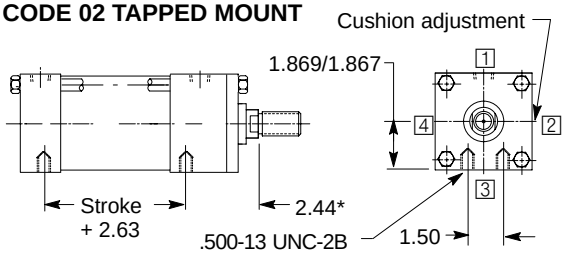
CODE 25 DOUBLE ROD SIDE LUG MOUNT



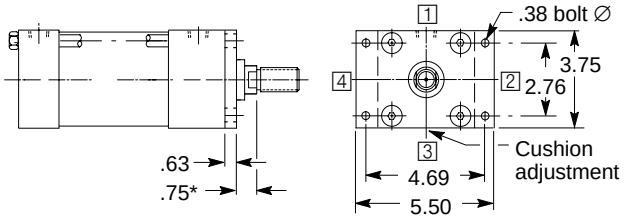
CODE 01 SIDE LUG MOUNT



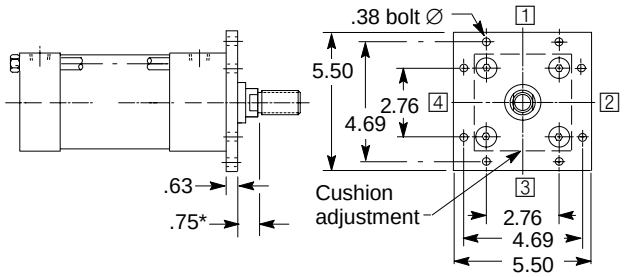
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

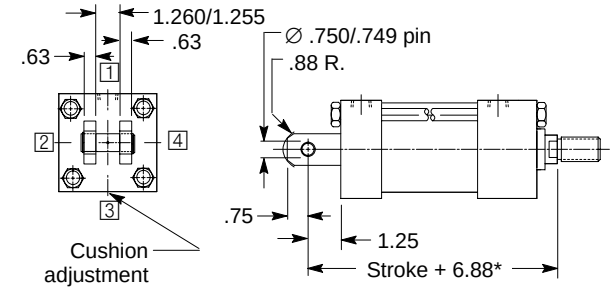


CODE 08 HEAD SQUARE FLANGE MOUNT

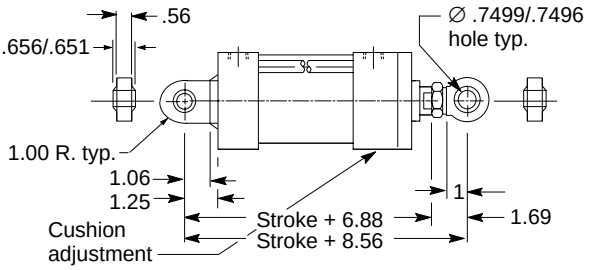


†Maximum working pressure 800 PSI (for minimum flange deflection)

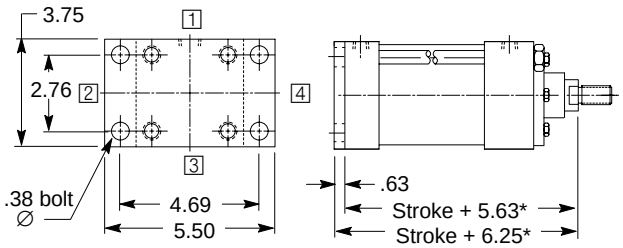
CODE 10 CLEVIS MOUNT



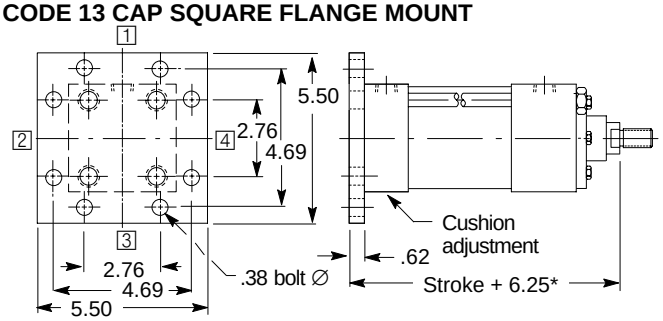
CODE 11 SPHERICAL BEARING MOUNT



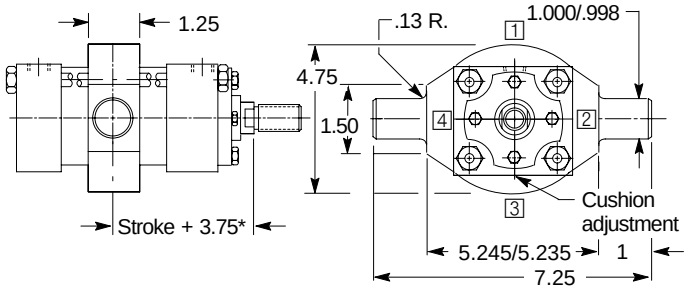
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



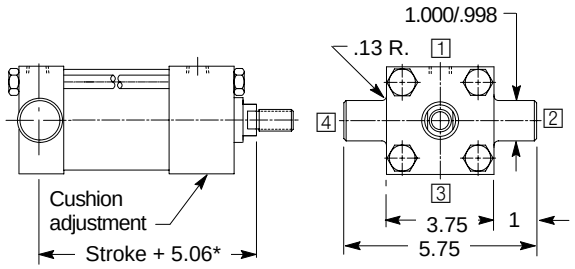
CODE 13 CAP SQUARE FLANGE MOUNT



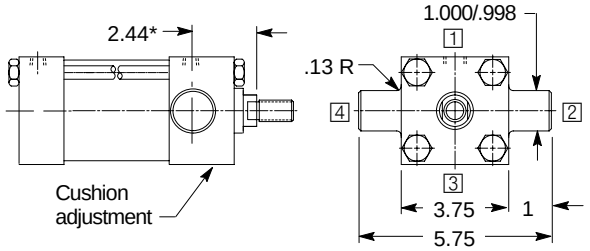
CODE 15 INTERMEDIATE TRUNNION MOUNT



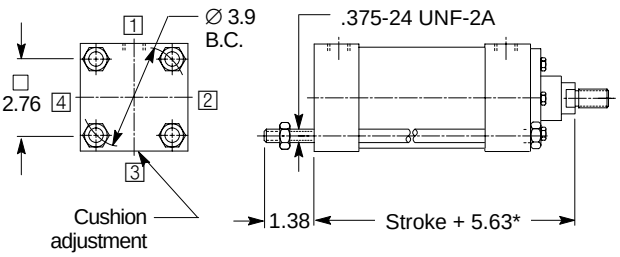
CODE 16 CAP TRUNNION MOUNT



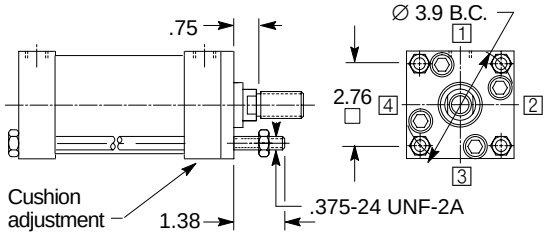
CODE 17 HEAD TRUNNION MOUNT



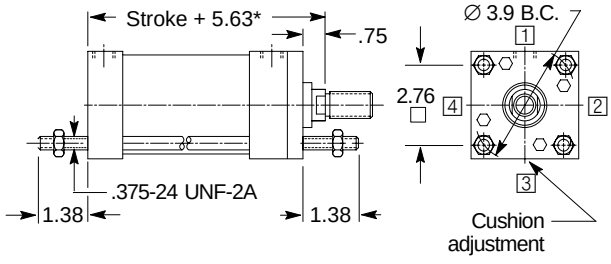
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

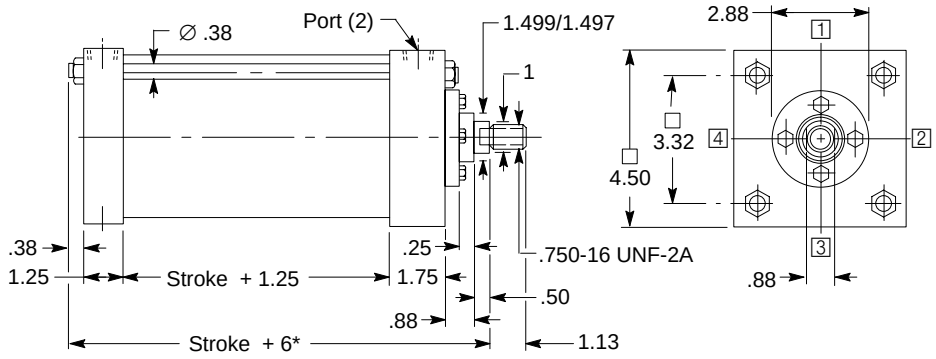


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



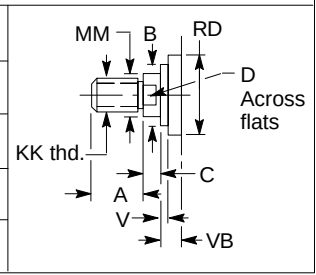
†Maximum working pressure 800 PSI (for minimum flange deflection)

4 inch Cylinder Bore

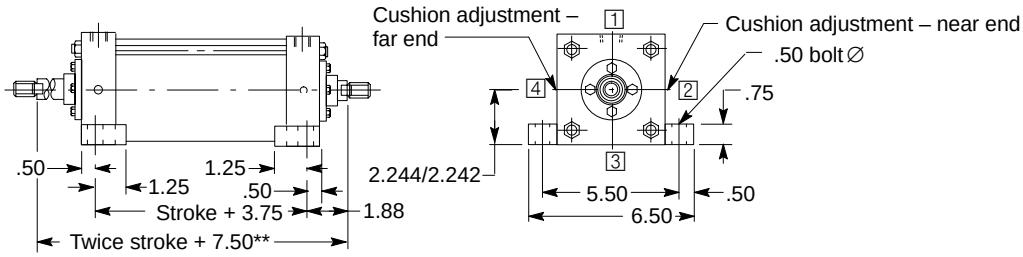


CODE 24 BASIC CYLINDER

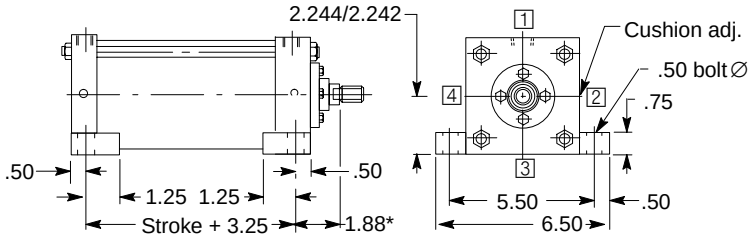
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	3.38	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624/ 2.622	.88	1.69	3.50	1.13	.50	1.500–12 UNF–2A
	2 1/2	.88	3	3.124/ 3.122	1	2.06	4	1.25	.63	1.875–12 UN–2A



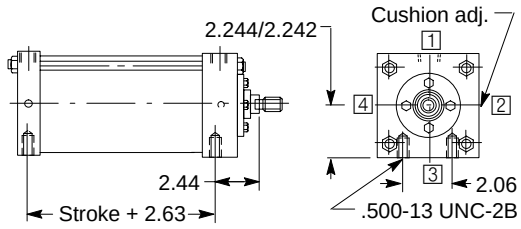
CODE 25 DOUBLE ROD SIDE LUG MOUNT



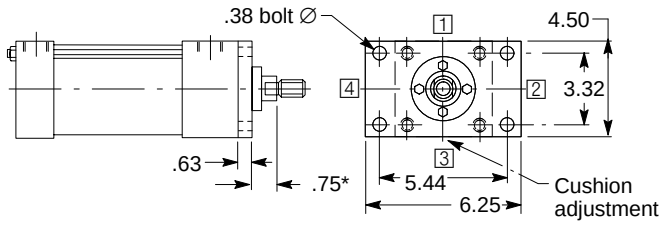
CODE 01 SIDE LUG MOUNT



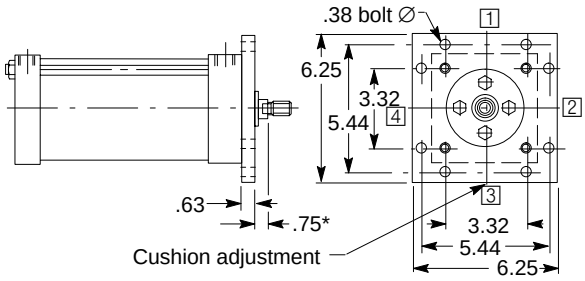
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

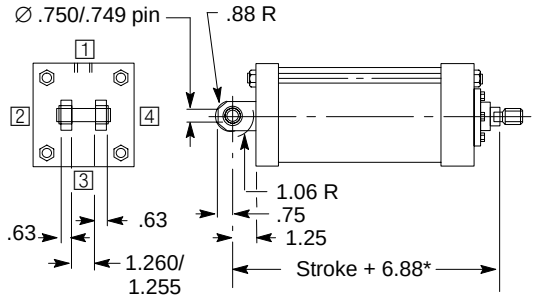


CODE 08 HEAD SQUARE FLANGE MOUNT

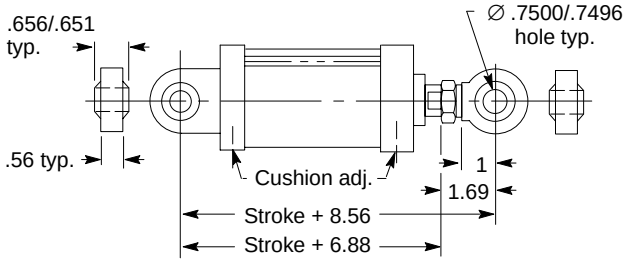


†Maximum working pressure 800 PSI (for minimum flange deflection)

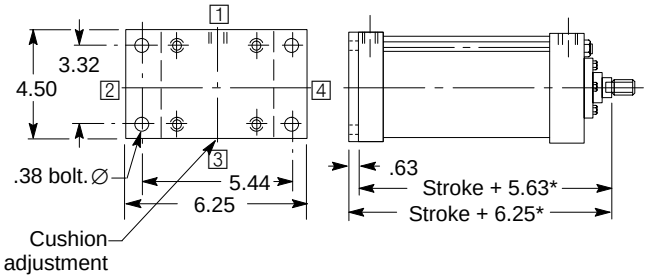
CODE 10 CLEVIS MOUNT



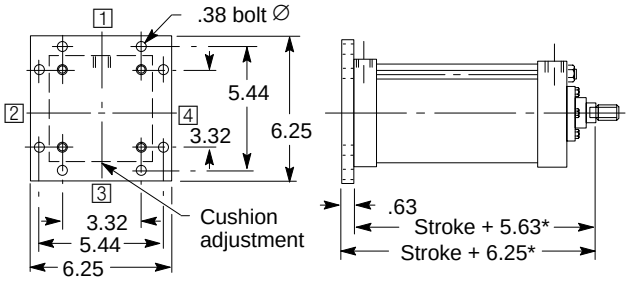
CODE 11 SPHERICAL BEARING MOUNT



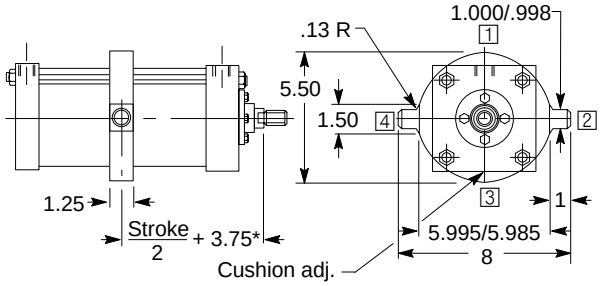
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



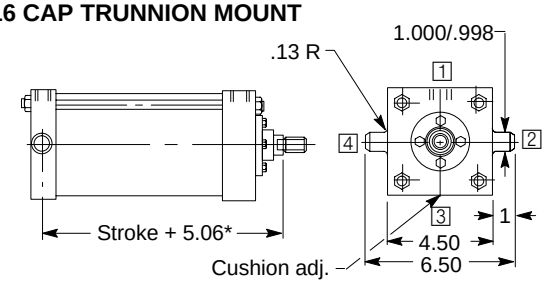
CODE 13 CAP SQUARE FLANGE MOUNT



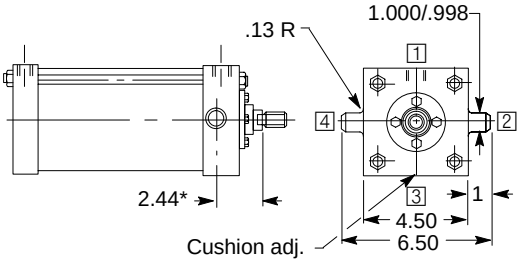
CODE 15 INTERMEDIATE TRUNNION MOUNT



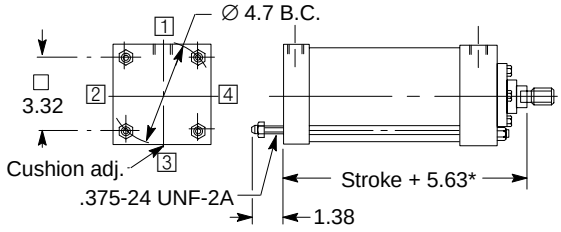
CODE 16 CAP TRUNNION MOUNT



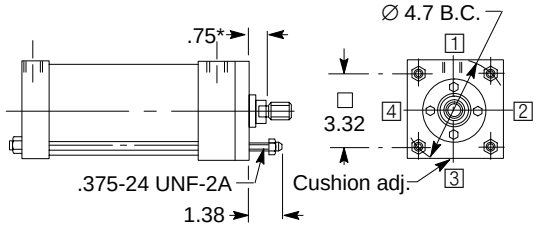
CODE 17 HEAD TRUNNION MOUNT



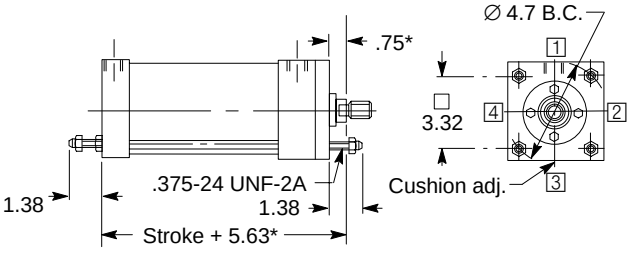
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

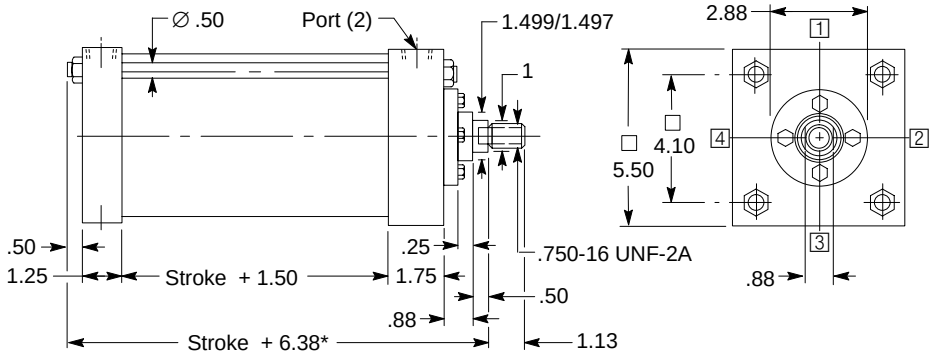


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



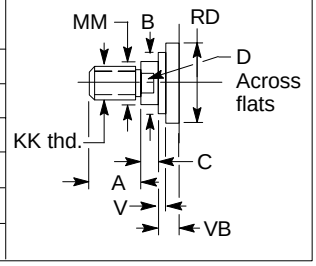
†Maximum working pressure 800 PSI (for minimum flange deflection)

5 inch Cylinder Bore

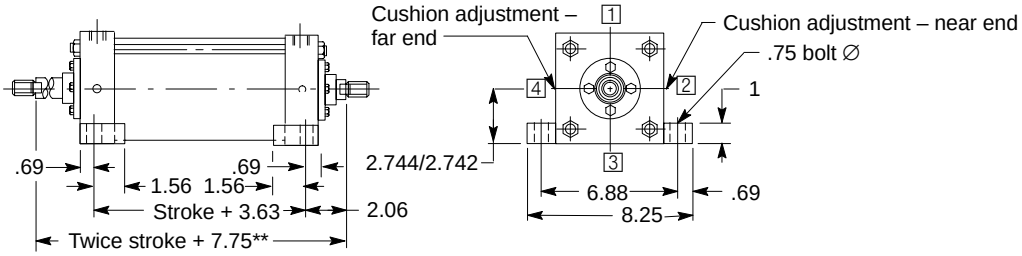


CODE 24 BASIC CYLINDER

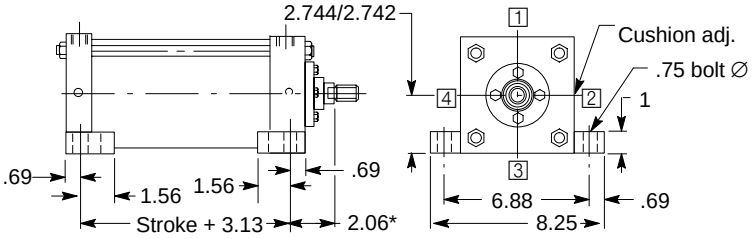
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B +.000 –.002	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374	.75	1.50	3.38	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624	.88	1.69	4	1.13	.50	1.500–12 UNF–2A
	2 1/2	.88	3	3.124	1	2.06	4.50	1.25	.63	1.875–12 UN–2A
	3	.88	3.50	3.749	1	2.63	5	1.25	.63	2.250–12 UN–2A
	3 1/2	.88	3.50	4.249	1	3	5.25	1.25	.63	2.500–12 UN–2A



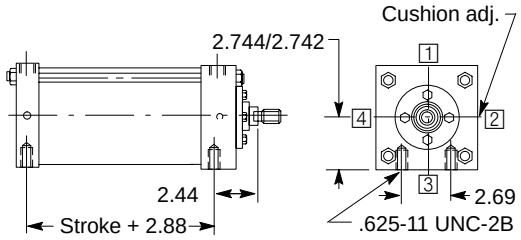
CODE 25 DOUBLE ROD SIDE LUG MOUNT



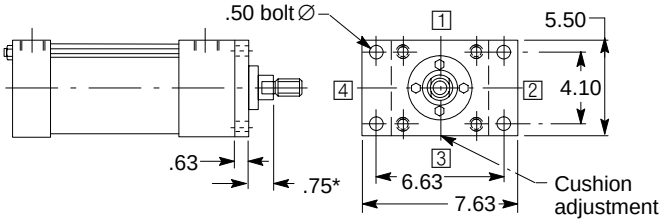
CODE 01 SIDE LUG MOUNT



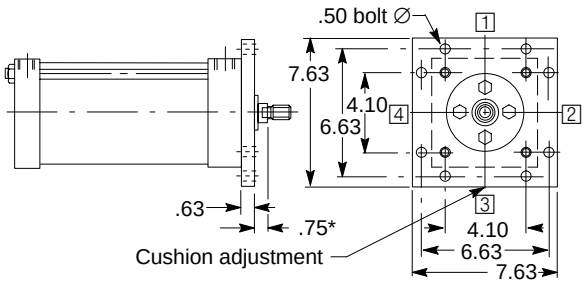
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

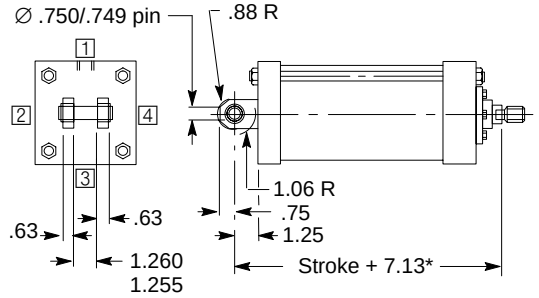


CODE 08 HEAD SQUARE FLANGE MOUNT

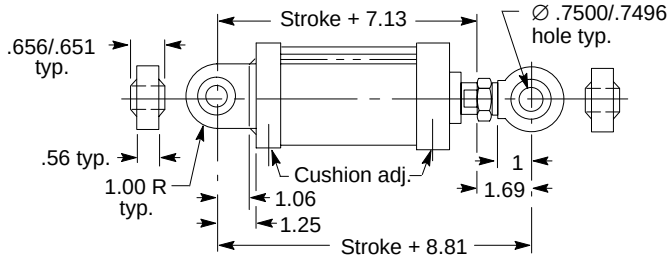


†Maximum working pressure 800 PSI (for minimum flange deflection)

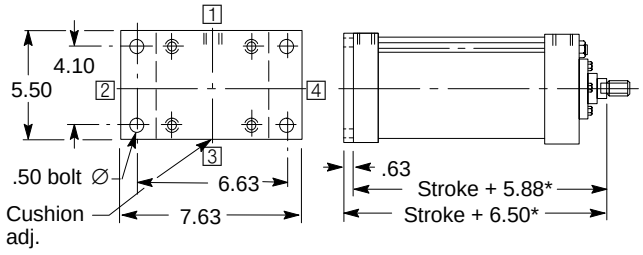
CODE 10 CLEVIS MOUNT



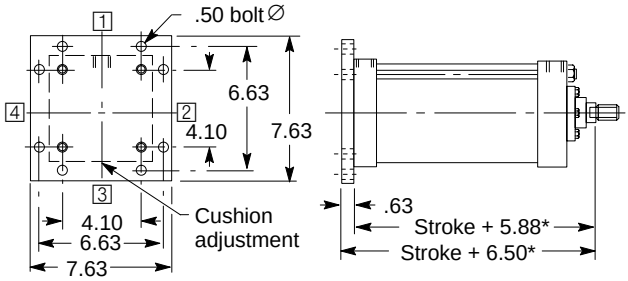
CODE 11 SPHERICAL BEARING MOUNT



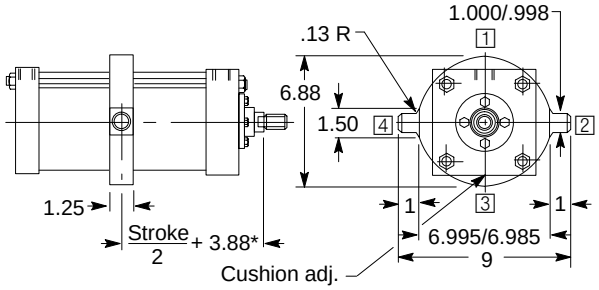
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



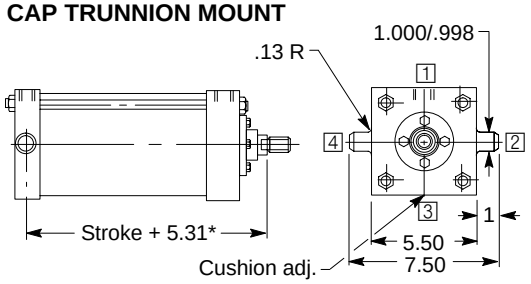
CODE 13 CAP SQUARE FLANGE MOUNT



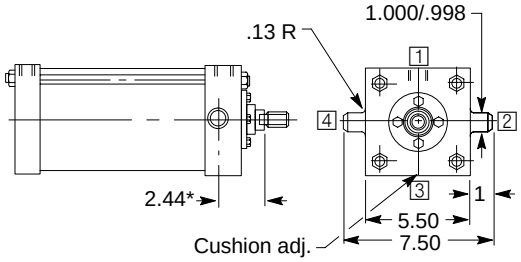
CODE 15 INTERMEDIATE TRUNNION MOUNT



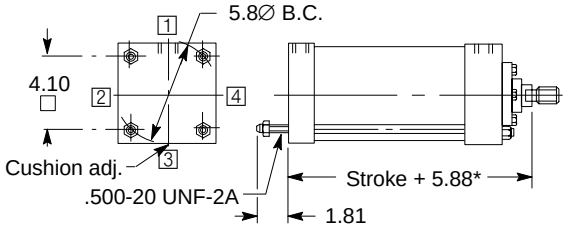
CODE 16 CAP TRUNNION MOUNT



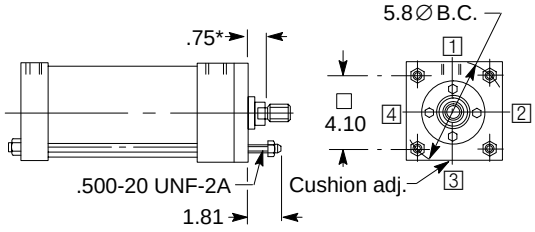
CODE 17 HEAD TRUNNION MOUNT



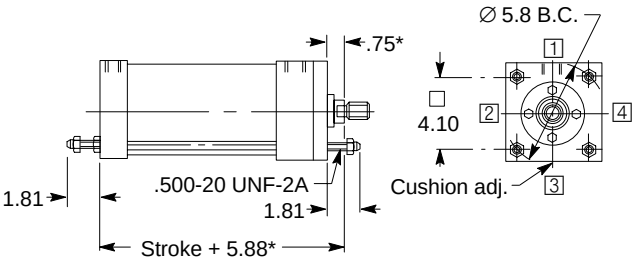
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

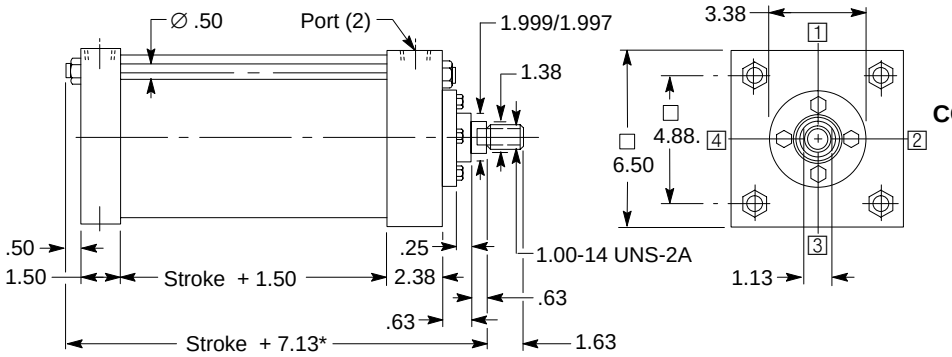


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



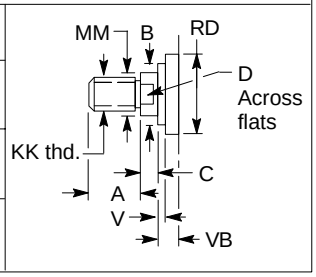
†Maximum working pressure 800 PSI (for minimum flange deflection)

6 inch Cylinder Bore

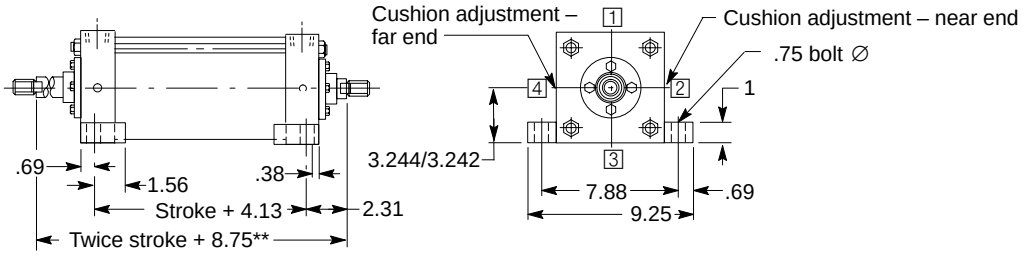


CODE 24 BASIC CYLINDER

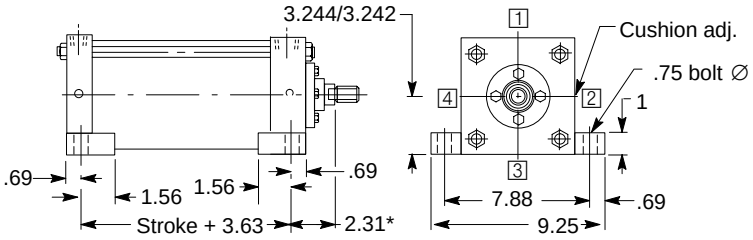
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.38	1.250–12 UNF–2A
	2 1/2	.63	3	3.124/ 3.122	1	2.06	4.50	.88	.50	1.875–12 UN–2A
	4	.63	4	4.749/ 4.746	1	3.38	6	.88	.50	3.000–12 UN–2A



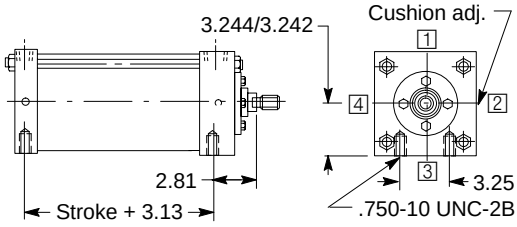
CODE 25 DOUBLE ROD SIDE LUG MOUNT



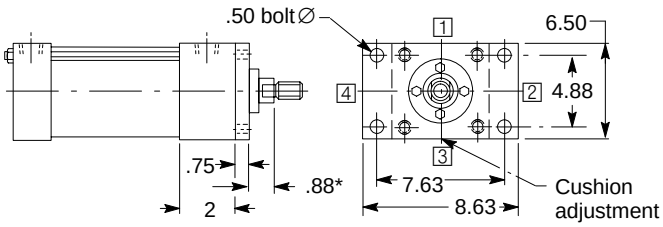
CODE 01 SIDE LUG MOUNT



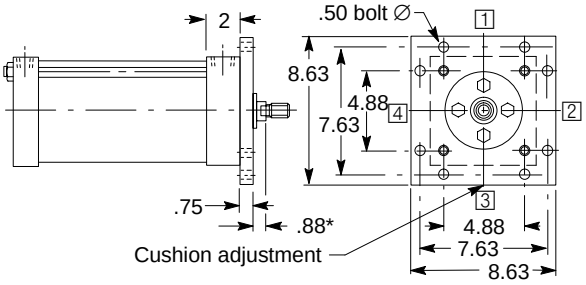
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

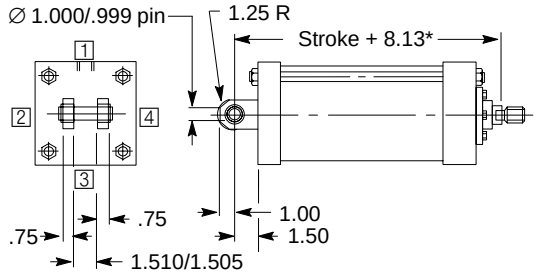


CODE 08 HEAD SQUARE FLANGE MOUNT

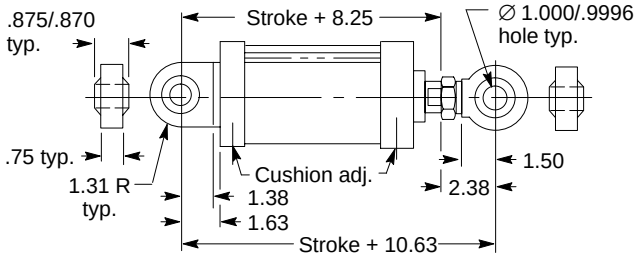


†Maximum working pressure 800 PSI (for minimum flange deflection)

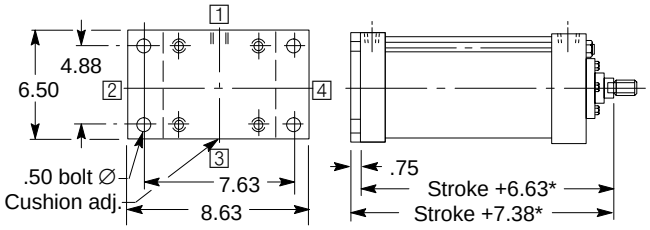
CODE 10 CLEVIS MOUNT



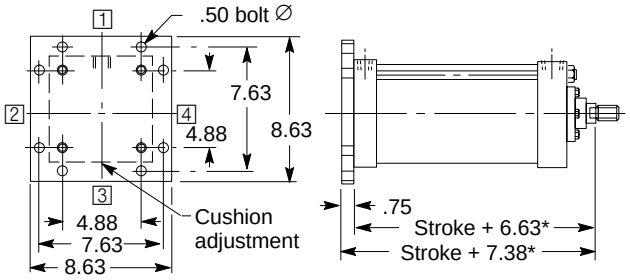
CODE 11 SPHERICAL BEARING MOUNT



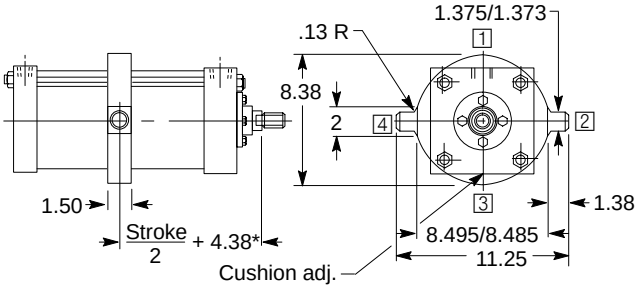
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



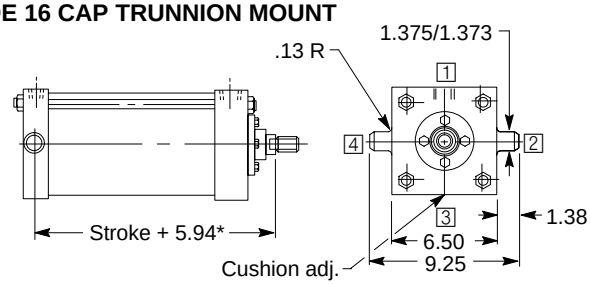
CODE 13 CAP SQUARE FLANGE MOUNT



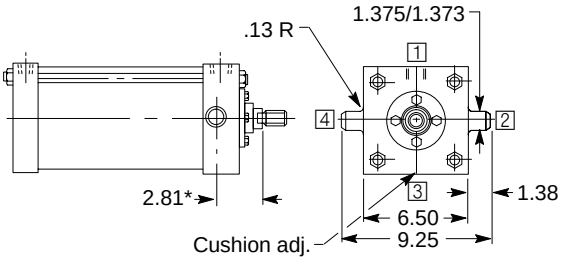
CODE 15 INTERMEDIATE TRUNNION MOUNT



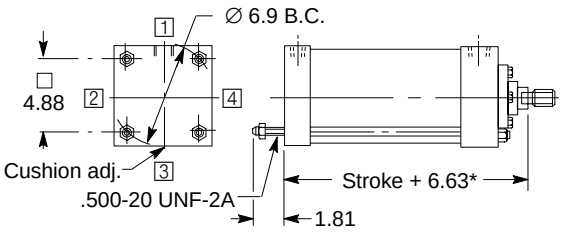
CODE 16 CAP TRUNNION MOUNT



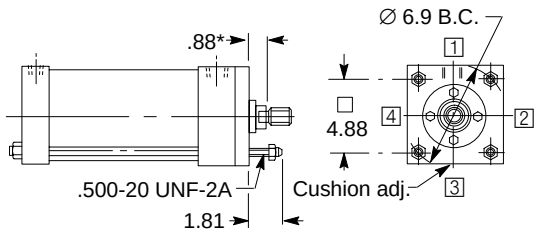
CODE 17 HEAD TRUNNION MOUNT



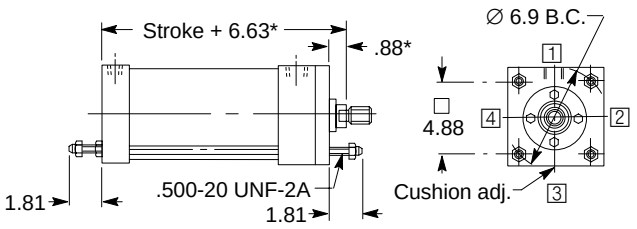
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

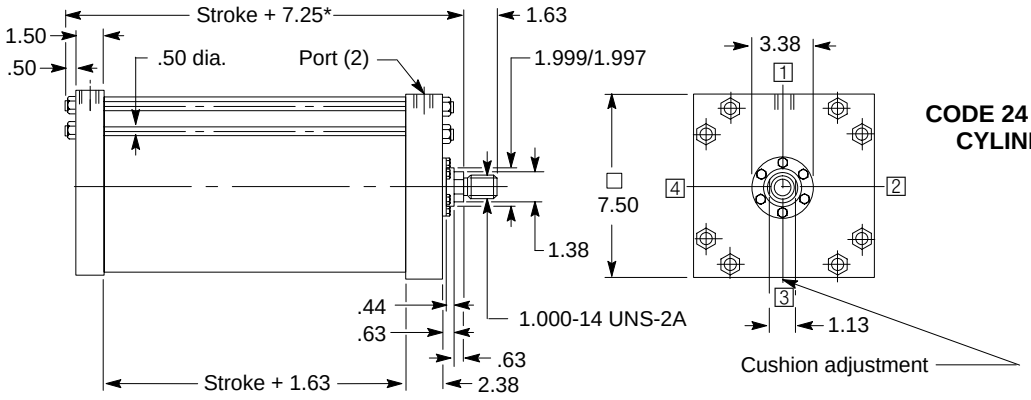


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



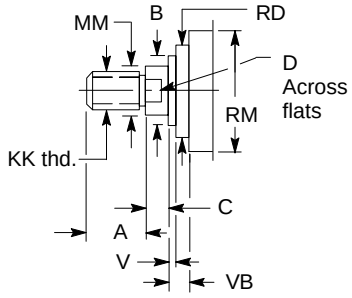
†Maximum working pressure 800 PSI (for minimum flange deflection)

7 inch Cylinder Bore

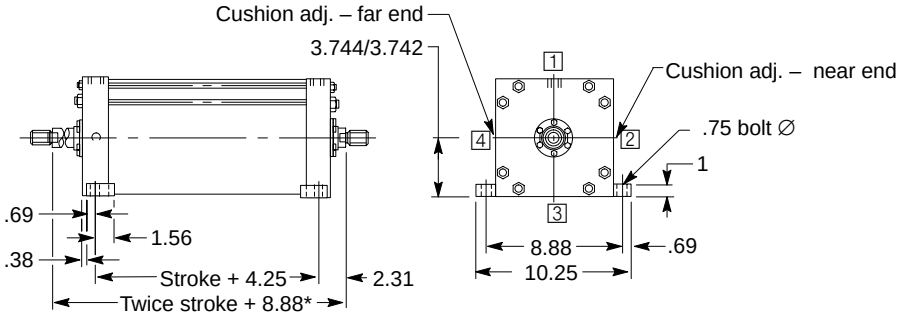


CODE 24 BASIC CYLINDER

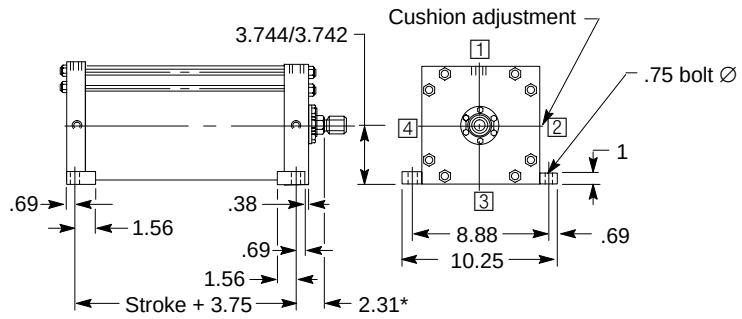
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.63	1.250–12 UNF–2A	4.499
	3	.63	3.50	3.749/ 3.747	1	2.63	5.50	.88	.63	2.250–12 UN–2A	6.249
	5	.63	5	5.749/ 5.746	1	4.25	6.88	.88	.50	3.500–12 UN–2A	6.874



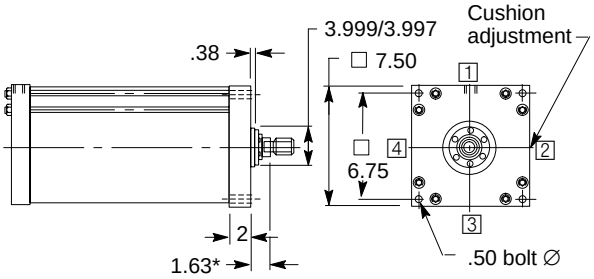
CODE 25 DOUBLE ROD SIDE LUG MOUNT



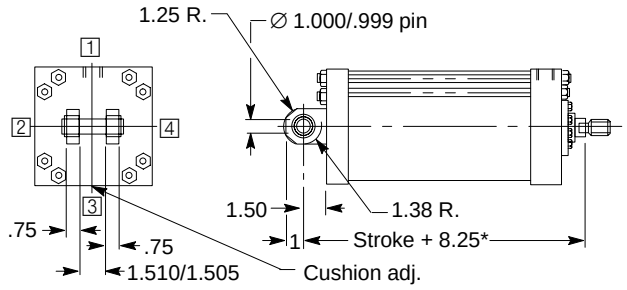
CODE 01 SIDE LUG MOUNT



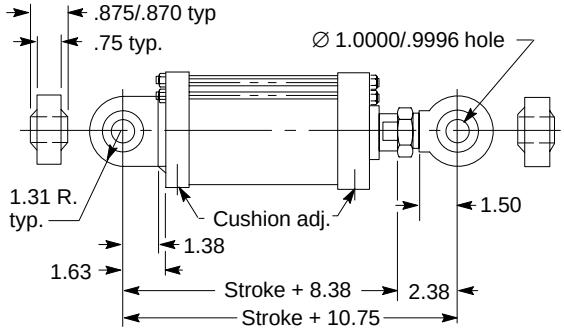
CODE 07 HEAD FLANGE MOUNT



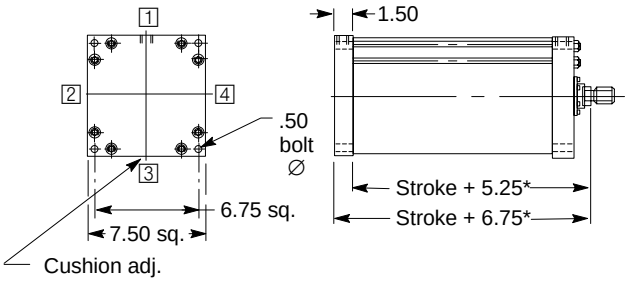
CODE 10 CLEVIS MOUNT



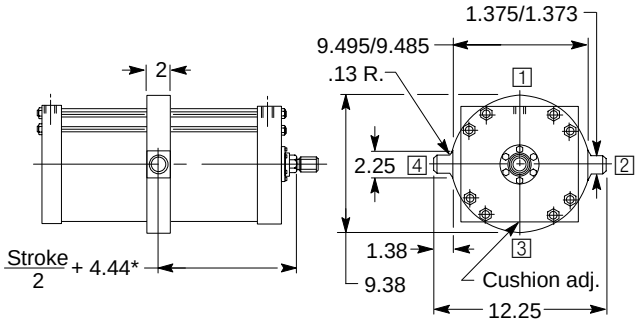
CODE 11 SPHERICAL BEARING MOUNT



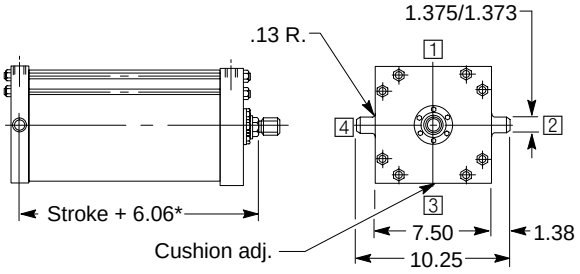
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



