Series TZ Cylinders

ANSI B93.15/NFPA Interchangeable
Nominal Pressure: 3000 psi (210 bar)

Contents

Features

Global Design:
Engineered for ANSI B93.15/NFPA interchangeability with the durability required for heavy-duty applications.

Rod Cartridge Assembly:
Quick Change design requires no other cylinder disassembly for rod seal maintenance.

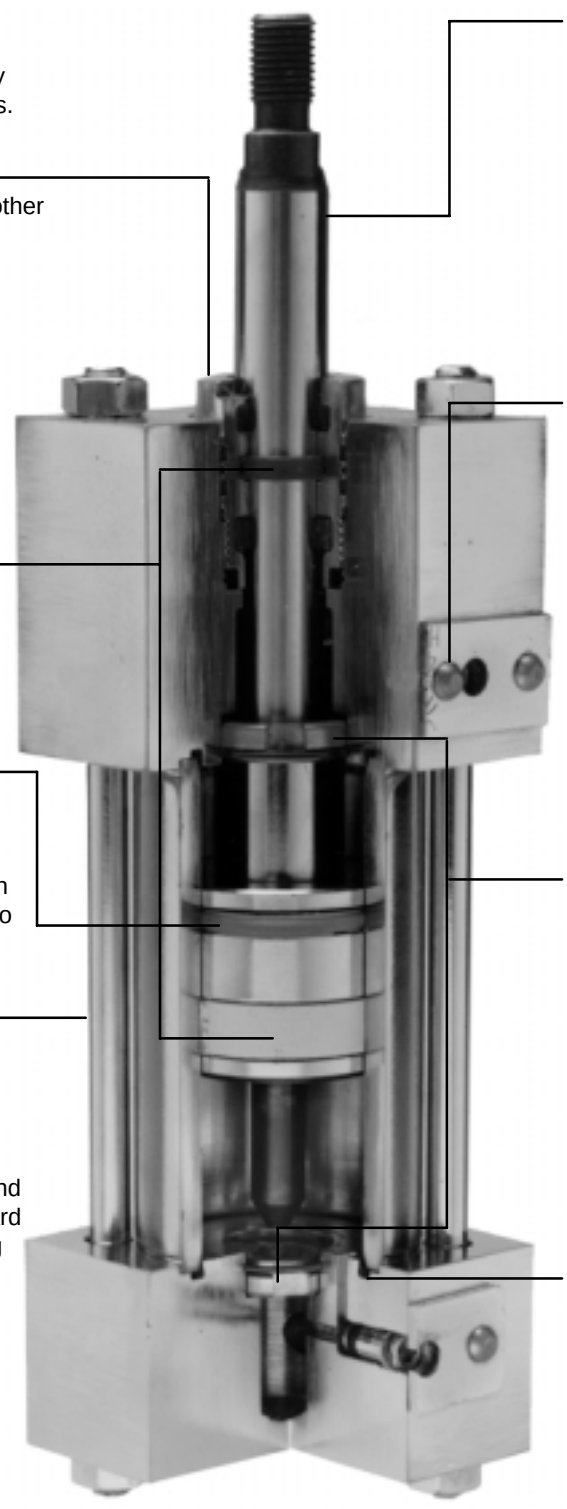
SureSeal™ Sealing System:
Carefully selected wiper and seal combinations are mated with a hard chrome plated piston rod to deliver exceptional all-around performance and durability.

Special Wearbands:
Metal-to-metal contact is eliminated, providing superior wearability, increased load carrying capability, and prolonged cylinder life.

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.

Square Head Tie-Rod Design:
Suitable for nominal working pressure up to 3000 psi.

Full Range of Ports:
Including SAE, ISO 228-1 BSPP, and metric to ISO 6149 and DIN standard 3852 to provide the broadest piping flexibility.



Piston Rod:
Case hardened, hard chrome plated piston rod in a variety of diameters between $^{5}/_{8}$ and $5^{1}/_{2}$ inches provides maximum durability and extends seal life. Several different rod end types are available.

ISO Standard Seal Grooves:
Rod and piston sealing systems both conform to ISO standard groove specifications.

Captive Screws:
Inadvertent removal of cushion screws and optional air bleed screws is prevented, while still allowing a full range of adjustment.

Bore Size Range:
Cylinder bores available between $1^{1}/_{2}$ and 8 inches.

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.

Attention to Details:
One example is the careful design of the body-to-head joint. The design assures ease of assembly while maintaining tight tolerances for exceptional concentricity between cylinder parts.

How To Order

Standard Cylinders

Vickers has created an easy system for ordering Series TZ 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 TZ cylinders.

To specify your Series TZ 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 TZ 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 TZ cylinder, you're assured of exactly the same top quality cylinder design.
- **Improve identification.** Every Series TZ 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.

NOTE

See pages 4 and 5 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).

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 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 a 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 Codes

(All dimensions are in inches)

TZ 17 KM 5 N 5 K W 108 PC

1,2 | 3,4 | 5,6 | 7 | 8 | 9 | 10 | 11 | 12,13,14 | 15,16

1,2 Series

TZ – ANSI B93.15/NFPA interchangeable hydraulic cylinder

3,4 Mounting style

Vickers Code	Style	ANSI Code
01 –	Side lug	**MS2**
02 –	Side tapped	**MS4**
04 –	Keyed side lug	
05 –	Keyed side tapped	
07 –	Head rectangular flange	**MF1**
08 –	Head square flange	**MF5**
09 –	Head rectangular	**ME5**
10 –	Cap clevis	**MP1**
** –	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 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, side tapped	
28 –	Double rod, keyed side lug	
29 –	Double rod, keyed side 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	

(See illustrations beginning on page 6.)

** – MP5 spherical bushing mountings are available in the Series JV catalog.

5,6 Bore and rod diameters

Code	Bore	Rod
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	$5^1/_2$

(See detailed information on page NO TAG.)

7 Rod end type

Code	Type
1 –	Short female metric thread
2 –	Short female UN thread
5 –	Small male UN thread
6 –	Plain no attachment
7 –	Small male metric thread
9 –	Intermediate male UN thread
0 –	Intermediate male metric
G –	Grooved end
K –	Extended small male UN thread
L –	Extended small male metric thread
M –	Extended intermediate male UN thread
N –	Extended intermediate male metric thread

(See detailed information on pages NO TAG & NO TAG.)

8 Sealing system

Code	Type
N –	Normal
L –	Low friction and water glycol
T –	High temperature

(See detailed information on page NO TAG.)

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
6 –	SAE 4-bolt manifold
7 –	BSPP
8 –	Oversize BSPP
9 –	Metric
0 –	Oversize metric

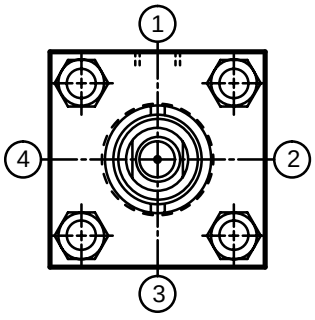
(See detailed information on page NO TAG.)

* – Not recommended for maximum reliability on new applications.

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
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

(See detailed information on page ~~NO TAG.~~)

11 **Cushion location**

Cushions are located as shown in item 7 when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no cushion.

Code	Head	Cap
A –	–	0
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

12,13,14 **Stroke length**

The first two digits indicate stroke length from 00 inches through 99 inches.

The third 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 **Enter applicable code for either:**

Extra rod projection ("C" dimension)

First number indicates inches from 0 through 9.

Second number indicates fractions of an inch per codes shown for item 14.

– or –

Air bleed, gland drain or proximity switch location.

Item 15 indicates air bleeds (**H**), gland drain **(G)** or proximity switches (**P**).

Item 16 indicates location of air bleeds, gland drains or proximity switches as shown in item 10 when viewing cylinder from head end (mounting end of double rod cylinders). "–" in table indicates no air bleed or proximity switch.

Code	Head	Cap
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

(See detailed information on page ~~NO TAG.~~)

Mounting Style

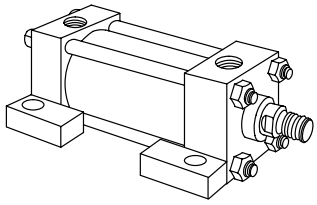
Available Mountings

The variety of standard ANSI/NFPA mountings available in the Series TZ 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 NO TAG through NO TAG. For custom mounts, enter “XX” for model code item 2, and give a detailed description with drawings. Series TZ cylinders are available in all mounting styles listed.

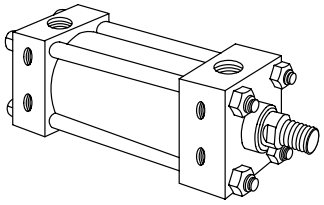
Selecting the Proper Mounting

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.

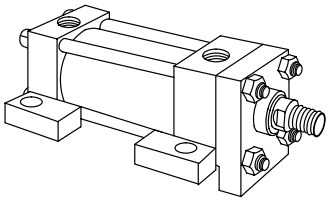
TZ01
Side lug
ANSI MS2



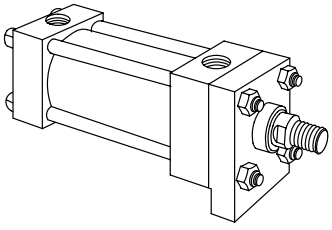
TZ02
Side tapped
ANSI MS4



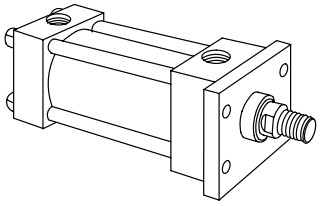
TZ04
Keyed side lug



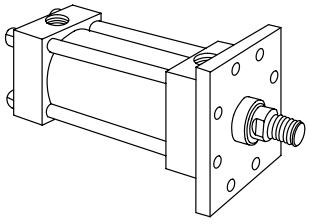
TZ05
Keyed side tapped



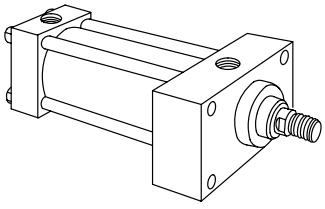
TZ07
Head rectangular flange
ANSI MF1
(Maximum working pressure 800 psi)



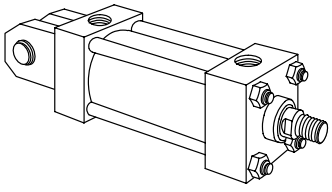
TZ08
Head square flange
ANSI MF5



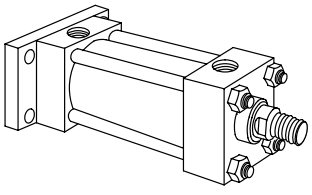
TZ09
Head rectangular
ANSI ME5



TZ10
Cap clevis
ANSI MP1

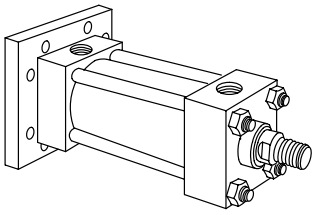


TZ12
Cap rectangular flange
ANSI MF2
(Maximum working pressure 800 psi)



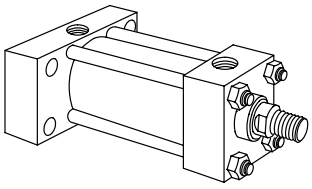
TZ13

Cap square flange
ANSI MF6



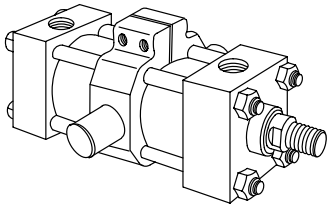
TZ14

Cap rectangular
ANSI ME6



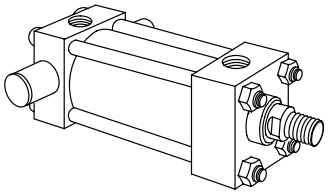
TZ15

Intermediate trunnion
ANSI MT4



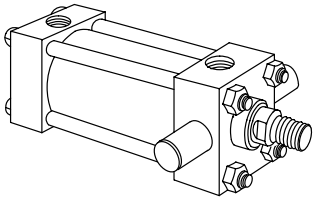
TZ16

Cap trunnion
ANSI MT2



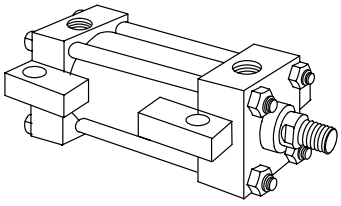
TZ17

Head trunnion
ANSI MT1



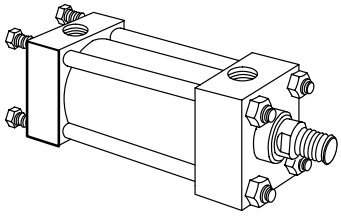
TZ19

Centerline lug
ANSI MS3



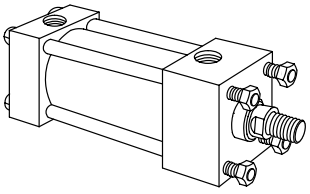
TZ21

Cap extended tie rod
ANSI MX2



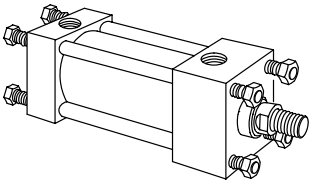
TZ22

Head extended tie rod
ANSI MX3



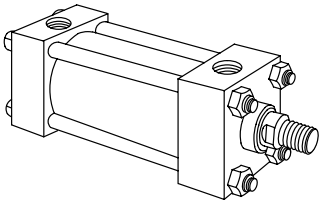
TZ23

Both ends extended tie rod
ANSI MX1



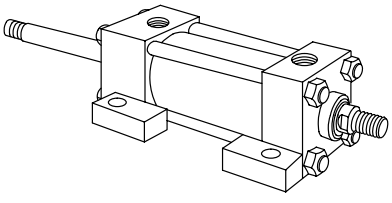
TZ24

No mount



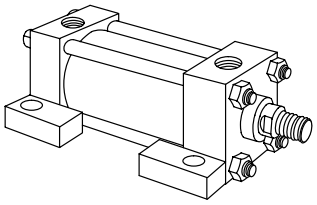
TZ25

Double rod, side lug



Series TZ Mounting Styles & Installation Dimensions

TZ01 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 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

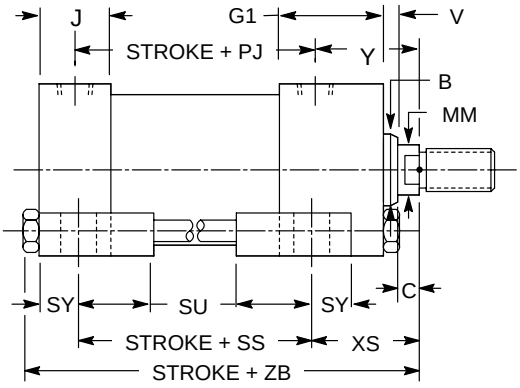
Limit operating pressure to 2320 psi for minimum deflection on 6, 7 and 8 inch bores. For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

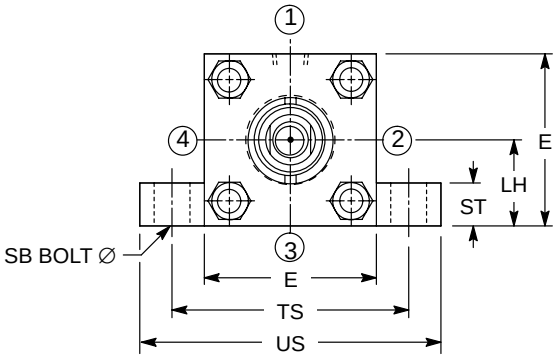
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

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, TZ04.

For severe side load applications, consult your local Vickers sales engineer.

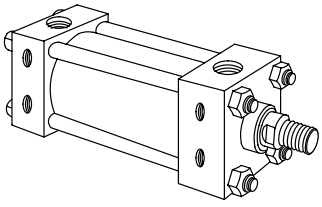




Bore	Rod MM	-.000/.002 B	C	E	G1	J	V	Y	-.006/-.010 LH	PJ+	SB	SS+	ST	SU	SY	TS	US	XS	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.25 .50	2.06 2.44	1.25 1.25	2.87 2.87	.38 .38	3.88 3.88	.50 .50	.91 .91	.39 .39	3.25 3.25	4.00 4.00	1.38 1.75	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.25 .38	2.39 2.64	1.50 1.50	2.91 2.91	.50 .50	3.63 3.63	.75 .75	1.24 1.24	.51 .51	4.00 4.00	5.00 5.00	1.88 2.13	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.25 .38 .50	2.30 2.55 2.80	1.75	3.15	.75	3.38	1.00	1.56	.68	4.88	6.25	2.06 2.31 2.56	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.25 .38 .38	2.66 2.91 3.03	2.25	3.66	.75	4.13	1.00	1.55	.69	5.88	7.25	2.31 2.56 2.69	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	.25 .25 .38	2.85 2.98 3.23	2.50	3.98	1.00	4.00	1.25	2.00	.87	6.75	8.50	2.75 2.88 3.13	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	.25 .38 .38 .38	2.82 3.06 3.06 3.06	3.25	4.64	1.00	4.50	1.25	2.00	.87	8.25	10.0	2.88 3.13 3.13 3.13	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.25	3.22	3.75	5.36	1.25	5.13	1.50	2.50	1.12	9.75	12.0	3.38	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.25	3.60	4.25	5.83	1.50	5.75	1.75	2.88	1.37	11.25	14.0	3.63	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	.25	3.86	4.75	6.50	1.50	6.75	1.75	2.88	1.37	12.25	15.0	3.63	13.00

+ Plus stroke

TZ02 Tapped
(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

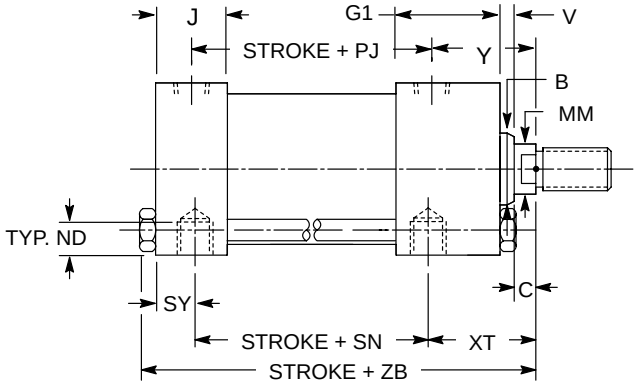
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

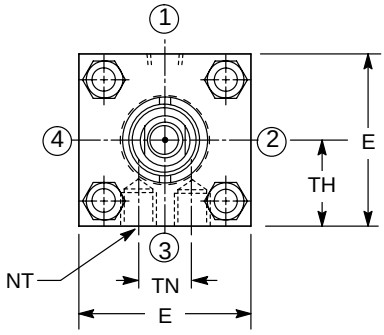
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

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, TZ04.

For severe side load applications, consult your local Vickers sales engineer.

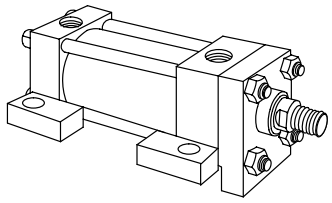




Bore	Rod MM	B -.000/-.002	C	E	G1	J	V	Y	Min. ND	NT	PJ+	SN+	TH -.006/-.010	TN	SY	XT	Max ZB+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.25 .50	2.06 2.44	.37 .37	3/8 - 16 3/8 - 16	2.87 2.87	2.88 2.88	1.25 1.25	.75 .75	.31 .31	2.00 2.38	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.25 .38	2.39 2.64	.49 .49	1/2 - 13 1/2 - 13	2.91 2.91	2.88 2.88	1.50 1.50	.94 .94	.39 .39	2.38 2.63	6.50 6.75
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.25 .38 .50	2.30 2.55 2.80	.61	5/8 - 11	3.15	3.00	1.75	1.31	.39	2.38 2.63 2.88	6.63 6.88 7.13
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.25 .38 .38	2.66 2.91 3.03	.75	3/4 - 10	3.66	3.50	2.25	1.50	.47	2.75 3.00 3.13	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	.25 .25 .38	2.85 2.98 3.23	.63	1 - 8	3.98	3.75	2.50	2.06	.67	3.00 3.13 3.38	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	.25 .38 .38 .38	2.82 3.06 3.06 3.06	1.00	1 - 8	4.61	4.25	3.25	2.94	.67	3.13 3.38 3.38 3.38	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.25	3.22	1.25	1 1/4 - 7	4.88	5.13	3.75	3.31	.87	3.50	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.25	3.60	1.50 1.50 1.50 1.50 1.12	1 1/2 - 6	5.38	5.88	4.25	3.75	.87	3.81	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	.25	3.86	1.50 1.50 1.50 1.50 1.25	1 1/2 - 6	6.50	6.63	4.75	4.25	1.14	3.94	13.00

+ Plus stroke

TZ04 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.

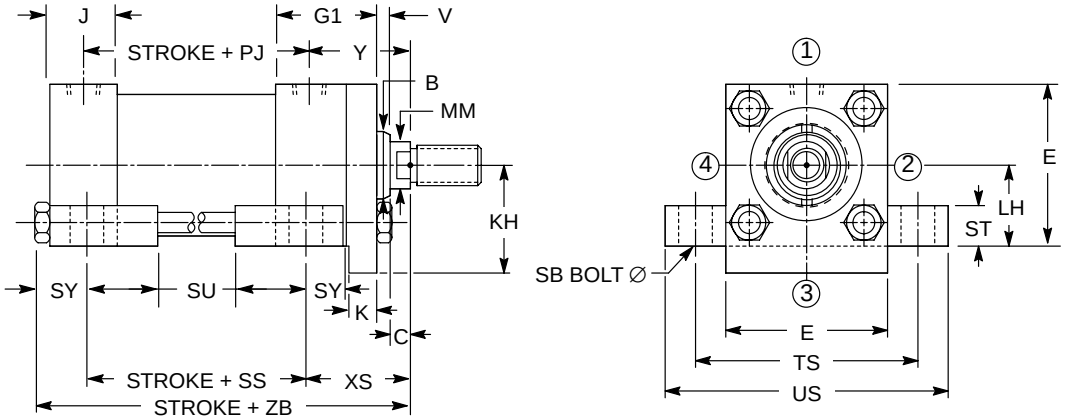
NOTE

For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

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.

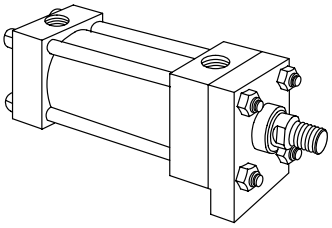
For severe side load applications, consult your local Vickers sales engineer.



Bore	Rod MM	-.000/-.002 B	C	E	G1	J	+.000/-.002 K	V	Y	Max KH	-.006/-.010 LH	PJ+	SB	SS+	ST	SU	SY	TS	US	XS	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.312 .312	.25 .50	2.06 2.44	1.44 1.44	1.25 1.25	2.87 2.87	.38 .38	3.88 3.88	.50 .50	.91 .91	.39 .39	3.25 3.25	4.00 4.00	1.38 1.75	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.562 .562	.25 .38	2.39 2.64	1.81 1.81	1.50 1.50	2.91 2.91	.50 .50	3.63 3.63	.75 .75	1.24 1.24	.51 .51	4.00 4.00	5.00 5.00	1.88 2.13	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.562	.25 .38 .50	2.30 2.55 2.80	2.06	1.75	3.15	.75	3.38	1.00	1.56	.68	4.88	6.25	2.06 2.31 2.56	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.687	.25 .38 .38	2.66 2.91 3.03	2.63	2.25	3.66	.75	4.13	1.00	1.55	.69	5.88	7.25	2.31 2.56 2.69	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.0	5.00	2.86	1.73	.812	.25 .38 .38	2.85 2.98 3.23	2.94	2.50	3.98	1.0	4.00	1.25	2.00	.87	6.75	8.50	2.75 2.88 3.13	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.0 1.0 1.0	6.50	2.98	1.73	.812	.25 .38 .38 .38	3.14 3.39 3.39 3.39	3.68	3.25	4.61	1.0	4.50	1.25	2.00	.87	8.25	10.0	2.88 3.13 3.13 3.13	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.0	7.50	3.23	2.23	.937	.25	3.50	4.25	3.75	4.88	1.3	5.13	1.50	2.50	1.12	9.75	12.0	3.38	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.0	8.50	3.73	2.73	.937	.25	3.81	4.75	4.25	5.38	1.5	5.75	1.75	2.88	1.37	11.3	14.0	3.63	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.0	9.63	4.23	2.98	.937	.25	3.86	5.25	4.75	6.50	1.5	6.75	1.75	2.88	1.37	12.3	15.0	3.63	13.00

+ Plus stroke

TZ05 Keyed Tapped



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

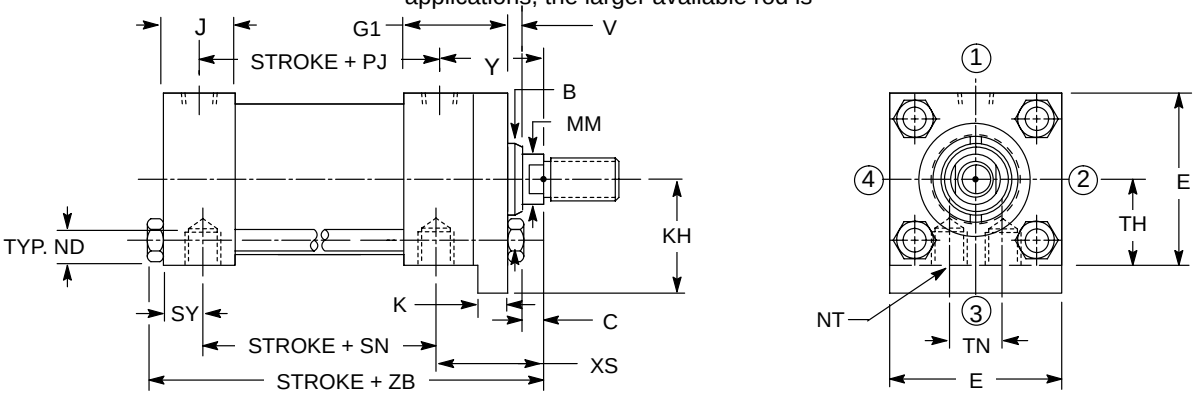
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

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, TZ04.

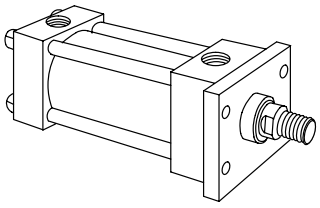
For severe side load applications, consult your local Vickers sales engineer.



Bore	Rod MM	-.000/-.002 B	C	E	G1	J	-+.000/-.002 K	V	Y	Max KH	Min. ND	NT	PJ+	SN+	-.006/-.010 TH	TN	SY	XS	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.312 .312	.25 .50	2.06 2.44	1.44 1.44	.37 .37	$^3/_8$ - 16 $^3/_8$ - 16	2.87 2.87	2.88 2.88	1.25 1.25	.75 .75	.31 .31	2.00 2.38	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.562 .562	.25 .38	2.39 2.64	1.81 1.81	.49 .49	$^1/_2$ - 13 $^1/_2$ - 13	2.91 2.91	2.88 2.88	1.50 1.50	.94 .94	.39 .39	2.38 2.63	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.562	.25 .38 .50	2.30 2.55 2.80	2.06	.61	$^5/_8$ - 11	3.15	3.00	1.75	1.31	.39	2.38 2.63 2.88	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.687	.25 .38 .38	2.66 2.91 3.03	2.63	.75	$^3/_4$ - 10	3.66	3.50	2.25	1.50	.47	2.75 3.00 3.13	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	.812	.25 .25 .38	2.85 2.98 3.23	2.94	.63	1 - 8	3.98	3.75	2.50	2.06	.67	3.00 3.13 3.38	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	.812	.25 .38 .38 .38	2.82 3.06 3.06 3.06	3.68	1.00	1 - 8	4.61	4.25	3.25	2.94	.67	3.13 3.38 3.38 3.38	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.937	.25	3.22	4.25	1.25	$1^1/_4$ - 7	4.88	5.13	3.75	3.31	.87	3.50	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.937	.25	3.60	4.75	1.50 1.50 1.50 1.50 1.12	$1^1/_2$ - 6	5.38	5.88	4.25	3.75	.87	3.81	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	.937	.25	3.86	5.25	1.50 1.50 1.50 1.50 1.25	$1^1/_2$ - 6	6.50	6.63	4.75	4.25	1.14	3.94	13.00

+ Plus stroke

TZ07 Head Rectangular 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.

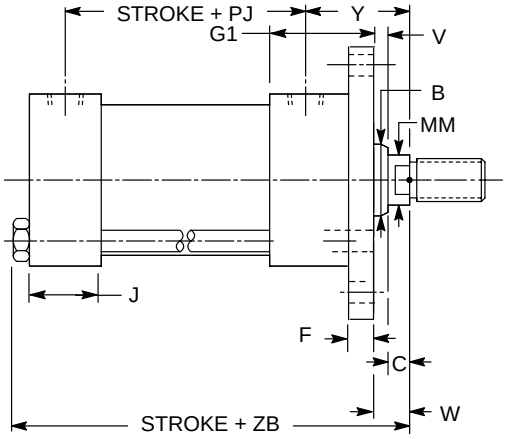
NOTE

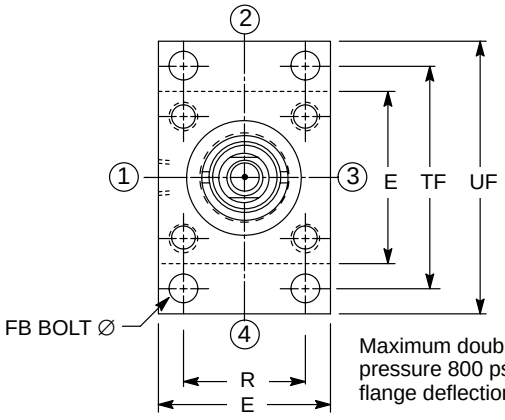
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

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 (TZ09) is recommended for heavy duty applications. TZ07 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.



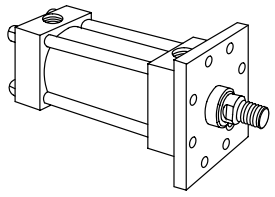


Maximum double acting working pressure 800 psi – for minimum flange deflection.

Bore	Rod MM	-.000/-.002 B	C	E	F	G1	J	R	V	W	Y	FB	PJ+	TF	UF	Max ZB+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	.38 .38	2.23 2.23	1.48 1.48	1.63 1.63	.25 .50	.63 1.00	2.06 2.44	.38 .38	2.87 2.87	3.44 3.44	4.25 4.25	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	.63 .63	2.36 2.36	1.48 1.48	2.05 2.05	.25 .38	.75 1.00	2.39 2.64	.50 .50	2.91 2.91	4.13 4.13	5.13 5.13	6.50 6.75
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	.63	2.36	1.48	2.55	.25 .38 .50	.75 1.00 1.25	2.30 2.55 2.80	.50	3.15	4.63	5.63	6.63 6.88 7.13
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	.75	2.73	1.73	3.25	.25 .38 .38	.88 1.13 1.25	2.66 2.91 3.03	.63	3.66	5.88	7.13	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	.88	2.86	1.73	3.82	.25 .25 .38	1.00 1.13 1.38	2.85 2.98 3.23	.63	3.98	6.38	7.63	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	.88	2.98	1.73	4.95	.25 .38 .38 .38	1.13 1.38 1.38 1.38	3.14 3.39 3.39 3.39	.88	4.61	8.19	9.75	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	1.00	3.23	2.23	5.73	.25	1.25	3.50	1.00	4.88	9.44	11.25	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	1.00	3.73	2.73	6.58	.25	1.25	3.81	1.13	5.38	10.63	12.63	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	1.00	4.23	2.98	7.50	.25	1.25	3.86	1.25	6.50	11.81	14.00	13.00

TZ08 Head Square Flange

(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.

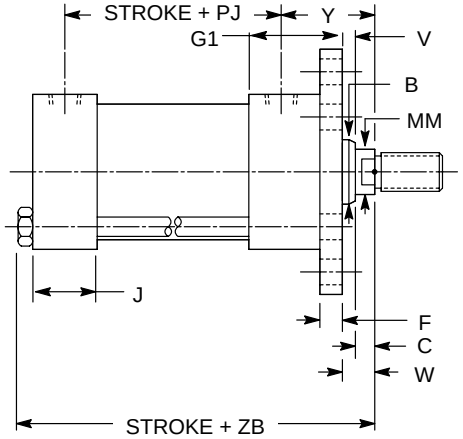
NOTE

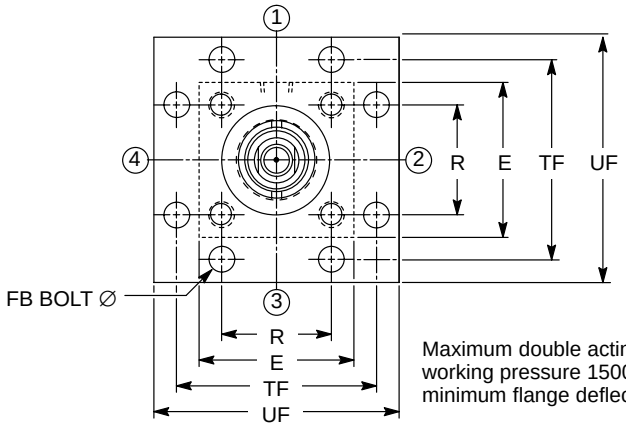
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

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 (TZ09) is recommended for heavy duty applications. Seven and eight inch bore TZ08 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.

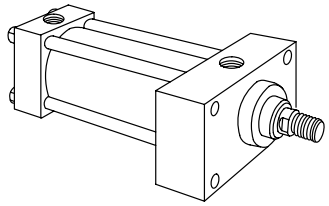




Maximum double acting working pressure 1500 psi for minimum flange deflection.

Bore	Rod MM	-.000/-.002 B	C	E	F	G1	J	R	V	W	Y	FB	PJ+	TF	UF	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	.38 .38	2.23 2.23	1.48 1.48	1.63 1.63	.25 .50	.63 1.00	2.06 2.44	.38 .38	2.87 2.87	3.44 3.44	4.25 4.25	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	.63 .63	2.36 2.36	1.48 1.48	2.05 2.05	.25 .38	.75 1.00	2.39 2.64	.50 .50	2.91 2.91	4.13 4.13	5.13 5.13	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	.63	2.36	1.48	2.55	.25 .38 .50	.75 1.00 1.25	2.30 2.55 2.80	.50	3.15	4.63	5.63	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	.75	2.73	1.73	3.25	.25 .38 .38	.88 1.13 1.25	2.66 2.91 3.03	.63	3.66	5.88	7.13	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	.88	2.86	1.73	3.82	.25 .25 .38	1.00 1.13 1.38	2.85 2.98 3.23	.63	3.98	6.38	7.63	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	.88	2.98	1.73	4.95	.25 .38 .38 .38	1.13 1.38 1.38 1.38	3.14 3.39 3.39 3.39	.88	4.61	8.19	9.75	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	1.00	3.23	2.23	5.73	.25	1.25	3.50	1.00	4.88	9.44	11.25	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	1.00	3.73	2.73	6.58	.25	1.25	3.81	1.13	5.38	10.63	12.63	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	1.00	4.23	2.98	7.50	.25	1.25	3.86	1.25	6.50	11.81	14.00	13.00

TZ09 Head Rectangular Mounts (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.

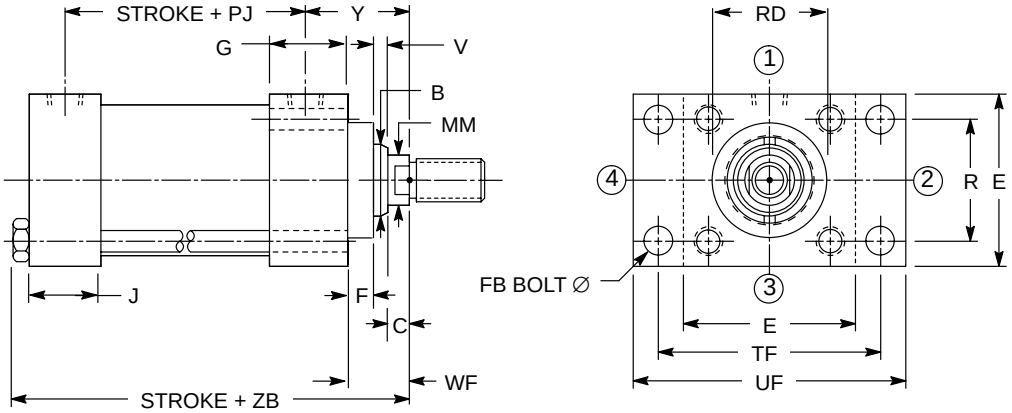
NOTE

For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

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 (TZ09) is recommended for heavy duty applications.

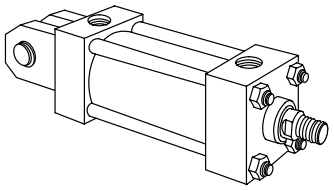
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer’s recommended torque.



Bore	Rod MM	-.000/-.002 B	C	E	Max. F	G	J	R	V	Y	FB	PJ+	+/- .001 Max. RD	TF	UF	WF	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	.38 .38	1.75 1.75	1.48 1.48	1.63 1.63	.25 .50	2.06 2.44	.38 .38	2.87 2.87	2.439 2.439	3.44 3.44	4.25 4.25	1.00 1.38	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	.63 .63	1.75 1.75	1.48 1.48	2.05 2.05	.25 .38	2.39 2.64	.50 .50	2.91 2.91	2.911 2.911	4.13 4.13	5.13 5.13	1.38 1.63	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	.63	1.75	1.48	2.55	.25 .38 .50	2.30 2.55 2.80	.50	3.15	2.951 3.226 3.462	4.63	5.63	1.38 1.63 1.88	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	.75	2.00	1.73	3.25	.25 .38 .38	2.66 2.91 3.03	.63	3.66	3.226 3.620 4.131	5.88	7.13	1.63 1.88 2.00	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	.88	2.00	1.73	3.82	.25 .25 .38	2.85 2.98 3.23	.63	3.98	3.620 4.131 4.918	6.38	7.63	1.88 2.00 2.25	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	.88	2.00	1.73	4.95	.25 .38 .38 .38	3.14 3.39 3.39 3.39	.88	4.61	4.131 4.918 5.903 5.903	8.19	9.75	2.00 2.25 2.25 2.25	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	1.00	2.25	2.23	5.73	.25	3.50	1.00	4.88	4.918 5.903 5.903 7.084	9.44	11.25	2.25	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	1.00	2.75	2.73	6.58	.25	3.81	1.13	5.38	5.903 5.903 6.690 8.264 8.264	10.63	12.63	2.25	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	1.00	3.25	2.98	7.50	.25	3.86	1.25	6.50	5.903 6.690 6.690 8.264 8.264	11.81	14.00	2.25	13.00

+ Plus stroke

TZ10 Clevis Mount (ANSI MP1)



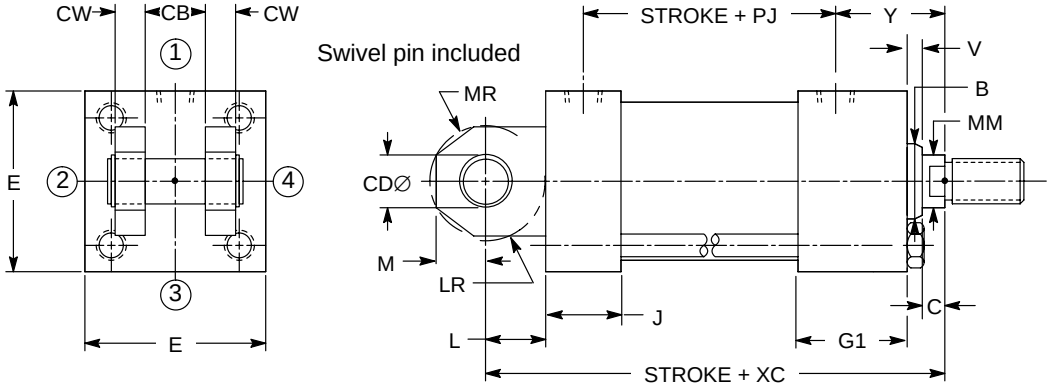
These mounts are for applications in which the machine member travels in a curved path within one plane.

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 37 for stroke limitations.

NOTE

For strokes in excess of 24 inches, see “Stop tube selection” on page NO TAG.

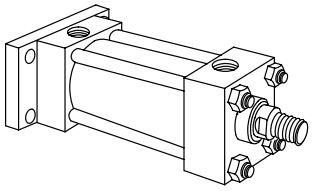
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excess side loading on the bearing and piston. This will lead to premature failure. For applications with small amounts of misalignment, consider the spherical bearing mount, as shown in the TV Catalog under TV11.



Bore	Rod MM	-.000/-.002 B	C	E	G1	J	L	M	V	Y	CB	CD	Max. CW	LR	PJ+	MR	XC+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.75 .75	.50 .50	.25 .50	2.06 2.44	.75 .75	.50 .50	.50 .50	.63 .63	2.87 2.87	.63 .63	6.38 6.75
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	1.25 1.25	.75 .75	.25 .38	2.39 2.64	1.25 1.25	.75 .75	.63 .63	1.13 1.13	2.91 2.91	.88 .88	7.25 7.50
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	1.25	.75	.25 .38 .50	2.30 2.55 2.80	1.25	.75	.63	1.13	3.15	.88	7.38 7.63 7.88
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	1.50	1.00	.25 .38 .38	2.66 2.91 3.03	1.50	1.00	.75	1.38	3.66	1.25	8.63 8.88 9.00
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	2.13	1.38	.25 .25 .38	2.85 2.98 3.23	2.00	1.38	1.00	1.88	3.98	1.63	9.75 9.88 10.13
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	2.25	1.50	.25 .38 .38 .38	3.14 3.39 3.39 3.36	2.50	1.75	1.25	2.00	4.61	1.88	10.50 10.75 10.75 10.75
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	2.50	2.00	.25	3.50	2.50	2.00	1.25	2.25	4.88	2.09	12.13
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	3.00	2.50	.25	3.81	3.00	2.50	1.50	2.75	5.38	2.63	13.75
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	3.25	2.75	.25	3.86	3.00	3.00	1.50	3.00	6.50	2.88	15.00

+ Plus stroke

TZ12 Cap Rectangular Flange (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.

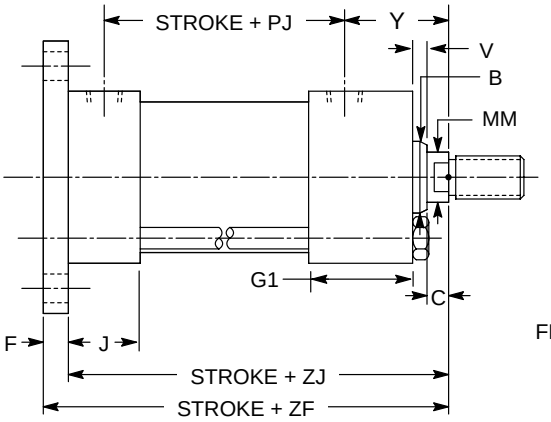
NOTE

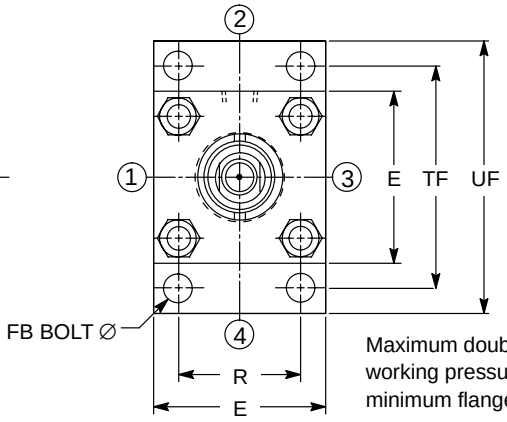
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The cap rectangular mounts (TZ14) is recommended for heavy duty applications. TZ12 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.





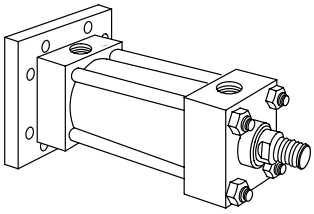
Maximum double acting working pressure 800 psi for minimum flange deflection.

Bore	Rod MM	-.000/-.002 B	C	E	F	G1	J	R	V	Y	FB	PJ+	TF	UF	ZF+	ZJ+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	.38 .38	2.23 2.23	1.48 1.48	1.63 1.63	.25 .50	2.06 2.44	.38 .38	2.87 2.87	3.44 3.44	4.25 4.25	6.00 6.38	5.63 6.00
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	.63 .63	2.36 2.36	1.48 1.48	2.05 2.05	.25 .38	2.39 2.64	.50 .50	2.91 2.91	4.13 4.13	5.13 5.13	6.63 6.88	6.00 6.25
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	.63	2.36	1.48	2.55	.25 .38 .50	2.30 2.55 2.80	.50	3.15	4.63	5.63	6.75 7.00 7.25	6.13 6.38 6.63
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	.75	2.73	1.73	3.25	.25 .38 .38	2.66 2.91 3.03	.63	3.66	5.88	7.13	7.88 8.13 8.25	7.13 7.38 7.50
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	.88	2.86	1.73	3.82	.25 .25 .38	2.85 2.98 3.23	.63	3.98	6.38	7.63	8.50 8.63 8.88	7.63 7.75 8.00
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	.88	2.98	1.73	4.95	.25 .38 .38 .38	3.14 3.39 3.39 3.39	.88	4.61	8.19	9.75	9.13 9.38 9.38 9.38	8.25 8.50 8.50 8.50
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	1.00	3.23	2.23	5.73	.25	3.50	1.00	4.88	9.44	11.25	10.63	9.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	1.00	3.73	2.73	6.58	.25	3.81	1.13	5.38	10.63	12.63	11.75	10.75
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	1.00	4.23	2.98	7.50	.25	3.86	1.25	6.50	11.81	14.00	12.75	11.75

+ Plus stroke

TZ13 Cap Square Flange

(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.

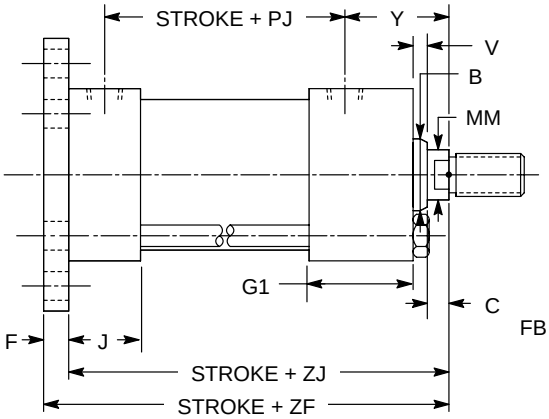
NOTE

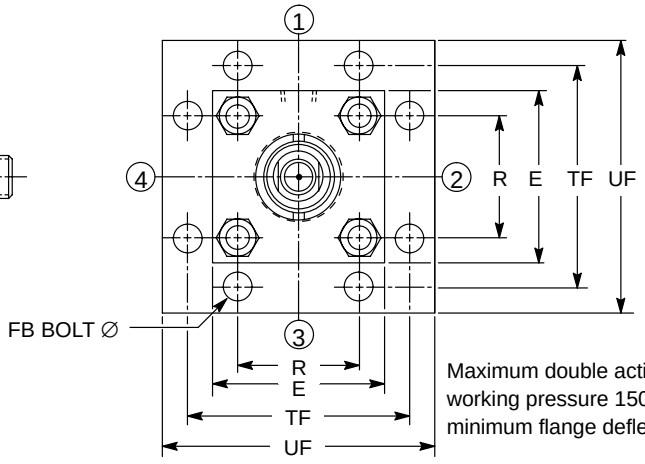
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The cap rectangular mounts (TZ14) is recommended for heavy duty applications. Seven and eight inch bore TZ13 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.



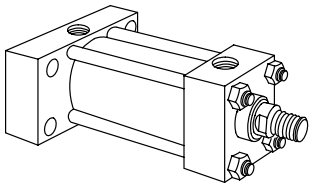


Maximum double acting working pressure 1500 psi for minimum flange deflection.

Bore	Rod MM	-.000/-.002 B	C	E	F	G1	J	R	V	Y	FB	PJ+	TF	UF	ZF+	ZJ+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	.38 .38	2.23 2.23	1.48 1.48	1.63 1.63	.25 .50	2.06 2.44	.38 .38	2.87 2.87	3.44 3.44	4.25 4.25	6.00 6.38	5.63 6.00
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	.63 .63	2.36 2.36	1.48 1.48	2.05 2.05	.25 .38	2.39 2.64	.50 .50	2.91 2.91	4.13 4.13	5.13 5.13	6.63 6.88	6.00 6.25
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	.63	2.36	1.48	2.55	.25 .38 .50	2.30 2.55 2.80	.50	3.15	4.63	5.63	6.75 7.00 7.25	6.13 6.38 6.63
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	.75	2.73	1.73	3.25	.25 .38 .38	2.66 2.91 3.03	.63	3.66	5.88	7.13	7.88 8.13 8.25	7.13 7.38 7.50
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	.88	2.86	1.73	3.82	.25 .25 .38	2.85 2.98 3.23	.63	3.98	6.38	7.63	8.50 8.63 8.88	7.63 7.75 8.00
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	.88	2.98	1.73	4.95	.25 .38 .38 .38	3.14 3.39 3.39 3.39	.88	4.61	8.19	9.75	9.13 9.38 9.38 9.38	8.25 8.50 8.50 8.50
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	1.00	3.23	2.23	5.73	.25	3.50	1.00	4.88	9.44	11.25	10.63	9.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	1.00	3.73	2.73	6.58	.25	3.81	1.13	5.38	10.63	12.63	11.75	10.75
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	1.00	4.23	2.98	7.50	.25	3.86	1.25	6.50	11.81	14.00	12.75	11.75

+ Plus stroke

TZ14 Cap Rectangular Mounts (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.

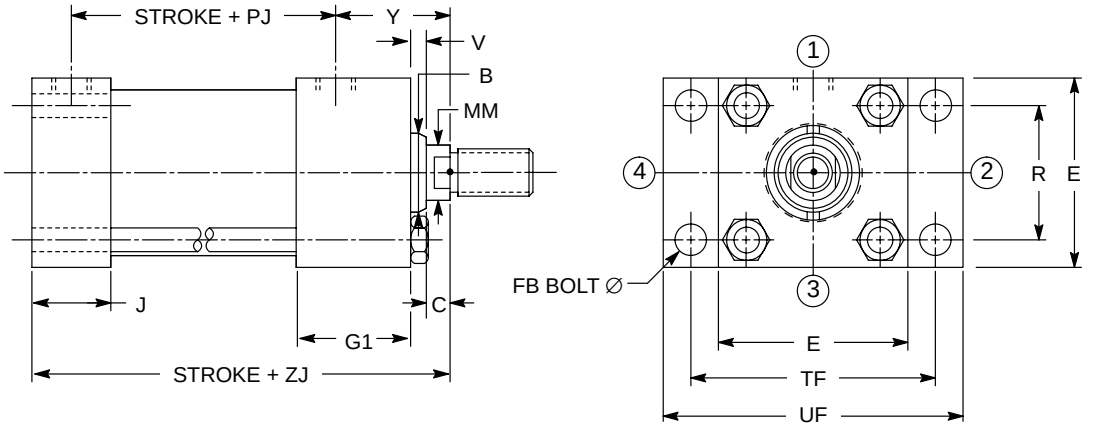
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The cap rectangular mount (TZ14) is recommended for heavy duty applications.

NOTE

For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer’s recommended torque value.

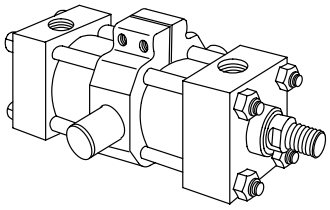


Bore	Rod MM	-.000/-.002 B	C	E	G1	J	R	V	Y	FB	PJ+	TF	UF	ZJ+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.50 1.50	1.63 1.63	.25 .50	2.06 2.44	.38 .38	2.87 2.87	3.44 3.44	4.25 4.25	5.63 6.00
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.50 1.50	2.05 2.05	.25 .38	2.39 2.64	.50 .50	2.91 2.91	4.13 4.13	5.13 5.13	6.00 6.25
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.50	2.55	.25 .38 .50	2.30 2.55 2.80	.50	3.15	4.63	5.63	6.13 6.38 6.63
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.75	3.25	.25 .38 .38	2.66 2.91 3.03	.63	3.66	5.88	7.13	7.13 7.38 7.50
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.75	3.82	.25 .25 .38	2.85 2.98 3.23	.63	3.98	6.38	7.63	7.63 7.75 8.00
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.75	4.95	.25 .38 .38 .38	3.14 3.39 3.39 3.39	.88	4.61	8.19	9.75	8.25 8.50 8.50 8.50
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.25	5.73	.25	3.50	1.00	4.88	9.44	11.25	9.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.75	6.58	.25	3.81	1.13	5.38	10.63	12.63	10.75
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	3.00	7.50	.25	3.86	1.25	6.50	11.81	14.00	11.75

+ Plus stroke

TZ15 Intermediate Trunnion Mount

(ANSI MT4)



The Intermediate Trunnion Mount is for longer stroke applications in which the machine member travels in a curved path in one plane.

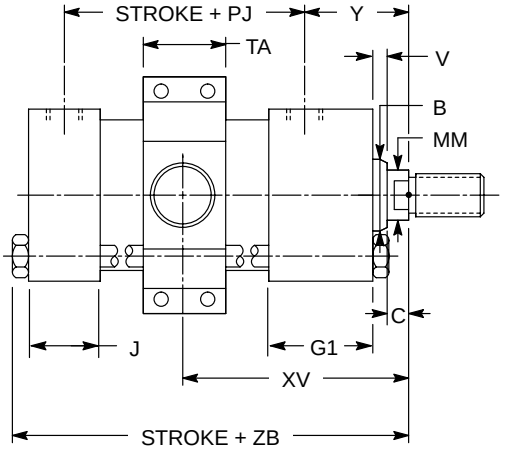
On special orders, the trunnion can be located anywhere along the body.

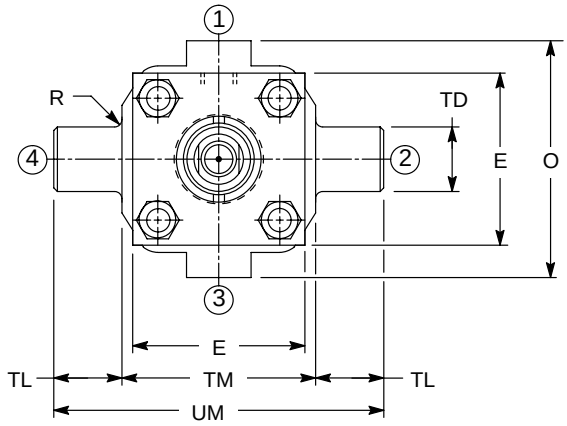
This mount can be used both in compression (push) and tension (pull) applications.

NOTE

For strokes in excess of 24 inches, see “Stop tube selection” on page NO TAG.

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.



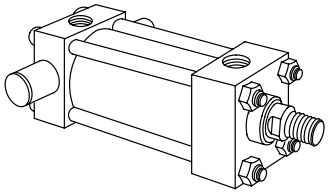


Bore	Rod MM	-.000/-.002 B	C	E	G1	J	Max. O	V	Y	PJ+	TA	-.000/-.002 TD	TL	TM	UM	XV* Min	XV* Std*	XV* Max+	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	3.38 3.38	.25 .50	2.06 2.44	2.87 2.87	1.14 1.14	1.000 1.000	.63 .63	3.00 3.00	4.26 4.26	3.49 3.86	3.44 3.81	3.53 3.91	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	4.13 4.13	.25 .38	2.39 2.64	2.91 2.91	1.52 1.52	1.375 1.375	.79 .79	3.50 3.50	5.08 5.08	3.92 4.17	3.81 4.19	3.72 3.97	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	4.80	.25 .38 .50	2.30 2.55 2.80	3.15	1.67	1.375	.98	4.00	5.96	4.00 4.25 4.50	3.88 4.13 4.38	3.47 3.99 4.24	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	6.00	.25 .38 .38	2.66 2.91 3.03	3.66	2.01	1.750	1.26	5.00	7.52	4.67 4.92 5.04	4.50 4.75 4.88	4.34 4.59 4.71	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.0	5.00	2.86	1.73	6.81	.25 .25 .38	2.85 2.98 3.23	3.98	2.60	1.750	1.57	5.50	8.64	5.21 5.34 5.59	4.88 5.00 5.25	4.53 4.66 4.91	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.0 1.0 1.0	6.50	2.98	1.73	8.43	.25 .38 .38 .38	3.14 3.39 3.39 3.39	4.61	3.31	1.750	1.75	7.00	10.5	5.82 6.07 6.07 6.07	5.25 5.50 5.50 5.50	4.81 5.06 5.06 5.06	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.0	7.50	3.23	2.23	10.23	.25	3.50	4.88	3.90	2.000	1.97	8.50	12.4	6.49	5.94	5.39	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.0	8.50	3.73	2.73	11.50	.25	3.81	5.38	4.65	2.500	2.50	9.75	14.75	7.36	6.50	5.64	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.0	9.63	4.23	2.98	13.66	.25	3.86	6.50	5.24	3.000	3.00	11.0	17.0	8.16	7.13	6.10	13.00

* The standard XV dimension is Stroke/2 + XV (std.) unless otherwise specified.
\+ Plus stroke

TZ16 Cap Trunnion Mounts

(ANSI MT2)



These mounts are for applications in which the machine member travels in a curved path in one plane.

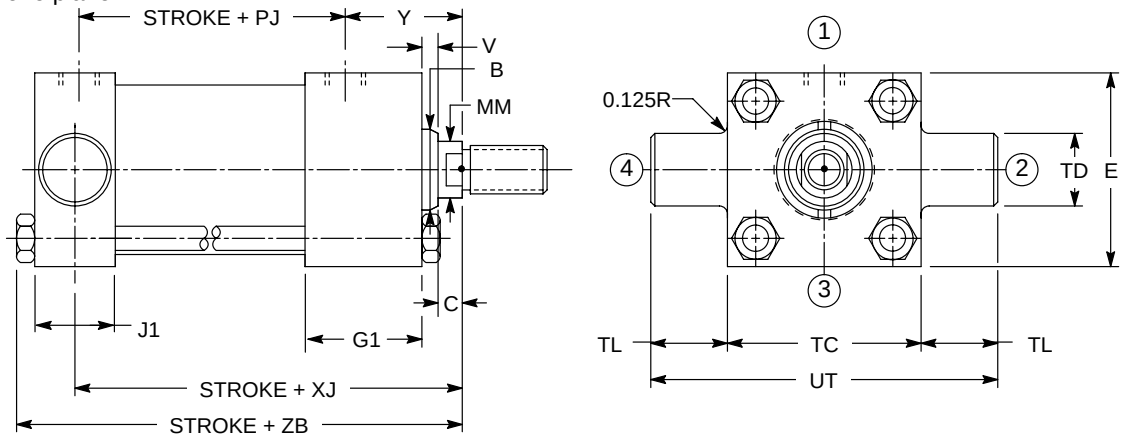
Either mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE

For strokes in excess of 24 inches, see “Stop tube selection” on page NO TAG.

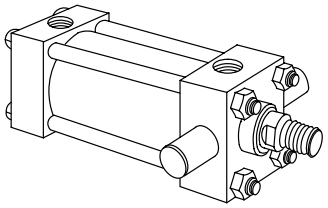
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

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 MM	-.000/-.002 B	C	E	G1	J1	V	Y	PJ+	TC	-.000/-.002 TD	TL	UT	XJ+	Max ZB+
$1^1/_2$	.625 1	1.24 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.25 .50	2.06 2.44	2.87 2.87	2.50 2.50	1.000 1.000	1.00 1.00	4.50 4.50	4.88 5.25	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.25 .38	2.39 2.64	2.91 2.91	3.00 3.00	1.375 1.375	1.38 1.38	5.75 5.75	5.25 5.50	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.25 .38 .50	2.30 2.55 2.80	3.15	3.50	1.375	1.38	6.25	5.38 5.63 5.88	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.98	.25 .38 .38	2.66 2.91 3.03	3.66	4.50	1.750	1.75	8.00	6.25 6.50 6.63	7.75 8.13 8.25
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.98	.25 .25 .38	2.85 2.98 3.23	3.98	5.00	1.750	1.75	8.50	6.75 6.88 7.13	8.40 8.50 8.75
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.98	.25 .38 .38 .38	3.14 3.39 3.39 3.39	4.61	6.50	1.750	1.75	10.0	7.38 7.63 7.63 7.63	9.25 9.44 9.44 9.44
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.25	3.50	4.88	7.50	2.000	2.00	11.5	8.38	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.25	3.81	5.38	8.50	2.500	2.50	13.5	9.38	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	3.23	.25	3.86	6.50	9.50	3.000	3.00	15.5	10.25	13.00

TZ17 Head Trunnion Mounts (ANSI MT1)



These mounts are for applications in which the machine member travels in a curved path in one plane.

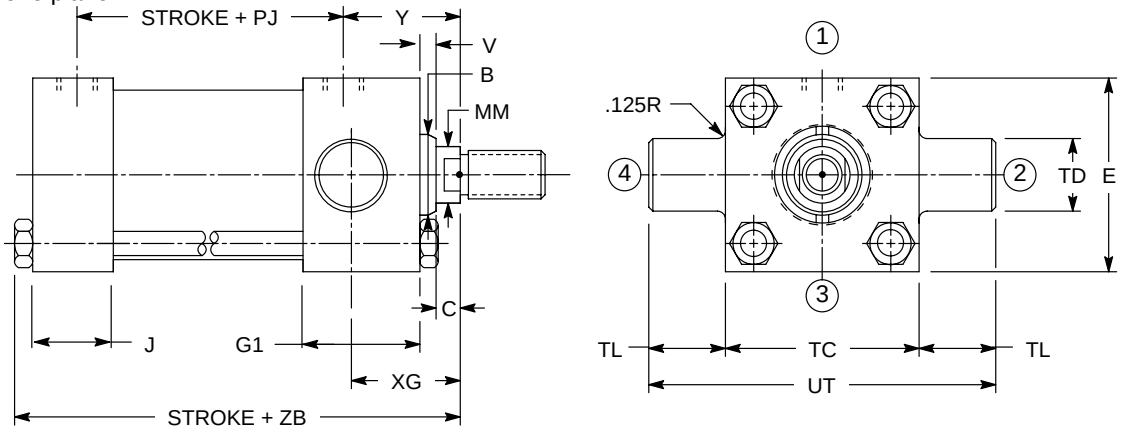
Either mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE

For strokes in excess of 24 inches, see “Stop tube selection” on page NO TAG.

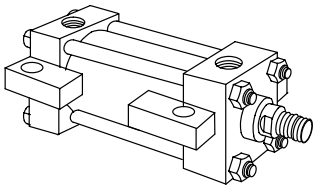
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

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 MM	-.000/-.002 B	C	E	G1	J	V	Y	PJ+	TC	-.000/-.002 TD	TL	UT	XG	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.25 .50	2.06 2.44	2.87 2.87	2.50 2.50	1.000 1.000	1.00 1.00	4.50 4.50	1.88 2.25	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.25 .38	2.39 2.64	2.91 2.91	3.00 3.00	1.375 1.375	1.38 1.38	5.75 5.75	2.25 2.50	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.25 .38 .50	2.30 2.55 2.80	3.15	3.50	1.375	1.38	6.25	2.25 2.50 2.75	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.25 .38 .38	2.66 2.91 3.03	3.66	4.50	1.750	1.75	8.00	2.63 2.88 3.00	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.0	5.00	2.86	1.73	.25 .25 .38	2.85 2.98 3.23	3.98	5.00	1.750	1.75	8.50	2.88 3.00 3.25	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.0 1.0 1.0	6.50	2.98	1.73	.25 .38 .38 .38	3.14 3.39 3.39 3.39	4.61	6.50	1.750	1.75	10.0	3.00 3.25 3.25 3.25	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.25	3.50	4.88	7.50	2.000	2.00	11.5	3.38	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.25	3.81	5.38	8.50	2.500	2.50	13.5	3.63	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.62	4.23	2.98	.25	3.86	6.50	9.50	3.000	3.00	15.5	3.75	13.00

TZ19 Centerline 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

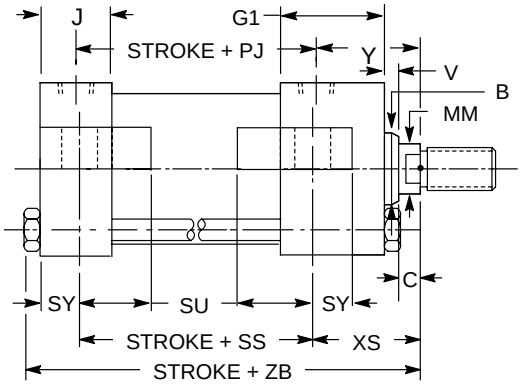
Limit operating pressure to 1500 psi for minimum deflection. For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

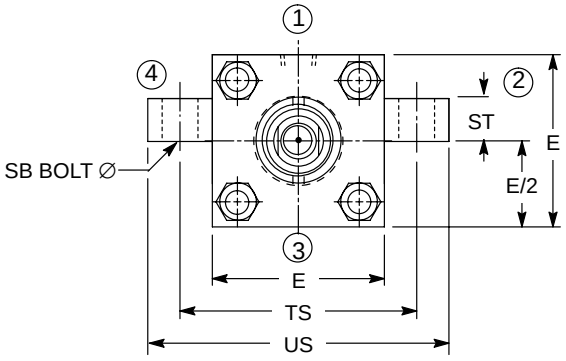
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

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 Vickers sales engineer.

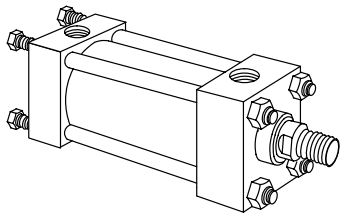




Bore	Rod MM	-.000/.002 B	C	E	G1	J	V	Y	E/2	PJ+	SB	SS+	ST	SU	SY	TS	US	XS	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.25 .50	2.06 2.44	1.25 1.25	2.87 2.87	.38 .38	3.88 3.88	.50 .50	.91 .91	.39 .39	3.25 3.25	4.00 4.00	1.38 1.75	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.25 .38	2.39 2.64	1.50 1.50	2.91 2.91	.50 .50	3.63 3.63	.75 .75	1.24 1.24	.51 .51	4.00 4.00	5.00 5.00	1.88 2.13	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.25 .38 .50	2.30 2.55 2.80	1.75	3.15	.75	3.38	1.00	1.56	.68	4.88	6.25	2.06 2.31 2.56	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.25 .38 .38	2.66 2.91 3.03	2.25	3.66	.75	4.13	1.00	1.55	.69	5.88	7.25	2.31 2.56 2.69	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	.25 .25 .38	2.85 2.98 3.23	2.50	3.98	1.00	4.00	1.25	2.00	.87	6.75	8.50	2.75 2.88 3.13	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	.25 .38 .38 .38	2.82 3.06 3.06 3.06	3.25	4.64	1.00	4.50	1.25	2.00	.87	8.25	10.0	2.88 3.13 3.13 3.13	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.25	3.22	3.75	5.36	1.25	5.13	1.50	2.50	1.12	9.75	12.0	3.38	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.25	3.60	4.25	5.83	1.50	5.75	1.75	2.88	1.37	11.25	14.0	3.63	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	.25	3.86	4.81	6.50	1.50	6.75	1.75	2.88	1.37	12.25	15.0	3.63	13.00

+ Plus stroke

TZ21 Cap Extended Tie Rod Mounts (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 (right).

NOTE

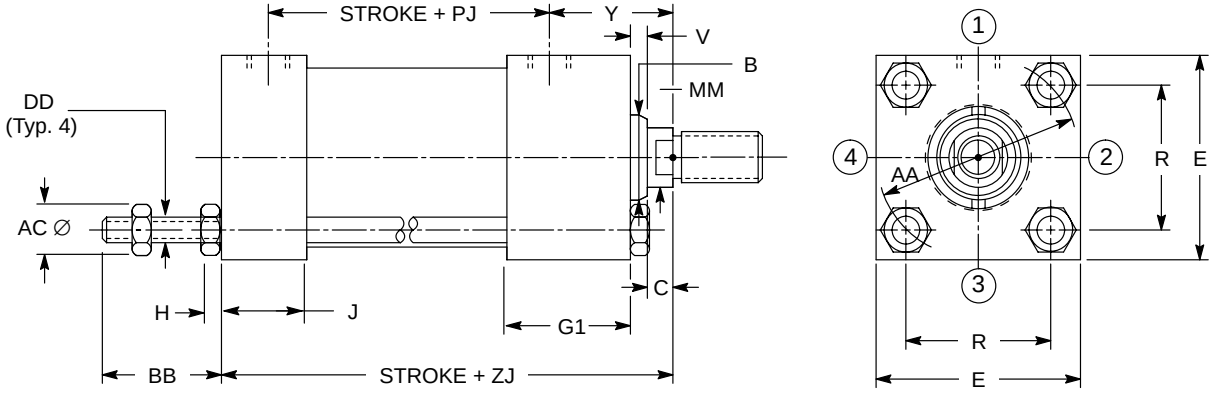
For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

Tie Rod Torque Values

Torque values in the following table apply to all mounting styles.

Bore ∅ (in)	Tie Rod Torque* (ft-lb)	(Nm)
$1^1/_2$	14	19
2	33	45
$2^1/_2$	50	68
$3^1/_4$	105	140
4	150	205
5	340	460
6	570	770
7	840	1140
8	1120	1520

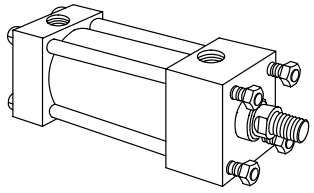
* Recommended torque values using MoS_2 lubricant with 0,12 coefficient of friction.



Bore	Rod MM	-.000/-.002 B	C	E	G1	Max H	J	R	V	Y	AA	Max AC	BB	(UN) DD	PJ+	ZJ+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	.38 .38	1.48 1.48	1.63 1.63	.25 .50	2.06 2.44	2.3 2.3	.69 .69	1.38 1.38	$^3/_8$ - 24 $^3/_8$ - 24	2.87 2.87	5.63 6.00
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	.50 .50	1.48 1.48	2.05 2.05	.25 .38	2.39 2.64	2.9 2.9	.88 .88	1.81 1.81	$^1/_2$ - 20 $^1/_2$ - 20	2.91 2.91	6.00 6.25
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	.50	1.48	2.55	.25 .38 .50	2.30 2.55 2.80	3.6	.88	1.81	$^1/_2$ - 20	3.15	6.13 6.38 6.63
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	.63	1.73	3.25	.25 .38 .38	2.66 2.91 3.03	4.6	1.12	2.31	$^5/_8$ - 18	3.66	7.13 7.38 7.50
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	.63	1.73	3.82	.25 .25 .38	2.85 2.98 3.23	5.4	1.12	2.31	$^5/_8$ - 18	3.98	7.63 7.75 8.00
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	.81	1.73	4.95	.25 .38 .38 .38	3.14 3.39 3.39 3.39	7.0	1.56	3.19	$^7/_8$ - 14	4.61	8.25 8.50 8.50 8.50
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	.94	2.23	5.73	.25	3.50	8.1	1.75	3.63	1 - 14	4.88	9.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	1.06	2.73	6.58	.25	3.81	9.3	2.00	4.13	$1^1/_8$ - 12	5.38	10.75
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.12	2.98	7.50	.25	3.86	10.6	2.19	4.50	$1^1/_4$ - 12	6.50	11.75

+ Plus stroke

TZ22 Head Extended Tie Rod Mounts (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.

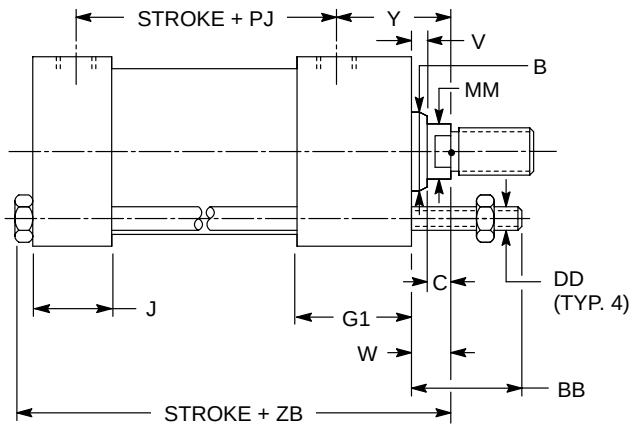
On head mount applications, the cartridge provides a pilot diameter to align the rod in the mounting frame.

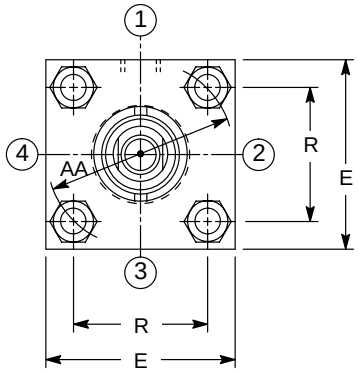
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on the previous page.

NOTE

For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

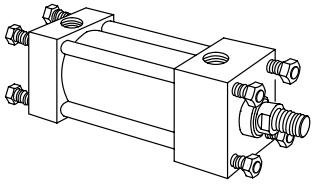
The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.





Bore	Rod MM	-.000/-.002 B	C	E	G1	J	R	V	W	Y	AA	BB	(UN) DD	PJ+	ZB+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	1.63 1.63	.25 .50	.63 1.00	2.06 2.44	2.3 2.3	1.38 1.38	3/8 - 24 3/8 - 24	2.87 2.87	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	2.05 2.05	.25 .38	.75 1.00	2.39 2.64	2.9 2.9	1.81 1.81	1/2 - 20 1/2 - 20	2.91 2.91	6.50 6.75
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	2.55	.25 .38 .50	.75 1.00 1.25	2.30 2.55 2.80	3.6	1.81	1/2 - 20	3.15	6.63 6.88 7.13
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	3.25	.25 .38 .38	.88 1.13 1.25	2.66 2.91 3.03	4.6	2.31	5/8 - 18	3.66	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	3.82	.25 .25 .38	1.00 1.13 1.38	2.85 2.98 3.23	5.4	2.31	5/8 - 18	3.98	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	4.95	.25 .38 .38 .38	1.13 1.38 1.38 1.38	3.14 3.39 3.39 3.39	7.0	3.19	7/8 - 14	4.61	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	5.73	.25	1.25	3.50	8.1	3.63	1 - 14	4.88	10.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	6.58	.25	1.25	3.81	9.3	4.13	1 1/8 - 12	5.38	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	7.50	.25	1.25	3.86	10.6	4.50	1 1/4 - 12	6.50	13.00

TZ23 Both Ends Extended Tie Rod Mounts (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.

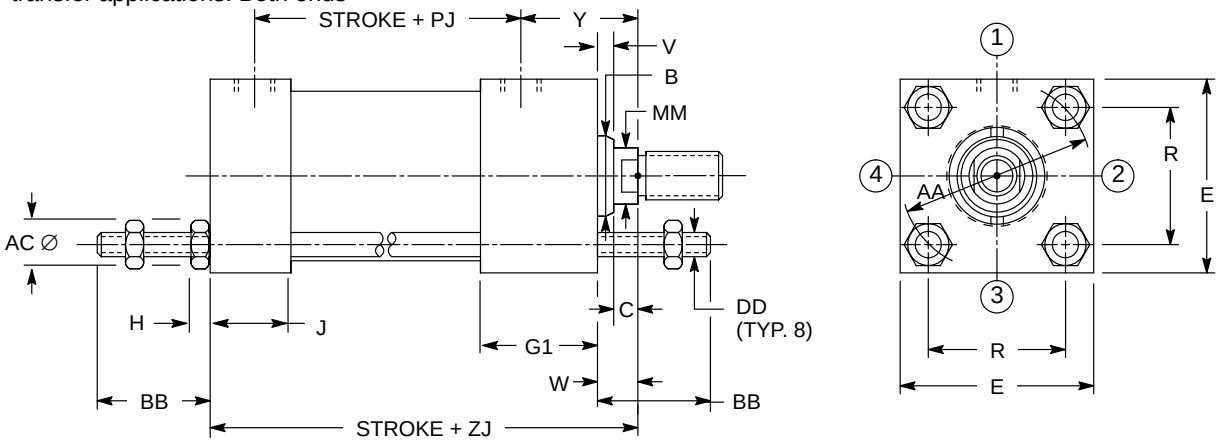
The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on page NO TAG.

NOTE

For strokes in excess of 30 inches, see “Stop tube selection” on page NO TAG.

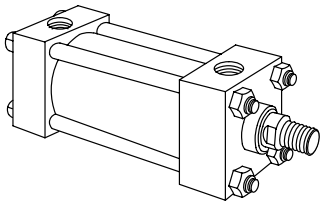
The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.



Bore	Rod MM	-.000/-.002 B	C	E	G1	Max H	J	R	V	W	Y	AA	Max AC	BB	(UN) DD	PJ+	ZJ+
1 1/2	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	.38 .38	1.48 1.48	1.63 1.63	.25 .50	.63 1.00	2.06 2.44	2.3 2.3	.69 .69	1.38 1.38	3/8 - 24 3/8 - 24	2.87 2.87	5.63 6.00
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	.50 .50	1.48 1.48	2.05 2.05	.25 .38	.75 1.00	2.39 2.64	2.9 2.9	.88 .88	1.81 1.81	1/2 - 20 1/2 - 20	2.91 2.91	6.00 6.25
2 1/2	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	.50	1.48	2.55	.25 .38 .50	.75 1.00 1.25	2.30 2.55 2.80	3.6	.88	1.81	1/2 - 20	3.15	6.13 6.38 6.63
3 1/4	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	.63	1.73	3.25	.25 .38 .38	.88 1.13 1.25	2.66 2.91 3.03	4.6	1.12	2.31	5/8 - 18	3.66	7.13 7.38 7.50
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	.63	1.73	3.82	.25 .25 .38	1.00 1.13 1.38	2.85 2.98 3.23	5.4	1.12	2.31	5/8 - 18	3.98	7.63 7.75 8.00
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	.81	1.73	4.95	.25 .38 .38 .38	1.13 1.38 1.38 1.38	3.14 3.39 3.39 3.39	7.0	1.56	3.19	7/8 - 14	4.61	8.25 8.50 8.50 8.50
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	.94	2.23	5.73	.25	1.25	3.50	8.1	1.75	3.63	1 - 14	4.88	9.63
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	1.06	2.73	6.58	.25	1.25	3.81	9.3	2.00	4.13	1 1/8 - 12	5.38	10.75
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.12	2.98	7.50	.25	1.25	3.86	10.6	2.19	4.50	1 1/4 - 12	6.50	11.75

+ Plus stroke

TZ24 No Mount



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 NO TAG.

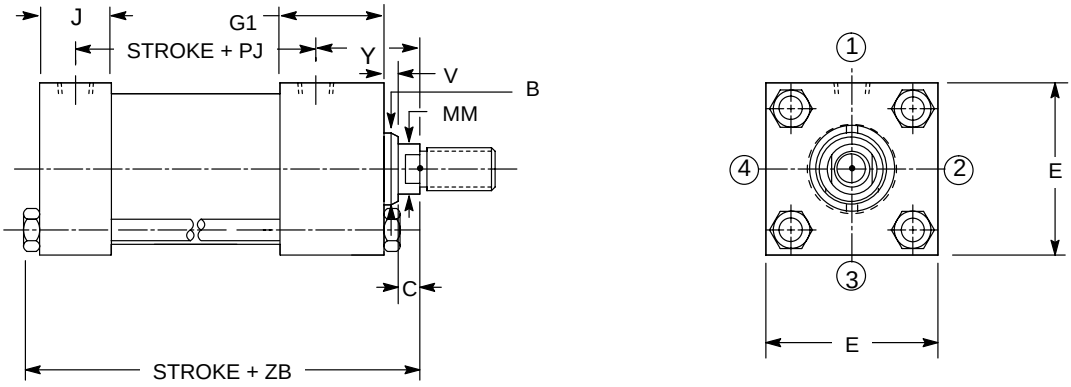
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

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, TZ04.

For severe side load applications, consult your local Vickers sales engineer.

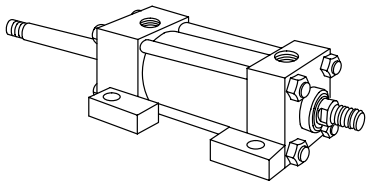


Bore	Rod MM	-.000/-.002 B	C	E	G1	J	V	Y	PJ+	Max ZB+
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	1.48 1.48	.25 .50	2.06 2.44	2.87 2.87	6.00 6.38
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	1.48 1.48	.25 .38	2.39 2.64	2.91 2.91	6.50 6.75
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	1.48	.25 .38 .50	2.30 2.55 2.80	3.15	6.63 6.88 7.13
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	1.73	.25 .38 .38	2.66 2.91 3.03	3.66	7.75 8.00 8.13
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	1.73	.25 .25 .38	2.85 2.98 3.23	3.98	8.25 8.38 8.63
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	1.73	.25 .38 .38 .38	2.82 3.06 3.06 3.06	4.61	9.00 9.25 9.25 9.25
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	2.23	.25	3.22	4.88	10.63

7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	2.73	.25	3.60	5.38	11.88
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	2.98	.25	3.86	6.50	13.00

+ Plus stroke

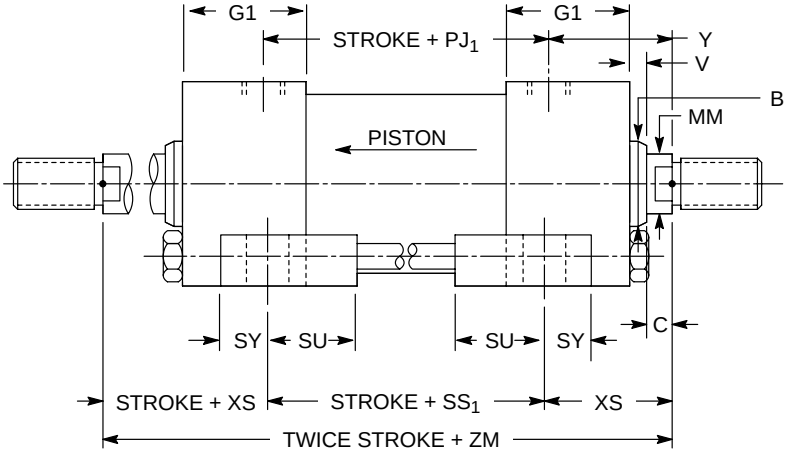
TZ25 Double Rod End, Side Lug Mounts

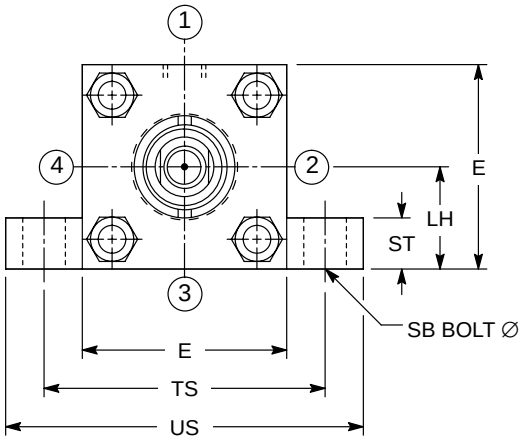


Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod.

The single rod mount application data is also applicable to double rod cylinders.

Rod and pilot related dimensions are typical for both ends.



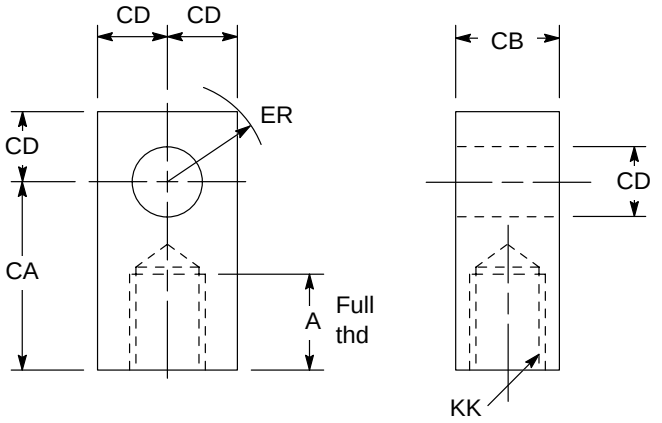


Bore	Rod mm	-.000/-.002 B	C	E	G1	V	Y	-.000/-.002 LH	PJ_1+	SB	SS_1+	ST	SU	SY	TS	US	XS	ZM++
$1^1/_2$	.625 1	1.124 1.499	.38 .50	2.50 2.50	2.23 2.23	.25 .50	2.06 2.44	1.25 1.25	2.87 2.87	.38 .38	4.13 4.13	.50 .50	.75 .75	.31 .31	3.25 3.25	4.00 4.00	1.38 1.75	6.88 7.63
2	1 1.375	1.499 1.999	.50 .63	3.00 3.00	2.36 2.36	.25 .38	2.39 2.64	1.50 1.50	2.91 2.91	.50 .50	3.88 3.88	.75 .75	.91 .91	.39 .39	4.00 4.00	5.00 5.00	1.88 2.13	7.63 8.38
$2^1/_2$	1 1.375 1.75	1.499 1.999 2.374	.50 .63 .75	3.50	2.36	.25 .38 .50	2.30 2.55 2.80	1.75	3.15	.75	3.63	1.00	.91	.39	4.88	6.25	2.06 2.31 2.56	7.75 8.25 8.75
$3^1/_4$	1.375 1.75 2	1.999 2.374 2.624	.63 .75 .88	4.50	2.73	.25 .38 .38	2.66 2.91 3.03	2.50	3.66	.75	4.38	1.00	1.30	.47	5.88	7.25	2.31 2.56 2.69	9.00 9.50 9.75
4	1.75 2 2.5	2.374 2.624 3.124	.75 .88 1.00	5.00	2.86	.25 .25 .38	2.85 2.98 3.23	2.50	3.98	1.00	4.25	1.25	1.57	.67	6.75	8.50	2.75 2.88 3.13	9.75 10.00 10.50
5	2 2.5 3 3.5	2.624 3.124 3.749 4.249	.88 1.00 1.00 1.00	6.50	2.98	.25 .38 .38 .38	3.14 3.39 3.39 3.39	3.25	4.61	1.00	4.75	1.25	1.57	.67	8.25	10.0	2.88 3.13 3.13 3.13	10.50 11.00 11.00 11.00
6	2.5 3 3.5 4	3.124 3.749 4.249 4.749	1.00	7.50	3.23	.25	3.50	3.75	4.88	1.25	5.13	1.50	2.00	.87	9.75	12.0	3.38	11.88
7	3 3.5 4 4.5 5	3.749 4.249 4.749 5.249 5.749	1.00	8.50	3.73	.25	3.81	4.25	5.38	1.50	5.75	1.75	2.00	.87	11.25	14.0	3.63	13.00
8	3.5 4 4.5 5 5.5	4.249 4.749 5.249 5.749 6.249	1.00	9.63	4.23	.25	3.86	4.75	6.50	1.50	6.75	1.75	2.48	1.14	12.25	15.0	3.63	14.00

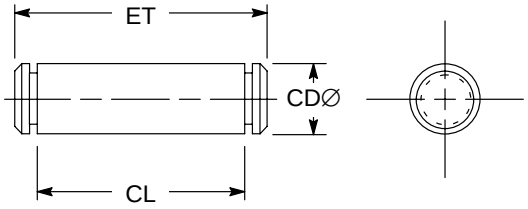
+ Plus Stroke ++ Plus 2x Stroke

Accessories

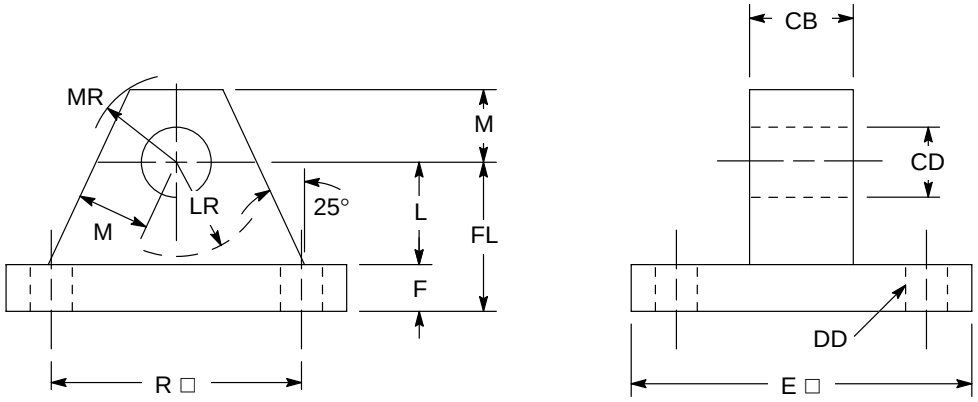
Rod Eye



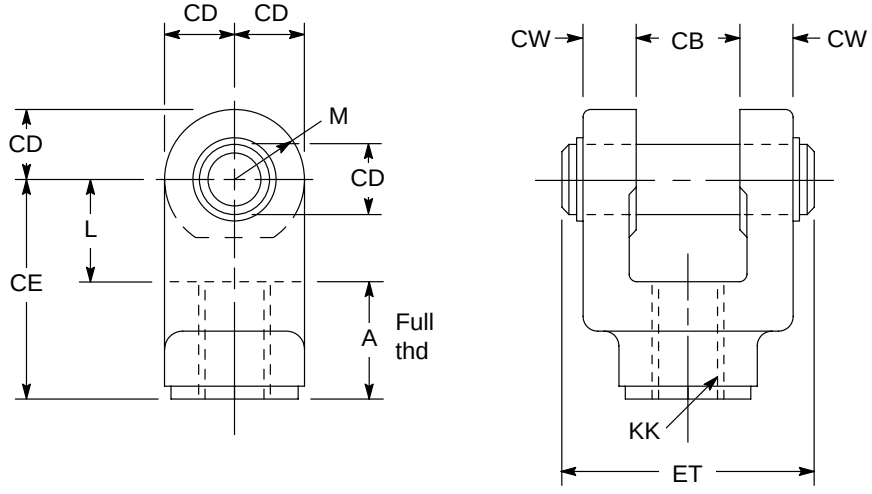
Swivel Pin (Includes two retaining rings)



Mounting Eye Bracket (For clevis mount cylinders)



Rod Clevis (Includes swivel pin and retaining rings)



All rod accessories must be torqued against the rod shoulder.

Mounting brackets, rod clevises, and rod eyes for all TZ cylinders are available from Vickers. 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.

Part Numbers, Weights, Thread Sizes, and Torques

Bore ∅	Thread Size KK	Torque* (ft-lb)	(N-M)	Rod Eye Part Number	Rod Eye Weight (lbs)	Rod Clevis Part Number	Rod Clevis Weight (lbs)	Eye Bracket Part Number	Eye Bracket Weight (lbs)	Swivel Pin Part Number	Swivel Pin Weight (lbs)
1 1/2	7/16–20 UNF–2B	36	49	S-1-560	0.38	S-1-562-10	0.56	S-1-552-M	0.94	TZ83050A-10	0.12
2, 2 1/2	3/4–16 UNF–2B	125	169	S-460	1.25	S-462-10	1.56	S-452-M	3.19	TZ83075A-10	0.38
3 1/4	1–14 NS–2B	250	339	S-660	2.50	S-662-10	3.31	TG780100	7.17	TZ83100A-10	0.75
4	1 1/4–12 UNF–2B	460	624	S-1060	5.94	S-1062-10	9.25	S-1052-M	11.7	TZ83137A-10	1.88
5	1 1/2–12 UNF–2B	663	900	SH-560	11.4	SH-562-10	14.62	TG7801C0	22.0	TZ83175A-10	3.88
6	1 7/8–12 UNF–2B	944	1280	SH-660	15.1	SH-662-10	21.0	TG780200	34.5	TZ83200A-10	4.94
7	2 1/4–12 UNF–2B	1315	1783	SH-760	27.0	SH-762-10	36.0	TG780280	55.4	TZ83250A-10	9.00
8	2 1/2–12 UNF–2B	5050	6850	SH-860	35.0	SH-862-10	43.0	TG780300	72.5	TZ83300A-10	12.80

***** Recommended torque values using MoS_2 lubricant with 0.12 coefficient of friction.

Dimensions

Bore ∅ (in)	A	E	F	L	M	R	CA	CB	CD	CE
1 1/2	3/4	2 1/2	3/8	3/4	1/2	1.63	1 1/2	3/4	1/2	1 1/2
2, 2 1/2	1 1/8	3 1/2	5/8	1 1/4	3/4	2.55	2 1/16	1 1/4	3/4	2 3/8
3 1/4	1 5/8	4 1/2	7/8	1 1/2	1	3.25	2 13/16	1 1/2	1	3 1/8
4	2	5	7/8	2 1/8	1 3/8	3.82	3 7/16	2	1 3/8	4 1/8
5	2 1/4	6 1/2	1 1/8	2 1/4	1 3/4	4.95	4	2 1/2	1 3/4	4 1/2
6	3	7 1/2	1 1/2	2 1/2	2	5.73	5	2 1/2	2	5 1/2
7	3 1/2	8 1/2	1 3/4	3	2 1/2	6.58	5 13/16	3	2 1/2	6 1/2
8	3 1/2	9 1/2	2	3 1/4	2 3/4	7.50	6 1/8	3	3	6 3/4

Bore ∅ (in)	Min. CL	Max. CW	DD	ER	Min. ET	FL	KK	LR	MR
1 1/2	1.83	1/2	3/8	45/64	2.16	1 1/8	7/16–20 UNF–2B	11/16	19/32
2, 2 1/2	2.58	5/8	1/2	1 1/16	2.92	1 7/8	3/4–16 UNF–2B	1 1/8	7/8
3 1/4	3.03	3/4	5/8	1 27/64	3.37	2 3/8	1–14 NS–2B	1 3/8	1 1/4
4	4.03	1	5/8	1 15/16	4.44	3	1 1/4–12 UNF–2B	1 7/8	1 5/8
5	5.03	1 1/4	7/8	2 15/16	5.52	3 3/8	1 1/2–12 UNF–2B	2	1 7/8
6	5.03	1 1/4	1	2 13/16	5.56	4	1 7/8–12 UNF–2B	2 1/4	2 3/32
7	6.03	1 1/2	1 1/8	3 17/32	6.68	4 3/4	2 1/4–12 UNF–2B	2 3/4	2 5/8
8	6.03	1 1/2	1 1/4	4 1/4	6.78	5 1/4	2 1/2–12 UNF–2B	3	2 7/8

Common Options Section

Rod End Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

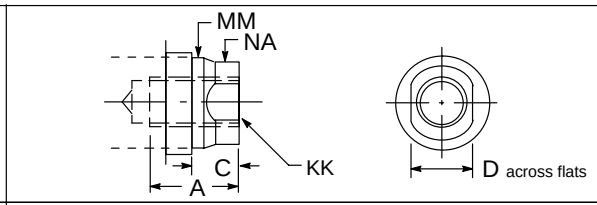
Twelve different inch and metric rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and we will build to your requirements.

The table on page 10 gives maximum allowable push strokes at various operating pressures for available rod diameters of Series TZ cylinders. Rod ends on rigid mount cylinders should be supported. Longer strokes are allowable for **pull only** applications. Contact your local Vickers sales engineer for application assistance if necessary.

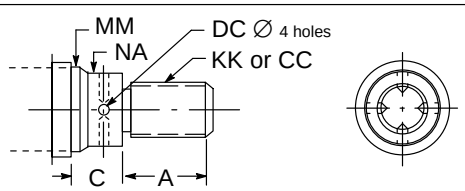
NOTE: Codes 0, 1, and N threads are to ISO 4395 and are based on the metric fine pitch series. Rod end accessories, locknuts, tooling, and gauging are readily available. These threads are also specified in ISO 6020–2 (160 bar compact) cylinder series. Codes 7 and L threads are based on the closest metric thread to the UN series and are recommended for replacement only.

Inch Rod Ends

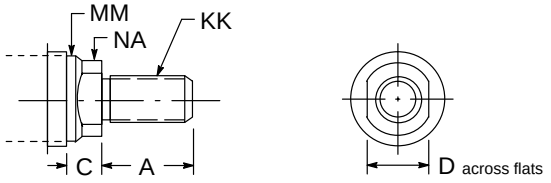
Code **2**



For rod sizes $3^1/_2$" thru $5^1/_2$"



Code **5**



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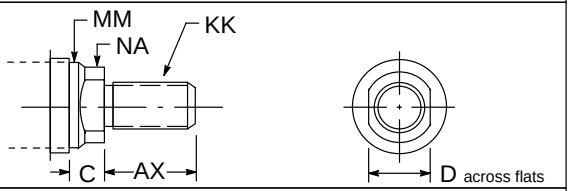
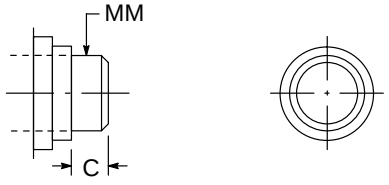
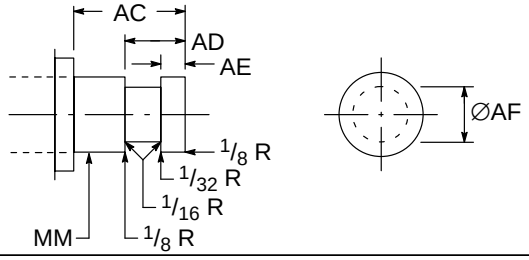


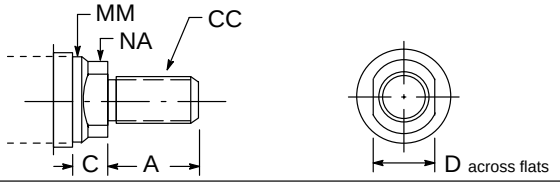
Code **6**



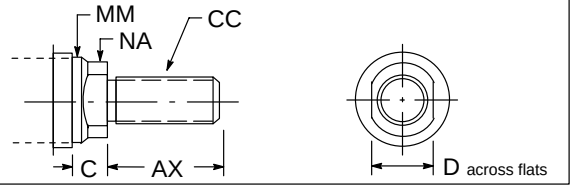
Code **G**



Code **9**



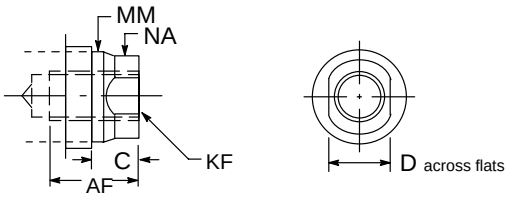
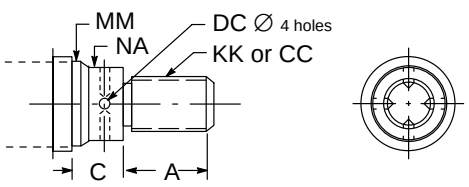
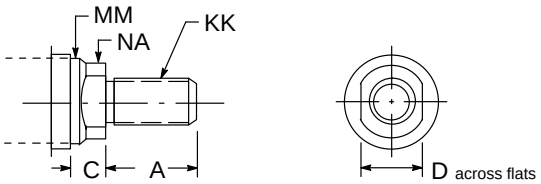
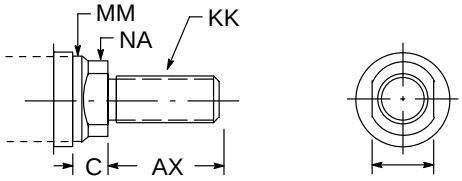
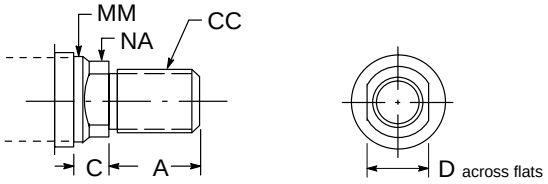
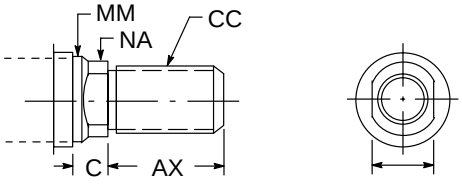
Code **M**



Dimensions in inches

Rod ∅ MM	A	C	D	AC	AD	AE	AF	AX	DC	UN(F) Thread CC	UN(F) Thread KK	NA
0.625	$^3/_4$	$^3/_8$	$^1/_2$	$1^1/_8$	$^5/_8$	$^1/_4$	$^3/_8$	$1^1/_8$	–	$^1/_2$–20	$^7/_{16}$–20	0.56
1	$1^1/_8$	$^1/_2$	$^7/_8$	$1^5/_8$	$^{15}/_{16}$	$^3/_8$	$^{11}/_{16}$	$1^{11}/_{16}$	–	$^7/_8$–14	$^3/_4$–16	0.91
1.375	$1^5/_8$	$^5/_8$	$1^1/_8$	$1^3/_4$	$1^1/_{16}$	$^3/_8$	$^7/_8$	$2^7/_{16}$	–	$1^1/_4$–12	1–14	1.31
1.75	2	$^3/_4$	$1^1/_2$	2	$1^5/_{16}$	$^1/_2$	$1^1/_8$	3	–	$1^1/_2$–12	$1^1/_4$–12	1.63
2	$2^1/_4$	$^7/_8$	$1^3/_4$	$2^5/_8$	$1^{11}/_{16}$	$^5/_8$	$1^3/_8$	$3^3/_8$	–	$1^3/_4$–12	$1^1/_2$–12	1.88
2.5	3	1	$2^1/_8$	$3^1/_4$	$1^{15}/_{16}$	$^3/_4$	$1^3/_4$	$4^1/_2$	–	$2^1/_4$–12	$1^7/_8$–12	2.38
3	$3^1/_2$	1	$2^5/_8$	$3^5/_8$	$2^7/_{16}$	$^7/_8$	$2^1/_4$	$5^1/_4$	–	$2^3/_4$–12	$2^1/_4$–12	2.88
3.5	$3^1/_2$	1	–	$4^3/_8$	$2^{11}/_{16}$	1	$2^1/_2$	$5^1/_4$	$^3/_8$	$3^1/_4$–12	$2^1/_2$–12	3.38
4	4	1	–	$4^1/_2$	$2^{11}/_{16}$	1	3	6	$^7/_{16}$	$3^3/_4$–12	3–12	3.88
4.5	$4^1/_2$	1	–	$5^1/_4$	$3^3/_{16}$	$1^1/_2$	$3^1/_2$	$6^3/_4$	$^7/_{16}$	$4^1/_4$–12	$3^1/_4$–12	4.38
5	5	1	–	$5^3/_8$	$3^3/_{16}$	$1^1/_2$	$3^7/_8$	$7^1/_2$	$^1/_2$	$4^3/_4$–12	$3^1/_2$–12	4.88
5.5	$5^1/_2$	1	–	$6^1/_4$	$3^{15}/_{16}$	$1^7/_8$	$4^3/_8$	$8^1/_4$	$^1/_2$	$5^1/_4$–12	4–12	5.38

Metric Rod Ends

Code **1**		**For rod sizes $3^1/_2$" thru $5^1/_2$"**	
Code **7**		**L**	
Code **0**		**N**	

Dimensions in millimeters (except rod ∅)

Rod ∅							**Metric Thread**			
MM (in)	**A**	**C**	**D**	**AF**	**AX**	**DC**	**CC** (ISO 4395)	**KF** (ISO 4395)	**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	14,29
1	28	12,7	22	28,6	40	–	▲	M20 x 1,5	M20 x 1,5	23,81
1.375	36	15,9	30	41,3	54	–	M27 x 2	M27 x 2	M26 x 1,5	33,34
1.75	45	19,0	36	50,8	66	–	▲	M33 x 2	M33 x 2	41,28
2	56	22,2	41	57,1	84	–	M42 x 2	M42 x 2	M39 x 2	47,63
2.5	63	25,4	55	76,2	96	–	▲	M48 x 2	M48 x 2	60,33
3	85	25,4	65	88,9	128	–	M64 x 3	M58 x 2	M58 x 2	73,03
3.5	85	25,4	–	88,9	128	9,52	M64 x 3	M64 x 3	M64 x 2	85,73
4	95	25,4	–	101,6	140	11,11	M80 x 3	M80 x 3	M76 x 2	98,43
4.5	106	25,4	–	114,3	158	11,11	M90 x 3	M90 x 3	M80 x 2	111,13
5	112	25,4	–	139,7	168	12,70	M100 x 3	M100 x 3	M90 x 2	123,83
5.5	112	25,4	–	139,7	168	12,70	M100 x 3	M100 x 3	M100 x 2	136,53

▲ Intermediate male metric thread not available for 1, $1^3/_4$, and $2^1/_2$ inch rod sizes. Use codes 7 or L.

Port Type and Size

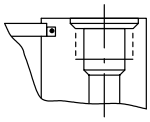
Available Ports

Series TZ 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.

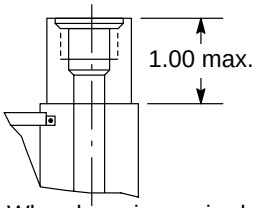
Some mounting styles have port location restrictions. Check the port location table on page 4 for your particular mounting style. Where a port or port boss interferes with cylinder mounting, mounting should take precedence.