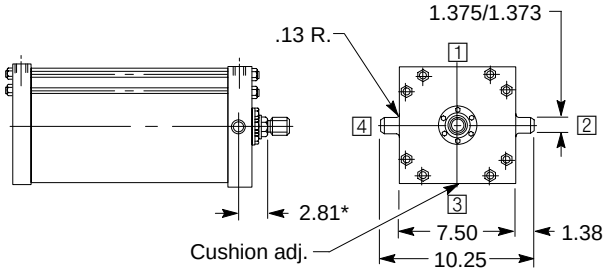
CODE 15 INTERMEDIATE TRUNNION MOUNT



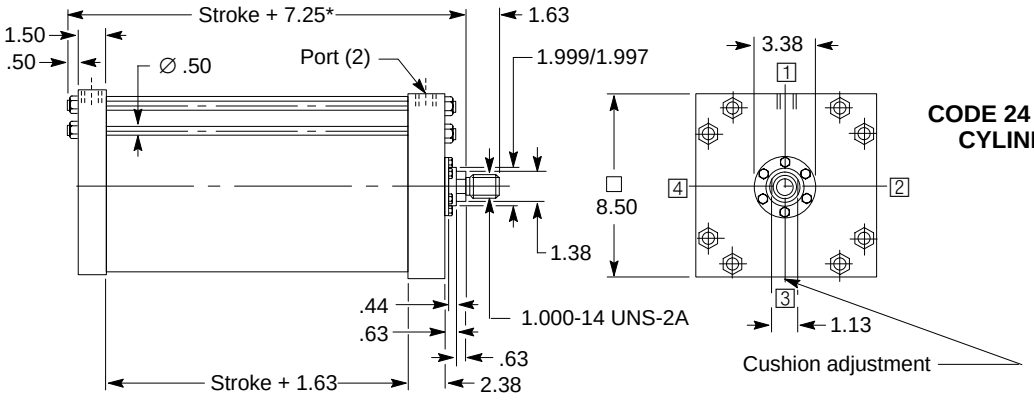
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

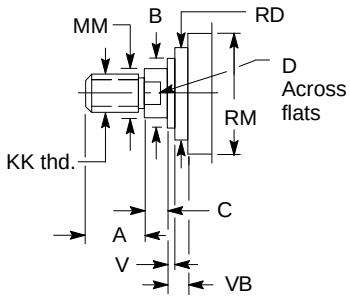


8 inch Cylinder Bore



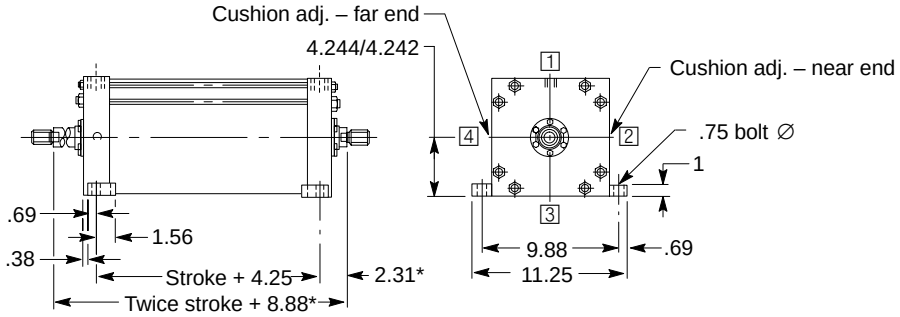
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.56	1.250–12 UNF–2A	4.499
	3 1/2	.63	3.50	4.249/ 4.246	1	3	5.88	.88	.63	2.500–12 UN–2A	6.374
	5 1/2	.63	5.50	6.249/ 6.246	1	4.63	7.38	.88	.50	4.000–12 UN–2A	7.374

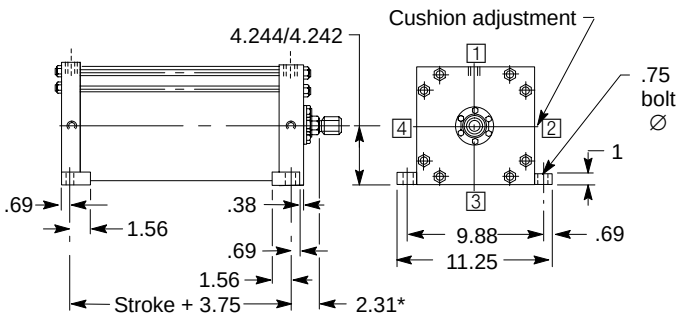


† Applies to Code 07 mount only

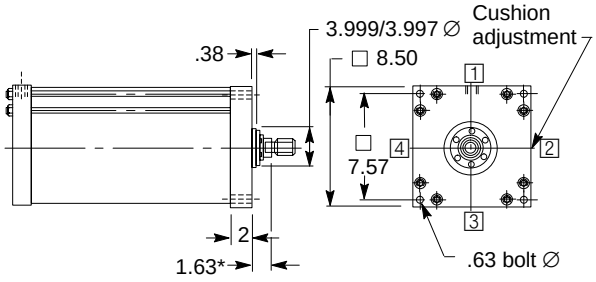
CODE 25 DOUBLE ROD SIDE LUG MOUNT



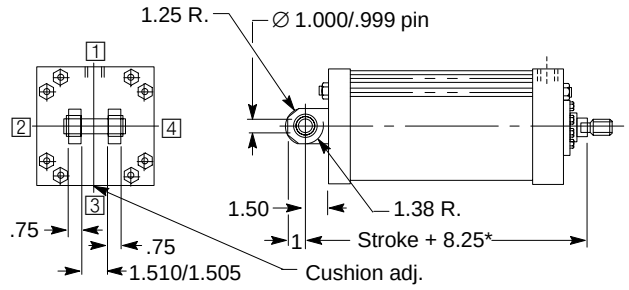
CODE 01 SIDE LUG MOUNT



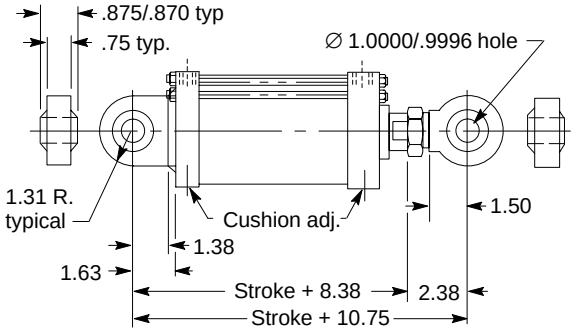
CODE 07 HEAD FLANGE MOUNT



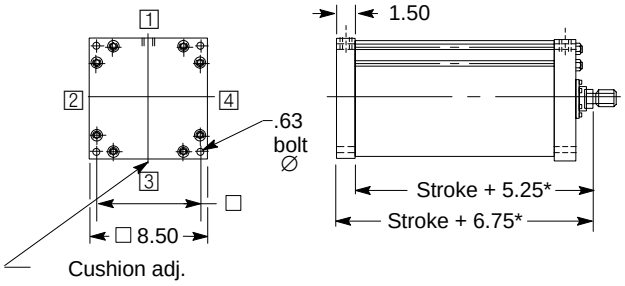
CODE 10 CLEVIS MOUNT



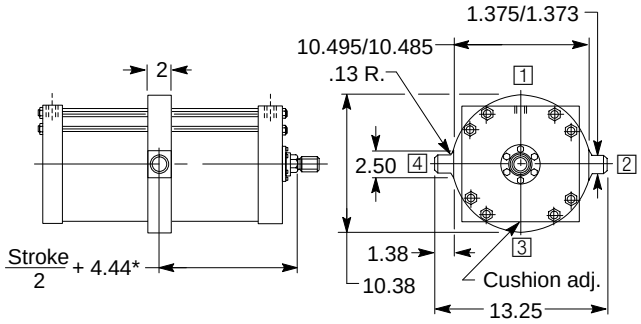
CODE 11 SPHERICAL BEARING MOUNT



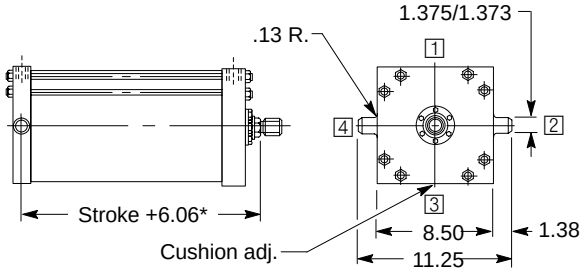
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



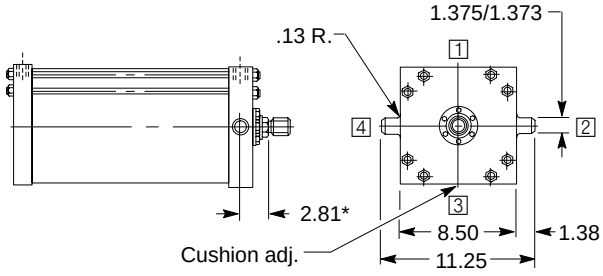
CODE 15 INTERMEDIATE TRUNNION MOUNT



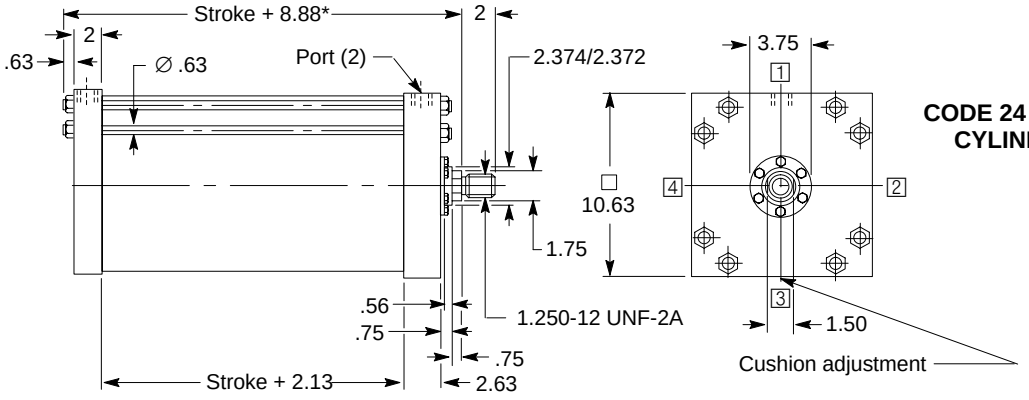
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

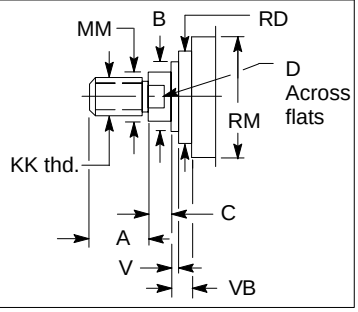


10 inch Cylinder Bore



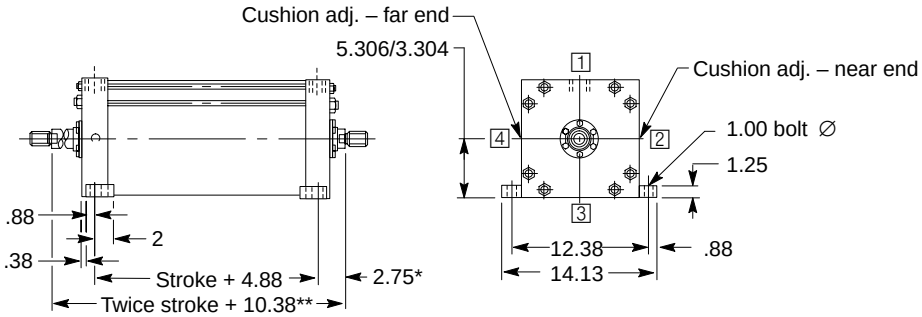
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	2	.13	2.25	2.624/ 2.622	.88	1.69	4	.75	.63	1.500–12 UNF–2A	4.749
	3 1/2	.38	3.50	4.249/ 4.246	1	3	5.88	.88	.63	2.500–12 UN–2A	6.374
	5 1/2	.38	5.50	6.249/ 6.245	1	4.63	7.38	.88	.50	4.000–12 UN–2A	7.374

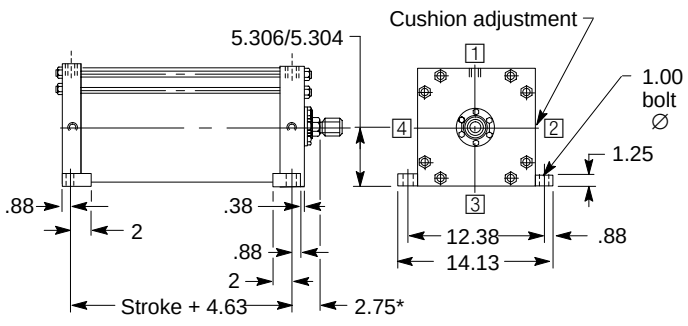


† Applies to Code 07 mount only

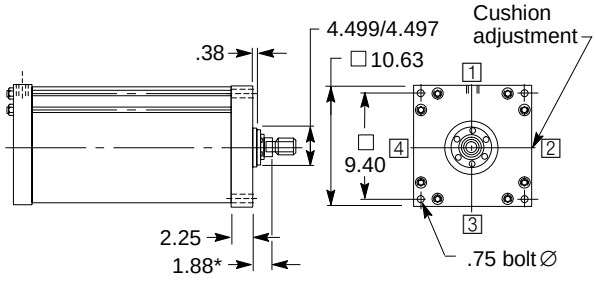
CODE 25 DOUBLE ROD SIDE LUG MOUNT



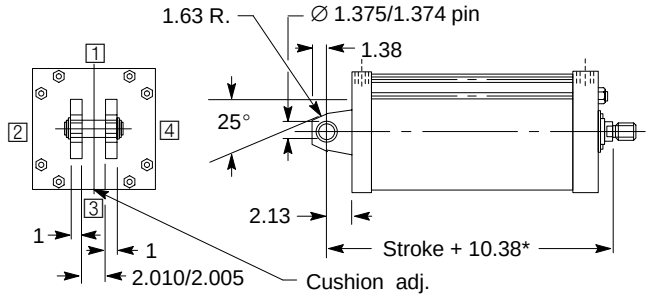
CODE 01 SIDE LUG MOUNT



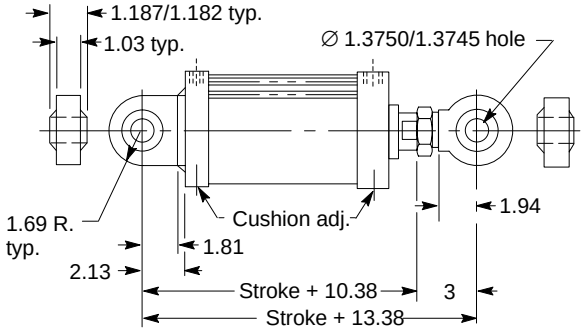
CODE 07 HEAD FLANGE MOUNT



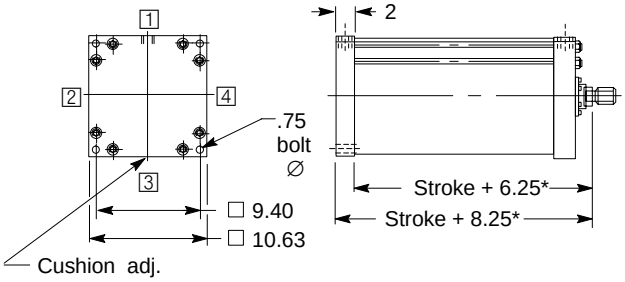
CODE 10 CLEVIS MOUNT



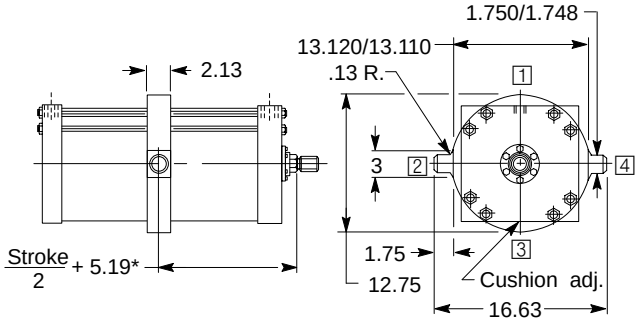
CODE 11 SPHERICAL BEARING MOUNT



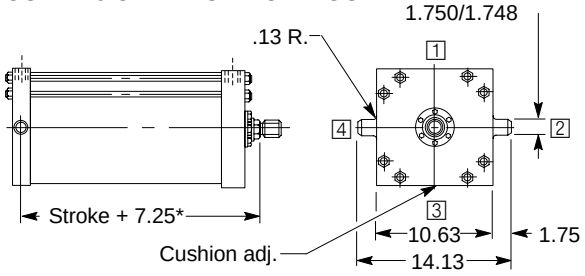
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



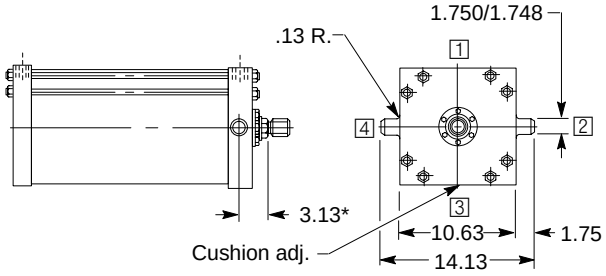
CODE 15 INTERMEDIATE TRUNNION MOUNT



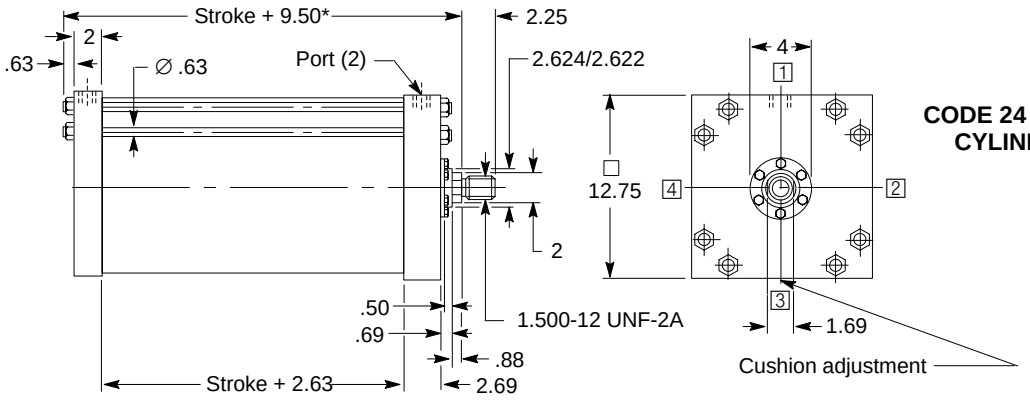
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

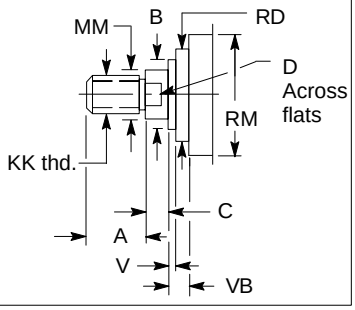


12 inch Cylinder Bore



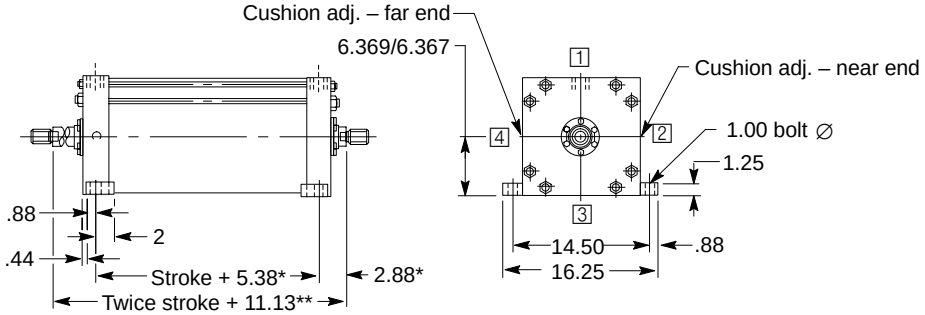
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	2 1/2	.25	3	3.124/ 3.122	1	2.06	4.50	.81	.63	1.875–12 UN–2A	5.249
	4	.25	4	4.749/ 4.746	1	3.38	6.38	.81	.56	3.000–12 UN–2A	6.999
	5 1/2	.25	5.50	6.249/ 6.245	1	4.63	7.38	.81	.50	4.000–12 UN–2A	7.374

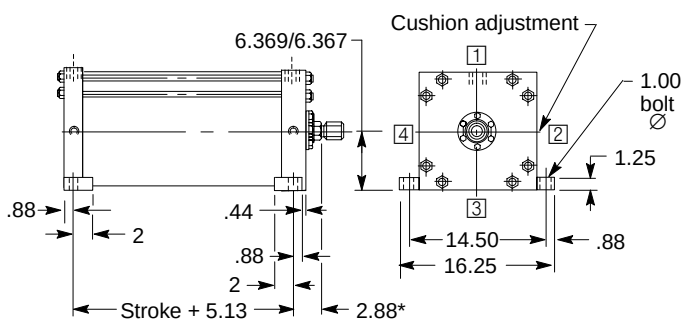


† Applies to Code 07 mount only

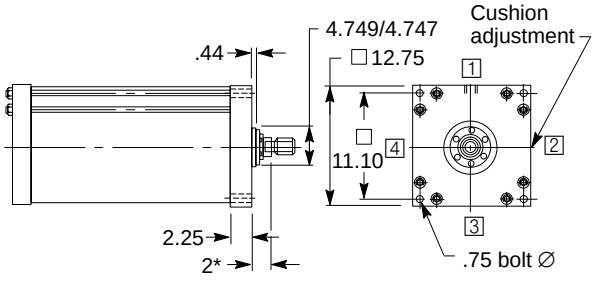
CODE 25 DOUBLE ROD SIDE LUG MOUNT



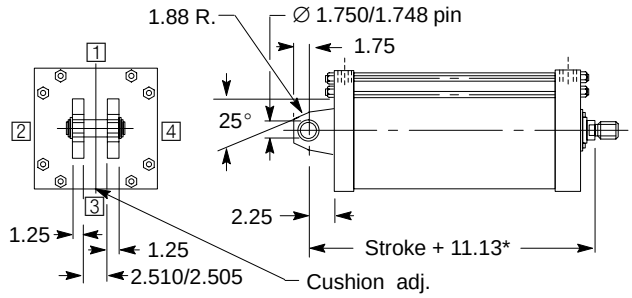
CODE 01 SIDE LUG MOUNT



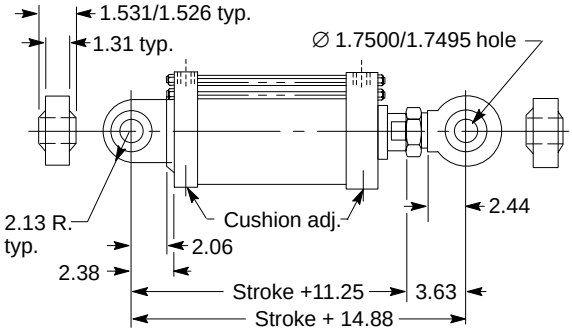
CODE 07 HEAD FLANGE MOUNT



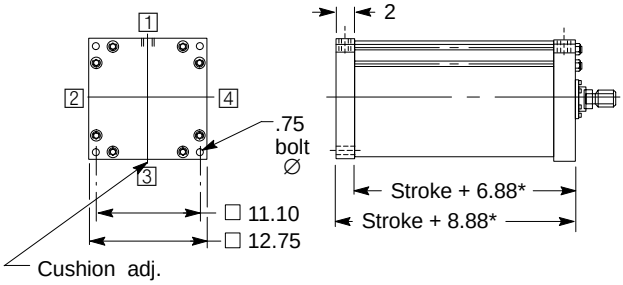
CODE 10 CLEVIS MOUNT



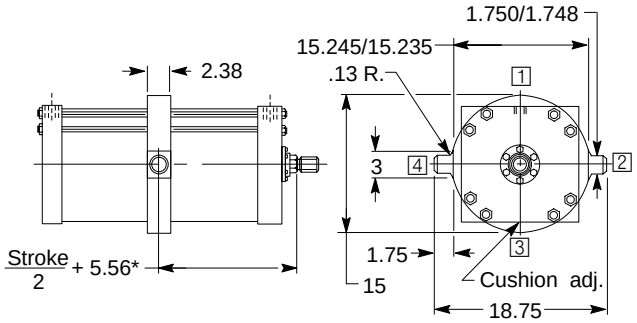
CODE 11 SPHERICAL BEARING MOUNT



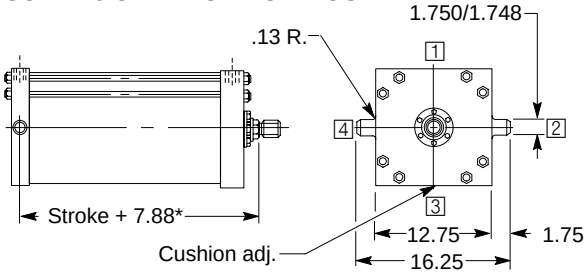
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



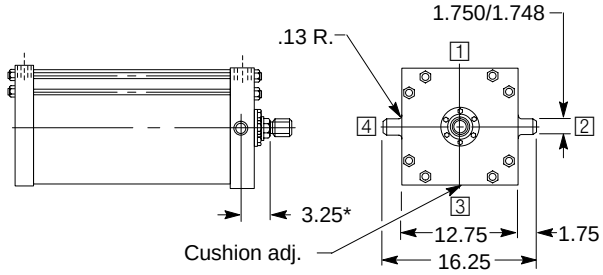
CODE 15 INTERMEDIATE TRUNNION MOUNT



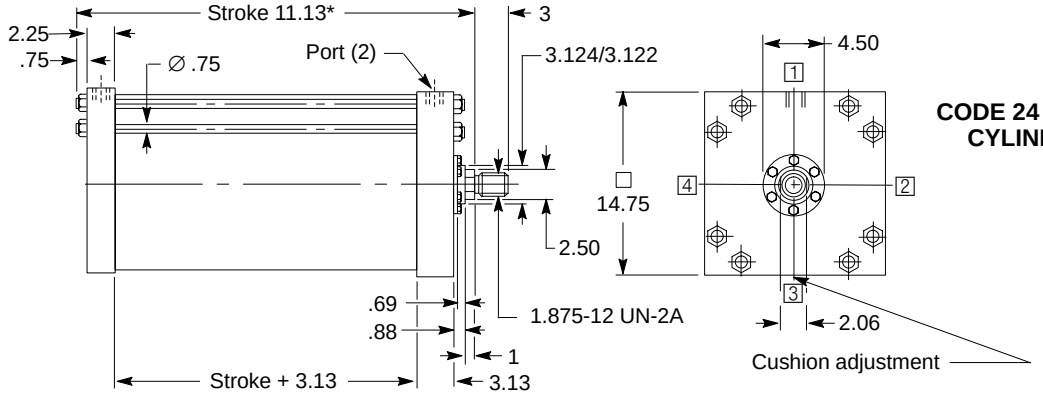
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

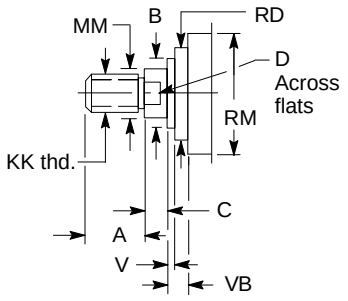


14 inch Cylinder Bore



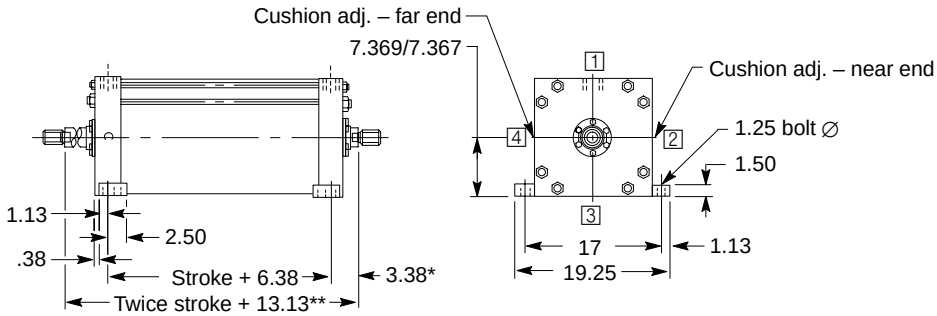
CODE 24 BASIC CYLINDER

ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED. Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM†
	3	–	3.50	3.749/ 3.747	1	2.63	5.50	.88	.63	2.250–12 UN–2A	6.248
	4	–	4	4.749/ 4.746	1	3.38	6.38	.88	.56	3.000–12 UN–2A	6.999
	5 1/2	–	5.50	6.249/ 6.245	1	4.63	7.38	.88	.50	4.000–12 UN–2A	7.374

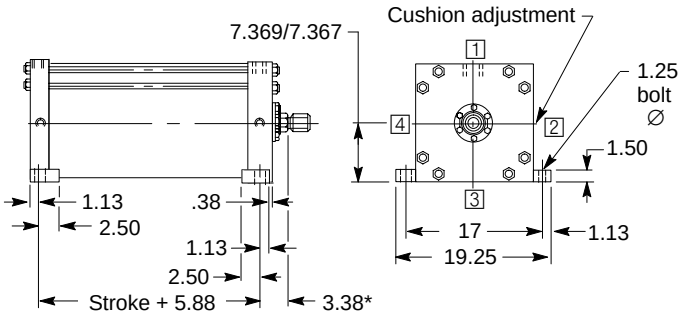


† Applies to Code 07 mount only

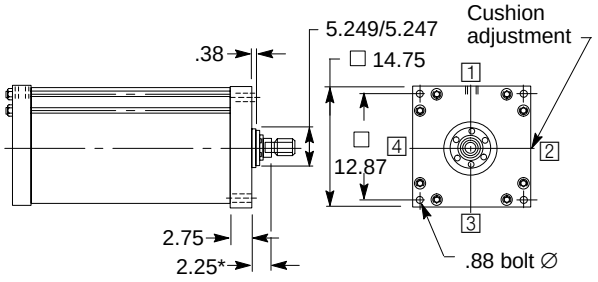
CODE 25 DOUBLE ROD SIDE LUG MOUNT



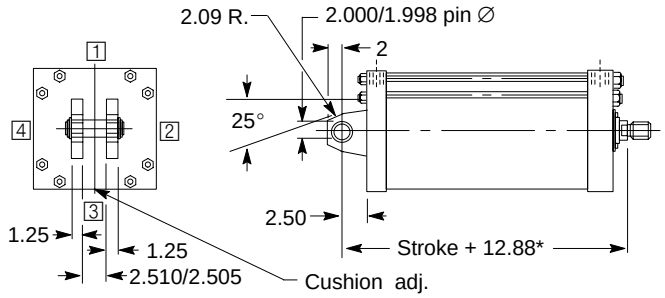
CODE 01 SIDE LUG MOUNT



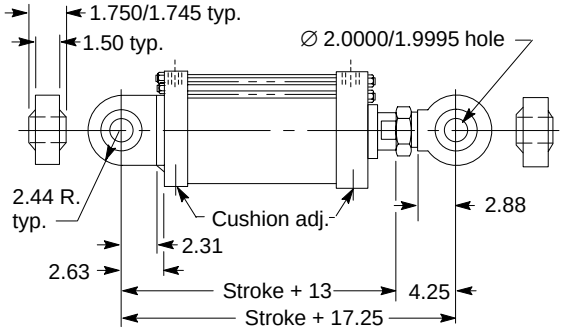
CODE 07 HEAD FLANGE MOUNT



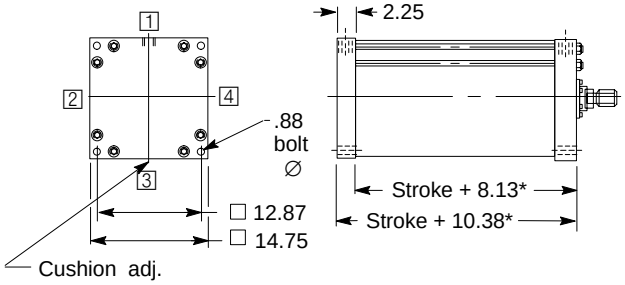
CODE 10 CLEVIS MOUNT



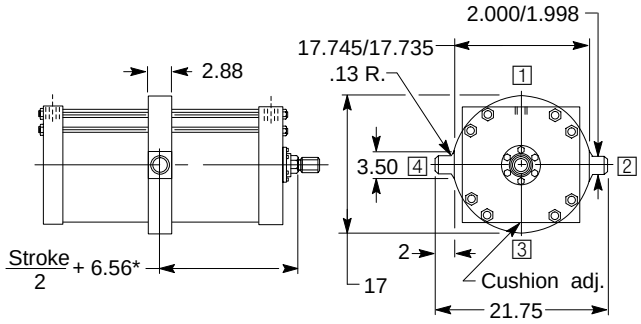
CODE 11 SPHERICAL BEARING MOUNT



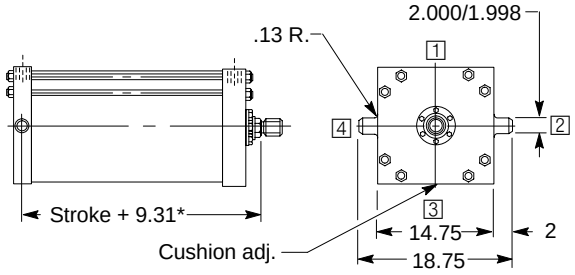
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



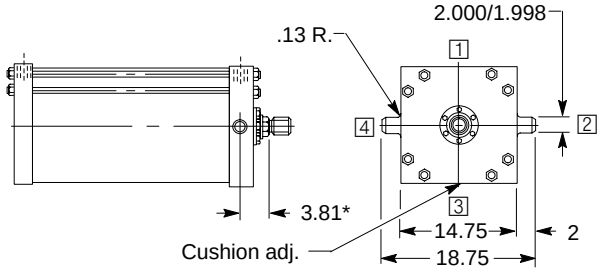
CODE 15 INTERMEDIATE TRUNNION MOUNT



CODE 16 CAP TRUNNION MOUNT



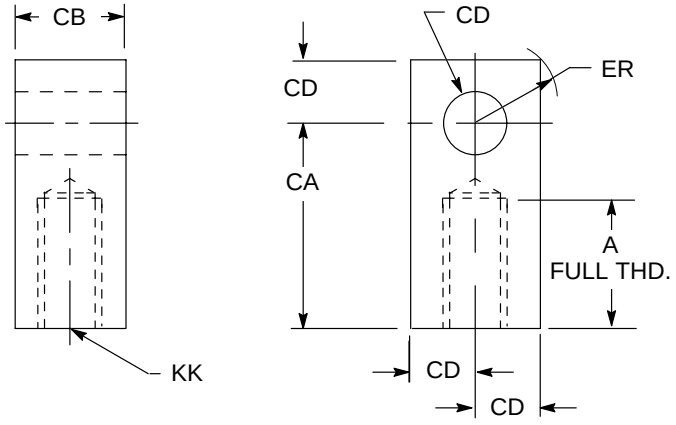
CODE 17 HEAD TRUNNION MOUNT



Accessories

Rod eyes, rod clevises and mounting brackets are available from Vickers. These accessories are detailed on the following pages, showing part numbers and all pertinent dimensional data. When ordering, please specify the part name and part number.

Rod Eye

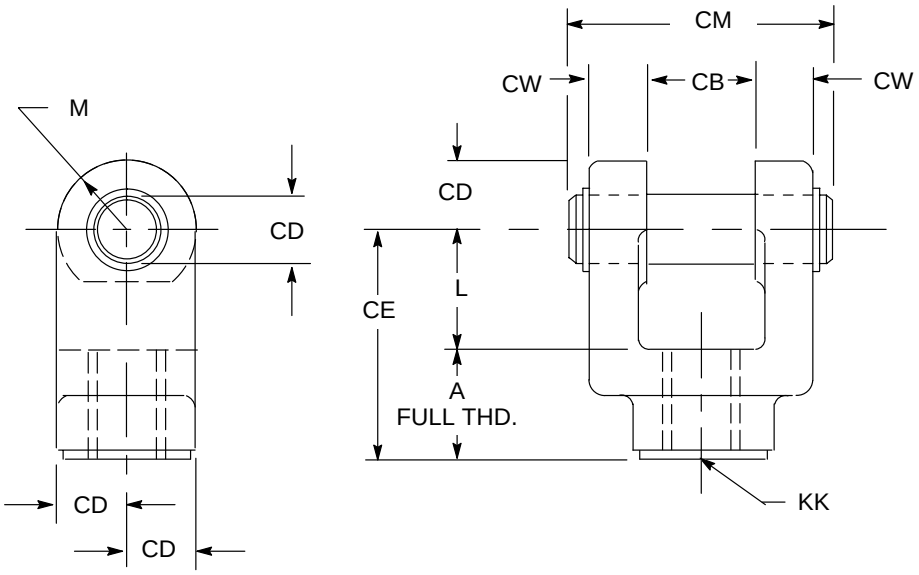


Bore dia.	A	CA	CB	CD	ER	KK thread Size	KK thread Torque (ft. lbs)*	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	1.50	.75	.50	.70	.4375-20 UNF-2B	36	S-1-560	.38
3 1/4, 4, 5	1.13	2.06	1.25	.75	1.06	.750-16 UNF-2B	125	S-460	1.25
6, 7, 8	1.63	2.81	1.50	1.00	1.42	1.000-14 NS-2B	250	S-660	2.50
10	2.00	3.44	2.00	1.38	1.94	1.250-12 UNF-2B	460	S-1060	5.94
12	2.25	4.00	2.50	1.75	2.94	1.500-12 UNF-2B	663	SH-560	11.4
14	3.00	5.00	2.50	2.00	2.81	1.875-12 UN-2B	944	SH-660	15.1

*Recommended values using MoS_2 lubricant or equivalent.
All rod accessories must be torqued against the rod shoulder.

Rod Clevis

(includes swivel pin and retaining rings)



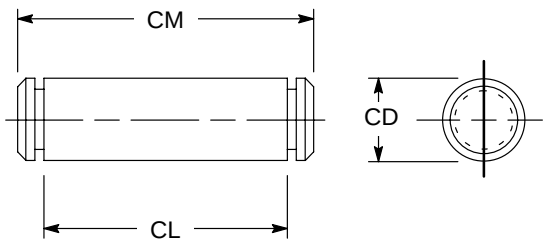
Bore dia.	A	CB	CD	CE	CM	CW
1 1/2, 2, 2 1/2	.75	.75	.50	1.50	2.00	.50
3 1/4, 4, 5	1.13	1.25	.75	2.38	2.75	.63
6, 7, 8	1.63	1.50	1.00	3.13	3.28	.75
10	2.00	2.00	1.38	4.13	4.28	1.00
12	2.25	2.50	1.75	4.50	5.44	1.25
14	3.00	2.50	2.00	5.50	5.44	1.25

Bore dia.	KK thread Size	KK thread Torque (ft. lbs)*	L (ref.)	M	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.4375-20 UNF-2B	36	.75	.50	S-1-562-10	.56
3 1/4, 4, 5	.750-16 UNF-2B	125	1.25	.75	S-462-10	1.56
6, 7, 8	1.000-14 NS-2B	250	1.50	1.00	S-662-10	3.31
10	1.250-12 UNF-2B	460	2.13	1.38	S-1062-10	9.25
12	1.500-12 UNF-2B	663	2.25	1.75	SH-562-10	14.62
14	1.875-12 UN-2B	944	2.50	2.25	SH-662-10	21.00

*Recommended values using MoS_2 lubricant or equivalent. All rod accessories must be torqued against the rod shoulder.

Swivel pin for rod clevis (includes two retaining rings)

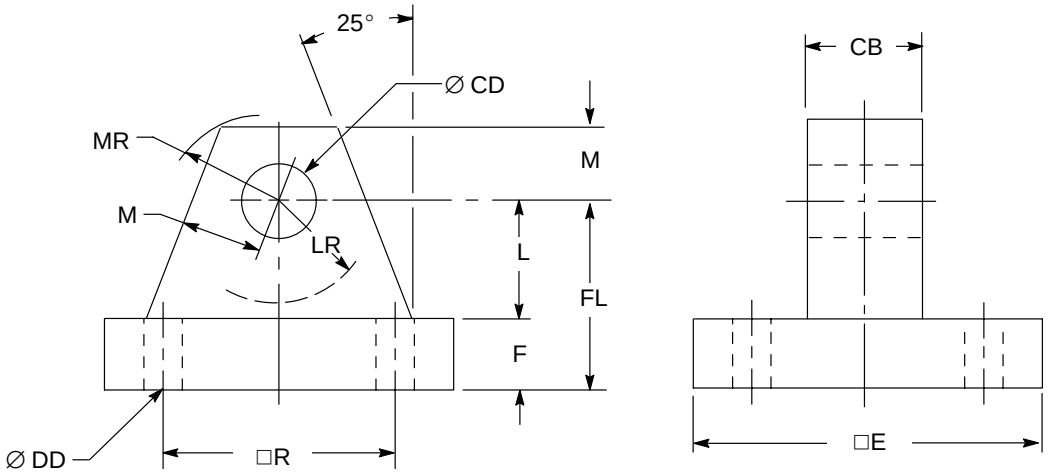
Bore dia.	CD	CL	CM	Part no.
1 1/2, 2, 2 1/2	.500/.499	1.82	2.00	S-1-583-10
3 1/4, 4, 5	.750/.749	2.57	2.75	S-483-10
6, 7, 8	1.000/.999	3.06	3.28	S-683-10
10	1.375/1.374	4.06	4.28	SH-483-10
12	1.750/1.748	5.06	5.44	SH-583-10
14	2.000/1.998	5.06	5.44	SH-683-10



Accessories

Mounting Eye Bracket

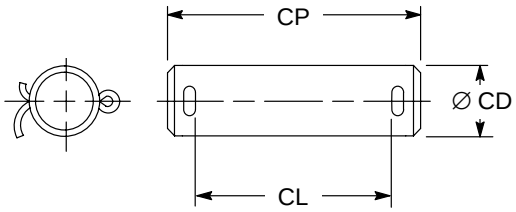
(for clevis mount cylinders)



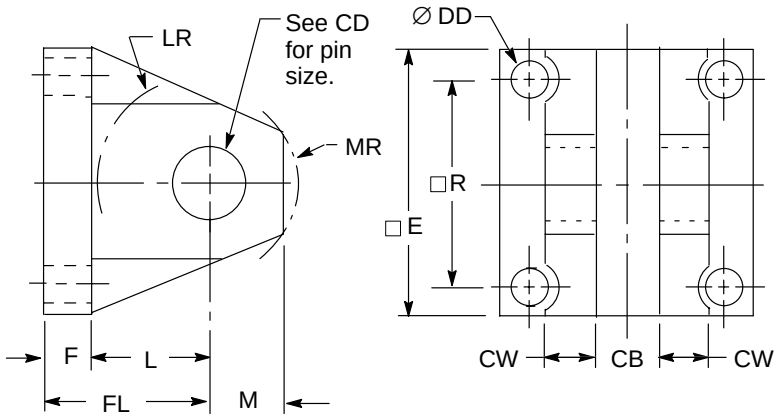
Bore diameter	CB	CD	DD	E	F	FL	L (ref.)	LR	M	MR	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	.50	.38	2.50	.38	1.13	.75	.69	.50	.59	S-1-552-M	.94
3 1/4, 4, 5	1.25	.75	.50	3.50	.63	1.88	1.25	1.13	.75	.88	S-452-M	3.19
6, 7, 8	1.50	1.00	.63	4.50	.75	2.25	1.50	1.38	1.00	1.25	S-652-M	6.50
10	2.00	1.38	.63	5.00	.88	3.00	2.13	1.88	1.38	1.63	S-1052-M	11.7
12	2.50	1.75	.88	6.50	.88	3.13	2.25	2.00	1.75	1.88	SH-552-M	19.2
14	2.50	2.00	1.00	7.50	1.00	3.50	2.50	2.25	2.25	2.09	SH-652-M	27

Accessories for Spherical Bushing Mounted Cylinders 4

Pivot Pin



Clevis Bracket



Bore dia.	CB	CD	CL	CP	CW	DD	E	F	FL	L(Ref)	LR	M	MR	R
1 1/2, 2, 2 1/2	.467 .472	.4997 .4992	1.47	2.19	.50	.38	2.50	.38	1.13	.75	.63	.50	.625	1.63
3 1/4, 4, 5	.686 .691	.7497 .7492	1.94	2.69	.63	.50	3.50	.63	1.88	1.25	1.13	.75	.875	2.55
6, 7, 8	.935 .940	.9996 .9991	2.44	3.19	.75	.63	4.50	.75	2.25	1.50	1.38	1.00	1.250	3.25
10	1.247 1.251	1.3745 1.3739	3.25	4.31	1.00	.63	5.00	.88	3.00	2.13	1.88	1.38	1.625	3.82
12	1.591 1.596	1.7495 1.7489	4.09	5.19	1.25	.88	6.50	.88	3.13	2.25	2.13	1.75	1.875	4.95
14	1.810 1.815	1.9995 1.9989	4.31	5.38	1.25	1.00	7.50	1.00	3.50	2.50	2.44	2.00	2.094	5.73

	Accessory part numbers				
Bore diameter	Spherical rod eye w/bushing*	Replacement bushing only*	SAB clevis bracket†	Pivot pin assembly†	Jam nut part number/size‡
1 1/2, 2, 2 1/2	S-1-560-SAB-10	6803-8	S-1-552-M-SAB	6856A-1-10	5202-008 .4375-20
3 1/4, 4, 5	S-460-SAB-10	6803-12	S-452-M-SAB	6856A-2-10	5202-003 .750-16
6, 7, 8	S-660-SAB-10	6803-16	S-652-M-SAB	6856A-3-10	5202-005 1.000-14
10	S-1060-SAB-10	6803-22	S-1052-M-SAB	6856A-4-10	5202-012 1.250-12
12	SH-560-SAB-10	6803-28	SH-552-M-SAB	6856A-5-10	5202-015 1.500-12
14	SH-660-SAB-10	6803-32	SH-652-M-SAB	6856A-6-10	5202-019 1.875-12

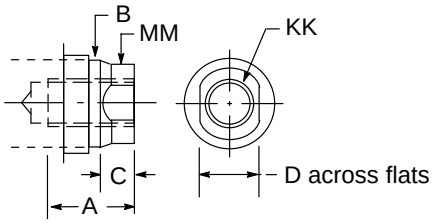
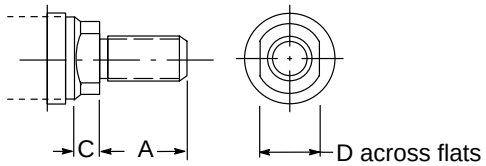
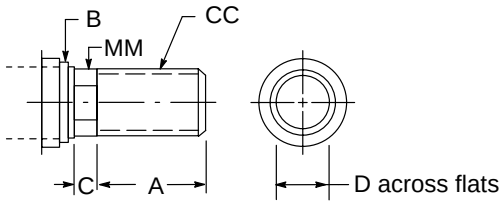
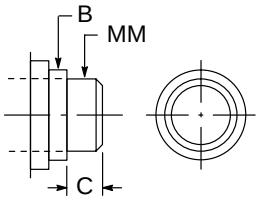
* Included in assembly
† Order separately.
‡ Use jam nut to lock rod eye to piston rod.