Code 3, 5 and A



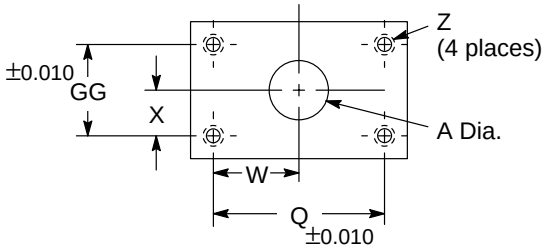
SAE straight thread O-ring seal port

Code 4 and B

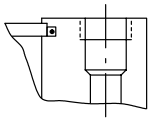


▲When boss is required

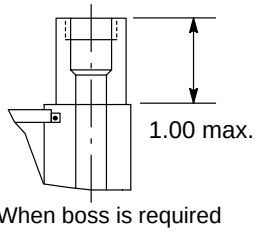
Code 6



Code 1, 7, and 9



Code 2, 8, and 0



▲When boss is required

Dimensions in inches

Flange Size	A	Q	W	X	Z	GG
$^3/_4$ (–12)	.75	1.875	.94	.44	$^3/_8$–16	.875
1 (–16)	1.00	2.062	1.03	.52	$^3/_8$–16	1.031
$1^1/_4$ (–20)	1.25	2.312	1.16	.59	$^7/_{16}$–14	1.188
$1^1/_2$ (–24)	1.50	2.750	1.38	.70	$^1/_2$–13	1.406

Bore ∅ (in)	Port Code 1	2	3	4	5[A]	6	7[D]	8	9	0
	NPTF[†] Pipe		SAE J1926 UN Thread O-ring / Thread Size			SAE 518 Code 61 Flange	ISO 228-1 BSPP		DIN 3852 Form X Metric	
$1^1/_2$	$^1/_2$	$^3/_4$▲	$^9/_{16}$–18 (–6)	$^7/_8$–14 (–10)	$^3/_4$–16 (–8)	–	G $^1/_2$	G $^3/_4$▲	M22 x 1.5	M27 x 2▲
2	$^1/_2$	$^3/_4$▲	$^9/_{16}$–18 (–6)	$^7/_8$–14 (–10)	$^3/_4$–16 (–8)	–	G $^1/_2$	G $^3/_4$▲	M22 x 1.5	M27 x 2▲
$2^1/_2$	$^1/_2$	$^3/_4$▲	$^9/_{16}$–18 (–6)	$^7/_8$–14 (–10)	$^3/_4$–16 (–8)	–	G $^1/_2$	G $^3/_4$▲	M22 x 1.5	M27 x 2▲
$3^1/_4$	$^3/_4$	1▲	$^7/_8$–14 (–10)	$1^3/_{16}$–12 (–14)	$1^1/_{16}$–12 (–12)	$^3/_4$ (–12)	G $^3/_4$	G 1▲	M27 x 2	M33 x 2▲
4	$^3/_4$	1▲	$^7/_8$–14 (–10)	$1^3/_{16}$–12 (–14)	$1^1/_{16}$–12 (–12)	$^3/_4$ (–12)	G $^3/_4$	G 1▲	M27 x 2	M33 x 2▲
5	$^3/_4$	1▲	$^7/_8$–14 (–10)	$1^3/_{16}$–12 (–14)	$1^1/_{16}$–12 (–12)	$^3/_4$ (–12)	G $^3/_4$	G 1▲	M27 x 2	M33 x 2▲
6	1	$1^1/_4$▲	$1^1/_{16}$–12 (–12)	$1^5/_8$–12 (–20)▲	$1^5/_{16}$–12 (–16)	1 (–16)	G 1	G $1^1/_4$▲	M33 x 2	M42 x 2▲
7	$1^1/_4$	$1^1/_2$▲	$1^5/_{16}$–12 (–16)	$1^7/_8$–12 (–24)▲	$1^5/_8$–12 (–20)	$1^1/_4$ (–20)	G $1^1/_4$	G $1^1/_2$▲	M42 x 2	M48 x 2▲
8	$1^1/_2$	2▲	$1^5/_{16}$–12 (–16)	$1^5/_8$–12 (–20)	$1^7/_8$–12 (–24)	$1^1/_2$ (–24)	G $1^1/_4$	G $1^1/_2$	M48 x 2	–

Bore ∅ (in)	Port Code A	B
	ISO 6149-1	
$1^1/_2$	M22 x 1.5	M27 x 2▲
2	M22 x 1.5	M27 x 2▲
$2^1/_2$	M22 x 1.5	M27 x 2▲
$3^1/_4$	M27 x 2	M33 x 2▲
4	M27 x 2	M33 x 2▲
5	M27 x 2	M33 x 2▲
6	M33 x 2	M42 x 2▲
7	M42 x 2	M48 x 2▲
8	M48 x 2	–

[A] – Size per ANSI B93.75M.
[D] – Conforms to DIN 24554.

* – Not available with 1.75 in rod diameter.
[†] – NPTF and BSPP ports are not recommended for maximum reliability on new applications.

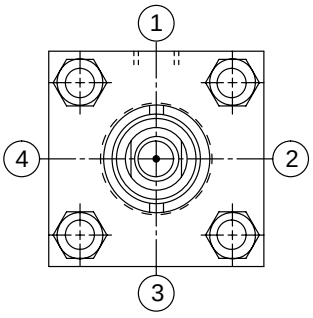
Port Selection

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)	(in^3)	Port Codes 1, 5, 6, 9 & A Flow (gpm)	Piston Velocity (in/s)	Port Codes 2, 4, 0 & B Flow (gpm)	Piston Velocity (in/s)	Port Code 3 Flow (gpm)	Piston Velocity (in/s)	Port Code 7 Flow (gpm)	Piston Velocity (in/s)	Port Code 8 Flow (gpm)	Piston Velocity (in/s)
1 1/2	Cap	0.0084	1.948	6.0	11.8	9.2	18.1	6.0	11.8	3.4	6.8	9.2	18.1
	0.625	0.0071	1.641	6.0	14.0	9.2	21.5	6.0	14.0	3.4	8.1	9.2	21.5
	1	0.0050	1.162	6.0	19.8	9.2	30.4	6.0	19.8	3.4	11.4	9.2	30.4
2	Cap	0.0132	3.043	6.0	7.6	9.2	11.6	6.0	7.6	3.4	4.4	9.2	11.6
	1	0.0096	2.258	6.0	10.2	9.2	15.6	6.0	10.2	3.4	5.9	9.2	15.6
	1.375	0.0067	1.559	6.0	14.8	9.2	22.7	6.0	14.8	3.4	8.5	9.2	22.7
2 1/2	Cap	0.0209	4.832	6.0	4.8	9.2	7.3	6.0	4.8	3.4	2.8	9.2	7.3
	1	0.0175	4.046	6.0	5.7	9.2	8.7	6.0	5.7	3.4	3.3	9.2	8.7
	1.375	0.0145	3.347	6.0	6.9	9.2	10.6	6.0	6.9	3.4	4.0	9.2	10.6
	1.75	0.0105	2.427	6.0	9.5	9.2	14.6	6.0	9.5	3.4	5.5	9.2	14.6
3 1/4	Cap	0.0337	7.791	14.5	7.2	20.2	10.0	14.5	7.2	9.2	4.6	27.9	13.8
	1.375	0.0273	6.306	14.5	8.9	20.2	12.4	14.5	8.9	9.2	5.6	27.9	17.0
	1.75	0.0233	5.386	14.5	10.4	20.2	14.5	14.5	10.4	9.2	6.6	27.9	19.9
	2	0.0201	4.650	14.5	12.0	20.2	16.8	14.5	12.0	9.2	5.6	27.9	23.1
4	Cap	0.0527	12.174	14.5	4.6	20.2	6.4	14.5	4.6	9.2	2.9	27.9	8.8
	1.75	0.0423	9.768	14.5	5.7	20.2	8.0	14.5	5.7	9.2	3.6	27.9	11.0
	2	0.0391	9.032	14.5	6.2	20.2	8.6	14.5	6.2	9.2	3.9	27.9	11.9
	2.5	0.0315	7.265	14.5	7.7	20.2	10.7	14.5	7.7	9.2	4.9	27.9	14.8
5	Cap	0.0623	19.021	14.5	2.9	20.2	4.1	14.5	2.9	9.2	1.9	27.9	5.6
	2	0.0687	15.880	14.5	3.5	20.2	4.9	14.5	3.5	9.2	2.2	27.9	6.8
	2.5	0.0611	14.113	14.5	4.0	20.2	5.5	14.5	4.0	9.2	2.5	27.9	7.6
	3	0.0517	11.953	14.5	4.7	20.2	6.5	14.5	4.7	9.2	3.0	27.9	9.0
	3.5	0.0407	9.400	14.5	6.0	20.2	8.3	14.5	6.0	9.2	3.8	27.9	11.4
6	Cap	0.1224	28.274	27.9	3.8	45.5	6.2	27.9	3.8	14.5	2.0	45.5	6.2
	2.5	0.1011	23.366	27.9	4.6	45.5	7.5	27.9	4.6	14.5	2.4	45.5	7.5
	3	0.0918	21.206	27.9	5.1	45.5	8.3	27.9	5.1	14.5	2.6	45.5	8.3
	3.5	0.0807	18.653	27.9	5.8	45.5	9.4	27.9	5.8	14.5	3.0	45.5	9.4
	4	0.0680	15.708	27.9	6.8	45.5	11.2	27.9	6.8	14.5	3.6	45.5	11.2
7	Cap	0.1666	38.485	45.5	4.6	67.4	6.7	45.5	4.6	27.9	2.8	67.4	6.7
	3	0.1360	31.416	45.5	5.6	67.4	8.3	45.5	5.6	27.9	3.4	67.4	8.3
	3.5	0.1249	28.863	45.5	6.1	67.4	9.0	45.5	6.1	27.9	3.7	67.4	9.0
	4	0.1122	25.918	45.5	6.8	67.4	10.0	45.5	6.8	27.9	4.1	67.4	10.0
	4.5	0.0977	22.580	45.5	7.8	67.4	11.5	45.5	7.8	27.9	4.8	67.4	11.5
	5	0.0616	18.850	45.5	9.3	67.4	13.8	45.5	9.3	27.9	5.7	67.4	13.8
8	Cap	0.2106	48.695	67.4	5.3	45.5	3.6	45.5	3.6	27.9	2.2	67.4	5.3
	3.5	0.1692	39.074	67.4	6.6	45.5	4.5	45.5	4.5	27.9	2.7	67.4	6.6
	4	0.1564	36.128	67.4	7.2	45.5	4.8	45.5	4.8	27.9	3.0	67.4	7.2
	4.5	0.1420	32.791	67.4	7.9	45.5	5.3	45.5	5.3	27.9	3.3	67.4	7.9
	5	0.1258	29.060	67.4	8.9	45.5	6.0	45.5	6.0	27.9	3.7	67.4	8.9
	5.5	0.1080	24.937	67.4	10.4	45.5	7.0	45.5	7.0	27.9	4.3	67.4	10.4

Port Location

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 TZ mounting style.

Mounting		Head Locations				Cap Locations			
Style Code	**Description**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
01	Side lug	A	**N**	A	**N**	A	**N**	A	**N**
02	Tapped	A	A	**N**	A	A	A	**N**	A
04	Keyed side lug	A	**N**	A	**N**	A	**N**	A	**N**
05	Keyed tapped	A	A	**N**	A	A	A	**N**	A
07	Head rectangular	A	A	A	A	A	A	A	A
08	Head square flange	W	W	W	W	A	A	A	A
09	Head rectangular flange	A	A	A	A	A	A	A	A
10	Clevis	A	A	A	A	A	A	A	A
12	Cap rectangular flange	A	A	A	A	A	W	A	W
13	Cap square flange	A	A	A	A	W	W	W	W
14	Cap rectangular	A	A	A	A	A	A	A	A
15	Intermediate trunnion	A	A	A	A	A	A	A	A
16	Cap trunnion	A	A	A	A	A	**N**	A	**N**
17	Head trunnion	A	**N**	A	**N**	A	A	A	A
19	Centerline lug	A	**N**	A	**N**	A	**N**	A	**N**
21	Cap extended tie rod	A	A	A	A	A	A	A	A
22	Head extended tie rod	A	A	A	A	A	A	A	A
23	Both ends extended tie rod	A	A	A	A	A	A	A	A
24	No mount	A	A	A	A	A	A	A	A
25	Double rod, side lug	A	**N**	A	**N**				
26	Double rod, tapped	A	A	**N**	A				
28	Double rod, keyed side lug	A	**N**	A	**N**				
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				

A – Available
N – Not available
W – Port available without port boss only. Proximity switch not available. (Port codes 1, 3, 5, 7 and 9.)

Sealing Systems

Three different sealing systems are available in Series TZ cylinders.

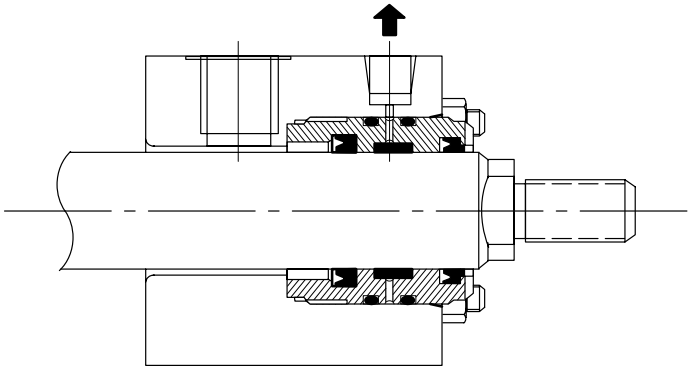
Determine the correct seal code for your application, then enter it as item 8 in the model code.

Code	Fluid	Temperature (°F)	Max. Speed (ft/s)	Application
N	Mineral oil, petroleum base Automotive transmission fluid	–31 to 176	2.25	Normal, typical industrial
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

Gland Drain Option

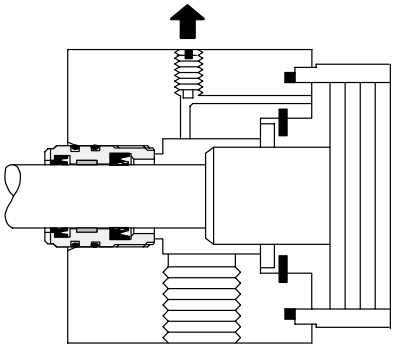
Gland drains are primarily used for long stroke cylinders (over 30 inches) and when extended speed exceeds retract speed.

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.



PS 200 Proximity Switches

PS 200 proximity switches for Series TZ cylinders are inductive type switches with a sensing probe that “looks” at the cushion collar or button to provide extend or 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 3000 psi (210 bar) hydraulic cylinders. Vickers switch adaptor allows full 360° rotation.

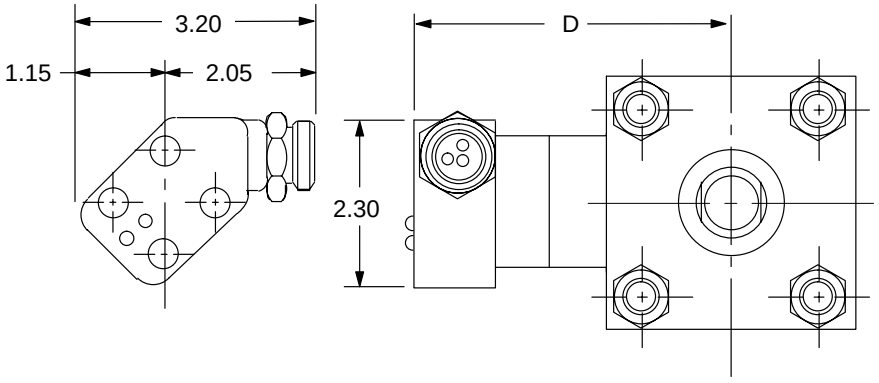
Short Circuit Protection is a standard feature on the PS 200 Proximity Switch. SCP protects the switch from shorts in the load or line. Upon sensing a short condition, the switch assumes a non-conducting mode. The fault condition must be removed and power turned off in order to reset the switch. This feature prevents unintended automatic restarts. The switch indicates when it is in SCP mode by flashing both LEDs.

Torque $^1/_4$–20 mounting screws to 15 ft-lb (20 Nm).

O-rings required:
- Size 115 – One per switch
- Size 116 – One per spacer
- Size 908 – One per adaptor

Series PS 200 2-wire AC/DC Proximity Switches	
Pressure	3000 psi
Sensing range	0.08 in ±10%
Sensing distance to end of stroke	0.25 - 0.38 stroke to go.
Operating temperature range	–4° to +158°F
Repeatability	0.001 in
Switching differential	10%
Supply voltage	20–220 V AC/DC
On-State voltage drop	10V @ 5–500 mA
Load current man.	0.5 Amp
Inrush current	3 Amp
Quiescent current	1.7 mA max.
Indicating LED’s (standard)	1 lit: Power on non-conducting 2 lit: Target present (both flashing = SCP mode)

Dimensions in inches.



With the new Vickers switch adaptor, the proximity switch can rotate 360°. Use the chart on previous page for available proximity switch locations for the various mounting styles.

Bore ∅	**Rod** ∅	Max. **D**	Max. **D** 09 & 14 Mounts pos. 2 & 4
$1^1/_2$	.625	3.44	4.58
	1	3.62	4.75
	Cap	3.69	4.83
2	1	3.67	4.81
	1.375	3.82	4.97
	Cap	3.82	4.97
$2^1/_2$	1	4.31	4.97
	1.375	4.35	5.00
	1.75	3.98	5.13
	Cap	4.46	5.00
$3^1/_4$	1.375	4.50	5.65
	1.75	4.50	5.65
	2	4.75	5.88
	Cap	4.52	5.88
4	1.75	5.19	6.56
	2	4.76	6.78
	2.5	5.00	6.15
	Cap	4.74	6.12
5	2	5.41	7.59
	2.5	5.65	7.03
	3	5.43	7.45
	3.5	5.43	7.45
	Cap	6.19	7.45
6	2.5	6.19	7.88
	3	6.09	8.27
	3.5	6.09	8.27
	4	6.32	8.50
	Cap	6.19	7.88
7	3	6.58	8.69
	3.5	6.58	8.69
	4	6.58	8.75
	4.5	6.58	8.75
	5	6.81	9.00
	Cap	7.17	8.69
8	3.5	7.46	9.29
	4	6.98	9.29
	4.5	6.98	9.29
	5	7.12	9.29
	5.5	7.12	9.29
	Cap	7.17	9.29

Application / Engineering Data

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:

To order a stop tube, enter XXX for model code items 12, 13 and 14. Then specify the cylinder's working stroke and the required stop tube length. Specify 1 inch of stop tube for each 10 inches (or fraction thereof) of stroke in excess of the maximums listed in the table.

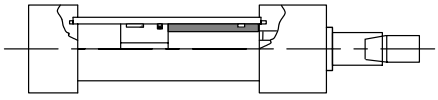
Bore	**Maximum Stroke** (inches)		
∅	**Pivot**	**Rigid mounts**	
(in)	**Mounts**	**Unsupported Rod**	**Supported Rod**
1.5	24	30	48
2	24	30	48
2.5	30	38	48
3.25	30	38	48
4	30	38	48
5	36	39	48
6	36	39	48
7	36	39	48
8	36	39	48

Stop Tube Designs

Three typical stop tube designs are illustrated below.

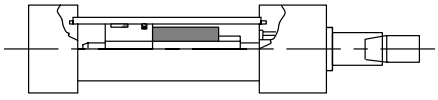
Design A

Used for cylinders not cushioned on the rod end.



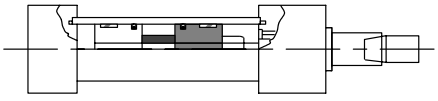
Design B

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

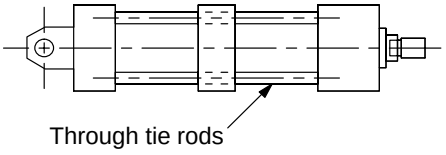
A tie rod spacer or center support should be applied when the stroke length exceeds 20 times the bore diameter.

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.

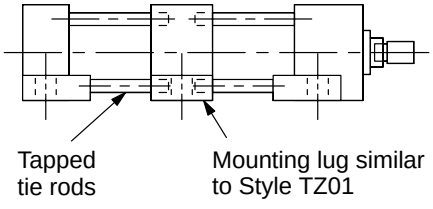
The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).



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 Diameters

Cylinder Size Selection

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.

Bore	**Rod**	**Work**	**Maximum Force** (lb_f) **At Working Pressure** (psi)					
∅	∅	**Area**	**500**	**750**	**1000**	**1500**	**2000**	**3000**
(in)	(in)	(in^2)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)
$1^1/_2$	–	1.948	974	1461	1948	2922	3896	5843
	0.625	1.641	820	1231	1641	2461	3282	4923
	1	1.162	581	872	1162	1744	2325	3487
2	–	3.043	1522	2283	3043	4565	6087	9130
	1	2.258	1129	1694	2258	3387	4516	6774
	1.375	1.559	779	1169	1559	2338	3117	4676
$2^1/_2$	–	4.832	2416	3624	4832	7248	9663	14495
	1	4.046	2023	3035	4046	6070	8093	12139
	1.375	3.347	1673	2510	3347	5020	6694	10041
	1.75	2.426	1213	1820	2426	3640	4853	7279
$3^1/_4$	–	7.791	3896	5843	7791	11687	15582	23373
	1.375	6.306	3153	4730	6306	9459	12613	18919
	1.75	5.386	2693	4039	5386	8079	10772	16158
	2	4.650	23325	3487	4650	6974	9299	13949
4	–	12.174	6087	9130	12174	18261	24347	36521
	1.75	9.768	4884	7326	9768	14653	19537	29305
	2	9.032	4516	6774	9032	13548	18064	27096
	2.5	7.265	3632	5449	7265	10897	14530	21795
5	–	19.021	9511	14266	19021	28532	38043	57064
	2	15.880	7940	11910	15880	23820	31760	47639
	2.5	14.113	7056	10584	14113	21169	28225	42338
	3	11.953	5976	8965	11953	17929	23906	35858
	3.5	9.400	4700	7050	9400	14100	18801	28201
6	–	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	37306	55960
	4	15.708	7854	11781	15708	23562	31416	47124
7	–	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	77754
	4.5	22.580	11290	16935	22580	33870	45160	67741
	5	18.850	9425	14137	18850	28274	37699	56549
8	–	48.695	24347	36521	48695	73042	97390	146084
	3.5	39.074	19537	29305	39074	58610	78147	117221
	4	36.128	18064	27096	36128	54193	72257	108385
	4.5	32.790	16395	24593	32790	49186	65581	98371
	5	29.060	14530	21795	29060	43590	58120	87179
	5.5	24.936	12468	18702	24936	37405	49873	74809

Maximum Allowable Push Strokes

In push applications, a cylinder acts as a loaded column.

To use the table below, 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 the bore/rod size represents the maximum allowable push stroke. This maximum stroke is based on column loading analysis only and does not consider side loading, stop tube requirements, or other cylinder stroke limiters.

For pressures above 3000 psi, consult your local Vickers representative.

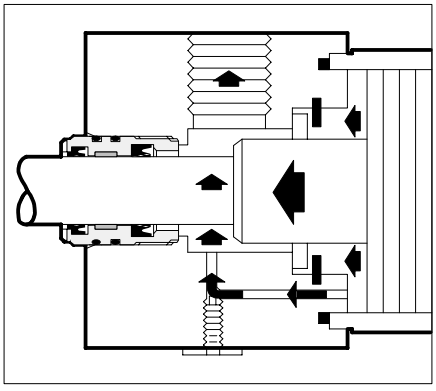
		Maximum Stroke (in) **at Working Pressure** (psi)																	
		Rigid Mounts (01, 02, 04, 05, 07, 08, 09, 12, 13, 14, 19, 21, 22, 23, 24, 25, 26, 28, 29, 31, 32, 33, 37, 39, and 40)						**Cap Swivel Mounts** (10 and 16)						**Intermediate Trunnion Mounts** (15, 17, 34, and 35)					
Bore	**Rod**	**500**	**750**	**1000**	**1500**	**2000**	**3000**	**500**	**750**	**1000**	**1500**	**2000**	**3000**	**500**	**750**	**1000**	**1500**	**2000**	**3000**
∅ (in)	∅ (in)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)	(psi)
1 1/2	0.625	29	23	19	13	10	3	13	10	8	6	4	1	16	12	10	7	5	2
	1	79	64	54	43	36	26	35	28	24	19	16	12	42	34	29	23	19	14
2	1	62	49	42	32	26	17	28	22	19	14	11	8	33	26	22	17	14	9
	1.375	121	97	83	66	55	42	54	43	37	29	25	19	64	52	44	35	29	22
2 1/2	1	48	37	31	22	16	6	21	17	14	10	7	3	26	20	16	12	9	3
	1.375	94	75	64	49	40	29	42	33	28	22	18	13	50	40	34	26	22	15
	1.75	155	125	107	85	71	54	69	56	47	38	32	24	83	67	57	45	38	29
3 1/4	1.375	72	57	47	35	27	15	32	25	21	15	12	6	39	30	25	19	14	8
	1.75	120	96	81	63	52	37	53	43	36	28	23	16	64	51	43	34	18	20
	2	159	127	108	85	71	53	71	57	48	38	32	24	85	68	58	46	38	28
4	1.75	94	74	61	46	35	20	42	33	27	20	16	9	50	39	33	24	19	11
	2	125	99	83	64	51	35	55	44	37	28	23	15	66	53	44	34	27	18
	2.5	198	159	136	107	89	66	88	71	60	47	39	29	106	85	72	57	47	35
5	2	97	75	62	45	33	13	43	33	28	20	15	6	52	40	33	24	18	7
	2.5	156	124	104	80	64	43	69	55	46	35	29	19	83	66	56	43	34	23
	3	228	183	155	122	101	74	101	81	69	54	45	33	122	97	83	65	54	40
	3.5	313	252	215	171	144	110	139	112	96	76	64	49	167	135	115	91	77	59
6	2.5	124	97	80	58	44	20	55	43	36	26	19	9	66	52	43	31	23	11
	3	184	146	122	93	75	50	82	65	54	42	33	22	98	78	65	50	40	27
	3.5	253	203	172	134	111	80	113	90	76	60	49	36	135	108	92	72	59	43
	4	334	269	229	181	151	114	149	120	102	81	67	51	178	143	122	97	81	61
7	3	154	121	100	74	56	29	69	54	44	33	25	13	82	64	53	39	30	15
	3.5	214	170	143	109	87	58	95	76	63	48	39	26	114	91	76	58	47	31
	4	283	226	192	149	123	88	126	101	85	66	55	39	151	121	102	80	66	47
	4.5	362	290	247	195	162	122	161	129	110	87	72	54	193	155	132	104	87	65
	5	449	362	309	246	207	158	200	161	138	109	92	70	240	193	165	131	110	84
8	3.5	188	147	123	91	71	40	83	66	55	41	31	18	100	79	65	49	38	21
	4	249	198	166	127	103	69	111	88	74	57	46	31	133	106	89	68	55	37
	4.5	319	255	216	168	138	100	142	113	96	75	61	44	170	136	115	90	74	53
	5	397	318	271	213	178	132	176	142	121	95	79	59	212	170	145	114	95	71
	5.5	483	389	332	263	221	168	215	173	148	117	98	75	258	207	177	140	118	90

Cushioning System

Vickers cylinders have standard features that are extra cost options or not available on other look-alike NFPA/ANSI cylinders. Series TZ hydraulic cylinders are available with a patented floating ring cushion seal or alternate solid design with check valve that provide positive cushion sealing with minimum wear and maximum piston acceleration on the return stroke.

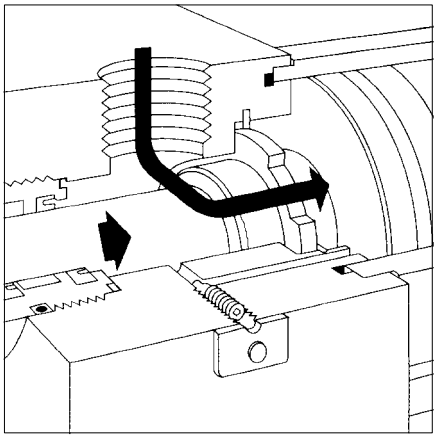
Advanced Cushions Provide Faster Cycle Times

Cylinder cushions are designed to decelerate the piston velocity near the end of each cylinder stroke to prevent excessive mechanical shock.



To accomplish this, the cushion collar contacts a floating sleeve or cylinder head which permits a very close 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.

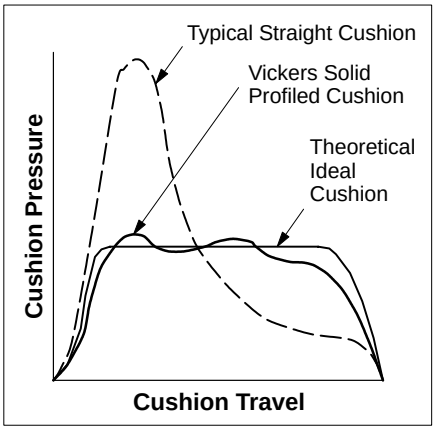
Vickers advanced cushions permit higher cylinder speed, shorter cycle time, and more work per hour.



The sleeve design used on bore sizes under four inches, is also free to move in an axial direction and functions as a fluid check. When the fluid flow is reversed, the sleeve moves off its seat, and fluid flows around the slots in the outer sleeve's diameter permitting nearly full flow for quick acceleration.

Cushion Features

- Cushion design provides consistent long wearing seal between cushion collar and head.
- Floating design self-aligns to minimize wear.
- Check valve action of sleeve provides rapid acceleration out of the cushion.



Cushions are recommended when piston speed exceeds 5 in/s. Any heavy loads attached to the piston rod should be absorbed by external means such as shock absorbers or springs.

Application Data

Cushioning System

Key Assumptions & Limitations

These assumptions provide parameters for determining maximum cushion performance. Actual performance may be different than determined by these methods, particularly if assumptions are not maintained.

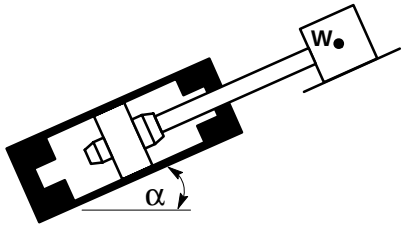
Efficiency factors are applied to the energy calculations that attempt to reflect characteristics of the Vickers cushion design.

The following assumptions should be considered when calculating cushion capacity:

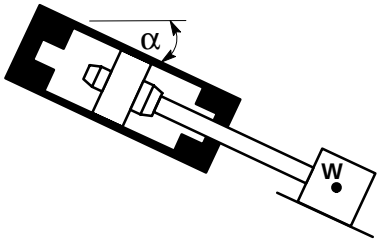
- Maximum cushion pressure is 310 bar (4500 psi).
- The upper limit of velocity is 18 in/s.
- If velocity is below 4 in/s, the cushions become ineffective on cylinders smaller than 2.5 in bore.
- Friction force is assumed to be zero.
- The cylinder is used in a linear system (not for rotary applications).
- Fluid viscosity is equivalent to 25 centistoke.
- The driving pressure is equal to the maximum system pressure, usually the relief valve setting.
- Cushion adjustment screws are provided to tune cushion performance within limits.
- Cushion efficiency (C_{eff}) is 0.67 for velocities between 4 and 12 in/sec or 0.1 and 0.3 m/sec., or 0.5 for velocities between 12 and 18 in/sec. or 0.3 and 0.5 m/sec.

Application 1

Application 2



Application 3



Application 1:

$E = (1/C_{eff}) \{[0.5 (W/386.1) V^2]$ extend or retract

Application 2:

$E = (1/C_{eff}) \{[0.5 (W/386.1) V^2] – [W L_{hc} \sin(\alpha)]\}$ extend

$E = (1/C_{eff}) \{[0.5 (W/386.1) V^2] + [W L_{cc} \sin(\alpha)]\}$ retract

Application 3:

$E = (1/C_{eff}) \{[0.5 (W/386.1) V^2] + [W L_{hc} \sin(\alpha)]\}$ extend

$E = (1/C_{eff}) \{[0.5 (W/386.1) V^2] – [W L_{cc} \sin(\alpha)]\}$ retract

Calculations for TZ Cylinder

Units (US)

E	Energy	in-lb
W	Weight	lbf
M	Mass	W/386.1
V	Velocity	in/s
P_d	Driving pressure	lbf/in^2
L_H	Head cushion length	in
L_C	Cap cushion length	in
g	Gravity constant	386.1 in/sec^2

Example

TZ cylinder in application 3 and extending:
Using a TZ cylinder with a 4 inch bore and 2.5 inch rod is mounted at a 45° angle from horizontal with rod down. A 3000 lb weight is attached to the rod and system pressure is 1500 psi. The cylinder is moving the weight at 12 in/sec.

Using the calculation for application 3:

$E = (1/C_{eff}) \{[0.5 (W/386.1) V^2] – [W L_{hc} \sin(\alpha)]\}$ extend

$E = (1/0.67)\{[0.5 (3000 / 386.1)*12^2] + [3000 * 1.378 * \sin(45)]\}$

$E = 5{,}198$ in-lb

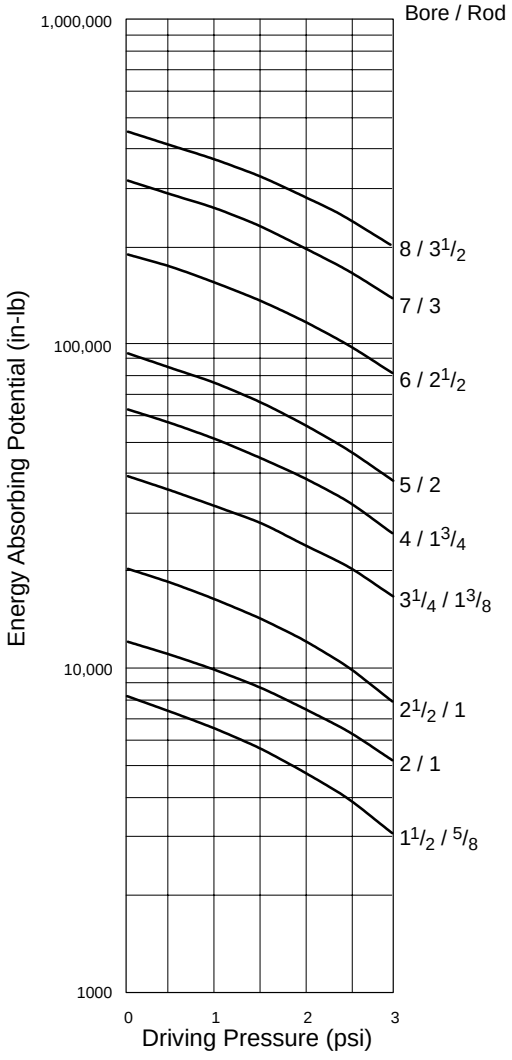
Pick the chart (see page 6) for TZ cylinder, rod extending -- third rod. The curve is for the $4 / 2^1/_2$ bore/rod model code. Enter the vertical axis at 5,198 in-lb and the horizontal axis at 1500 psi. The point of intersection is below the $4 / 2^1/_2$ curve so the cushion is acceptable. The maximum allowable pressure on the cap end is 1901 psi which is greater than the specified system pressure of 1500 psi.

Cushion Data

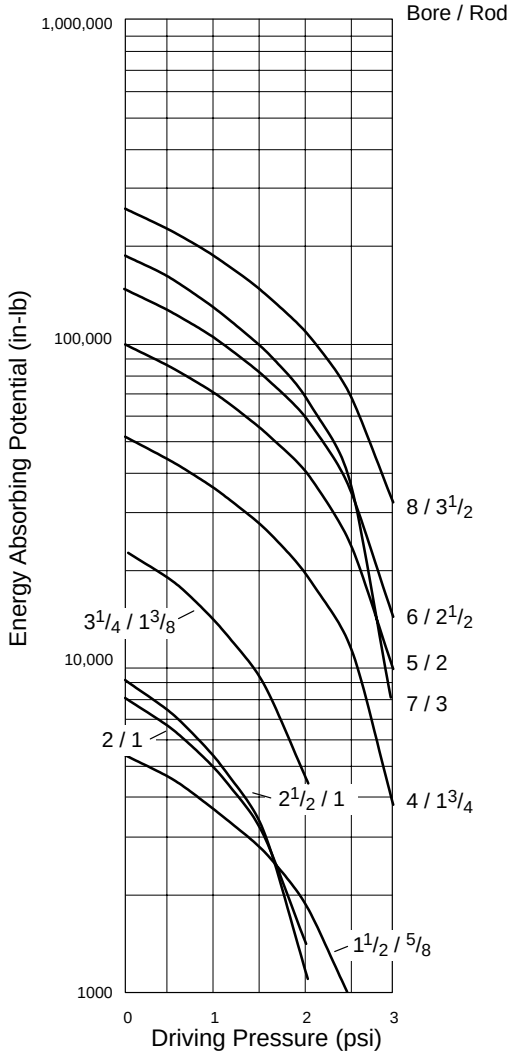
Bore Diameter (in.)	Rod Diameter (in.)	Model Code Designation Bore Rod	Max. Cap Pressure (psi)	Effective Cap End Cushion Length (in.)	Effective Rod End Cushion Length (in.)
1.5	0.625	CC	3000	1.030	0.922
1.5	1.00	CE	1797	1.030	1.181
2.0	1.00	DE	2419	1.030	1.102
2.0	1.375	DH	1325	1.030	1.181
2.5	1.00	EE	2568	1.030	0.834
2.5	1.375	EH	2404	1.030	1.181
2.5	1.75	EL	1665	1.030	1.181
3.25	1.375	GH	2685	1.187	1.186
3.25	1.75	GL	2685	1.187	1.186
3.25	2.00	GM	1709	1.187	1.378
4.0	1.75	HL	3000	1.260	1.299
4.0	2.00	HM	2657	1.260	1.378
4.0	2.50	HP	1901	1.260	1.378
5.0	2.00	KM	3000	1.181	1.575
5.0	2.50	KP	2837	1.181	1.575
5.0	3.00	KU	1734	1.181	1.378
5.0	3.50	KV	1734	1.181	1.378
6.0	2.50	LP	3000	1.575	1.378
6.0	3.00	LU	2639	1.575	1.496
6.0	3.50	LV	2639	1.575	1.496
6.0	4.00	LW	2156	1.575	1.457
7.0	3.00	MU	3000	1.969	1.575
7.0	3.50	MV	3000	1.969	1.575
7.0	4.00	MW	2346	1.969	1.575
7.0	4.50	MY	2346	1.969	1.575
7.0	5.00	MZ	1906	1.969	1.575
8.0	3.50	NV	3000	2.165	1.575
8.0	4.00	NW	2934	2.165	1.575
8.0	4.50	NY	2934	2.165	1.575
8.0	5.00	NZ	1969	2.165	1.575
8.0	5.50	N1	1969	2.165	1.575

Energy Absorbing Potential Charts

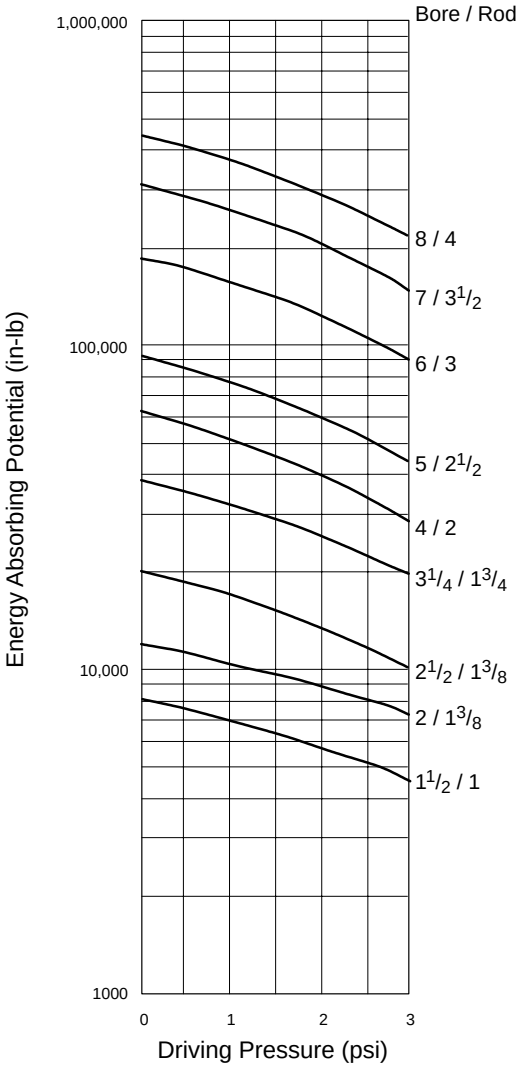
TZ Cap Cushion - Rod Retracting First Rod



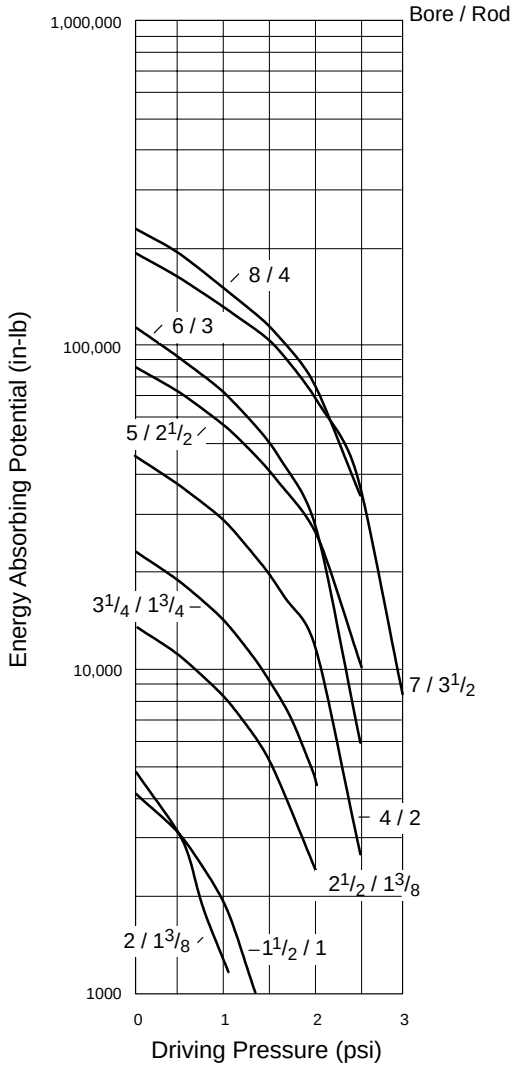
TZ Rod Cushion - Rod Extending First Rod



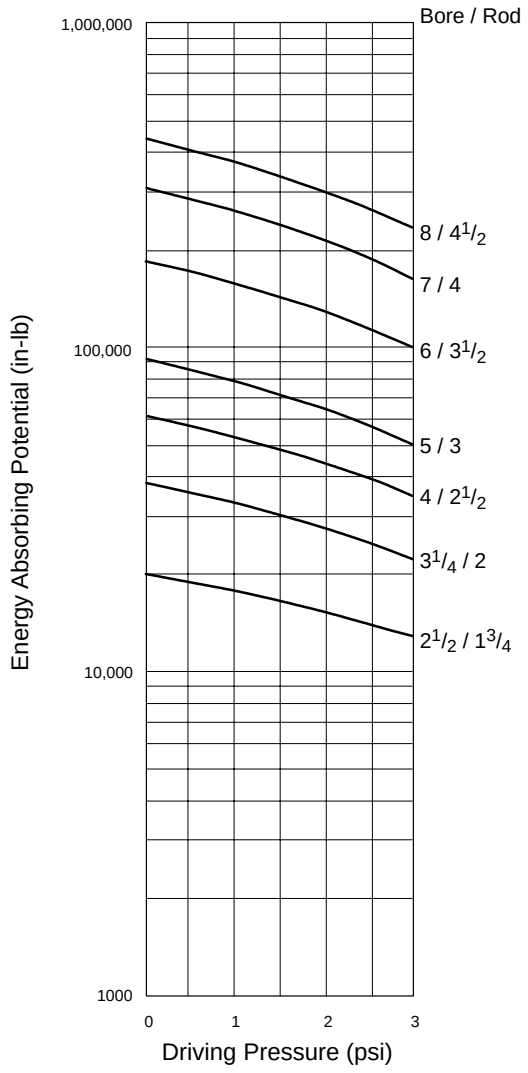
TZ Cap Cushion - Rod Retracting Second Rod



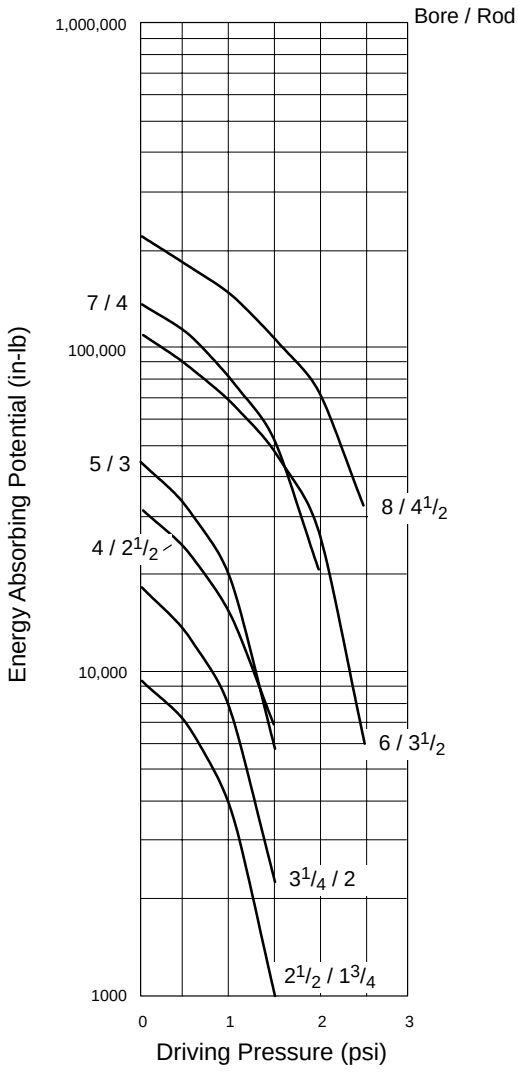
TZ Rod Cushion - Rod Extending Second Rod



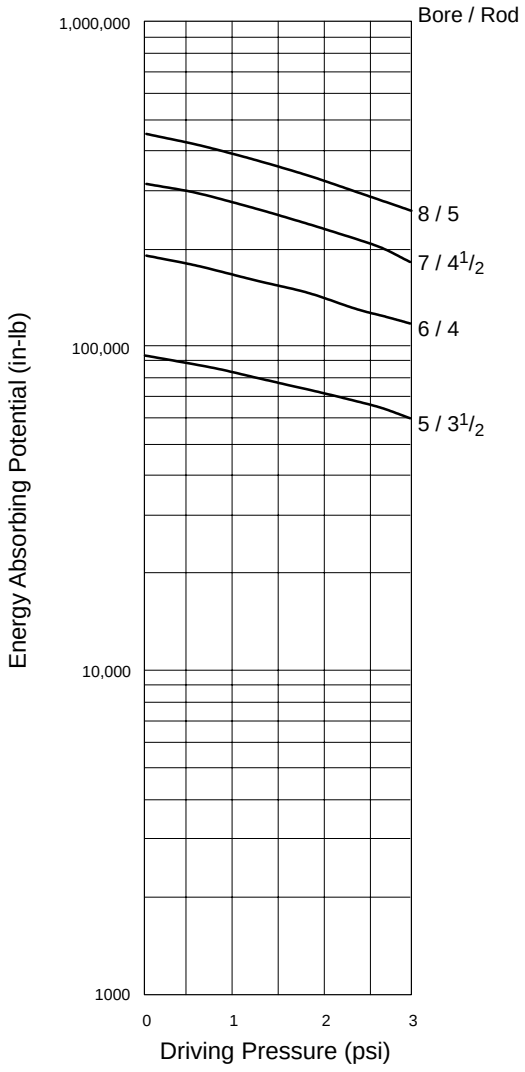
TZ Cap Cushion - Rod Retracting Third Rod



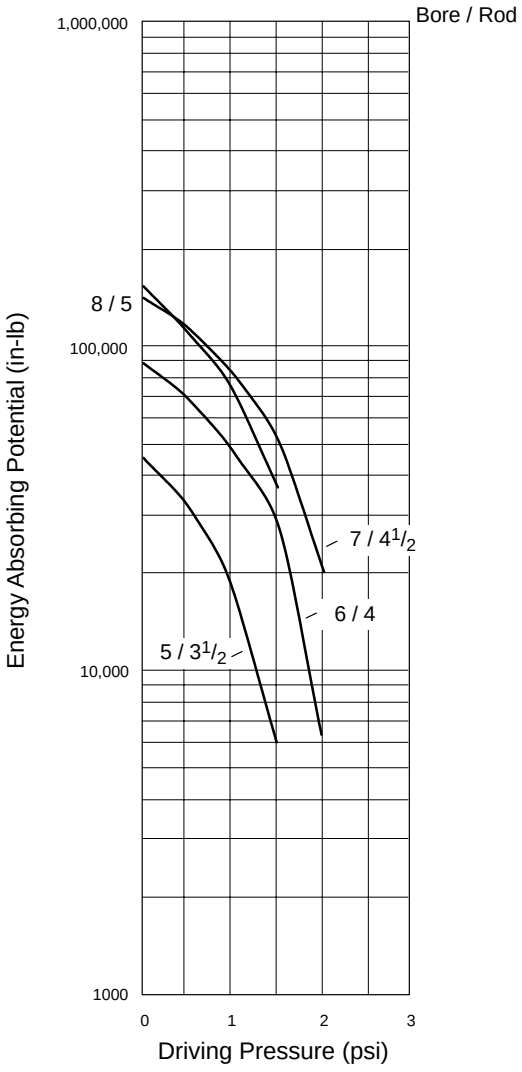
TZ Rod Cushion - Rod Extending Third Rod



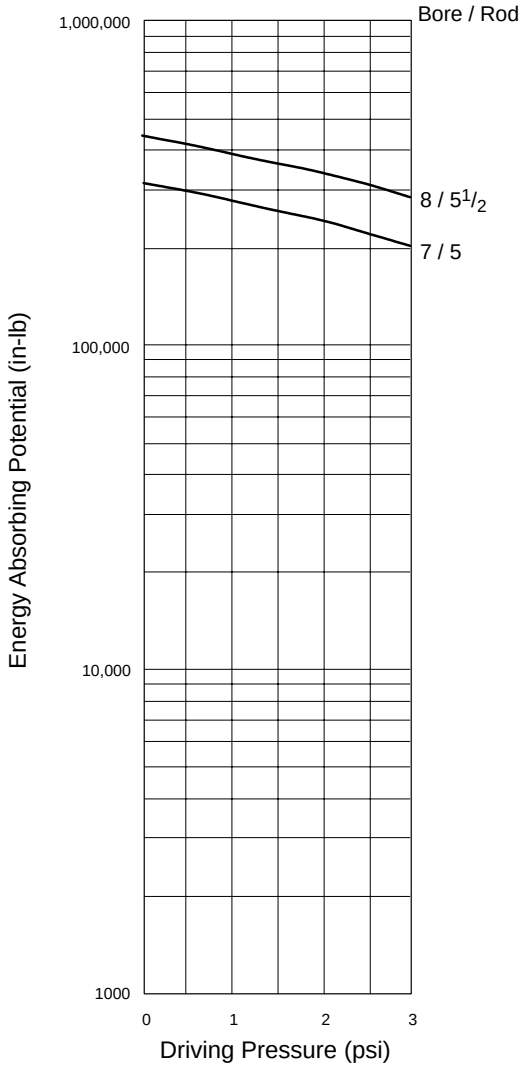
TZ Cap Cushion - Rod Retracting Fourth Rod



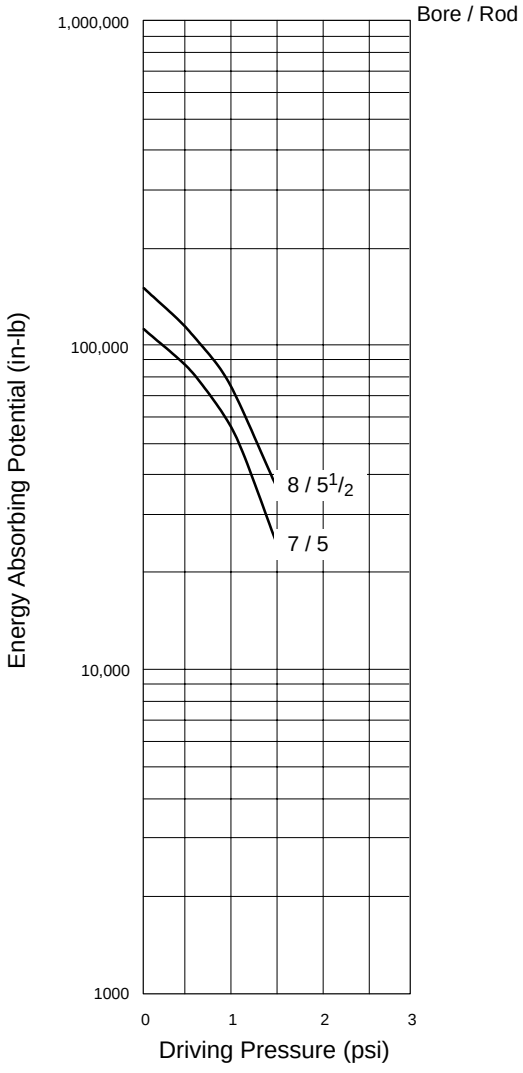
TZ Rod Cushion - Rod Extending Fourth Rod



TZ Cap Cushion - Rod Retracting Fifth Rod



TZ Rod Cushion - Rod Extending Fifth Rod



Weights

The following tables list approximate net weights of Series TZ cylinder.

Weights shown are based on cylinders with standard rod diameter and single rod end. All weights are expressed in pounds.

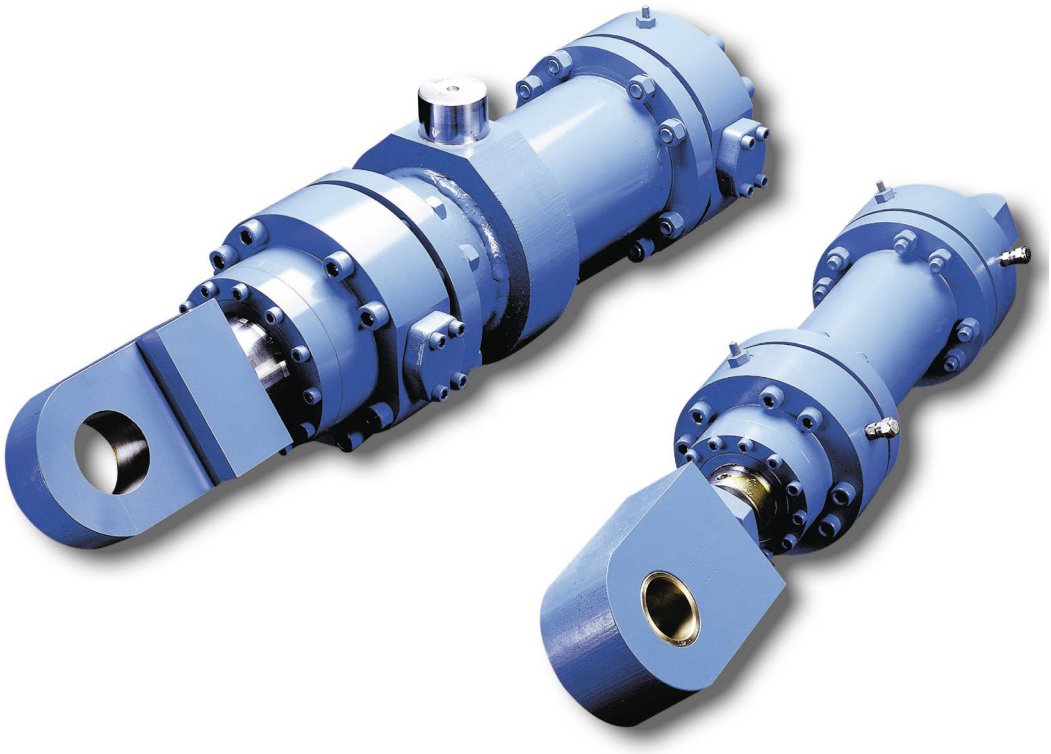
Double rod cylinder weight is equal to 1.15 times the weight listed, plus weight due to stroke.