Rod Sizes and Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

Four different rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and define your requirements.

The tables on pages 55 through 58 give maximum allowable push strokes at various operating pressures for available rod diameters. Rod ends on rigid mount cylinders should be supported. Longer strokes are allowable for **pull only** applications. The largest available rod size should be specified for maximum fatigue life. Contact your local Vickers sales engineer for application assistance if necessary.

End Type	
2	
5	
4	
6	

Dimensions in inches

MM rod dia.	**C**	**KK** thread	**A**	**B** +.000/–.002	**D**	**CC** thread
5/8	.37	.4375–20	.75	1.124	.50	.625–18
1	.50	.7500–16	1.12	1.499	.87	1.000–14
1 3/8	.62	1.000–14	1.62	1.999	1.12	1.375–12
1 3/4	.75	1.250–12	2.00	2.374	1.50	1.750–12
2	.87	1.500–12	2.25	2.624	1.69	2.000–12
2 1/2	1.00	1.875–12	3.00	3.124	2.06	2.500–12
3	1.00	2.250–12	3.50	3.749	2.62	3.000–12
3 1/2	1.00	2.500–12	3.50	4.249	3.00	3.500–12
4	1.00	3.000–12	4.00	4.749	3.37	4.000–12
5	1.00	3.500–12	5.00	5.749	4.25	5.000–12
5 1/2	1.00	4.000–12	5.50	6.249	4.62	5.500–12

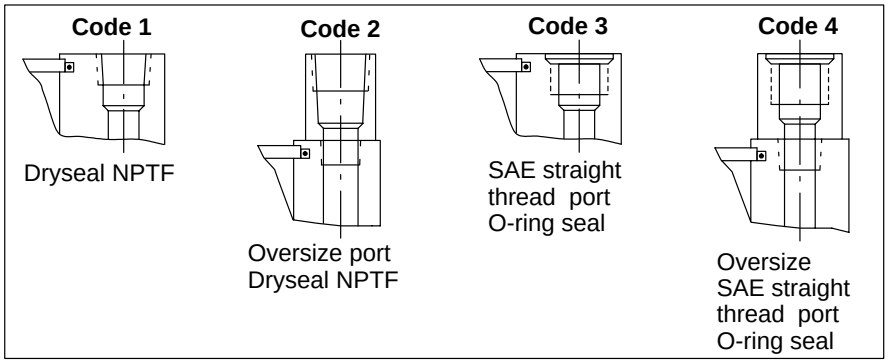
Port Types, Sizes and Locations

Series TE/TL cylinders have the full flow national pipe thread (NPTF) ports as standard. SAE straight thread O-ring ports are recommended for maximum reliability in Series TF hydraulic applications.

The table below, and on the following page, list the port types and sizes available for each bore diameter.

The tables on pages 53 and 54 list the maximum piston velocities obtainable with each bore diameter and standard port combination, for hydraulic service.

Ports may be located as shown on page 7. Some mounting styles have location restrictions. Where a port or port boss interferes with the cylinder mounting, the mounting takes precedence.



Bore dia. inch	Rod dia inch	NPTF		Tube dash number	
		Code 1	Code 2	Code 3	Code 4
1 1/2	5/8	3/8	1/2	–6	N/A
	1			N/A	–6
2	5/8	3/8	1/2	–6	N/A
	1				
	1 3/8				
2 1/2	5/8	3/8	1/2	–6	N/A
	1				
	1 3/8				
	1 3/4				
3 1/4	1	1/2	3/4	–10	N/A
	1 3/8				
	1 3/4			–8	–10
	2				
4	1	1/2	3/4	–10	N/A
	1 3/8				
	1 3/4			–8	–10
	2				
	2 1/2				
5	1	1/2	3/4	–10	N/A
	1 3/8				
	1 3/4				
	2				
	2 1/2				
	3			–8	–10
	3 1/2				

Bore dia. inch	Rod dia inch	NPTF		Tube dash number	
		Code 1	Code 2	Code 3	Code 4
6	1 3/8	3/4	1	–12	–14
	1 3/4				
	2 1/2				
	4				
7	1 3/8	3/4	1	–12	–14
	1 3/4				
	3				
	5				
8	1 3/8	3/4	1	–12	–14
	1 3/4				
	3 1/2				
	5 1/2				
10	1 3/4	1	1 1/4	–16	N/A
	2				
	3 1/2				
	5 1/2				
12	2	1	1 1/4	–16	N/A
	2 1/2				
	4				
	5 1/2				
14	2 1/2	1 1/4	1 1/2	–20	N/A
	3				
	4				
	5 1/2				

N/A – Not available

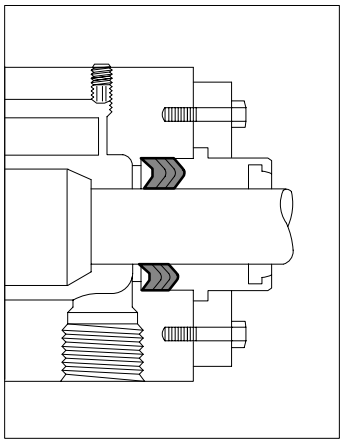
Seal Options

Select the type of piston seal for your application, then select the seal compound from the compatibility chart below.

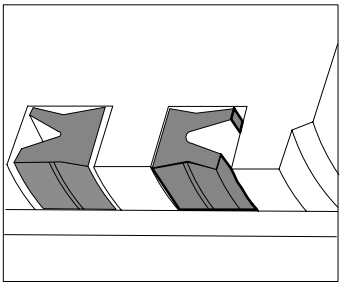
Determine the correct seal code for your application, then enter it as item 8 in the model code.

Code	Piston seal type	Seal material	
		All seals	Scraper retainer
A	U-cup	Nitrile	Nitrile†
B	Cast iron rings		
C	G.F.T.‡		
D	U-cup	Viton	Viton
E	Cast iron rings		
F	G.F.T.‡		
K	U-cup	Viton	Nitrile
L	Cast iron rings		
M	G.F.T.‡		

† Codes A, B, and C indicate a polyurethane rod wiper in Series TE, TL; a metallic rod scraper in Series TF.
‡ Glass filled Teflon.



Pressure energized v-ring rod seal is standard on TE and TF cylinders. A single lip cup seal is standard on series TL.



Pressure energized U-cup piston packings are standard on TE and TF cylinders. Elastomer energized glass filled Teflon rings (standard on TL cylinders) or cast iron rings are available options.

Class of hydraulic fluid	Seal compounds	
	Nitrile (standard)	**Viton** (optional)
Petroleum base	Compatible	Compatible
Phosphate ester	Not compatible	Compatible ●
Silicone	Compatible	Compatible
Water		
Water/oil emulsion		
Water-glycol		
Ethylene glycol		
Auto transmission fluid		
Auto brake fluid	Not compatible	Not compatible
Temperature range ▪	–40° F to +250° F	–20° F to +400° F

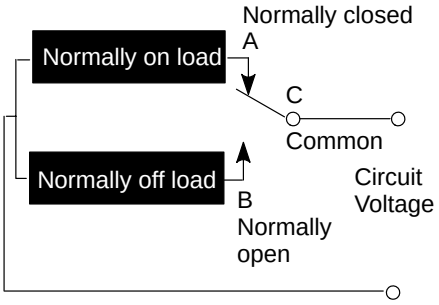
● Except certain aircraft and commercial fluids.
▪ Maximum ratings for continuous exposure of sealing system only.
The above technical data represents generally accepted design parameters.
Consult Vickers Engineering for more specific application data.

Limit Switches

Two different built-in limit switches are available as options. Both come with a $^1/_2$" pipe conduit connection in the enclosure wall.

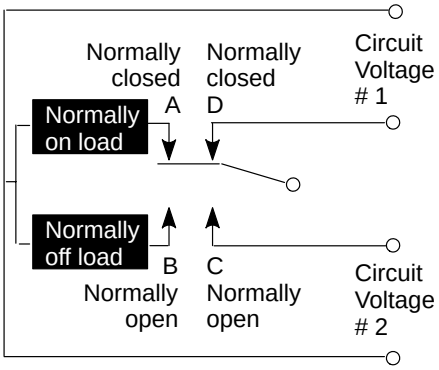
A quick disconnect plug, factory wired to the limit switch, is an option. In addition, air-pilot valves (3-way and 2-way) can be fitted to the cylinders. See Bulletin 4098 for complete information on limit switches and valves.

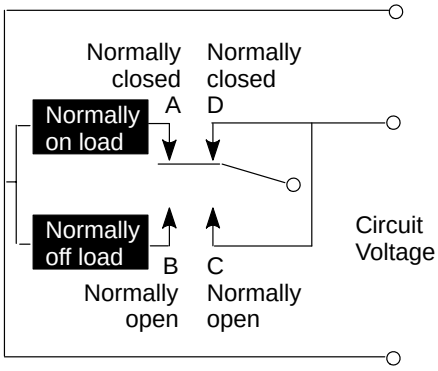
Switch "01" single pole, double throw (standard)



15 Amperes	125 Volts AC
	250 Volts AC
	480 Volts AC
1/8 H.P.	125 Volts AC
1/4 H.P.	250 Volts AC
1/4 Ampere	125 Volts AC
1/2 Ampere	125 Volts AC

Switch "03" single pole, double throw, double break (optional)

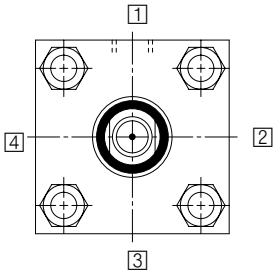




15 Amperes	125 Volts AC
	250 Volts AC
1 Ampere	125 Volts AC
1/2 Ampere	250 Volts AC
1/4 H.P.	125 Volts AC
1/2 H.P.	250 Volts AC

Switch positions

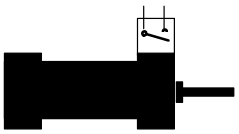
Type 01 and type 03 switches are positioned as shown below when viewing the cylinder from the head end (mounting end of double rod cylinder).



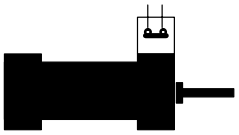
Switch type 01		
Code	Head end position	Cap end position
B	1	–
C	2	–
D	3	–
E	4	–
F	1	1
G	2	2
H	3	3
J	4	4
K	0	1
L	0	2
M	0	3
N	0	4

Switch type 03		
Code	Head end position	Cap end position
5	1	1
6	2	2
7	3	3
8	4	4

Switch mounted on head end only

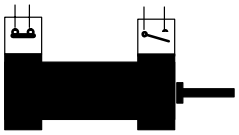


Piston rod retracted or in motion – switch open

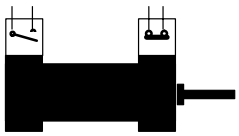


Piston rod fully extended – switch closed

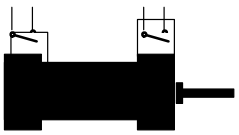
Switches mounted on both head end and cap end



Piston rod fully retracted – cap end switch closed, head end switch open



Piston rod fully extended – head end switch closed, cap end switch open



Piston rod in motion – both switches open

PS 200 Proximity Switches

PS 200 proximity switches are inductive type switches with a sensing probe that “looks” at the cylinder’s cushion collar or button to provide full extend or full retract indication. Since the probe is inside the cylinder, harsh external environments don’t affect sensing. The 2-wire circuit will operate on AC or DC and works as reliably as a programmable controller. PS 200 switches meet UL requirements for 1000 psi hydraulic cylinders. Four mounting holes allow 90° rotation increments.

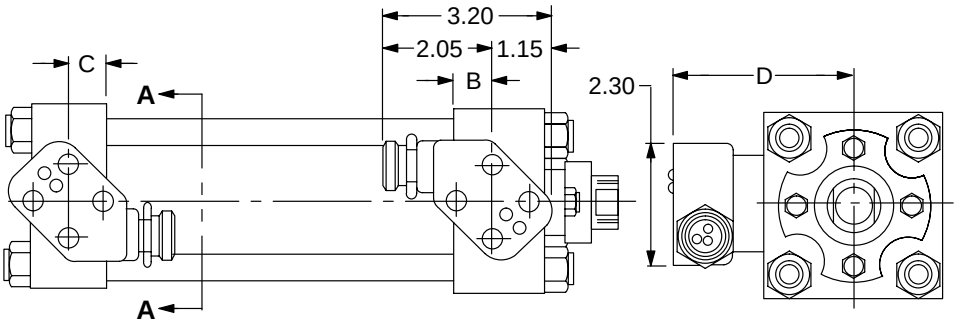
Short circuit protection is a standard feature on the PS 200 proximity switch. It protects the switch from shorts in the load or line. Upon sensing a short condition, the switch assumes a non-conducting mode. The fault condition must be removed and power turned off in order to reset the switch. This feature prevents unintended automatic restarts. The switch indicates when it is in the short circuit protection mode by flashing both LEDs.

Series PS 200 2-wire AC/DC Proximity Switches

Pressure	1000 psi
Sensing range	0.08” ±10%
Operating temperature range	–20° to +70°C
Repeatability	.001”
Switching differential	10%
Supply voltage	20–220 V AC/DC
On-state voltage drop	10V @ 5–500 mA
Load current maximum	0.5 Amp
Inrush current	3 Amp
Quiescent current	1.7 mA maximum
Indicating LEDs (standard)	1 lit: Power on/non-conducting 2 lit: Target present (both flashing = short circuit protection mode)

Cable 13 Pin Plug-in Connectors for PS 200 Proximity Switches

3-foot cable	Part no. 7552–3
6-foot cable	Part no. 7552–6
12-foot cable	Part no. 7552-12



Switch is rotatable in 90° increments from position shown.

Torque .250–20 mounting screws to 12–15 ft-lb.

O-rings required:
Size 115 – One per switch
Size 116 – One per spacer

Bore dia. inch	**Rod dia.** inch	**Switch 7550-**	**Spacer 7551-**	**B**	**C**	**D max**
1 1/2	5/8	1.225	–	.72	–	3.43
	1	1.225	125	.72	–	3.55
	Cap end	1.725	250	–	.63	3.68
2	5/8	1.225	–	.75	–	3.68
	1	1.225	–	.75	–	3.68
	1 3/8	1.225	–	.75	–	3.74
	Cap end	1.725	–	–	.67	3.81
2 1/2	5/8	1.225	281	.72	–	3.50
	1	1.225	375	.62	–	3.61
	1 3/8	1.225	281/250	.81	–	3.77
	1 3/4	1.225	500/219	.62	–	3.95
	Cap end	1.225	–	–	.59	3.34
3 1/4	1	1.225	156	.81	–	3.75
	1 3/8	1.225	156	.81	–	3.77
	1 3/4	1.225	406	.81	–	4.00
	2	1.225	281/250	.81	–	4.13
	Cap end	1.725	219	–	.78	3.81
4	1	1.725	281	.81	–	4.25
	1 3/8	1.725	281	.81	–	4.27
	1 3/4	1.725	281/250	.81	–	4.50
	2	1.225	156	.81	–	4.13
	2 1/2	1.225	406	.81	–	4.38
	Cap end	2.375	500	–	.78	4.47

Bore dia. inch	**Rod dia.** inch	**Switch 7550-**	**Spacer 7551-**	**B**	**C**	**D max**
5	1	2.375	438	.81	–	4.91
	1 3/8	2.375	438	.81	–	4.92
	1 3/4	2.375	500/188	.81	–	5.31
	2	1.725	156	.81	–	4.63
	2 1/2	1.725	406	.81	–	4.88
	3	1.225	156	.81	–	4.63
	3 1/2	1.225	406	.81	–	4.88
	Cap end	2.375	–	–	.78	4.47
6	1 3/8	2.375	188	1.00	–	5.16
	1 3/4	2.375	188	1.00	–	5.16
	2 1/2	2.375	312/250	1.00	–	5.53
	4	1.225	156	.94	–	5.13
	Cap end	2.875	125	–	.97	5.09
7	1 3/8	2.875	188	1.00	–	5.66
	1 3/4	2.875	188	1.00	–	5.66
	3	2.375	312	.94	–	5.78
	5	1.225	156	.94	–	5.63
	Cap end	3.750	500	–	.97	5.97
8	1 3/8	3.750	312/250	1.00	–	6.53
	1 3/4	3.750	312/250	1.00	–	6.53
	3 1/2	2.875	312/250	1.00	–	6.53
	5 1/2	1.725	406	.94	–	6.38
	Cap end	3.750	–	–	.97	5.97
10	1 3/4	4.560	312/250	1.00	–	7.59
	2	4.560	312/250	1.00	–	7.59
	3 1/2	3.750	375	1.00	–	7.41
	5 1/2	2.375	–	.94	–	7.03
	Cap end	4.990	250	–	.97	7.28

Stop Tube, Tie Rod Spacers and Center Supports

Stop Tube Selection

The following table lists the maximum stroke permissible without the use of a stop tube. Strokes are listed for rigid mounting styles as well as clevis and trunnion pivot mounts.

As the stroke length of a cylinder increases, the resultant bearing loads on the piston rod become greater. To keep these bearing loads from exceeding design limitations, and to obtain optimum life from a cylinder, stop tubes should be specified according to the following procedure:

Specify one inch of stop tube for each 10 inches (or fraction thereof) of stroke in excess of the maximums listed in the table.

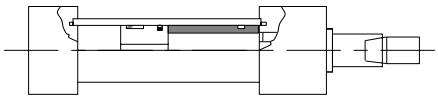
	Type of cylinder mounting		
Bore dia. (inch)	**Pivot** (clevis & trunnion)	**Rigid** (no rod support)	**Rigid** (with rod support)
1 1/2 and 2	24 in.	30 in.	48 in.
2 1/2 to 4	30 in.	38 in.	
5 to 14	36 in.	40 in.	

Stop Tube Designs

Three typical stop tube designs are illustrated below.

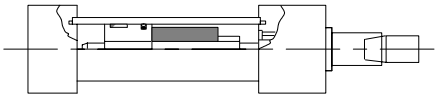
Design A

Used for cylinders not cushioned on the rod end.



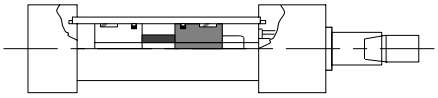
Design B

Used for cushioned hydraulic cylinders.



Design C

The best choice for a cylinder with an exceptionally long stop tube requirement. Note that the piston's effective bearing area is doubled, in addition to gaining the normal increased minimum distance between bearing points.



Tie Rod Spacers and Center Supports

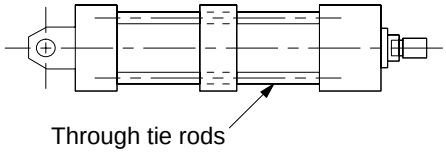
Tie rod spacers and center supports are used to improve the structural rigidity of long stroke tie rod cylinders.

A tie rod spacer or center support should be applied when the stroke length exceeds 20 times the bore diameter.

Tie rod spacer 7

The spacers have through holes for the tie rods and are held in place on the cylinder barrel with a small tack weld or set screw.

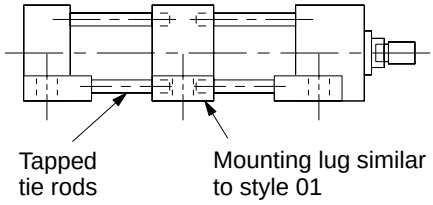
The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).



Tie rod center support

The center support has side mounting lugs similar to side lug mount heads and serves as an additional mounting location. The tie rods are threaded into the center support and it becomes a load-carrying component of the cylinder assembly.

The exact location of the tie rod center support is generally optional, which greatly increases the flexibility in mounting a long stroke cylinder.



Selecting Cylinder Size

To choose the proper size of cylinder for your application, first determine the maximum push and/or pull force required to do the job. Then, use the table below to select the cylinder that will provide that force. Remember that force capabilities derived from charts and formulas may be theoretically correct, but other factors must be considered. Be sure to allow for pressure drop between the pump outlet and the cylinder port. Also, some of a cylinder's force is used up overcoming seal friction and, to a lesser extent, the inertia of the piston itself. In Vickers cylinders, the amount of extra force needed to compensate for these factors has been limited to 5% or less of the cylinder's theoretical power – without sacrificing sealing performance.

For maximum reliability and fatigue life of the piston rod, the largest rod offered in a given bore size should be specified. The smaller rods for a given bore are primarily intended for short stroke push loading or reduced pressure applications.

The chart below lists the theoretical push and pull forces that cylinders will exert when supplied with various working pressures. To calculate the theoretical forces for pressures not listed, multiply the pressure in psi times the work area shown.

Bore dia. inch	**Rod dia.** inch	**Work area** sq. in.	**Air working pressure – psi**					**Hydraulic working pressure – psi**					
			60	**80**	**100**	**200**	**250**	**300**	**400**	**500**	**600**	**750**	**1000**
1 1/2	–	1.767	106	141	177	353	442	530	707	884	1060	1325	1767
	5/8	1.460	88	117	146	292	365	438	584	730	876	1095	1460
	1	.982	59	79	98	196	246	294	393	491	588	737	982
2	–	3.142	189	251	314	628	786	942	1257	1571	1884	2357	3142
	5/8	2.835	170	227	284	567	709	851	1134	1418	1702	2126	2835
	1	2.357	141	189	236	471	590	707	943	1179	1414	1768	2357
	1 3/8	1.657	99	133	166	331	415	497	663	829	994	1243	1657
2 1/2	–	4.909	295	393	491	982	1228	1473	1964	2455	2946	3682	4909
	5/8	4.602	276	368	460	920	1151	1380	1841	2301	2760	3452	4602
	1	4.124	247	330	412	825	1031	1236	1650	2062	2472	3093	4124
	1 3/8	3.424	205	274	342	685	856	1026	1370	1712	2052	2568	3424
	1 3/4	2.504	150	200	250	501	626	750	1002	1252	1500	1878	2504
3 1/4	–	8.296	498	664	830	1659	2074	2490	3318	4148	4980	6222	8296
	1	7.511	451	601	751	1502	1878	2253	3004	3756	4506	5633	7511
	1 3/8	6.811	409	545	681	1362	1703	2043	2724	3406	4086	5108	6811
	1 3/4	5.891	353	471	589	1178	1473	1767	2356	2946	3534	4418	5891
	2	5.154	309	412	515	1031	1289	1545	2062	2577	3090	3866	5154
4	–	12.566	754	1005	1257	2513	3142	3771	5026	6283	7542	9425	12566
	1	11.781	707	942	1178	2356	2946	3534	4712	5891	7068	8836	11781
	1 3/8	11.081	665	886	1108	2216	2771	3324	4432	5541	6648	8311	11081
	1 3/4	10.161	610	813	1016	2032	2541	3048	4064	5081	6096	7621	10161
	2	9.424	565	754	942	1885	2356	2826	3770	4712	5652	7068	9424
	2 1/2	7.657	4594	613	766	1531	1915	2298	3063	3829	4596	5743	7657

(continued)

Bore dia. inch	Rod dia. inch	Work area sq. in.	Air Working Pressure – psi					Hydraulic working pressure – psi					
			60	80	100	200	250	300	400	500	600	750	1000
5	–	19.635	1178	1571	1964	3927	4909	5894	7854	9818	11784	14726	19635
	1	18.850	1131	1508	1885	3770	4713	5655	7540	9425	11310	14138	18850
	1 3/8	18.150	1089	1452	1815	3630	4538	5445	7260	9075	10890	13613	18150
	1 3/4	17.230	1034	1378	1723	3446	4308	5169	6892	8615	10338	12923	17230
	2	16.493	990	1319	1649	3299	4124	4947	6597	8247	9894	12370	16493
	2 1/2	14.726	884	1178	1473	2945	3682	4419	5890	7363	8838	11045	14726
	3	12.566	754	1005	1257	2531	3142	3771	5026	6283	7542	9425	12566
	3 1/2	10.014	601	801	1001	2003	2504	3003	4006	5007	6006	7511	10014
6	–	28.274	1696	2262	2827	5655	7069	8481	11310	14137	16962	21206	28274
	1 3/8	26.789	1607	2144	2679	5358	6698	8037	10716	13395	16074	20092	26789
	1 3/4	25.869	1552	2070	2587	5174	6468	7761	10348	12935	15522	19402	25869
	2 1/2	23.365	1402	1869	2337	4673	5842	7011	9346	11683	14022	17524	23365
	4	15.708	942	1257	1571	3142	3927	4731	6283	7854	9426	11781	15708
7	–	38.485	2309	3079	3849	7697	9622	11547	15394	19243	23091	–	–
	1 3/8	37.000	2220	2960	3700	7400	9250	11100	14800	18500	22200	–	–
	1 3/4	36.080	2165	2886	3608	7216	9020	10824	14432	18040	21648	–	–
	3	31.416	1885	2513	3142	6283	7854	9426	12566	15708	18850	–	–
	5	18.850	1131	1508	1885	3770	4713	5655	7540	9425	11310	–	–
8	–	50.265	3016	4021	5027	10053	12567	15081	20106	25133	30159	–	–
	1 3/8	48.780	2927	3902	4878	9756	12195	14634	19512	24390	29268	–	–
	1 3/4	47.860	2872	3829	4786	9572	11965	14358	19144	23930	28716	–	–
	3 1/2	40.644	2439	3252	4064	8129	10161	12192	16258	20322	24386	–	–
	5 1/2	26.507	1590	2121	2651	5301	6627	7953	10603	13254	15904	–	–
10	–	78.540	4712	6283	7854	15708	19635	23562	31416	39270	–	–	–
	1 3/4	76.135	4568	6091	7614	15227	19034	22842	30454	38068	–	–	–
	2	75.398	4524	6032	7540	15080	18850	22620	30159	37699	–	–	–
	3 1/2	68.919	4135	5514	6892	13784	17230	20676	27568	34460	–	–	–
	5 1/2	54.782	3287	4383	5478	10956	13696	16434	21913	27391	–	–	–
12	–	113.10	6786	9048	11310	22620	28275	33930	45240	56550	–	–	–
	2	109.96	6598	8797	10996	21992	27490	32988	43984	54980	–	–	–
	2 1/2	108.19	6491	8655	10819	21638	27048	32457	43276	54095	–	–	–
	4	100.53	6032	8042	10053	20106	25133	30159	40212	50265	–	–	–
	5 1/2	89.34	5360	7147	8934	17868	22335	26802	35736	44670	–	–	–
14	–	153.94	9236	12315	15394	30788	38485	46182	61576	76970	–	–	–
	2 1/2	149.03	8942	11922	14903	29806	37258	44709	59612	74515	–	–	–
	3	146.87	8812	11750	14687	29374	36718	44061	58748	73435	–	–	–
	4	141.37	8482	11310	14137	28274	35343	42411	56548	70685	–	–	–
	5 1/2	130.18	7811	10414	13018	26036	32545	39054	52072	65090	–	–	–

Piston Velocity

The chart below lists theoretical piston velocities for cylinders supplied with 15 ft./sec. fluid velocity through standard size pipe, in hydraulic applications.

To calculate the piston velocity in inches per minute, divide the flow rate in gallons per minute by the listed fluid required per inch of stroke in gallons.

For piston velocities exceeding 5 in./sec., cushions are recommended for load deceleration.

Bore dia. inch	**Rod dia.** inch	**Fluid required per inch of stroke**		**Std. NPTF port**	**Fluid velocity @ 15 ft./sec.**	
		Gallon	**Cubic foot**		**Flow** gpm	**Piston velocity** in./sec.
1 1/2	–	.00765	.00102	3/8	6.6	14.4
	5/8	.00632	.00084	3/8	6.6	17.4
	1*	.00425	.00057	3/8	6.6	25.9
2	–	.01360	.00182	3/8	6.6	8.2
	5/8	.01227	.00164	3/8	6.6	9.0
	1	.01020	.00136	3/8	6.6	10.8
	1 3/8	.00717	.00096	3/8	6.6	15.3
2 1/2	–	.02125	.00284	3/8	6.6	5.2
	5/8	.01992	.00266	3/8	6.6	5.5
	1	.01785	.00239	3/8	6.6	6.2
	1 3/8	.01482	.00198	3/8	6.6	7.4
	1 3/4	.01084	.00145	3/8	6.6	10.1
3 1/4	–	.0359	.00480	1/2	11.0	5.1
	1	.0325	.00435	1/2	11.0	5.6
	1 3/8	.0295	.00394	1/2	11.0	6.2
	1 3/4	.0255	.00341	1/2	11.0	7.2
	2	.0223	.00298	1/2	11.0	8.2
4	–	.0544	.00727	1/2	11.0	3.4
	1	.0510	.00682	1/2	11.0	3.6
	1 3/8	.0480	.00641	1/2	11.0	3.8
	1 3/4	.0440	.00588	1/2	11.0	4.2
	2	.0408	.00545	1/2	11.0	4.5
	2 1/2	.0331	.00443	1/2	11.0	5.5

(continued)

Piston Velocity

Bore dia. inch	Rod dia. inch	Fluid required per inch of stroke		Std. NPTF port	Fluid velocity @ 15 ft./sec.	
		Gallon	Cubic foot		Flow gpm	Piston velocity in./sec.
5	–	.0850	.01136	1/2	11.0	2.2
	1	.0816	.01091	1/2	11.0	2.2
	1 3/8	.0786	.01050	1/2	11.0	2.3
	1 3/4	.0746	.00997	1/2	11.0	2.4
	2	.0714	.00954	1/2	11.0	2.6
	2 1/2	.0637	.00852	1/2	11.0	2.9
	3	.0544	.00727	1/2	11.0	3.4
	3 1/2	.0434	.00580	1/2	11.0	4.2
6	–	.1224	.01636	3/4	20.3	2.8
	1 3/8	.1160	.01550	3/4	20.3	2.9
	1 3/4	.1120	.01497	3/4	20.3	3.0
	2 1/2	.1011	.01352	3/4	20.3	3.3
	4	.0680	.00909	3/4	20.3	5.0
7	–	.1666	.02227	3/4	20.3	2.0
	1 3/8	.1602	.02141	3/4	20.3	2.1
	1 3/4	.1562	.02088	3/4	20.3	2.2
	3	.1360	.01818	3/4	20.3	2.5
	5	.0816	.01091	3/4	20.3	4.1
8	–	.2176	.02909	3/4	20.3	1.6
	1 3/8	.2112	.02823	3/4	20.3	1.6
	1 3/4	.2072	.02770	3/4	20.3	1.6
	3 1/2	.1759	.02352	3/4	20.3	1.9
	5 1/2	.1147	.01534	3/4	20.3	2.9
10	–	.3400	.04545	1	33.8	1.6
	1 3/4	.3296	.04406	1	33.8	1.7
	2	.3264	.04363	1	33.8	1.7
	3 1/2	.2984	.03988	1	33.8	1.9
	5 1/2	.2372	.03170	1	33.8	2.4
12	–	.4896	.06545	1	33.8	1.2
	2	.4760	.06363	1	33.8	1.2
	2 1/2	.4684	.06261	1	33.8	1.2
	4	.4352	.05818	1	33.8	1.3
	5 1/2	.3868	.05170	1	33.8	1.4
14	–	.6664	.0891	1 1/4	60.2	1.5
	2 1/2	.6452	.0862	1 1/4	60.2	1.6
	3	.6358	.0850	1 1/4	60.2	1.6
	4	.6120	.0818	1 1/4	60.2	1.6
	5 1/2	.5635	.0753	1 1/4	60.2	1.8

Maximum Allowable Push Strokes

In push applications, a cylinder acts as a loaded column. There are two basic ways to measure the column length.

Pivot mounts:
The length is measured from the pivot point to the end of the rod in the fully extended position.

Flange and other rigid mounts:
The exposed piston rod is considered to be the column length with a fixed end at the cylinder which allows longer strokes.

To use the following tables, first go to the section for your mounting style. Then locate the column which is closest to, but not below, your application's operating pressure. The intersection of operating pressure and bore/rod size represents the maximum allowable push stroke in inches. This maximum stroke is based on column loading analysis only and does not consider side loading, stop tube requirements or other cylinder stroke limiters.8

Bore dia. inch	**Rod dia.** inch	**Rigid mounts** (codes 01, 02, 07, 08, 12, 13, 21, 22, 23)							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
1 1/2	5/8	88	74	62	46	41	31	28	20
	1*	255	225	175	135	120	88	79	59
2	5/8	62	55	45	34	30	22	19	12
	1	175	165	135	92	82	62	58	41
	1 3/8	360	320	250	195	165	130	120	81
2 1/2	5/8	50	43	35	27	23	16	14	6
	1	150	135	100	70	65	49	42	31
	1 3/8	275	240	197	145	130	92	85	61
	1 3/4	430	390	320	244	210	160	145	110
3 1/4	1	105	90	70	54	48	35	30	20
	1 3/8	210	180	148	110	98	70	63	45
	1 3/4	345	295	245	180	155	128	110	80
	2	425	390	300	230	205	155	145	110
4	1	80	70	56	43	37	26	21	11
	1 3/8	160	150	120	82	72	55	49	32
	1 3/4	255	245	190	143	130	91	81	61
	2	345	300	247	185	160	130	115	82
	2 1/2	555	495	396	297	252	200	180	145

(continued)

Maximum Allowable Push Strokes

Bore dia. inch	**Rod dia.** inch	**Rigid mounts** (codes 01, 02, 07, 08, 12, 13, 21, 22, 23)							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
5	1	62	55	42	32	27	16	12	7
	1 3/8	130	120	85	64	55	41	35	20
	1 3/4	200	190	145	120	98	71	62	42
	2	265	235	190	145	133	100	84	62
	2 1/2	425	370	300	235	202	155	143	100
	3	620	555	447	420	300	245	210	157
	3 1/2	820	740	600	590	405	310	296	220
6	1 3/8	100	88	70	52	45	30	24	10
	1 3/4	175	150	130	89	79	56	49	30
	2 1/2	350	310	248	195	175	132	120	80
	4	900	800	650	500	445	335	305	245
7	1 3/8	82	75	58	40	37	22	16	–
	1 3/4	145	130	98	72	65	44	38	–
	3	440	390	300	235	210	155	145	–
	5	999	999	895	650	600	450	415	–
8	1 3/8	70	64	48	35	29	13	10	–
	1 3/4	145	120	85	63	55	35	27	–
	3 1/2	550	450	375	278	250	196	180	–
	5 1/2	–	–	900	700	640	495	430	–
10	1 3/4	92	85	65	47	37	18	–	–
	2	130	125	88	62	55	32	–	–
	3 1/2	400	355	295	220	200	147	–	–
	5 1/2	995	900	702	550	500	398	–	–
12	2	105	90	68	46	39	15	–	–
	2 1/2	165	148	120	82	70	45	–	–
	4	435	390	310	240	220	155	–	–
	5 1/2	820	710	600	450	405	310	–	–
14	2 1/2	145	130	92	65	56	26	–	–
	3	200	180	145	100	90	56	–	–
	4	360	325	255	198	185	130	–	–
	5 1/2	700	640	500	380	350	260	–	–

(continued)

Bore dia. inch	Rod dia. inch	Pivot mounts															
		Mounting codes 10, 11, 16								Mounting codes 15, 17							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig	**80** psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
1 1/2	5/8	38	33	27	21	19	14	13	9	42	40	35	25	23	18	16	13
	1*	98	85	68	55	50	39	35	25	140	125	90	70	61	49	42	33
2	5/8	28	25	20	15	13	10	8.5	6	34	30	25	20	18	13	11	7
	1	70	63	51	40	36	28	25	19	190	85	68	51	49	35	31	24
	1 3/8	148	135	105	79	70	54	49	39	240	160	130	100	90	69	60	48
2 1/2	5/8	23	20	16	13	10	7	6	4	28	25	20	15	13	9	8	4
	1	58	51	41	34	29	22	19	14	71	65	55	40	38	28	25	17
	1 3/8	125	105	80	61	56	42	39	29	145	135	100	73	70	52	50	37
	1 3/4	198	180	135	100	90	70	65	49	245	205	175	140	130	90	80	60
3 1/4	1	45	39	33	24	22	15	14	8	55	50	40	30	28	20	17	11
	1 3/8	86	75	61	47	41	31	29	20	110	95	75	59	54	40	36	25
	1 3/4	145	138	100	77	70	51	49	35	180	160	140	99	90	68	60	45
	2	198	175	140	100	90	69	62	49	230	200	160	130	120	90	80	60
4	1	36	32	26	19	17	12	9.5	7	45	40	35	24	22	15	13	7
	1 3/8	69	60	50	37	34	24	21	15	85	78	61	48	42	32	24	20
	1 3/4	120	100	80	61	55	41	37	27	149	140	105	80	70	52	49	35
	2	150	135	110	80	75	58	50	37	180	160	145	100	95	70	65	48
	2 1/2	243	200	185	130	120	88	80	60	300	255	205	165	150	120	100	75
5	1	28	24	20	14	12	7	7	7	35	32	25	18	15	9	7	7
	1 3/8	52	48	40	30	25	18	15	10	69	60	50	36	33	24	20	13
	1 3/4	89	80	61	49	43	33	28	20	125	100	80	60	55	40	36	25
	2	125	104	85	61	58	45	38	26	150	140	105	80	71	55	50	35
	2 1/2	190	165	135	100	90	70	61	46	240	200	160	130	120	90	80	60
	3	255	245	195	145	140	100	90	70	350	300	248	195	160	130	120	90
	3 1/2	350	310	250	200	175	140	135	98	450	400	348	250	240	180	160	120

(continued)

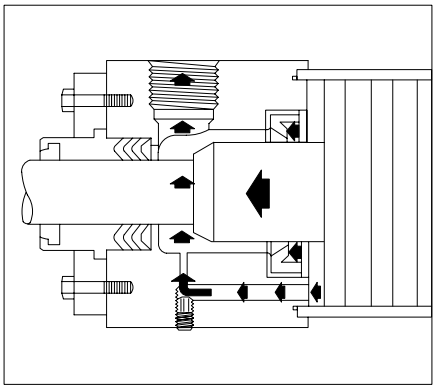
Maximum Allowable Push Strokes

Bore dia. inch	Rod dia. inch	Pivot mounts															
		Mounting codes 10, 11, 16								Mounting codes 15, 17							
		80 psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig	**80** psig	**100** psig	**150** psig	**250** psig	**300** psig	**500** psig	**600** psig	**1000** psig
6	1 3/8	45	39	32	23	20	13	11	10	58	50	40	30	26	18	15	10
	1 3/4	71	62	52	40	35	25	23	14	95	82	65	50	45	31	28	17
	2 1/2	145	140	110	81	75	56	50	36	199	165	140	105	89	70	65	45
	4	375	348	280	210	197	150	140	101	500	450	355	290	250	195	180	135
7	1 3/8	37	33	26	18	16	10	10	–	48	43	35	24	20	13	10	–
	1 3/4	61	55	45	32	29	19	16	–	80	70	55	40	37	25	22	–
	3	175	160	135	100	90	69	61	–	248	215	160	140	130	90	80	–
	5	505	490	385	295	255	200	180	–	650	600	490	360	348	250	240	–
8	1 3/8	33	28	22	15	13	10	10	–	41	38	28	19	16	11	10	–
	1 3/4	55	48	38	27	24	15	13	–	70	60	58	35	30	20	17	–
	3 1/2	230	195	155	135	115	81	72	–	275	250	200	155	145	120	100	–
	5 1/2	510	495	400	300	295	210	198	–	700	640	500	400	350	280	250	–
10	1 3/4	42	36	29	20	16	13	–	–	55	48	36	25	21	13	–	–
	2	58	49	39	27	24	15	–	–	70	62	50	35	30	19	–	–
	3 1/2	183	154	135	97	75	63	–	–	230	200	160	130	120	90	–	–
	5 1/2	430	395	310	250	225	175	–	–	550	500	400	300	280	220	–	–
12	2	45	40	31	21	17	15	–	–	59	50	40	25	23	15	–	–
	2 1/2	71	63	51	36	30	20	–	–	90	80	65	45	40	25	–	–
	4	195	175	145	101	90	69	–	–	248	225	160	135	115	90	–	–
	5 1/2	360	325	260	200	185	145	–	–	480	403	350	250	240	170	–	–
14	2 1/2	60	54	41	28	24	18	–	–	79	69	53	36	30	18	–	–
	3	89	79	61	45	40	25	–	–	125	100	80	60	50	31	–	–
	4	165	145	125	85	75	51	–	–	200	180	150	125	100	70	–	–
	5 1/2	300	275	225	170	155	115	–	–	390	350	280	210	190	145	–	–

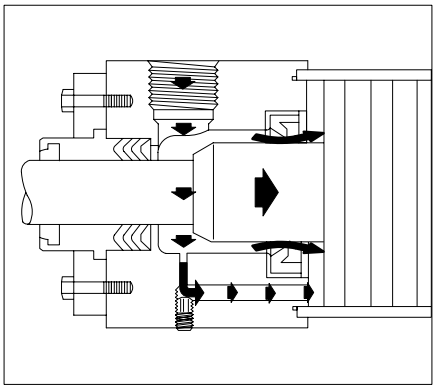
Cushioning System

Vickers patented SUPER CUSHIONS incorporate several design features to permit higher cylinder speeds for increased work output and shorter cycle times. Cylinder cushions are designed to decelerate the piston velocity near the end of each cylinder stroke to prevent excessive mechanical shock.

Air Cushion

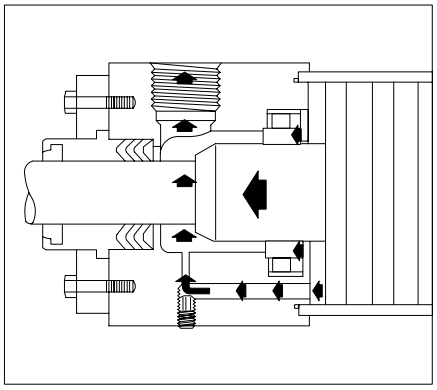


Series TE/TL cylinders employ a *flexible lip ring* at the cushion chamber entrance. As the cushion collar enters the cushion chamber, the flexible lip of the super cushion blocks the direct flow of air to the exhaust port. Exhausting air must now flow through a metered by-pass. Adjustment of the needle valve in the by-pass controls the cushioning action.

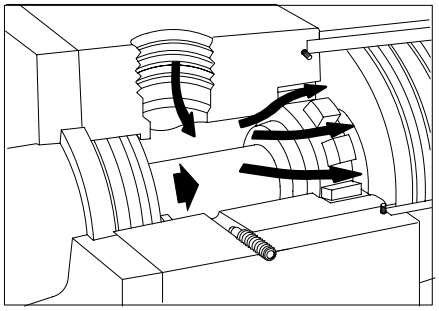


On the return stroke, air pressure blows the flexible lip of the super cushion away from the cushion collar, permitting a large volume of air to immediately reach the piston face. This allows quick acceleration and eliminates ball checks and binding between the cushion collar and cushion chamber.

Hydraulic Cushion



The Series TF cylinder cushion collar contacts a *floating bronze sleeve*. The floating action of the sleeve provides a very close tolerance seal contact without high loading. The sleeve seats against the head and provides a very effective seal to trap the fluid. Consistent performance and long life are provided since the radial loading on the sleeve is minimal. This sleeve can be easily replaced, if required.



The sleeve is also free to move in an *axial* direction, and functions as a built-in fluid check which opens to permit nearly full flow for quick acceleration. When the fluid flow is reversed, the sleeve moves off its seat, and fluid may flow around the slots in the outer diameter of the sleeve.

Cylinder Weights

The following table lists the approximate net weights of TE/TF/TL cylinders.

Weights shown are based on cylinders with standard rod diameter and single rod end. All weights are expressed in pounds.

Double rod cylinder weight is equal to 1.15 times chart weight, plus weight due to stroke.

Bore dia.	Mounting style code										Add per inch of stroke	
	01, 07 & 19	02	08	10	12	13	15	16 & 17	21 & 22	23	Single rod	Double rod
1 1/2	4.6	4.3	4.8	4.4	4.8	5.2	6	4.5	4.1	4.2	.32	.41
2	6.9	6.8	7.5	6.7	7.4	8.1	8.8	6.8	6.5	6.6	.41	.50
2 1/2	10	10	10.7	9.8	10.9	11.7	12.4	9.9	9.6	9.7	.47	.55
3 1/4	19.5	19.2	20.9	19.6	21.7	23.4	21.8	18.5	18.2	18.4	.72	.94
4	27.3	27.2	29.1	27.4	30.8	32.7	29.8	26.3	26	26.2	.81	1.03
5	43.7	42.3	45.2	41.8	47.6	50.5	46.2	40.7	40.6	40.8	1.01	1.24
6	63.3	62.8	66.6	63.3	71.7	75.6	70.6	61	60.2	60.6	1.96	2.38
7	81.3	77.8	–	81.3	77.8	–	93.6	79	78.6	79.4	2.39	2.81
8	106	102	–	106	102	–	120	103	103	104	2.60	3.02
10	191	184	–	193	184	–	213	187	186	188	3.66	4.34
12	288	281	–	297	281	–	321	284	283	285	6.84	7.73
14	462	448	–	467	448	–	504	452	451	453	5.07	6.46

Hydraulic Formulas

Hydraulic work

Work = force x distance
= pressure x area x stroke
= pressure x volume

$= \frac{lb}{in^2} \times in^3 = in\text{-}lb$

Hydraulic power

$Power = \frac{work}{time}$

$= pressure \times \frac{volume}{time}$

= pressure x capacity

Horsepower input to pump

$P = pressure = \frac{lb}{in^2}$

Q = pump capacity = gpm

33,000 ft-lbs of work per minute = 1 hp

E = pump efficiency

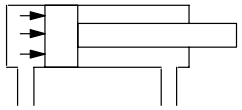
$HP = K \times P \times Q = \frac{lb/in^2 \times gpm \times 231}{12 \times 33000 \times E}$

$= \frac{.000583 \times P \times Q}{E} = \frac{PSI \times GPM}{1714 \times E}$

Hydraulic Cylinder Formulas

Pressure and force

P = psi
A = area
$= in^2$

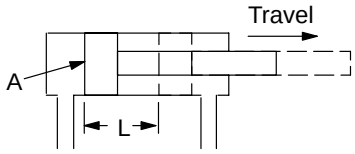


Force = pressure x area

F = P x A

$= \frac{lbs}{in^2} \times in^2 = lbs$

Rate of cylinder travel



$A = cap\ area = in^2$
L = cylinder stroke = in
V = volume traversed = LA

$Q = pump\ capacity = \frac{cu\ in}{sec}$

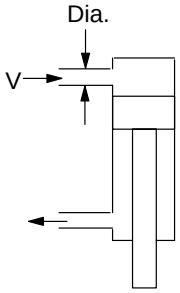
$T = time = \frac{volume\ traversed}{pump\ capacity} = \frac{V}{Q} = \frac{in^3}{in^3/sec} = sec$

$= sec$

$R = rate\ of\ piston\ travel = \frac{in}{sec} = \frac{L}{T}$

$R = \frac{L}{T} = \frac{L}{V/Q} = \frac{QL}{V} = \frac{QL}{LA} = \frac{Q}{A}$

Quantity of flow



V = fluid velocity = ft/sec
D = pipe diameter = inches
Q = quantity of flow = gpm

$\frac{ft}{sec} \times 12 = \frac{inches}{sec}$

$gpm \times \frac{231}{60} = \frac{cu\ in}{sec}$

$\frac{\pi D^2}{4}$ = pipe area $= in^2 = A$

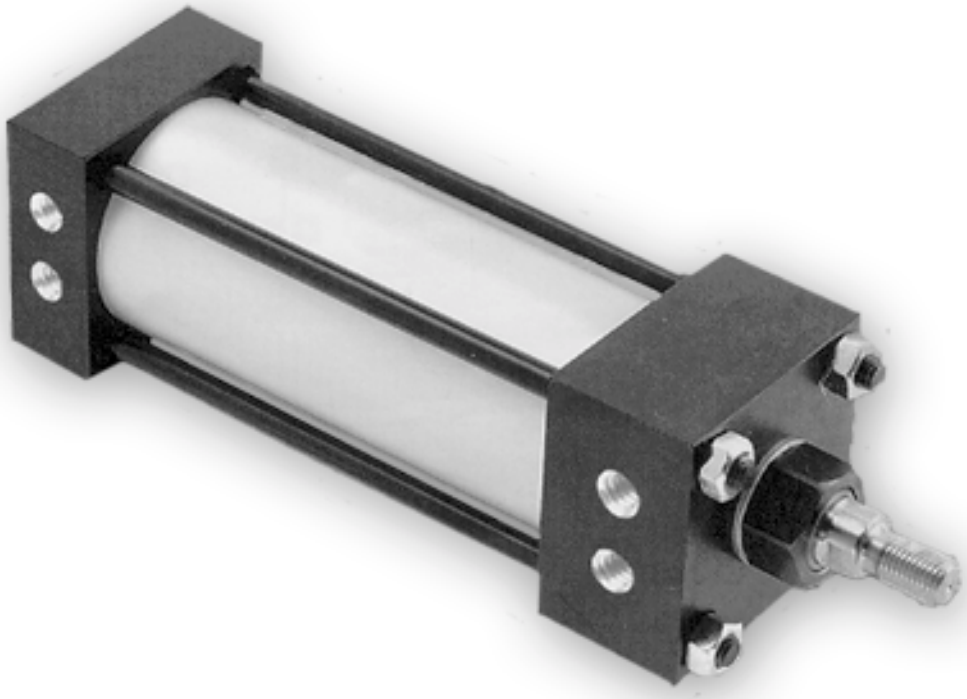
$Q = AV = in^2 \times \frac{in}{sec} = \frac{cu\ in}{sec}$

Vickers®

Cylinders

Series VN/VP Cylinders

Nominal Pressure: 250 psi Air, 400 psi Hydraulic



Contents

Features

Wiper Seal.
Urethane wiper seal keeps contaminates from getting into cylinder by aggressively wiping foreign materials from the piston rod, enhancing the rod seal life.