Approximate Cylinder Weights

Bore ∅ (in)	TZ01 TZ04 TZ19	TZ02 TZ23 TZ24	TZ05 TZ07	TZ08	TZ09 TZ14 TZ15	TZ10	TZ12	TZ13	TZ16 TZ17	TZ21 TZ22	Add Per Inch of Stroke Single Rod	Double Rod
$1^1/_2$	7.8	7.7	7.7	7.9	10.6	7.6	8.2	9.1	7.7	7.5	.49	.58
2	13.0	12.4	12.7	14.2	18.0	13.2	14.0	15.7	12.7	12.0	.81	1.03
$2^1/_2$	19.5	16.8	17.3	20.0	22.9	17.6	19.1	21.1	17.0	16.4	1.06	1.28
$3^1/_4$	34.0	32.2	33.0	37.0	46.0	34.0	36.7	40.4	33.0	31.5	1.76	2.18
4	48.8	43.3	45.0	49.3	58.7	50.2	50.4	55.0	44.0	42.5	2.23	2.91
5	84.0	81.3	84.3	91.0	101	92.4	81.0	98.4	79.3	80.0	3.90	4.79
6	136	128	131	143	155	141	144	154	125	125	5.17	6.56
7	204	190	194	210	235	215	209	223	191	186	6.47	8.47
8	273	263	264	285	323	293	284	302	260	256	8.91	11.63

EATON | Vickers

Series AM/MM/WM Mill Type Cylinders



VICKERS®

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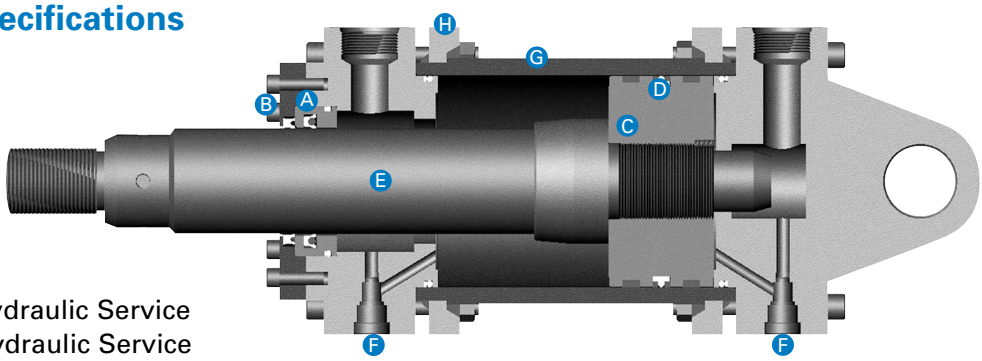
Design Features and Specifications



Specifications

Bore Sizes: 2″ - 16″
Pressure Ratings:
MM- 2,000 psi Nominal Hydraulic Service
WM- 3,000 psi Nominal Hydraulic Service
AM- 250 psi Pneumatic Service

A Heavy Duty Rod Cartridge

- SAE 660 bronze rod cartridge is pilot-fitted into the head and incorporates inboard and outboard bearing areas.
- Aluminum bronze material available as an option.

B Rod Seal and Wiper

Hydraulic:
- High durometer urethane mechanically loaded rod seal with a double lip rod wiper provides contamination exclusion and abrasion resistance.
- High durometer double lip rod wiper.
- Metallic rod scraper available as an option.
- Other rod sealing and wiping systems are available as an option.

Pneumatic:
- High quality nitrile U-cup rod seal and double-lipped wiper.
- Other rod sealing and wiping systems are available as an option.

C Secured Piston

- One piece pilot-fitted ductile iron material.
- Secured to the piston rod by set screws staked in place.
- Steel pistons available as an option with wear bands or bronze overlay.

D Piston Seals

Hydraulic:
- Bi-directional nitrile piston seal with outboard wearbands prevents pressure traps and protects against sideloading.
- Other sealing configurations are available as an option.

Pneumatic:
- High quality nitrile U-cup piston seals.
- Other sealing configurations are available as an option.

E High Yield Piston Rod

- High yield, turned, ground and polished C1045/50 microalloy steel.
- Hard chrome plated a minimum of .001″ diametrically.
- Heavier plating available as an option, in addition to various types of stainless steel and chrome over nickel plated rod material.

F Cushions

- Adjustable design allows for smooth deceleration.
- Ball check design allows for a smooth breakaway from cushion.

G High Yield Steel Tubing

Hydraulic:
- High yield strength steel.
- All tubes honed after welding of flanges.
- Chrome-plated bores available as an option.

Pneumatic:
- High yield strength steel.
- Tubes honed & chrome-plated to .001″ minimum diametrically.
- Heavier plating available as an option.

H Body Flanges

- Steel construction.
- Grade 8 bolts used for assembly with hardened steel washers.
- Hydraulic: Flanges threaded or welded to the body tube for maximum strength and durability.
- Pneumatic: Split ring and groove design secures flanges in standard duty applications; threaded or welded flanges are available for heavier duty applications.

Standard Cylinders

Eaton has created an easy system for ordering Vickers Series AM/MM/WM 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 AM/MM/WM cylinders.

To specify your Series AM/MM/WM 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 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 AM/MM/WM 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. 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 4 and 5 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 custom Vickers 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 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 Vickers replacement parts.

How to Order Series AM/MM/WM Cylinders

WM	10	KM	5	N	3	K	W	108	PC
1,2	3,4	5,6	7	8	9	10	11	12,13,14	15,16

1,2 Series

WM - 3000 psi Hydraulic Mill Cylinder
MM - 2000 psi Hydraulic Mill Cylinder
AM - 250 psi Pneumatic Mill Cylinder

3,4 Mounting Style

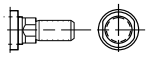
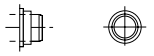
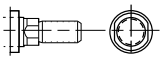
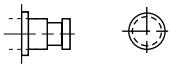
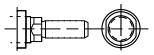
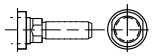
Code	Mounting Style
01	Side Lug
09	Head Rectangular
10	Cap Clevis
11	Spherical Bearing
14	Cap Rectangular
15	Intermediate Trunnion
24	No Mount
25	Double Rod Side Lug
33	Double Rod Rectangular
34	Double Rod Intermediate Trunnion
41	Double Rod No Mount

5,6 Bore & Rod diameter

Code	Bore	Rod
DE	2	1
DH	2	1-3/8
FH	3	1-3/8
FL	3	1-3/4
FM	3	2
HL	4	1-3/4
HM	4	2
HP	4	2-1/2
KM	5	2
KP	5	2-1/2
KV	5	3-1/2
LP	6	2-1/2
LU	6	3
LW	6	4
MU	7	3
MV	7	3-1/2
MZ	7	5
NV	8	3-1/2
NW	8	4
N1	8	5-1/2
RW	10	4
RZ	10	5
R1	10	5-1/2
R4	10	7
S1	12	5-1/2
S4	12	7
S6	12	8
T4	14	7
T7	14	9
U7	16	9
U8	16	10

All dimensions in inches.

7 Rod end type

Code	Rod End Style	
2	Short Female UN Thread	
5	Small Male UN Thread	
6	Plain- No Attachment	
9	Intermediate Male UN Thread	
G	Grooved End	
K	Extended Small Male UN Thread	
M	Extended Int. Male UN Thread	

8 Seals

Code	Application Type
N	Normal
L	Low Friction
T	High Temperature
C	Classic (Chevron/ C.I. Rings)

WM	10	KM	5	N	3	K	W	108	PC
1,2	3,4	5,6	7	8	9	10	11	12,13,14	15,16

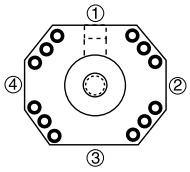
9 Ports

For maximum reliability, SAE ports are recommended.

Code	Port Style
1 NPTF	
2 Oversize NPTF	
3 SAE/UN Straight thread O-ring	
4 Oversize SAE/UN O-ring	
7 BSPP	
8 Oversize BSPP	

10 Port Location

Ports are located as shown below when viewing cylinder from head end (mounting end of double rod cylinder). Some mounting styles have port location restrictions.



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

11 Cushion Location

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

12,13,14 Cylinder Stroke

Items 12 & 13 indicate total stroke length from 1 through 99 inches. Item 14 indicates fractions of an inch as follows:

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 Enter applicable code for either:

Extra Rod Protection ("C" dimension)

Item 15 indicates inches from 0 through 9.

Item 16 indicates fractions on an inch per codes shown for item 14.

-OR-

Air bleed, gland drain or proximity sensor positions

Item 15 indicates air bleeds (H), gland drains (G), or proximity sensors (P).

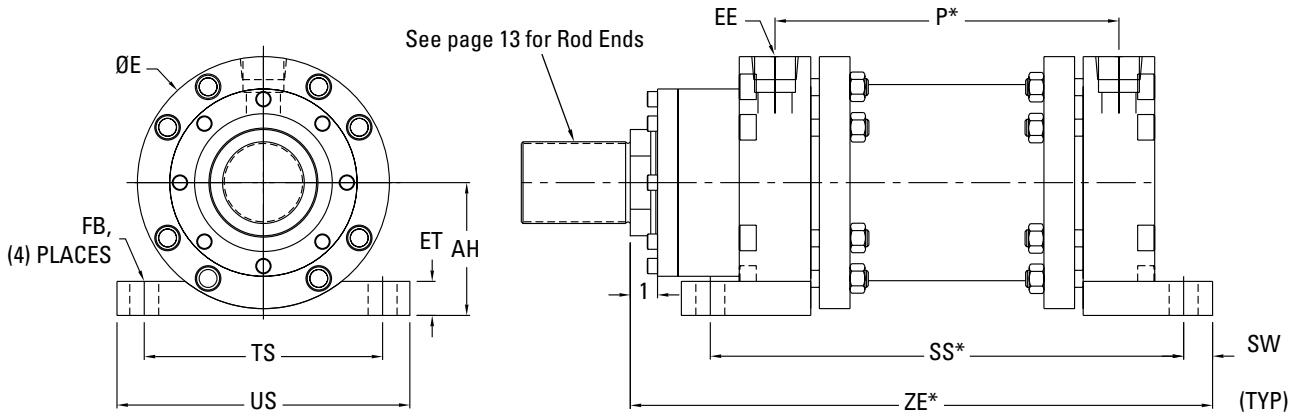
Item 16 indicates location of air bleeds, gland drain* or proximity switches as shown in item 10 when viewing cylinder from head end (or mounting end of double rod end cylinders).

"-" in table indicates no air bleed or proximity sensor.

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

* Gland drain is used on head end only

01 Side Lug Mount



AM01/MM01

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	ZE*	SS*	SW	FB	US	TS	ET	AH
2	1 1.375	3.88	1/2	#8	3.75	8.13	6.13	.38	.41	5.06	4.25	.63	2.188
3	1.375 2	5.19	1/2	#8	4.25	8.88	7.00	.50	.56	6.56	5.56	.75	2.844
4	1.75 2.5	6.25	3/4	#12	4.50	10.00	7.50	.63	.69	7.88	6.63	1.00	3.375
5	2 3.5	7.88	3/4	#12	5.50	12.88	9.24	.75	.81	9.75	8.25	1.13	4.188
6	2.5 4	9.25	1	#16	6.25	14.88	10.88	1.00	1.06	11.63	9.63	1.50	4.875
7	3 5	10.75	1-1/4	#20	6.38	16.00	11.38	1.13	1.19	13.25	11.13	1.75	5.625
8	3.5 5.5	12.00	1-1/2	#24	7.75	18.13	13.75	1.25	1.31	14.88	12.38	1.88	6.250
10	4 5.5	14.94	2	#32	9.25	20.44	15.75	1.50	1.56	18.31	15.31	2.25	7.781
12	5.5 7	17.19	2-1/2	#32	10.44	23.25	17.75	1.75	1.81	21.06	17.56	2.63	9.125
14	7 9	19.50	2-1/2	#32	10.69	25.25	18.50	2.00	2.06	23.88	19.88	3.00	10.500
16	9 10	23.38	3	#32	11.19	28.38	20.38	2.25	2.31	28.25	23.75	3.38	12.438

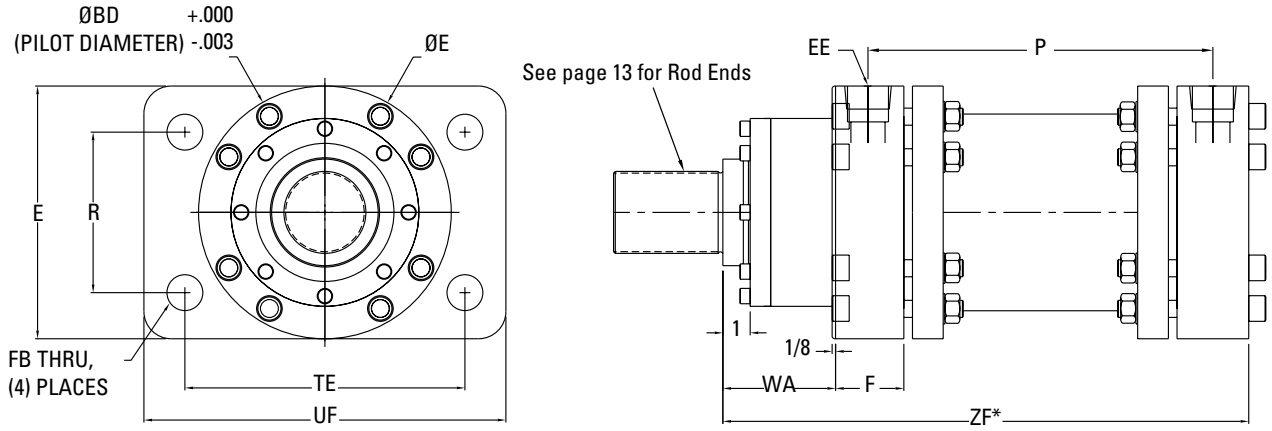
WM01 3000 PSI

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	ZE*	SS*	SW	FB	US	TS	ET	AH
3	1.375 2	5.19	1/2	#8	5.38	11.50	8.13	.50	.56	6.56	5.56	.75	2.844
4	1.75 2.5	6.50	3/4	#12	5.75	12.19	8.75	.63	.69	8.13	6.88	1.00	3.500
5	2 3.5	7.88	3/4	#12	7.00	15.25	10.75	.75	.81	9.75	8.25	1.13	4.188
6	2.5 4	9.25	1	#16	7.94	17.56	12.56	1.00	1.06	11.63	9.63	1.50	4.875
7	3 5	10.75	1-1/4	#20	8.63	19.63	13.50	1.13	1.19	13.38	11.13	1.75	5.625
8	3.5 5.5	12.38	1-1/2	#24	10.25	22.69	16.25	1.25	1.31	15.38	12.75	1.88	6.438
10	4 5.5	14.94	2	#32	10.50	25.44	17.00	1.50	1.56	18.31	15.31	2.25	7.781
12	5.5 7	17.50	2-1/2	#32	11.31	27.88	18.63	1.75	1.81	21.63	17.88	2.63	9.125
14	7 9	20.38	2-1/2	#32	11.56	29.75	19.38	2.00	1.06	24.75	20.75	3.00	10.688
16	9 10	23.38	3	#32	12.50	33.75	21.25	2.25	2.31	28.25	23.75	3.38	12.438

*Add stroke to these dimensions

All dimensions in inches

09 Head Rectangular Mount



AM09/MM09

			BSP or NPT	SAE									
BORE	**ROD**	**E**	**EE**	**EE**	**P***	**ZF***	**F**	**FB**	**R**	**TE**	**UF**	**BD**	**WA**
2	1 1.375	3.88	1/2	#8	3.75	7.38	1.50	.41	3.13	4.25	5.00	3.875	2.13
3	1.375 2	5.19	1/2	#8	4.25	7.88	1.63	.56	4.19	5.75	6.75	5.187	2.00
4	1.75 2.5	6.25	3/4	#12	4.50	8.75	1.63	.69	5.00	6.94	8.19	6.250	2.63
5	2 3.5	7.88	3/4	#12	5.50	11.38	2.13	.81	6.38	8.69	10.19	7.875	3.75
6	2.5 4	9.25	1	#16	6.25	12.88	2.50	1.06	7.25	10.31	12.31	9.250	4.13
7	3 5	10.75	1-1/4	#20	6.38	13.63	2.50	1.19	8.38	11.94	14.19	10.750	4.75
8	3.5 5.5	12.00	1-1/2	#24	7.75	15.63	3.38	1.31	9.50	13.94	15.81	12.000	4.50
10	4 5.5	14.94	2	#32	9.25	17.44	3.38	1.56	11.94	16.50	19.50	14.937	4.81
12	5.5 7	17.19	2-1/2	#32	10.44	19.75	3.69	1.81	13.69	19.00	22.50	17.187	5.63
14	7 9	19.50	2-1/2	#32	10.69	21.50	3.69	2.06	15.50	21.56	25.56	19.500	7.13
16	9 10	23.38	3	#32	11.19	23.88	4.13	2.31	18.88	25.69	30.19	23.000	8.13

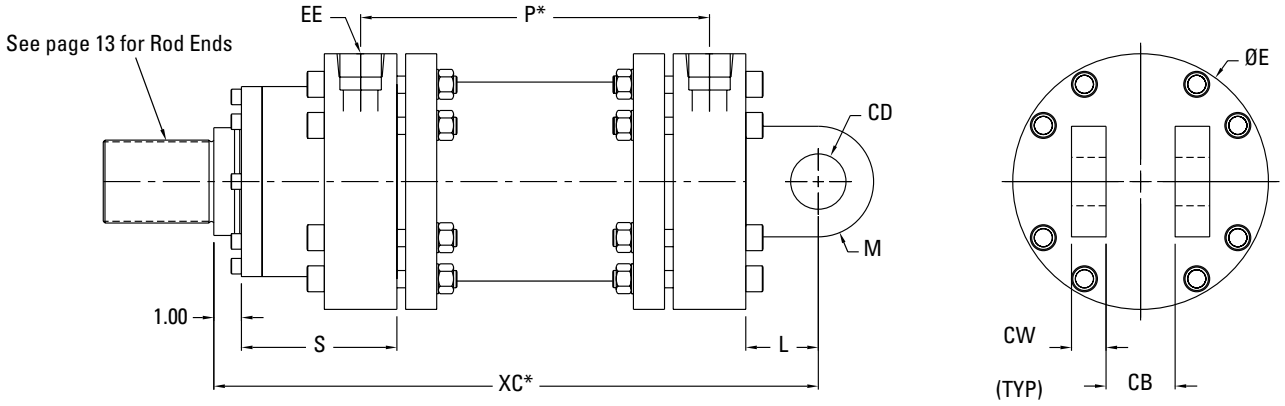
WM09 3000 PSI

			BSP or NPT	SAE									
BORE	**ROD**	**E**	**EE**	**EE**	**P***	**ZF***	**F**	**FB**	**R**	**TE**	**UF**	**BD**	**WA**
3	1.375 2	5.19	1/2	#8	5.38	10.50	1.63	.56	4.19	5.75	6.75	5.187	3.50
4	1.75 2.5	6.50	3/4	#12	5.75	10.19	1.63	.69	5.25	7.19	8.44	6.250	3.56
5	2 3.5	7.88	3/4	#12	7.00	13.75	2.13	.81	6.38	8.69	10.19	7.875	4.63
6	2.5 4	9.25	1	#16	7.94	15.56	2.50	1.06	7.25	10.31	12.31	9.250	5.13
7	3 5	10.75	1-1/4	#20	8.63	17.38	2.50	1.19	8.50	11.94	14.19	10.750	6.25
8	3.5 5.5	12.38	1-1/2	#24	10.25	20.19	3.38	1.31	9.88	13.69	16.19	12.000	6.56
10	4 5.5	14.94	2	#32	10.50	21.94	3.38	1.56	11.94	16.50	19.50	14.937	8.56
12	5.5 7	17.50	2-1/2	#32	11.31	24.38	3.69	1.81	14.00	19.31	22.81	17.187	9.38
14	7 9	20.38	2-1/2	#32	11.56	25.75	3.69	2.06	16.38	22.44	26.44	19.500	10.50
16	9 10	23.38	3	#32	12.50	29.25	4.13	2.31	18.88	25.69	30.19	23.000	12.63

*Add stroke to these dimensions

All dimensions in inches

10 Clevis Mount



AM10/MM10

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	XC*	S	M	CD	L	CW	CB
2	1 1.375	3.88	1/2	#8	3.75	8.63	3.63	.75	.750	1.25	.63	1.25
3	1.375 2	5.19	1/2	#8	4.25	9.38	3.63	1.00	1.000	1.50	.75	1.50
4	1.75 2.5	6.25	3/4	#12	4.50	10.88	4.25	1.38	1.375	2.12	1.00	2.00
5	2 3.5	7.88	3/4	#12	5.50	13.63	5.88	1.75	1.750	2.25	1.25	2.50
6	2.5 4	9.25	1	#16	6.25	15.38	6.63	2.00	2.000	2.50	1.25	2.50
7	3 5	10.75	1-1/4	#20	6.38	16.63	7.25	2.50	2.500	3.00	1.50	3.00
8	3.5 5.5	12.00	1-1/2	#24	7.75	18.88	7.88	3.00	3.000	3.25	1.50	3.00
10	4 5.5	14.94	2	#32	9.25	21.44	8.19	3.50	3.500	4.00	2.00	4.00
12	5.5 7	17.19	2-1/2	#32	10.44	24.25	9.31	4.00	4.000	4.50	2.25	4.50
14	7 9	19.50	2-1/2	#32	10.69	27.25	10.81	5.00	5.000	5.75	3.00	6.00
16	9 10	23.38	3	#32	11.63	30.88	12.25	6.00	6.000	7.00	3.50	7.00

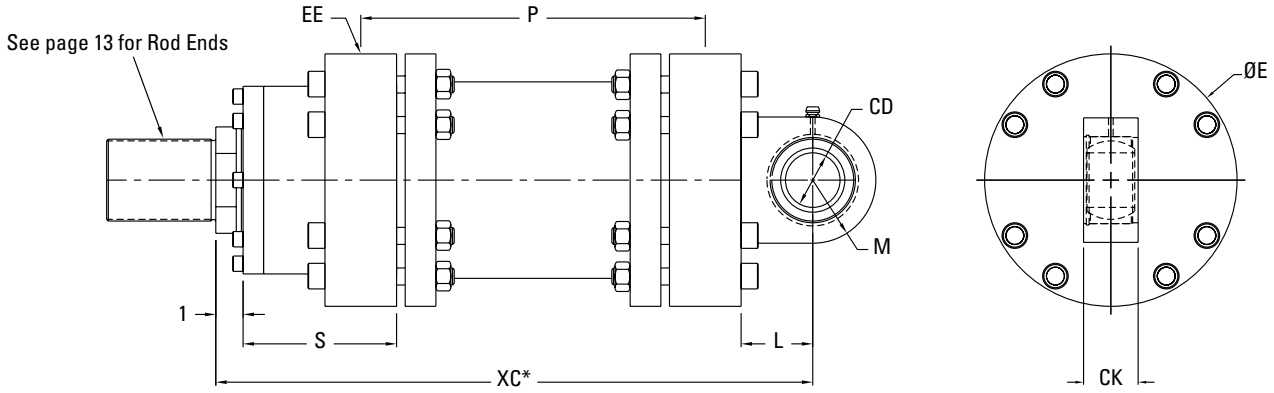
WM10 3000 PSI

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	XC*	S	M	CD	L	CW	CB
3	1.75 2	5.19	1/2	#8	5.38	12.00	5.13	1.00	1.000	1.50	.75	1.50
4	2 2.5	6.50	3/4	#12	5.75	13.06	5.19	1.38	1.375	2.13	1.00	2.00
5	2.5 3.5	7.88	3/4	#12	7.00	16.00	6.75	1.75	1.750	2.25	1.25	2.50
6	3 4	9.25	1	#16	7.94	18.06	7.63	2.00	2.000	2.50	1.25	2.50
7	3.5 5	10.75	1-1/4	#20	8.63	20.38	8.75	2.50	2.500	3.00	1.50	3.00
8	4 5.5	12.38	1-1/2	#24	10.25	23.44	9.94	3.00	3.000	3.25	1.50	3.00
10	5 7	14.94	2	#32	10.50	26.44	11.94	3.50	3.500	4.00	2.00	4.00
12	5.5 8	17.50	2-1/2	#32	11.31	28.88	13.06	4.00	4.000	4.50	2.25	4.50
14	7 9	20.38	2-1/2	#32	11.56	31.50	14.19	5.00	5.000	5.75	3.00	6.00
16	9 10	23.38	3	#32	12.50	36.25	16.75	6.00	6.000	7.00	3.50	7.00

*Add stroke to these dimensions

All dimensions in inches

11 Spherical Bearing Mount



AM11/MM11

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	XC*	S	M	CD	L	CK
2	1 1.375	3.88	1/2	#8	3.75	8.63	3.63	1.25	.750	1.25	.56
3	1.375 2	5.19	1/2	#8	4.25	9.38	3.63	1.63	1.000	1.50	1.00
4	1.75 2.5	6.25	3/4	#12	4.50	10.88	4.25	1.75	1.375	2.13	1.50
5	2 3.5	7.88	3/4	#12	5.50	13.63	5.88	2.50	1.750	2.25	1.75
6	2.5 4	9.25	1	#16	6.25	15.38	6.63	2.88	2.000	2.50	2.00
7	3 5	10.75	1-1/4	#20	6.38	16.63	7.25	3.38	2.500	3.00	2.50
8	3.5 5.5	12.00	1-1/2	#24	7.75	18.88	7.88	3.88	3.000	3.25	3.00
10	4 5.5	14.94	2	#32	9.25	21.44	8.19	5.50	3.500	4.00	3.19
12	5.5 7	17.19	2-1/2	#32	10.44	24.25	9.31	6.00	4.000	4.50	3.50
14	7 9	19.50	2-1/2	#32	10.69	27.25	10.81	5.75	5.000	5.75	4.25
16	9 10	23.38	3	#32	11.63	30.88	12.25	7.50	6.000	7.00	4.63

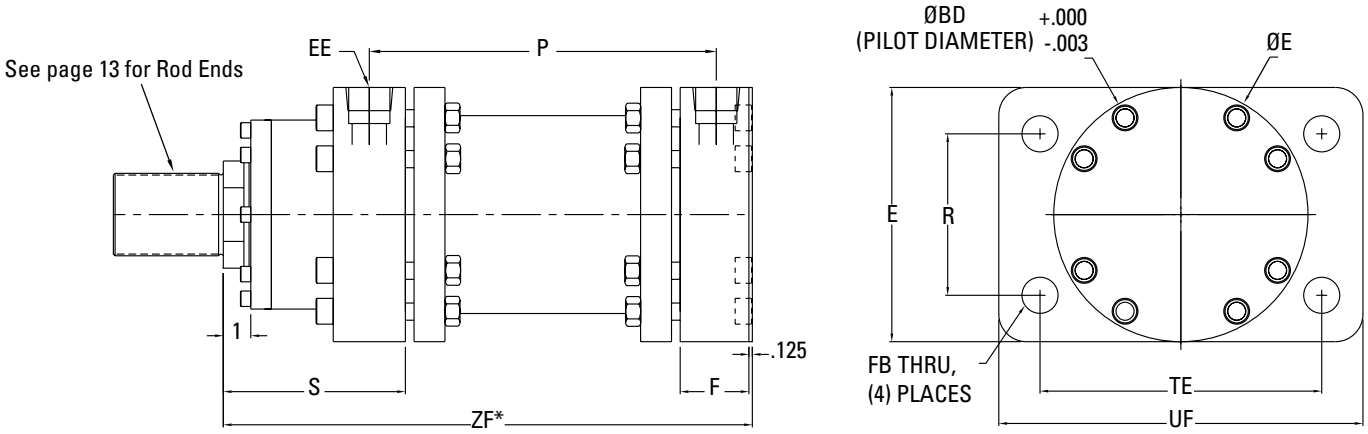
WM11 3000 PSI

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	XC*	S	M	CD	L	CK
3	1.75 2	5.19	1/2	#8	5.38	12.00	5.13	1.63	1.000	1.50	1.00
4	2 2.5	6.50	3/4	#12	5.75	13.06	5.19	1.75	1.375	2.13	1.50
5	2.5 3.5	7.88	3/4	#12	7.00	16.00	6.75	2.50	1.750	2.25	1.75
6	3 4	9.25	1	#16	7.94	18.06	7.63	2.88	2.000	2.50	2.00
7	3.5 5	10.75	1-1/4	#20	8.63	20.38	8.75	3.38	2.500	3.00	2.50
8	4 5.5	12.38	1-1/2	#24	10.25	23.44	9.94	3.88	3.000	3.25	3.00
10	5 7	14.94	2	#32	10.50	26.44	11.94	5.50	3.500	4.00	3.19
12	5.5 8	17.50	2-1/2	#32	11.31	28.88	13.06	6.00	4.000	4.50	3.50
14	7 9	20.38	2-1/2	#32	11.56	31.50	14.19	6.75	5.000	5.75	4.25
16	9 10	23.38	3	#32	12.50	36.25	16.75	7.50	6.000	7.00	4.63

*Add stroke to these dimensions

All dimensions in inches

14 Cap Rectangular Mount



AM14/MM14

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	ZF*	F	FB	R	TE	UF	BD	S
2	1 1.375	3.88	1/2	#8	3.75	7.38	1.50	.41	3.13	4.25	5.00	3.875	3.63
3	1.375 2	5.19	1/2	#8	4.25	7.88	1.63	.56	4.19	5.75	6.75	5.187	3.63
4	1.75 2.5	6.25	3/4	#12	4.50	8.75	1.63	.69	5.00	6.94	8.19	6.250	4.25
5	2 3.5	7.88	3/4	#12	5.50	11.38	2.13	.81	6.38	8.69	10.19	7.875	5.88
6	2.5 4	9.25	1	#16	6.25	12.88	2.50	1.06	7.25	10.31	12.31	9.250	6.63
7	3 5	10.75	1-1/4	#20	6.38	13.63	2.50	1.19	8.38	11.94	14.19	10.750	7.25
8	3.5 5.5	12.00	1-1/2	#24	7.75	15.63	3.38	1.31	9.50	13.94	15.81	12.000	7.88
10	4 5.5	14.94	2	#32	9.25	17.44	3.38	1.56	11.94	16.50	19.50	14.937	8.19
12	5.5 7	17.19	2-1/2	#32	10.44	19.75	3.69	1.81	13.69	19.00	22.50	17.187	9.31
14	7 9	19.50	2-1/2	#32	10.69	21.50	3.69	2.06	15.50	21.56	25.56	19.500	10.81
16	9 10	23.38	3	#32	11.19	23.88	4.13	2.31	18.88	25.69	30.19	23.000	12.25

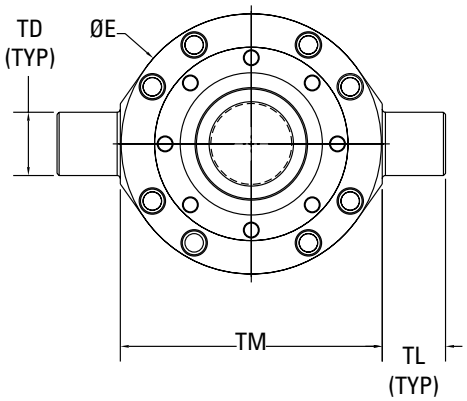
WM14 3000 PSI

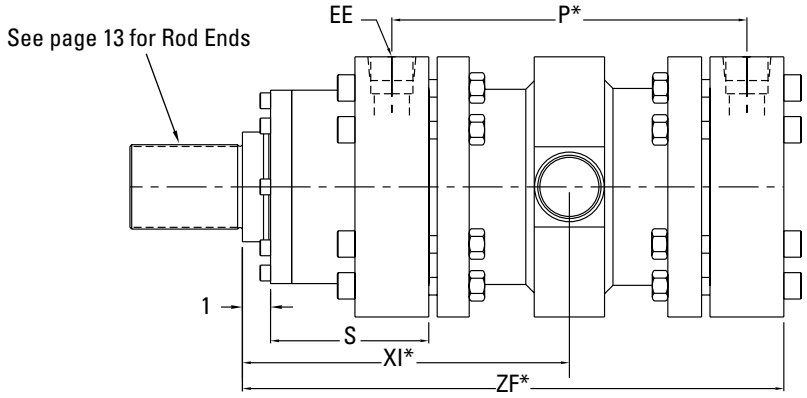
BORE	ROD	E	BSP or NPT EE	SAE EE	P*	ZF*	F	FB	R	TE	UF	BD	S
3	1.375 2	5.19	1/2	#8	5.38	10.50	1.63	.56	4.19	5.75	6.75	5.187	5.13
4	1.75 2.5	6.50	3/4	#12	5.75	10.19	1.63	.69	5.25	7.19	8.44	6.250	5.19
5	2 3.5	7.88	3/4	#12	7.00	13.75	2.13	.81	.38	8.69	10.19	7.875	6.75
6	2.5 4	9.25	1	#16	7.94	15.56	2.50	1.06	7.25	10.31	12.31	9.250	7.63
7	3 5	10.75	1-1/4	#20	8.63	17.38	2.50	1.19	8.50	11.94	14.19	10.750	8.75
8	3.5 5.5	12.38	1-1/2	#24	10.25	20.19	3.38	1.31	9.88	13.69	16.19	12.000	9.94
10	4 5.5	14.94	2	#32	10.50	21.94	3.38	1.56	11.94	16.50	19.50	14.937	11.94
12	5.5 7	17.50	2-1/2	#32	11.31	24.38	3.69	1.81	14.00	19.31	22.81	17.187	13.06
14	7 9	20.38	2-1/2	#32	11.56	25.75	3.69	2.06	16.38	22.44	26.44	19.500	14.19
16	9 10	23.38	3	#32	12.50	29.25	4.13	2.31	18.88	25.69	30.19	23.000	16.75

*Add stroke to these dimensions

All dimensions in inches

15 Trunnion Mount





AM15/MM15

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	ZF*	S	TM	TL	TD
2	1 1.375	3.88	1/2	#8	3.75	7.38	3.63	3.94	1.25	1.250
3	1.375 2	5.19	1/2	#8	4.25	7.88	3.63	5.25	1.38	1.375
4	1.75 2.5	6.25	3/4	#12	4.50	8.75	4.25	6.31	1.75	1.750
5	2 3.5	7.88	3/4	#12	5.50	11.38	5.88	7.94	2.00	2.000
6	2.5 4	9.25	1	#16	6.25	12.88	6.63	9.94	2.25	2.250
7	3 5	10.75	1-1/4	#20	6.38	13.63	7.25	10.81	2.38	2.375
8	3.5 5.5	12.00	1-1/2	#24	7.75	15.63	7.88	12.06	2.50	2.500
10	4 5.5	14.94	2	#32	9.25	17.44	8.19	15.00	3.00	3.000
12	5.5 7	17.19	2-1/2	#32	10.44	19.75	9.31	17.25	3.50	3.500
14	7 9	19.50	2-1/2	#32	10.69	21.50	10.81	19.56	4.50	4.500
16	9 10	23.38	3	#32	11.19	23.88	12.25	23.44	5.00	5.000

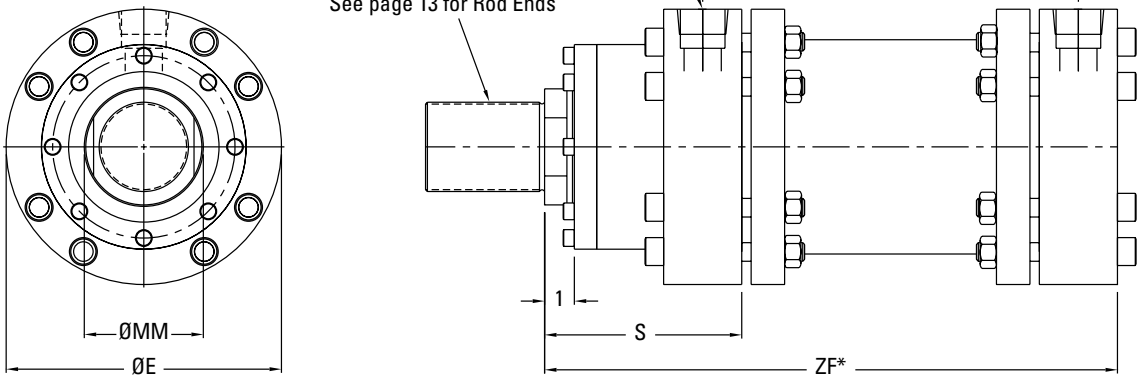
WM15 3000 PSI

BORE	ROD	E	BSP or NPT EE	SAE EE	P*	ZF*	S	TM	TL	TD
3	1.75 2	5.19	1/2	#8	5.38	10.50	5.13	5.25	1.50	1.500
4	2 2.5	6.50	3/4	#12	5.75	10.81	5.19	6.56	1.75	1.750
5	2.5 3.5	7.88	3/4	#12	7.00	13.75	6.75	7.94	2.25	2.250
6	3 4	9.25	1	#16	7.94	15.56	7.63	9.31	2.50	2.500
7	3.5 5	10.75	1-1/4	#20	8.63	17.38	8.75	10.81	3.00	3.000
8	4 5.5	12.38	1-1/2	#24	10.25	20.19	9.94	12.44	3.50	3.500
10	5 7	14.94	2	#32	10.50	21.94	11.94	15.00	4.00	4.000
12	5.5 8	17.50	2-1/2	#32	11.31	24.38	13.06	17.56	5.00	5.000
14	7 9	20.38	2-1/2	#32	11.56	25.75	14.19	20.44	5.50	5.500
16	9 10	23.38	3	#32	12.50	29.25	16.75	23.44	6.50	6.500

*Add stroke to these dimensions

All dimensions in inches

24 Basic No Mount



AM24/MM24

			BSP or NPT	SAE			
BORE	**ROD**	**E**	**EE**	**EE**	**P***	**ZF***	**S**
2	1 1-3/8	3.88	1/2	#8	3.75	7.38	3.63
3	1-3/8 2	5.19	1/2	#8	4.25	7.88	3.63
4	1-3/4 2-1/2	6.25	3/4	#12	4.50	8.75	4.25
5	2 3-1/2	7.88	3/4	#12	5.50	11.38	5.88
6	2-1/2 4	9.25	1	#16	6.25	12.88	6.63
7	3 5	10.75	1-1/4	#20	6.38	13.63	7.25
8	3-1/2 5-1/2	12.00	1-1/2	#24	7.75	15.63	7.88
10	4 5-1/2	14.94	2	#32	9.25	17.44	8.19
12	5-1/2 7	17.19	2-1/2	#32	10.44	19.75	9.31
14	7 9	19.50	2-1/2	#32	10.69	21.50	10.81
16	9 10	23.38	3	#32	11.63	23.88	12.25

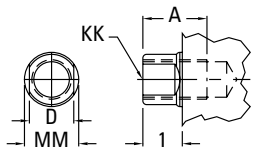
WM24 3000 PSI

			BSP or NPT	SAE			
BORE	**ROD**	**E**	**EE**	**EE**	**P***	**ZF***	**S**
3	1-3/4 2	5.19	1/2	#8	5.38	10.50	5.13
4	2 2-1/2	6.50	3/4	#12	5.75	10.19	5.18
5	2-1/2 3-1/2	7.88	3/4	#12	7.00	13.75	6.75
6	3 4	9.25	1	#16	7.94	15.56	7.63
7	3-1/2 5	10.75	1-1/4	#20	8.63	17.38	8.75
8	4 5-1/2	12.38	1-1/2	#24	10.25	20.19	9.94
10	5 7	14.94	2	#32	10.50	21.94	11.94
12	5-1/2 8	17.50	2-1/2	#32	11.44	24.38	13.06
14	7 9	20.38	2-1/2	#32	11.56	25.75	14.19
16	9 10	23.38	3	#32	12.50	29.25	16.75

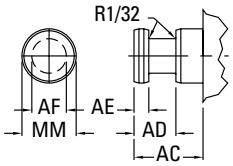
*Add stroke to these dimensions

All dimensions in inches

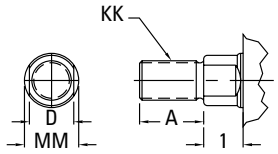
Rod End Selection



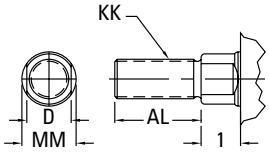
STYLE #2



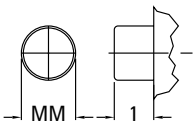
STYLE #G



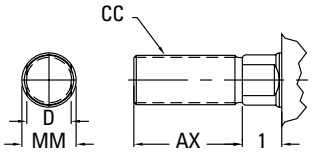
STYLE #5



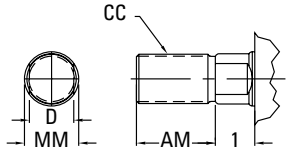
STYLE #K



STYLE #6



STYLE #M



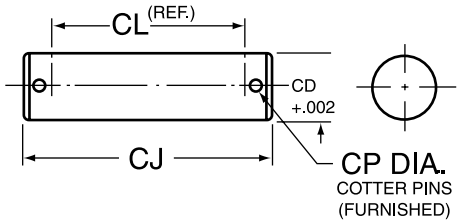
STYLE #9

NOTES:

* Wrench flats for rods less than 4 inches, larger rods will have 2 spanner holes 180° apart.

MM	A	AC	AD	AE	AF	AL	AM	AX	CC	D*	KK
1	1.13	1.50	.94	.375	.688	1.56	1.50	1.94	.875-14	.875	.750-16
1.375	1.63	1.75	1.06	.375	.875	2.19	2.00	2.75	1.250-12	1.125	1.000-14
1.75	2.00	1.75	1.31	.500	1.125	2.75	2.25	3.13	1.500-12	1.500	1.250-12
2	2.25	2.63	1.69	.625	1.375	3.13	3.00	4.13	1.750-12	1.688	1.500-12
2.5	3.00	3.25	1.94	.750	1.750	4.13	3.50	4.75	2.250-12	2.062	1.875-12
3	3.50	3.63	2.44	.875	2.250	4.75	3.50	5.50	2.750-12	2.625	2.250-12
3.5	3.50	4.38	2.69	1.000	2.500	5.00	4.50	6.38	3.250-12	3.000	2.500-12
4	4.00	4.50	2.69	1.000	3.000	5.63	4.50	6.56	3.750-12	*	3.000-12
4.5	4.50	4.50	2.69	1.000	3.000	6.38	5.00	7.31	3.750-12	*	3.250-12
5	5.00	5.38	3.19	1.500	3.875	7.00	5.00	7.56	4.750-12	*	3.500-12
5.5	5.50	6.25	3.94	1.875	4.375	7.75	6.75	9.56	5.250-12	*	4.000-12
7	7.00	6.50	4.06	2.000	5.750	10.00	7.00	10.50	6.500-12	*	5.500-12
8	8.00	6.50	4.06	2.000	6.500	11.25	8.00	12.00	7.500-12	*	6.000-12
9	9.00	6.75	4.13	2.000	7.250	12.50	9.00	13.50	8.500-12	*	6.500-12
10	10.00	7.25	4.63	2.375	8.000	14.00	10.00	15.13	9.500-12	*	7.250-12

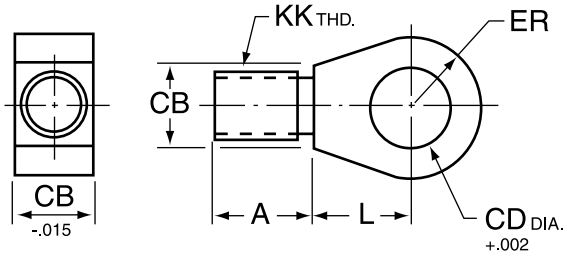
Swivel Pin



1. Swivel pins are furnished with clevis mounted cylinders.
2. Swivel pins must be ordered as a separate item if to be used with female eye, female clevis, standard eye bracket and clevis bracket. They are included only with swivel eye bracket.

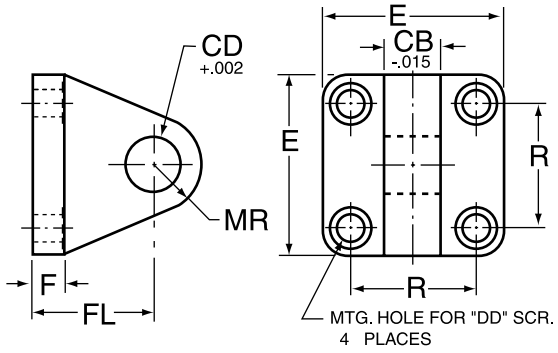
Part No.	CD	CJ	CL	CP
WM83075-10	.750	3.25	2.5	.188
WM83125-10	1.250	3.75	3	.188
WM83137-10	1.375	4.00	3.25	.188
WM83150-10	1.500	4.75	3.75	.25
WM83175-10	1.750	5.50	4.5	.25
WM83200-10	2.000	7.00	6	.25
WM83250-10	2.500	8.00	7	.25
WM83300-10	3.000	10.50	9	.375
WM83350-10	3.500	11.50	10	.375
WM83425-10	4.250	13.50	12	.375

Rod Eye



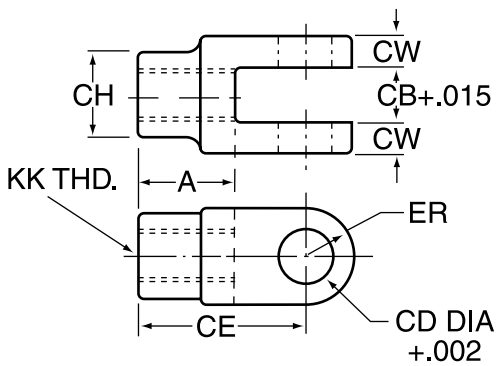
Part No.	A	CB	CD	ER	KK	L
WM60075	.88	1.25	.752	.63	.750-16	.88
WM60125	1.25	1.50	1.252	1.13	1.000-14	1.38
WM60137	1.63	2.00	1.377	1.25	1.250-12	1.50
WM60150	1.88	2.25	1.502	1.38	1.500-12	1.68
WM60175	2.38	2.75	1.752	1.63	1.875-12	1.88
WM60200	2.88	3.25	2.002	1.88	2.250-12	2.13
WM60250	3.38	3.75	2.502	2.38	2.500-12	2.63
WM60300	4.00	4.50	3.002	2.88	3.000-12	3.13
WM60350	5.50	6.00	3.502	3.38	4.000-12	3.63
WM60425	6.50	7.50	4.252	4.00	5.000-12	4.25

Eye Bracket



Part No.	CB	CD	DD	E	F	FL	MR	R
WM78075	1.00	.752	.38	3.00	.56	1.75	.63	2.25
WM78125	1.25	1.252	.63	5.00	.94	3.00	1.13	3.75
WM78137	1.25	1.377	.75	6.00	1.19	3.88	1.25	4.50
WM78150	1.25	1.502	1.00	7.00	1.44	4.63	1.38	5.00
WM78175	1.50	1.752	1.25	8.25	11.06	5.63	1.63	6.00
WM78200	3.00	2.002	1.50	10.00	11.31	6.88	1.88	7.25
WM78250	3.50	2.502	1.75	13.25	2.19	8.75	2.38	10.00
WM78300	4.50	3.002	2.00	15.75	2.44	10.25	2.88	12.00
WM78350	5.00	3.502	2.00	18.00	2.44	11.25	3.38	14.25
WM78425	6.00	4.252	2.50	20.50	2.94	12.50	4.00	16.00

Rod Clevis



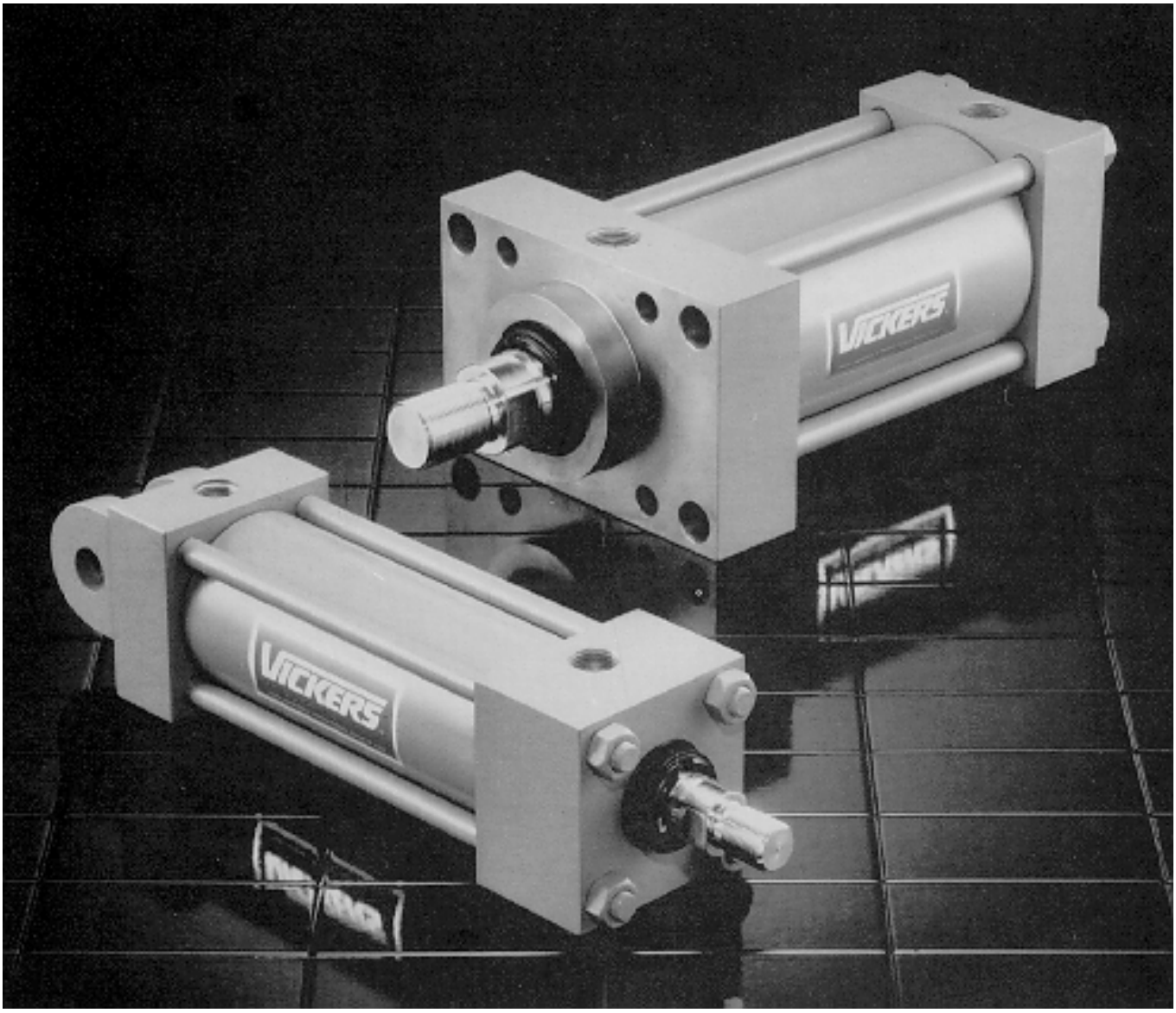
Part No.	A	CB	CD	CE	CH	CW	ER	KK
WM62075	1.13	1.00	.752	2.00	1.13	.75	.63	.750-16
WM62125	1.50	1.25	1.252	2.88	2.00	.88	1.13	1.000-14
WM62137	1.88	1.25	1.377	3.38	2.25	1.00	1.25	1.250-12
WM62150	2.13	1.25	1.502	3.75	2.50	1.25	1.38	1.500-12
WM62175	2.63	1.50	1.752	4.50	3.00	1.50	1.63	1.875-12
WM62200	3.13	3.00	2.002	5.25	3.50	1.50	1.88	2.250-12
WM62250	3.63	3.50	2.502	6.25	4.00	1.75	2.38	2.500-12
WM62300	4.38	4.50	3.002	7.50	5.00	2.25	2.88	3.000-12
WM62350	5.88	5.00	3.502	9.50	6.00	2.50	3.38	4.000-12
WM62425	7.25	6.00	4.252	11.50	7.50	3.00	4.00	5.000-12

Vickers®

Cylinders

Series TV Cylinders

ISO 6020-2 and DIN 24554 Interchangeable
Nominal Pressure: 160 bar Hydraulic
Working Pressure: Up to 210 bar Hydraulic



Revised 3/96

4147

Features

Global Design:
Engineered for ISO 6020-2/DIN 24554 interchangeability with the durability required for heavy-duty applications.

Rod Cartridge Assembly:
Quick Change design requires no other cylinder disassembly for rod seal maintenance.

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.

Special Wearbands:
Metal-to-metal contact is eliminated, providing superior wearability, increased load carrying capability, and prolonged cylinder life.

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.

Square Head Tie-Rod Design:
Suitable for nominal pressure to 160 bar and working pressure up to 210 bar.

Full Range of Ports:
Including SAE, ISO 228-1 BSPP, and metric to ISO 6149 and DIN standard 3852 to provide the broadest piping flexibility.

Piston Rod:
Case hardened, hard chrome plated piston rod in a variety of diameters between 12 and 140 millimeters provides maximum durability and extends seal life. Several different rod end types are available.

ISO Standard Seal Grooves:
Rod and piston sealing systems both conform to ISO standard groove specifications.

Captive Screws:
Inadvertent removal of cushion screws and optional air bleed screws is prevented, while still allowing a full range of adjustment.

Bore Size Range:
Cylinder bores available between 25 and 200 millimeters.

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 production.

Attention to Details:
One example is the careful design of the body-to-head joint. The design assures ease of assembly while maintaining tight tolerances for exceptional concentricity between cylinder parts.

Contents

How To Order

Standard Cylinders

Vickers has created an easy system for ordering Series TV 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 TV cylinders.

To specify your Series TV 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 TV 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 TV cylinder, you're assured of exactly the same top quality cylinder design.
- **Improve identification.** Every Series TV 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.

NOTE

See pages 4 and 5 for a summary of ISO 6020-2 model code options. See page 6 for a summary of DIN 24554 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 80mm total rod projection and M22 x 1,5 thread 35mm long." The cylinder will then be given a unique five 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 five digit design number on receipt of your order (as explained below).

Replacement Cylinders

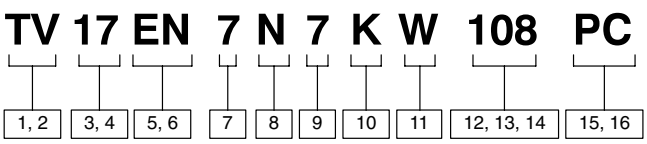
Every Vickers custom cylinder is assigned a unique design number. This number is contained in the last five digits of the sixteen digit model code, and item 12 is always an alpha character. In other words, the "Stroke" and "Extra Rod Projection" locations (items 12 through 16) become the "Design Number" 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 Codes for ISO 6020-2 Series TV Cylinders*

(All dimensions are in millimeters)



1, 2 Series

TV – ISO 6020-2 interchangeable hydraulic cylinder

3, 4 Mounting style

Vickers Code	Style	ISO Code
01 –	Side lug	**MS2**
04 –	Keyed side lug	
09 –	Head rectangular	**ME5**
10 –	Cap clevis	**MP1**
11 –	Spherical bearing	**MP5**
14 –	Cap rectangular	**ME6**
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	
33 –	Double rod, head rectangular	
34 –	Double rod, intermediate trunnion	
35 –	Double rod, head trunnion	
39 –	Double rod, extended tie rod	
40 –	Double rod, both ends extended tie rod	
41 –	Double rod, no mount	
47 –	Cap fixed eye	**MP3**

(See detailed information on page 8.)

5, 6 Bore and rod diameters

Code	Bore	Rod
BB –	25	12
BE –	25	18
2C –	32	14
2G –	32	22
CE –	40	18
CG –	40	22
CJ –	40	28
DG –	50	22
DJ –	50	28
DL –	50	36
EJ –	63	28
EL –	63	36
EN –	63	45
GL –	80	36
GN –	80	45
GQ –	80	56
HN –	100	45
HQ –	100	56
HS –	100	70
KQ –	125	56
KS –	125	70
KU –	125	90
LS –	160	70
LU –	160	90
LW –	160	110
NU –	200	90
NW –	200	110
NZ –	200	140

(See detailed information on page NO TAG.)

7 Rod end type

Code	Type
0 –	Intermediate male metric thread
1 –	Short female metric thread
6 –	Plain no attachment
7 –	Small male metric thread
N –	Extended intermediate male metric thread

(See detailed information on page NO TAG.)

8 Sealing System

Code	Type
N –	Normal
L –	Low friction and water glycol
T –	High temperature

(See detailed information on page NO TAG.)

9 Port type and size

Code	Type
3 –	SAE/UN O-ring
4 –	Oversize SAE/UN
5 –	NFPA standard SAE/UN
6 –	SAE 4-bolt manifold
7 –	BSPP
8 –	Oversize BSPP
9 –	Metric
0 –	Oversize metric
A –	ISO 6149 O-ring
B –	Oversize ISO 6149 O-ring

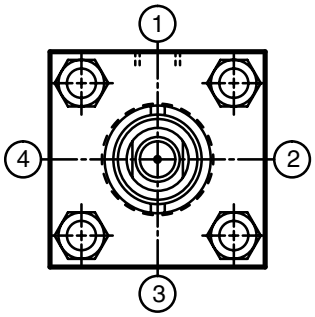
(See detailed information on page NO TAG.)

* See page 6 for DIN 24554 cylinder model codes.

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
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

(See detailed information on page NO TAG.)

11 **Cushion location**

Cushions are located as shown in item 10 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

12, 13, 14 **Stroke length**

Stroke length can be from 001 mm to 999 mm.

15, 16 **Enter applicable code for either:**

Extra rod projection ("C" dimension)

This number is the extra rod projection from 00 mm through 99 mm.

– or –

Air bleed, gland drain or proximity switch location

Position 15 indicates air bleeds (**H**), gland drain (**G**) or proximity switches (**P**).

Position 16 indicates location of air bleeds, gland drain, or proximity switches as shown in item 10 when viewing cylinder from head end (mounting end of double rod cylinder). "–" in table indicates no air bleed or proximity switch.

Code	Head	Cap
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

(See detailed information on page NO TAG.)

* Only these position codes should be used for the (**G**) gland drain option.

Model Codes for DIN 24554 Series TV Cylinders*

(All dimensions are in millimeters)

TV 17 EN7 N 7 K W 108 HR

1, 2 | 3, 4 | 5, 6, 7 | 8 | 9 | 10 | 11 | 12, 13, 14 | 15, 16

1, 2 Series

TV – DIN 24554 interchangeable hydraulic cylinder

3, 4 Mounting style

Vickers Code	Style	DIN Code
01 –	Side lug	**MS2**
07 –	Head rectangular	**ME5**
11 –	Spherical bearing	**MP5**
14 –	Cap rectangular	**ME6**
15 –	Intermediate trunnion	**MT4**

(See detailed information on page 7.)

5, 6, 7 Bore and rod diameters and rod end type

Code	Bore	Rod	Thread
BB0 –	25	12	M10 x 1,25
BE7 –	25	18	M10 x 1,25
2C0 –	32	14	M12 x 1,25
2G7 –	32	22	M12 x 1,25
CE0 –	40	18	M14 x 1,5
CJ7 –	40	28	M14 x 1,5
DG0 –	50	22	M16 x 1,5
DL7 –	50	36	M16 x 1,5
EJ0 –	63	28	M20 x 1,5
EN7 –	63	45	M20 x 1,5
GL0 –	80	36	M27 x 2
GQ7 –	80	56	M27 x 2
HN0 –	100	45	M33 x 2
HS7 –	100	70	M33 x 2
KQ0 –	125	56	M42 x 2
KU7 –	125	90	M42 x 2
LS0 –	160	70	M48 x 2
LW7 –	160	110	M48 x 2
NU0 –	200	90	M64 x 3
NZ7 –	200	140	M64 x 3

(See detailed information on pages NO TAG, NO TAG and NO TAG.)

8 Sealing System

Code	Type
N –	Normal
L –	Low friction and water glycol
T –	High temperature

(See detailed information on page NO TAG.)

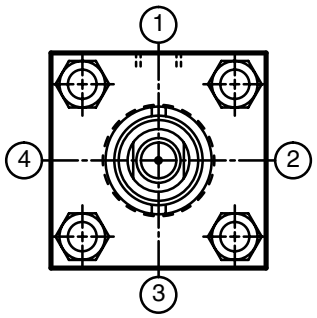
9 Port type and size

Code	Type
7 –	BSPP to ISO 228/1

(See detailed information on page NO TAG.)

10 Port location

Ports are located as shown below when viewing cylinder from head end.



Code	Head	Cap
K –	1	1

(See detailed information on page NO TAG.)

11 Cushion location

Cushions are located as shown in item 10 when viewing cylinder from head end. "–" in table indicates no cushion.

Code	Head	Cap
A –	–	–
R▪ –	2	2
W –	3	3

▪ – Conforms to DIN 24554 for TV01 (MS2) mounting only.

12, 13, 14 Stroke length

Stroke length can be from 001 mm to 999 mm.

15, 16 Enter applicable code for either:

Extra rod projection ("C" dimension)

The two digits indicate extra rod projection from 00 mm through 99 mm.

– or –

Air bleed location

This number indicates location of air bleeds as shown in item 10 when viewing cylinder from head end.

Code	Head	Cap
HK –	1	1
HR –	2	2
HW –	3	3
H4 –	4	4

* See pages 4 and 5 for ISO 6020-2 cylinder model codes.

Mounting Style

Available Mountings

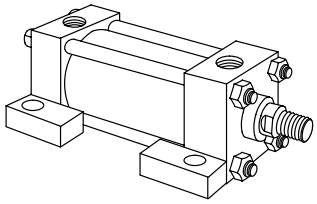
The variety of standard ISO and DIN mountings available in the Series TV gives you a broad selection to match the proper mount to your application. Vickers offers rigid mounts (including side lug, flange, and extended tie rod) and swivel mounts (including clevis and trunnion). The mounting styles that conform to DIN 24554 are shown on this page. Other ISO 6020-2 compatible mounts are shown on the next page. A guide to proper mount selection is provided on pages NO TAG through NO TAG. For custom mounts, enter “XX” for model code items 3 and 4 and give a detailed description with drawings. Series TV cylinders are available in all mounting styles listed.

Selecting the Proper Mounting

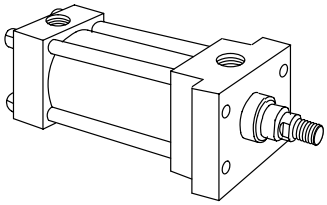
Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. All Series TV mounts are designed to absorb the full rated force of the cylinder when properly applied. Note that the TV01 has been downrated to 70 bar and the TV04 and TV25 are downrated to 100 bar to minimize deflection on these non-centerline mounts. 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.

DIN Mounting Styles

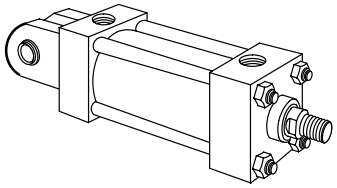
TV01
Side lug
ISO MS2



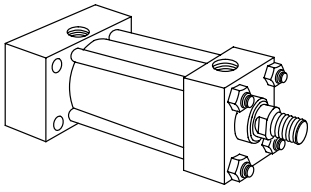
TV07
Head rectangular
DIN ME5



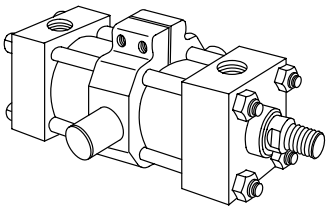
TV11
Spherical bearing
ISO MP5



TV14
Cap rectangular
ISO ME6

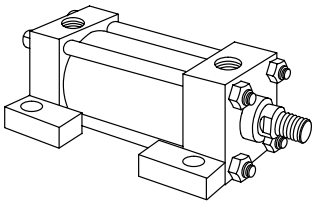


TV15
Intermediate trunnion
ISO MT4

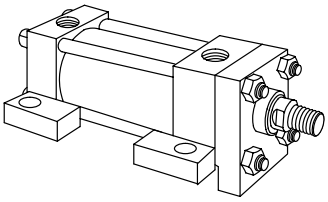


ISO Mounting Styles

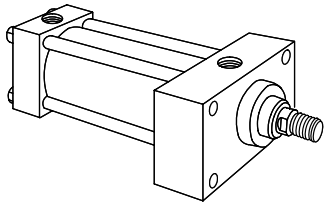
TV01
Side lug
ISO MS2



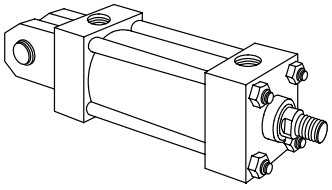
TV04
Keyed side lug



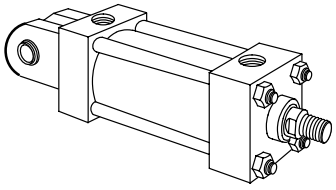
TV09
Head rectangular
ISO ME5



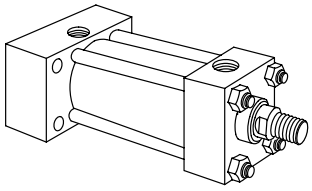
TV10
Cap clevis
ISO MP1



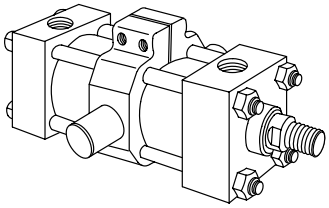
TV11
Spherical bearing
ISO MP5



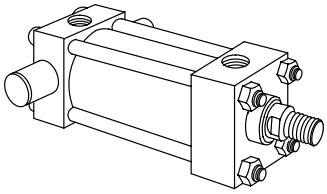
TV14
Cap rectangular
ISO ME6



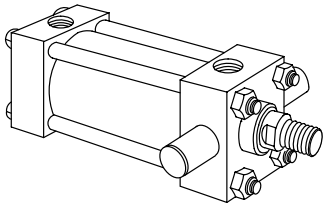
TV15
Intermediate trunnion
ISO MT4



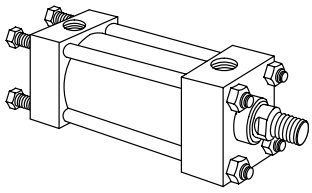
TV16
Cap trunnion
ISO MT2



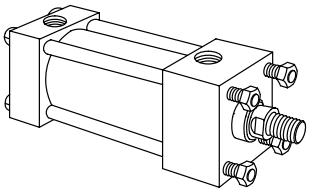
TV17
Head trunnion
ISO MT1



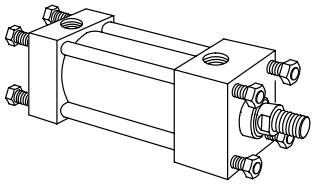
TV21
Cap extended tie rod
ISO MX2



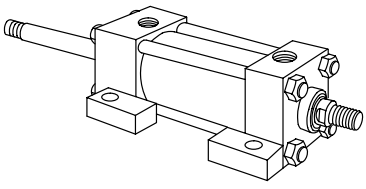
TV22
Head extended tie rod
ISO MX3



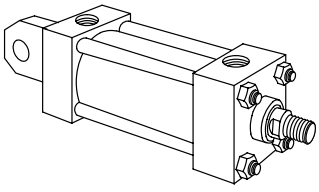
TV23
Both ends extended tie rod
ISO MX1



TV25
Double rod, side lug

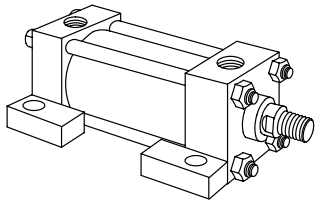


TV47
Cap fixed eye
ISO MP3



Series TV Mounting Styles & Installation Dimensions

TV01 Side Lug Mounts



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

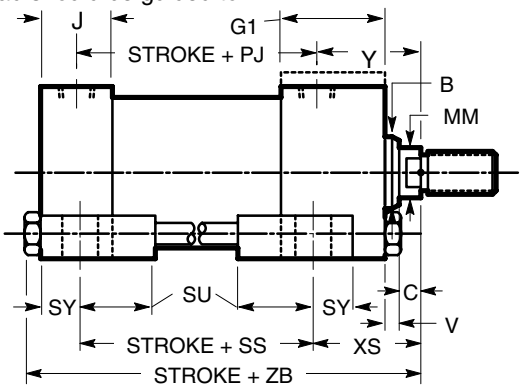
Limit operating pressure to 70 bar for minimum deflection. For strokes in excess of 600mm, see “Stop tube selection” on page NO TAG.

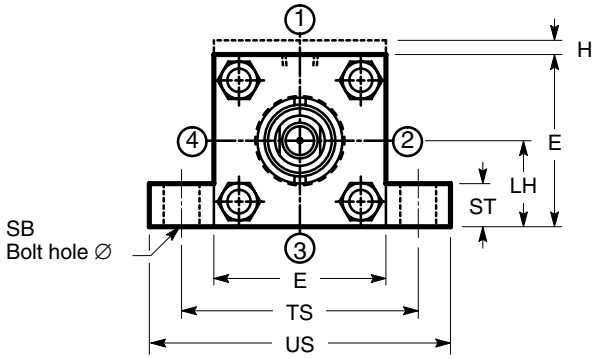
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

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, TV04.

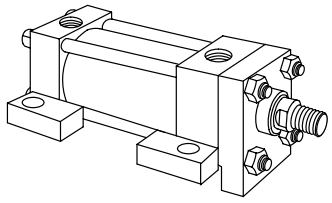
For severe side load applications, consult your local Vickers sales engineer.





Bore	Rod MM	(f9) B	C	E	G1	H	J	V	Y	(h10) LH	PJ+	SB	SS+	ST	SU	SY	TS	US	XS	Max ZB+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	6 6	50 50	19 19	53 53	6,6 6,6	73 73	9 9	19 19	8 8	54 54	72 72	33 33	121 121
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	10 9	60 60	22 22	56 56	9 9	73 73	13 13	23 23	10 10	63 63	84 84	45 45	137 137
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	6 9 12	62	31	73	11	98	13	23	10	83	103	45	166
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	9 5 9	67	37	74	14	92	19	33	12	102	127	54	176
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	5 9 12	71	44	80	18	86	26	40	17	124	161	65	185
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	5 9 9	77	57	93	18	103	26	40	17	149	186	68	212
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	5 5 9	82	63	101	26	102	32	51	22	172	216	79	225
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	9	86	82	117	26	131	32	51	22	210	254	79	260
160	70 90 110	88 108 133	26	205	88	– – –	57	7 6 6	86	101	130	33	130	38	63	29	260	318	86	279
200	90 110 140	108 133 163	26	245	107	– – –	76	6	98	122	165	39	172	44	73	35	311	381	92	336

TV04 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.

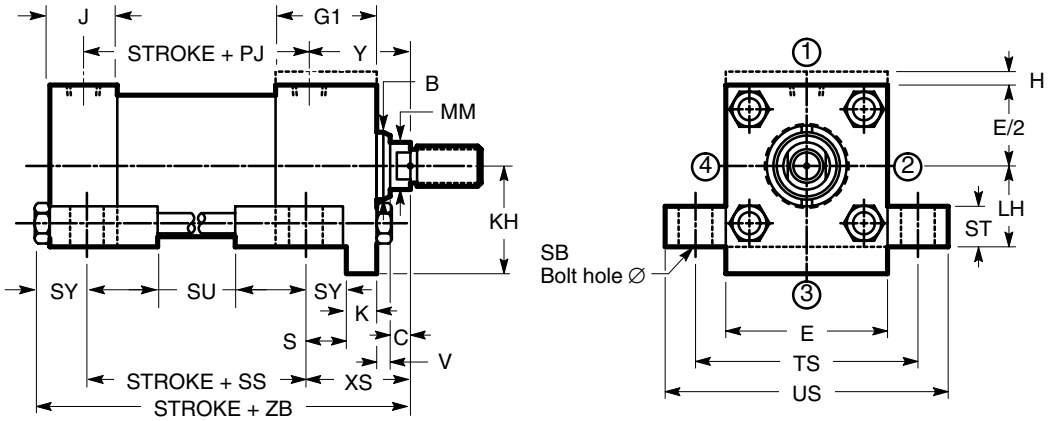
NOTE

Limit operating pressure to 100 bar for minimum deflection. For strokes in excess of 600mm, see “Stop tube selection” on page NO TAG.

With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.

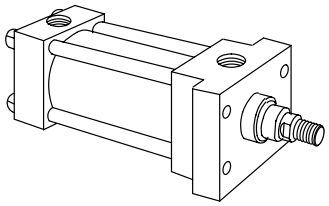
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer’s recommended torque.

For severe side load applications, consult your local Vickers sales engineer.



Bore	Rod MM	(f9) B	C	E	G1	H	J	K	S	V	Y	Max KH	(h10) LH	PJ+	SB	SS+	ST	SU	SY	TS	US	XS	Max ZB+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	8 8	10 10	6 6	50 50	19 19	19 19	53 53	6,6 6,6	73 73	9 9	19 19	8 8	54 54	72 72	33 33	121 121
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	8 8	12 12	10 9	60 60	22 22	22 22	56 56	9 9	73 73	13 13	23 23	10 10	63 63	84 84	45 45	137 137
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	8	12	6 9 12	62	31	31	73	11	98	13	23	10	83	103	45	166
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	14	15	9 5 9	67	37	37	74	14	92	19	33	12	102	127	54	176
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	14	19	5 9 12	71	44	44	80	18	86	26	40	17	124	161	65	185
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	18	19	5 9 9	77	57	57	93	18	103	26	40	17	149	186	68	212
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	22	22	5 5 9	82	63	63	101	26	102	32	51	22	172	216	79	225
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	22	22	9	86	82	82	117	26	131	32	51	22	210	254	79	260
160	70 90 110	88 108 133	26	205	88	– – –	57	25	29	7 6 6	86	101	101	130	33	130	38	63	29	260	318	86	279
200	90 110 140	108 133 163	26	245	107	– – –	76	25	35	6	98	122	122	165	39	172	44	73	35	311	381	92	336

TV07 Head Rectangular Mounts (DIN 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.

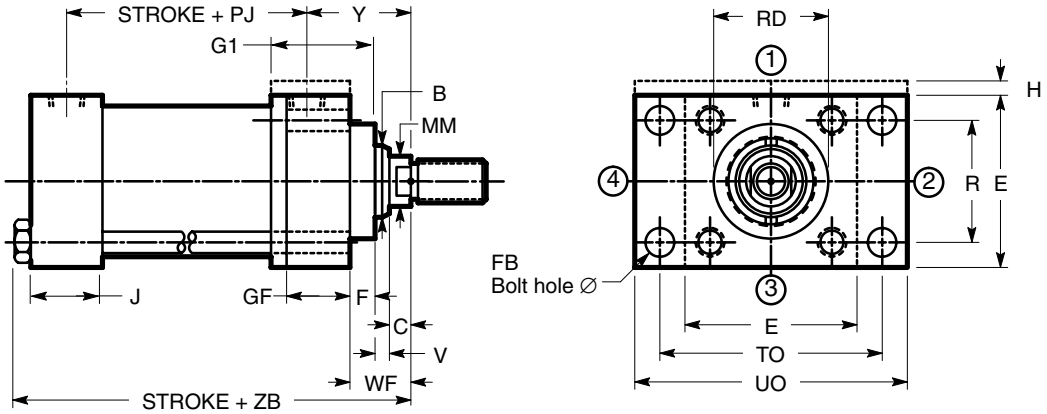
NOTE

For strokes in excess of 600mm, see “Stop tube selection” on page NO TAG.

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.

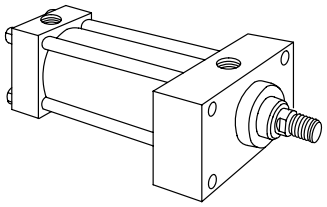
The head rectangular mounts (TV07 and TV09) are recommended for heavy duty applications.

Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer’s recommended torque.



Bore	Rod MM	(f9) B	C	E	Max F	G1	GF	H	J	R	V	Y	FB	PJ+	(f8) RD	TO	Max UO	WF	Max ZB+
25	12 18	24 30	10 10	40 40	10 10	50 50	25 25	5 5	25 25	27 27	6 6	50 50	5,5 5,5	53 53	38 38	51 51	65 65	25 25	121 121
32	14 22	26 34	15 17	45 45	10 10	50 50	25 25	5 5	27 27	33 33	10 9	60 60	6,6 6,6	56 56	42 42	58 58	70 70	35 35	137 137
40	18 22 28	30 34 42	20 17 14	63	10	57	38	– – –	38	41	6 9 12	62	11	73	62	87	110	35	166
50	22 28 36	34 42 50	17 20 17	75	16	60	38	– – –	38	52	9 5 9	67	14	74	74	105	130	41	176
63	28 36 45	42 50 60	27 24 20	90	16	60	38	– – –	38	65	5 9 12	71	14	80	75 82 88	117	145	48	185
80	36 45 56	50 60 72	26 23 23	115	20	69	45	– – –	44	83	5 9 9	77	18	93	82 92 105	149	180	51	212
100	45 56 70	60 72 88	30 30 26	130	22	73	45	– – –	44	97	5 5 9	82	18	101	92 105 125	162	200	57	225
125	56 70 90	72 88 108	27 26 26	165	22	80	58	– – –	57	126	9	86	22	117	105 125 150	208	250	57	260
160	70 90 110	88 108 133	26	205	25	88	58	– – –	57	155	7 6 6	86	26	130	125 150 170	253	300	57	279
200	90 110 140	108 133 163	26	245	27	107	76	– – –	76	190	6	98	33	165	150 170 210	300	360	57	336

TV09 Head Rectangular Mounts (ISO 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.

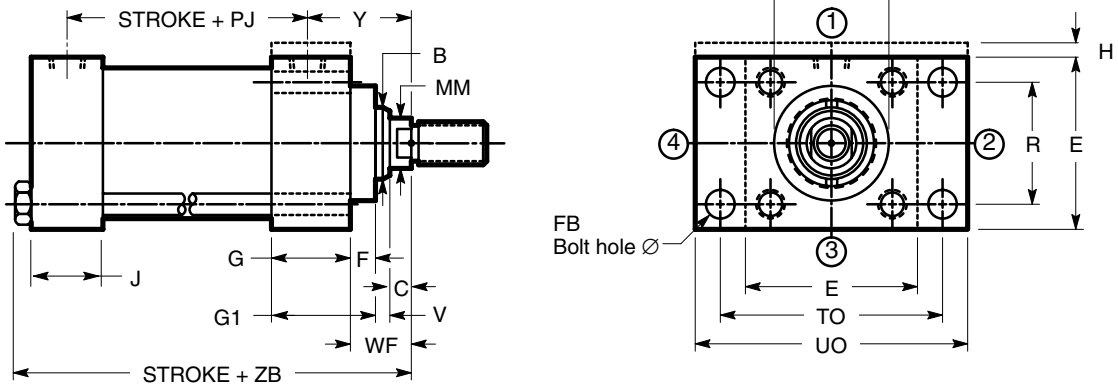
NOTE

For strokes in excess of 600mm, see "Stop tube selection" on page NO TAG.

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 (TV07 and TV09) are recommended for heavy duty applications.

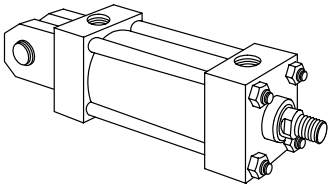
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.



Bore	Rod MM	(f9) B	C	E	Max F	G	G1	H	J	R	V	Y	FB	PJ+	(f8) RD	TO	Max UO	WF	Max ZB+
25	12 18	24 30	10 10	40 40	10 10	40 40	50 50	5 5	25 25	27 27	6 6	50 50	5,5 5,5	53 53	38 38	51 51	65 65	25 25	121 121
32	14 22	26 34	15 17	45 45	10 10	40 40	50 50	5 5	27 27	33 33	10 9	60 60	6,6 6,6	56 56	42 42	58 58	70 70	35 35	137 137
40	18 22 28	30 34 42	20 17 14	63	10	47	57	– – –	38	41	6 9 12	62	11	73	62	87	110	35	166
50	22 28 36	34 42 50	17 20 17	75	16	44	60	– – –	38	52	9 5 9	67	14	74	74	105	130	41	176
63	28 36 45	42 50 60	27 24 20	90	16	44	60	– – –	38	65	5 9 12	71	14	80	75 82 88	117	145	48	185
80	36 45 56	50 60 72	26 23 23	115	20	49	69	– – –	44	83	5 9 9	77	18	93	82 92 105	149	180	51	212
100	45 56 70	60 72 88	30 30 26	130	22	51	73	– – –	44	97	5 5 9	82	18	101	92 105 125	162	200	57	225
125	56 70 90	72 88 108	27 26 26	165	22	58	80	– – –	57	126	9	86	22	117	105 125 150	208	250	57	260
160	70 90 110	88 108 133	26	205	25	58	88	– – –	57	155	7 6 6	86	26	130	125 150 170	253	300	57	279
200	90 110 140	108 133 163	26	245	27	76	107	– – –	76	190	6	98	33	165	150 170 210	300	360	57	336

TV10 Clevis Mount

(ISO MP1)



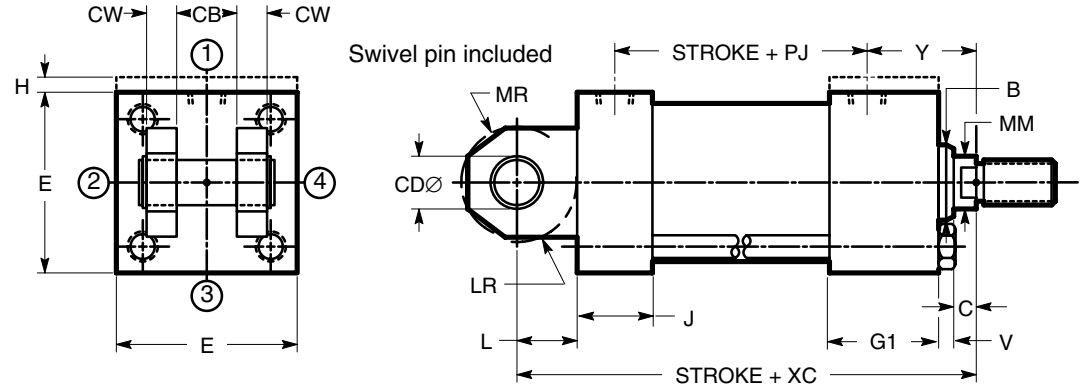
These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See page NO TAG for stroke limitations.

NOTE

For strokes in excess of 500mm, see "Stop tube selection" on page NO TAG.

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, TV11.

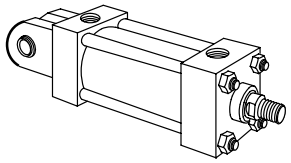
These mounts are for applications in which the machine member travels in a curved path within one plane.



Bore	Rod MM	(f9) B	C	E	G1	H	J	Min L	V	Y	(A16) CB	(f8) CD	Max CW	Min LR	Max MR	PJ+	XC+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	13 13	6 6	50 50	12 12	10 10	8,5 8,5	12 12	12 12	53 53	127 127
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	19 19	10 9	60 60	16 16	12 12	10,5 10,5	17 17	17 17	56 56	147 147
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	19	6 9 12	62	20	14	12,5	17	17	73	172
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	32	9 5 9	67	30	20	18	29	29	74	191
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	32	5 9 12	71	30	20	18	29	29	80	200
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	39	5 9 9	77	40	28	23,5	34	34	93	229
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	54	5 5 9	82	50	36	28,5	50	50	101	257
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	57	9	86	60	45	34,5	53	53	117	289
160	70 90 110	88 108 133	26	205	88	– – –	57	63	7 6 6	86	70	56	39,5	59	59	130	308
200	90 110 140	108 133 163	26	245	107	– – –	76	82	6	98	80	70	44,5	78	78	165	381

TV11 Spherical Bearing Mount

(ISO MP5)



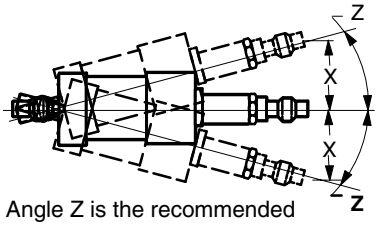
This mount is for applications in which the machine member travels in a curved path in one plane where some misalignment is unavoidable. The amount of allowable misalignment can be calculated.

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 page NO TAG for stroke limitations.

NOTE

For strokes in excess of 500mm, see "Stop tube selection" on page NO TAG.

Maximum radial static and dynamic bearing loads must not exceed the recommended ratings shown in the following table.

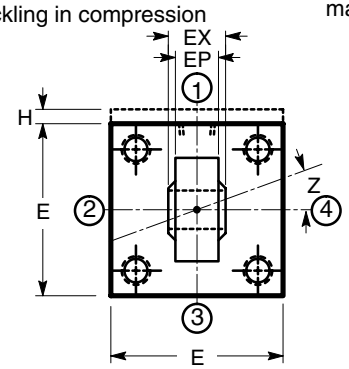


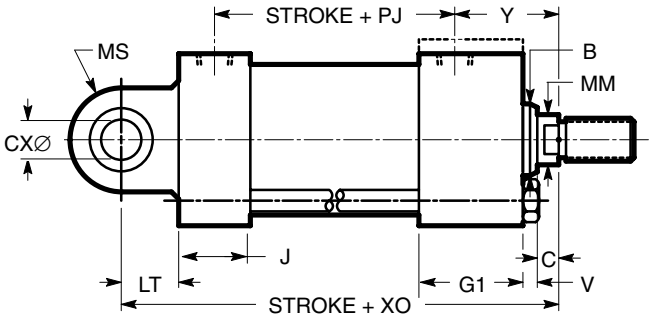
Angle Z is the recommended maximum angle of misalignment.

To find the maximum recommended X distance, multiply the distance between pivot mounting holes (see TV11 dimensional drawing) by the tangent of angle Z.

Bore ∅ (mm)	**Mounting Hole** ∅ (mm)	**Static Radial Load Rating** (KN)
25	12	8
32	16	12,5
40	20	20
50	25	32
63	30	50
80	40	80
100	50	125
125	60	200
160	80	320
200	100	500

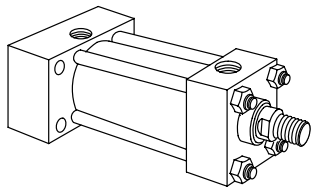
See page NO TAG for spherical rod end bearing accessory.





Bore	**Rod MM**	(f9) **B**	**C**	**E**	**G1**	**H**	**J**	**V**	**Y**	Min **Z**	**CX**	**EP**	**EX**	Min **LT**	Max **MS**	**PJ+**	**XC+**
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	6 6	50 50	3° 3°	12 +0,00/-0,008 12 +0,00/-0,008	8 8	10 +0,00/-0,12 10 +0,00/-0,12	16 16	20 20	53 53	130 130
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	10 9	60 60	3° 3°	16 +0,00/-0,008 16 +0,00/-0,008	11 11	14 +0,00/-0,12 14 +0,00/-0,12	20 20	23 23	56 56	148 148
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	6 9 12	62	3°	20 +0,00/-0,012	13	16 +0,00/-0,12	25	29	73	178
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	9 5 9	67	3°	25 +0,00/-0,012	17	20 +0,00/-0,12	31	33	74	190
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	5 9 12	71	3°	30 +0,00/-0,012	19	22 +0,00/-0,12	38	40	80	206
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	5 9 9	77	3°	40 +0,00/-0,012	23	28 +0,00/-0,12	48	50	93	238
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	5 5 9	82	3°	50 +0,00/-0,012	30	35 +0,00/-0,12	58	62	101	261
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	9	86	3°	60 +0,00/-0,015	38	44 +0,00/-0,15	72	80	117	304
160	70 90 110	88 108 133	26	205	88	– – –	57	7 6 6	86	3°	80 +0,00/-0,015	47	55 +0,00/-0,15	92	100	130	337
200	90 110 140	108 133 163	26	245	107	– – –	76	6	98	3°	100 +0,00/-0,020	57	70 +0,00/-0,20	116	120	165	415

TV14 Cap Rectangular Mounts (ISO 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.

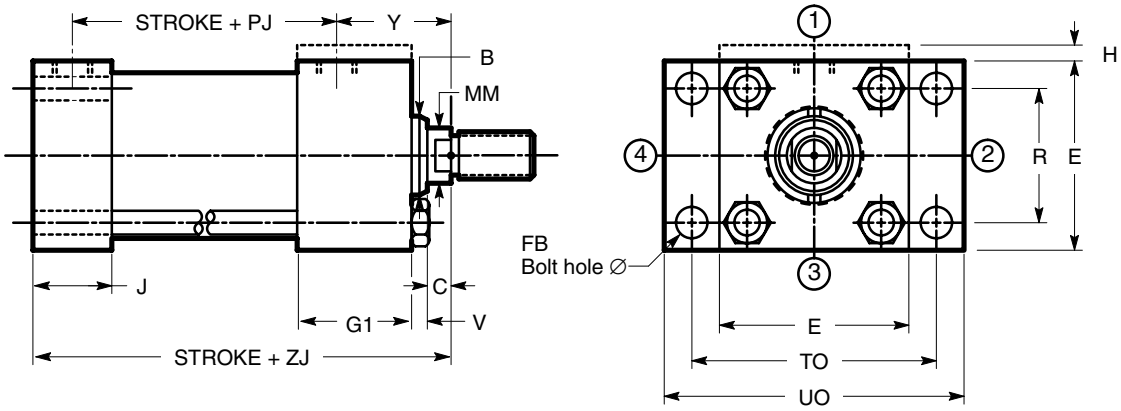
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

The cap rectangular mount (TV14) is recommended for heavy duty applications.

NOTE

For strokes in excess of 600mm, see "Stop tube selection" on page NO TAG.

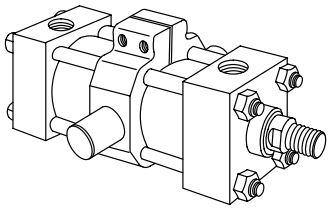
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque value.



Bore	Rod MM	(f9) B	C	E	G1	H	J	R	V	Y	FB	PJ+	TO	Max UO	ZJ+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	27 27	6 6	50 50	5,5 5,5	53 53	51 51	65 65	114 114
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	33 33	10 9	60 60	6,6 6,6	56 56	58 58	70 70	128 128
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	41	6 9 12	62	11	73	87	110	153
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	52	9 5 9	67	14	74	105	130	159
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	65	5 9 12	71	14	80	117	145	168
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	83	5 9 9	77	18	93	149	180	190
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	97	5 5 9	82	18	101	162	200	203
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	126	9	86	22	117	208	250	232
160	70 90 110	88 108 133	26	205	88	– – –	57	155	7 6 6	86	26	130	253	300	245
200	90 110 140	108 133 163	26	245	107	– – –	76	190	6	98	33	165	300	360	299

TV15 Intermediate Trunnion Mount

(ISO MT4)



The Intermediate Trunnion Mount is for longer stroke applications in which the machine member travels in a curved path in one plane.

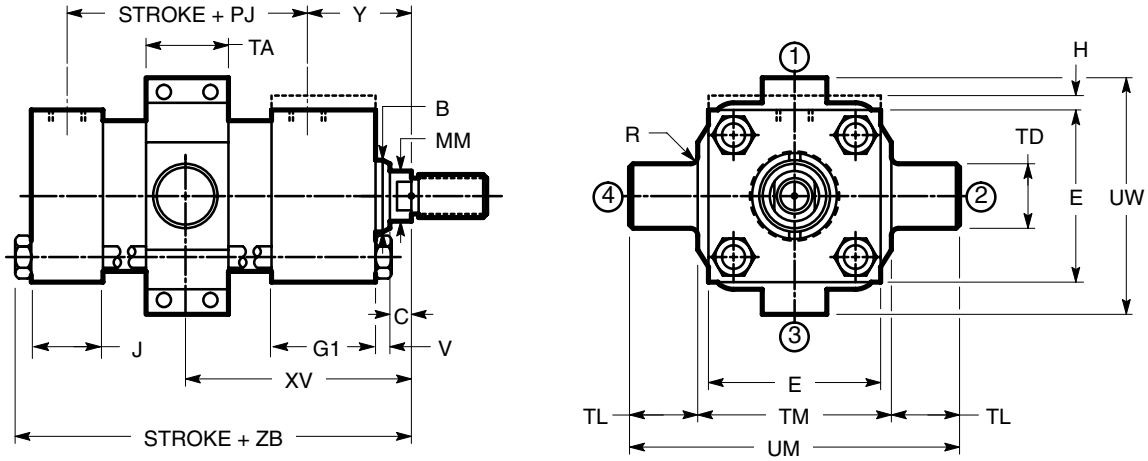
On special orders, the trunnion can be located anywhere along the body.

This mount can be used both in compression (push) and tension (pull) applications.

NOTE

For strokes in excess of 500mm, see "Stop tube selection" on page NO TAG.

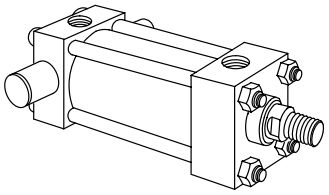
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.



Bore	Rod MM	(f9) B	C	E	G1	H	J	R	V	Y	PJ+	TA	TD	TL	TM	UM	Max UW	XV* Min	XV* Std*	XV* Max+	Max ZB+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	1,5 1,5	6 6	50 50	53 53	17,5 17,5	12 –0,016/-0,043 12 –0,016/-0,043	10 10	48 48	68 68	63 63	82 82	77 77	72 72	121 121
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	1,5 1,5	10 9	60 60	56 56	20,0 20,0	16 –0,016/-0,043 16 –0,016/-0,043	12 12	55 55	79 79	75 75	96 96	89 89	82 82	137 137
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	2,0	6 9 12	62	73	29,0	20 –0,020/-0,053	16	76	108	92	107	98	88	166
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	2,0	9 5 9	67	74	38,5	25 –0,020/-0,053	20	89	129	112	117	104	90	176
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	2,0	5 9 12	71	80	42,5	32 –0,025/-0,064	25	100	150	126	132	112	91	185
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	2,0	5 9 9	77	93	51,0	40 –0,025/-0,064	32	127	191	160	147	123	99	212
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	2,0	5 5 9	82	101	66,0	50 –0,025/-0,064	40	140	220	180	158	133	107	225
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	2,0	9	86	117	84,0	63 –0,030/-0,076	50	178	278	215	180	145	109	260
160	70 90 110	88 108 133	26	205	88	– – –	57	2,0	7 6 6	86	130	106	80 –0,030/-0,076	63	215	341	260	198	154	104	279
200	90 110 140	108 133 163	26	245	107	– – –	76	2,0	6	98	165	133	100 –0,036/-0,090	80	279	439	355	226	181	130	336

* The standard XV dimension is Stroke/2 + XV (std.) unless otherwise specified.
\+ Plus stroke

TV16 Cap Trunnion Mounts
(ISO MT2)



These mounts are for applications in which the machine member travels in a curved path in one plane.

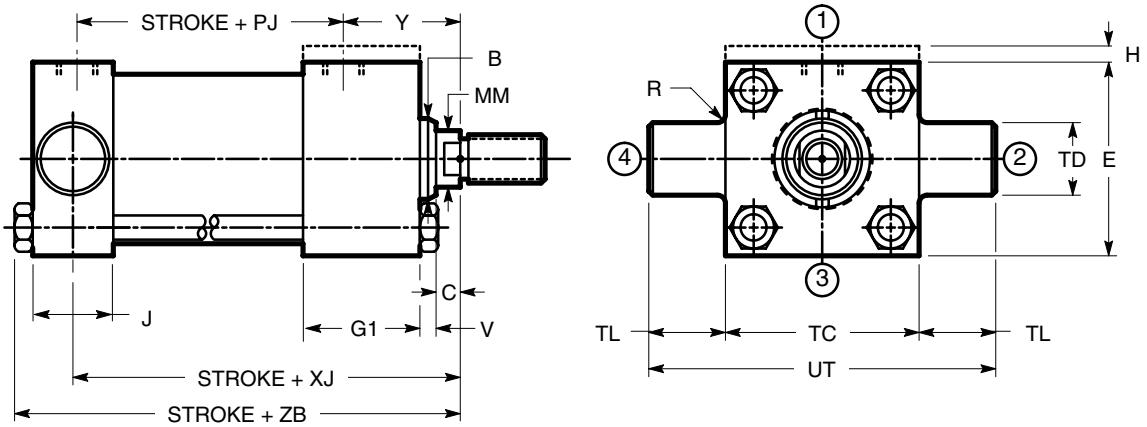
Either mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE

For strokes in excess of 500mm, see "Stop tube selection" on page NO TAG.

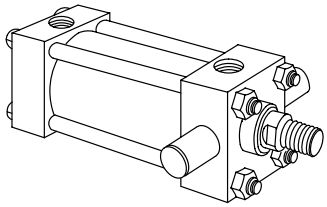
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

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 MM	(f9) B	C	E	G1	H	J	Max R	V	Y	PJ+	(h14) TC	(f8) TD	TL	(h15) UT	XJ+	Max ZB+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	1,1 1,1	6 6	50 50	53 53	38 38	12 12	10 10	58 58	101 101	121 121
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	1,1 1,1	10 9	60 60	56 56	44 44	16 16	12 12	68 68	115 115	137 137
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	1,1	6 9 12	62	73	63	20	16	95	134	166
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	1,1	9 5 9	67	74	76	25	20	116	140	176
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	1,9	5 9 12	71	80	89	32	25	139	149	185
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	1,9	5 9 9	77	93	114	40	32	178	168	212
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	1,9	5 5 9	82	101	127	50	40	207	287	225
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	1,9	9	86	117	165	63	50	265	209	260
160	70 90 110	88 108 133	26	205	88	– – –	57	1,9	7 6 6	86	130	203	80	63	329	230	279
200	90 110 140	108 133 163	26	245	107	– – –	76	1,9	6	98	165	241	100	80	401	276	336

TV17 Head Trunnion Mounts (ISO MT1)



These mounts are for applications in which the machine member travels in a curved path in one plane.

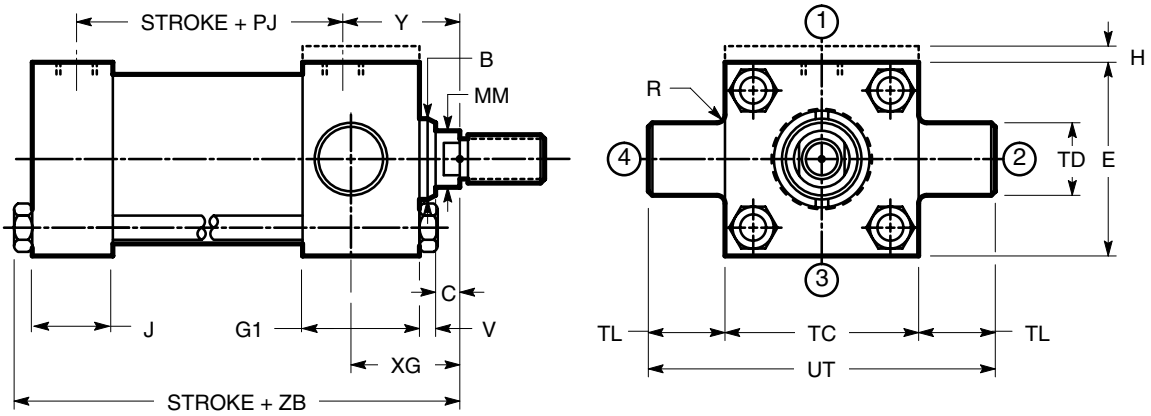
Either mount can be used both in compression (push) and tension (pull) applications. When used in compression applications, head trunnion mounts provide a longer maximum stroke than cap trunnion mounts.

NOTE

For strokes in excess of 500mm, see “Stop tube selection” on page NO TAG.

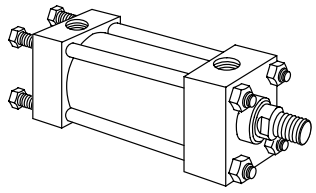
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

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 MM	(f9) B	C	E	G1	H	J	Max R	V	Y	PJ+	(h14) TC	(f8) TD	TL	(h15) UT	XG	Max ZB+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	1,1 1,1	6 6	50 50	53 53	38 38	12 12	10 10	58 58	44 44	121 121
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	1,1 1,1	10 9	60 60	56 56	44 44	16 16	12 12	68 68	54 54	137 137
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	1,1	6 9 12	62	73	63	20	16	95	57	166
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	1,1	9 5 9	67	74	76	25	20	116	64	176
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	1,9	5 9 12	71	80	89	32	25	139	70	185
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	1,9	5 9 9	77	93	114	40	32	178	76	212
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	1,9	5 5 9	82	101	127	50	40	207	71	225
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	1,9	9	86	117	165	63	50	265	75	260
160	70 90 110	88 108 133	26	205	88	– – –	57	1,9	7 6 6	86	130	203	80	63	329	75	279
200	90 110 140	108 133 163	26	245	107	– – –	76	1,9	6	98	165	241	100	80	401	85	336

TV21 Cap Extended Tie Rod Mounts (ISO 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 (right).

NOTE

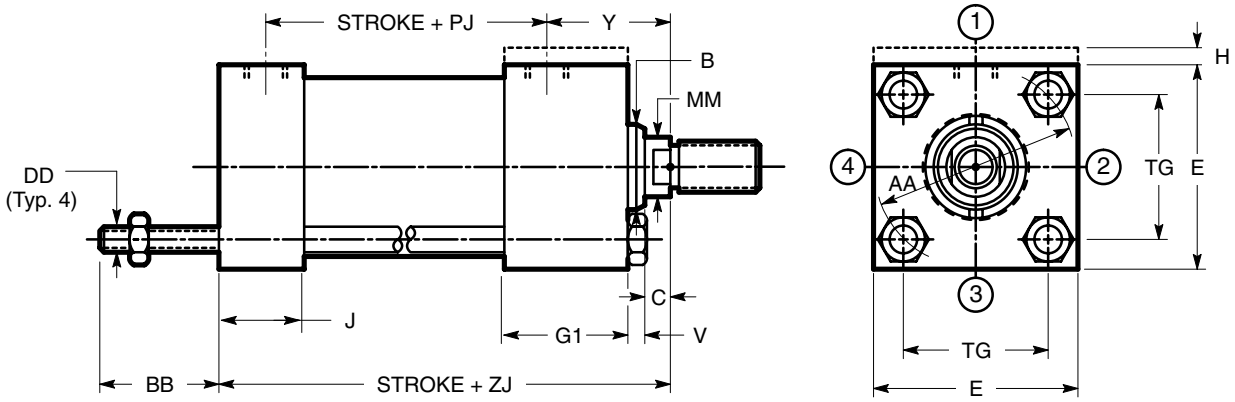
For strokes in excess of 600mm, see "Stop tube selection" on page NO TAG.

Tie Rod Diameters & Torque Values

Diameters and torque values in the following table apply to all mounting styles.

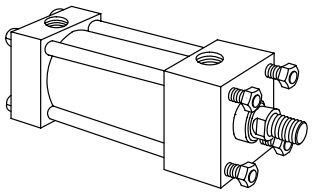
Bore ∅ (mm)	Tie Rods ∅ (mm)	Torque* (Nm)
25	5	5,5
32	6	11
40	8	19
50	12	45
63	12	68
80	16	140
100	16	205
125	22	460
160	27	935
200	30	1520

* Recommended torque values using MoS_2 lubricant with 0,12 coefficient of friction.



Bore	Rod MM	(f9) B	C	E	G1	H	J	V	Y	AA	BB	DD	PJ+	TG	ZJ+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	6 6	50 50	40 40	19 19	M5 x 0,8 M5 x 0,8	53 53	28,3 28,3	114 114
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	10 9	60 60	47 47	24 24	M6 x 1 M6 x 1	56 56	33,2 33,2	128 128
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	6 9 12	62	59	35	M8 x 1	73	41,7	153
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	9 5 9	67	74	46	M12 x 1,25	74	52,3	159
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	5 9 12	71	91	46	M12 x 1,25	80	64,3	168
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	5 9 9	77	117	59	M16 x 1,5	93	82,7	190
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	5 5 9	82	137	59	M16 x 1,5	101	96,9	203
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	9	86	178	81	M22 x 1,5	117	125,9	232
160	70 90 110	88 108 133	26	205	88	– – –	57	7 6 6	86	219	92	M27 x 2	130	154,9	245
200	90 110 140	108 133 163	26	245	107	– – –	76	6	98	269	115	M30 x 2	165	190,2	299

TV22 Head Extended Tie Rod Mounts (ISO 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.

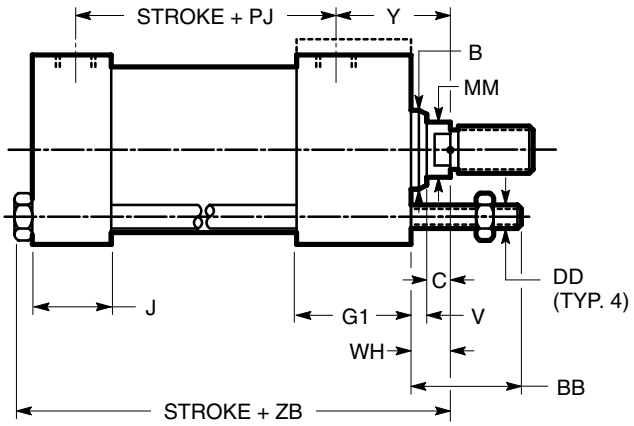
On head mount applications, the cartridge provides a pilot diameter to align the rod in the mounting frame.

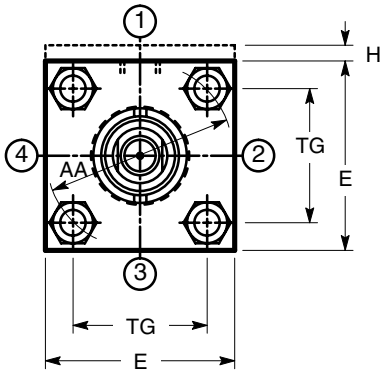
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on the previous page.

NOTE

For strokes in excess of 600mm, see “Stop tube selection” on page NO TAG.

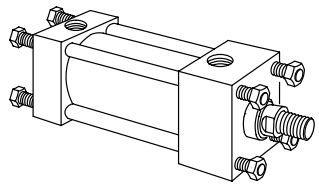
The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.