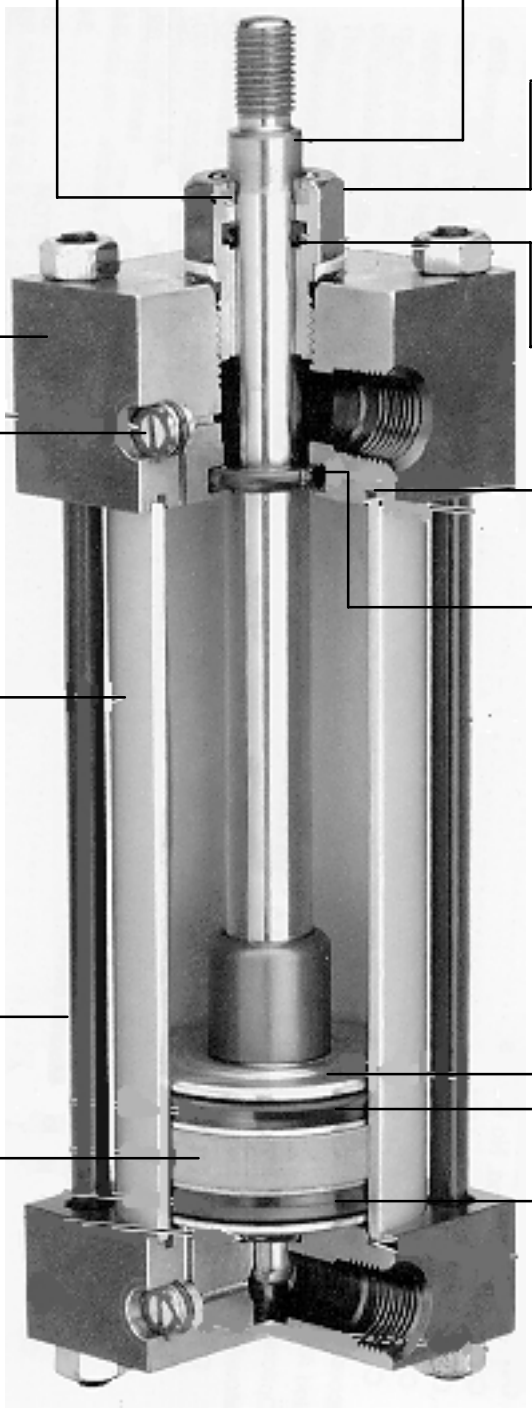
Head/Cap.
Precision machined from alloy aluminum, then black anodized for corrosion resistance in Series VP, and electroless nickel plated for Series VN option.

Adjustable Captive Cushion Adjusting Screw.
One-piece stainless steel cushion screw with fine threads is held captive by a stainless steel press-in retaining washer. This allows for safe and precise adjustment of the cushion without inadvertent removal.

Cylinder Body.
High-strength aluminum allow tubing is clear anodized on the O.D. and hard anodic coated on the I.D., resulting in a smooth, file hard (60RC), corrosion and score resistant surface finish for extended seal life in Series VP. Stainless steel tubing is used in Series VN option.

Tie Rods.
High-strength steel in Series VP, and stainless steel for Series VN option, maintains uniform compression on body end seals.

Wear Ring.
Reinforced Teflon® compounded with polyphenylene sulfide provides supreme wear and excellent bearing support.



Piston Rod.
Hard chrome plated high-tensile carbon steel, ground and polished in Series VP, and stainless steel for Series VN option.

Rod Bearing.
Externally removable threaded steel bearing cartridge with black oxide finish in Series VP, or stainless steel for Series VN option, both with an oil-impregnated sintered iron rod bearing.

Rod Seal.
Nitrile lip-type seal is pressure energized and wear compensating for durability and long life.

O-Ring Body Seal:
Nitrile material is standard, with Viton® optional.

Super Cushion Seals.
Advanced design features a unique, one-piece, compound seal of nitrile* captured within a precision machined groove. Linear and radial “float” of the cushion seals eliminates misalignment. Super Cushions provide exceptionally fast “out of cushion” stroke reversal. (Head and Cap Cushions are optional on 1-1/2 thru 8 inch bore cylinders.)
*Nitrile seals on the 5/8″ & 1″ rod diameter. For rod sizes 1–3/8″ and larger, urethane seals are standard.

Piston.
Machined solid aluminum alloy, light-weight for low inertia, yet strong. (Threaded and installed with high strength threadlocker adhesive.)

Piston Seals.
Long-wearing nitrile cup seals.

Teflon® and Viton® are registered trademarks of E.I. Dupont Company.

How To Order

Standard Cylinders

Vickers has created an easy system for ordering Series VN/VP Cylinders. This system has been developed to improve our service to you. The model code consists of sixteen alpha-numeric digits which fully describe the most common standard options offered on Series VN/VP cylinders.

To specify your Series VN/VP cylinder, review the following pages for a full description of each option available and select the desired code.

This model code system will:

- **Simplify the re-order process.** Each Vickers Series VN/VP cylinder is assigned a sixteen digit model code. That code is unique to a particular cylinder description. That way, when you re-order your Series VN/VP cylinder, you're assured of exactly the same top quality cylinder design.
- **Improve identification.** Every Series VN/VP cylinder has its sixteen digit model code clearly labeled on the product. Each sixteen digit code completely describes a specific cylinder. This allows seals and replacement components to be easily identified in the field.
- **Facilitate communications.** This fully descriptive model code system allows you to work directly with your local Vickers sales engineer to identify and service your Vickers cylinder.

NOTE

See pages 6 and 7 for a summary of model code options.

Custom Cylinders

New Cylinders

Although the model code has been arranged to cover the vast majority of available options, there will be occasions when you require an option which cannot be coded. When specifying such an option, enter an "X" for the appropriate item in the sixteen digit model code, then describe your requirements. For example, if you have an application which requires a custom thread on the end of the piston rod, enter an "X" for item 7. Then add a full description at the end of the model code, such as "With 3.25 inch total rod projection and M22 x 1.5 thread 1.375 inches long." The cylinder will then be given a unique five digit design number on receipt of order (as explained below).

Replacement Cylinders

Every Vickers custom cylinder is assigned a unique design number. This number is contained in the last five digits of the sixteen digit model code, and item 12 is always an alpha character. In other words, the "Stroke" and "Extra Rod Projection" locations (items 12 through 16) become the "Design Number" items for custom cylinders. When ordering a replacement cylinder, simply give the sixteen digit model code or the five digit design number to your local Vickers Sales Representative.

Replacement Parts

Each design number is stored in a quick retrieval computerized storage system. This gives our field sales representatives rapid access to assist you in identifying and specifying genuine Vickers replacement parts.

Model Code

VP	10	E	A	C	A	1	A	H	108	00
1,2	3,4	5	6	7	8	9	10	11	12,13,14	15,16

1,2 **Series** (ANSI B93.15/NFPA)

VP - Non-lubricated air/hydraulic cylinder

VN - Corrosion resistant air cylinder

3,4 **Mounting style** (see pgs. 6–8)

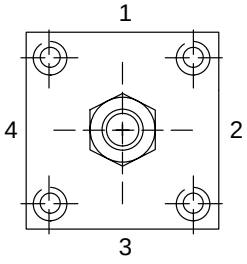
Vickers Code	Style	ANSI Code
	1-1/2″ thru 8″ Bore	
01 –	Side lug	**MS2**
02 –	Side tapped	**MS4**
03 –	End lug	**MS7**
07 –	Head rectangular flange	**MF1**
08 –	Head square	**ME3**
10 –	Cap fixed clevis	**MP1**
12 –	Cap rectangular flange	**MF2**
13 –	Cap square	**ME4**
16 –	Cap trunnion	**MT2**
17 –	Head trunnion	**MT1**
18 –	Sleeve nut for tapped face	**–**
21 –	Cap extended tie rod	**MX2**
22 –	Head extended tie rod	**MX3**
23 –	Both ends extended tie rod	**MX1**
24 –	No mounts	**MX0**
41 –	Double rod, no mounts	**–**
45 –	Angle	**MS1**
48 –	Detachable eye	**MP4**
50 –	Detachable clevis	**MP2**
	3/4″ thru 1-1/8″ Bore	
01 –	Bolt thru	**MS8**
02 –	Tapped	**MS9**
07 –	Head rectangular flange	**MF1**
12 –	Cap rectangular flange	**MF2**
18 –	Head tapped face	**MR1**
20 –	Threaded nose	**MNR1**
24 –	No mounts	**MX0**
25 –	Double rod w/bolt thru	**–**
47 –	Fixed eye	**MP3**
48 –	Detachable eye	**MP4**
50 –	Detachable clevis	**MP2**

5 **Bore size**

Code	Bore Size
A	3/4
1	1-1/8
C	1-1/2
D	2
E	2-1/2
G	3-1/4
H	4
K	5
L	6
M	7
N	8

6 **Cushion location**

Cushions are located as shown below when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no cushion.

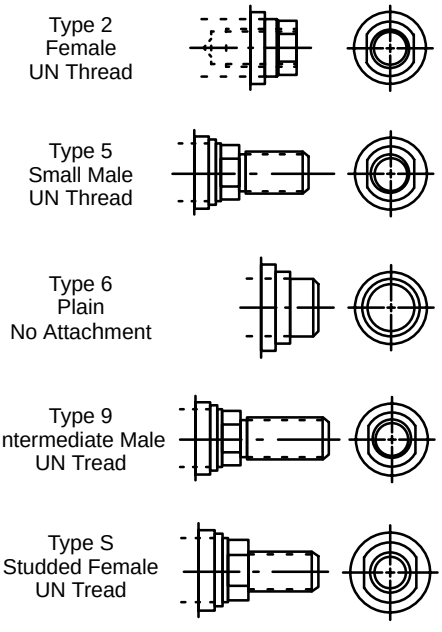


Code	Head	Cap
A	–	–
B	–	1
C	–	2
D	–	3
E	–	4
F	1	–
G	2	–
H	3	–
J	4	–
K	1	1
R	2	2
S	2	3
T	2	4
V	3	2
W	3	3
Y	3	4
4	4	4

Double Rod Cylinders:
"Head" = "Mounting End"
"Cap" = Non-mounting End

7 **Rod size and type**

Bore Size	Rod Size	Rod End Type 2	9	5	6	S
3/4	5/16	**A**	**B**	**C**	**D**	**S**
1-1/8	3/8	**A**	**B**	**C**	**D**	**S**
1-1/8	1/2	**E**	**F**	**G**	**H**	**T**
1-1/2	5/8	**A**	**B**	**C**	**D**	**S**
1-1/2	1	**E**	**F**	**G**		**T**
2	5/8	**A**	**B**	**C**	**D**	**S**
2	1	**E**	**F**	**G**	**H**	**T**
2-1/2	5/8	**A**	**B**	**C**	**D**	**S**
2-1/2	1	**E**	**F**	**G**	**H**	**T**
3-1/4	1	**A**	**B**	**C**	**D**	**S**
3-1/4	1-3/8	**E**	**F**	**G**	**H**	**T**
4	1	**A**	**B**	**C**	**D**	**S**
4	1-3/8	**E**	**F**	**G**	**H**	**T**
5	1	**A**	**B**	**C**	**D**	**S**
5	1-3/8	**E**	**F**	**G**	**H**	**T**
6	1-3/8	**A**	**B**	**C**	**D**	**S**
6	1-3/4	**E**	**F**	**G**	**H**	**T**
7	1-3/8	**A**	**B**	**C**	**D**	**S**
7	1-3/4	**E**	**F**	**G**	**H**	**T**
8	1-3/8	**A**	**B**	**C**	**D**	**S**
8	1-3/4	**E**	**F**	**G**	**H**	**T**



8 **Seal options**

	Code
Nitrile (Standard)	**A**
High Temperature Viton®	**T**

9 **Port options**

	Code
NPTF Dryseal (Standard)	**1**
NPTF Dryseal (Oversized)	**2**

10 **Port locations**

Positions are numbers as shown in item 6.

Code	Port Locations
A	1
F	2
L	3
S	4

11 **Proximity switch magnet**

Code	Magnet Type
N	Magnet not required (no proximity switch option)
H	Magnet furnished to operate **Hall Effect or Reed type** switch

Note: Switches will not function as designed without the magnet installed.

12,13,14 **Cylinder stroke**

Items 12 and 13 indicate stroke length from 00 inches through 99 inches.

Item 14 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	**8**	$^{1}/_{2}$
1	$^{1}/_{16}$	**9**	$^{9}/_{16}$
2	$^{1}/_{8}$	**A**	$^{5}/_{8}$
3	$^{3}/_{16}$	**B**	$^{11}/_{16}$
4	$^{1}/_{4}$	**C**	$^{3}/_{4}$
5	$^{5}/_{16}$	**D**	$^{13}/_{16}$
6	$^{3}/_{8}$	**E**	$^{7}/_{8}$
7	$^{7}/_{16}$	**F**	$^{15}/_{16}$

15,16 **Extra rod projection**

Item 15 indicates inches from **0** thru **9**.

Item 16 indicates fraction of an inch per the following codes:

Code	Fraction	Code	Fraction
0	0	**8**	$^{1}/_{2}$
1	$^{1}/_{16}$	**9**	$^{9}/_{16}$
2	$^{1}/_{8}$	**A**	$^{5}/_{8}$
3	$^{3}/_{16}$	**B**	$^{11}/_{16}$
4	$^{1}/_{4}$	**C**	$^{3}/_{4}$
5	$^{5}/_{16}$	**D**	$^{13}/_{16}$
6	$^{3}/_{8}$	**E**	$^{7}/_{8}$
7	$^{7}/_{16}$	**F**	$^{15}/_{16}$

Mounting Style: 1-1/2 – 8 inch Bores

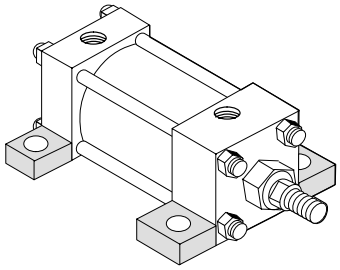
Available Mountings

The variety of standard ANSI/NFPA mountings available in the Series VN/VP gives you a broad selection to match the proper mount to your application. Vickers offers rigid mounts (including side lug mounts, flange mounts, and extended tie rod mounts) and swivel mounts (including clevis mounts and trunnion mounts). A guide to proper mount selection is provided on pages # through ##. For custom mounts, enter “XX” for model code positions 3 and 4, and give a detailed description with drawings. Series VN/VP cylinders are available in all mounting styles listed.

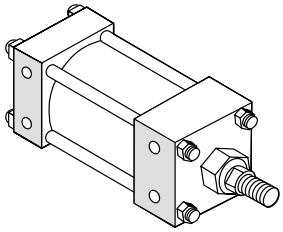
Selecting the Proper Mounting

Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. Note: In the mounting information, some mounts have been downrated to minimize deflection. For applications where the motion is linear and parallel to the cylinder rod motion, a rigid mount is recommended. For curvilinear motion, a swivel mount should be chosen. The specifics of each application dictate the correct mounting style.

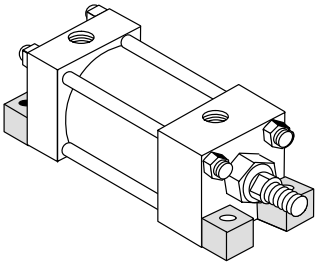
Code 01 (MS2)
Side Lug



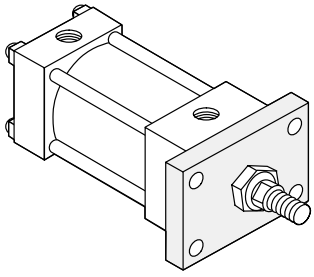
Code 02 (MS4)
Tapped



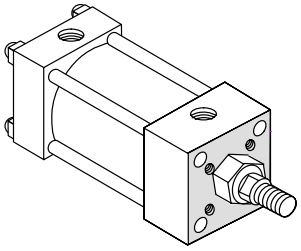
Code 03 (MS7)
End Lug



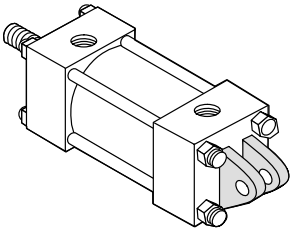
Code 07 (MF1)
Head Rectangular Flange



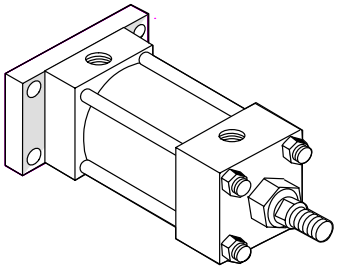
Code 08 (ME3)
Head Square



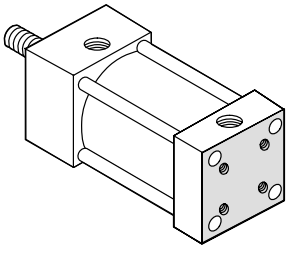
Code 10 (MP1)
Cap Fixed Clevis



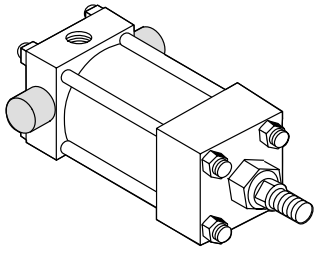
Code 12 (MF2)
Cap Rectangular Flange



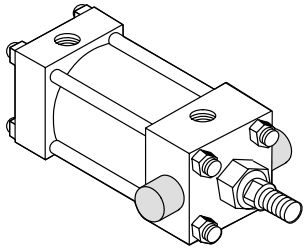
Code 13 (ME4)
Cap Square



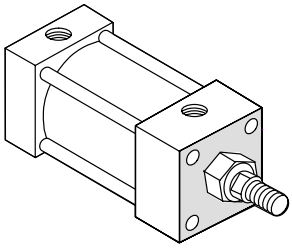
Code 16 (MT2)
Cap Trunnion



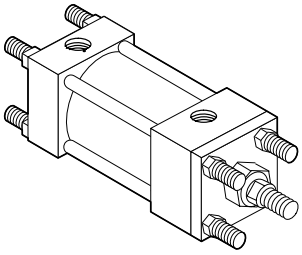
Code 17 (MT2)
Head Trunnion



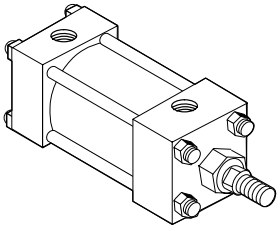
Code 18 Sleeve Nut
Construction for
Tapped Faces



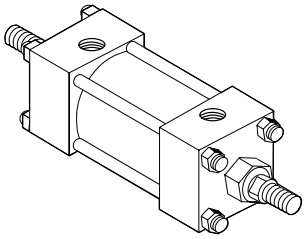
Codes 21 (MX2) Cap, 22 (MX3)
head, 23 (MX1) Extended Tie Rod



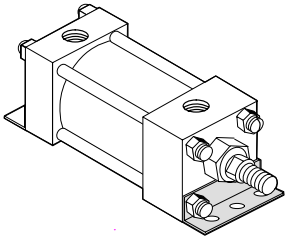
Code 24 (MX0)
No Mounts



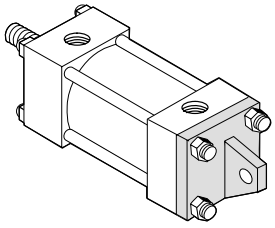
Double Rod
Code 41 (MX0)
No Mounts



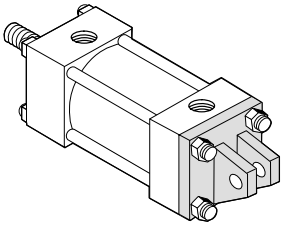
Code 45 (MS1)
Angle



Code 48 (MP4)
Cap Detachable Eye

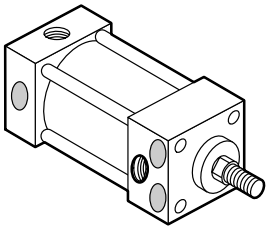


Code 50 (MP2)
Cap Detachable Clevis

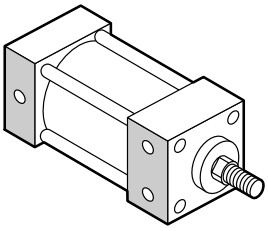


Mounting Style: 3/4 & 1-1/8 inch Bores

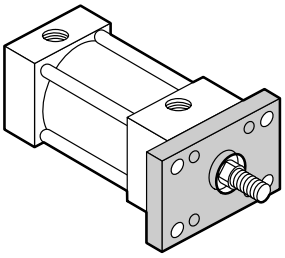
Code 01 (MS8)
Bolt Thru



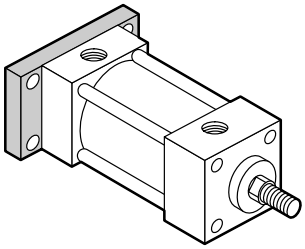
Code 02 (MS9)
Tapped



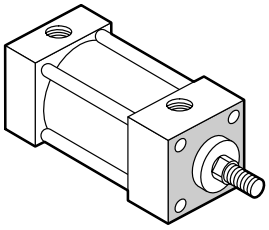
Code 07 (MF1)
Head Rectanular Flange



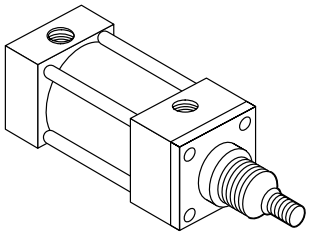
Code 12 (MF2)
Cap Rectangular Flange



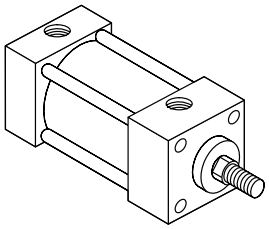
Code 18 (MR1)
Head Tapped Face



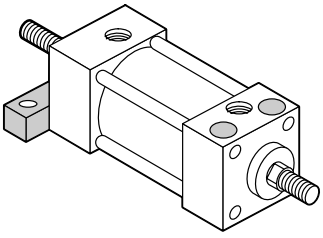
Code 20 (MNR1)
Threaded Nose Mounts



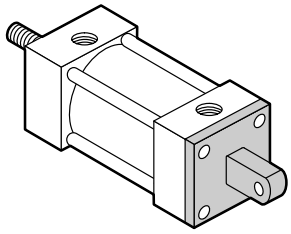
Code 24 (MX0)
No Mounts



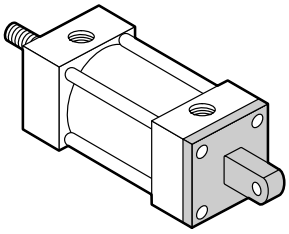
Code 25 Double Rod,
Bolt Thru



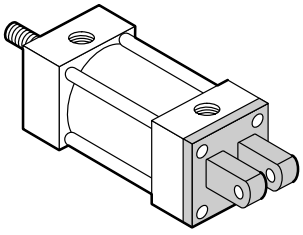
Code 47 (MP3)
Fixed Eye



Code 48 (MP4)
Detachable Eye

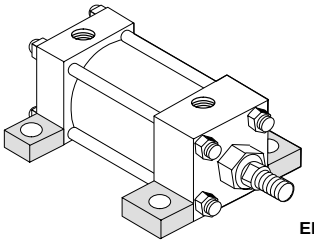


Code 50 (MP2)
Detachable Clevis



Series VN/VP Mounting Styles and Installation Dimensions

Code 01 Side Lug Mounts
(ANSI MS2)



Side lug mounts are for moving loads along a flat guided surface as in a carriage along rails.

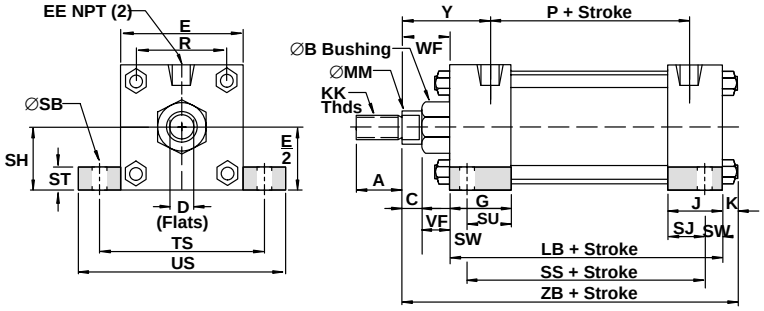
The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to transverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

Limit operating pressure to 400 psi (27 bar) non-shock hydraulic for minimum deflection. For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

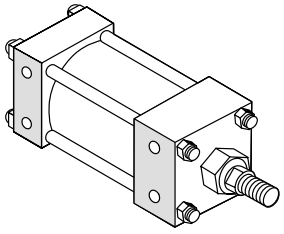
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.



Dimension		1 1/2 Bore (38.10)		2″ Bore (50.80)		2 1/2″ Bore (63.50)		3 1/4″ Bore (82.55)		4″ Bore (101.60)		5″ Bore (127.00)		6″ Bore (152.40)		7″ Bore (177.80)		8″ Bore (203.20)	
∅Rod	Std.	5/8″	(15.88)	5/8″	(15.88)	5/8″	(15.88)	1″	(25.40)	1″	(25.40)	1″	(25.40)	1-3/8″	(34.93)	1-3/8″	(34.93)	1-3/8″	(34.93)
	O.S.	1″	(25.40)	1″	(25.40)	1″	(25.40)	1-3/8″	(34.93)	1-3/8″	(34.93)	1-3/8″	(34.93)	1-3/4″	(44.45)	1-3/4″	(44.45)	1-3/4″	(44.45)
A	Std.	.750	(19.05)	.750	(19.05)	.750	(19.05)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
	O.S.	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
B +.000 −.002	Std.	1.124	(28.55)	.750	(19.05)	.750	(19.05)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
B +.000 −.002	O.S.	1.499	(38.08)	1.125	(28.58)	1.125	(28.58)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
C	Std.	.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)
	O.S.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.625	(15.88)	.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.750	(19.05)
CC	Std.	1/2 – 20		1/2 – 20		1/2 – 20		7/8 – 14		7/8 – 14		7/8 – 14		1-1/4 – 12		1-1/4 – 12		1-1/4 – 12	
	O.S.	7/8 – 14		7/8 – 14		7/8 – 14		1-1/4 – 12		1-1/4 – 12		1-1/4 – 12		1-1/2 – 12		1-1/2 – 12		1-1/2 – 12	
D	Std.	.500	(12.70)	.500	(12.70)	.500	(12.70)	.813	(12.70)	.813	(12.70)	.813	(12.70)	1.125	(15.88)	1.125	(15.88)	1.125	(15.88)
	O.S.	.813	(20.64)	.813	(20.64)	.813	(20.64)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
E		2.000	(50.80)	2.500	(63.50)	3.000	(76.20)	3.750	(95.25)	4.500	(114.30)	5.500	(139.70)	6.500	(165.10)	7.500	(190.50)	8.500	(215.90)
EE		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	.750	(19.05)
FF	Std.	5/8 – 18		5/8 – 18		5/8 – 18		1 – 14		1 – 14		1 – 14		1-3/8 – 12		1-3/8 – 12		1-3/8 – 12	
	O.S.	1 – 14		1 – 14		1 – 14		1-3/8 – 12		1-3/8 – 12		1-3/8 – 12		1-3/4 – 12		1-3/4 – 12		1-3/4 – 12	
G		1.500	(38.10)	1.500	(38.10)	1.500	(38.10)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)	2.000	(50.80)	2.000	(50.80)	2.000	(50.80)
J		1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.250	(31.75)	1.250	(31.75)	1.250	(31.75)	1.500	(38.10)	1.500	(38.10)	1.500	(38.10)
K		.250	(6.35)	.313	(7.94)	.313	(7.94)	.375	(j9.53)	.375	(j9.53)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)
KK	Std.	7/16 – 20		7/16 – 20		7/16 – 20		3/4 – 16		3/4 – 16		3/4 – 16		1 – 14		1 – 14		1 – 14	
	O.S.	3/4 – 16		3/4 – 16		3/4 – 16		1 – 14		1 – 14		1 – 14		1-1/4 – 12		1-1/4 – 12		1-1/4 – 12	
LB		3.625	(92.08)	3.625	(92.08)	3.750	(95.25)	4.250	(107.95)	4.250	(107.95)	4.500	(114.30)	5.000	(127.00)	5.125 (130.18)		5.125 (130.18)	
MM	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)
	O.S.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)
P		2.313	(58.74)	2.313	(58.74)	2.438	(61.91)	2.625	(66.68)	2.625	(66.68)	2.875	(73.03)	3.125	(79.38)	3.250	(82.55)	3.250	(82.55)
R		1.428	(36.27)	1.838	(46.68)	2.192	(55.67)	2.758	(70.05)	3.323	(84.40)	4.101	(104.16)	4.879	(123.92)	5.639	(145.54)	6.442	(163.63)
SB		.438	(11.11)	.438	(11.11)	.438	(11.11)	.563	(14.29)	.563	(14.29)	.813	(20.64)	.813	(20.64)	.813	(20.64)	.813	(20.64)
SH		1.000	(25.40)	1.250	(31.75)	1.500	(38.10)	1.875	(47.63)	2.250	(57.15)	2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.250	(107.95)
SJ		.625	(15.88)	.625	(15.88)	.625	(15.88)	.750	(19.05)	.750	(19.05)	.813	(20.64)	.813	(20.64)	.813	(20.64)	.813	(20.64)
SS		2.875	(73.03)	2.875	(73.03)	3.000	(76.20)	3.250	(82.55)	.750	(19.05)	.813	(20.64)	.813	(20.64)	.813	(20.64)	.813	(20.64)
ST		.500	(12.70)	.500	(12.70)	.500	(12.70)	.750	(19.05)	.750	(19.05)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
SU		1.125	(28.58)	1.125	(28.58)	1.125	(28.58)	1.250	(31.75)	1.250	(31.75)	1.063	(26.99)	1.313	(33.34)	1.313	(33.34)	1.313	(33.34)
SW		.375	(9.53)	.375	(9.53)	.375	(9.53)	.500	(12.70)	.500	(12.70)	.688	(17.46)	.688	(17.46)	.688	(17.46)	.688	(17.46)
TS		2.750	(69.85)	3.250	(82.55)	3.750	(95.25)	4.750	(120.65)	5.500	(139.70)	6.875	(174.63)	7.875	(200.03)	8.875	(225.43)	9.875	(250.83)
US		3.500	(88.90)	4.000	(101.60)	4.500	(114.30)	5.750	(146.05)	6.500	(165.10)	8.250	(209.55)	9.250	(234.95)	10.250	(260.35)	11.250	(285.75)
VF	Std.	.625	(15.88)	.625	(15.88)	.625	(15.88)	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)
	O.S.	.875	(22.23)	.875	(22.23)	.875	(22.23)	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.125	(28.58)	1.125	(28.58)	1.125	(28.58)
WF	Std.	1.000	(25.40)	1.000	(25.40)	1.000	(25.40)	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)
	O.S.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.625	(41.28)	1.625	(41.28)	1.625	(41.28)	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)
XS	Std.	1.375	(34.93)	1.375	(34.93)	1.375	(34.93)	1.875	(47.63)	1.875	(47.63)	2.062	(52.37)	2.313	(58.74)	2.313	(58.74)	2.313	(58.74)
	O.S.	1.750	(44.45)	1.750	(44.45)	1.750	(44.45)	2.125	(53.98)	2.125	(53.98)	2.313	(58.74)	2.562	(65.07)	2.562	(65.07)	2.562	(65.07)
Y	Std.	1.875	(47.63)	1.875	(47.63)	1.875	(47.63)	2.438	(61.91)	2.438	(61.91)	2.438	(61.91)	2.813	(71.44)	2.813	(71.44)	2.813	(71.44)
	O.S.	2.250	(57.15)	2.250	(57.15)	2.250	(57.15)	2.688	(68.26)	2.688	(68.26)	2.688	(68.26)	3.063	(77.79)	3.063	(77.79)	3.063	(77.79)
ZB	Std.	4.875	(123.83)	4.938	(125.41)	5.063	(128.59)	6.000	(152.40)	6.000	(152.40)	6.313	(160.34)	7.063	(179.39)	7.313	(185.74)	7.313	(185.74)
	O.S.	5.250	(133.35)	5.313	(134.94)	5.438	(138.11)	6.250	(158.75)	6.250	(158.75)	6.563	(166.69)	7.313	(185.74)	7.563	(192.09)	7.563	(192.09)

All dimensions in inches (mm)

Code 02 Tapped Mounts
(ANSI MS4)



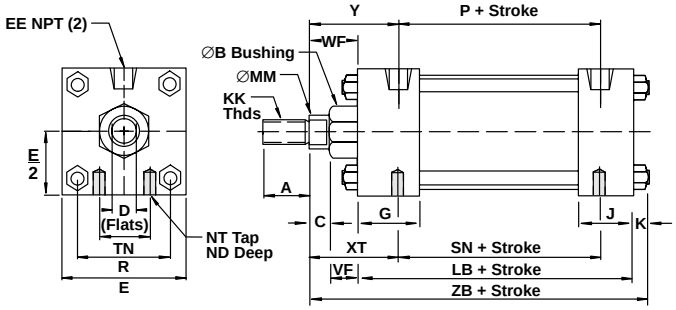
Tapped mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

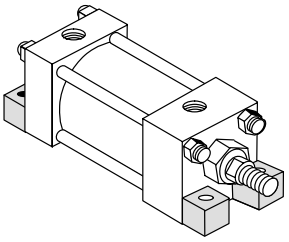


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.499 (38.08)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (12.70)	.813 (12.70)	.813 (12.70)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (j9.53)	.375 (j9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
ND		.375 (9.53)	.375 (9.53)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.938 (23.81)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
NT		1/4 – 20	5/16 – 18	3/8 – 18	1/2 – 13	1/2 – 13	5/8 – 11	3/4 – 10	3/4 – 10	3/4 – 10
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.639 (145.54)	6.442 (163.63)
SN		2.250 (57.15)	2.250 (57.15)	2.375 (60.33)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
TN		.625 (15.88)	.875 (22.23)	1.250 (31.75)	1.500 (38.10)	2.063 (52.37)	2.688 (68.28)	3.250 (82.55)	3.500 (88.90)	4.500 (114.30)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XT	Std.	1.938 (49.21)	1.938 (49.21)	1.938 (49.21)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.313 (58.74))	2.313 (58.74))	2.313 (58.74))	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)	7.313 (185.74)	7.313 (185.74)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)	7.563 (192.09)	7.563 (192.09)

All dimensions in inches (mm)

Code 03 End Lug Mounts

(ANSI MS7)



End lug mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

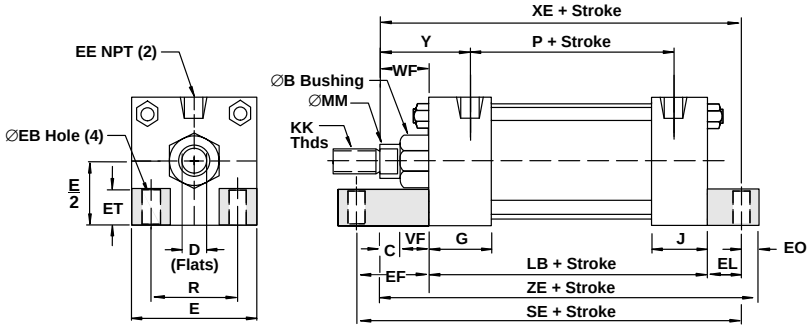
The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

Limit operating pressure to 400 psi (27 bar) non-shock hydraulic for minimum deflection.

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

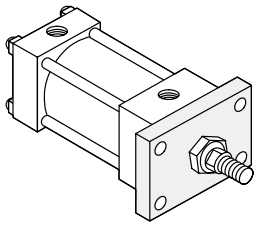
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
B +.000 −.002	O.S.	1.499 (38.08)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (12.70)	.813 (12.70)	.813 (12.70)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EB		.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)	.688 (17.46)	.688 (17.46)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
EF		1.125 (28.58)	1.313 (33.34)	1.438 (36.51)	1.500 (38.10)	1.625 (41.28)	1.688 (42.88)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
EL		.750 (19.05)	.938 (23.81)	1..063 (26.99)	.875 (22.23)	1.000 (25.40)	1.063 (26.99)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)
EO		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
ET		.500 (12.70)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	2.063 (52.39)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.639 (145.54)	6.442 (163.63)
SE		5.500 (139.70)	5.875 (149.23)	6.250 (158.75)	6.625 (168.28)	6.875 (174.63)	7.250 (184.15)	7.750 (196.85)	8.000 (203.20)	8.000 (203.20)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XE	Std.	5.375 (136.53)	5.563 (141.29)	5.813 (147.64)	6.500 (165.10)	6.625 (168.28)	6.938 (176.21)	7.625 (193.68)	7.875 (200.03)	7.875 (200.03)
	O.S.	5.750 (146.05)	5.938 (150.81)	6.188 (157.16)	6.750 (171.45)	6.875 (174.63)	7.188 (182.56)	7.875 (200.03)	8.125 (206.38)	8.125 (206.38)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZE	Std.	5.625 (142.88)	5.875 (149.23)	6.125 (155.58)	6.875 (174.63)	7.000 (177.80)	7.438 (188.91)	8.125 (206.38)	8.500 (215.90)	8.500 (215.90)
	O.S.	6.000 (152.40)	6.250 (158.75)	6.500 (165.10)	7.125 (180.98)	7.250 (184.15)	7.688 (195.26)	8.375 (212.73)	8.750 (222.25)	8.750 (222.25)

All dimensions in inches (mm)

Code 07 Head Rectangular Flange Mounts (ANSI MF1)



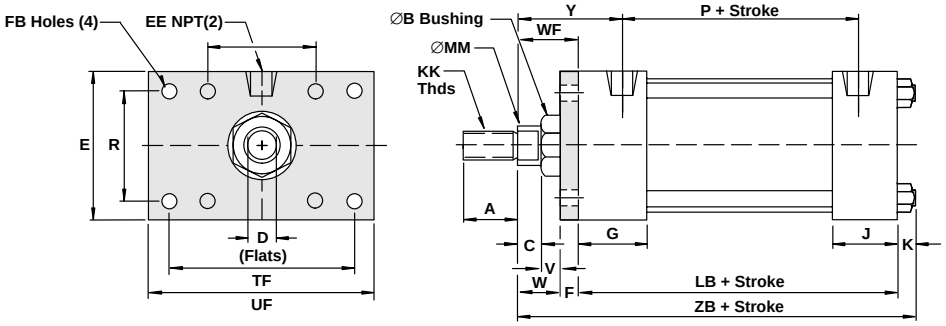
These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

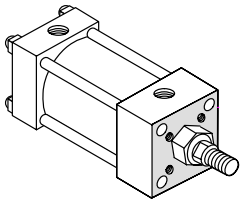
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″Bore (152.40)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.499 (38.08)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (12.70)	.813 (12.70)	.813 (12.70)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FB		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.438 (11.11)	.438 (11.11)	1.500 (38.10)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.688 (119.06)	5.438 (138.11)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
V	Std.	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	375 (9.53)	375 (9.53)	375 (9.53)	375 (9.53)
W	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	.875 (22.23)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)

All dimensions in inches (mm)

Code 08 Head Square Mounts (ANSI ME3)



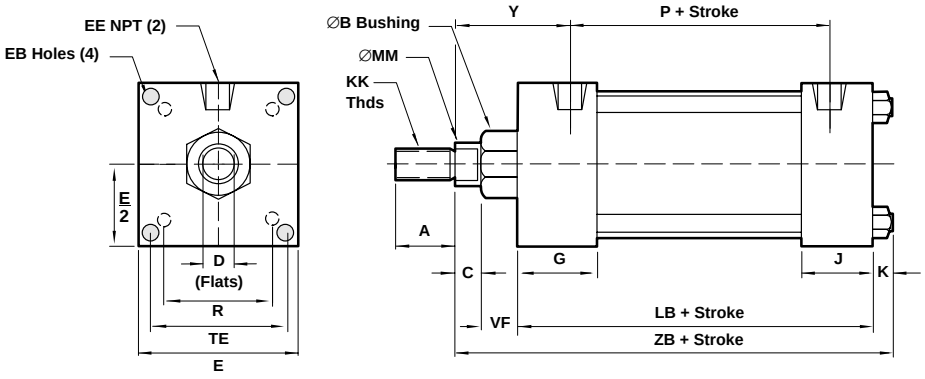
These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat, and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

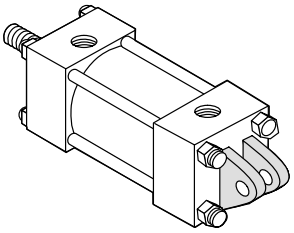


Dimension		7″ Bore (177.80)	8″ Bore (203.20)
∅ Rod	Std.	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
C	Std.	.625 (15.88)	.625 (15.88)
	O.S.	.750 (19.05)	.750 (19.05)
CC	Std.	1-1/4 – 12	1-1/4 – 12
	O.S.	1-1/2 – 12	1-1/2 – 12
D	Std.	1.125 (15.88)	1.125 (15.88)
	O.S.	1.500 (38.10)	1.500 (38.10)
E		7.500 (190.50)	8.500 (215.90)
EB		.688 (17.46)	.688 (17.46)
EE		.750 (19.05)	.750 (19.05)
FF	Std.	1-3/8 – 12	1-3/8 – 12
	O.S.	1-3/4 – 12	1-3/4 – 12
G		2.000 (50.80)	2.000 (50.80)
J		1.500 (38.10)	1.500 (38.10)
K		.563 (14.29)	.563 (14.29)
KK	Std.	1 – 14	1 – 14
	O.S.	1-1/4 – 12	1-1/4 – 12
LB		5.125 (130.18)	5.125 (130.18)
MM	Std.	1.375 (34.93)	1.375 (34.93)
	O.S.	1.750 (44.45)	1.750 (44.45)
P		3.250 (82.55)	3.250 (82.55)
R		5.639 (145.54)	6.442 (163.63)
TE		6.750 (171.45)	7.570 (192.27)
VF	Std.	1.000 (25.40)	1.000 (25.40)
	O.S.	1.125 (28.58)	1.125 (28.58)
Y	Std.	2.813 (71.44)	2.813 (71.44)
	O.S.	3.063 (77.79)	3.063 (77.79)
ZB	Std.	7.313 (185.74)	7.313 (185.74)
	O.S.	7.563 (192.09)	7.563 (192.09)

All dimensions in inches (mm)

Code 10 Fixed Clevis

(MP1)

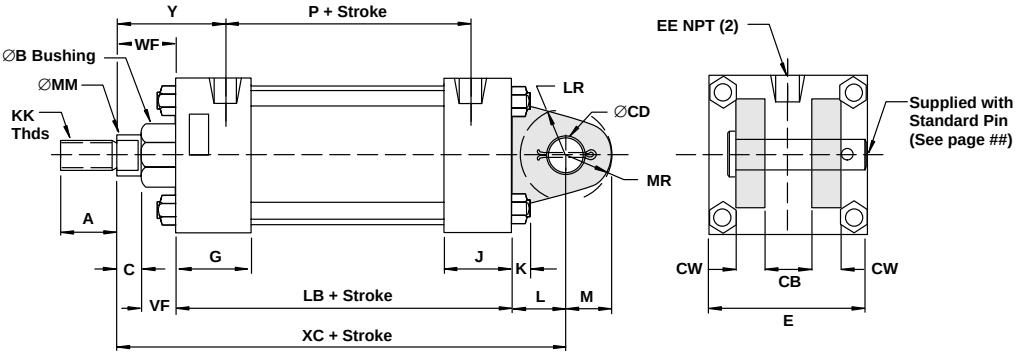


These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

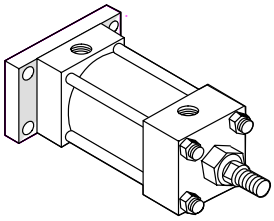
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. Any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅ Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CB		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
CD		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
CW		.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (12.70)	.813 (12.70)	.813 (12.70)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
L		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
LR		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
M		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
MR		.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)	1.188 (30.16)	1.188 (30.16)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XC	Std.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.875 (174.63)	6.875 (174.63)	7.125 (180.98)	8.125 (206.38)	8.250 (209.55)	8.250 (209.55)
	O.S.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)	8.500 (215.90)	8.500 (215.90)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

All dimensions in inches (mm)

Code 12 Cap Rectangular Flange Mounts (ANSI MF2)



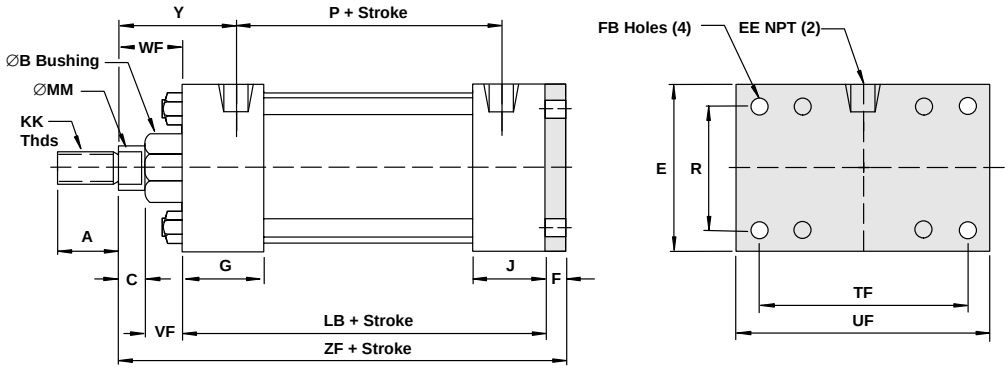
These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing), as in push presses. For tension applications (pulling), a head rectangular mount is more appropriate.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

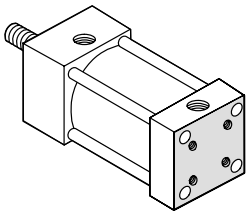
Cap rectangular mounts are recommended for heavy duty applications.



Dimension		1 1/2″ Bor (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CB		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (12.70)	.813 (12.70)	.813 (12.70)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
F		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
FB		.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.93)
TF		2.750 (69.85)	3.375 (85.73)	3.875 (98.43)	4.687 (119.05)	5.438 (138.11)	6.625 (168.28)	7.625 (193.68)
UF		3.375 (85.73)	4.125 (104.78)	4.625 (117.48)	5.500 (139.70)	6.250 (158.75)	7.625 (193.68)	8.625 (219.08)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)
ZF	Std.	5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	6.250 (158.75)	6.250 (158.75)	6.500 (165.10)	7.375 (187.33)
	O.S.	5.375 (136.53)	5.375 (136.53)	5.500 (139.70)	6.500 (165.10)	6.500 (165.10)	6.750 (171.45)	7.625 (193.68)

All dimensions in inches (mm)

Code 13 Cap Square Mounts (ANSI ME4)



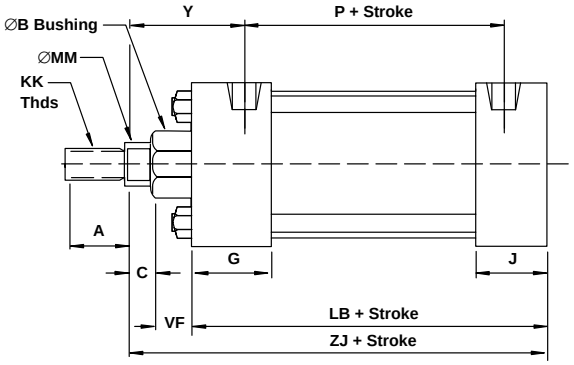
These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing). The mounting surface should be flat and the rod end cartridge should be piloted into it.

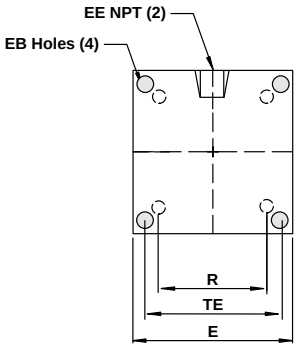
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

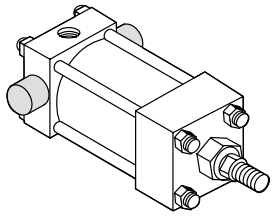




Dimension		7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
C	Std.	.625 (15.88)	.625 (15.88)
	O.S.	.750 (19.05)	.750 (19.05)
CC	Std.	1-1/4 – 12	1-1/4 – 12
	O.S.	1-1/2 – 12	1-1/2 – 12
D	Std.	1.125 (15.88)	1.125 (15.88)
	O.S.	1.500 (38.10)	1.500 (38.10)
E		7.500 (190.50)	8.500 (215.90)
EB		.688 (17.46)	.688 (17.46)
EE		.750 (19.05)	.750 (19.05)
FF	Std.	1-3/8 – 12	1-3/8 – 12
	O.S.	1-3/4 – 12	1-3/4 – 12
G		2.000 (50.80)	2.000 (50.80)
J		1.500 (38.10)	1.500 (38.10)
K		.563 (14.29)	.563 (14.29)
KK	Std.	1 – 14	1 – 14
	O.S.	1-1/4 – 12	1-1/4 – 12
LB		5.125 (130.18)	5.125 (130.18)
MM	Std.	1.375 (34.93)	1.375 (34.93)
	O.S.	1.750 (44.45)	1.750 (44.45)
P		3.250 (82.55)	3.250 (82.55)
R		5.639 (145.54)	6.442 (163.63)
TE		6.750 (171.45)	7.570 (192.27)
VF	Std.	1.000 (25.40)	1.000 (25.40)
	O.S.	1.125 (28.58)	1.125 (28.58)
Y	Std.	2.813 (71.44)	2.813 (71.44)
	O.S.	3.063 (77.79)	3.063 (77.79)
ZB	Std.	7.313 (185.74)	7.313 (185.74)
	O.S.	7.563 (192.09)	7.563 (192.09)

All dimensions in inches (mm)

Code 16 Cap Trunnion Mounts (ANSI MT2)



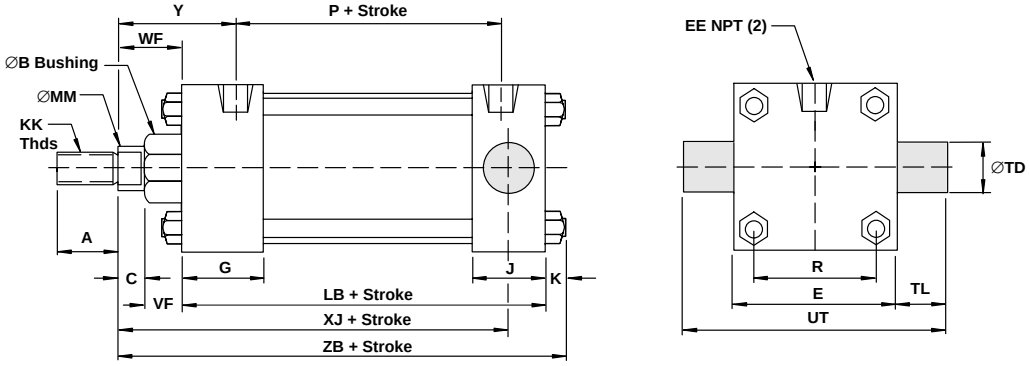
These mounts are for applications in which the machine member travels in a curved path in one plane.

The mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE

For strokes in excess of 30 inches, see “Stop tube selection” on page 45.

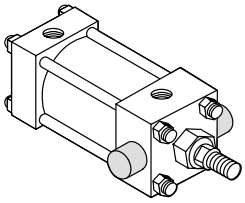
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.435 (163.44)
TD +.000 -.001		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
TL		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
UT		4.000 (101.60)	4.500 (114.30)	5.000 (127.00)	5.750 (146.05)	6.500 (165.10)	7.500 (190.50)	9.250 (234.95)	10.250 (260.35)	11.250 (285.75)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XJ	Std.	4.125 (104.78)	4.125 (104.78)	4.250 (107.95)	5.000 (127.00)	5.250 (133.35)	5.500 (139.70)	6.125 (155.58)	6.250 (158.75)	6.250 (158.75)
	O.S.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)	8.500 (215.90)	8.500 (215.90)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)	7.313 (185.74)	7.313 (185.74)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)	7.563 (192.09)	7.563 (192.09)

All dimensions in inches (mm)

Code 17 Head Trunnion Mounts (ANSI MT1)



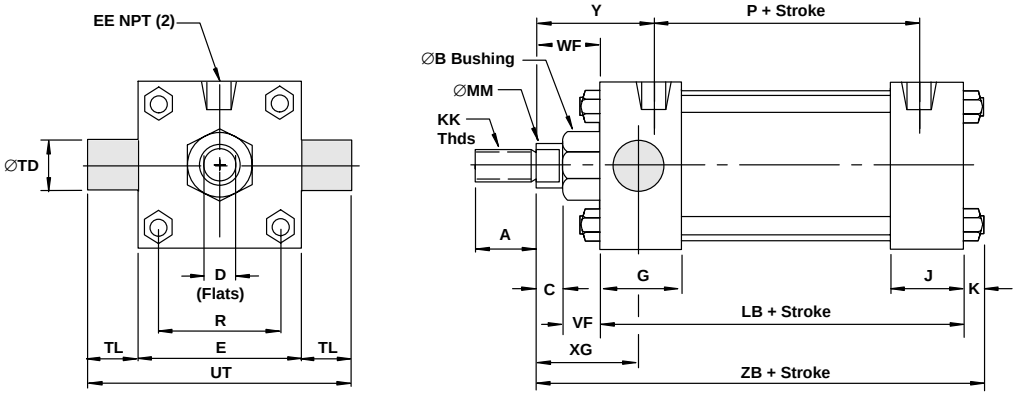
These mounts are for applications in which the machine member travels in a curved path in one plane.

The mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

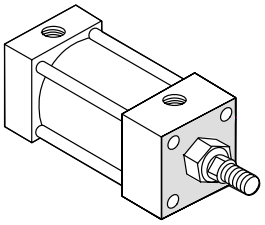
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.435 (163.44)
TD +.000 -.001		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
TL		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
UT		4.000 (101.60)	4.500 (114.30)	5.000 (127.00)	5.750 (146.05)	6.500 (165.10)	7.500 (190.50)	9.250 (234.95)	10.250 (260.35)	11.250 (285.75)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XJ	Std.	4.125 (104.78)	4.125 (104.78)	4.250 (107.95)	5.000 (127.00)	5.250 (133.35)	5.500 (139.70)	6.125 (155.58)	6.250 (158.75)	6.250 (158.75)
	O.S.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.125 (180.98)	7.125 (180.98)	7.375 (187.33)	8.375 (212.73)	8.500 (215.90)	8.500 (215.90)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)	7.313 (185.74)	7.313 (185.74)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)	7.563 (192.09)	7.563 (192.09)

All dimensions in inches (mm)

Code 18 Sleeve Nut, for Tapped Face Mounts



16 Sleeve Nut Construction
Basic Cylinder Side Tapped (Universal)

These mounts are for straight line force transfer applications in which the cylinder is used in tension (pulling).

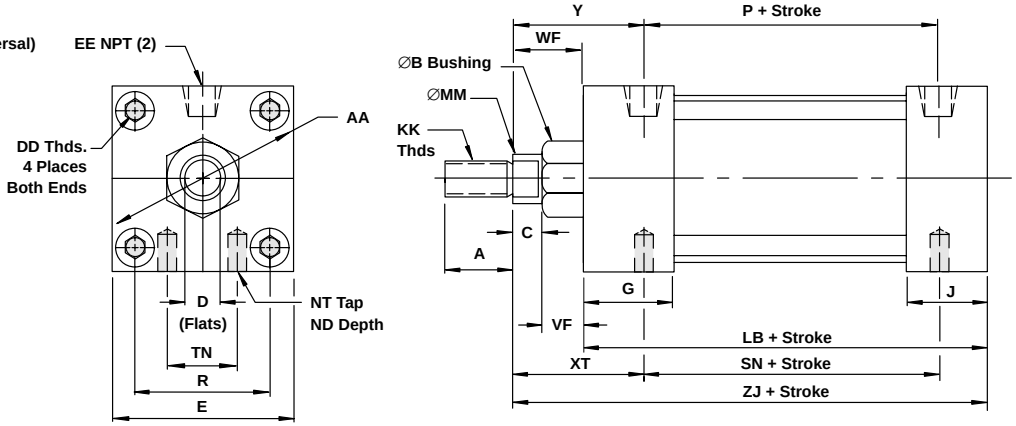
The mounting surface should be flat and the rod end cartridge should be piloted into it.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

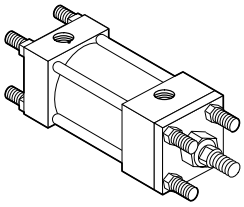
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)
∅ Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)
AA		2.020 (51.31)	2.600 (66.04)	3.100 (78.74)	3.900 (99.06)	4.700 (119.38)	5.800 (147.32)	6.900 (175.26)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)
DD		1/4 – 28	5/16 – 24	5/16 – 24	3/8 – 24	3/8 – 24	1/2 – 20	1/2 – 20
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)
NT		1/4 – 20	5/16 – 18	3/8 –16	1/2 – 13	1/2 – 13	5/8 – 11	3/4 – 10
ND		.375 (9.53)	.375 (9.53)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.938 (23.81)	1.125 (28.58)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)
SN		2.250 (57.15)	2.250 (57.15)	2.375 (60.33)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)
TN		.625 (15.88)	.875 (22.23)	1.250 (31.75)	1.500 (38.10)	2.063 (52.39)	2.688 (68.26)	3.250 (82.55)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)
XT	Std.	1.938 (49.21)	1.938 (49.21)	1.938 (49.21)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)
	O.S.	2.313 (58.74)	2.313 (58.74)	2.313 (58.74)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)
ZJ	Std.	4.625 (117.48)	4.625 (117.48)	4.750 (120.65)	5.625 (142.88)	5.625 (142.88)	5.625 (142.88)	6.625 (168.28)
	O.S.	5.000 (127.00)	5.000 (127.00)	5.125 (130.18)	5.875 (149.23)	5.875 (149.23)	5.875 (149.23)	6.875 (174.63)

All dimensions in inches (mm)

Codes 21 Cap (MX2), 22 Head (MX3), & 23 Both Ends (MX1) Extended Tie Rod Mounts



These mounts are for straight line force transfer applications. Both ends extended tie rod mounts are suited for tension and compression applications or applications where additional hardware is to be attached to cylinders.

The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the right column table.

NOTE

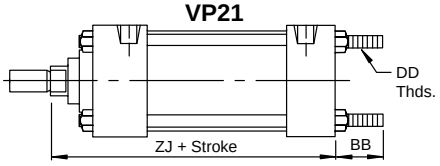
For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.

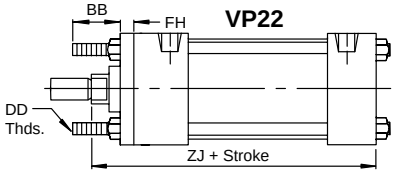
Recommended Torques for Tightening Tie Rods

Cylinder Bore	Series VP Steel Tie Rod	Series VN Stainless Tie Rod
1-1/2″	6.6 ft. lbs.	3.75 ft. lbs.
2″	11 ft. lbs.	7.5 ft. lbs.
2-1/2″	13 ft. lbs.	7.5 ft. lbs.
3-3/4″	20 ft. lbs.	14 ft. lbs.
4″	24 ft. lbs.	14 ft. lbs.
5″	40 ft. lbs.	33 ft. lbs.
6″	48 ft. lbs.	33 ft. lbs.
7″ & 8″	100 ft. lbs.	65 ft. lbs.

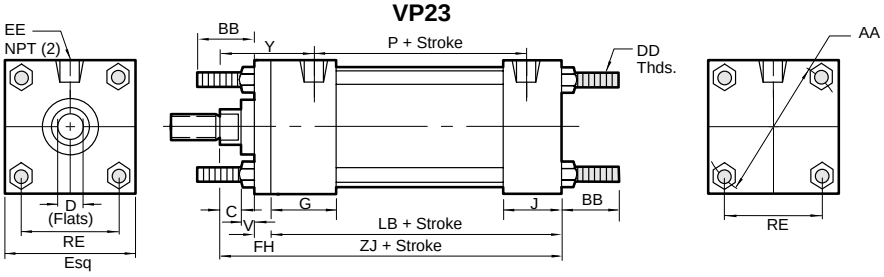
VP21



VP22



VP23

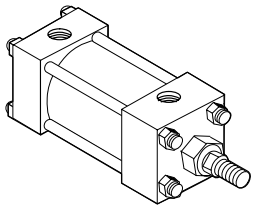


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
⌀Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
BB		1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.375 (34.93)	1.375 (34.93)	1.813 (46.04)	1.813 (46.04)	2.313 (58.74)	2.313 (58.74)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)**
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
DD		1/4 – 28	5/16 – 24	5/16 – 24	3/8 – 24	3/8 – 24	1/2 – 20	1/2 – 20	5/8 – 18	5/8 – 18
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
F		.375 (9.53)	.375 (9.53)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.442 (163.63)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)	7.313 (185.74)	7.313 (185.74)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)	7.563 (192.09)	7.563 (192.09)

**BB dimension on 8 bore is from the head.
All dimensions in inches (mm)

Code 24 No Mount Cylinder

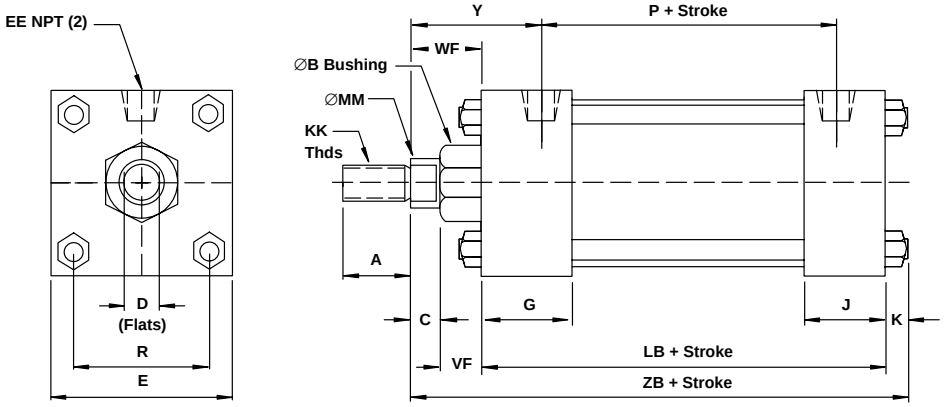
(ANSI MX0)



The basic cylinder is often used by customers who have designed their own method of mounting. These mounting methods may include custom made mounting flanges, machining into the end caps, and clamping mechanisms to secure the cylinder. Consult Vickers engineering when using the cylinder in this fashion.

NOTE

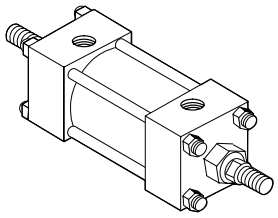
For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.



Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅ Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (15.88)	1.125 (15.88)	1.125 (15.88)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.442 (163.63)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZB	Std.	4.875 (123.83)	4.938 (125.41)	5.063 (128.59)	6.000 (152.40)	6.000 (152.40)	6.313 (160.34)	7.063 (179.39)	7.313 (185.74)	7.313 (185.74)
	O.S.	5.250 (133.35)	5.313 (134.94)	5.438 (138.11)	6.250 (158.75)	6.250 (158.75)	6.563 (166.69)	7.313 (185.74)	7.563 (192.09)	7.563 (192.09)

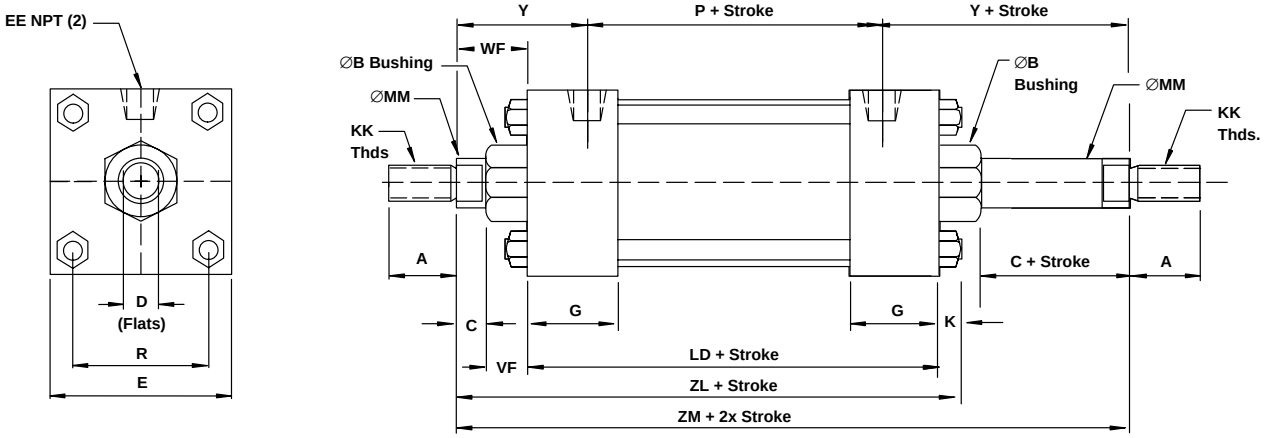
All dimensions in inches (mm)

Code 41 Double Rod, No Mount



Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod. The single rod mount application data is also applicable to double rod cylinders.

Rod and pilot related dimensions are typical for both ends.

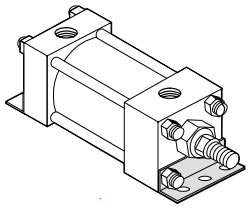


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	.875 (22.23)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.442 (163.63)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)
ZL	Std.	5.375 (136.53)	5.438 (138.11)	5.563 (141.29)	6.500 (165.10)	6.500 (165.10)	6.813 (174.04)	7.563 (192.09)	7.813 (198.44)	7.813 (198.44)
	O.S.	6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.500 (190.50)	7.500 (190.50)	7.500 (190.50)	8.750 (222.25)	8.875 (225.43)	8.875 (225.43)
ZM	O.S.	6.875 (174.63)	6.875 (174.63)	7.000 (177.80)	8.000 (203.20)	8.000 (203.20)	8.000 (203.20)	9.250 (234.95)	9.375 (238.13)	9.375 (238.13)

All dimensions in inches (mm)

Code 45 Angle Mounts

(ANSI MS1)



Angle mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

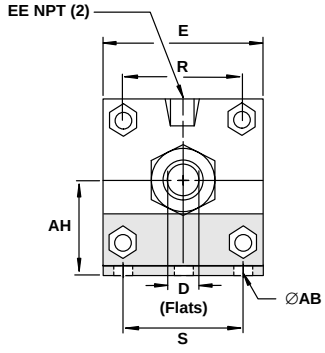
The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

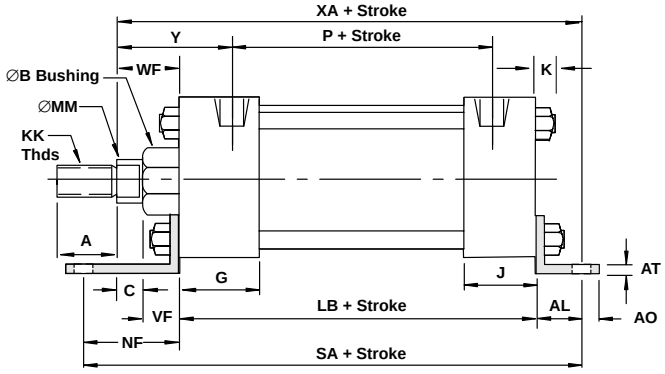
NOTE

Limit operating pressure to 400 psi (27 bar) non-shock hydraulic for minimum deflection.

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

For applications with unsupported loads, the bearing must absorb more force. The larger available rod is recommended, and stop tubes should be considered.

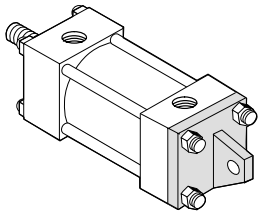




Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
AB		.438 (11.11)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)	.688 (17.46)	.813 (20.64)	.813 (20.64)	.813 (20.64)
AH		1.188 (30.16)	1.438 (36.51)	1.625 (41.28)	1.938 (49.21)	2.250 (57.15)	2.750 (69.85)	3.250 (82.55)	3.750 (95.25)	4.250 (107.95)
AL		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.375 (34.93)	1.375 (34.93)	1.813 (46.04)	1.813 (46.04)
AO		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.688 (17.46)	.688 (17.46)
AT		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.187 (4.75)	.187 (4.75)	.250 (6.35)	.250 (6.35)
B +.000 –.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
NF		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.875 (47.63)	1.875 (47.63)	2.000 (50.80)	2.125 (53.98)	1.813 (46.04)	1.813 (46.04)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
R		1.428 (36.27)	1.838 (46.68)	2.192 (55.67)	2.758 (70.05)	3.323 (84.40)	4.101 (104.16)	4.879 (123.92)	5.730 (145.54)	6.442 (163.63)
S		1.250 (31.75)	1.750 (44.45)	2.250 (57.15)	2.750 (69.85)	3.500 (88.90)	4.250 (107.95)	5.250 (133.35)	6.125 (155.58)	7.125 (180.98)
SA		6.000 (152.40)	6.000 (152.40)	6.125 (155.58)	7.375 (187.33)	7.375 (187.33)	7.875 (200.03)	8.500 (215.90)	8.750 (222.25)	8.750 (222.25)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XA	Std.	5.625 (142.88)	5.438 (138.11)	5.750 (146.05)	6.875 (174.63)	6.875 (174.63)	7.250 (184.15)	8.000 (203.20)	8.562 (217.47)	8.562 (217.47)
	O.S.	6.000 (152.40)	6.000 (152.40)	6.125 (155.58)	7.125 (180.98)	7.125 (180.98)	7.500 (190.50)	8.250 (209.55)	8.813 (223.84)	8.813 (223.84)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

All dimensions in inches (mm)

Code 48 Detachable Eye Mounts (MP4)

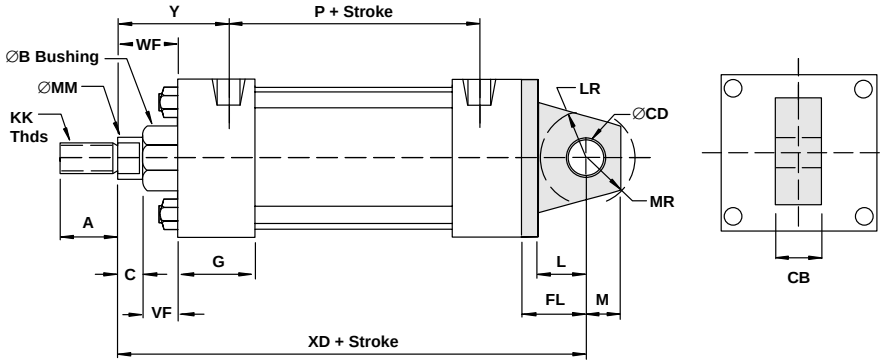


These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.

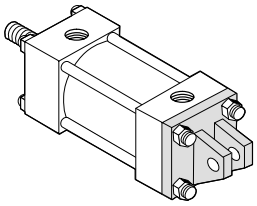


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CB		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
FL		1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
L		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
LR		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
M		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
MR		.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)	1.188 (30.16)	1.188 (30.16)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XD	Std.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.500 (190.50)	7.500 (190.50)	7.750 (196.85)	8.875 (225.43)	9.000 (228.60)	9.000 (228.60)
	O.S.	6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.750 (196.85)	7.750 (196.85)	8.000 (203.20)	9.125 (231.78)	9.250 (234.95)	9.250 (234.95)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

All dimensions in inches (mm)

Code 50 Detachable Clevis

(MP2)

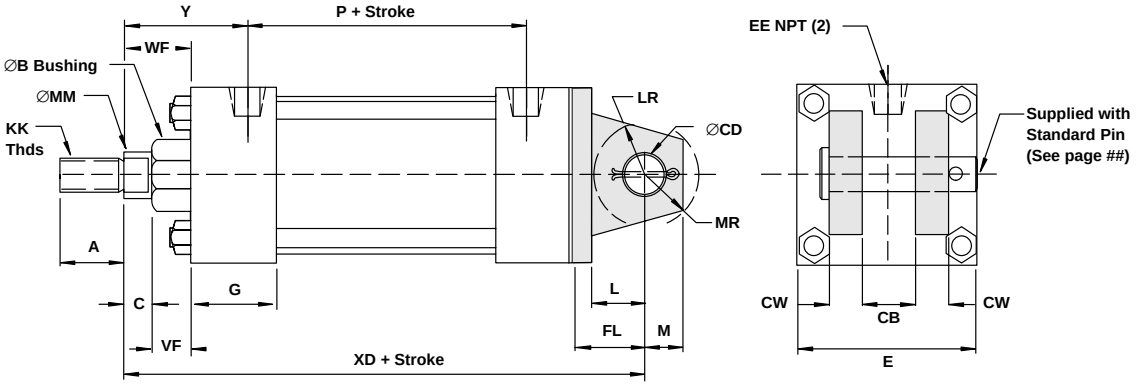


These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. Any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.

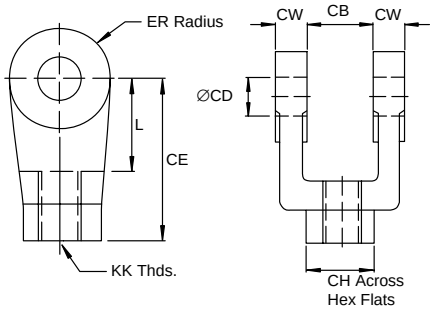


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CB		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
CD		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
CW		.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
E		2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)	5.500 (139.70)	6.500 (165.10)	7.500 (190.50)	8.500 (215.90)
EE		.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)
FF	Std.	5/8 – 18	5/8 – 18	5/8 – 18	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12
	O.S.	1 – 14	1 – 14	1 – 14	1-3/8 – 12	1-3/8 – 12	1-3/8 – 12	1-3/4 – 12	1-3/4 – 12	1-3/4 – 12
FL		1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
G		1.500 (38.10)	1.500 (38.10)	1.500 (38.10)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
J		1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
K		.250 (6.35)	.313 (7.94)	.313 (7.94)	.375 (9.53)	.375 (9.53)	.438 (11.11)	.438 (11.11)	.563 (14.29)	.563 (14.29)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
L		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
LB		3.625 (92.08)	3.625 (92.08)	3.750 (95.25)	4.250 (107.95)	4.250 (107.95)	4.500 (114.30)	5.000 (127.00)	5.125 (130.18)	5.125 (130.18)
LR		.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
M		.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
MM	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
	O.S.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)	1.750 (44.45)
MR		.625 (15.88)	.625 (15.88)	.625 (15.88)	.938 (23.81)	.938 (23.81)	.938 (23.81)	1.188 (30.16)	1.188 (30.16)	1.188 (30.16)
P		2.313 (58.74)	2.313 (58.74)	2.438 (61.91)	2.625 (66.68)	2.625 (66.68)	2.875 (73.03)	3.125 (79.38)	3.250 (82.55)	3.250 (82.55)
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
WF	Std.	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)
XD	Std.	5.750 (146.05)	5.750 (146.05)	5.875 (149.23)	7.500 (190.50)	7.500 (190.50)	7.750 (196.85)	8.875 (225.43)	9.000 (228.60)	9.000 (228.60)
	O.S.	6.125 (155.58)	6.125 (155.58)	6.250 (158.75)	7.750 (196.85)	7.750 (196.85)	8.000 (203.20)	9.125 (231.78)	9.250 (234.95)	9.250 (234.95)
Y	Std.	1.875 (47.63)	1.875 (47.63)	1.875 (47.63)	2.438 (61.91)	2.438 (61.91)	2.438 (61.91)	2.813 (71.44)	2.813 (71.44)	2.813 (71.44)
	O.S.	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.688 (68.26)	2.688 (68.26)	2.688 (68.26)	3.063 (77.79)	3.063 (77.79)	3.063 (77.79)

All dimensions in inches (mm)

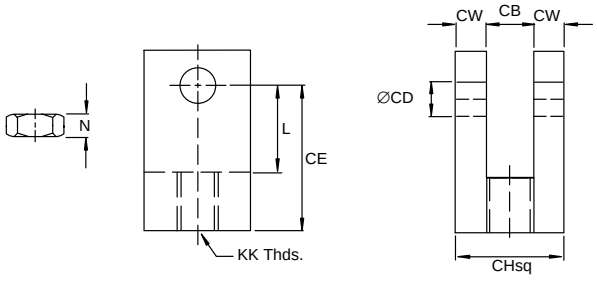
Accessories for 1-1/2 thru 8 inch Bore Cylinders

NFPA Rod Clevis



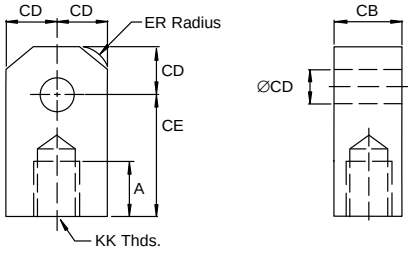
	VP62008A	VP62008B	VP6200CA	VP62010A	VP62016A
CB	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
CE	1.500 (38.10)	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)	4.125 (104.78)
CH	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CW	.500 (12.70)	.500 (12.70)	.625 (15.88)	.750 (19.05)	1.000 (25.40)
ER	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
KK	7/16–20	1/2–20	3/4–16	1–14	1-1/4–12
L	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)

Small Rod Clevis & Jam Nut



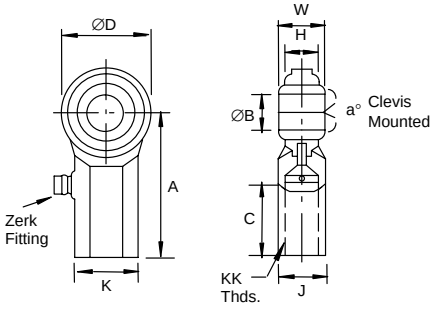
	VP62008C	VP6200CC
CB	.500 (12.70)	.750 (19.05)
CD	.500 (12.70)	.750 (19.05)
CE	1.375 (34.93)	1.750 (44.45)
CH	1.000 (25.40)	1.500 (38.10)
CW	.250 (6.35)	.375 (9.53)
KK	1/2–20	3/4–16
L	.750 (19.05)	1.000 (25.40)
N	.375 (9.53)	.500 (12.70)

NFPA Rod Eye



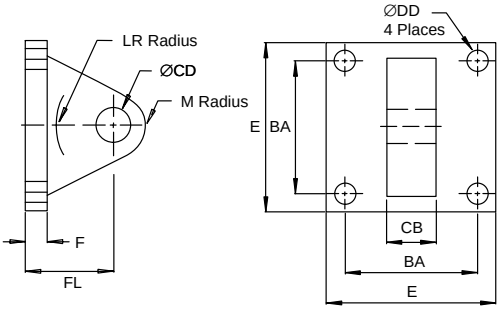
	VP60008A	VP60008C	VP6000CA	VP60010A	VP60016A
CB	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
CE	1.500 (38.10)	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)	4.125 (104.78)
ER	.5)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
L	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)

Spherical Rod Eye



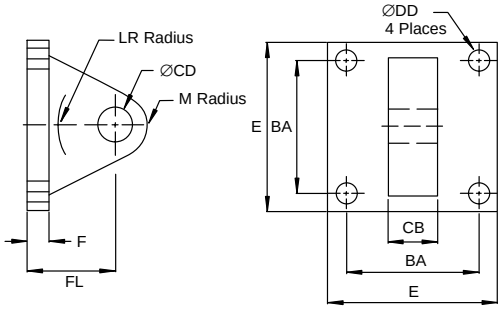
		VP62008C	VP6200CC	VP60010B
Bore		1-1/2 & 2-1/2	3-1/4 , 4 & 5	6 & 8
a°	Misalign. Angle	12	14	14
A	± .015	2.125 (53.98)	2.875 (73.03)	4.125 (104.78)
B	+.0025 / –.0005	.500 (12.70)	.750 (19.05)	1.000 (25.40)
C	+.062 / –.031	1.062 (26.97)	1.562 (39.67)	2.125 (53.98)
D	± .010	1.312 (33.32)	1.750 (44.45)	2.750 (69.85)
H	REF.	.453 (11.51)	.593 (15.06)	1.000 (25.40)
J	± .010	.750 (19.05)	1.000 (25.40)	1.500 (38.10)
K	± .010	.875 (22.23)	1.125 (28.58)	1.625 (41.28)
KK	UNF-2B	1/2-20	3/4-16	1-14
W	+.000 / –.005	.625 (15.88)	.875 (22.23)	1.375 (34.93)

NFPA Eye Bracket



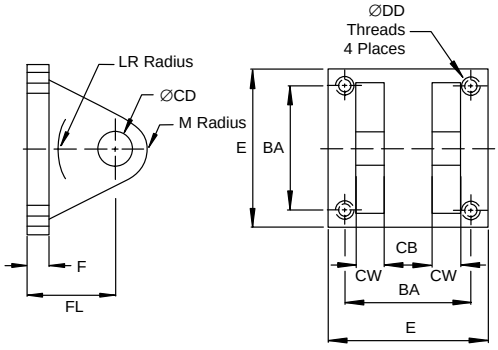
	VP62008A	VP62008B	VP6200CA	VP62010A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)	3.812 (96.82)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
DD	.406 (10.31)	.531 (13.49)	.656 (16.66)	.656 (16.66)
E	2.500 (63.50)	3.500 (88.90)	4.500 (114.30)	5.000 (127.00)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)	.875 (22.23)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)	3.000 (76.20)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.125 (53.98)

Alternate Eye Bracket



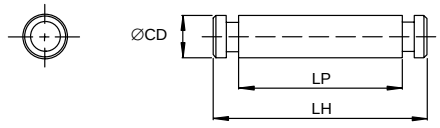
	VP78008B	VP78008C	VP78008D	VP7800CB	VP7800CC
BA	1.437 (36.50)	1.844 (46.84)	2.187 (55.55)	2.937 (74.60)	3.562 (90.47)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
DD	.281 (7.14)	.343 (8.71)	.343 (8.71)	.469 (11.91)	.469 (11.91)
E	2.000 (50.80)	2.500 (63.50)	3.000 (76.20)	3.750 (95.25)	4.500 (114.30)
F	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)
FL	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.750 (44.45)	1.750 (44.45)
LR	.562 (14.27)	.562 (14.27)	.562 (14.27)	1.000 (25.40)	1.000 (25.40)
M	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)

NFPA Clevis Bracket



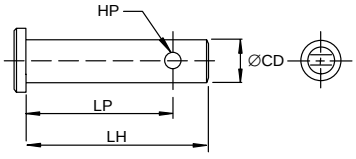
	VP61008A	VP6100CA	VP61010A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)
DD	3/8 – 24	1/2 – 20	5/8 – 18
E	2..500 (63.50)	3.500 (88.90)	4.500 (114.30)
F	.375 (9.53)	.625 (15.88)	.750 (19.05)
FL	1.125 (28.58)	1.875 (47.63)	2.250 (57.15)
LR	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
M	.500 (12.70)	.812 (20.62)	1.000 (25.40)

NFPA Pin



	VP83008A	VP8300CA	VP83010A
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
LH	2.219 (56.36)	3.125 (79.38)	3.750 (95.25)
LP	1.875 (47.63)	2.750 (69.85)	3.250 (82.55)

Alternate Eye Bracket



	VP83008B	VP83008C	VP83008CB	VP8300CC	VP83010B	VP83016B
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)	1.000 (25.40)	1.375 (34.93)
HP	.156 (3.96)	.156 (3.96)	.156 (3.96)	.156 (3.96)	.203 (5.16)	.250 (6.35)
LH	1.421 (36.09)	2.250 (57.15)	2.000 (50.80)	3.000 (76.20)	3.500 (88.90)	5.000 (127.00)
LP	1.266 (32.16	2.093 (53.16)	1.843 (46.81)	2.843 (72.21)	3.297 (83.74)	4.500 (114.30)

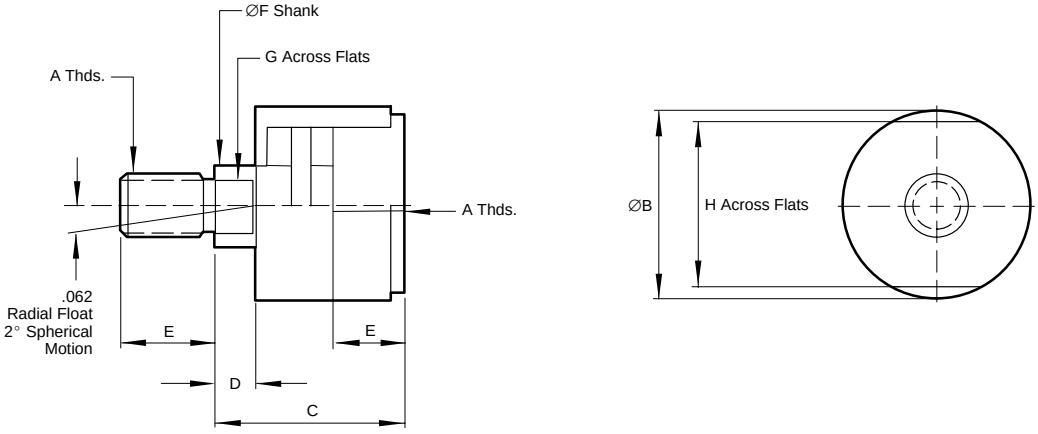
All dimensions in inches (mm)

Rod Alignment Coupler

TheRod Alignment Coupler allows 1/16 inch of radial float and 2° of spherical movement. This prevents cylinder binding due to misalignment thus extending bearing and seal life, and permits greater tolerance between the centerline of the cylinder and mating part for simplified installation.

NOTE

A Rod Alignment Coupler is not recommended for unbuided loads.



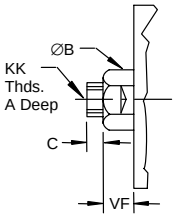
	7756A-1/4-28	7756A-5/16-24	7756A-3/8-24	7756A-7/16-20	7756A-1/2-20	7756A-5/8-18	7756A-3/4-16	7756A-7/8-14	7756A-1-14	7756A-1-1/4-12	7756A-1-1/2-12	7756A-1-3/4-12
A	1/4 – 28	5/16 – 24	3/8 – 24	7/16 – 20	1/2 – 20	5/8 – 18	3/4 – 16	7/8 – 14	1 – 14	1-1/4 – 12	1-1/2 – 12	1-3/4 – 12
B	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	1.750 (44.45)	1.750 (44.45)	2.500 (63.50)	2.500 (63.50)	3.250 (82.50)	3.250 (82.50)
C	1.250 (31.75)	1.250 (31.75)	1.250 (31.75)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)	2.312 (58.72)	2.312 (58.72)	2.937 (74.60)	2.937 (74.60)	4.375 (111.13)	4.375 (111.13)
D	.250 (6.35)	.250 (6.35)	.250 (6.35)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)
E	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	2.250 (57.15)	2.250 (57.15)
F	.312 (7.92)	.312 (7.92)	.375 (9.53)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.969 (24.61)	.969 (24.61)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	1.750 (44.45)
G	.187 (4.75))	.250 (6.35)	.312 (7.92)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.812 (20.62)	.812 (20.62)	1.156 (29.36)	1.156 (29.36)	1.500 (38.10)	1.500 (38.10)
H	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	2.250 (57.15)	2.250 (57.15)	3.000 (76.20)	3.000 (76.20)
Max Pull lbs. (kg)	1,500 (680)	2,075 (941)	2,075 (941)	2,500 (1134)	3,500 (1588)	4,750 (2155)	8,500 (3856)	9,750 (4423)	16,000 (7258)	19,500 (8845)	33,500 (15196)	33,500 (15196)

Optional Rod Ends for 1-1/2 thru 8 inch Bore Cylinders

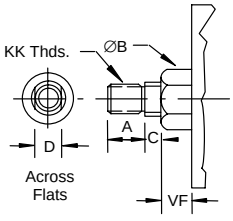
Rod End Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

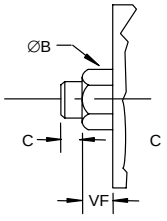
Five different inch rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and define your requirements.



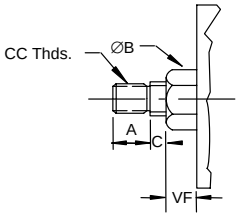
Type 2
Female
UN Thread



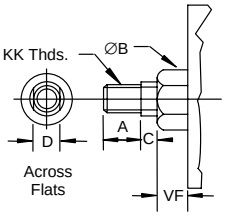
Type 5
Small Male
UN Thread



Type 6
Plain
No Attachment



Type 9
Intermediate Male
UN Thread



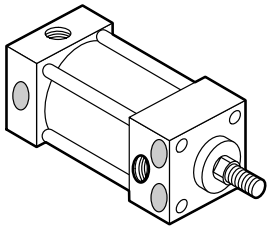
Type S
Studded Female
UN Thread

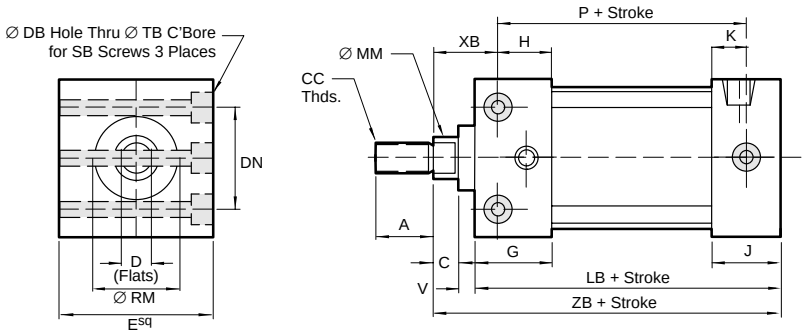
Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅ Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/4″ (44.45)	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)
	O.S.	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.625 (41.28)	1.625 (41.28)	1.625 (41.28)	2.000 (50.80)	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.124 (28.55)	1.124 (28.55)	1.124 (28.55)	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)
	O.S.	1.499 (38.08)	1.499 (38.08)	1.499 (38.08)	1.999 (50.78)	1.999 (50.78)	1.999 (50.78)	2.374 (60.30)	2.374 (60.30)	2.374 (60.30)
C	Std.	.375 (9.53)	.375 (9.53)	.375 (9.53)	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.750 (19.05)	.750 (19.05)	.750 (19.05)
CC	Std.	1/2 – 20	1/2 – 20	1/2 – 20	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
	O.S.	7/8 – 14	7/8 – 14	7/8 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12	1-1/2 – 12	1-1/2 – 12	1-1/2 – 12
D	Std.	.500 (12.70)	.500 (12.70)	.500 (12.70)	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
	O.S.	.813 (20.64)	.813 (20.64)	.813 (20.64)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)	1.500 (38.10)	1.500 (38.10)	1.500 (38.10)
KK	Std.	7/16 – 20	7/16 – 20	7/16 – 20	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14
	O.S.	3/4 – 16	3/4 – 16	3/4 – 16	1 – 14	1 – 14	1 – 14	1-1/4 – 12	1-1/4 – 12	1-1/4 – 12
VF	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)
	O.S.	.875 (22.23)	.875 (22.23)	.875 (22.23)	1.000 (25.40)	1.000 (25.40)	1.000 (25.40)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)

All dimensions in inches (mm)

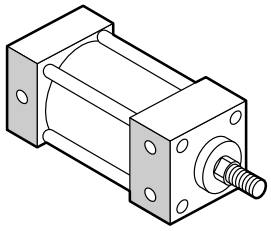
3/4 & 1-1/8 inch Bore Cylinders and Mounts

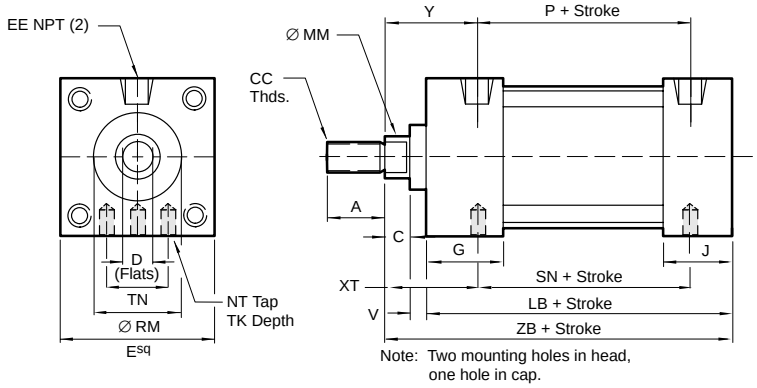
Code 01 Bolt Thru Mounts
(ANSI MS8)





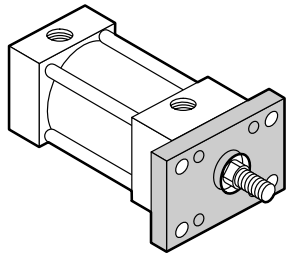
Code 02 Tapped Mounts
(ANSI MS9)

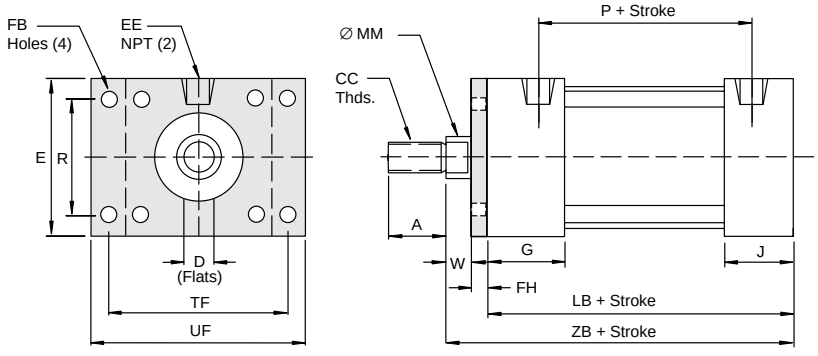




Note: Two mounting holes in head, one hole in cap.