Bore	Rod MM	(f9) B	C	E	G1	H	J	V	Y	AA	BB	DD	PJ+	TG	WH	Max ZB+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	6 6	50 50	40 40	19 19	M5 x 0,8 M5 x 0,8	53 53	28,3 28,3	15 15	121 121
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	10 9	60 60	47 47	24 24	M6 x 1 M6 x 1	56 56	33,2 33,2	25 25	137 137
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	6 9 12	62	59	35	M8 x 1	73	41,7	25	166
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	9 5 9	67	74	46	M12 x 1,25	74	52,3	25	176
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	5 9 12	71	91	46	M12 x 1,25	80	64,3	32	185
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	5 9 9	77	117	59	M16 x 1,5	93	82,7	31	212
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	5 5 9	82	137	59	M16 x 1,5	101	96,9	35	225
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	9	86	178	81	M22 x 1,5	117	125,9	35	260
160	70 90 110	88 108 133	26	205	88	– – –	57	7 6 6	86	219	92	M27 x 2	130	154,9	32	279
200	90 110 140	108 133 163	26	245	107	– – –	76	6	98	269	115	M30 x 2	165	190,2	32	336

TV23 Both Ends Extended Tie Rod Mounts (ISO 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.

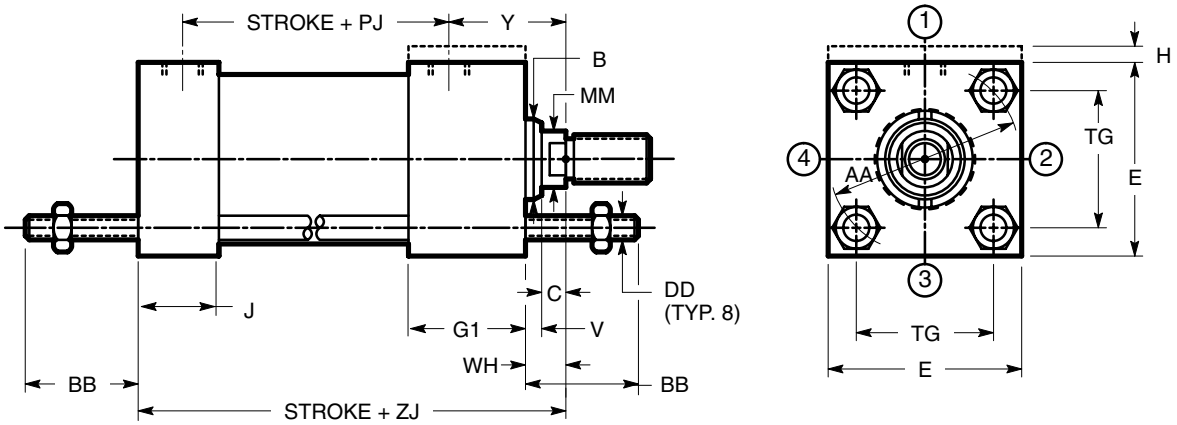
The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on page 19.

NOTE

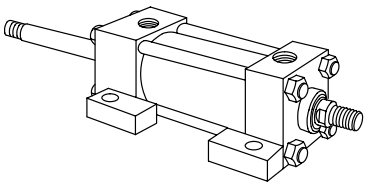
For strokes in excess of 600mm, see "Stop tube selection" on page NO TAG.

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 MM	(f9) B	C	E	G1	H	J	V	Y	AA	BB	DD	PJ+	TG	WH	ZJ+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	6 6	50 50	40 40	19 19	M5 x 0,8 M5 x 0,8	53 53	28,3 28,3	15 15	114 114
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	10 9	60 60	47 47	24 24	M6 x 1 M6 x 1	56 56	33,2 33,2	25 25	128 128
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	6 9 12	62	59	35	M8 x 1	73	41,7	25	153
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	9 5 9	67	74	46	M12 x 1,25	74	52,3	25	159
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	5 9 12	71	91	46	M12 x 1,25	80	64,3	32	168
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	5 9 9	77	117	59	M16 x 1,5	93	82,7	31	190
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	5 5 9	82	137	59	M16 x 1,5	101	96,9	35	203
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	9	86	178	81	M22 x 1,5	117	125,9	35	232
160	70 90 110	88 108 133	26	205	88	– – –	57	7 6 6	86	219	92	M27 x 2	130	154,9	32	245
200	90 110 140	108 133 163	26	245	107	– – –	76	6	98	269	115	M30 x 2	165	190,2	32	299

TV25 Double Rod End, Side Lug Mounts (ISO MX1)

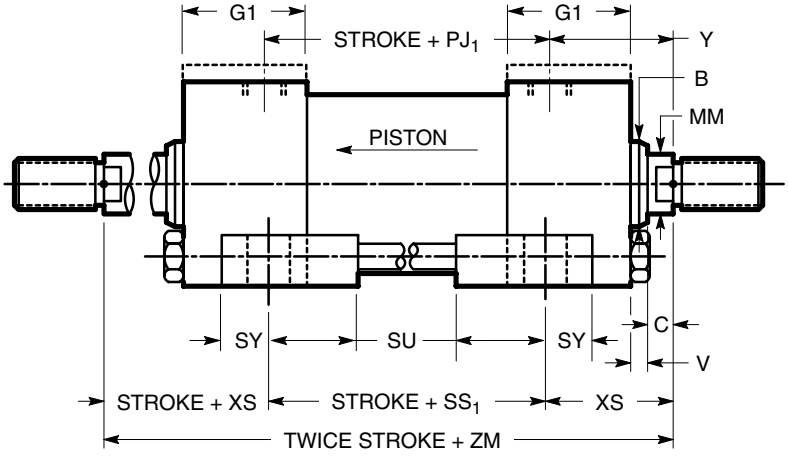


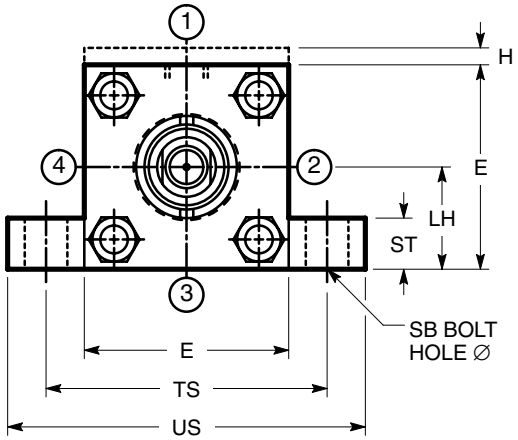
Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod.

The single rod mount application data is also applicable to double rod cylinders.

NOTE

Limit operating pressure to 100 bar for minimum deflection.





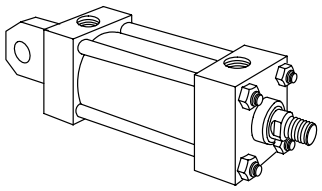
Bore	Rod MM	(f9) B	C	E	G1	H	V	Y	(h10) LH	PJ1+	SB	SS1+	ST	SU	SY	TS	US	XS	ZM++
25	12 18	24 30	10 10	40 40	50 50	5 5	6 6	50 50	19 19	51 51	6,6 6,6	85 85	9 9	19 19	8 8	54 54	72 72	33 33	151 151
32	14 22	26 34	15 17	45 45	50 50	5 5	10 9	60 60	22 22	56 56	9 9	86 86	13 13	23 23	10 10	63 63	84 84	45 45	176 176
40	18 22 28	30 34 42	20 17 14	63	57	– – –	6 9 12	62	31	69	11	103	13	23	10	83	103	45	193
50	22 28 36	34 42 50	17 20 17	75	60	– – –	9 5 9	67	37	72	14	98	19	33	12	102	127	54	206
63	28 36 45	42 50 60	27 24 20	90	60	– – –	5 9 12	71	44	81	18	93	26	40	17	124	161	65	223
80	36 45 56	50 60 72	26 23 23	115	69	– – –	5 9 9	77	57	92	18	110	26	40	17	149	186	68	246
100	45 56 70	60 72 88	30 30 26	130	73	– – –	5 5 9	82	63	103	26	109	32	51	22	172	216	79	268
125	56 70 90	72 88 108	27 26 26	165	80	– – –	9	86	82	114	26	128	32	51	22	210	254	79	286
160	70 90 110	88 108 133	26	205	88	– – –	7 6 6	86	101	137	33	137	38	63	29	260	318	86	309
200	90 110 140	108 133 163	26	245	107	– – –	6	98	122	160	39	172	44	73	35	311	381	92	356

\+ Plus Stroke

++ Plus 2x Stroke

TV47 Cap Fixed Eye Mount

(ISO MP3)

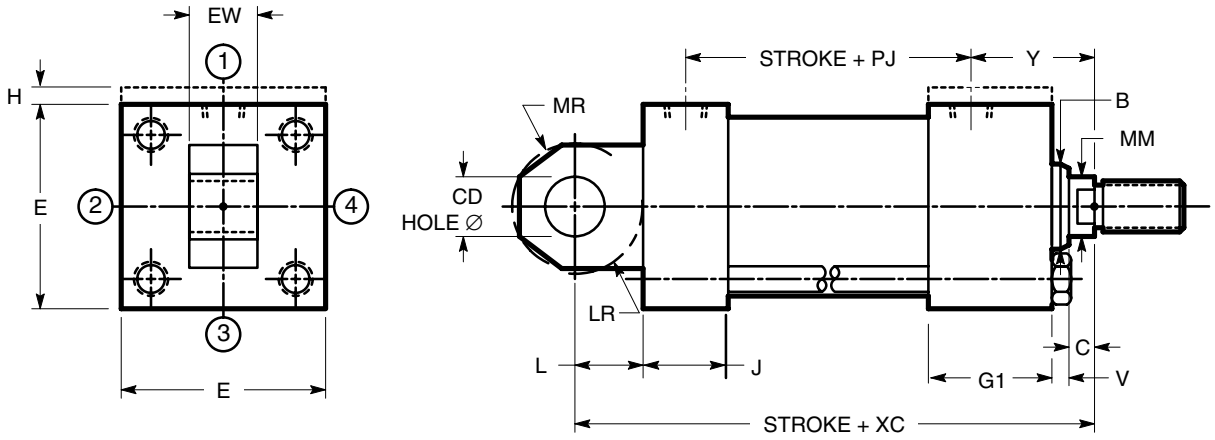


These mounts are for applications in which the machine member travels in a curved path within one plane.

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 41 for stroke limitations.

NOTE

For strokes in excess of 500mm, see "Stop tube selection" on page NO TAG.



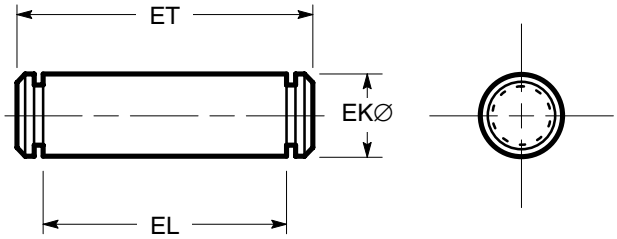
Bore	Rod MM	(f9) B	C	E	G1	H	J	L	V	Y	(h9) CD	EW	Min LR	Max MR	PJ+	XC+
25	12 18	24 30	10 10	40 40	50 50	5 5	25 25	13 13	6 6	50 50	10 10	12 12	12 12	12 12	53 53	127 127
32	14 22	26 34	15 17	45 45	50 50	5 5	27 27	19 19	10 9	60 60	12 12	16 16	17 17	17 17	56 56	147 147
40	18 22 28	30 34 42	20 17 14	63	57	– – –	38	19	6 9 12	62	14	20	17	17	73	172
50	22 28 36	34 42 50	17 20 17	75	60	– – –	38	32	9 5 9	67	20	30	29	29	74	191
63	28 36 45	42 50 60	27 24 20	90	60	– – –	38	32	5 9 12	71	20	30	29	29	80	200
80	36 45 56	50 60 72	26 23 23	115	69	– – –	44	39	5 9 9	77	28	40	34	34	93	229
100	45 56 70	60 72 88	30 30 26	130	73	– – –	44	54	5 5 9	82	36	50	50	50	101	257
125	56 70 90	72 88 108	27 26 26	165	80	– – –	57	57	9	86	45	60	53	53	117	289
160	70 90 110	88 108 133	26	205	88	– – –	57	63	7 6 6	86	56	70	59	59	130	308
200	90 110 140	108 133 163	26	245	107	– – –	76	82	6	98	70	80	78	78	165	381

Accessories

All rod accessories must be torqued against the rod shoulder.

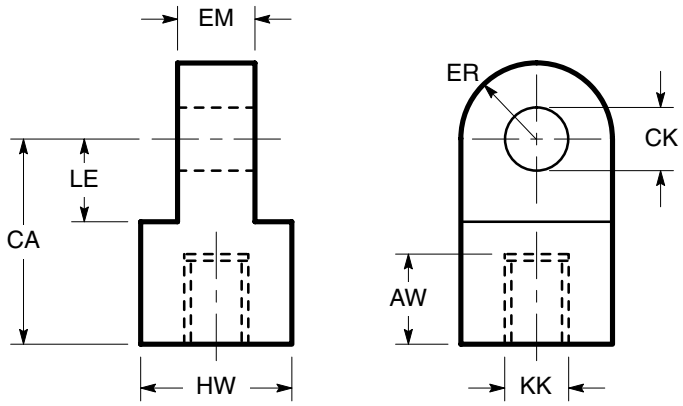
Mounting brackets, rod clevises, and rod eyes for all TV cylinders are available from Vickers. These accessories are detailed below showing part numbers and all pertinent dimensional data. When ordering, please specify the part name and part number.

Plain Swivel Pin (Includes two retaining rings)



Part Number	EK	Min. EL	Max. ET	Maximum Load (kN)	Maximum Load (lbs)	Weight (kg)
TV83010A–10	$10^{-0,013/-0,035}$	29	37,6	8	1800	0,023
TV83012A–10	$12^{-0,016/-0,043}$	37	45,6	12,5	2800	0,040
TV83016A–10	$14^{-0,016/-0,043}$	45	53,4	20	4500	0,061
TV83025A–10	$20^{-0,020/-0,053}$	66	75,2	50	11250	0,182
TV83030A–10	$28^{-0,020/-0,053}$	87	96,9	80	18000	0,407
TV83040A–10	$36^{-0,025/-0,064}$	107	120,5	125	28100	0,930
TV83050A–10	$45^{-0,025/-0,064}$	129	144,0	200	45000	1,635
TV83060A–10	$56^{-0,030/-0,076}$	149	164,6	320	72000	3,100
TV83080A–10	$70^{-0,030/-0,076}$	169	187,4	500	112400	5,390

Plain Rod Eye



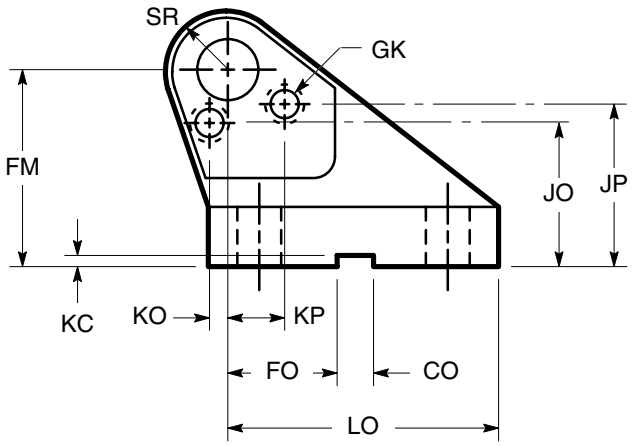
Part Number	Bore ∅	Min. AW	CA (js13)	CK (H9)	+0,00 EM (h13)	Max. ER
TV60010A	25	14	32 ±0,20	10 +0,036/–0,000	12 –0,27	12
TV60012A	32	16	36 ±0,20	12 +0,043/–0,000	16 –0,27	17
TV60016A	40	18	38 ±0,20	14 +0,043/–0,000	20 –0,33	17
TV60020A	50	22	54 ±0,23	20 +0,052/–0,000	30 –0,33	29
TV60025A	63	28	60 ±0,23	20 +0,052/–0,000	30 –0,33	29
TV60030A	80	36	75 ±0,23	28 +0,052/–0,000	40 –0,39	34
TV60040A	100	45	99 ±0,27	36 +0,062/–0,000	50 –0,39	50
TV60050A	125	56	113 ±0,27	45 +0,062/–0,000	60 –0,46	53
TV60060A	160	63	126 ±0,32	56 +0,074/–0,000	70 –0,46	59
TV60080A	200	85	168 ±0,32	70 +0,074/–0,000	80 –0,46	78

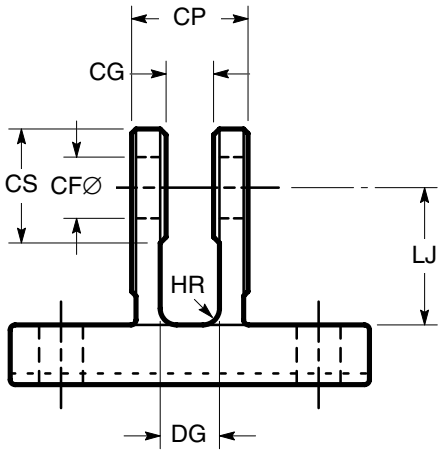
Part Number	Bore ∅	HW	KK*	Min. LE	Nominal Force (kN)	(lbs)
TV60010A	25	18	M10 x 1,25	13	8	1800
TV60012A	32	22	M12 x 1,25	19	12,5	2800
TV60016A	40	20	M14 x 1,5	19	20	4500
TV60020A	50	30	M16 x 1,5	32	32	7200
TV60025A	63	33	M20 x 1,5	32	50	11250
TV60030A	80	40	M27 x 2	39	80	18000
TV60040A	100	50	M33 x 2	54	125	26100
TV60050A	125	65	M42 x 2	57	200	45000
TV60060A	160	90	M48 x 2	63	320	72000
TV60080A	200	110	M64 x 3	83	500	112400

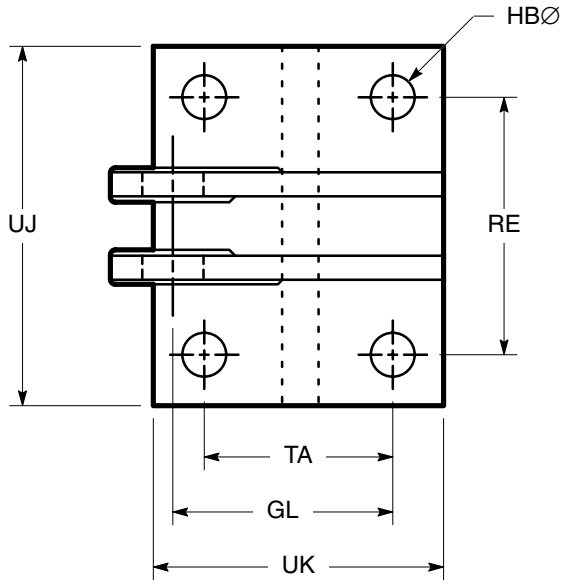
***** Proper rod end type must be selected.

Accessories

Spherical Bearing Clevis Bracket (per DIN 24556 / ISO 8133)







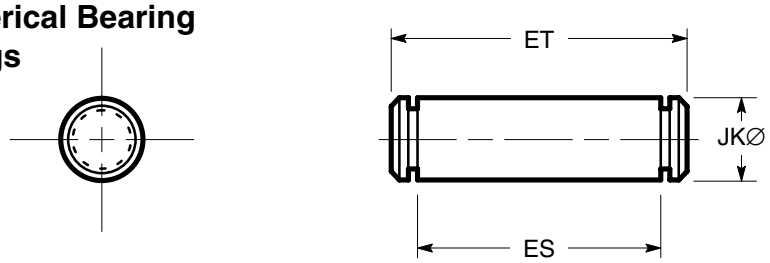
Part Number	CF (K7)	CG +0,3/+0,1	CO (N9) +0,00	CP (h14)	CS Max.	DG +2/–0	FM (js11)	FO (js14)
TV61012B	12 +0,006/–0,012	10	10 –0,036	30 +0,00/–0,62	16	12	40 ±0,08	16 ±0,215
TV61016B	16 +0,006/–0,012	14	16 –0,043	40 +0,00/–0,62	22	16	50 ±0,10	18 ±0,26
TV61020B	20 +0,006/–0,015	16	16 –0,043	50 +0,00/–0,74	25	19	55 ±0,10	20 ±0,26
TV61025B	25 +0,006/–0,015	20	25 –0,052	60 +0,00/–0,74	30	24	65 ±0,10	22 ±0,26
TV61030B	30 +0,006/–0,015	22	25 –0,052	70 +0,00/–0,74	35	26	85 ±0,11	24 ±0,26
TV61040B	40 +0,007/–0,018	28	36 –0,062	80 +0,00/–0,87	47	32	100 ±0,11	24 ±0,26
TV61050B	50 +0,007/–0,018	35	36 –0,062	100 +0,00/–0,87	58	41	125 ±0,13	35 ±0,31
TV61060B	60 +0,009/–0,021	44	50 –0,062	120 +0,00/–1,00	68	50	150 ±0,13	35 ±0,31
TV61080B	80 +0,009/–0,021	55	50 –0,062	160 +0,00/–1,00	90	65	190 ±0,15	35 ±0,31
TV61100B	100 +0,010/–0,025	70	63 –0,074	200 +0,00/–1,15	111	80	210 ±0,15	35 ±0,31

Part Number	GK	GL (js13)	HB	HR	JO ±0,2	JP ±0,2	KC +0,30/–0,00	KO ±0,2	KP ±0,2	LJ
TV61012B	M6	46 ±0,20	9	3	29,1	33,2	3,3	3,9	11,6	29
TV61016B	M6	61 ±0,23	11	3	36,7	42,2	4,3	5,2	18,9	38
TV61020B	M6	64 ±0,23	14	3	38,3	44,7	4,3	8,5	15,6	40
TV61025B	M6	78 ±0,23	16	4	48,5	48,5	5,4	11	14	49
TV61030B	M6	97 ±0,27	18	4	66	66	5,4	15	15	63
TV61040B	M8	123 ±0,32	22	4	77	77	8,4	21	21	73
TV61050B	M8	155 ±0,32	30	6	95,5	95,5	8,4	22,5	22,5	92
TV61060B	M10	187 ±0,36	39	6	116,5	116,5	11,4	27,5	27,5	110
TV61080B	M10	255 ±0,41	45	6	146	146	11,4	30	30	142
TV61100B	M10	285 ±0,41	48	6	154	154	12,4	45	45	152

Part Number	LO	RE (js13)	SR Max.	TA (js13)	UJ	UK	Max. Load (kN)	Max. Load (lbs)	Weight (kg)	Weight (lbs)
TV61012B	56	55 ±0,23	12	40 ±0,20	75	60	8	1800	0,52	1,15
TV61016B	74	70 ±0,23	16	55 ±0,23	95	80	12,5	2800	1,05	2,31
TV61020B	80	85 ±0,27	20	58 ±0,23	120	90	20	4500	1,72	3,79
TV61025B	98	100 ±0,27	25	70 ±0,23	140	110	32	7200	2,72	6,00
TV61030B	120	115 ±0,27	30	90 ±0,27	160	135	50	11250	5,15	11,35
TV61040B	148	135 ±0,32	40	120 ±0,32	190	170	80	18000	9,30	20,50
TV61050B	190	170 ±0,32	50	145 ±0,32	240	215	125	26100	18,3	40,3
TV61060B	225	200 ±0,36	60	185 ±0,36	270	260	200	45000	35,0	77,2
TV61080B	295	240 ±0,36	80	260 ±0,41	320	340	320	72000	63,0	138,9
TV61100B	335	300 ±0,41	100	300 ±0,41	400	400	500	112400	109,0	240,3

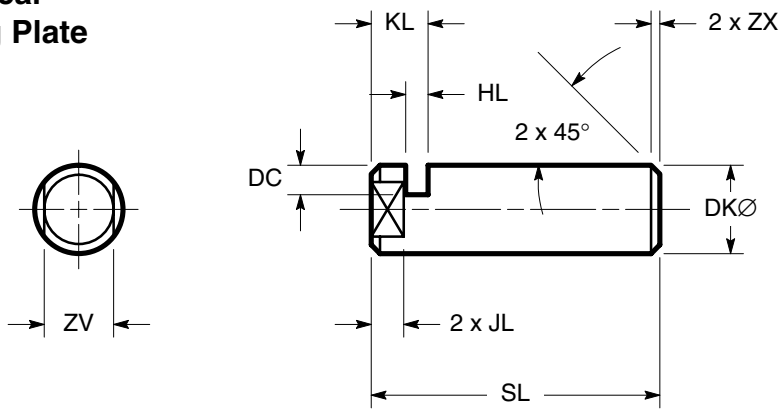
Accessories

Swivel Pin for Spherical Bearing with Retaining Rings



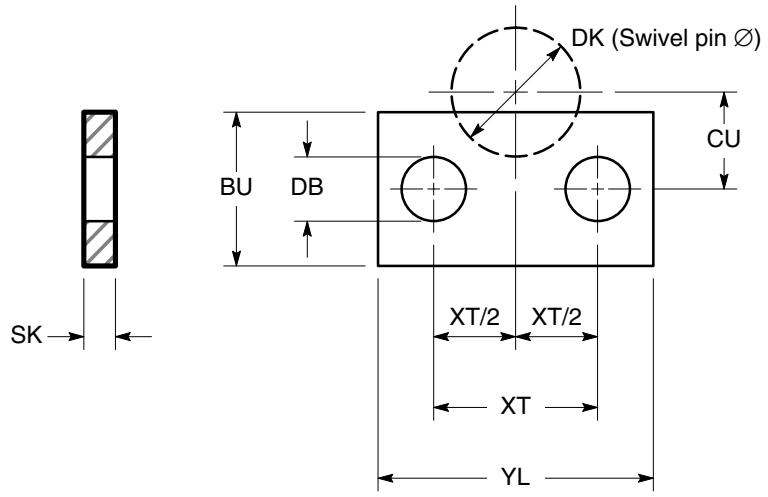
Part Number	JK		Max. ET	Min. ES	Max. Load (kN)	(lbs)	Weight (kg)
TV83012C–10	12	+0,000/–0,011	39,6	31	8	1800	0,035
TV83016C–10	16	+0,000/–0,011	49,6	41	12,5	2800	0,075
TV83020C–10	20	+0,000/–0,013	60,2	51	20	4500	0,145
TV83025C–10	25	+0,000/–0,013	70,2	61	32	7200	0,260
TV83030C–10	30	+0,000/–0,013	80,8	71	50	11250	0,380
TV83040C–10	40	+0,000/–0,016	94,5	81	80	18000	0,895
TV83050C–10	50	+0,000/–0,016	116,5	101	125	26100	1,630
TV83060C–10	60	+0,000/–0,019	136,6	121	200	45000	2,950
TV83080C–10	80	+0,000/–0,019	179,2	161	320	72000	6,730
TV83100C–10	100	+0,000/–0,022	220,4	201	500	112400	13,500

Swivel Pin for Spherical Bearing with Locking Plate



Part Number	DK +0,00 (h6)	DC	HL +0,2/–0,0	JL	KL	SL	ZV	ZX	Max. Load (kN)	(lbs)	Weight (kg)
TV83012B	12 –0,011	4	3,3	4,5	8	40	10	1	8	1800	0,035
TV83016B	16 –0,011	4	3,3	5,5	8	50	13	1	12,5	2800	0,075
TV83020B	20 –0,013	5	4,5	5,5	10	62	17	1,5	20	4500	0,150
TV83025B	25 –0,013	5	4,5	5,5	10	72	22	1,5	32	7200	0,270
TV83030B	30 –0,013	6	5,5	7,5	13	85	24	2	50	11250	0,410
TV83040B	40 –0,016	7	6,5	9,5	16	100	32	2	80	18000	0,950
TV83050B	50 –0,019	8	9,0	10,0	19	122	41	2	125	26100	1,710
TV83060B	60 –0,019	9	9,0	11,0	20	145	50	2	200	45000	3,130
TV83080B	80 –0,019	11	11,0	15,0	26	190	70	3	320	72000	7,140
TV83100B	100 –0,021	14	13,0	15,0	30	235	90	3	500	112400	14,400

Locking Plate for Swivel Pin



Part Number	DK	BU	DB	SK	YL	±0,2 XT	Ref. CU	(2 included) Screw	Weight (kg)
7959–012	12	15	6,4	3	27	16	9,5	M6 x 12	0,015
7959–016	16	15	6,4	3	40	25	11,5	M6 x 12	0,020
7959–020	20	18	6,4	4	40	25	14,5	M6 x 15	0,032
7959–025	25	18	6,4	4	40	25	16,5	M6 x 15	0,032
7959–030	30	20	6,4	5	45	30	19,0	M6 x 15	0,050
7959–040	40	20	8,4	6	62	42	23,0	M8 x 20	0,078
7959–050	50	25	8,4	8	65	45	29,5	M8 x 20	0,090
7959–060	60	25	10,5	8	80	55	33,5	M10 x 25	0,170
7959–080	80	30	10,5	10	90	60	44,0	M10 x 25	0,250
7959–100	100	40	10,5	12	120	90	56,0	M10 x 25	0,490

Common Options Section

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 rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and define your requirements.

The table on page NO TAG gives maximum allowable push strokes at various operating pressures for available rod diameters of Series TV cylinders. Rod ends on rigid mount cylinders should be supported. Longer strokes are allowable for **pull only** applications. Contact your local Vickers sales engineer for application assistance if necessary.

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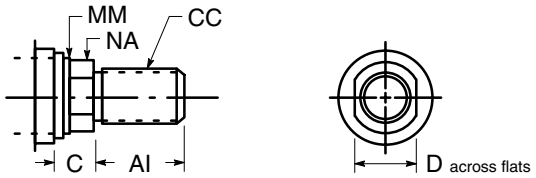
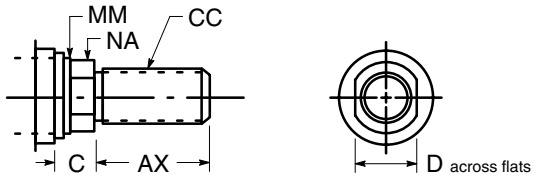
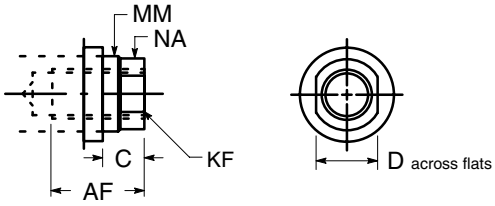
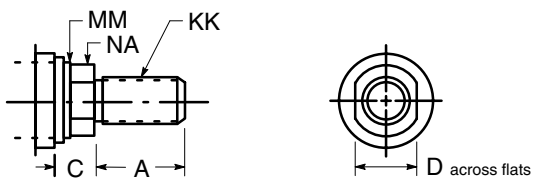
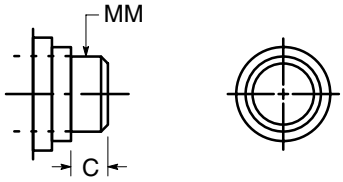
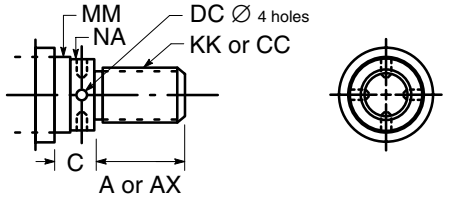
Code		Code	
0		**N**	
1		**7**	
6		**For rod sizes 90, 110, and 140**	

Dimensions in millimetres

Rod ∅			**Metric Thread**							
MM	**D**	**DC**	**CC**	**AI**	**AX**	**KF**	**AF**	**KK**	**A**	**NA**
12	10	–	M10 x 1,25	14	22	M8 x 1	12	M8 x 1	12	11
14	12	–	M12 x 1,25	16	24	M10 x 1,25	14	M10 x 1,25	14	13
18	15	–	M14 x 1,5	18	28	M12 x 1,25	16	M10 x 1,25	14	16,5
22	18	–	M16 x 1,5	22	32	M16 x 1,5	22	M12 x 1,25	16	20,5
28	22	–	M20 x 1,5	28	40	M20 x 1,5	28	M14 x 1,5	18	26
36	30	–	M27 x 2	36	54	M27 x 2	36	M16 x 1,5	22	34
45	38	–	M33 x 2	45	66	M33 x 2	45	M20 x 1,5	28	43
56	48	–	M42 x 2	56	84	M42 x 2	56	M27 x 2	36	53
70	62	–	M48 x 2	63	96	M48 x 2	63	M33 x 2	45	67
90	–	8	M64 x 3	85	128	M64 x 3	85	M42 x 2	56	87
110	–	10	M80 x 3	95	140	M80 x 3	95	M48 x 2	63	106
140	–	12	M100 x 3	112	168	M100 x 3	112	M64 x 3	85	136

See pages 9 through 23 for **C** dimensions.

Port Type and Size

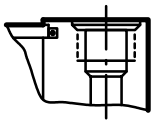
Available Ports

Series TV 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 page NO TAG lists the maximum piston velocities obtainable with each bore diameter and port type combination.

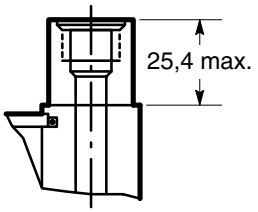
Some mounting styles have location restrictions. Where a port or port boss interferes with cylinder mounting, mounting takes precedence. See page 5 for a table of port location availability.

Code 3, 5 and A



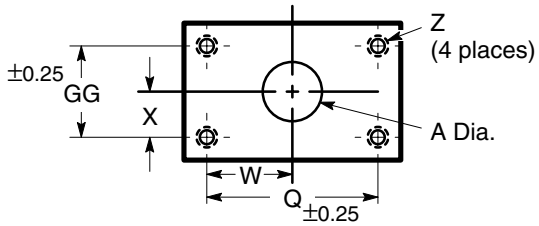
SAE straight thread O-ring seal port

Code 4 and B



▲When boss is required

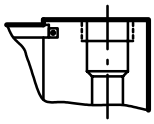
Code 6



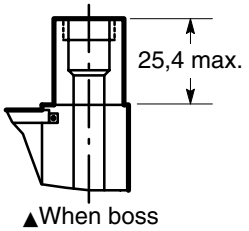
Dimensions in mm

Flange Size	A	Q	W	X	Z	GG
19	19,1	47,63	23,88	11,18	M10 x 1,5	22,23
25	25,4	52,37	26,16	13,21	M10 x 1,5	26,19
32	31,6	58,72	29,46	14,99	M12 x 1,75	30,18
38	38,1	69,85	35,05	17,78	M14 x 2	35,71

Code 7 and 9



Code 8 and 0



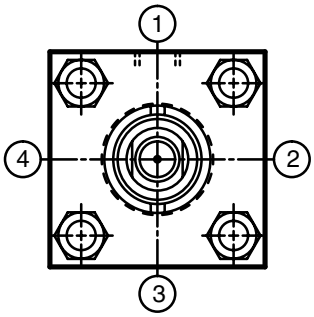
▲When boss is required

Bore ∅ (mm)	Port Code 3	4	5[A]	6	7[D]	8	9	0	A	B
	SAE J1926 UN Thread O-ring / Thread Size			SAE 518 Code 61 Flange	ISO 228-1 BSPP		DIN 3852 Form X Metric		ISO 6149	
25	9/16-18 (-6)	3/4-16 (-8)▲	–	–	G1/4	G3/8▲	M14 x 1,5	M22 x 1,5▲	M14 x 1,5	M22 x 1,5▲
32	9/16-18 (-6)	3/4-16 (-8)▲	–	–	G1/4	G3/8▲	M14 x 1,5	M22 x 1,5▲	M14 x 1,5	M22 x 1,5▲
40	9/16-18 (-6)	7/8-14 (-10)	3/4-16 (-8)	–	G3/8	G1/2	M22 x 1,5	M27 x 2▲	M22 x 1,5	M27 x 2▲
50	9/16-18 (-6)	7/8-14 (-10)	3/4-16 (-8)	–	G1/2	G3/4▲	M22 x 1,5	M27 x 2▲	M22 x 1,5	M27 x 2▲
63	9/16-18 (-6)	7/8-14 (-10)	3/4-16 (-8)	–	G1/2	G3/4▲	M22 x 1,5	M27 x 2▲	M22 x 1,5	M27 x 2▲
80	7/8-14 (-10)	1 3/16-12 (-14)	1 1/16-12 (-12)	19	G3/4	G1▲	M27 x 2	M33 x 2▲	M27 x 2	M33 x 2▲
100	7/8-14 (-10)	1 3/16-12 (-14)	1 1/16-12 (-12)	19	G3/4	G1▲	M27 x 2	M33 x 2▲	M27 x 2	M33 x 2▲
125	7/8-14 (-10)	1 3/16-12 (-14)	1 1/16-12 (-12)	19	G1	G1 1/4▲	M27 x 2	M33 x 2	M27 x 2	M33 x 2
160	1 1/16-12 (-12)	1 5/8-12 (-20)▲	1 5/16-12 (-16)	25	G1	G1 1/4▲	M33 x 2	M42 x 2	M33 x 2	M42 x 2▲
200	1 5/16-12 (-16)	1 5/8-12 (-20)	1 7/8-12 (-24)	38	G1 1/4	G1 1/2	M48 x 2	–	M48 x 2	–

[A] - Size per ANSI B93.75M.
[D] - Conforms to DIN 24554.

Port Location

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 below.



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 TV mounting style.

Mounting		Head Locations				Cap Locations			
Style Code	Description	1	2	3	4	1	2	3	4
01	Side lug	A	W	A	W	A	W	A	W
04	Keyed side lug	A	W	A	W	A	W	A	W
07	Head rectangular	A	A	A	A	A	A	A	A
09	Head rectangular	A	A	A	A	A	A	A	A
10	Clevis	A	A	A	A	A	A	A	A
11	Spherical bearing	A	A	A	A	A	A	A	A
14	Cap rectangular	A	A	A	A	A	A	A	A
15	Intermediate trunnion	A	A	A	A	A	A	A	A
16	Cap trunnion	A	A	A	A	A	**N**	A	**N**
17	Head trunnion	A	**N**	A	**N**	A	A	A	A
21	Cap extended tie rod	A	A	A	A	A	A	A	A
22	Head extended tie rod	A	A	A	A	A	A	A	A
23	Both ends extended tie rod	A	A	A	A	A	A	A	A
24	No mount	A	A	A	A	A	A	A	A
25	Double rod, side lug	A	W	A	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**				
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

A – Available
N – Not available
W– Port available without port boss only. Proximity switch not available. (Port codes 3, 5, 7, and 9)

Sealing Systems

Three different sealing systems are available in Series TV cylinders.

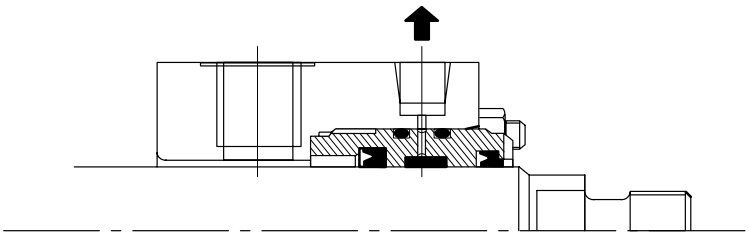
Determine the correct seal code for your application, then enter it as item 8 in the model code.

Code	Fluid	Temperature (°C)	Max. Speed (m/s)	Application
N	Mineral oil, petroleum base Automotive transmission fluid	–35 to 80	0,7	Normal, typical industrial
L	Mineral oil	–35 to 120	5	Low friction servo
	Water glycol (HFC) Oil-in-water emulsions (HFA) Water-in-oil emulsions (HFB)	10 to 70	1	Fire retardant fluids
T	Mineral oil	–25 to 200	5	High temperature
	Phosphate esters, petroleum oil blends Fyrquel 220, 550, 1000 Hought-O-Safe 1340 Pydraul 200, 230C, 280, 312C, 540C, A200	0 to 200	5	Fire retardant fluids

Gland Drain Option

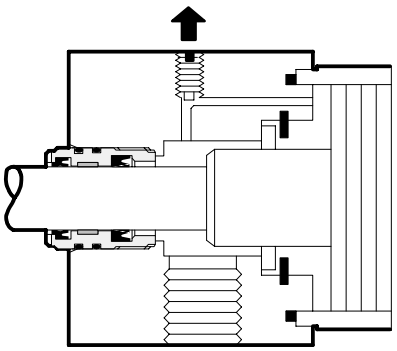
Gland drains are primarily used for long stroke cylinders (over 1 m) and when extended speed exceeds retract speed.

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.



PS 200 Proximity Switches

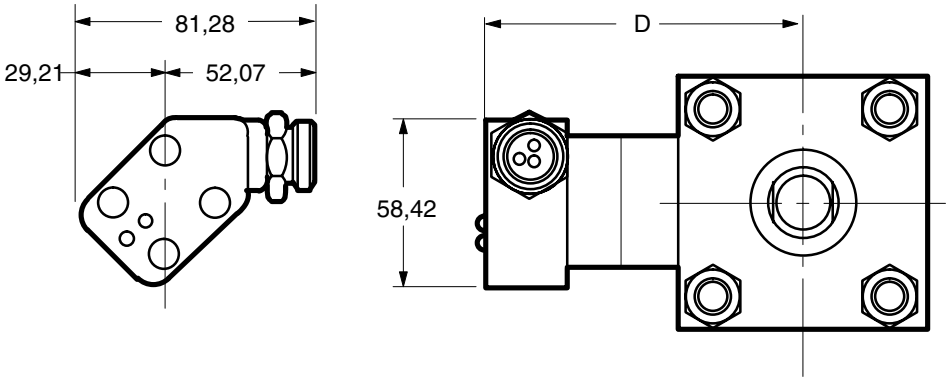
PS 200 proximity switches for Series TV cylinders are inductive type switches with a sensing probe that “looks” at the cushion collar or button to provide full extend or full retract indication. Since the probe is inside the cylinder, harsh external environments don’t affect sensing. The 2-wire circuit will operate on AC or DC and works as reliably as a programmable controller. PS 200 switches meet UL requirements for 210 bar hydraulic cylinders. Vickers switch adaptor allows full 360° rotation.

Short Circuit Protection is a standard feature on the PS 200 Proximity Switch. SCP 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 SCP mode by flashing both LEDs.

Torque $^1/_4$–20 mounting screws to 20 Nm (15 ft-lb).

O-rings required:
Size 115 – One per switch
Size 116 – One per spacer

Series PS 200 2-wire AC/DC Proximity Switches	
Pressure	210 bar
Sensing range	2,0 mm ±10%
Operating temperature range	–20° to +70°C
Repeatability	0,025 mm
Switching differential	10%
Supply voltage	20–220 V AC/DC
On-State voltage drop	10V @ 5–500 mA
Load current man.	0,5 Amp
Inrush current	3 Amp
Quiescent current	1,7 mA max.
Indicating LED’s (standard)	1 lit: Power on non-conducting 2 lit: Target present (both flashing = SCP mode)



With the new Vickers switch adaptor, the proximity switch can rotate 360°. Use the chart on previous page for available proximity switch locations for the various mounting styles.

Dimensions in millimetres

Bore ∅	**Rod** ∅	Max. **D**
25	12	N/A
	18	N/A
	Cap	N/A
32	14	N/A
	22	N/A
	Cap	N/A
40	18	94
	22	94
	28	94
	Cap	94
50	22	104
	28	97
	36	97
	Cap	97
63	28	113
	36	113
	45	113
	Cap	113
80	36	115
	45	115
	56	121
	Cap	115
100	45	132
	56	121
	70	121
	Cap	121
125	56	157
	70	157
	90	157
	Cap	157
160	70	157
	90	167
	110	165
	Cap	157
200	90	189
	110	182
	140	182
	Cap	182

Application / Engineering Data

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:

To order a stop tube, enter XXX for model code item 8. Then specify the cylinder's working stroke and the required stop tube length. Specify 25 mm of stop tube for each 250 mm (or fraction thereof) of stroke in excess of the maximums listed in the table.

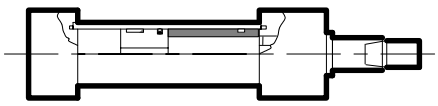
Bore	**Maximum Stroke** (mm)		
∅	**Pivot**	**Rigid mounts**	
(mm)	**Mounts**	**Unsupported Rod**	**Supported Rod**
25	500	600	1000
32	500	600	1000
40	600	750	1200
50	600	750	1200
63	750	965	1200
80	750	965	1200
100	750	965	1200
125	900	1000	1200
160	900	1000	1200
200	900	1000	1200

Stop Tube Designs

Three typical stop tube designs are illustrated below.

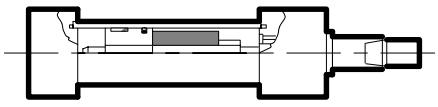
Design A

Used for cylinders not cushioned on the rod end.



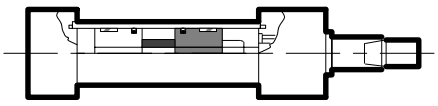
Design B

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

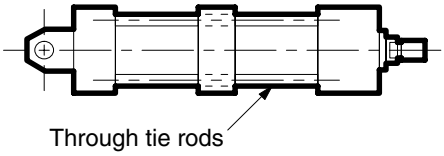
A tie rod spacer or center support should be applied when the stroke length exceeds 20 times the bore diameter.

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.

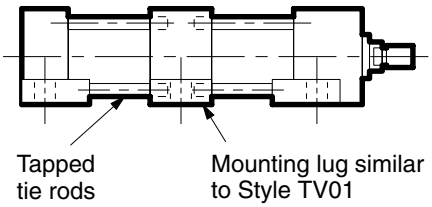
The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).



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 Diameters

Cylinder Size Selection

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.

Bore	**Rod**	**Work**	**Maximum Force** (kN) **At Working Pressure** (bar)						
∅	∅	**Area**	**30**	**50**	**70**	**100**	**140**	**160**	**210**
(mm)	(mm)	(cm^2)	(bar)	(bar)	(bar)	(bar)	(bar)	(bar)	(bar)
25	–	4,9	1,47	2,45	3,44	4,91	6,87	7,85	10,31
	12	3,8	1,13	1,89	2,64	3,78	5,29	6,04	7,93
	18	2,4	0,71	1,18	1,65	2,36	3,31	3,78	4,96
32	–	8,0	2,41	4,02	5,63	8,04	11,26	12,87	16,89
	14	6,5	1,95	3,25	4,55	6,50	9,10	10,40	13,66
	22	4,2	1,27	2,12	2,97	4,24	5,94	6,79	8,91
40	–	12,6	3,77	6,28	8,80	12,57	17,59	20,11	26,39
	18	10,0	3,01	5,01	7,02	10,02	14,03	16,03	21,05
	22	8,8	2,63	4,38	6,14	8,77	12,27	14,03	18,41
	28	6,4	1,92	3,20	4,49	6,41	8,97	10,25	13,46
50	–	19,6	5,89	9,82	13,74	19,63	27,49	31,42	41,23
	22	15,8	4,75	7,92	11,08	15,83	22,17	25,33	33,25
	28	13,5	4,04	6,74	9,44	13,48	18,87	21,57	28,31
	36	9,5	2,84	4,73	6,62	9,46	13,24	15,13	19,86
63	–	31,2	9,35	15,59	21,82	31,17	43,64	49,88	65,46
	28	25,0	7,50	12,51	17,51	25,01	35,02	40,02	52,53
	36	21,0	6,30	10,50	14,70	21,00	29,39	33,59	44,09
	45	15,3	4,58	7,63	10,69	15,27	21,38	24,43	32,06
80	–	50,3	15,08	25,13	35,19	50,27	70,37	80,42	105,56
	36	40,1	12,03	20,04	28,06	40,09	56,12	64,14	84,18
	45	34,4	10,31	17,18	24,06	34,37	48,11	54,99	72,17
	56	25,6	7,69	12,82	17,94	25,64	35,89	41,02	53,83
100	–	78,5	23,56	39,27	54,98	78,54	109,96	125,66	164,93
	45	62,6	18,79	31,32	43,84	62,64	87,69	100,22	131,53
	56	53,9	16,18	26,96	37,74	53,92	75,48	86,27	113,23
	70	40,1	12,02	20,03	28,04	40,06	56,08	64,09	84,12
125	–	122,7	36,82	61,36	85,90	122,72	171,81	196,35	257,71
	56	98,1	29,43	49,04	68,66	98,09	137,32	156,94	205,99
	70	84,2	25,27	42,12	58,97	84,24	117,94	134,79	176,91
	90	59,1	17,73	29,55	41,37	59,10	82,74	94,56	124,11
160	–	201,1	60,32	100,53	140,74	201,06	281,49	321,70	422,23
	70	162,6	48,77	81,29	113,80	162,58	227,61	260,12	341,41
	90	137,5	41,24	68,73	96,22	137,46	192,45	219,94	288,67
	110	106,0	31,81	53,01	74,22	106,03	148,44	169,65	222,66
200	–	314,2	94,25	157,08	219,91	314,16	439,82	502,65	659,73
	90	250,5	75,16	125,27	175,38	250,54	350,76	400,87	526,14
	110	219,2	65,75	109,58	153,41	219,15	306,82	350,65	460,22
	140	160,2	48,07	80,11	112,15	160,22	224,31	256,35	336,46

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 table below, 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. This maximum stroke is based on column loading analysis only and does not consider side loading, stop tube requirements or other cylinder stroke limiters.

For pressures above 210 bar, consult your local Vickers representative.

		Maximum Stroke (mm) **at Working Pressure** (bar)																	
BORE	**ROD**	**Rigid Mounts** (01, 04, 07, 09, 14, 21, 22, 23, 25, 33, 39, 40, and 47)						**Cap Swivel Mounts** (10, 11, and 16)						**Trunnion Mounts** (15, 17, 34, and 35)					
∅ (mm)	∅ (mm)	**30** (bar)	**50** (bar)	**70** (bar)	**100** (bar)	**160** (bar)	**210** (bar)	**30** (bar)	**50** (bar)	**70** (bar)	**100** (bar)	**160** (bar)	**210** (bar)	**30** (bar)	**50** (bar)	**70** (bar)	**100** (bar)	**160** (bar)	**210** (bar)
25	12	758	566	460	361	243	175	337	252	205	161	108	78	404	302	246	193	130	94
	18	1754	1339	1114	910	684	569	780	595	495	405	304	253	936	714	595	486	365	304
32	14	797	591	475	366	230	145	355	263	211	163	102	64	425	315	254	195	123	77
	22	2042	1556	1293	1054	787	651	908	692	575	469	350	289	1090	831	690	562	420	347
40	18	1058	786	635	491	317	211	471	350	282	219	141	94	565	419	339	262	169	112
	22	1612	1216	999	799	569	446	717	541	444	355	253	198	860	649	533	426	304	238
	28	2649	2020	1680	1370	1025	850	1178	898	747	609	456	378	1414	1078	896	731	547	454
50	22	1261	935	753	580	367	234	561	416	335	258	163	104	673	499	402	309	196	125
	28	2091	1579	1299	1041	745	588	930	702	578	463	331	261	1116	843	693	556	398	314
	36	3508	2677	2228	1820	1367	1138	1560	1191	991	810	608	506	1872	1429	1189	971	730	607
63	28	1623	1204	971	750	479	311	722	536	432	333	213	138	866	643	518	400	255	166
	36	2748	2077	1711	1374	989	785	1222	924	761	611	440	349	1466	1109	913	733	528	419
	45	4348	3318	2761	2254	1691	1407	1934	1475	1228	1003	752	626	2321	1771	1473	1203	903	751
80	36	2116	1572	1269	983	634	422	941	699	564	437	282	187	1129	839	677	525	338	225
	45	3377	2551	2099	1683	1206	953	1502	1134	934	748	536	424	1802	1361	1120	898	644	508
	56	5298	4040	3359	2740	2050	1701	2356	1797	1494	1219	912	756	2827	2156	1793	1462	1094	908
100	45	2645	1965	1587	1229	792	527	1176	874	706	546	352	234	1412	1049	847	656	423	281
	56	4183	3158	2599	2082	1490	1175	1860	1405	1156	926	663	523	2232	1686	1387	1111	795	627
	70	6623	5050	4199	3425	2563	2126	2945	2246	1867	1523	1140	945	3534	2695	2241	1828	1368	1134
125	56	3275	2432	1963	1518	976	644	1457	1082	873	675	434	286	1748	1298	1047	810	521	344
	70	5228	3948	3248	2603	1863	1469	2325	1756	1445	1158	828	653	2790	2107	1733	1389	994	784
	90	8769	6693	5571	4551	3418	2846	3900	2976	2477	2024	1520	1266	4680	3572	2973	2429	1824	1519
160	70	3986	2953	2376	1828	1151	724	1773	1313	1057	813	512	322	2127	1576	1268	975	614	386
	90	6754	5102	4199	3366	2412	1905	3004	2269	1867	1497	1073	847	3605	2723	2241	1796	1287	1017
	110	10212	7782	6467	5269	3933	3254	4542	3461	2876	2343	1749	1447	5450	4153	3451	2812	2099	1736
200	90	5290	3930	3173	2457	1584	1054	2353	1748	1411	1093	705	469	2823	2097	1693	1311	846	562
	110	8058	6079	4995	3995	2844	2228	3584	2703	2222	1777	1265	991	4300	3244	2666	2132	1518	1189
	140	13245	10100	8398	6850	5126	4252	5890	4491	3735	3046	2279	1891	7068	5390	4482	3656	2735	2269

Port Selection

Use this table to determine which bore diameter, rod diameter, and port combination will provide the piston velocity required for your application.

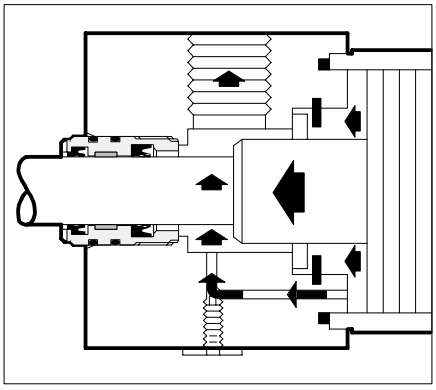
Bore ∅ (mm)	Rod ∅ (mm)	Fluid Req. per 10 mm of Stroke (l)	Port Code 3		Port Codes 4 and 0, B		Port Codes 5, 6, and 9, A		Port Code 7		Port Code 8	
			Flow (l/min)	Piston Velocity (m/s)	Flow (l/min)	Piston Velocity (m/s)	Flow (l/min)	Piston Velocity (m/s)	Flow (l/min)	Piston Velocity (m/s)	Flow (l/min)	Piston Velocity (m/s)
25	Cap	0,0049	13,4	0,46	23,2	0,79	13,4	0,46	4,5	0,15	13,4	0,46
	12	0,0038	13,4	0,59	23,2	1,02	13,4	0,59	4,5	0,20	13,4	0,59
	18	0,0024	13,4	0,94	23,2	1,64	13,4	0,94	4,5	0,32	13,4	0,94
32	Cap	0,0080	13,4	0,28	23,2	0,48	13,4	0,28	4,5	0,09	13,4	0,28
	14	0,0065	13,4	0,34	23,2	0,60	13,4	0,34	4,5	0,12	13,4	0,34
	22	0,0042	13,4	0,53	23,2	0,91	13,4	0,53	4,5	0,18	13,4	0,53
40	Cap	0,0126	13,4	0,18	35,6	0,47	23,2	0,31	13,4	0,18	23,2	0,31
	18	0,0100	13,4	0,22	35,6	0,59	23,2	0,39	13,4	0,22	23,2	0,39
	22	0,0088	13,4	0,25	35,6	0,68	23,2	0,44	13,4	0,25	23,2	0,44
	28	0,0064	13,4	0,35	35,6	0,93	23,2	0,60	13,4	0,35	23,2	0,60
50	Cap	0,0196	13,4	0,11	35,6	0,30	23,2	0,20	23,2	0,20	56,4	0,48
	22	0,0158	13,4	0,14	35,6	0,38	23,2	0,24	23,2	0,24	56,4	0,59
	28	0,0135	13,4	0,17	35,6	0,44	23,2	0,29	23,2	0,29	56,4	0,70
	36	0,0095	13,4	0,24	35,6	0,63	23,2	0,41	23,2	0,41	56,4	0,99
63	Cap	0,0312	13,4	0,07	35,6	0,19	23,2	0,12	23,2	0,12	56,4	0,30
	28	0,0250	13,4	0,09	35,6	0,24	23,2	0,16	23,2	0,16	56,4	0,38
	36	0,0210	13,4	0,11	35,6	0,28	23,2	0,18	23,2	0,18	56,4	0,45
	45	0,0153	13,4	0,15	35,6	0,39	23,2	0,25	23,2	0,25	56,4	0,62
80	Cap	0,0503	35,6	0,12	78,6	0,26	56,4	0,19	56,4	0,19	108,3	0,36
	36	0,0401	35,6	0,15	78,6	0,33	56,4	0,23	56,4	0,23	108,3	0,45
	45	0,0344	35,6	0,17	78,6	0,38	56,4	0,27	56,4	0,27	108,3	0,53
	56	0,0256	35,6	0,23	78,6	0,51	56,4	0,37	56,4	0,37	108,3	0,70
100	Cap	0,0785	35,6	0,08	78,6	0,17	56,4	0,12	108,3	0,12	108,3	0,23
	45	0,0626	35,6	0,10	78,6	0,21	56,4	0,15	108,3	0,29	108,3	0,29
	56	0,0539	35,6	0,11	78,6	0,24	56,4	0,17	108,3	0,33	108,3	0,33
	70	0,0401	35,6	0,15	78,6	0,33	56,4	0,24	108,3	0,45	108,3	0,45
125	Cap	0,1227	35,6	0,05	78,6	0,11	108,3	0,15	108,3	0,15	176,6	0,24
	56	0,0981	35,6	0,06	78,6	0,13	108,3	0,18	108,3	0,18	176,6	0,30
	70	0,0842	35,6	0,07	78,6	0,16	108,3	0,21	108,3	0,21	176,6	0,35
	90	0,0591	35,6	0,10	78,6	0,22	108,3	0,30	108,3	0,30	176,6	0,50
160	Cap	0,2011	56,4	0,05	176,6	0,15	108,3	0,09	108,3	0,09	176,6	0,15
	70	0,1626	56,4	0,06	176,6	0,18	108,3	0,11	108,3	0,11	176,6	0,18
	90	0,1375	56,4	0,07	176,6	0,21	108,3	0,13	108,3	0,13	176,6	0,21
	110	0,1060	56,4	0,09	176,6	0,28	108,3	0,17	108,3	0,17	176,6	0,28
200	Cap	0,3142	108,3	0,06	176,6	0,09	261,7	0,14	176,6	0,09	261,7	0,14
	90	0,2505	108,3	0,07	176,6	0,12	261,7	0,17	176,6	0,12	261,7	0,17
	110	0,2192	108,3	0,08	176,6	0,13	261,7	0,20	176,6	0,13	261,7	0,27
	140	0,1602	108,3	0,11	176,6	0,18	261,7	0,27	176,6	0,18	261,7	0,27

Cushioning System

Vickers cylinders have standard features that are extra cost options or not available on other look-alike ISO/DIN cylinders. Series TV hydraulic cylinders are available with a patented floating ring cushion seal or alternate solid design with check valve that provide positive cushion sealing with minimum wear and maximum piston acceleration on the return stroke.

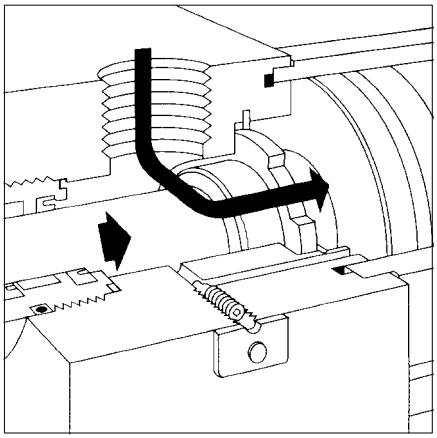
Advanced Cushions Provide Faster Cycle Times

Cylinder cushions are designed to decelerate the piston velocity near the end of each cylinder stroke to prevent excessive mechanical shock.



To accomplish this, the cushion collar contacts a floating sleeve or cylinder head which permits a very close 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.

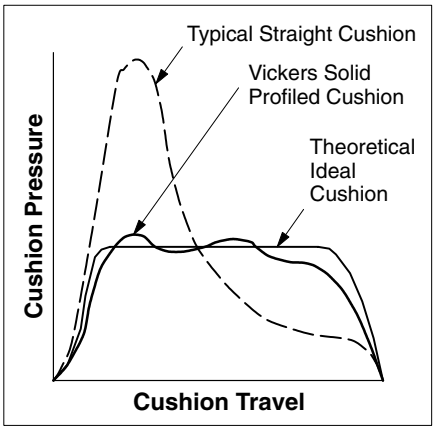
Vickers advanced cushions permit higher cylinder speed, shorter cycle time, and more work per hour.



The sleeve design is also free to move in an axial direction and functions as a fluid check. When the fluid flow is reversed, the sleeve moves off its seat, and fluid flows around the slots in the outer sleeve's diameter permitting nearly full flow for quick acceleration.

Cushion Features

- Cushion design provides consistent long wearing seal between cushion collar and head.
- Floating design self-aligns to minimize wear.
- Check valve action of sleeve provides rapid acceleration out of the cushion.



Cushions are recommended when piston speed exceeds 0,13 m/s. Any heavy loads attached to the piston rod should be absorbed by external means such as shock absorbers or springs.

Application Data

Cushioning System

Key Assumptions & Limitations

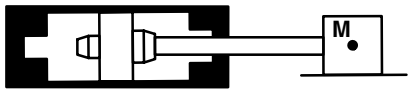
These assumptions provide parameters for determining maximum cushion performance. Actual performance may be different than determined by these methods, particularly if assumptions are not maintained.

Efficiency factors are applied to the energy calculations that attempt to reflect characteristics of the Vickers cushion design.

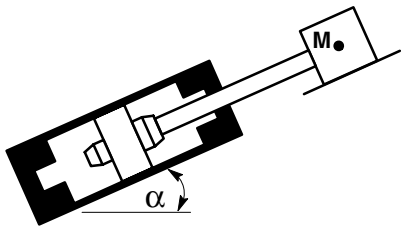
The following assumptions should be considered when calculating cushion capacity:

- Maximum cushion pressure is 310 bar (4500 psi).
- The upper limit of velocity is 0.5 m/s.
- If velocity is below 0,13 m/s, the cushions become ineffective on cylinders smaller than 80 mm bore.
- Friction force is assumed to be zero.
- The cylinder is used in a linear system (not for rotary applications).
- Fluid viscosity is equivalent to 25 centistoke.
- The driving pressure is equal to the maximum system pressure, usually the relief valve setting.
- Cushion adjustment screws are provided to tune cushion performance within limits.
- Cushion efficiency (C_{eff}) is 0.67 for velocities between 0,1 and 0,3 m/s., or 0,5 for velocities between 0,3 and 0,5 m/s.

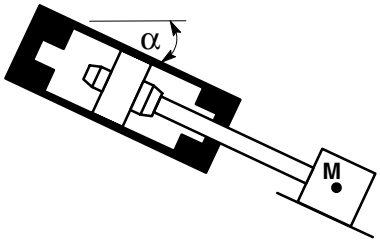
Application 1



Application 2



Application 3



Application 1:

$E = [0,5\ M\ V^2]$ extend or retract

Application 2:

$E = (1/C_{eff})\ \{[0.5\ M\ V^2] - [9,81\ M\ (L_{hc}/1000 \sin(\alpha))]\}$ extend

$E = (1/C_{eff})\ \{[0.5\ M\ V^2] + [9,81\ M\ (L_{cc}/1000 \sin(\alpha))]\}$ retract

Application 3:

$E = (1/C_{eff})\ \{[0.5\ M\ V^2] + [9,81\ M\ (L_{hc}/1000 \sin(\alpha))]\}$ extend

$E = (1/C_{eff})\ \{[0.5\ M\ V^2] - [9,81\ M\ (L_{cc}/1000 \sin(\alpha))]\}$ retract

Calculations for TV Cylinder

Units (US)

E	Energy	joule
M	Mass	kg
V	Velocity	m/s
P_d	Driving pressure	bar
L_H	Head cushion length	mm
L_C	Cap cushion length	mm
g	Gravity constant	9,81/1000

Example

TV cylinder in application 3 and extending:
Using a TV cylinder with a 100 mm bore, 45 mm rod is mounted at a 45° angle from horizontal with rod down. A 1300 kg mass is attached to the rod and system pressure is 100 bar. The cylinder is moving the mass at 0,3 m/s.

Using the calculation for application 3:

$E = (1/C_{eff})\ \{[0.5\ M\ V^2] + [9,81\ M\ (L_{hc}/1000 \sin(\alpha))]\}$

$E = (1/0.67)\{[0.5 * 1300 * 0,3^2] + [9,81 * 1300 * (33/1000) * \sin(45)]\}$

$E = 531$ newton-m (joule)

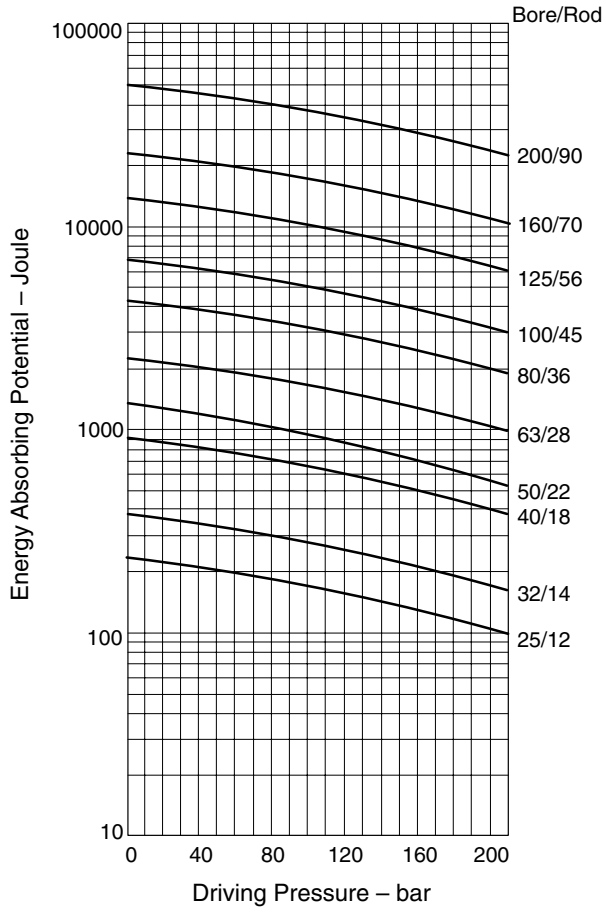
Pick the chart (see page 46) for TV cylinder, rod extending, and first rod. The curve is for the 100/45 bore/rod. Enter the vertical axis at 531 newton-m and the horizontal axis at 100 bar. The point of intersection is below the 100/45 curve so the cushion is acceptable. The maximum allowable pressure on the cap end is 160 bar which is greater than the specified system pressure of 100 bar.

Cushion Data

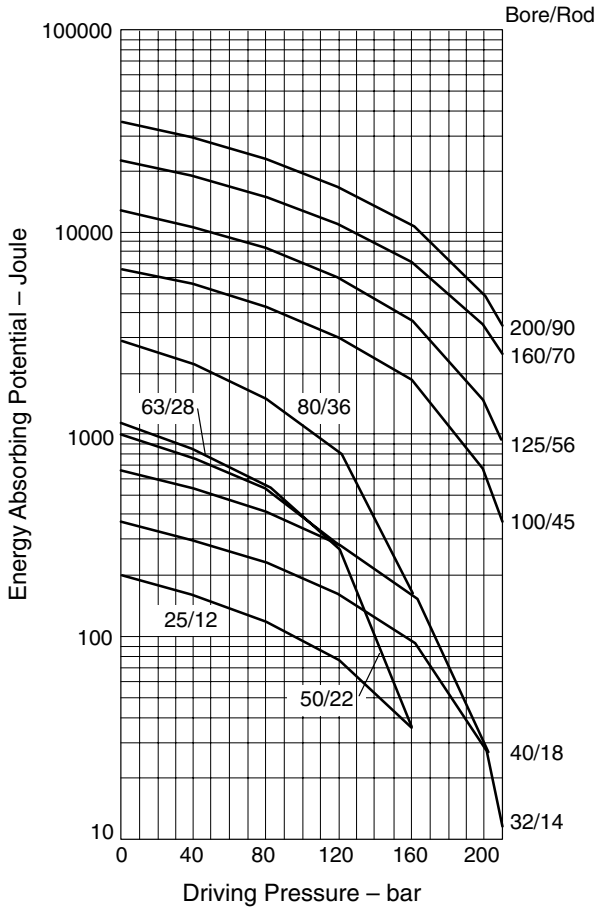
Bore Diameter (mm)	Rod Diameter (mm)	Model Code Designation Bore/Rod	Max. Cap Pressure (bar)	L_C Effective Cap End Cushion Length (mm)	L_H Effective Head End Cushion Length (mm)
25	12	BB	160	17	20
25	18	BE	112	17	20
32	14	2C	160	17	20
32	22	2G	136	17	20
40	18	CE	160	26	23
40	22	CG	158	26	25
40	28	CJ	124	26	30
50	22	DG	160	26	28
50	28	DJ	160	26	28
50	36	DL	91	26	30
63	28	EJ	160	26	21
63	36	EL	160	26	30
63	45	EN	115	26	30
80	36	GL	160	30	30
80	45	GN	160	30	30
80	56	GQ	118	30	35
100	45	HN	160	32	33
100	56	HQ	160	32	35
100	70	HS	131	32	35
125	56	KQ	160	40	40
125	70	KS	160	40	40
125	80	KU	119	40	35
160	70	LS	160	40	40
160	90	LU	160	40	38
160	110	LW	141	40	37
200	90	NU	160	55	40
200	110	NW	160	55	40
200	140	NZ	136	55	40

Energy Absorbing Potential Charts

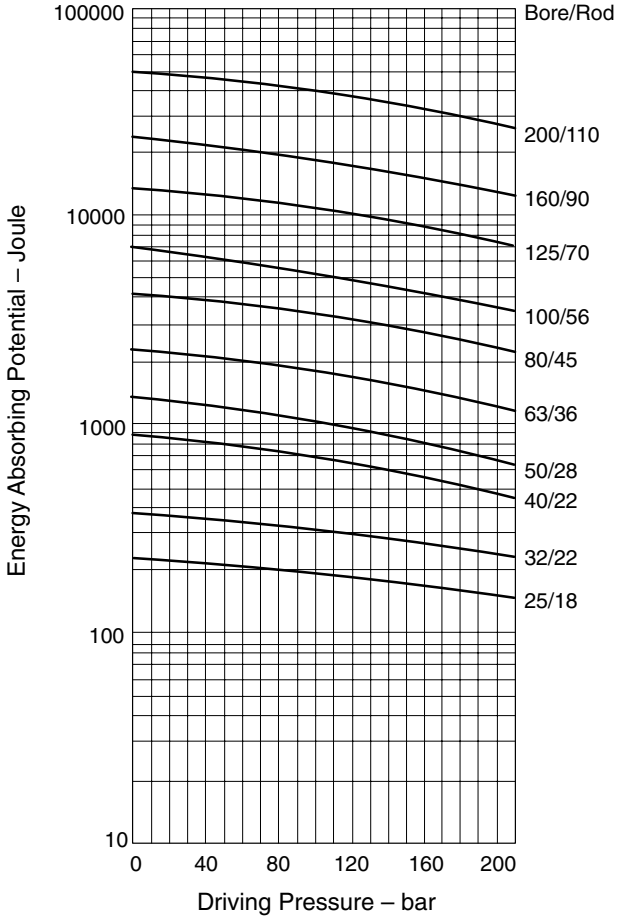
TV Cap Cushion - Rod Retracting First Rod



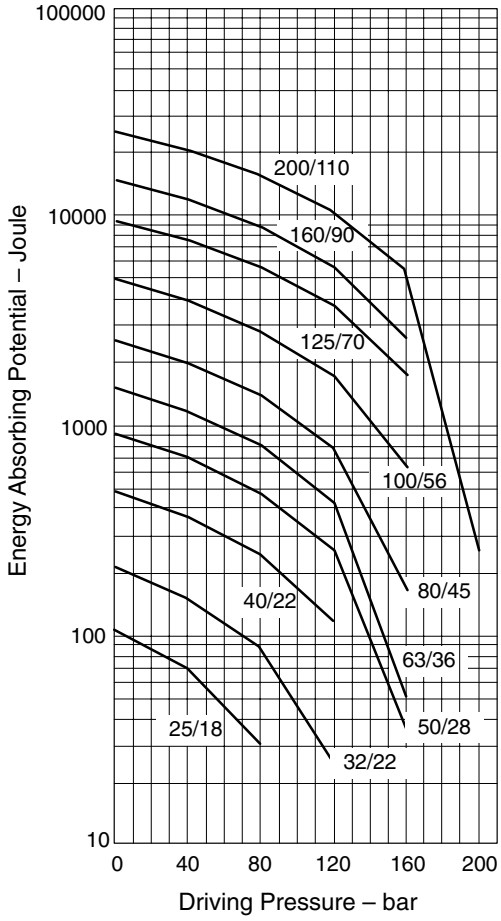
TV Rod Cushion - Rod Extending First Rod



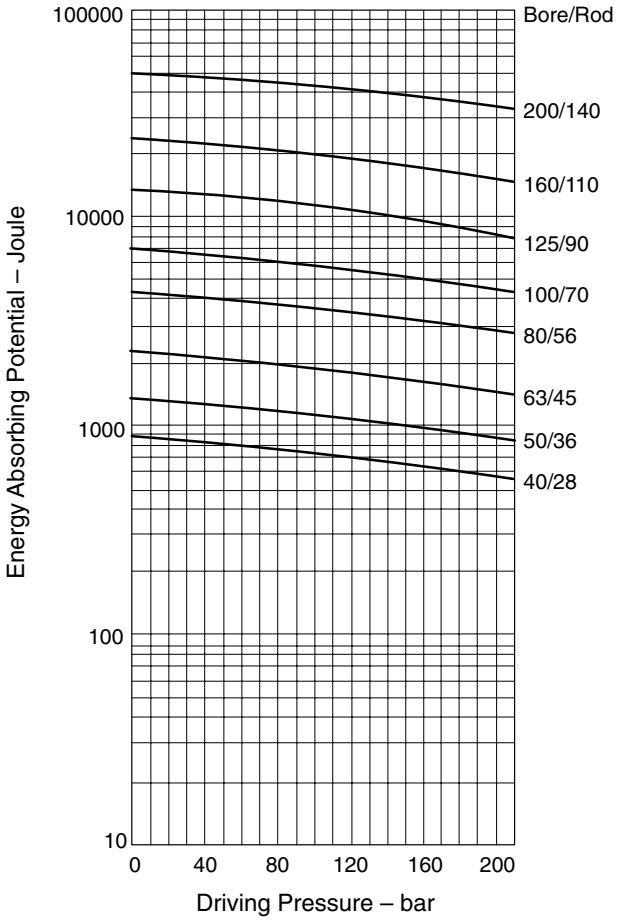
TV Cap Cushion - Rod Retracting Second Rod



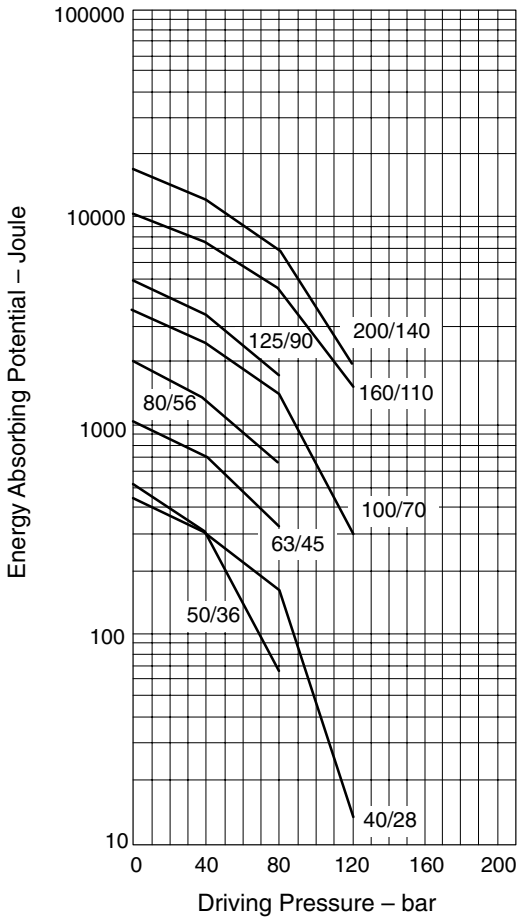
TV Rod Cushion - Rod Extending Second Rod



TV Cap Cushion - Rod Retracting Third Rod



TV Rod Cushion - Rod Extending Third Rod



Weights

The following table lists approximate net weights of Series TV cylinders.

Weights shown are based on cylinders with standard rod diameter and single rod end. All weights are expressed in kilograms.

Double rod cylinder weight is equal to 1,15 times chart weight plus weight due to stroke.

Approximate Cylinder Weights

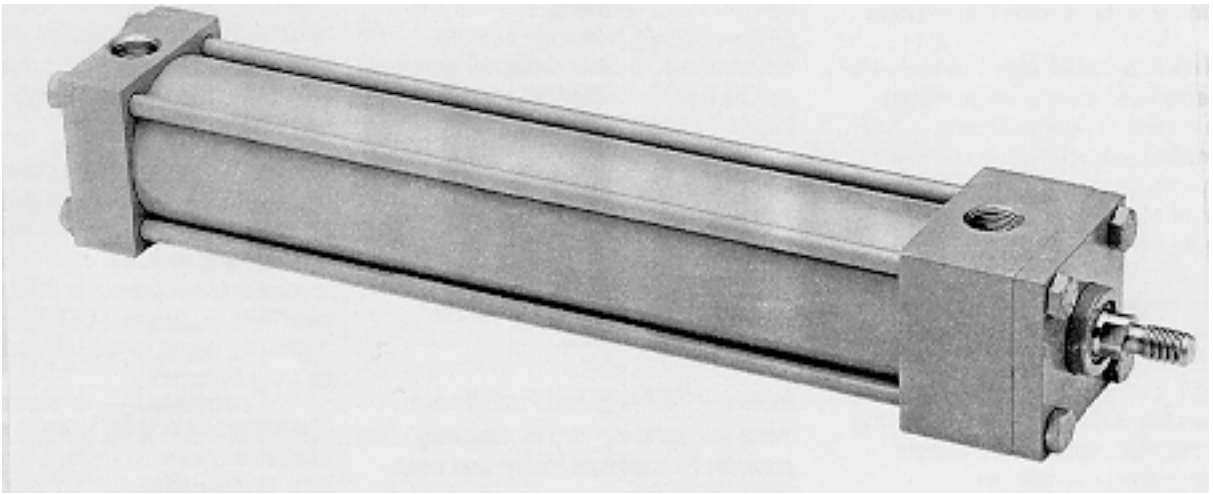
Bore ∅ (mm)	Rod ∅ (mm)	Zero Length Weight (kg) TV11 TV21 TV22	TV01 TV04 TV10 TV47	TV09 TV14 TV15	TV16 TV17 TV23	Single Rod Weight per mm of Stroke (kg)	Double Rod Weight per mm of Stroke (kg)
25	12	1,2	1,2	1,7	1,2	0,004	0,005
32	14	1,6	1,6	2,2	1,6	0,006	0,007
40	18	3,5	3,7	4,9	3,6	0,009	0,011
50	22	5,3	5,5	7,3	5,5	0,013	0,016
63	28	7,4	7,8	10,4	7,7	0,019	0,024
80	36	14,2	14,9	19,9	14,7	0,031	0,039
100	45	19,2	20,2	26,9	20,0	0,046	0,058
125	56	37,6	39,5	47,4	39,1	0,074	0,093
160	70	61,6	64,7	77,6	64,0	0,113	0,143
200	90	113,0	118,6	142,4	117,5	0,158	0,208

Vickers®

Cylinders

Series TE/TF/TL Cylinders

Nominal Pressure: 250 psi Air / 1000 psi Hydraulic



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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.

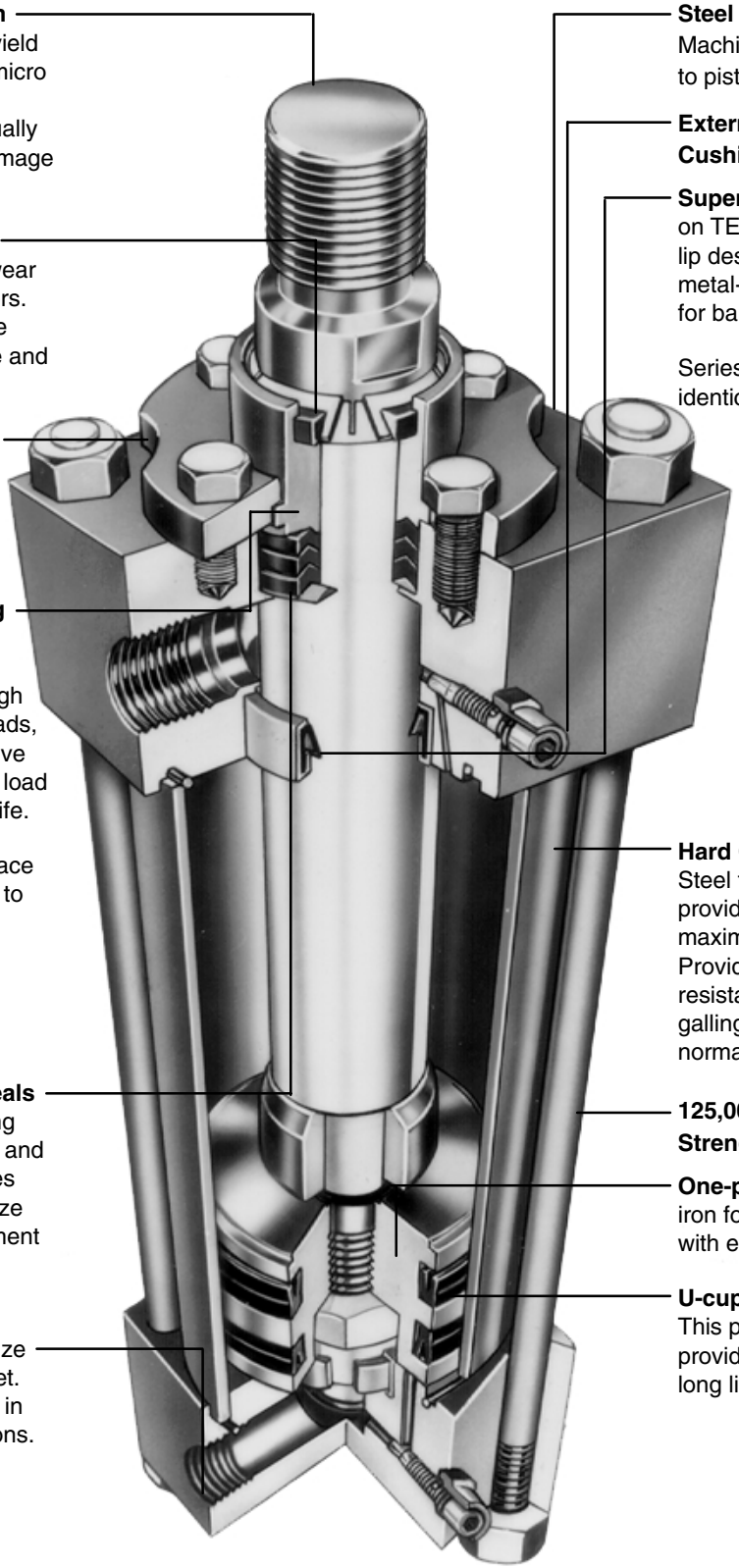
QC-100 Quick-change Rod Bearing Assembly permits easy replacement of rod seals without disassembling cylinder.

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

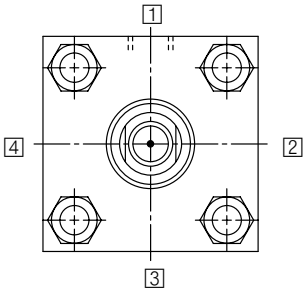
5 Bore size (in inches)

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

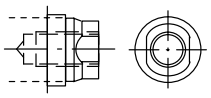
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

7 Rod size and rod end type

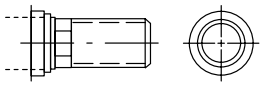
Bore size (inch)	Rod size (inch)	Code (for rod size *and* rod end type) "2" rod end type	"4" rod end type	"5" rod end type	"6" rod end type
1 1/2	5/8	**A**	**B**	**C**	**D**
	1*	**E**	**F**	**G**	**H**
2	5/8	**A**	**B**	**C**	**D**
	1	**E**	**F**	**G**	**H**
	1 3/8	**J**	**K**	**L**	**M**
2 1/2	5/8	**A**	**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.

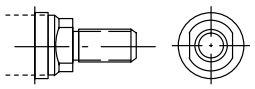
Type 2 rod end
Short female UN thread



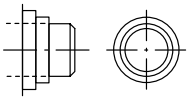
Type 4 rod end
Full male UN thread



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.)

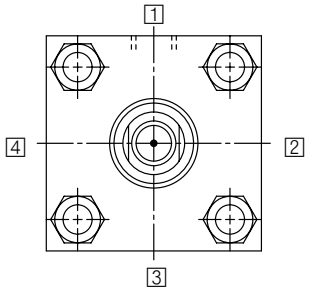
TE 01 E A C A 3 A A 108 00

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

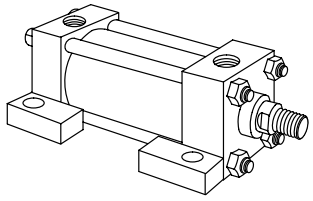
Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. All mounts are designed to absorb the full rated force of the cylinder when properly applied. For applications where the motion 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

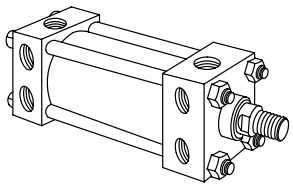
The variety of standard ANSI and NFPA mountings available gives you a broad selection to match the proper mount to your application. Vickers offers rigid mounts (including side lug, flange, and extended tie rod) and swivel mounts (including clevis and trunnion). A guide to proper mount selection is provided 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

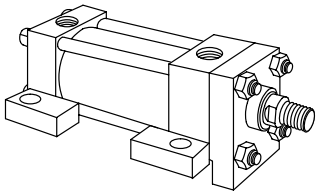
Code 01
Side lug
ANSI MS2



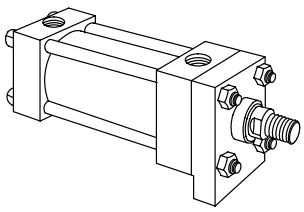
Code 02
Tapped
ANSI MS4



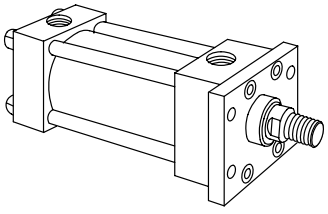
Code 04
Keyed side lug



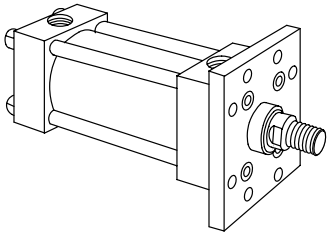
Code 05
Keyed tapped



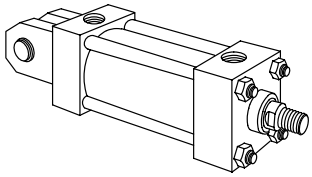
Code 07
Head rectangular flange
ANSI MF1 & ME3



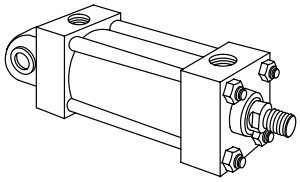
Code 08
Rod end square flanged
ANSI MF5



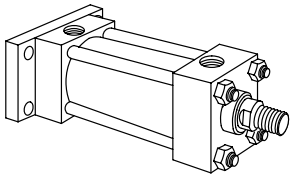
Code 10
Cap clevis
ANSI MP1



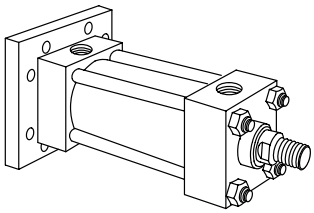
Code 11
Spherical bearing



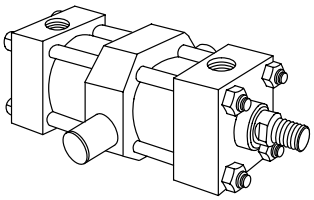
Code 12
Cap rectangular flange
ANSI MF2 & ME4



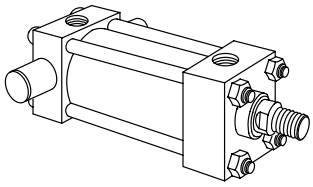
Code 13
Cap square flange
ANSI MF6



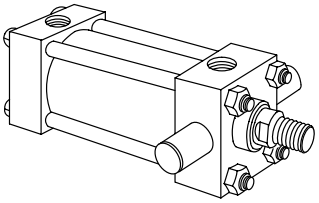
Code 15
Intermediate trunnion
ANSI MT4



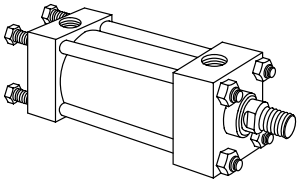
Code 16
Cap trunnion
ANSI MT2



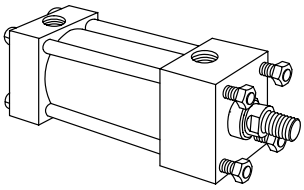
Code 17
Head trunnion
ANSI MT1



Code 21
Cap extended tie rod
ANSI MX2



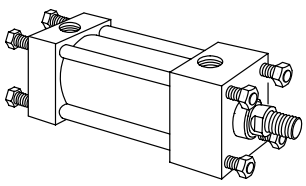
Code 22
Head extended tie rod
ANSI MX3



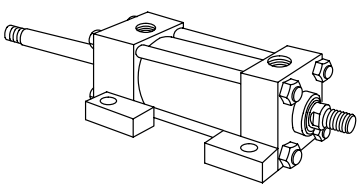
Mounting Styles Not Shown:

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

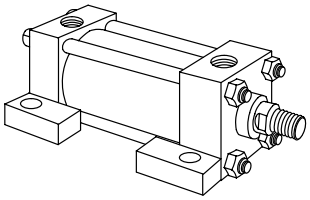


Code 25
Double rod, side lug

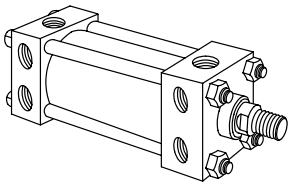


Application Guide for Mountings

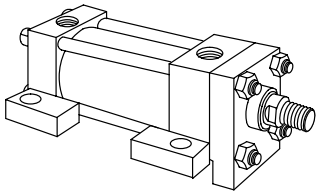
Code 01 Side Lug (ANSI MS2)



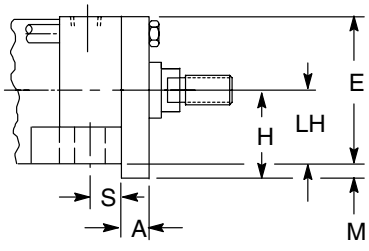
Code 02 Tapped



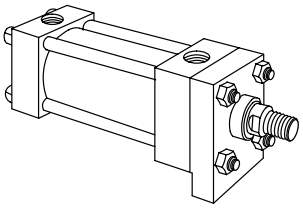
Code 04 Keyed Side Lug



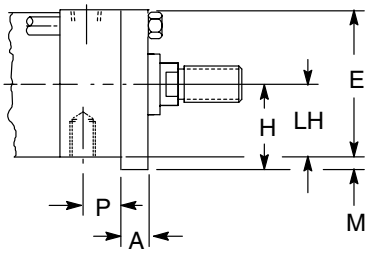
The drawing below shows the modification of a Code 01 mount to convert it to a Code 04. Use drawings for Code 01, pages 16–39, for dimensions not shown.



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).

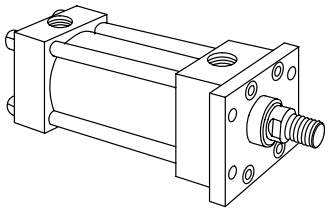
For severe side load applications, consult your local Vickers sales engineer.

See individual bore size drawings for maximum allowable pressure ratings.

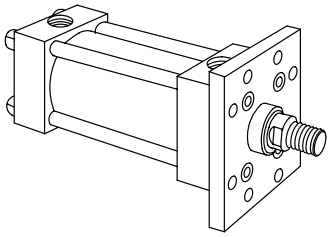
NOTE

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.

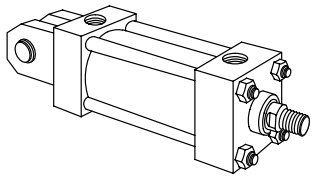
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

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.

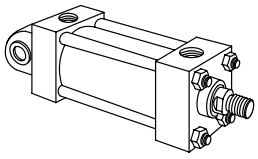
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excessive side loading on the bearing and piston. This will lead to premature failure. For applications 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

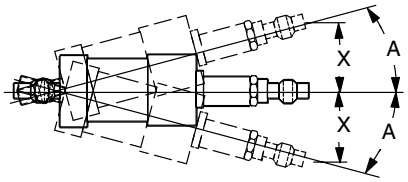
Code 11 Spherical Bearing



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.

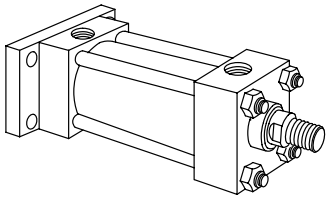
To find the maximum recommended X distance, multiply the distance between pivot mounting holes (see bore size drawing) by the tangent of angle A.

NOTE

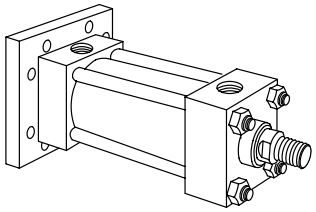
For strokes in excess of 24", see "Stop tube selection" on page 50.

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.

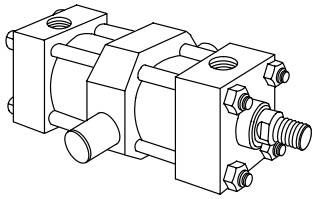
The cap square flange mount (code 13) is recommended for heavy duty applications.

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.

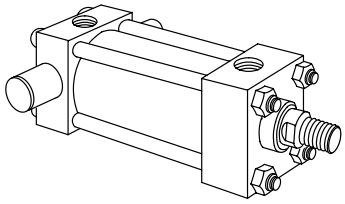
This mount can be used both in compression (push) and tension (pull) applications.

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.

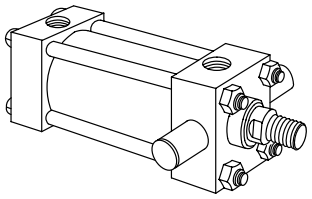
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

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.

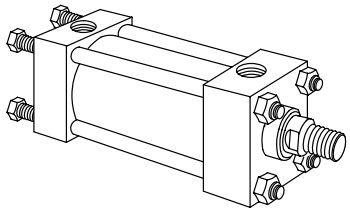
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

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.

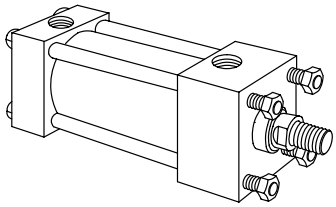
Bore dia. (inch)	**Tie rods** **Dia.** (inch)	**Torque** (ft. lbs.)
1 1/2	1/4	8
2, 2 1/2	5/16	16
3 1/4, 4	3/8	28
5, 6, 7, 8	1/2	66
10, 12	5/8	150
14	3/4	225

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.

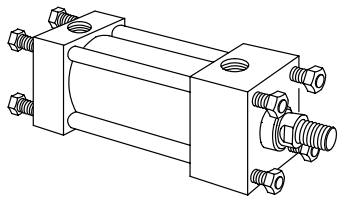
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on the previous page.

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.

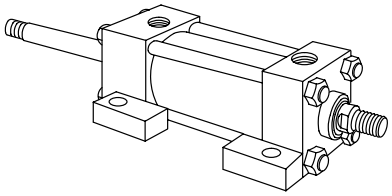
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on page 14.

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)

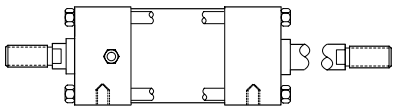


Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod.

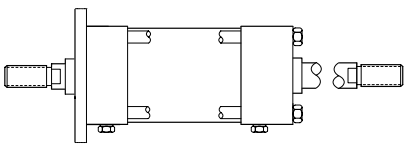
The single rod mount application data is also applicable to double rod cylinders.

In addition to the side lug mount illustrated above, the following mounts are also available for double rod end cylinders.

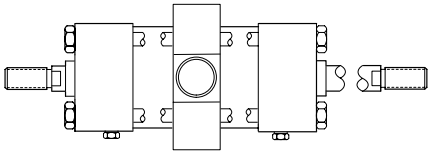
Code 26 Double Rod, Tapped



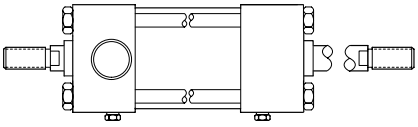
Code 31 Double Rod, Rectangular Flange and Code 32 Double Rod, Square Flange



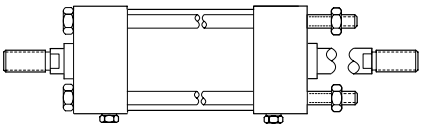
Code 34 Double Rod, Intermediate Trunnion



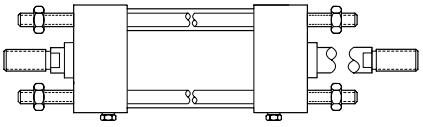
Code 35 Double Rod, Head Trunnion



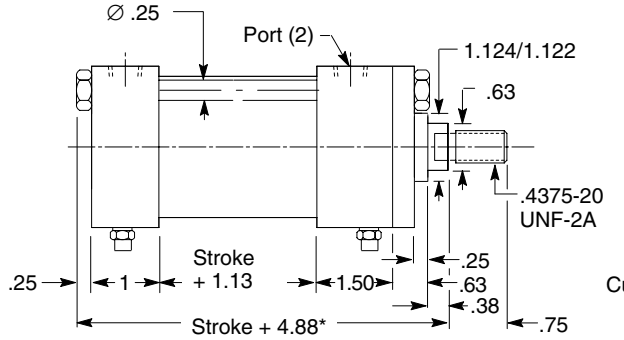
Code 39 Double Rod, Head Extended Tie Rod

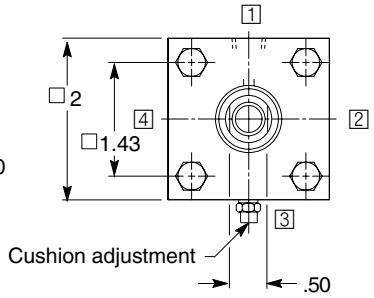


Code 40 Double Rod, Both Ends Extended Tie Rod



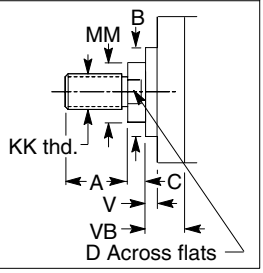
1 1/2 inch Cylinder Bore



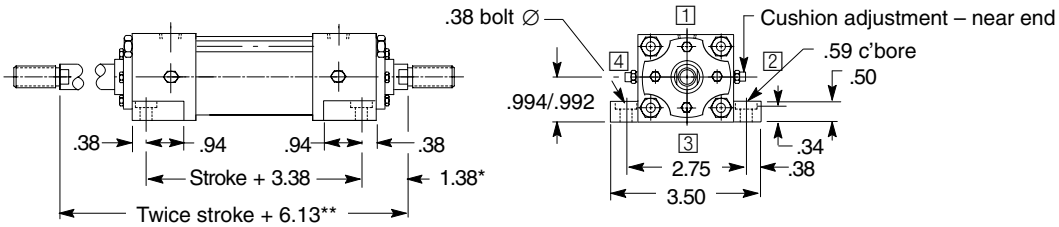


CODE 24 BASIC CYLINDER

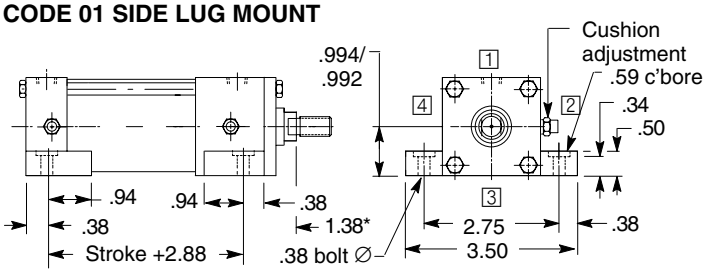
ALTERNATE ROD SIZES AVAILABLE	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *. N*	A	B	C	D	VB	V	KK thd.
(in inches)	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A



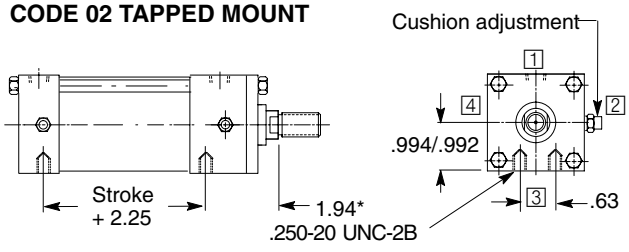
CODE 25 DOUBLE ROD SIDE LUG MOUNT



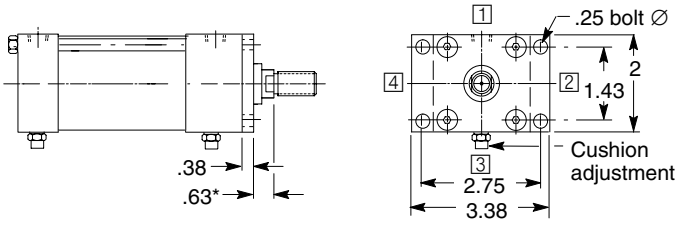
CODE 01 SIDE LUG MOUNT



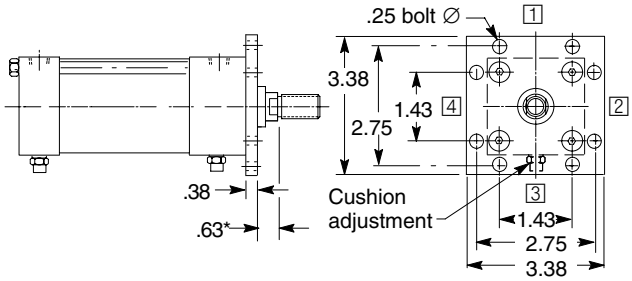
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

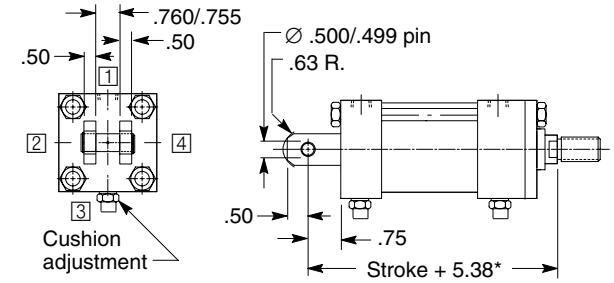


CODE 08 HEAD SQUARE FLANGE MOUNT

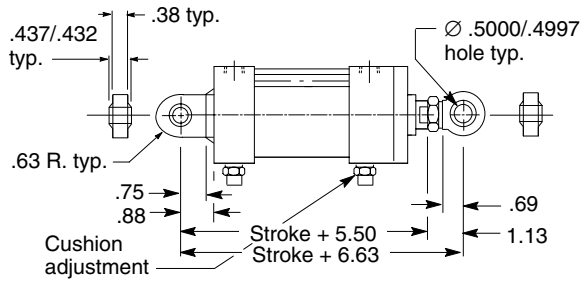


†Maximum working pressure 800 PSI (for minimum flange deflection)

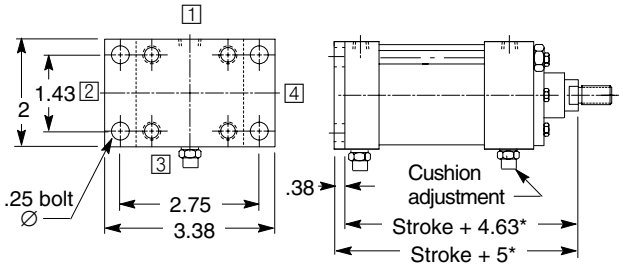
CODE 10 CLEVIS MOUNT



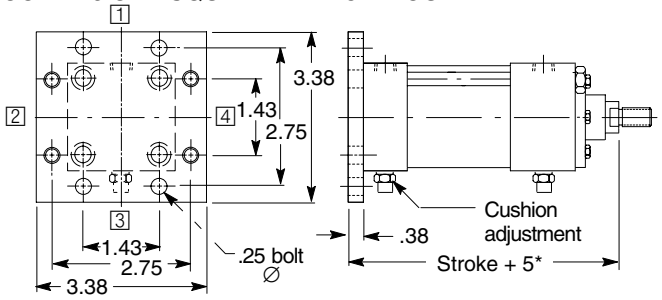
CODE 11 SPHERICAL BEARING MOUNT



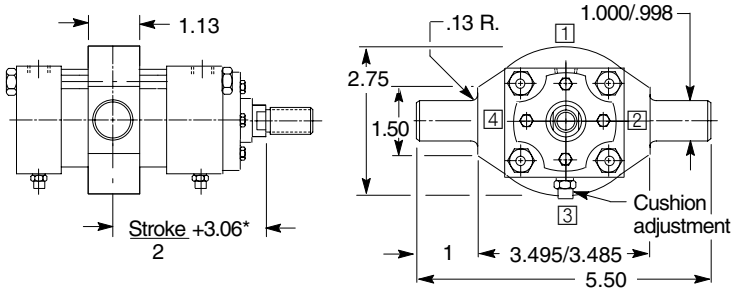
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