Code 07 Head Rectangular Flange Mounts (ANSI MF1)



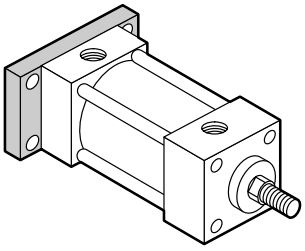


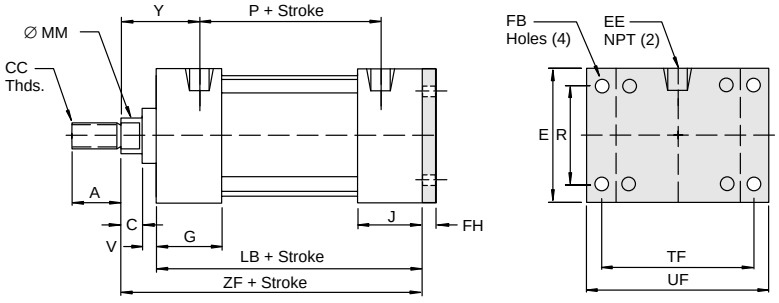
Dimension		01 Bolt Thru Mounts (MS8)		02 Bolt Thru Mounts (MS8)		07 Head Rect. Flange Mounts (MF1)	
		3/4″	1-1/8″	3/4″	1-1/8″	3/4″	1-1/8″
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	–	.750 (19.05)	–	.750 (19.05)	–	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CC	Std.	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24
	O.S.	–	1/2 – 20	–	1/2 – 20	–	1/2 – 20
D	Std.	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)
	O.S.	–	.437 (11.10)	–	.437 (11.10)	–	.437 (11.10)
DB		.172 (4.37)	.203 (5.16)	–	–	–	–
DN		.625 (15.88)	1.000 (25.40)	–	–	–	–
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)	–	–
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	–	–
FB		–	–	–	–	.219 (5.56)	.219 (5.56)
FH		–	–	–	–	.250 (6.35)	.250 (6.35)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
H		.687 (17.45)	.625 (15.88)	–	–	–	–
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
K		.375 (9.53)	.375 (9.53)	–	–	–	–
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
MM	Std.	.307 (7.80)	.307 (7.80)	.307 (7.80)	.307 (7.80)	.307 (7.80)	.307 (7.80)
	O.S.	–	.495 (12.57)	–	.495 (12.57)	–	.495 (12.57)
NT		–	–	8 – 32	10 – 32	–	–
P		–	–	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
R		–	–	–	–	.500 (12.70)	1.000 (25.40)
RM	Std.	.562 (14.27)	.750 (19.05)	.562 (14.27)	.750 (19.05)	–	–
	O.S.	–	1.000 (25.40)	–	1.000 (25.40)	–	–
SB		#8	#10	–	–	–	–
SN		–	–	1.812 (46.02)	1.750 (44.45)	–	–
TB		.281 (7.14)	.328 (8.33)	–	–	–	–
TF		–	–	–	–	1.500 (38.10)	2.000 (56.80)
TK		–	–	.187 (4.87)	.250 (6.35)	–	–
TN		–	–	.625 (15.88)	1.000 (25.40)	–	–
UF		–	–	–	–	2.000 (56.80)	2.500 (63.50)
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XT		–	–	.562 (14.27)	.625 (15.88)	–	–
W		–	–	–	–	.125 (3.18)	.125 (3.18)
XB		.562 (14.27)	.625 (15.88)	–	–	–	–
Y		–	–	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)
ZB		–	–	2.625 (66.68)	2.625 (66.68)	2.625 (66.68)	2.625 (66.68)

All dimensions in inches (mm)

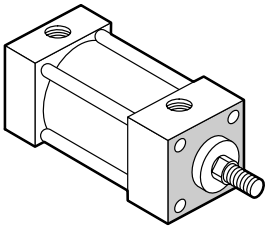
3/4 & 1-1/8 inch Bore Cylinders and Mounts

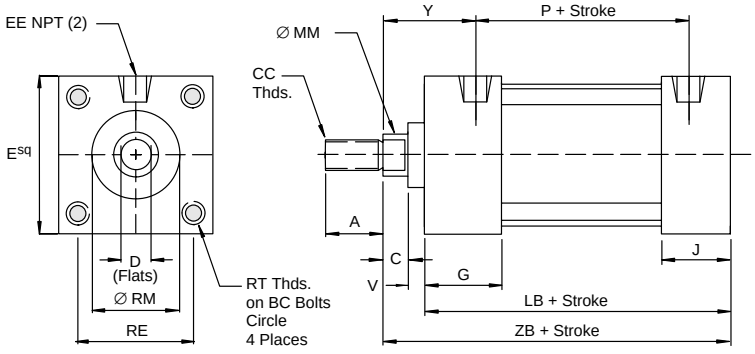
Code 12 Cap Rectangular Flange Mounts (ANSI MF2)



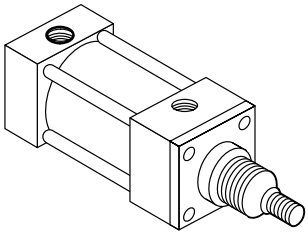


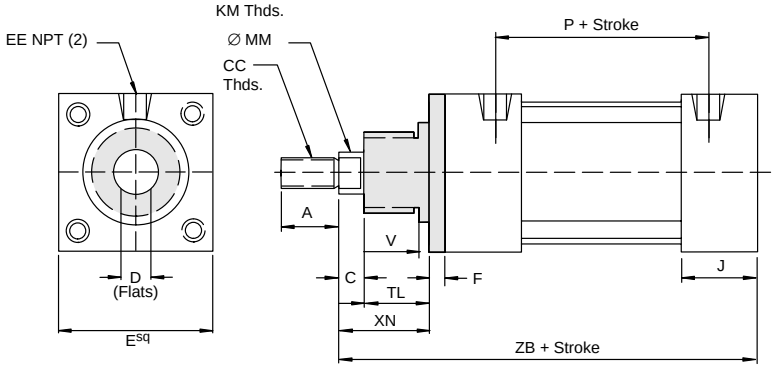
Code 18 Head Tapped Face Mounts (ANSI MR1)





Code 20 Threaded Nose Mounts (ANSI MNR1)



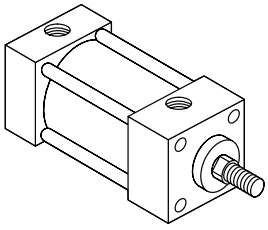


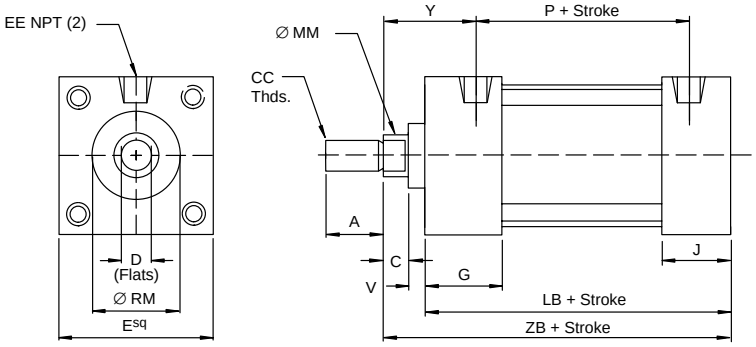
Dimension		12 Cap. Rect. Flange Mounts (MF2)		18 Head Tapped Face Mounts (MR1)		20 Threaded Nose Mounts (MNR1)	
		3/4″	**1-1/8″**	**3/4″**	**1-1/8″**	**3/4″**	**1-1/8″**
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	–	.750 (19.05)	–	.750 (19.05)	–	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CC	Std.	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24
	O.S.	–	1/2 – 20	–	1/2 – 20	–	1/2 – 20
D	Std.	–	–	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)
	O.S.	–	–	–	.437 (11.10)	–	.437 (11.10)
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
F		–	–	–	–	.250 (6.35)	.250 (6.35)
FB		.219 (5.56)	.219 (5.56)	–	–	–	–
FH		.250 (6.35)	.250 (6.35)	–	–	–	–
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
KM		–	–	–	–	5/8 – 18	1 – 14
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
MM	Std.	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)
	O.S.	–	.495 (12.57)	–	.495 (12.57)	–	.495 (12.57)
P		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
R		.500 (12.70)	1.000 (25.40)	–	–	–	–
RE		.750 (19.05)	1.125 (28.58)	.750 (19.05)	1.125 (28.58)	–	–
RM	Std.	–	–	.625 (15.88)	.750 (19.05)	.625 (15.88)	1.062 (26.97)
	O.S.	–	–	–	–	–	–
RT		–	–	8 – 32	10 – 32	–	–
TF		1.500 (38.10)	2.000 (50.80)	–	–	–	–
TL		–	–	–	–	.625 (15.88)	.875 (22.23)
UF		2.000 (50.80)	2.500 (63.50)	–	–	–	–
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XN		–	–	–	–	.875 (22.23)	1.125 (28.58)
Y		.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)
ZB		–	–	2.625 (66.68)	2.625 (66.68)	3.375 (85.73)	3.625 (92.08)
ZF		2.875 (73.03)	2.875 (73.03)	–	–	–	–

All dimensions in inches (mm)

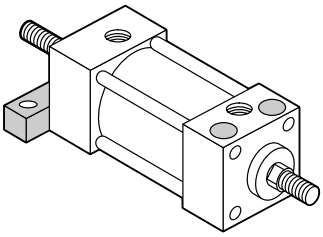
3/4 & 1-1/8 inch Bore Cylinders and Mounts

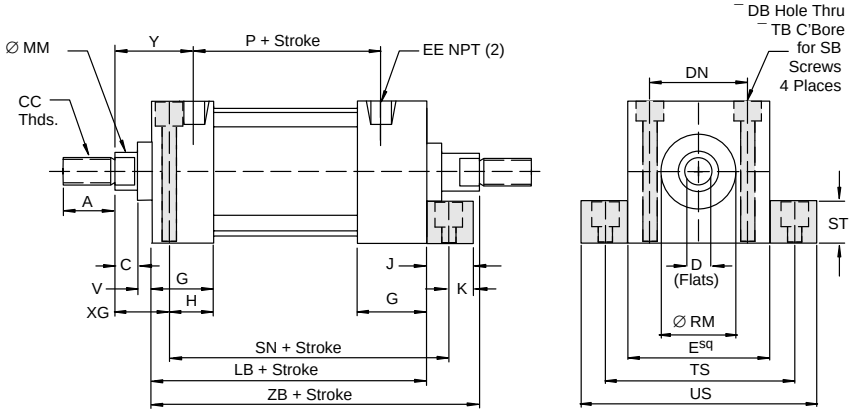
Code 24 No Mounts
(ANSI MX0)



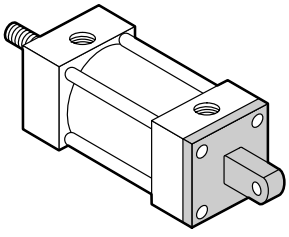


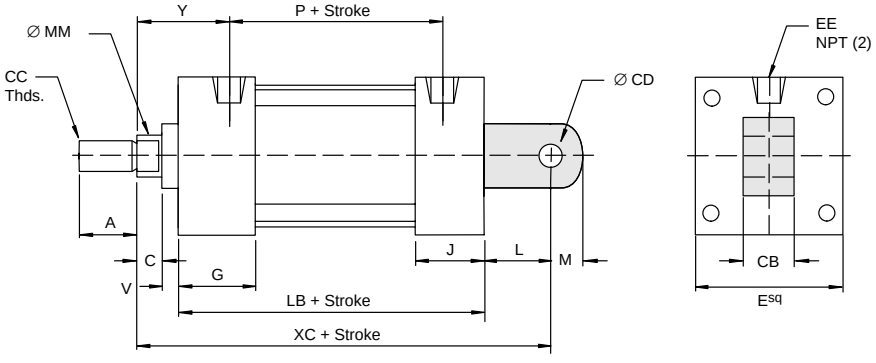
Code 25 Double Rod, Bolt Thru Mounts





Code 47 Fixed Eye Mounts
(ANSI MP3)



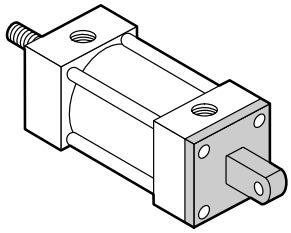


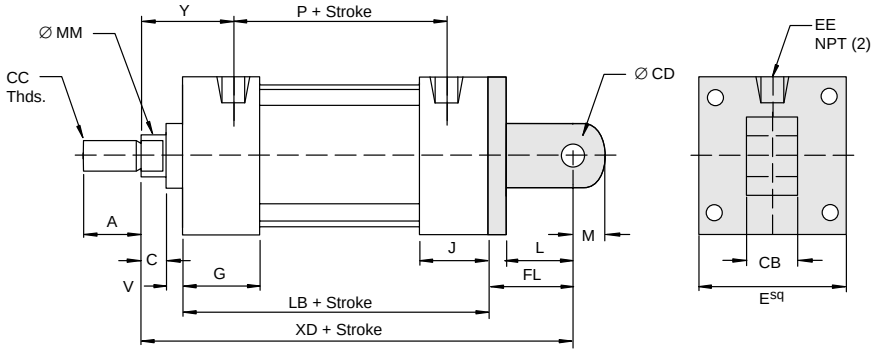
Dimension		24 No Mount (MX0)		25 Double Rod Bolt Thru Mounts (MS8)		47 Fixed Eye Mounts (MP3)	
		3/4″	1-1/8″	3/4″	1-1/8″	3/4″	1-1/8″
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	–	.750 (19.05)	–	.750 (19.05)	–	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CB		–	–	–	–	.250 (6.35)	.375 (9.53)
CC	Std.	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24
	O.S.	–	1/2 – 20	–	1/2 – 20	–	1/2 – 20
CD		–	–	–	–	.250 (6.35)	.375 (9.53)
D	Std.	.250 (6.35)	.312 (7.92)	.250 (6.35)	.312 (7.92)	.250 (6.35)	–
	O.S.	–	.437 (11.10)	–	.437 (11.10)	–	–
DB		–	–	.172 (4.37)	.203 (5.16)	–	–
DN		–	–	.625 (15.88)	1.000 (25.40)	–	–
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
H		–	–	.687 (17.45)	.625 (15.88)	–	–
J		.625 (15.88)	.625 (15.88)	.500 (12.70)	.500 (12.70)	.625 (15.88)	.625 (15.88)
K		–	–	.250 (6.35)	.250 (6.35)	–	–
L		–	–	–	–	.437 (11.10)	.437 (11.10)
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
M		–	–	–	–	.250 (6.53)	.375 (9.53)
MM	Std.	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)
	O.S.	–	.495 (12.57)	–	.495 (12.57)	–	.495 (12.57)
P		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
RM	Std.	.562 (14.27)	.750 (19.05)	.625 (15.88)	.750 (19.05)	–	–
	O.S.	–	1.000 (25.40)	–	1.000 (25.40)	–	–
SB		–	–	#8	#10	–	–
SD		–	–	2.562 (65.07)	2.500 (63.50)	–	–
ST		–	–	.375 (9.53)	.375 (9.53)	–	–
TB		–	–	.281 (7.14)	.328 (8.33)	–	–
TS		–	–	1.375 (34.93)	1.875 (47.63)	–	–
US		–	–	1.750 (44.45)	2.250 (57.15)	–	–
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XC		–	–	–	–	3.062 (77.77))	3.062 (77.77))
XG		–	–	.562 (14.27)	.625 (15.88)	–	–
Y		.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)
ZB		2.625 (66.68)	2.625 (66.68)	3.250 (82.55)	3.250 (82.55)	–	–

All dimensions in inches (mm)

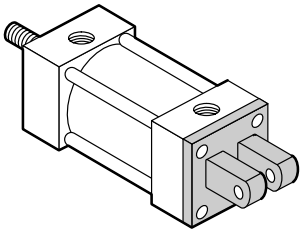
3/4 & 1-1/8 inch Bore Cylinders and Mounts

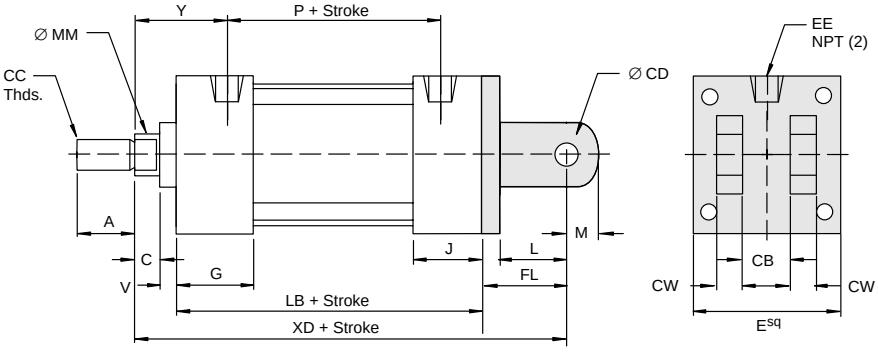
Code 48 Detachable Eye Mounts (ANSI MP4)





Code 50 Detachable Clevis Mounts (ANSI MP2)





Dimension		48 Detachable Eye Mounts (MP4)		50 Detachable Clevis Mounts (MP2)	
		3/4″	1-1/8″	3/4″	1-1/8″
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
	O.S.	–	.750 (19.05)	–	.750 (19.05)
C		.250 (6.35)	.250 (6.35)	.250 (6.35)	.250 (6.35)
CB		.250 (6.35)	.375 (9.53)	.250 (6.35)	.375 (9.53)
CC	Std.	1/4 – 28	3/8 – 24	1/4 – 28	3/8 – 24
	O.S.	–	1/2 – 20	–	1/2 – 20
CD		.250 (6.35)	.375 (9.53)	.250 (6.35)	.375 (9.53)
D	Std.	.250 (6.35)	.312 (7.92)	–	–
	O.S.	–	.437 (11.10)	–	–
E		1.000 (25.40)	1.500 (38.10)	1.000 (25.40)	1.500 (38.10)
EE		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
FL		.937 (23.80)	1.125 (28.58)	1.125 (28.58)	1.125 (28.58)
G		.875 (22.23)	.875 (22.23)	.875 (22.23)	.875 (22.23)
J		.625 (15.88)	.625 (15.88)	.625 (15.88)	.625 (15.88)
L		.437 (11.10)	.625 (15.88)	.625 (15.88)	.625 (15.88)
LB		2.250 (57.15)	2.250 (57.15)	2.250 (57.15)	2.250 (57.15)
M		.250 (6.35)	.375 (9.53)	.250 (6.35)	.375 (9.53)
MM	Std.	.307 (7.80)	.370 (9.40)	.307 (7.80)	.370 (9.40)
	O.S.	–	.495 (12.57)	–	.495 (12.57)
P		1.375 (34.93)	1.375 (34.93)	1.375 (34.93)	1.375 (34.93)
V		.125 (3.18)	.125 (3.18)	.125 (3.18)	.125 (3.18)
XD		3.562 (90.47)	3.750 (95.25)	3.750 (95.25)	3.750 (95.25)
Y		.938 (23.83)	.938 (23.83)	.938 (23.83)	.938 (23.83)

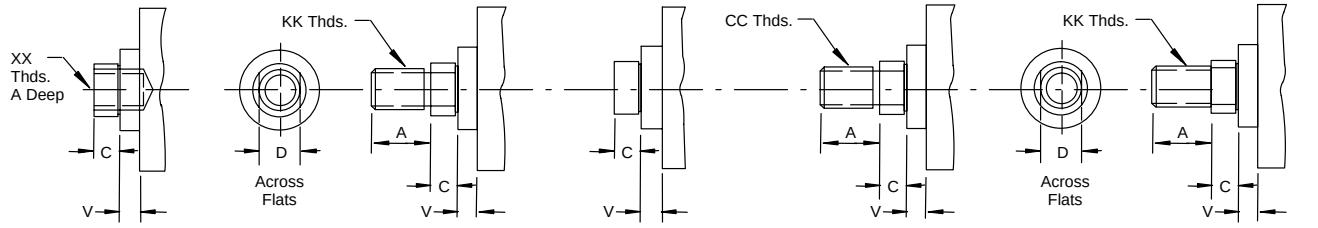
All dimensions in inches (mm)

Rod Ends for 3/4 & 1-1/8 inch Bore Cylinders

Rod End Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

Three different inch rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and define your requirements.



Type 2
Optional Female

Type 5
Standard Male

Type 6
Optional Plain

Type 9
Optional Male

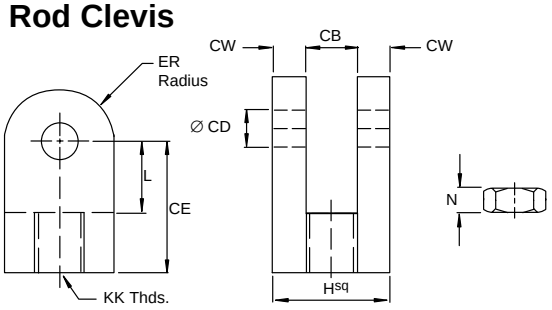
Type S
Optional Studded

Dimension		Standard & Optional Rod Ends	
		3/4″	1-1/8″
∅ Rod	Std.	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)
	O.S.	–	.750 (19.05)
C		.250 (6.35)	.250 (6.35)
CC	Std.	5/16 – 24	3/8 – 24
	O.S.	–	1/2 – 20
D	Std.	.250 (6.35)	.312 (7.92)
	O.S.	–	.437 (11.10)
KK	Std.	1/4 – 28	5/16 – 24
	O.S.	–	7/16 – 20
V		.125 (3.18)	.125 (3.18)
XX	Std.	10 – 32	1/4 – 28
	O.S.	–	3/8 – 24

All dimensions in inches (mm)

Accessories for 3/4 & 1-1/8 inch Bore Cylinders

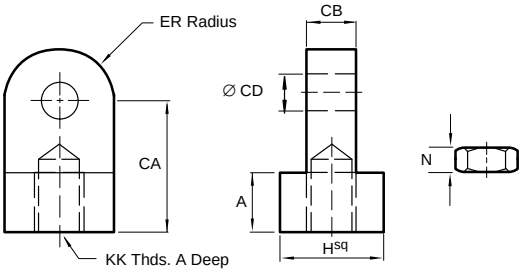
Rod Clevis



	3/4″		1-1/8″	
	VP62004A*	VP62004B*	VP62006A*	VP62006B*
CB	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
CD	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
CE	.812 (20.60)	.812 (20.60)	.875 (22.23)	.875 (22.23)
CW	.125 (3.18)	.125 (3.18)	.187 (4.75)	.187 (4.75)
ER	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
H	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
KK	1/4 – 28	5/16 – 24	3/8 – 24	1/2 – 20
L	.500 (12.70)	.500 (12.70)	.500 (12.70)	.500 (12.70)
N	.156 (3.96)	.187 (4.75)	.219 (5.56)	.312 (7.92)

*Includes Jam Nut

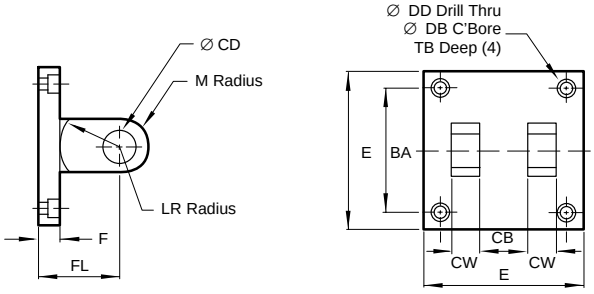
Rod Eye



	3/4″		1-1/8″	
	VP60004A*	VP60004B*	VP60006A*	VP60006B*
A	.312 (7.92)	.312 (7.92)	.437 (11.10)	.437 (11.10)
CA	.750 (19.05)	.750 (19.05)	.875 (22.23)	.875 (22.23)
CB	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
CD	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
ER	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
H	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
KK	1/4 – 28	5/16 – 24	3/8 – 24	1/2 – 20
N	.156 (3.96)	.187 (4.75)	.219 (5.56)	.312 (7.92)

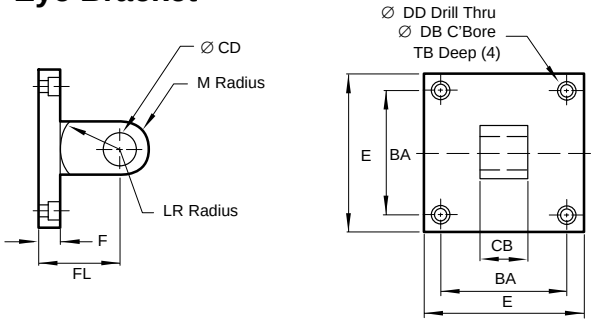
*Includes Jam Nut

Clevis Bracket



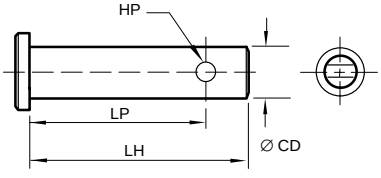
	3/4″	1-1/8″
	VP61004A	VP61006A
BA	.750 (19.05)	1.125 (28.58)
CB	.250 (6.35)	.375 (9.53)
CD	.250 (6.35)	.375 (9.53)
CW	.250 (6.35)	.250 (6.35)
DB	.250 (6.35)	.328 (8.33)
DD	.156 (3.96)	.203 (5.16)
E	1.000 (25.40)	1.500 (38.10)
F	.500 (12.70)	.500 (12.70)
FL	1.125 (28.58)	1.125 (28.58)
LR	.437 (11.10)	.625 (15.88)
M	.250 (6.35)	.375 (9.53)
TB	.125 (3.18)	.250 (6.53)

Eye Bracket



	3/4″	1-1/8″
	VP78004A	VP78006A
BA	.750 (19.05)	1.125 (28.58)
CB	.250 (6.35)	.375 (9.53)
CD	.250 (6.35)	.375 (9.53)
DB	.250 (6.35)	.328 (8.33)
DD	.156 (3.96)	.203 (5.16)
E	1.000 (25.40)	1.500 (38.10)
F	.500 (12.70)	.500 (12.70)
FL	.937 (23.80)	1.125 (28.58)
LR	.437 (11.10)	.625 (15.88)
M	.250 (6.35)	.375 (9.53)
TB	.125 (3.18)	.250 (6.53)

Clevis Pin



	3/4″		1-1/8″	
	VP83004B	VP83004C	VP83006B	VP83006C
CD	.250 (6.35)	.250 (6.35)	.375 (9.53)	.375 (9.53)
HP	.094 (2.39)	.094 (2.39)	.156 (3.96)	.156 (3.96)
LH	.750 (19.05)	1.000 (25.40)	1.094 (27.79)	1.250 (31.75)
LP	.656 (16.66)	.906 (23.01)	.937 (23.80)	1.032 (26.21)
Use w/	VP62004A	VP78004A	VP62006A	VP78006A
	VP620048	VP61004A	VP62006B	VP61006A
	–	VP60004A	–	VP60006A

All dimensions in inches (mm)

Switches for 3/4 thru 8 inch Bore Cylinders

Vickers utilizes a magnetically operated, non-contact sensing system consisting of a magnet in the piston, and a sensing switch clamped to the cylinder tie rod.

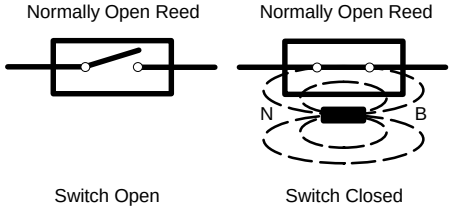
One or more switches may be mounted to provide an indication of piston position.

Switches use vinyl molded cable, and are supplied with adjustable mounting brackets allowing the switches to be securely positioned anywhere along the range of piston travel.

LED indicator lights facilitate installation and troubleshooting.

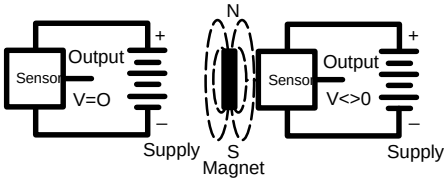
Reed Switch Working Principle

Reed switch sensors contain hermetically sealed reed elements (mechanical contacts) which are open in their normal state. When a magnetic field moves within proximity of the switch, magnetism is induced into the leads and forces the contacts to close.



Hall Effect/Magnetoresistive Working Principle

The solid state (no moving parts) magnetoresistive sensor responds to a parallel magnetic pole by providing a digital signal to the output control circuit. this technique enables the sensing of weak magnetic fields, with no limit to the maximum strength of the magnetic field.



Application Recommendations and Precautions

To provide maximum reliability:

1. Always stay within the specifications and power rating limitations of the unit installed.
2. Primary and control circuit wiring should not be mixed in the same conduit.

   Motors will produce high pulses that will be introduced into the control wiring if the wiring is carried in the same conduit.
3. Never connect the switch without a load present. The switch will be destroyed.
4. Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch Model PS7-24 whenever capacitive loading may occur.

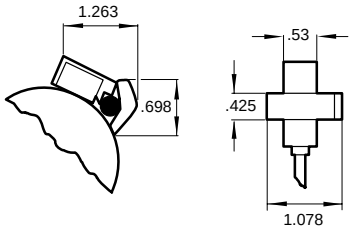
In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature, and (3) excessive ferrous filing or chip buildup.

Improper wiring may damage or destroy the switch. The wiring diagram, along with the listed power ratings, must be carefully observed before connecting power to the switch.

Lower power switches are designed for signaling electronic circuits. Do not use on relay loads or with incandescent bulbs. Resistive loads only.

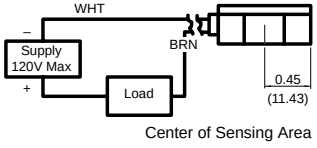
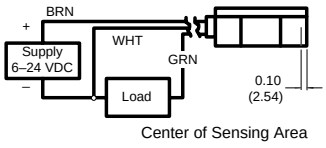
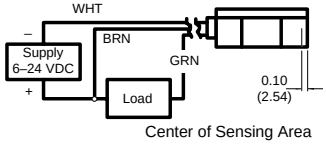
Switch and Mounting Bracket Dimensions

PS8-2 Series

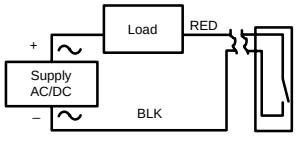
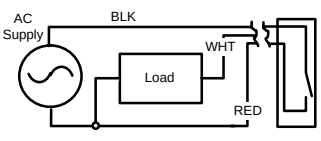
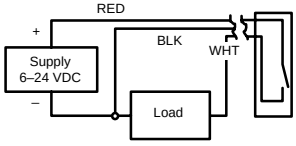
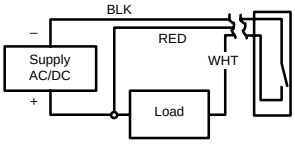


Specifications: 3/4 thru 2-1/2 inch Bores

*Metal Oxide Varsitor surge Suppression. **Note:** All PS7 and PS* Series Switches are supplied with 9 foot leads.

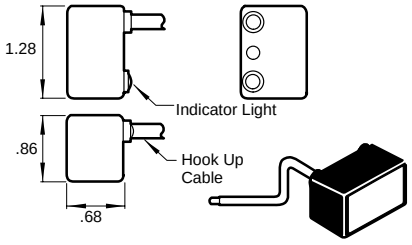
Switch Model	PS8-2-04 Reed	PS8-2-31 Hall	PS8-2-32 Hall
Bore Sizes	3/4″ thru 2-1/2″	3/4″ thru 2-1/2″	3/4″ thru 2-1/2″
Switch Type	Reed Switch *MOV & Light	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking PNP
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 VDC/VAC 50/60 Hz	6-24 VDC	6-24 VDC
Switching Current	.5 Amp Max .005 Amp Min	.5 Amp Max	.5 Amp Max
Switching Power	10 VA	12 Watts Max	12 Watts Max
Max Voltage Drop	3.5 Volts	.5 Volts	.5 Volts
Magnetic Sensitivity	85 Gauss	85 Gauss	85 Gauss
Enclosure Classification	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
Temperature Range	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F
Wiring Diagrams			

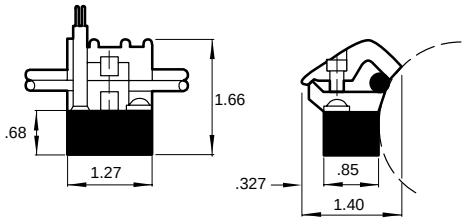
Specifications: 2 thru 8 inch Bores

PS7-04 Reed	PS7-24 Reed	PS7-31 Hall	PS7-32 Hall
2″ thru 8″	2″ thru 8″	2″ thru 8″	2″ thru 8″
Reed Switch *MOV & Light	Reed Switch *MOV & Light, 3 Wire	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking PNP
Normally Open	Normally Open	Normally Open	Normally Open
5-240 VDC/VAC 50/60 Hz	24-240 VAC 50/60 Hz	6-24 VAC	6-24 VAC
1 Amp Max	4 Amp Max 50 Amp Inrush	1 Amp Max	1 Amp Max
30 Watts Max	100 Watts Max	24 Watts Max	24 Watts Max
3 Volts	N/A	.5 Volts	.5 Volts
85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel	85 Gauss Parallel
NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved	NEMA 6 & CSA Approved
-22°F to +176°F	-22°F to +176°F	-22°F to +176°F	-22°F to +176°F
			

Note: For 8″ bore add **9** to part number. Example: PS7-**9**-04

PS7 Series





Technical Information

Operating Temperatures:

A Seal Code -40°F to 200°F (-40°C to 93°C)
T Seal Code -20°F to 400°F (-29°C to 204°C)

Operating Pressure:

250 psig air (17.2 bar)
400 psig hydraulic (27.6 bar)
Bore Sizes: 3/4″, 1-1/8″, 1-1/2″, 2″, 2-1/2″, 3-1/4″, 4″, 5″, 6″, 8″
Note: 3/4″ and 1-1/8″ bores are not rated for hydraulic service.

Supply:

Filtered compressed air to 250 psi
Petroleum based hydraulic fluid to 400 psi

Lubrication:

None required
Vickers VN/VP Air Cylinders are rated for “no lube added” service. All internal components are lubricated at time of assembly with a Teflon® based grease.

Series VP Materials:

Head and End Caps: anodized aluminum
Body: aluminum, clear anodized O.D., hard coat anodized I.D.
Rod: hard chrome plated steel
Piston: solid aluminum alloy
Rod Bearing: cast iron, Teflon® coated
Seals: urethane rod seal and wiper, nitrile piston seals
Tie Rods: steel

Alternate Series VN Materials:

Body: stainless steel
Rod: stainless steel
Rod Bearing: stainless steel
Tie Rods: stainless steel

Side Loading:

Cylinders are specifically designed to push and pull. Side loading of the piston rod should be avoided to ensure maximum operating performance and life.

Care should be taken during installation to properly align the load to be moved with the center line of the cylinder. The use of a rod alignment coupler (see page ##) is strongly recommended whenever possible.

Cylinder Weights

In pounds (kilograms)

Bore Inch (mm)	Rod Inch (mm)	Mounting Code 02, 24, 18	07	12, 13	23	01, 16, 17	45	10	03	08, 13, 50, 47	15, 48, 11	Add Per Inch of Stroke
1 1/2″ (38.10)	5/8″ (15.88)	1.9 (.86)	2.6 (1.18)	2.7 (.23)	2.1 (.95)	2.5 (1.13)	2.3 (1.04)	2.8 (1.27)	2.5 (1.13)	3.0 (1.36)	2.8 (1.27)	0.18 (.08)
2″ (50.80)	5/8″ (15.88)	2.8 (1.27)	3.9 (.77)	4.0 (1.81)	3.1 (1.41)	3.5 (1.59)	3.3 (1.50)	4.0 (1.81)	3.8 (1.72)	4.2 (1.91)	3.9 (1.77)	0.21 (.10)
	1″ (25.40)	3.4 (1.54)	4.4 (2.00)	4.6 (2.09)	3.7 (1.68)	4.1 (1.86)	3.9 (1.77)	4.6 (2.09)	4.4 (2.00)	4.8 (2.18)	4.5 (2.04)	0.35 (.16)
2 1/2″ (63.50)	5/8″ (15.88)	3.9 (.77)	5.3 (2.40)	5.5 (2.49)	4.1 (1.86)	4.6 (2.09)	4.4 (2.00)	5.3 (2.40)	5.3 (2.40)	5.5 (2.49)	5.3 (2.40)	0.23 (.10)
	1″ (25.40)	4.5 (2.04)	5.9 (2.68)	6.1 (2.77)	4.7 (2.13)	5.2 (2.36)	5.1 (2.31)	5.9 (2.68)	6.0 (2.72)	6.1 (2.77)	5.9 (2.68)	0.38 (.17)
3 1/4″ (82.55)	1″ (25.40)	7.3 (3.31)	10.8 (4.90)	11.1 (5.03)	7.7 (3.49)	8.9 (4.04)	8.2 (3.72)	11.1 (5.03)	9.7 (4.40)	11.8 (5.35)	11.4 (5.17)	0.42 (.19)
	1 3/8″ (34.93)	8.2 (3.72)	11.5 (5.22)	12.1 (5.49)	8.7 (3.95)	9.9 (4.50)	9.2 (4.17)	12.1 (5.49)	10.7 (4.85)	12.8 (5.80)	12.4 (5.62)	0.63 (.29)
4″ (101.60)	1″ (25.40)	9.8 (4.45)	14.8 (6.71)	15.1 (6.85)	10.2 (4.63)	11.5 (5.22)	10.9 (4.94)	14.8 (6.71)	13.3 (6.03)	15.5 (7.03)	15.2 (6.89)	0.45 (.20)
	1 3/8″ (34.93)	10.8 (4.90)	15.5 (7.03)	16.1 (7.30)	11.2 (5.08)	12.5 (5.67)	11.9 (5.40)	15.8 (7.17)	14.3 (6.49)	16.5 (7.48)	16.2 (7.35)	0.66 (.30)
5″ (127.00)	1″ (25.40)	15.1 (6.85)	22.7(10.30)	23.1(10.48)	16.1 (7.30)	18.7 (8.48)	17.6 (7.98)	22.2(10.07)	20.8 (9.43)	22.8(10.34)	22.5(10.21)	0.51 (.23)
	1 3/8″ (34.93)	16.2 (7.35)	23.5(10.66)	24.1(10.93)	17.2 (7.80)	19.7 (8.94)	18.6 (8.44)	23.2(10.52)	21.9 (9.93)	23.9(10.84)	23.5(10.70)	0.73 (.33)
6″ (152.40)	1 3/8″ (34.93)	23.5(16.19)	35.6(16.15)	36.3(16.47)	24.5(11.11)	27.3(12.38)	26.6(12.07)	35.7(10.66)	32.1(14.56)	37.0(16.78)	36.3(16.47)	0.77 (.35)
	1 3/4″ (44.45)	24.8(11.27)	36.9(16.77)	37.6(17.09)	25.8(11.73)	28.3(12.86)	27.9(12.68)	35.2(15.97)	33.4(15.18)	38.3(17.41)	37.6(17.09)	1.03 (.47)
7″ (177.80)	1 3/8″ (34.93)	32.1(14.56)	32.1(14.56)	32.1(14.56)	33.4(15.15)	33.5(15.20)	36.8(16.69)	36.5(16.59)	32.1(14.56)	48.9(22.18)	48.2(21.86)	1.00 (.45)
	1 3/4″ (44.45)	33.4(15.18)	33.4(15.18)	33.4(15.18)	34.7(15.77)	34.8(15.82)	38.1(17.32)	37.0(16.82)	33.4(15.18)	50.2(22.82)	49.5(22.50)	1.26 (.57)
8″ (203.20)	1 3/8″ (34.93)	40.0(18.14)	40.0(18.14)	40.0(18.14)	41.3(18.73)	41.4(18.78)	45.7(20.73)	43.0(19.50)	40.0(18.14)	60.5(27.44)	59.7(27.08)	1.06 (.48)
	1 3/4″ (44.45)	47.3(21.50)	41.3(18.77)	41.3(18.77)	42.6(19.36)	42.7(19.41)	47.0(21.36)	44.3(20.14)	41.3(18.77)	61.8(28.09)	61.0(27.73)	1.32 (.60)

All Dimensions in inches (mm). All Weights in pounds (kilograms).

Listed are the average breakaway pressures in psi for all Series VN/VP Cylinders.

If your application requires a lower breakaway pressure than indicated for a particular bore size, consult the factory.

Breakaway Pressures in PSI (bar)

Bore	A Seals		T Seals	
	Extend	Retract	Extend	Retract
3/4″	9 (.62)	10 (.69)	5 (.35)	6 (.41)
1 1/8″	6 (.41)	7 (.48)	3 (.21)	4 (.28)
1 1/2″, 2″, 2 1/2″	6 (.41)	7 (.48)	3 (.21)	4 (.28)
3 1/4″, 4″	4 (.28)	5 (.35)	2 (.14)	3 (.21)
5″, 6″, 8″	3 (.21)	4 (.28)	1 (.07)	2 (.14)

Note: Breakaway pressures were established with the cylinders mounted horizontally and no load on the piston rod.

Piston Rod Diameter Selection:

Applications requiring long extend (push) strokes may require oversize piston rod diameters to prevent buckling. To determine the correct rod diameter for your application, follow these simple steps:

1. Select the force from the **Cylinder Force and Volume Chart** that is required for your application.

   Force = Piston Surface Area × Operating Pressure

2. From the **Cylinder Mounting Diagrams** select the mounting style being used.

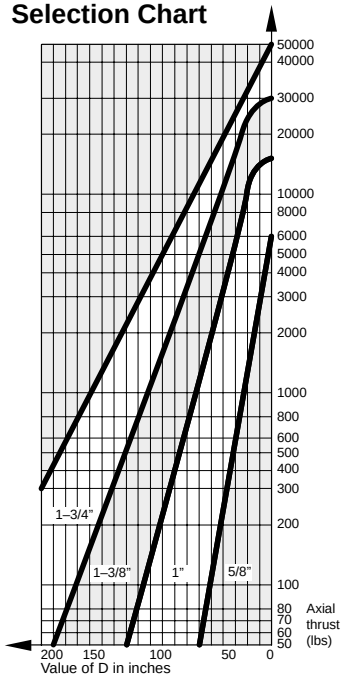
3. With the piston rod fully extended, calculate the value of D (in inches) using the formula shown or the cylinder mounting diagram selected in step #2.

4. Locate the value of D (in inches) at the bottom of the **Selection Chart**. Enter the chart at this point and move vertically upward until intersecting with the horizontal line representing the required thrust which was selected in step #1. The band within which these lines intersect represents the minimum recommended piston rod diameter.

Stop Tube Selection:

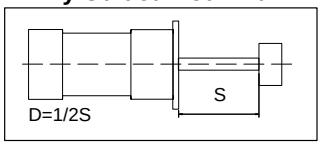
Stop tubes enhance the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension. When the value of D (calculated from the piston rod diameter selection instructions above) is less than 40″, a stop tube is not required. However, if D is 40″ or more, 1″ of stop tube is recommended for every 10″ (or fraction thereof) over 40″.

Selection Chart

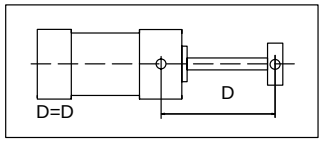


Cylinder Mounting Diagrams

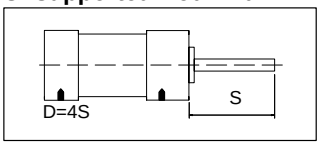
Firmly Guided Rod End



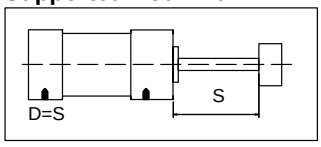
Head Trunnion



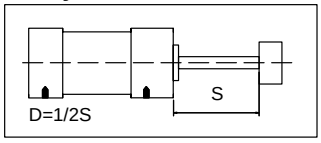
Unsupported Rod End



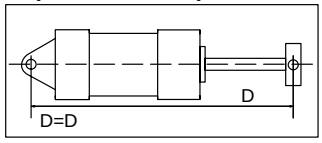
Supported Rod End



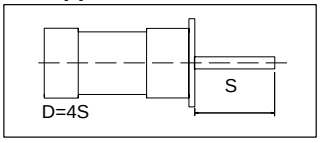
Firmly Guided Rod



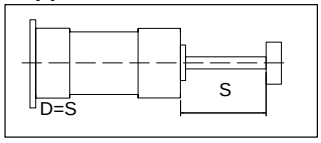
Cap Clevis or Cap Trunnion



Unsupported Rod End



Supported Rod End



Stop Tubes

As the stroke of a cylinder increases, the resultant loads on the piston rod become greater. To keep these bearing loads from exceeding design limitations and to obtain optimum life from a cylinder, stop tubes should be specified according to the following procedure:

SPECIFY ONE INCH OF STOP TUBE FOR EACH 10 INCHES (OR FRACTION THEREOF) OF STROKE IN EXCESS OF THE MAXIMUM LISTED IN THE FOLLOWING TABLE.

Maximum Stroke Permissible Without Stop Tube

Bore Diameter	Pivot Mount Cylinder (clevis & trunnion)	Rigid Mount Cylinder (without rod support)	Rigid Mount Cylinder (with rod support)
$1^1/_2$″ & 2″	24″	30″	48″
$2^1/_2$″ to 4″	30″	38″	48″
5″ to 8″	36″	40″	48″

Stop Tube Design

Three typical stop tube designs are illustrated below.

Design A

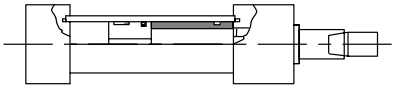
Used for cylinders non-cushioned on the rod.

Design B

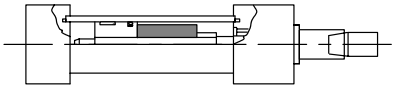
Used for cushioned hydraulic cylinders.

Design C

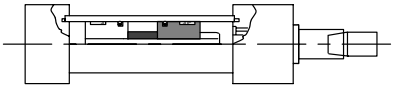
The best choice for a cylinder with an exceptionally long stop tube requirement. Note that the piston's effective bearing area is doubled. In addition to gaining the normal increased minimum distance between bearing points.



Stop Tube



Stop Spacer



Double Piston with Spacer

Cylinder Force and Volume Charts

Extend Forces in pounds (newtons)

Bore	Piston Area in^2 (cm^2)	psi (bar)						Vol. Cu. Ft. (cm^3) Displacement Per Stroke Inch
		40 (3)	60 (4)	80 (6)	100 (7)	150 (10)	200 (14)	
$1^1/_2$″	1.77 (11.40)	71 (315)	106 (472)	142 (629)	177 (786)	266 (1179)	353 (1570)	.00102 (29)
2″	3.14 (20.27)	126 (559)	189 (839)	251 (1119)	314 (1398)	471 (2097)	628 (2793)	.00182 (52)
$2^1/_2$″	4.91 (31.67)	196 (874)	295 (1311)	393 (1748)	491 (2185)	737 (3277)	982 (4368)	.00284 (80)
$3^1/_4$″	8.30 (53.32)	332 (1477)	498 (2215)	664 (2953)	830 (3692)	1245 (5538)	1659 (7379)	.00480 (136)
4″	12.57 (81.07)	503 (2237)	754 (3355)	1005 (4473)	1257 (5592)	1886 (8388)	2513 (11178)	.00727 (206)
5″	19.64(126.71)	785 (3491)	1178 (5240)	1571 (6988)	1964 (8736)	2946 (13104)	3928(17472)	.01137 (322)
6″	28.27(182.39)	1130 (5026)	1696 (7544)	2262 (10061)	2827 (12574)	4240 (18860)	5654(25149)	.01837 (520)
8″	50.26(324.26)	2010 (8940)	3015 (13411)	4020 (17881)	5026 (22356)	7539 (33533)	10052(44711)	.02227 (631)

Deduct these Forces for Retract Strokes

Bore	Piston Area in^2 (cm^2)	psi (bar)						Vol. Cu. Ft. (cm^3) Displacement Per Stroke Inch
		40 (3)	60 (4)	80 (6)	100 (7)	150 (10)	200 (14)	
$^5/_8$″	.307 (1.98)	12 (53)	18 (80)	25 (111)	31 (138)	46 (205)	61 (271)	.00018 (5)
1″	.785 (5.06)	31 (138)	47 (209)	63 (280)	70 (351)	118 (525)	157 (698)	.00045 (13)
$1^3/_8$″	1.485 (9.58)	59 (262)	89 (396)	119 (529)	118 (525)	222 (997)	297 (1321)	.00086 (24)
$1^3/_4$″	2.404 (15.51)	95 (423)	144 (641)	192 (854)	240 (1068)	360 (1601)	480 (2135)	.00139 (39)

Additional locations:

Vickers, Incorporated
7638 Pacific Avenue
White City, Oregon 97503-1091
U.S.A.
Phone: 503-826-2131
Fax: 503-826-3344

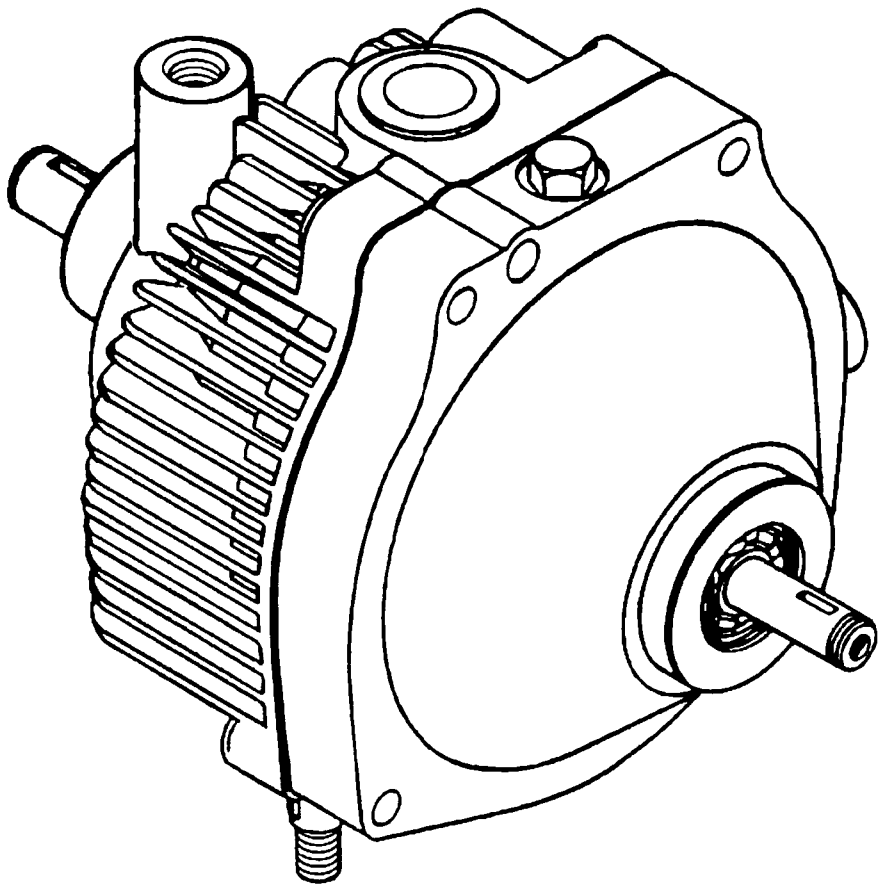
Vickers, Incorporated
Route 1, Box 17
250 Courtland Road
Decatur, Alabama 35603
U.S.A.
Phone: 205-353-2001
Fax: 205-351-9224

Vickers, Incorporated
2425 W. Michigan Avenue
Jackson, Michigan 49202-3984
U.S.A.
Phone: 517-787-7220
Fax: 517-787-3450

EATON | Hydraulics

Repair Information

Model 11 Eaton Hydrostatic Transmissions



2 - NOTES

Contents

3

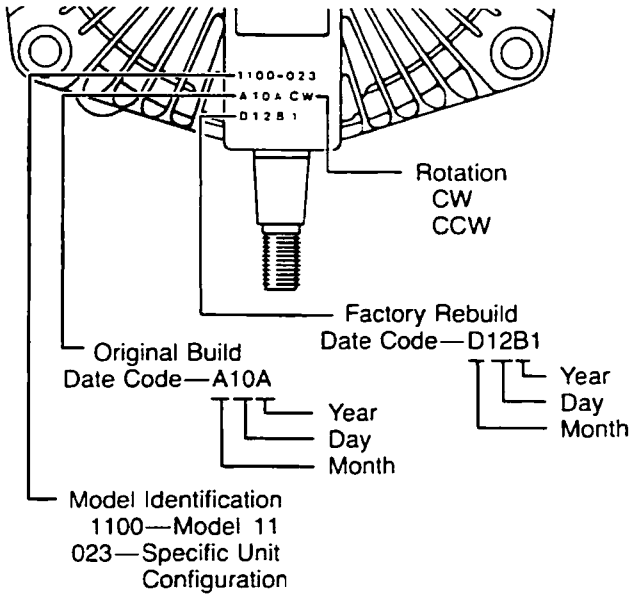
4 - NOTES

Product Identification and Ordering Information

Refer to specific listing covering your Eaton transmission. Parts listings are available from the Hydraulics Division, Minneapolis Plant.

When ordering parts, please include the following:

- Model Number
- Date Code
- Part Number
- Part Name
- Quantity of Parts



Special tools to aid in Disassembly/Reassembly

2" x 6" x 10" wooden block with ¾" dia. hole in the center.

2 large, wide rubber bands.

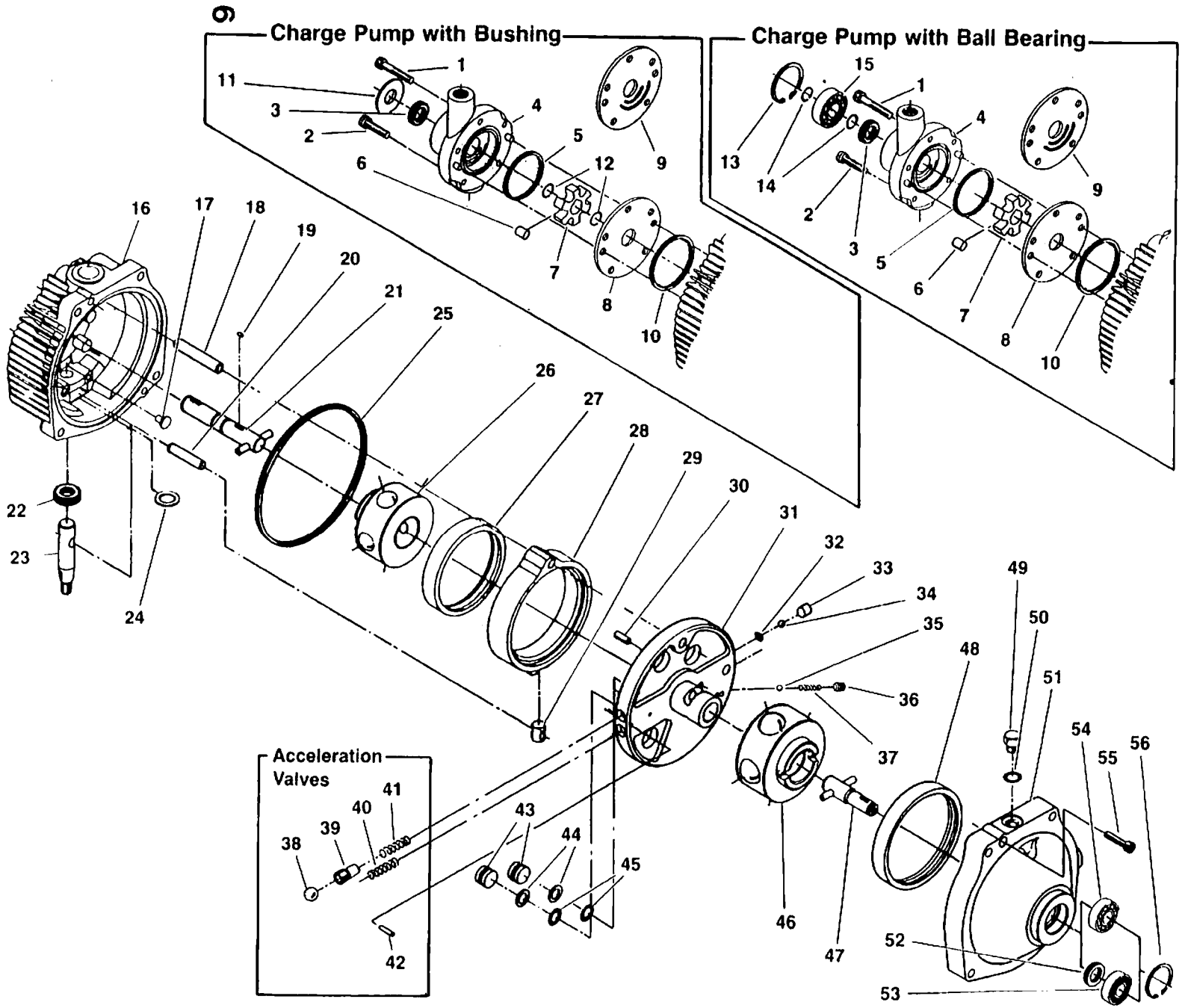
5/16-18 tap.

3/16" dia. rod — 10"-12" long.

Two jaw bearing puller, modified slightly if necessary to fit notches in charge pump with ball bearing.

Light petroleum jelly (such as Vaseline).

Steel bar stock or piece of wood — 2" dia. x 2½" long.


Charge Pump with Bushing
Charge Pump with Ball Bearing
Acceleration Valves
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56

General Parts List

Item No.	Description	Item No.	Description
1	Cap Screw, Socket Head	29	Cam Ring Insert
2	Cap Screw, Socket Head	30	Coil Pin (5/16 Dia. x 3/4 Lg.)
3	Oil Seal	31	Pintle
4	Charge Pump Body	32	Retaining Ring
5	Seal Ring, Square Cut	33	Check Valve Body
6	Roll	34	Check Valve Ball (5/16 Dia.)
7	Carrier	35	Check Valve Ball (7/16 Dia.)
8	Pump Plate	36	Relief Valve Plug
9	Port Plate	37	Relief Valve Spring
10	Seal Ring, Square Cut	38	Acceleration Valve Ball
11	Shield	39	Acceleration Valve Body
12	Snap Ring	40	Acceleration Valve Spring (lower)
13	Retaining Ring	41	Acceleration Valve Spring (upper)
14	Snap Ring	42	Dowel Pin
15	Bearing (Input)	43	Dampening Piston
16	Cover	44	Back-up Ring
17	Button	45	O-ring
18	Dowel, Pivot Pin	46	Motor Rotor and Ball Assembly
19	Drive Pin	47	Output Shaft
20	Dowel (7/16 Dia. x 2" Lg.)	48	Motor Race
21	Input Shaft	49	Hex Head Plug
22	Oil Seal	50	O-ring, Plug/Tube fitting
23	Control Shaft	51	Body
24	Control Shaft Washer	52	Oil Seal
25	Seal Ring, Square Cut	53	Sealed Bearing (output)
26	Pump Rotor and Ball Assembly	54	Flow Through Bearing (output)
27	Pump Race	55	Cap Screw, Socket Head
28	Cam Ring	56	Retaining Ring

This parts list is for identification of parts only. To insure the correct replacement parts for your transmission, it will be necessary to order the replacement parts by part number. For parts numbers, consult your supplier for a parts list for your specific model number.

Disassembly/Reassembly

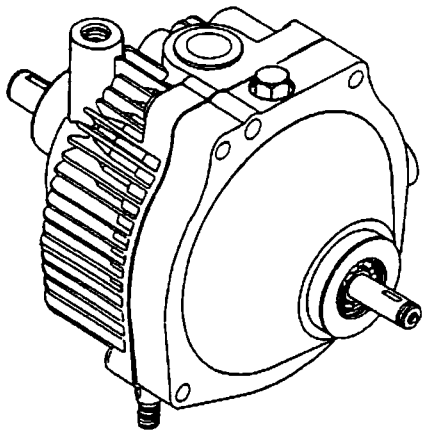


Fig. 1

Clean the transmission exterior thoroughly before repairs are begun. Use a cleaning solution that will not affect paint, gaskets, rubber seals, and plastic.

Important: When compressed air is used in cleaning, do not expose lip seals or bearing surfaces to high pressure.

Drain fluid from transmission.

Note: A 2" x 6" x 10" wooden block with a ¾ inch hole in the center is recommended for a suitable bench fixture.

Body/Cover—Disassembly

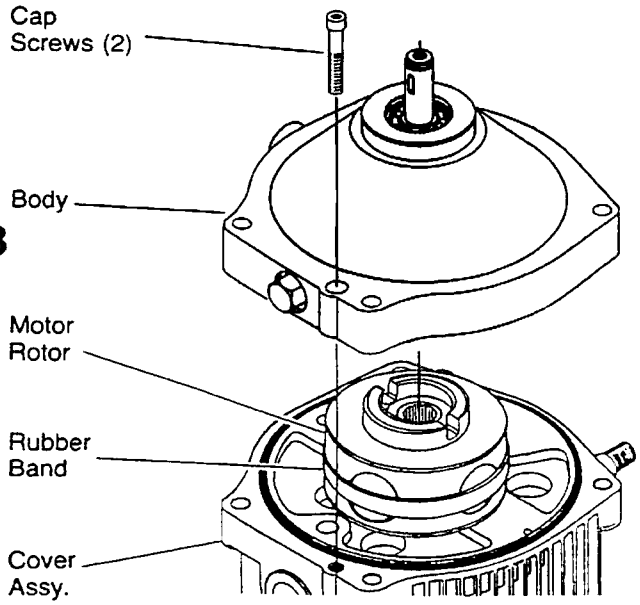


Fig. 2

1 Use a 7/32" allen wrench to remove the two 5/16" socket head cap screws.

2 Separate the body from the cover.

If the cover does not separate easily from the body because of fluid seal, tap the body and/or cover with plastic hammer to break the seal.

Important: The motor ball piston assembly must remain intact as the ball pistons are matched to the motor rotor. A large rubber band may be used to retain the ball pistons in place during handling.

Body Assembly-Disassembly

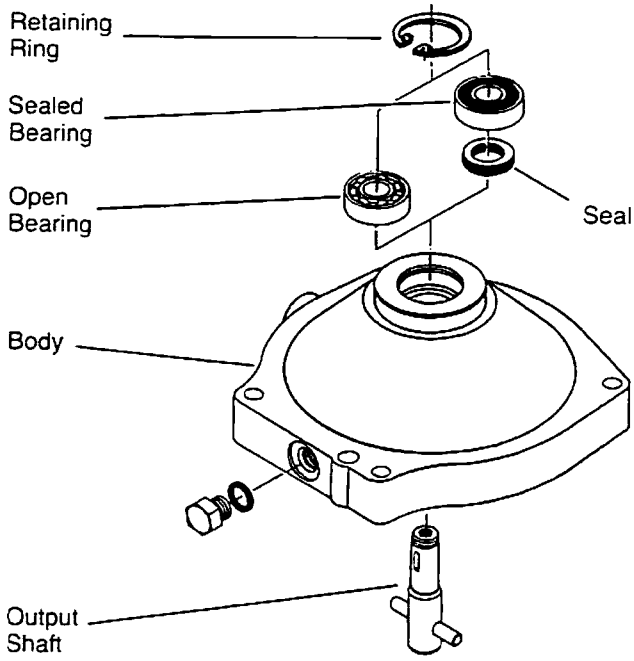


Fig. 3

3 Remove the bearing retaining ring and tap or press the output shaft inward. Drive or press the output bearing out from the motor body. Two types of output shaft bearings are used on Eaton light-duty transmissions—flow through or sealed. Sealed bearings have an oil seal located under the bearing. If your transmission has a seal, remove it by driving or pressing it out from the motor body.

Motor Rotor-Disassembly

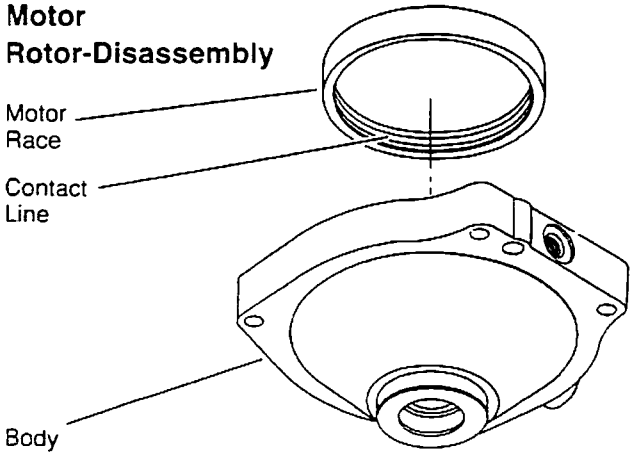


Fig. 4

4 Inspect the contact line of the motor ball pistons on the motor race located in body. This contact area must be smooth and completely free of any irregularities. If any irregularities are noted, replace the mofor race.

Note: If irregularities are noted in the motor race, it is reasonable to assume that one or more ball pistons and rotor bores will also be damaged.

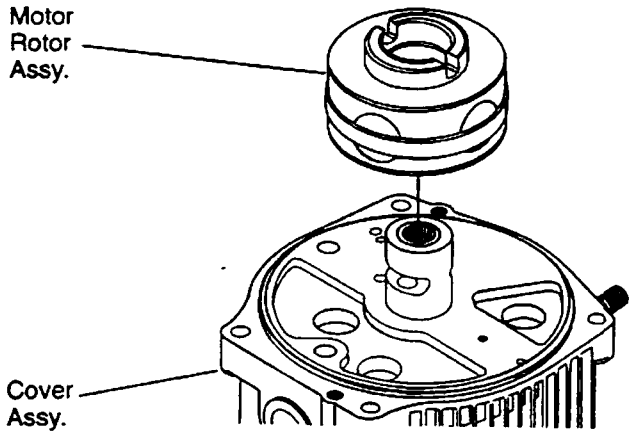


Fig. 5

5 Hold the pintle assembly in position against the cover and remove the motor rotor assembly intact.

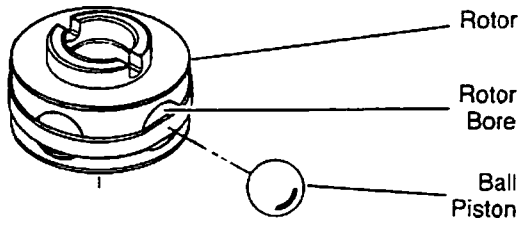


Fig. 6

6 Inspect the rotor assembly. Remove the piston balls from the rotor, one at a time, by working clockwise from the letter stamped in the face of the rotor and placing in a prepared container.

Note: Each ball must be replaced in the same bore from which it was removed. Use a suitable container for piston ball storage such as an egg carton or ice cube tray.

7 Inspect the piston balls. They must be smooth and completely free of any irregularities.

8 Inspect rotor bores, rotor bushing and pintle journals for irregularities or excessive clearance. The ball piston to rotor bore clearance is select fit electronically to .0002 to .0006 of an inch. When irregularities or excessive clearance are noted, replace the complete rotor assembly.

Install motor ball pistons in their matching bores. Hold them in place with a rubber band.

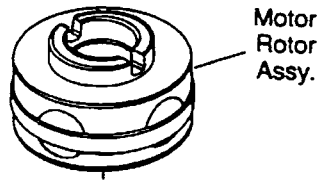


Fig. 7

Pintle Assembly—Removal

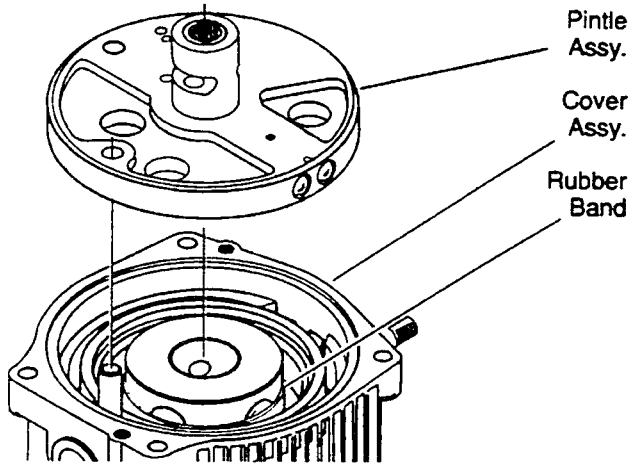


Fig. 8

9 Hold the pump assembly in the bottom position and tap lightly on the cover. Use a wood or plastic hammer so as not to damage aluminum cover. Lift the pintle assembly out.

Important: The pump ball piston assembly must remain intact as the ball pistons are matched to the pump rotor. Use a wide rubber band to retain the ball pistons in place during handling.

Pintle Assembly—Disassembly/Inspection

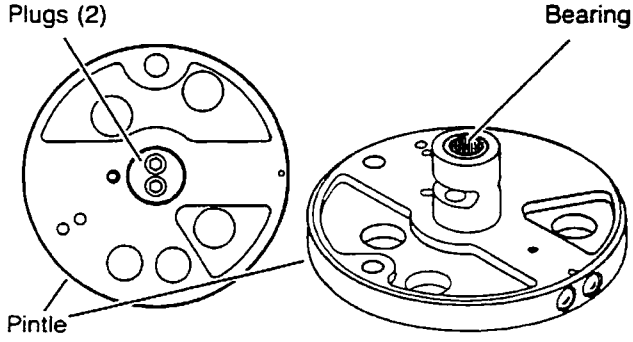


Fig. 9

10 We do not recommend complete disassembly of the pintle assembly for cleaning. Normal flushing should be all that is required. However, if complete disassembly is required, use the following procedures:

Note: Do not remove the two large plugs located on pintle journal.

Relief Valve—Removal/Inspection

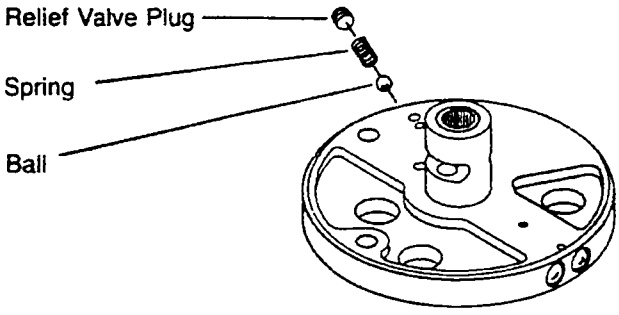


Fig. 10

11 Use a ¼" allen wrench to remove relief valve plug. Then remove spring and ball.

12 Inspect all parts for irregularities. Replace any defective part.

Relief Valve—Installation

13 Install ball, spring and plug in pintle. Screw plug in to just below surface of pintle. **Do not tighten**

Dampening Piston—Removal

Note: Remove only if surface is scored.

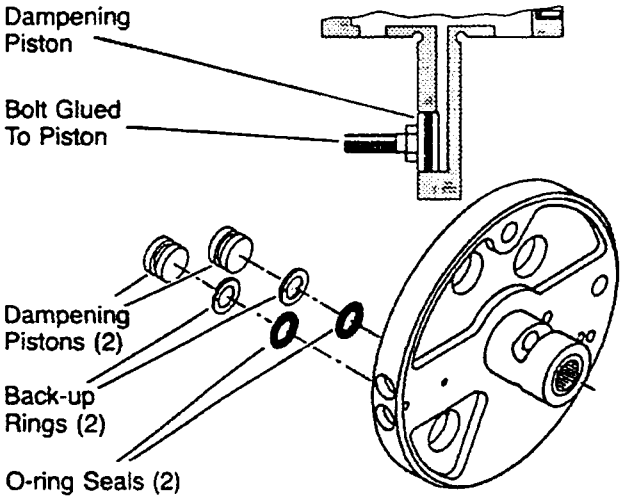


Fig. 11

14 To remove pistons, firmly tap the outside edge of pintle on a work surface. Remove back-up ring and o-ring from pistons.

Important: When dislodging dampening pistons, do not hit pintle journals or the pintle housing will be ruined.

Note: If tapping of pintle does not dislodge the pistons, use adhesive to cement a bolt or similar object to the pistons and pull them from the bore.

Dampening Piston—Installation

15 Install new back-up rings nearest to the smooth piston face and o-rings in grove on a new piston.

16 Lubricate outer surface of the pistons. Press pistons (smooth face up) in bores in pintle to the bottom position.

Check Valve—Removal

Note: Removal of check valves is not necessary if check valve balls move freely and seat properly.

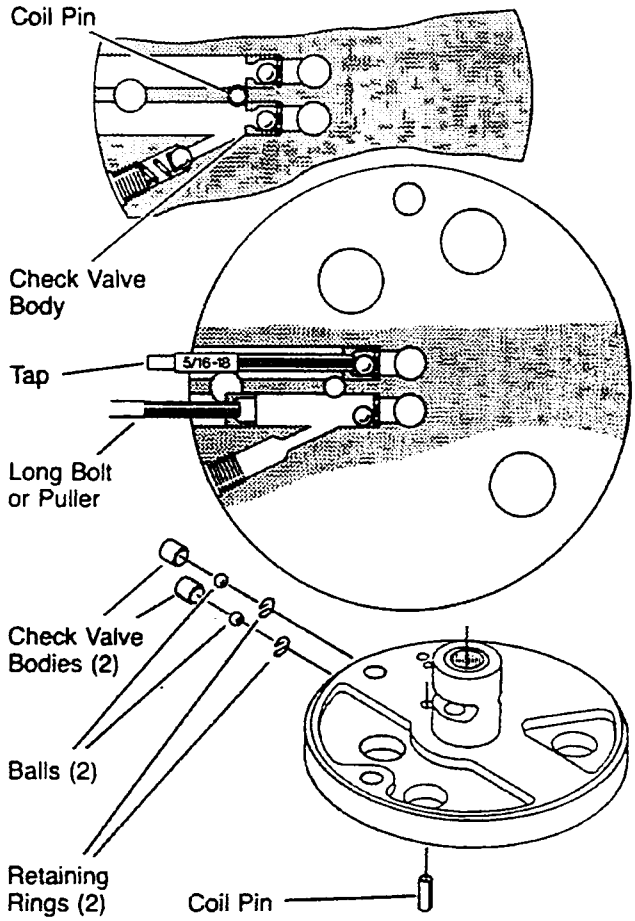


Fig. 12

17 Press or drive out the coil pin that retains the two check valve bodies. Use a four blade 5/16-18 tap to tap holes in check valve bodies. Insert a long bolt or a puller, pull the check valve bodies from the pintle housing and discard them.

18 Remove check balls and retaining ring.

Note: On units with acceleration valves—see steps 23-25 for check valve removal.

19 Inspect check valve balls and retaining rings. Replace any defective parts.

Check Valve—Installation

20 Install retaining rings and check valve balls in bores of pintle. Press *new* check valve bodies in bores. Press far enough in for coil pin clearance.

Important: To prevent dislodging of retaining rings *do not drive* check valve bodies into bores.

21 Press coil pin into pintle until flush with or slightly below surface.

Acceleration Valves—Removal

Note: Not all models have acceleration valves. If your model has them—they are located directly opposite the check valves.

See Figure 13.

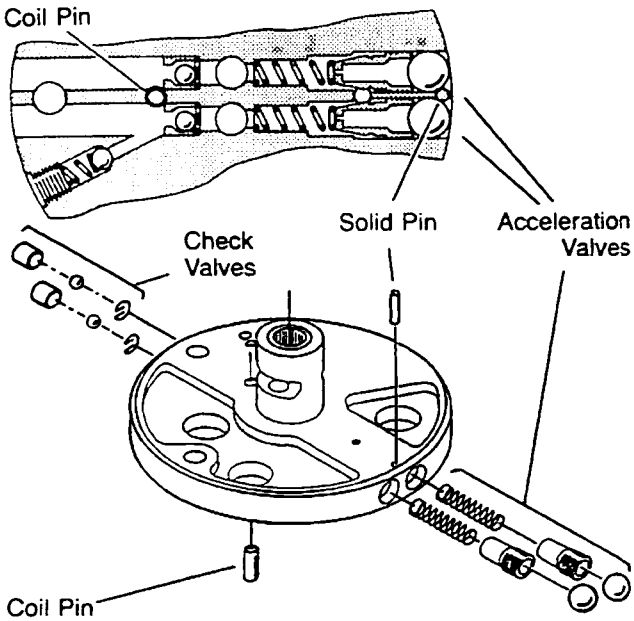


Fig. 13

22 Press solid pin from pintle housing. See Figure 13.

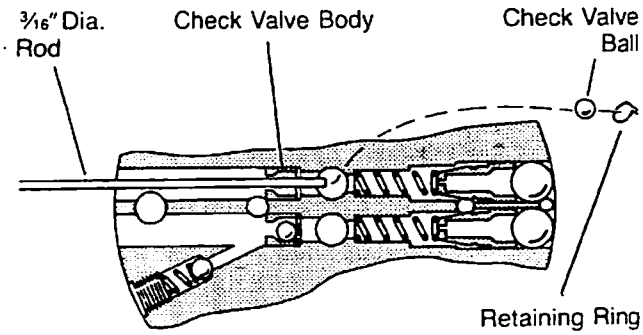


Fig. 14

23 Insert 3/16 diameter rod through the check valve body. Tap the rod against the (see Fig. 14) check valve ball to dislodge the retaining rings. Repeat for the second check valve ball and ring. Shake dislodged rings and balls out the large port area of pintle journal.

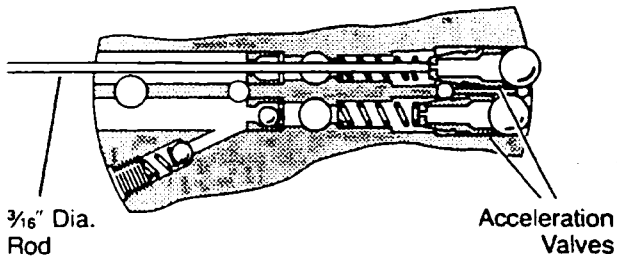


Fig. 15

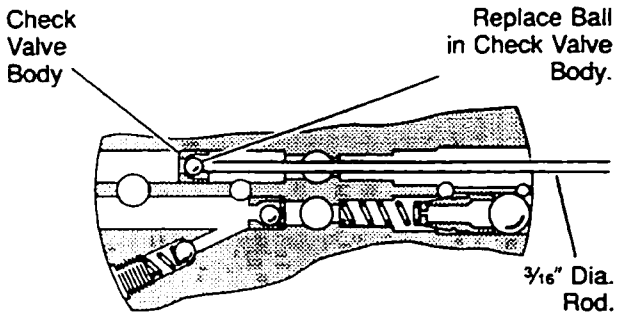


Fig. 16

24 Insert the rod through the check valve body against the acceleration valve body and drive both the valve body and ball out of the bore. Repeat method for second valve body and ball. Remove springs.

Note: Some models use different springs for forward and reverse. Be sure to identify the springs with the acceleration valves so they can be replaced in the same bore from which they were removed.

25 Press or drive coil pin from pintle housing. Replace the ball through the port into the check valve body. Place the 3/16 diameter rod through the acceleration valve bore against the check valve ball and drive the check valve body and ball from the pintle housing. Repeat this method for the second check valve body.

Acceleration Valves—Installation

26 Clean all parts thoroughly. Inspect parts for defects. Replace all defective parts, including retaining rings, which were damaged when driven out of their seats.

27 Install acceleration valve springs and acceleration valves. Be sure that both acceleration valve bodies slide freely in the bores and that the orifices are clean.

28 Press the two balls against the acceleration valve bodies until the solid pin will clear. Press or drive the dowel pin in so it is flush with or slightly below the pintle surface.

29 Install new check valve retaining rings and balls in pintle bores.

30 Press new check valve bodies into bores until coil pin will clear.

Important: Use a press to install check valve bodies. Driving them into position may dislodge the retaining rings.

31 Press or drive the coil pin in to flush or slightly below pintle surface.

Pump Rotor Assembly—Removal/Inspection

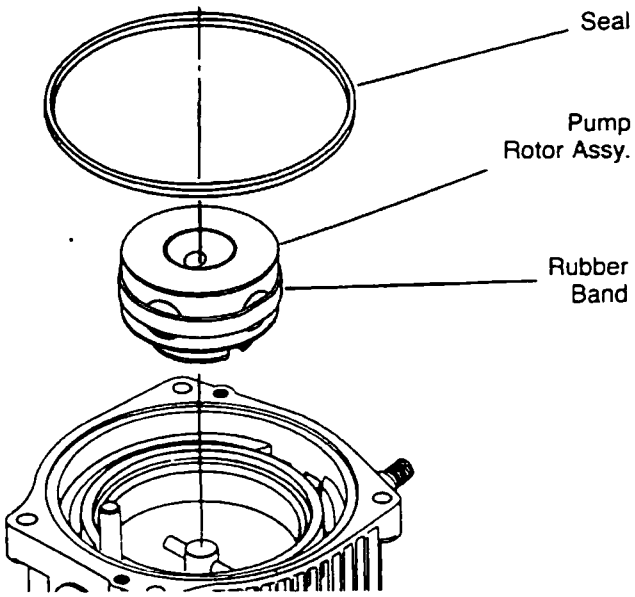


Fig. 17

32 Remove seal from cover, lift pump rotor assembly intact from the cover assembly.

Important: Use a wide rubber band to retain the ball pistons in place during handling. The pump ball piston assembly must remain intact as the ball pistons are matched to the pump rotor.

If complete disassembly, inspection and reassembly of pump rotor is necessary follow same procedures as for motor rotor—see steps 5 through 8.

Cam Ring—Disassembly/Inspection

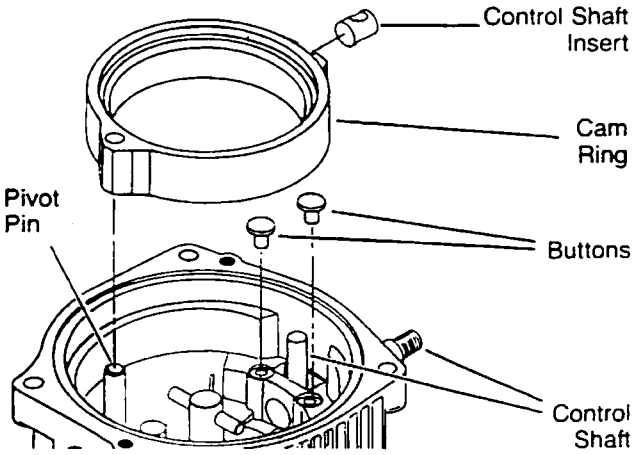


Fig. 18

33 Slide the cam ring from the pivot pin and control shaft in the cover. Then lift ring from the cover.

34 Remove the control shaft insert.

35 Inspect area where the ball pistons contact the race. This area must be smooth and completely free of irregularities. If it is not, replace the pump race.

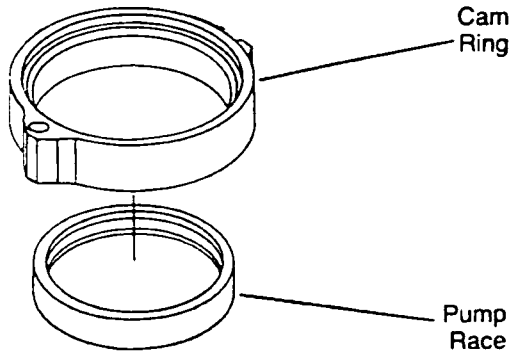


Fig. 19

Note: The pump race is press fit in the cam ring and will require a press to remove it. The cam ring and pump race are available as an assembly.

36 Remove the two buttons from cover.

Charge Pump with Bushing—Disassembly/Inspection

Note: Before removing the charge pump polish the input shaft to remove paint, burrs, nicks, etc.

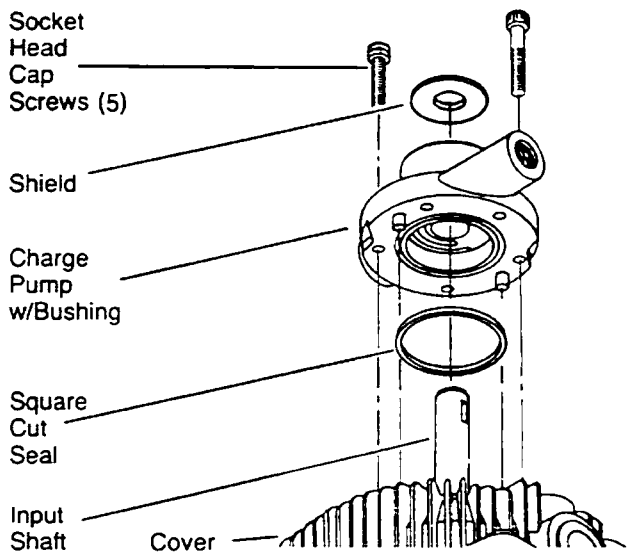


Fig. 20

37 Remove shield.

38 Use a ¼" allen wrench to remove the 5 socket head cap screws.

39 Carefully remove the charge pump.

40 Remove the square cut seal from the charge pump housing.

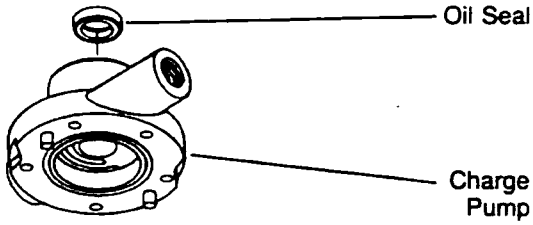


Fig. 21

41 Press or drive the oil seal from the charge pump.

Important: Be careful not to damage the input shaft bushing.

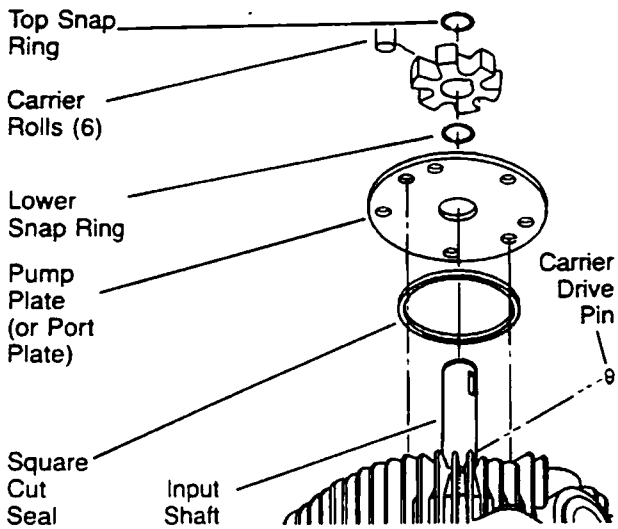


Fig. 22

42 Remove six carrier rolls.

43 Remove top snap ring from input shaft.

44 Mark top of carrier indicating which side is up.

Important: Do not mark the roll carrier in such a manner that would damage the carrier surface.

45 Remove carrier and drive pin.

46 Remove lower snap ring and pump or port plate.

47 Inspect the input shaft bushing, carrier, rolls and inner race contact areas in the charge pump. If any irregularities are found, replace the complete pump assembly.

48 Remove square cut seal from cover.

Charge Pump with Ball Bearing—Disassembly/Inspection

49 Remove pump retaining ring. See Figure 24.

50 Remove shaft retaining ring.

51 Use ¼" allen wrench to remove five cap screws.

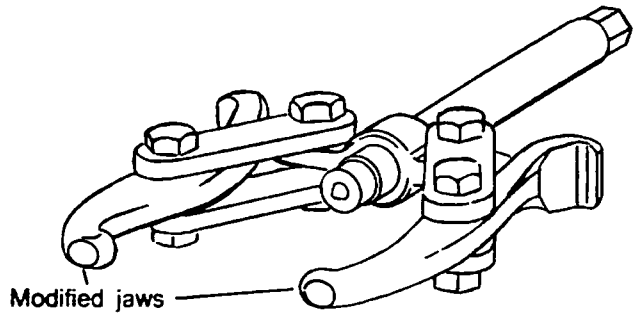


Fig. 23

52 Use a modified two jaw bearing puller, pulling against the two notches machined in the housing to remove the charge pump assembly.

Important: Do not pound on the bearing puller while removing the charge pump body. Apply a steady pull only.

Important: Do not damage the bore for the input shaft during removal of charge pump.

53 Remove the square cut seal from the pump assembly.

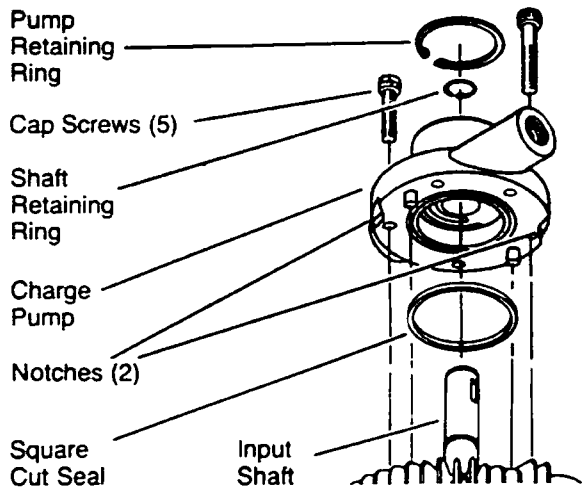


Fig. 24

54 Remove the bearing and the oil seal from the charge pump. Discard the oil seal.

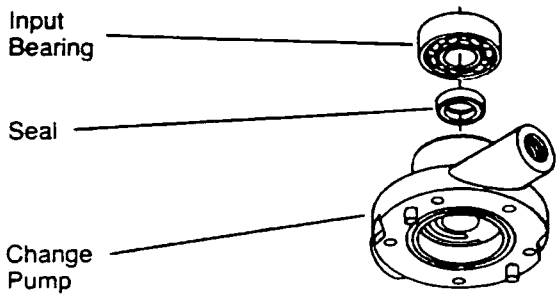


Fig. 25

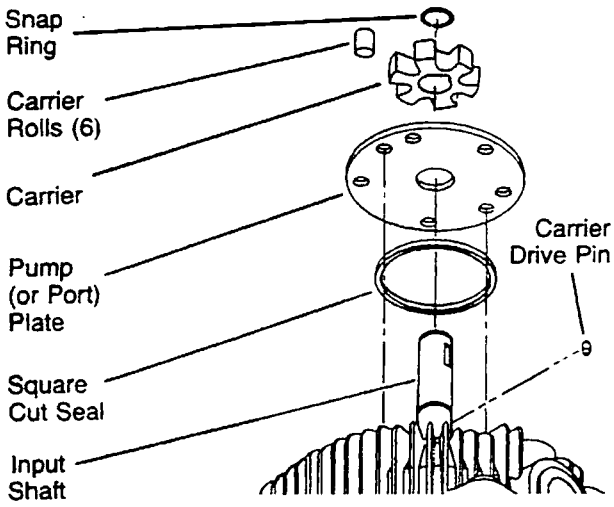


Fig. 26

55 Remove six carrier rolls.

56 Remove snap ring.

57 Mark top of carrier indicating which side is up.

Important: Do not mark the roll carrier in a way that would damage the carrier surface.

58 Remove carrier and carrier drive pin from input shaft.

59 Remove pump (or port) plate.

Remove square cut seal from cover and discard.

60 Inspect the ball bearing. If any irregularities are present, replace the bearing.

61 Inspect the carrier, rolls, inner race contact areas in the charge pump housing and pump plate. If any irregularities are found, replace the complete charge pump assembly.

Cover Assembly—Disassembly/Inspection

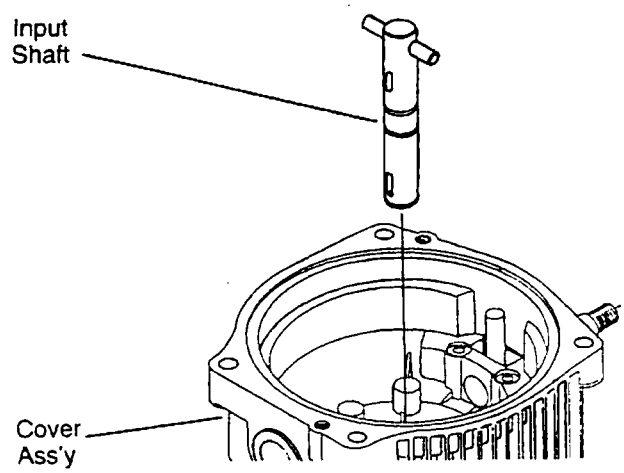


Fig. 27

62 Reposition cover assembly as shown in Figure 27. Then remove input shaft.

Important: Be careful not to damage the input shaft bushing in the cover.

63 Inspect input shaft for stripped keyways or other irregularities. If found, replace the input shaft.

64 Inspect bushing located in face of cover for broken bushing or other irregularities. If found, replace the cover.

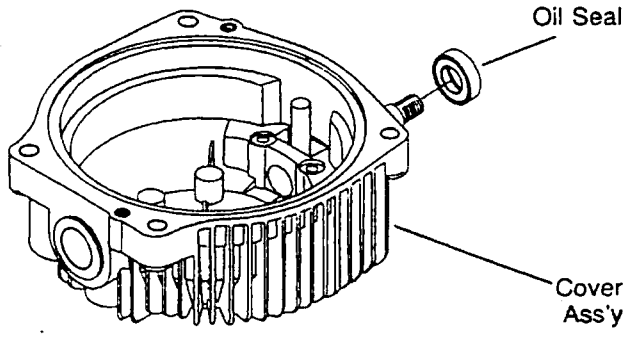


Fig. 28

65 Use a sharp, narrow edged tool to pierce the top metal part of the oil seal and remove seal from the cover.

Important: Do not scratch the control shaft or distort the seal counter bore when removing seal.

66 Inspect cover assembly, especially around the control shaft area. Replace the cover assembly if it is broken, cracked or if side clearance between control shaft and cover exceeds .006".

67 In most cases, it will not be necessary to remove the control shaft from the cover. If the dowel is loose or broken in the control shaft, remove the shaft using the following procedures.

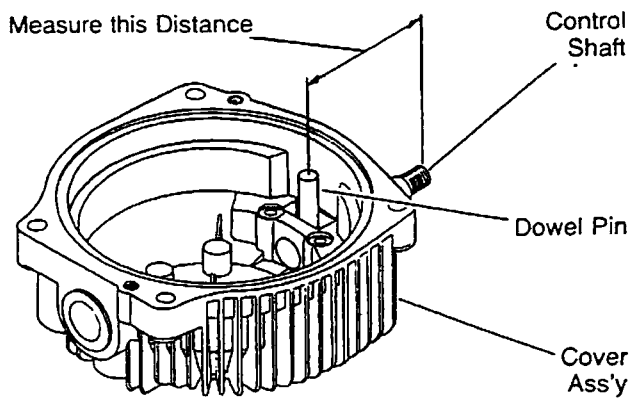


Fig. 29

68 Measure the distance between center of dowel pin and the end of the shaft as shown in Figure 29.

69 Turn cover over. Use dimension obtained in Step 68 to locate dowel pin in cover face. Drill 11/32" diameter hole at center point of dowel pin. Drill hole exactly in line with center of shaft.

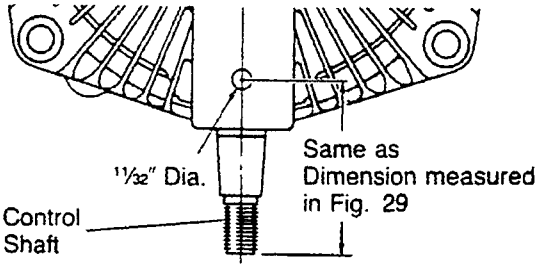


Fig. 30

70 Press damaged pin from control shaft. Remove control shaft and washer.

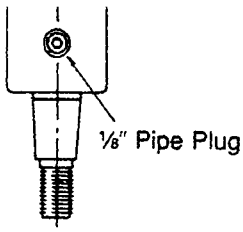


Fig. 31

71 Tap hole drilled in Step 69 with 1/8" pipe tap. Install 1/8" diameter flush type pipe plug.

Cover Assembly—Reassembly

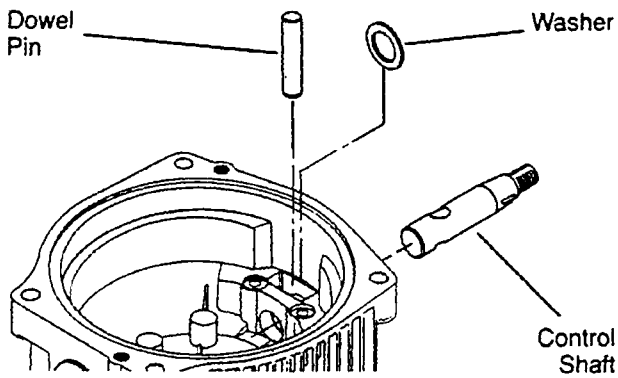


Fig. 32

72 Install new control shaft and washer in cover.

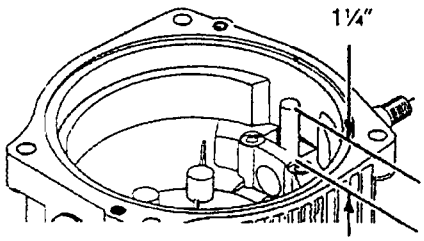


Fig. 33

73 Press new dowel pin through the shaft. Leave 1¼" of dowel extending from the shaft.

74 Lubricate I.D. of new oil seal with clean lubricant. Then press or tap seal in bore until completely seated.

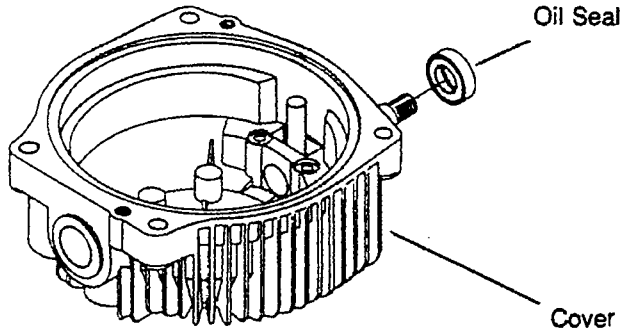


Fig. 34

Important: Be careful not to damage the inner portion of the oil seal. Excessive pressing or driving of the oil seal will damage the rubber portion of the oil seal.

75 Install input shaft in cover.

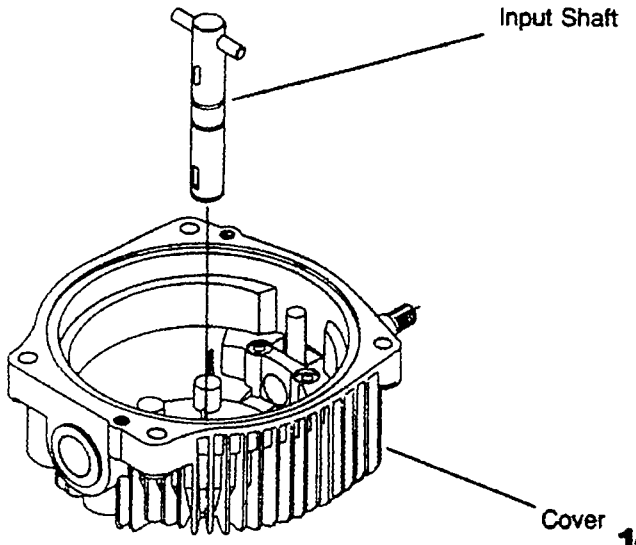


Fig. 35

76 Turn cover over. Support input shaft from underneath. Use a piece of steel bar stock or hard wood—2" in diameter by at least 2½" long to keep the shaft cross pin against the cover.

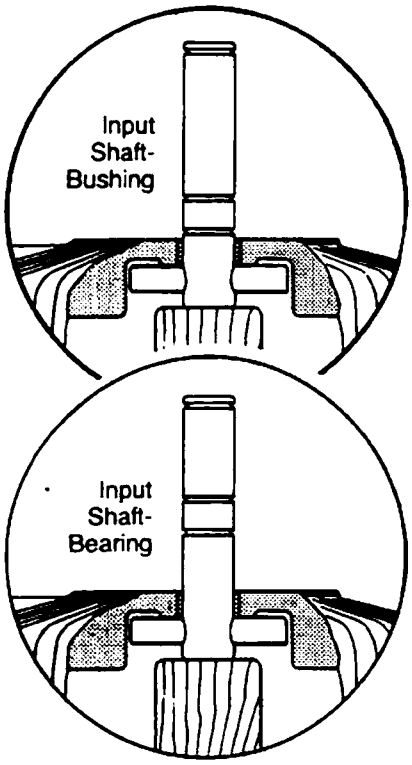


Fig. 36

77 Lightly lubricate new square cut seal and install in seal groove in cover.

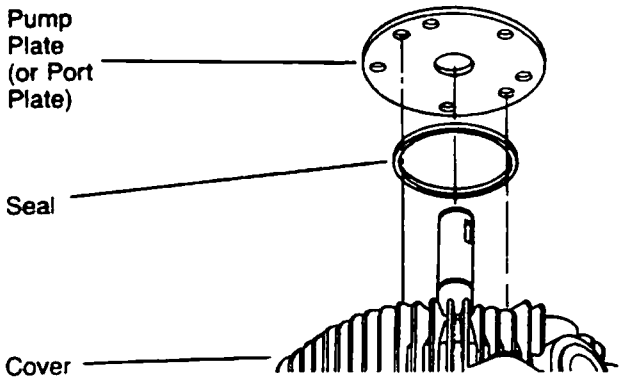


Fig. 37

Pump Plate/Port Plate—Installation

78 Install pump plate or port plate on cover. Either side of the pump plate may face the cover regardless of input rotation. However, the port plate must be installed per specific input rotation. See Figure 38.

Important: Stamping on cover indicates if charge pump rotation is clockwise or counter clockwise.

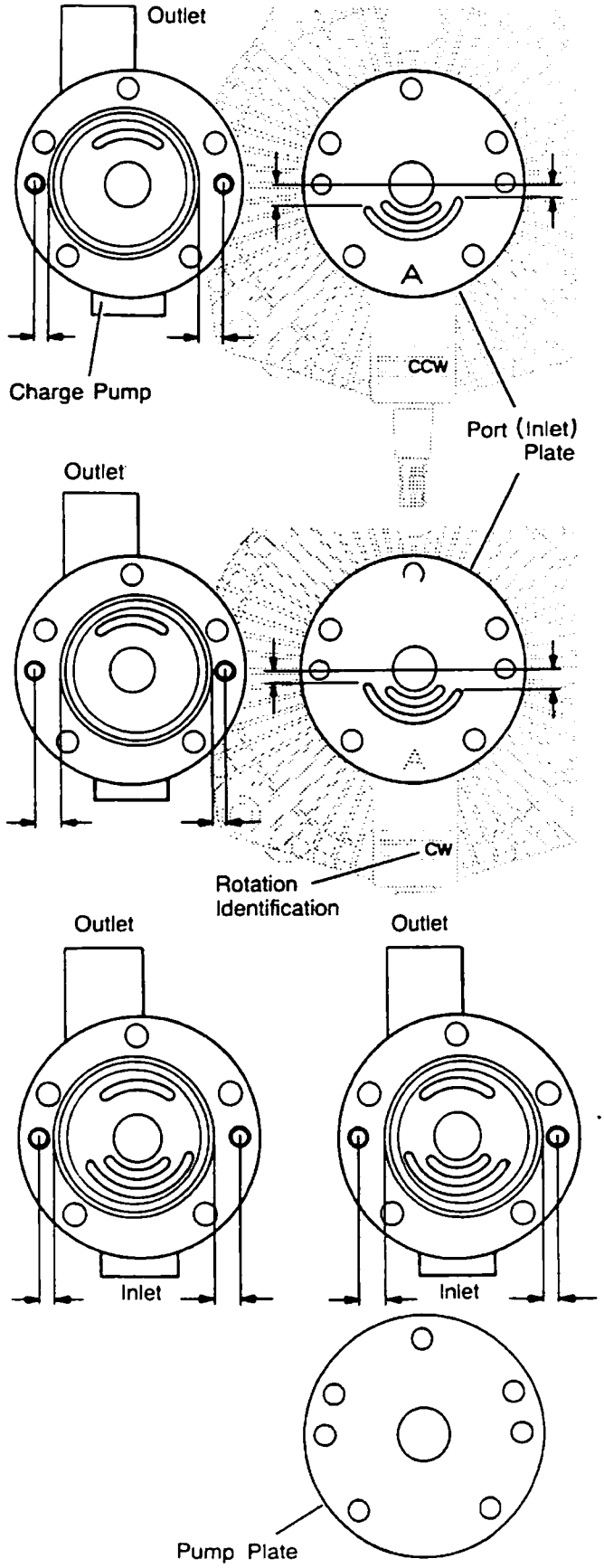


Fig. 38

79 For counter clockwise (CCW) rotation, the letter A must be up, facing the charge pump. For clockwise (CW) rotation the letter A must face down toward the cover.

*Charge Pump with Bushing—Installation

For charge pumps with ball bearing, see Steps 89 through 94 for installation.

Install snap ring in lower snap ring groove (against plate) of input shaft.

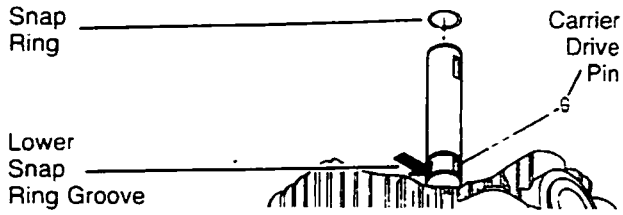


Fig. 39

80 Install carrier drive pin in keyway of input shaft. Use a small amount of petroleum jelly or equivalent to hold pin in place.

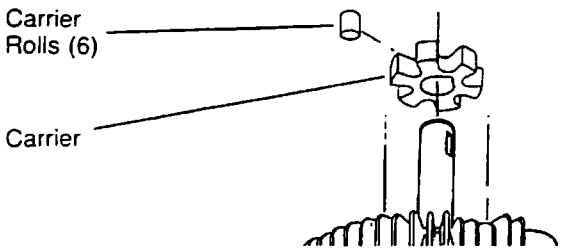


Fig. 40

81 Install carrier over input shaft with side marked "up" (see step 57). Be sure keyway in carrier fits over carrier drive pin in output shaft.

Important: For correct carrier rotation the leading edge of carrier must rotate in the same direction as the input shaft. Install as shown in Figure 41.

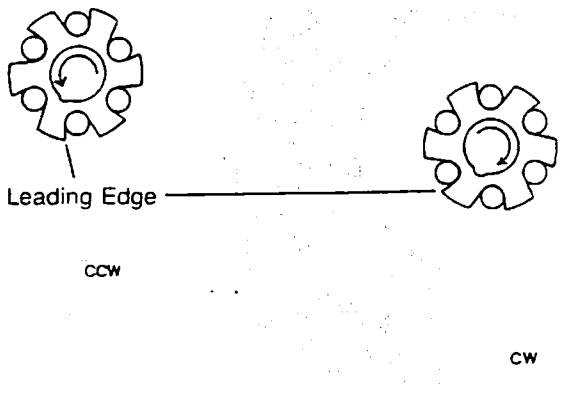


Fig. 41

82 Install snap ring in upper snap ring groove in input shaft (against carrier).

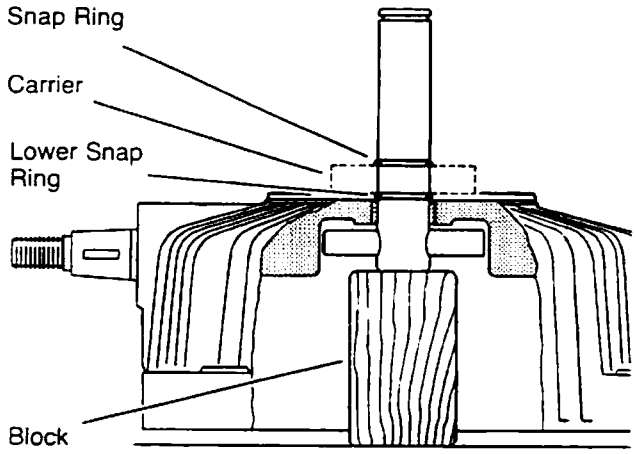


Fig. 42

83 Lightly lubricate the six carrier rolls and install them in the carrier.

84 Lubricate inner surface of new oil seal and install in charge pump housing as shown in Figure 43 with the rubber lip toward the bore. Make sure seal is completely seated.

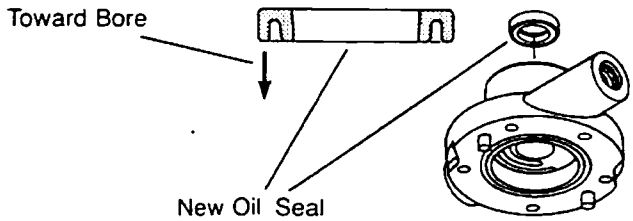


Fig. 43

Important: Excessive pressing or force on oil seal may cause damage to rubber sealing portion or may distort counterbore of housing.

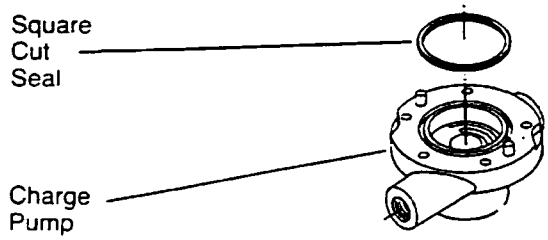


Fig. 44

85 Lightly lubricate new square cut seal with petroleum jelly and install in seal groove of pump housing.

Important: If an elbow fitting is used in the pump inlet, it must be installed before mounting charge pump.

* Charge pump with Bearing see page 18.

86 Align charge pump dowel pins with holes in cover. Then guide pump over shaft, carrier and rolls until pins engage holes.

Important: Protect oil seal lip from keyways, snap ring grooves and shaft splines.

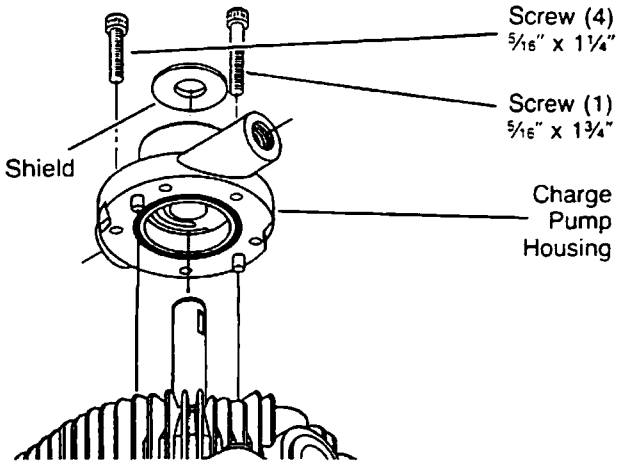


Fig. 45

87 Install 4 screws (5/16" x 1¼") and one screw 5/16" x 1¾") in pump housing. Torque to 15 foot pounds.

Important: Install 1¾" screw in thicker section of charge pump body. If installed and tightened in any of the other four holes, internal damage could occur.

88 Install protective shield on housing.

Important: Install protective shield so that flange is pointing away from oil seal. Shield may damage oil seal if installed improperly.

Charge Pump with Ball Bearing—Installation

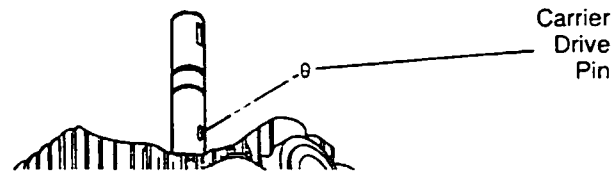


Fig. 46

89 Lubricate carrier drive pin and install in keyway of input shaft.

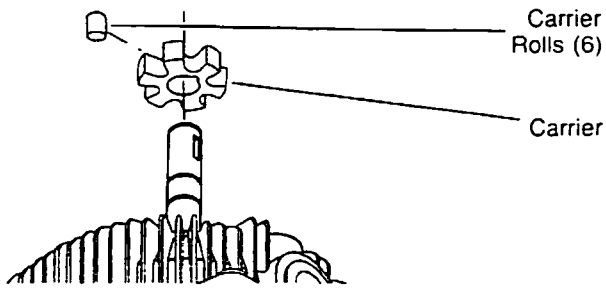


Fig. 47

90 Install carrier over input shaft with side marked "up" (see step 57). Be sure keyway in carrier fits over carrier drive pin in input shaft.

Important: For correct carrier rotation the leading edge of carrier must rotate in the same direction as the input shaft. Install as shown in Figure 48.

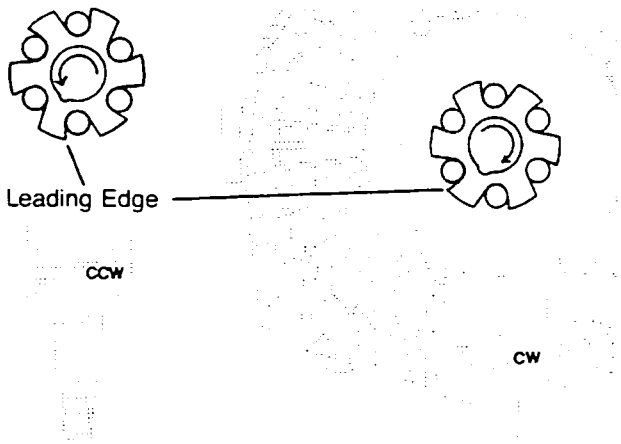


Fig. 48

91 Lightly lubricate and install the six carrier rolls in the carrier. Use a small amount of petroleum jelly or equivalent to hold the rolls in place.

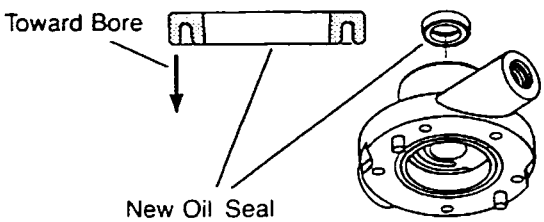


Fig. 49

92 Lubricate inner surface of new oil seal and install in charge pump housing as shown in Figure 49 with the rubber lip toward the bore. Make sure seal is completely seated.

Important: Excessive pressing or force on oil seal may cause damage to rubber sealing portion or may distort counterbore of housing.

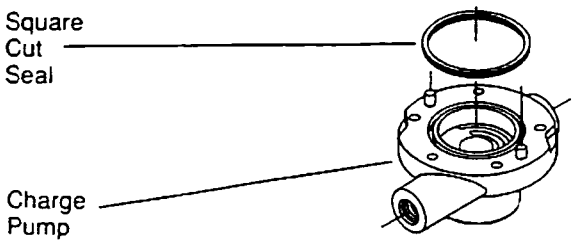


Fig. 50

93 Lightly lubricate new square cut seal and install in seal groove of pump housing.

Important: If an elbow fitting is used in the pump inlet, it must be installed before mounting charge pump.

94 Align charge pump dowel pins with holes in cover. Protect oil seal lip from keyways, snap ring grooves and shaft splines. Then guide pump over shaft, carrier and rolls until pins engage holes.

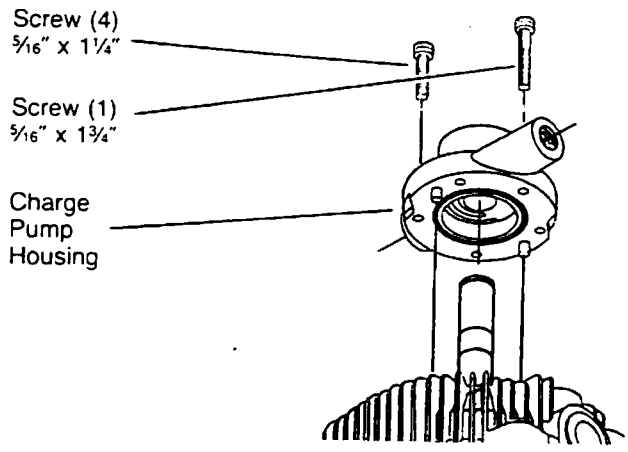


Fig. 51

95 Install 4 screws (5/16" x 1¼") and one screw 5/16" x 1¾") in pump housing. Torque to 15 foot pounds.

Important: Install 1¾" screw in thicker section of charge pump body. If installed and tightened in any of the other four holes, internal damage could occur.

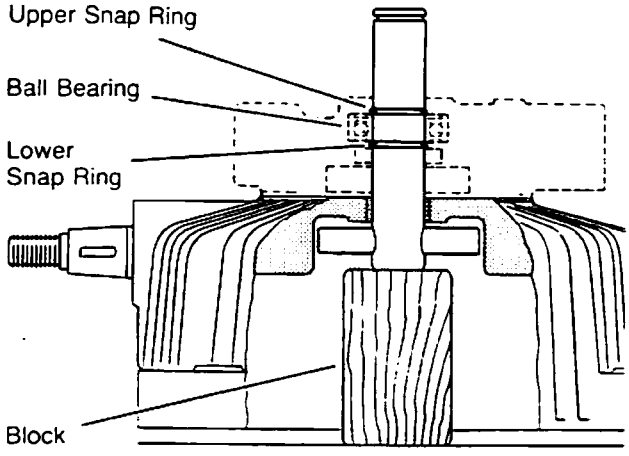


Fig. 52

96 Install snap ring in lower groove of input shaft.

97 With cover assembly separated from the body and the input shaft properly supported (see Figure 52) the input shaft bearing may be pressed into position.

Press to the bottom position in the charge pump housing against the retaining ring.

98 Install snap ring in upper groove of input shaft against inner bearing race.

99 Install large snap ring used to retain bearing in housing.

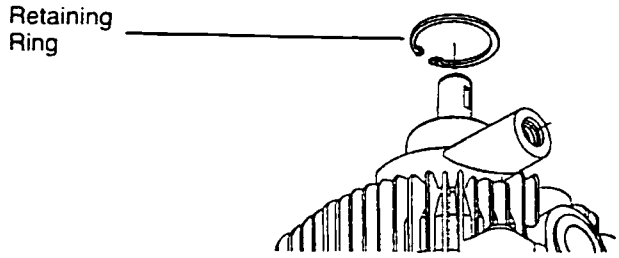


Fig. 53

Important: Input shaft should rotate freely by hand. If it does not, recheck installation.

Cam Ring—Installation

100 Install 2 buttons in the cover as shown in Figure 54.

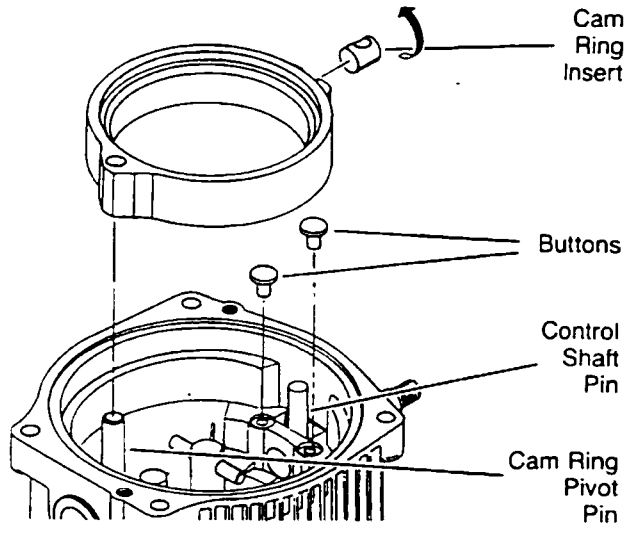


Fig. 54

101 Install the cam ring insert with the hole away from the cam ring as shown in Figure 54.

102 Align the cam ring with the control shaft pin and the cam ring pivot pin.

Install the cam ring with the flush side of the bearing race facing the cover. Press in firmly until the cam ring has bottomed in the cover assembly.

Important: Cam ring must move freely from stop to stop. If binding occurs at either stop rotate the cam ring insert 180°. Check the cam ring movement again.

Pump Rotor Assembly—Installation

103 Align the slot in the pump rotor with the input shaft cross pin. Install rotor assembly on shaft.

Important: Keep rotor assembly intact with wide rubber band. Remove rubber band *after* installing rotor assembly in cover assembly.

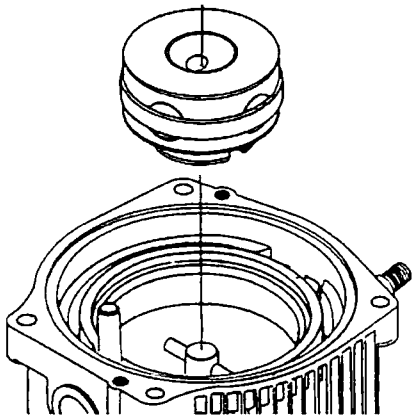


Fig. 55

Pintle Assembly—Installation

Note: To determine pintle rotation, place a small ruler or straight edge in the porting slot as shown in Figure 56.

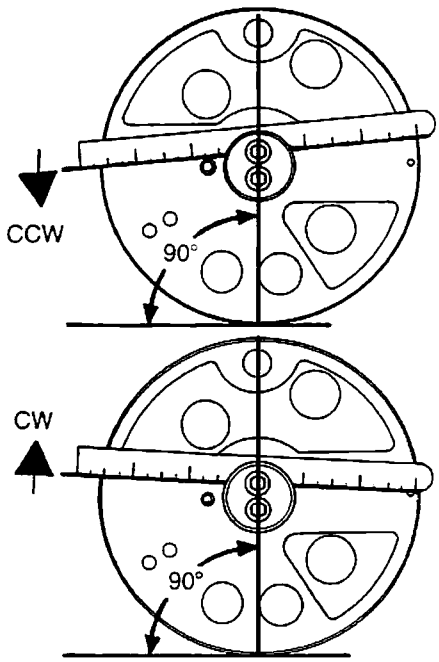


Fig. 56

104 Align dowel pin hole in pintle assembly with cam ring pivot pin and install over pump rotor assembly.

105 Lightly grease a new square cut seal and install it in the groove in the housing.

Important: Do not force pintle over rotor assembly. It is a slip fit and the pintle must turn freely by hand. If it does not, recheck the pintle installation.

Motor Rotor Assembly—Installation

106 Install the motor rotor assembly on the pintle. See Figure 57.

Important: Do not force the rotor assembly over the pintle. It is a slip fit and the rotor must rotate freely by hand.

Keep the rotor assembly intact with wide rubber band. Remove rubber band **after** installing rotor assembly.

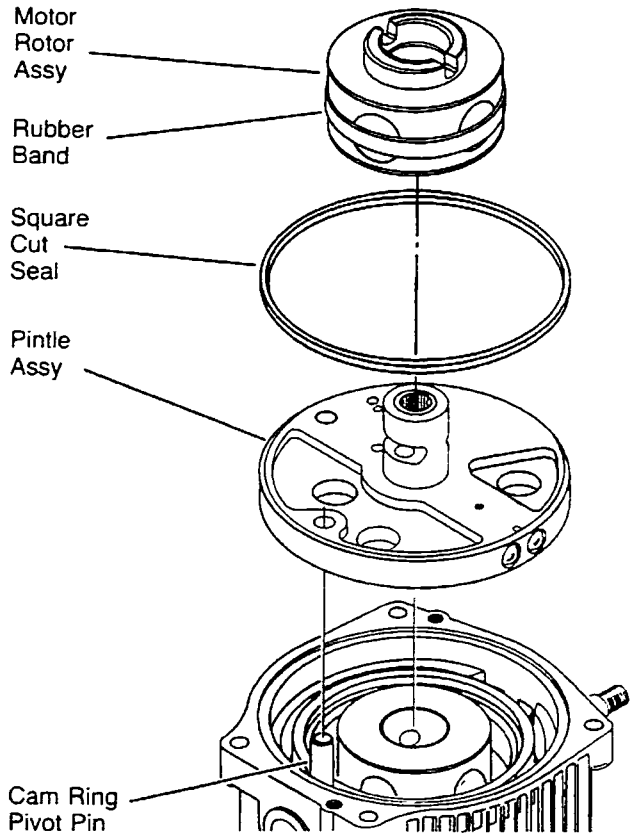


Fig. 57

Body Assembly—Reassembly

Note: Transmissions with sealed bearings incorporate an oil seal under the output bearing.

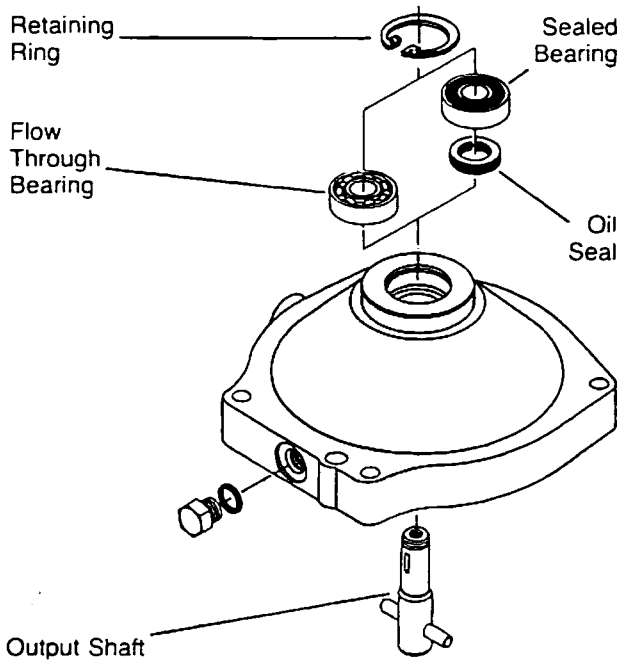


Fig. 58

107 When applicable, install oil seal in body with the rubber lip toward the counter bore in the body. Press or tap the seal into the bottom position in the counter bore.

Important: Do not over press or drive the oil seal. This may damage the rubber sealing portion of the oil seal.

108 Install output bearing. Position bearing on the body and press on the outer bearing race to the bottom position in the body.

109 Install the bearing retaining ring.

110 Install output shaft. This is a press fit. Be sure to support the inner race of the ball bearing while pressing the shaft into the bearing.

Body/Cover—Reassembly

111 Install body. Align the output shaft with the bearing located in pintle and shaft cross pin with the slot in the motor rotor assembly. Install two 5/16" x 1¼" socket head cap screws. Torque to 15 foot pounds.

Important: Be sure the output shaft rotates freely by hand. If it does not, recheck body installation.

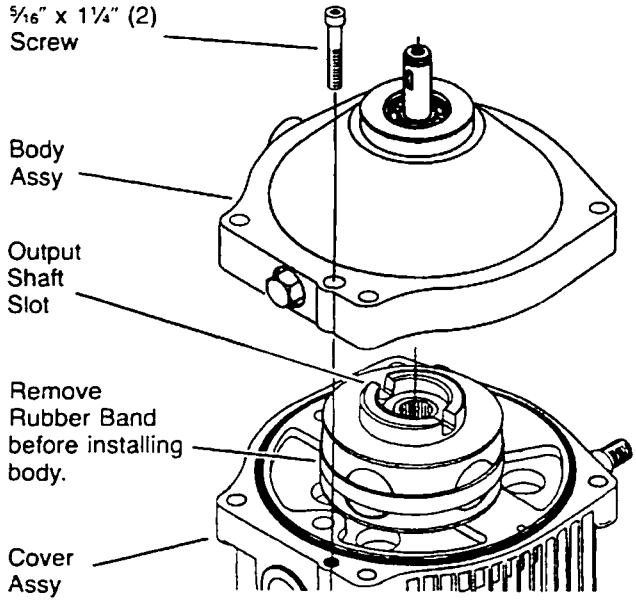


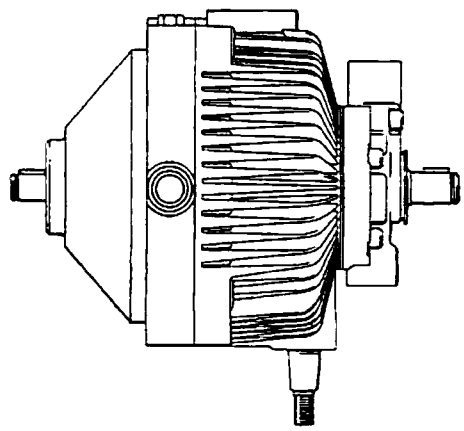
Fig. 59

Start-up Procedure

112 Fill transmission with fluid. See page 24 for fluid recommendations. On transmission that incorporates flow through output bearing, fill through the axle to the manufacturer's specified fluid level.

On transmissions that incorporate sealed output shaft bearings, fill through the reservoir to the manufacturer's specified fluid level. Start the engine and run the transmission in both directions at low engine speed for a short time to purge trapped air from the system. **Stop**, shut off engine and recheck fluid level.

The transmission is now ready for use.

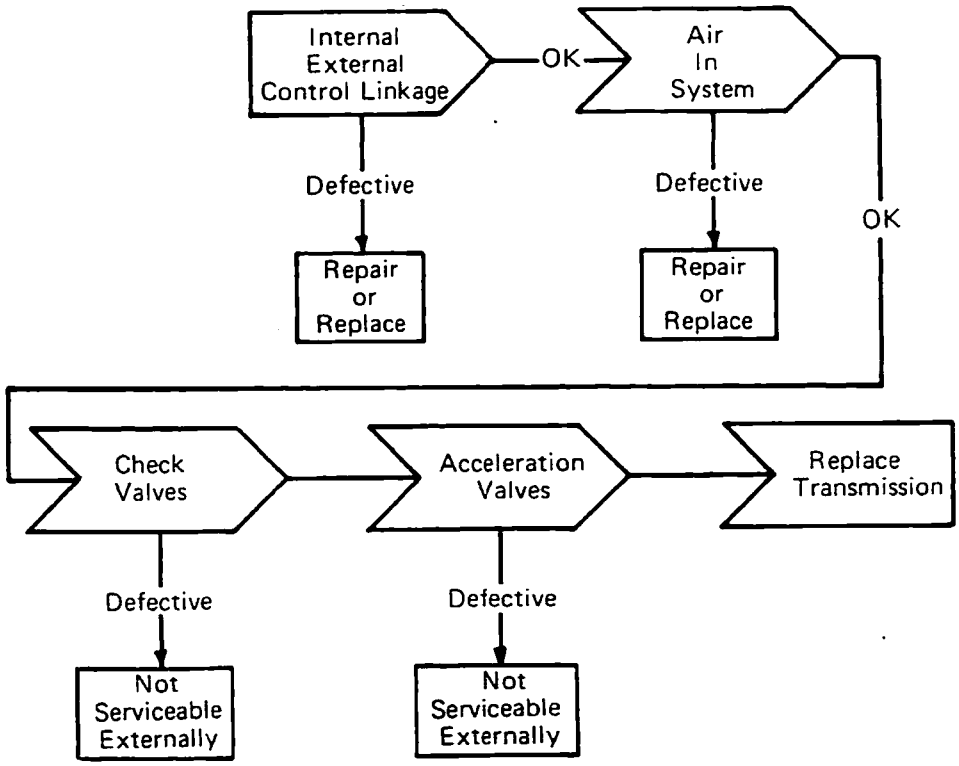


Trouble Shooting Instructions

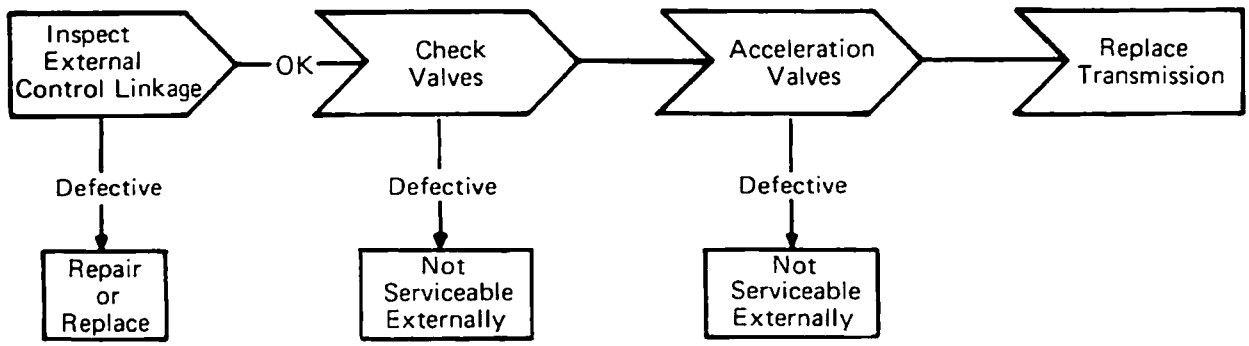
This fault-logic troubleshooting section is designed as a diagnostic aid in locating transmission problems.

Match the transmission problem with the problem statements and follow the action steps shown in the diagrams. This will give the user expedient aids in correcting the problem and eliminating unnecessary machine down time.

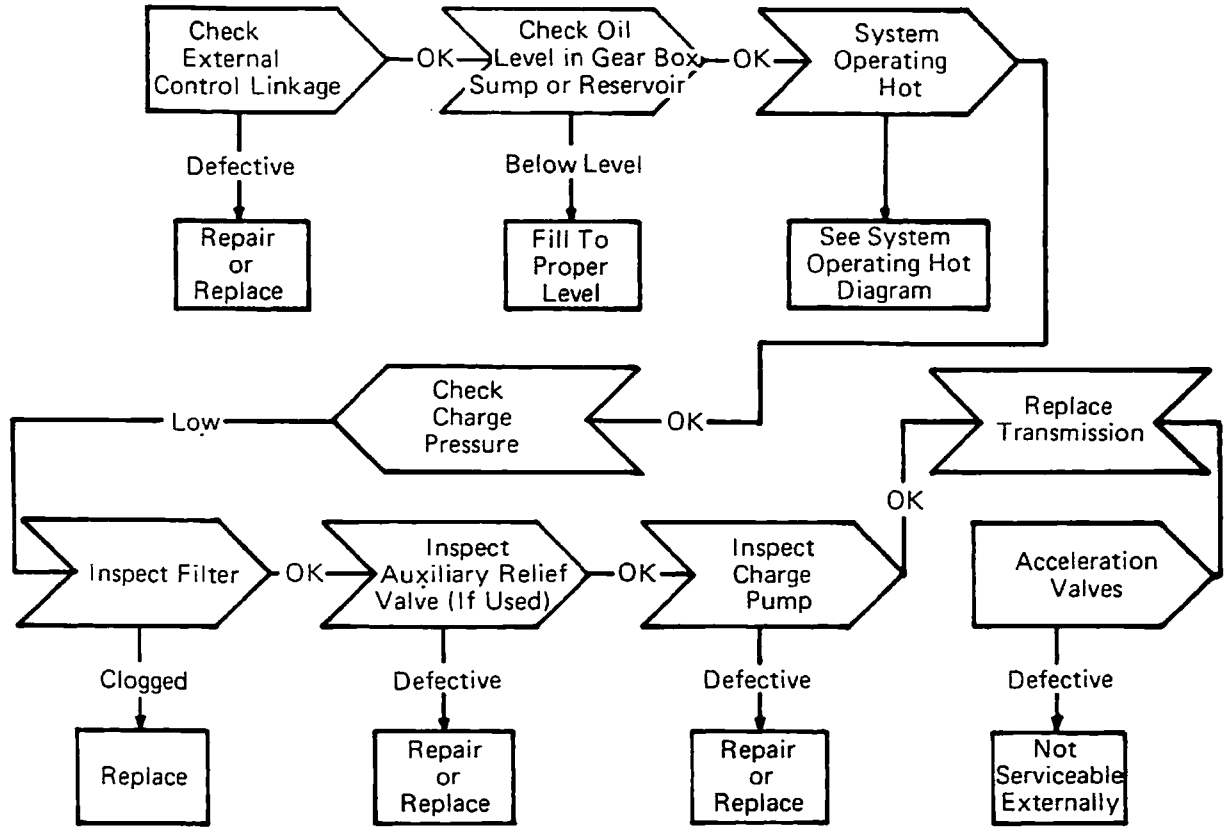
System Jerky/Noisy when Starting



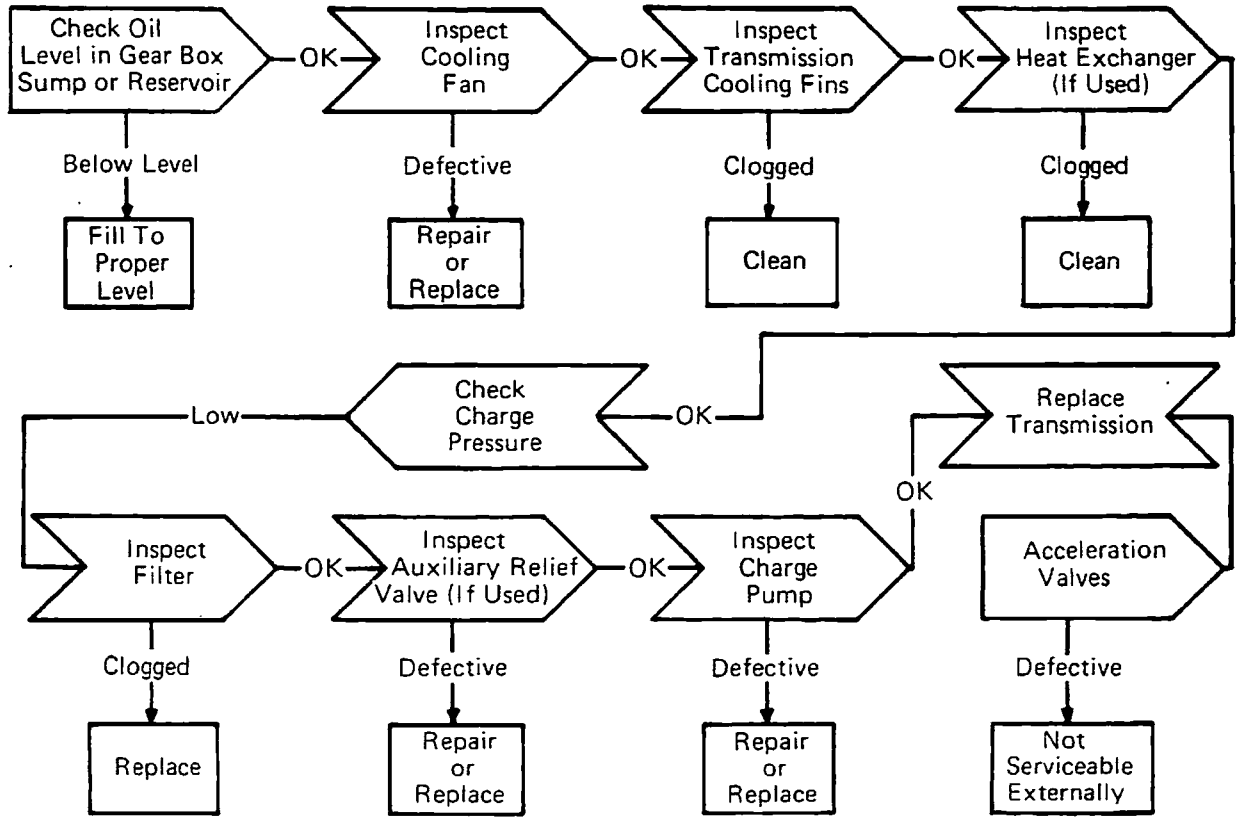
System Operates in One Direction Only



Loss of Power or System Will Not Operate in Either Direction



System Operating Hot



Fluid Recommendations

A reputable supplier can help you make the best selection of hydraulic fluid for use in Eaton light duty hydrostatic transmissions.

For satisfactory operation, the following fluid conditions apply:

1. Accurate level readings can be checked only when the fluid is cold.
2. If the natural color of the fluid has become black or milky, it is possible that an overheating or water contaminant problem exists.
3. Proper viscosity is essential. At normal operating temperatures, the optimum range is between 80-180 SUS (16-40 cSt), and it should never fall below 60 SUS (10 cSt).
4. The fluid should be chemically stable, incorporating rust and oxidation inhibitors.

Specific types of fluid meeting these requirements may be:

(1) Premium hydraulic oil
(2) Engine crankcase oil
(3) Automatic transmission oil
(4) Hydraulic transmission oil

Eaton
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
Tel: 952 937-9800
Fax: 952 974-7722
www.hydraulics.eaton.com

Eaton
20 Rosamond Road
Footscray
Victoria 3011
Australia
Tel: (61) 3 9319 8222
Fax: (61) 3 9318 5714

Eaton
46 New Lane, Havant
Hampshire PO9 2NB
England
Tel: (44) 23 92 486 451
Fax: (44) 23 92 487 110

EATON | Hydraulics

Printed in USA
Document No. 07-402
December 2002