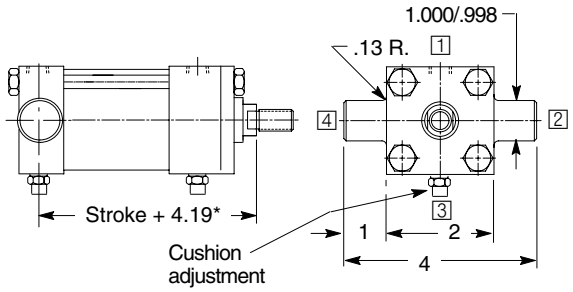
CODE 13 CAP SQUARE FLANGE MOUNT



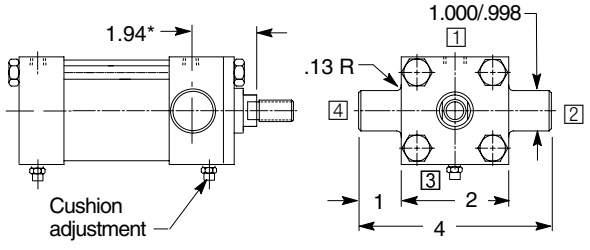
CODE 15 INTERMEDIATE TRUNNION MOUNT



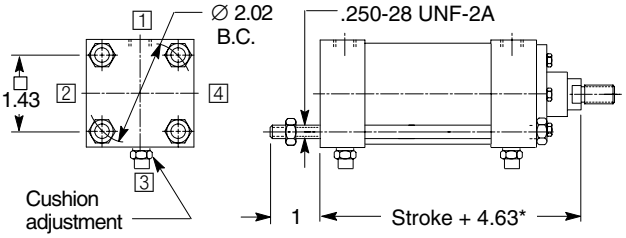
CODE 16 CAP TRUNNION MOUNT



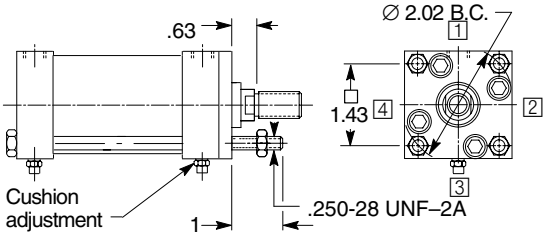
CODE 17 HEAD TRUNNION MOUNT



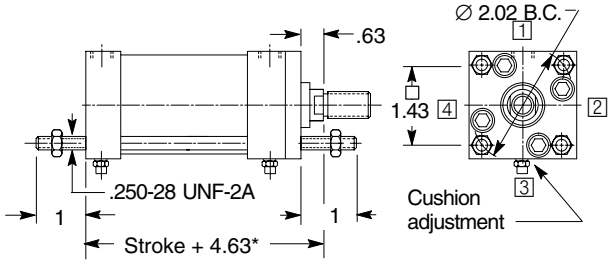
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

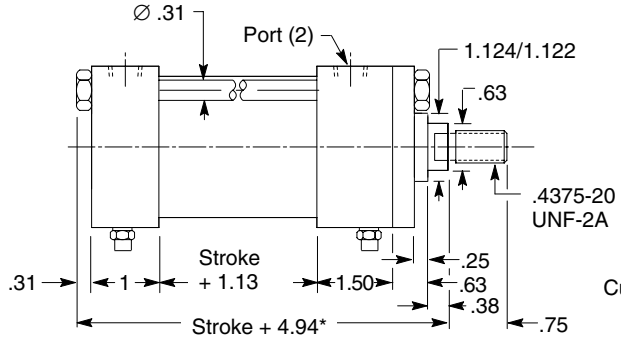


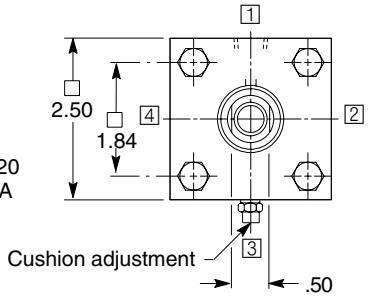
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

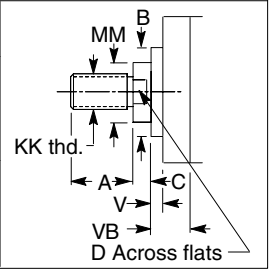
2 inch Cylinder Bore



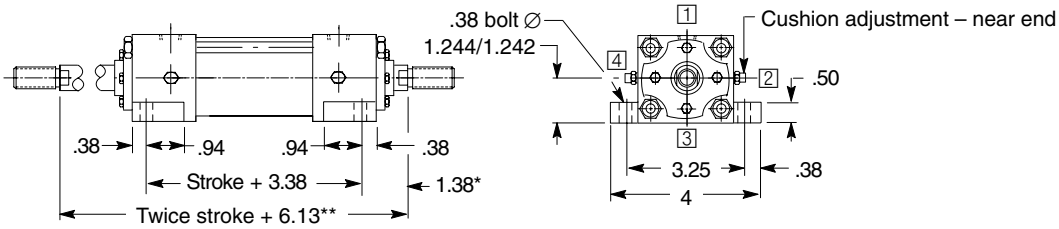


CODE 24 BASIC CYLINDER

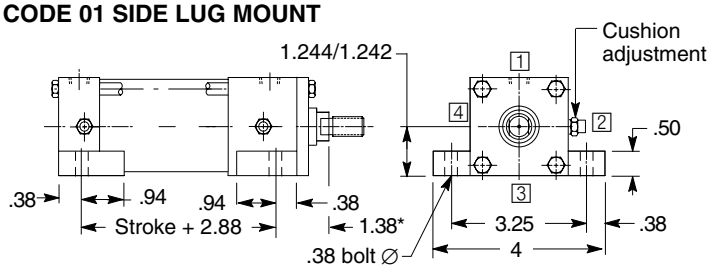
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *. N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1 3/8	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A



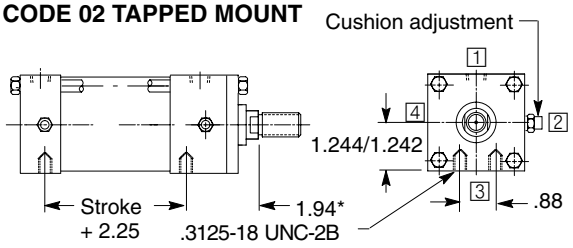
CODE 25 DOUBLE ROD SIDE LUG MOUNT



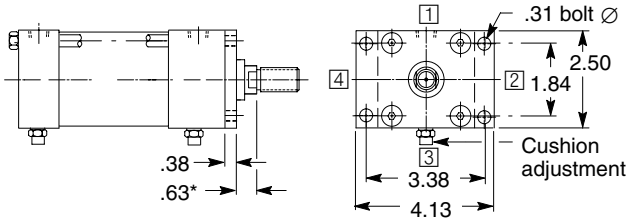
CODE 01 SIDE LUG MOUNT



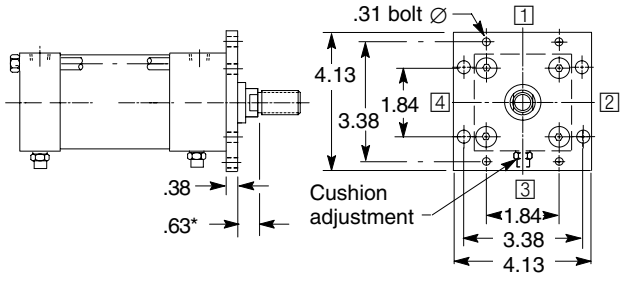
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

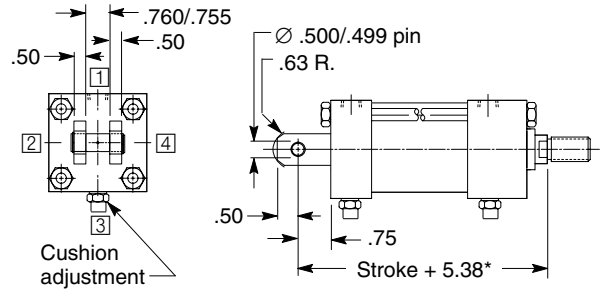


CODE 08 HEAD SQUARE FLANGE MOUNT

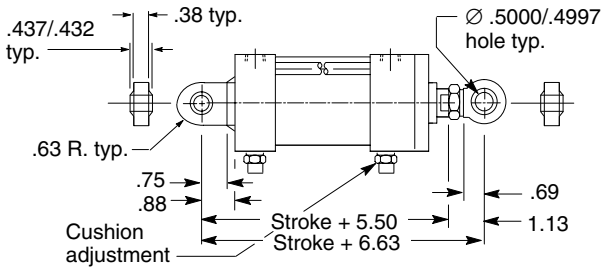


†Maximum working pressure 800 PSI (for minimum flange deflection)

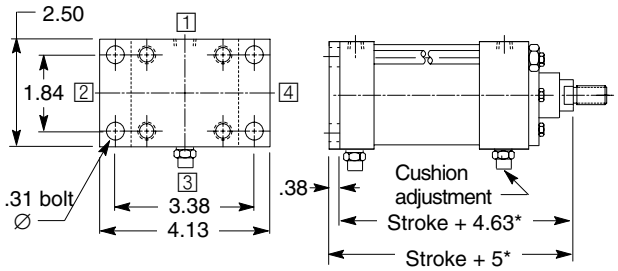
CODE 10 CLEVIS MOUNT



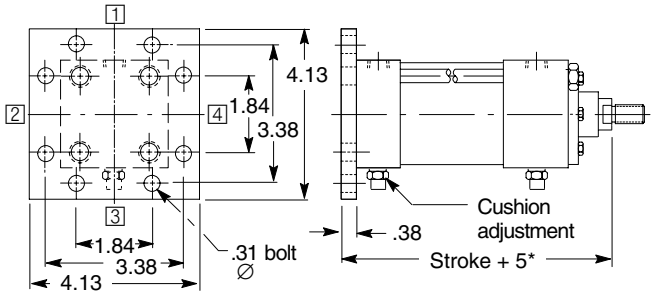
CODE 11 SPHERICAL BEARING MOUNT



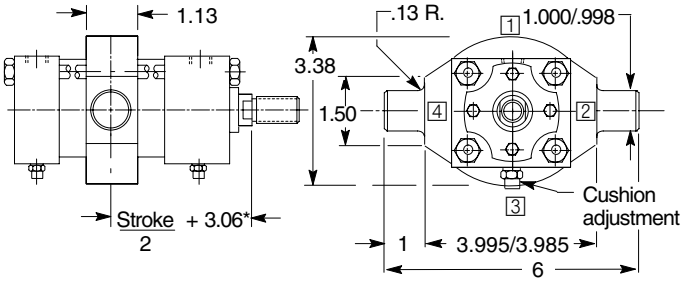
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



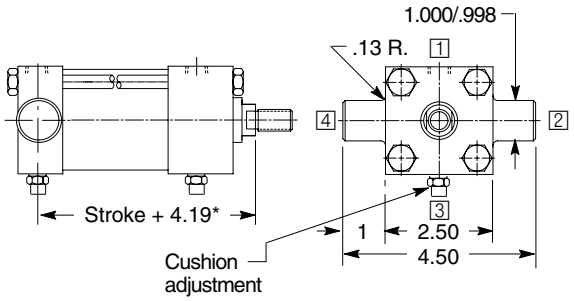
CODE 13 CAP SQUARE FLANGE MOUNT



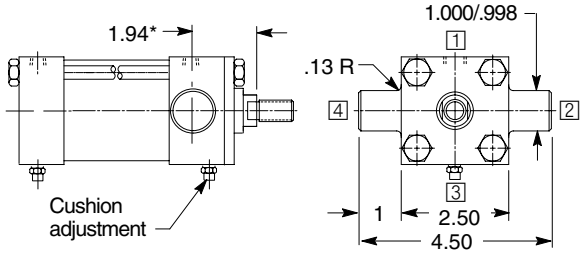
CODE 15 INTERMEDIATE TRUNNION MOUNT



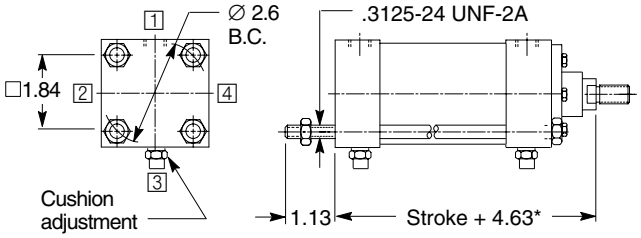
CODE 16 CAP TRUNNION MOUNT



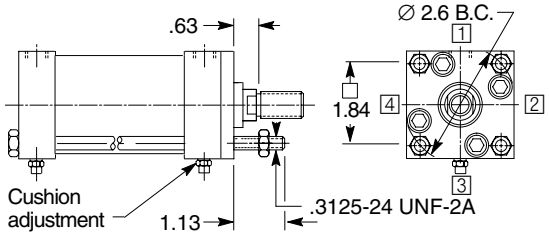
CODE 17 HEAD TRUNNION MOUNT



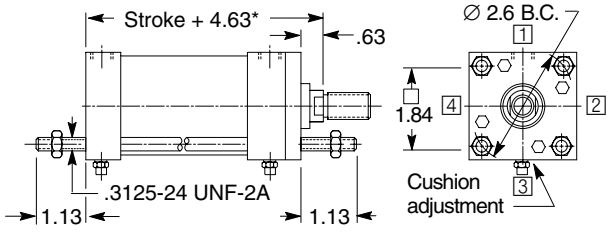
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

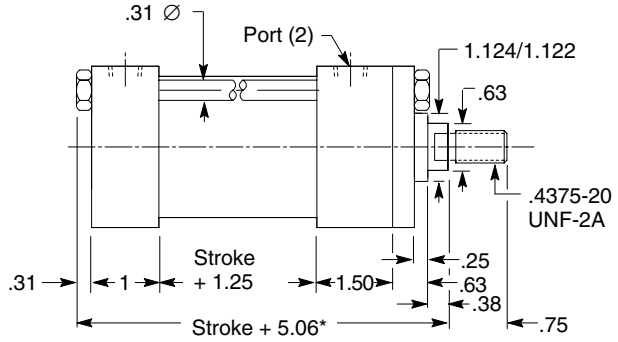


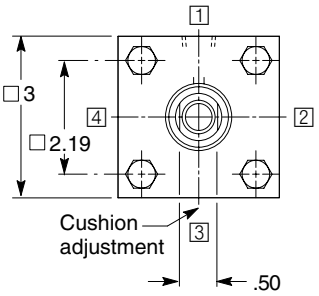
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

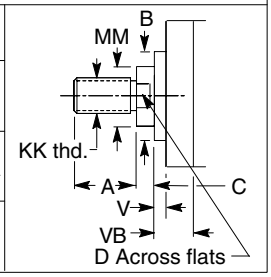
2 1/2 inch Cylinder Bore



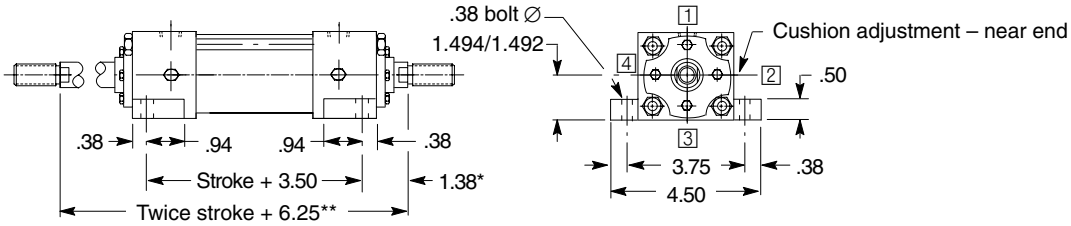


CODE 24 BASIC CYLINDER

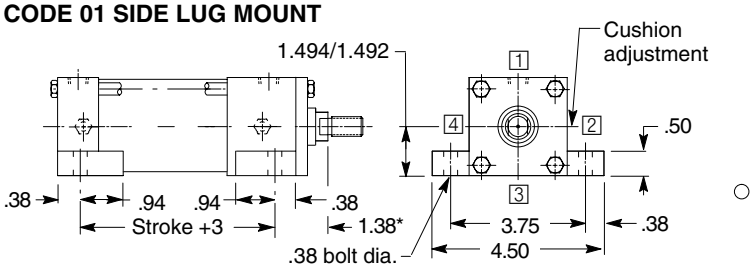
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1.38	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A
	1.75	.88	2	2.374/ 2.372	.75	1.50	1.13	.75	1.250–12 UNF–2A



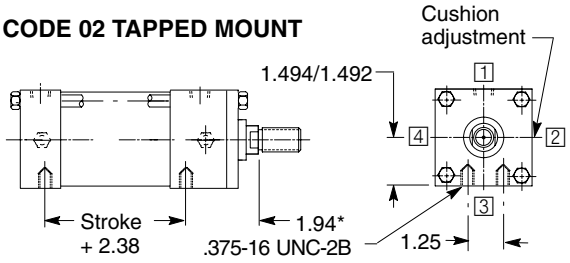
CODE 25 DOUBLE ROD SIDE LUG MOUNT



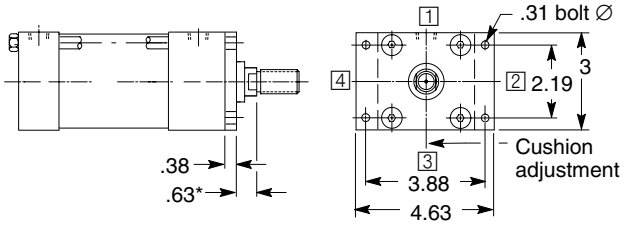
CODE 01 SIDE LUG MOUNT



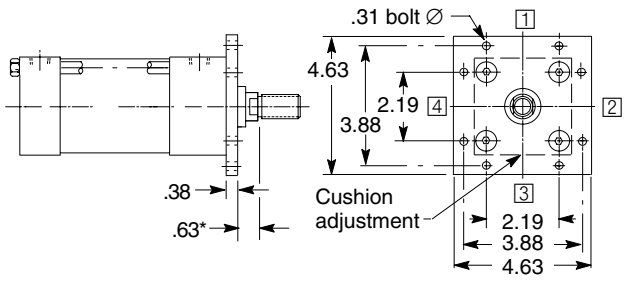
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

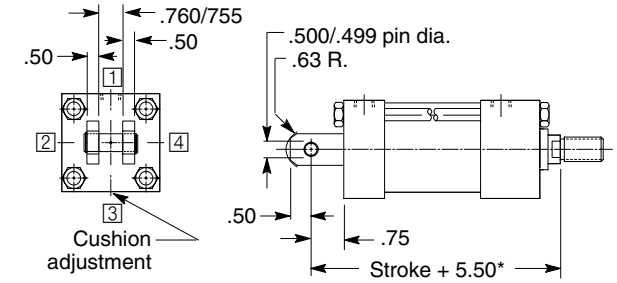


CODE 08 HEAD SQUARE FLANGE MOUNT

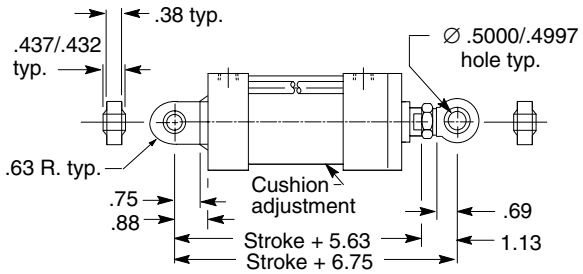


†Maximum working pressure 800 PSI (for minimum flange deflection)

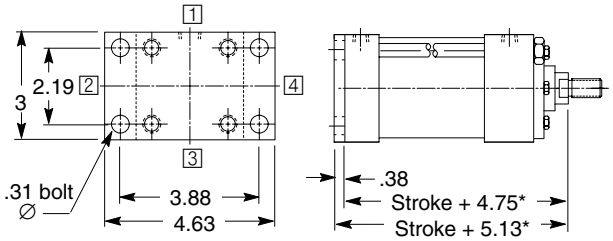
CODE 10 CLEVIS MOUNT



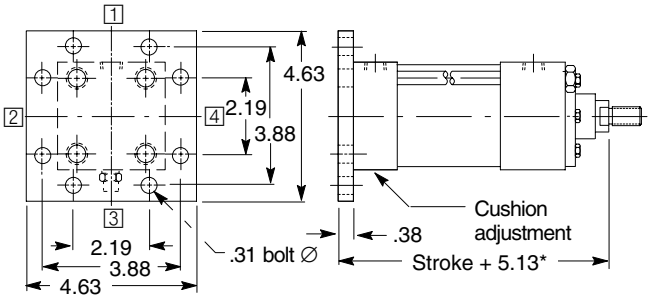
CODE 11 SPHERICAL BEARING MOUNT



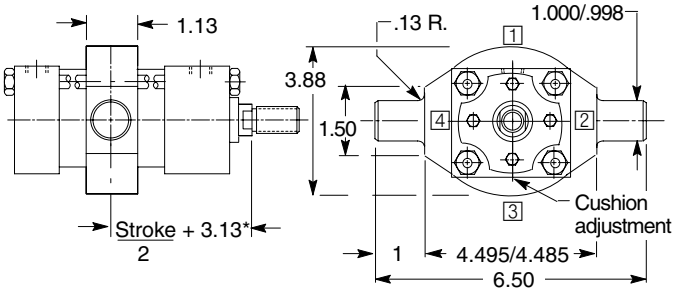
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



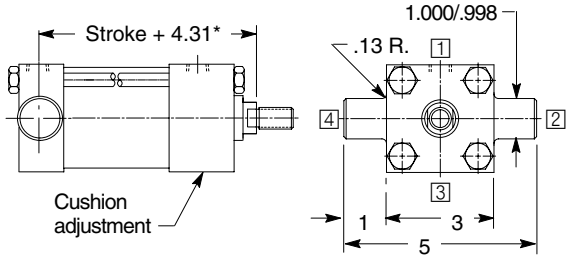
CODE 13 CAP SQUARE FLANGE MOUNT



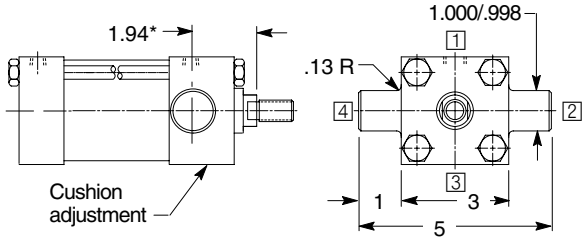
CODE 15 INTERMEDIATE TRUNNION MOUNT



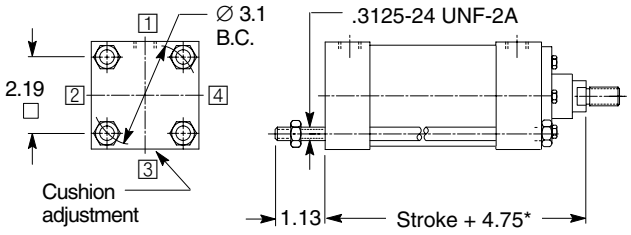
CODE 16 CAP TRUNNION MOUNT



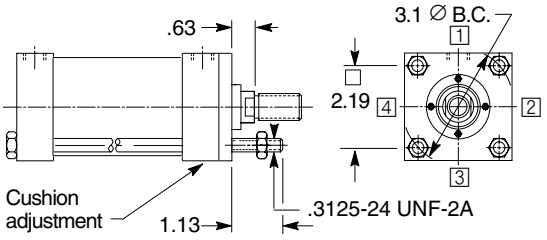
CODE 17 HEAD TRUNNION MOUNT



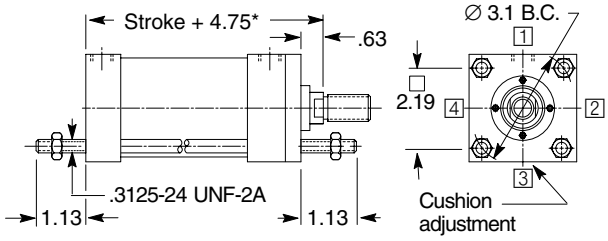
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

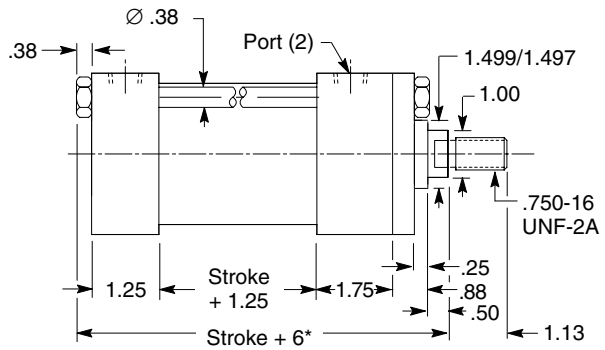


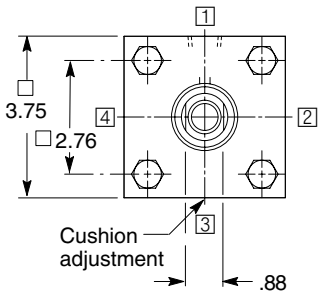
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

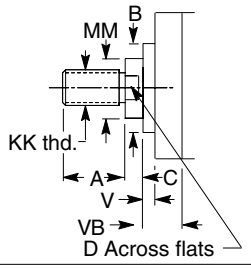
3 1/4 inch Cylinder Bore



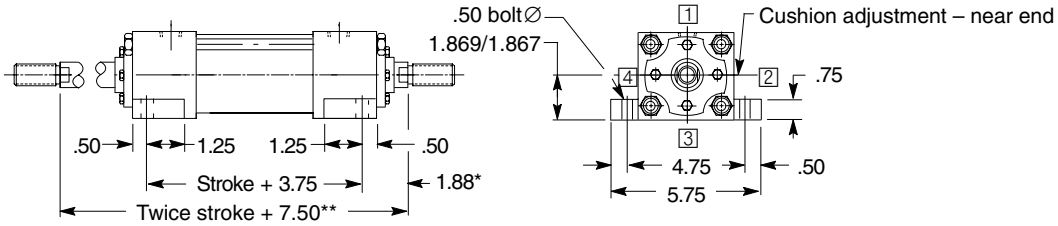


CODE 24 BASIC CYLINDER

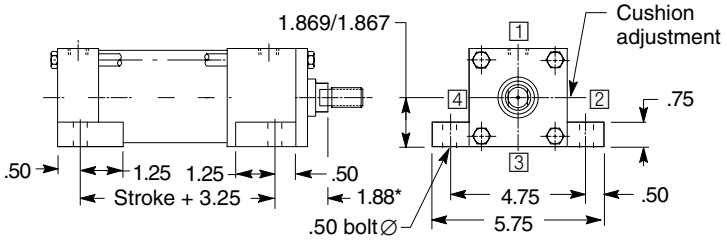
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624/ 2.622	.88	1.69	1.13	.50	1.500–16 UNF–2A



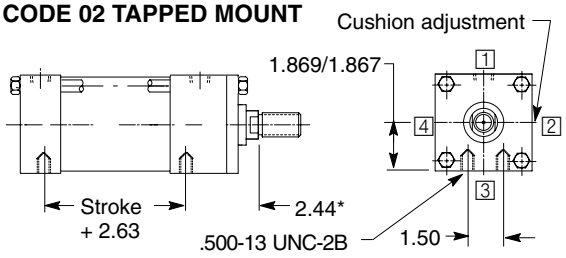
CODE 25 DOUBLE ROD SIDE LUG MOUNT



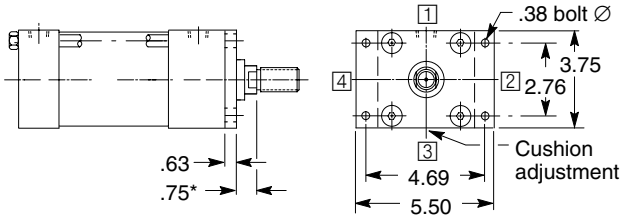
CODE 01 SIDE LUG MOUNT



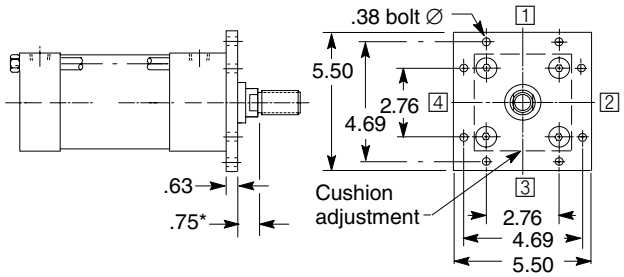
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

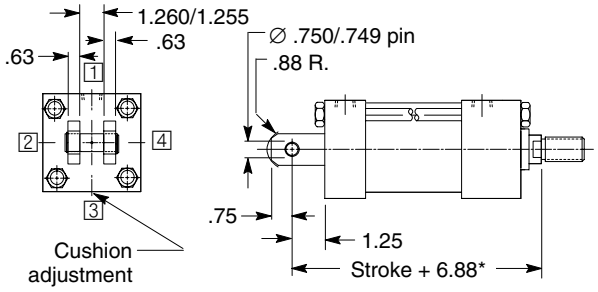


CODE 08 HEAD SQUARE FLANGE MOUNT

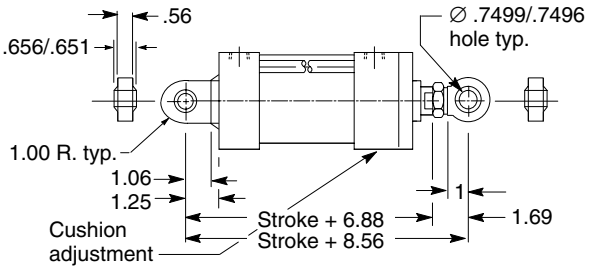


†Maximum working pressure 800 PSI (for minimum flange deflection)

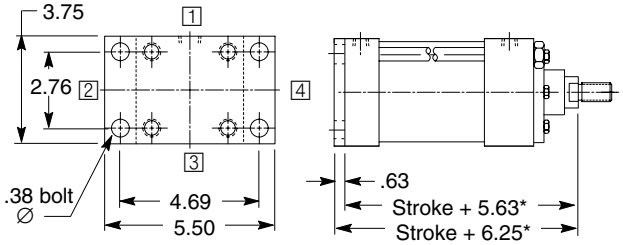
CODE 10 CLEVIS MOUNT



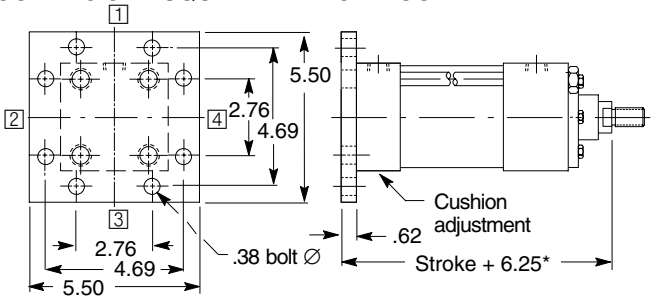
CODE 11 SPHERICAL BEARING MOUNT



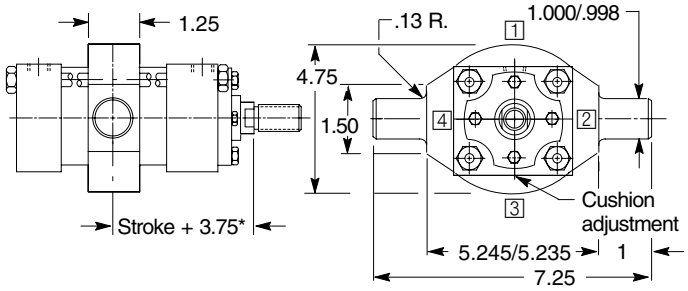
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



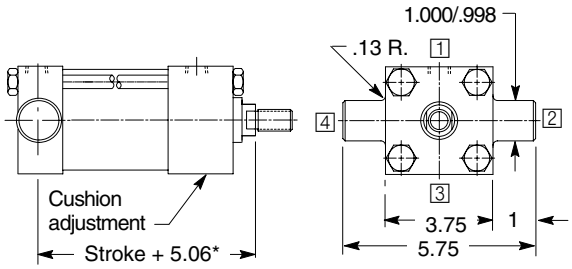
CODE 13 CAP SQUARE FLANGE MOUNT



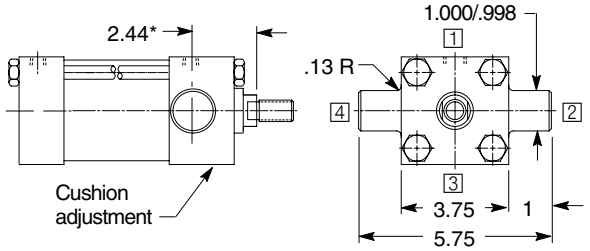
CODE 15 INTERMEDIATE TRUNNION MOUNT



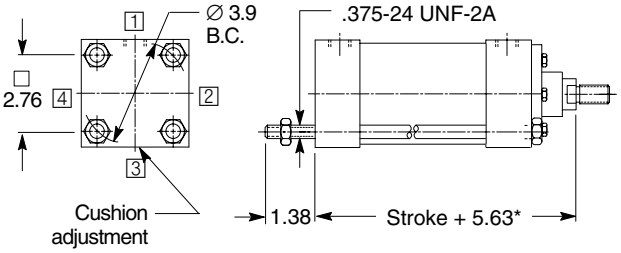
CODE 16 CAP TRUNNION MOUNT



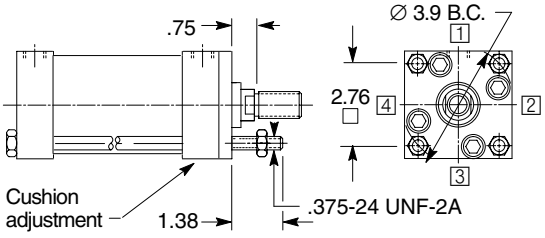
CODE 17 HEAD TRUNNION MOUNT



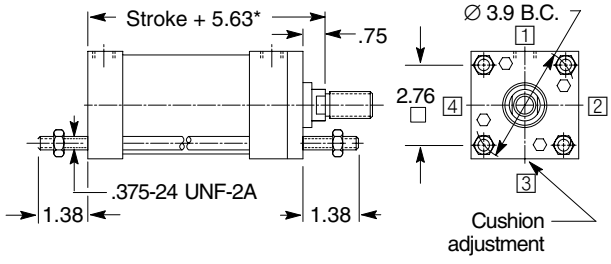
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

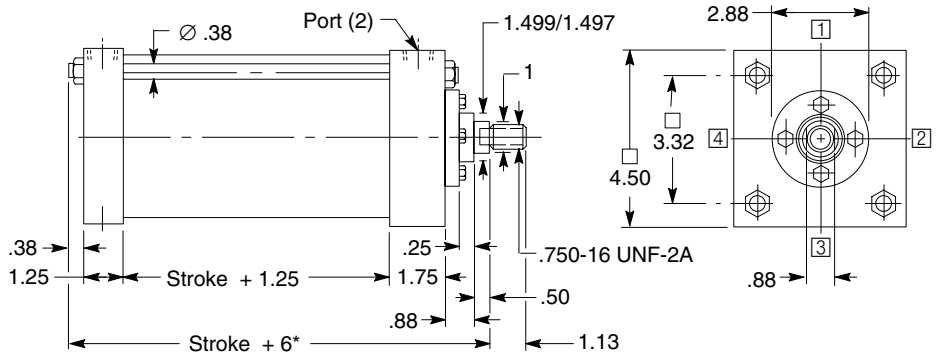


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



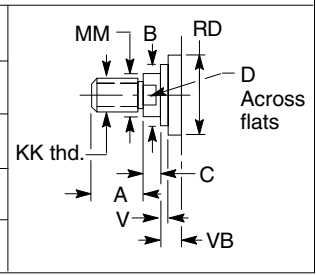
†Maximum working pressure 800 PSI (for minimum flange deflection)

4 inch Cylinder Bore

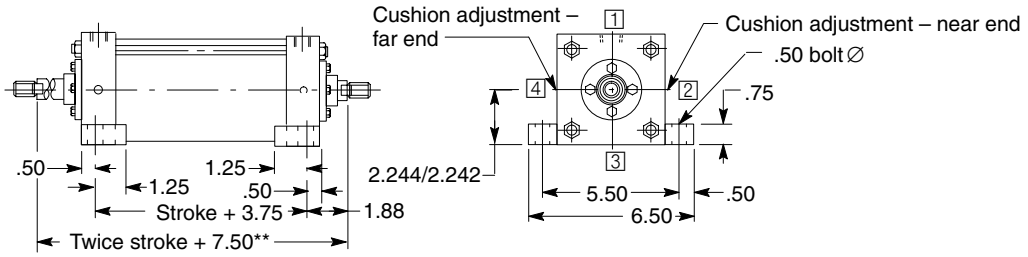


CODE 24 BASIC CYLINDER

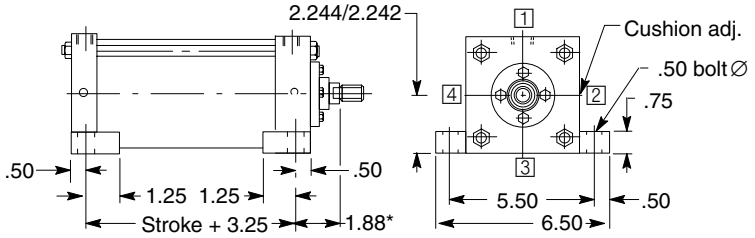
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	3.38	1.13	.50	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



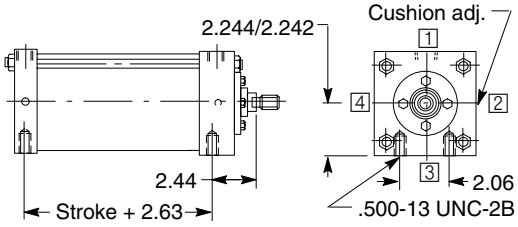
CODE 25 DOUBLE ROD SIDE LUG MOUNT



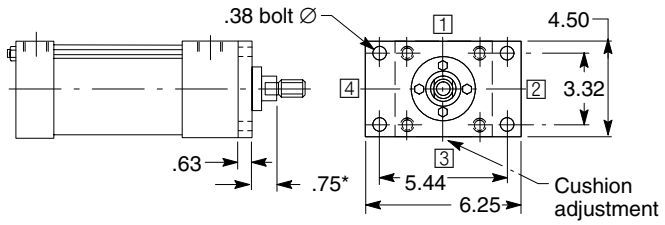
CODE 01 SIDE LUG MOUNT



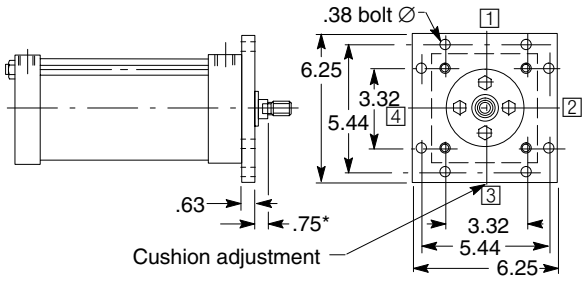
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

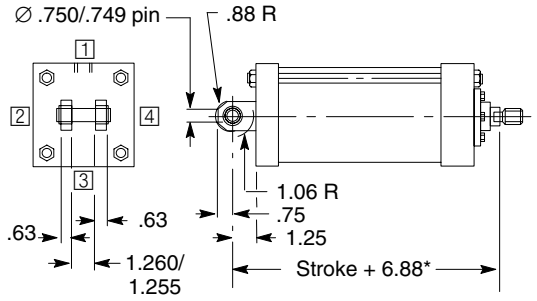


CODE 08 HEAD SQUARE FLANGE MOUNT

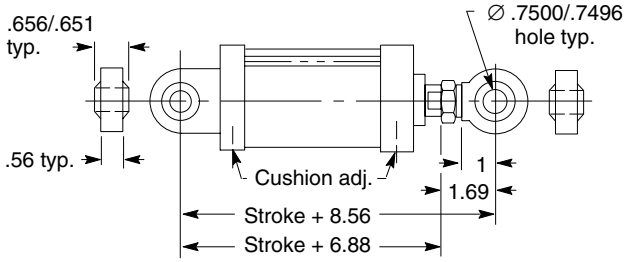


†Maximum working pressure 800 PSI (for minimum flange deflection)

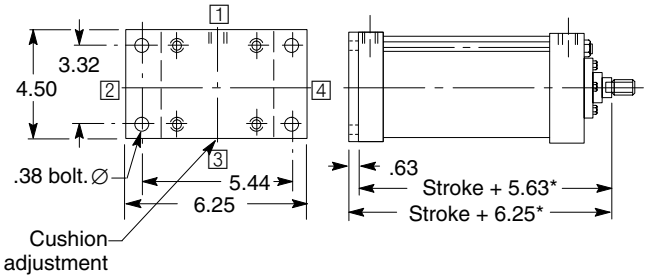
CODE 10 CLEVIS MOUNT



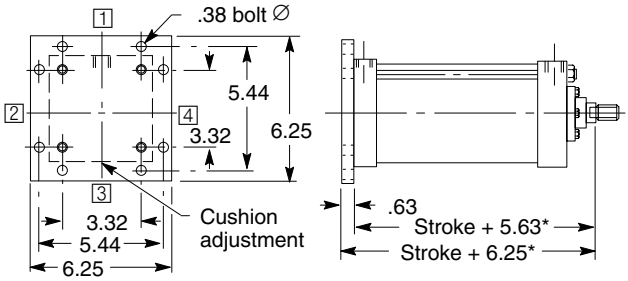
CODE 11 SPHERICAL BEARING MOUNT



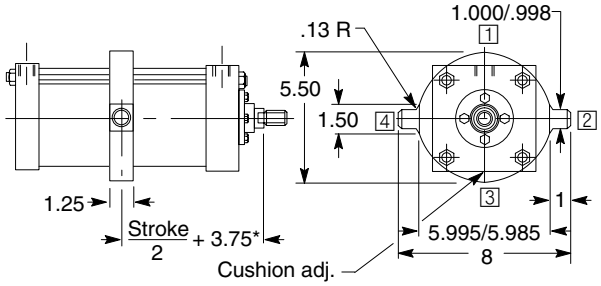
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



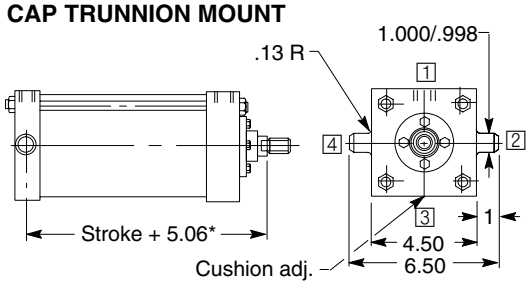
CODE 13 CAP SQUARE FLANGE MOUNT



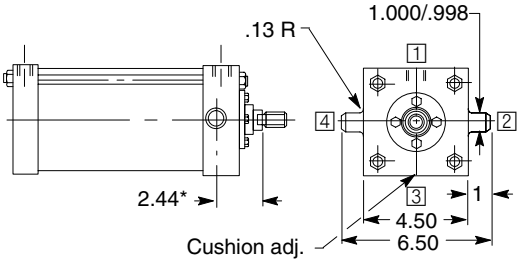
CODE 15 INTERMEDIATE TRUNNION MOUNT



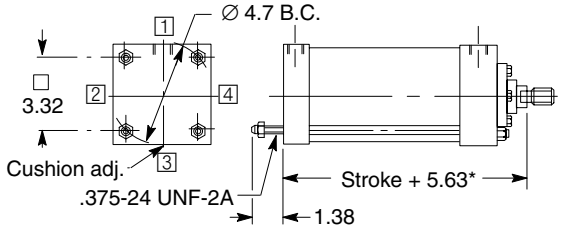
CODE 16 CAP TRUNNION MOUNT



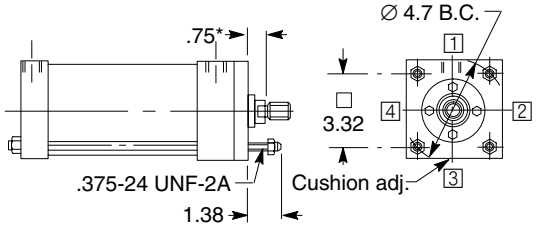
CODE 17 HEAD TRUNNION MOUNT



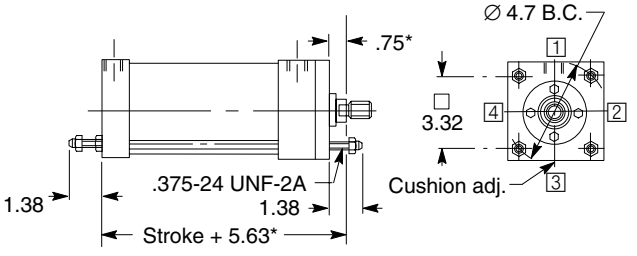
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

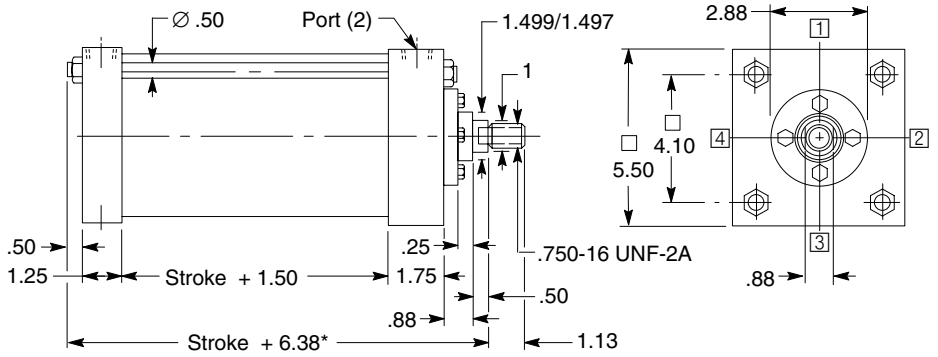


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



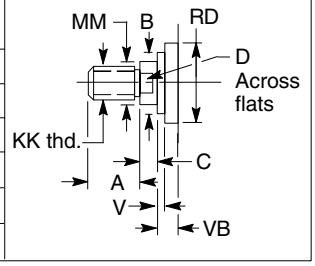
†Maximum working pressure 800 PSI (for minimum flange deflection)

5 inch Cylinder Bore

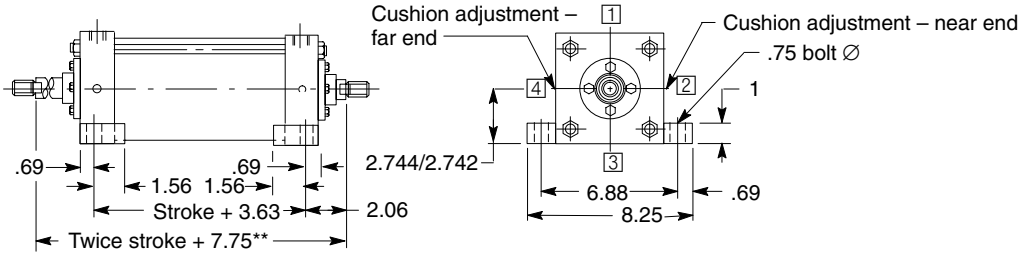


CODE 24 BASIC CYLINDER

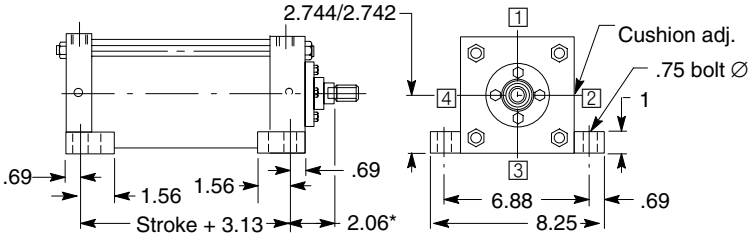
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B +.000 –.002	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374	.75	1.50	3.38	1.13	.50	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



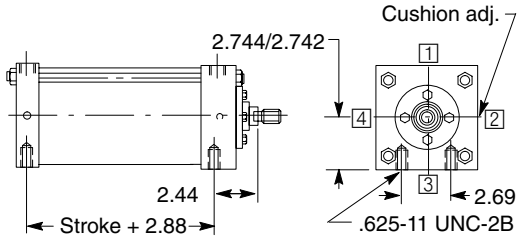
CODE 25 DOUBLE ROD SIDE LUG MOUNT



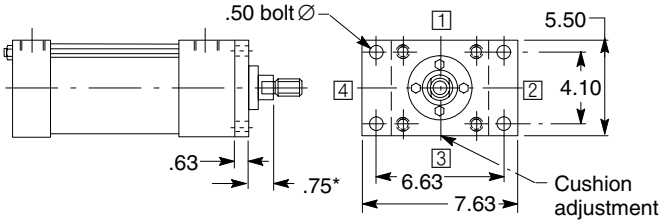
CODE 01 SIDE LUG MOUNT



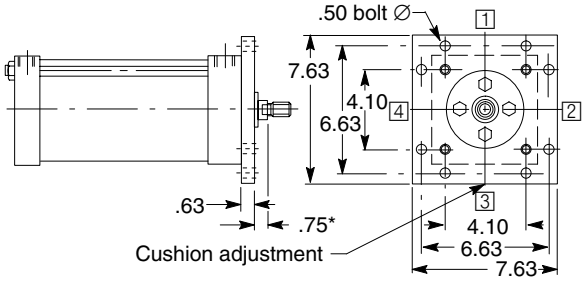
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

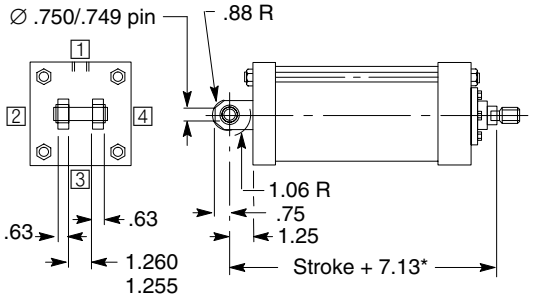


CODE 08 HEAD SQUARE FLANGE MOUNT

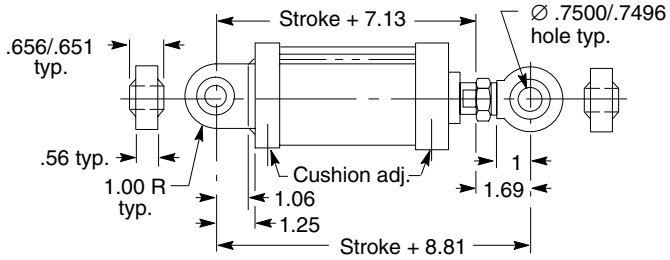


†Maximum working pressure 800 PSI (for minimum flange deflection)

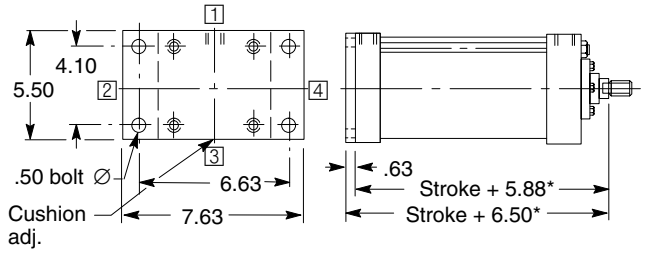
CODE 10 CLEVIS MOUNT



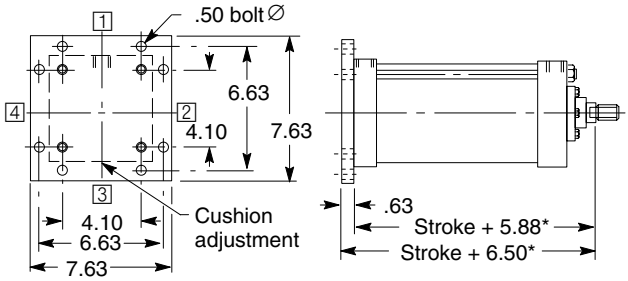
CODE 11 SPHERICAL BEARING MOUNT



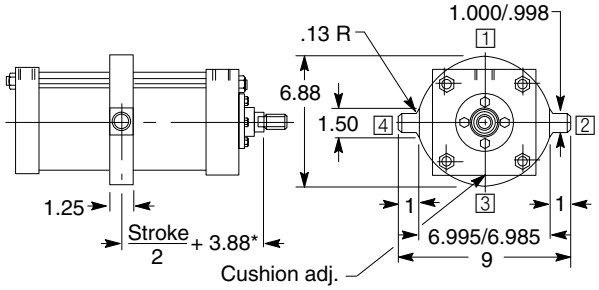
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



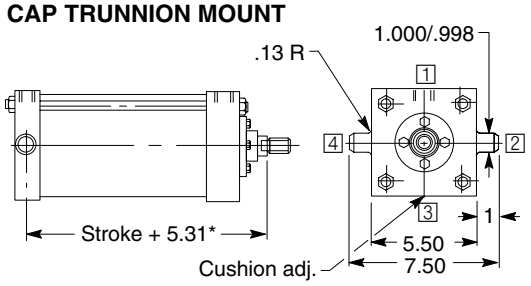
CODE 13 CAP SQUARE FLANGE MOUNT



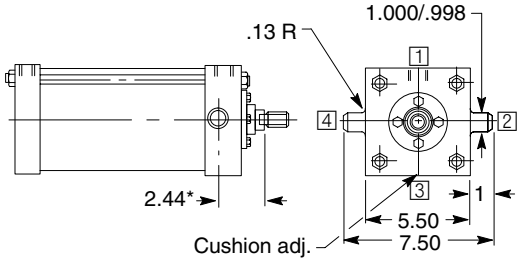
CODE 15 INTERMEDIATE TRUNNION MOUNT



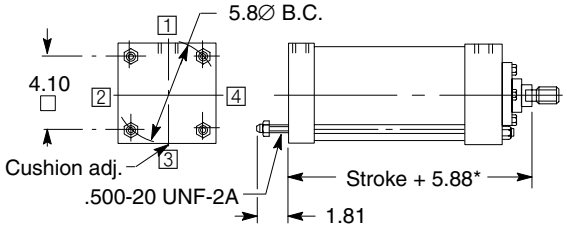
CODE 16 CAP TRUNNION MOUNT



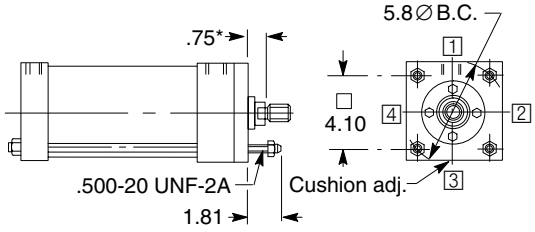
CODE 17 HEAD TRUNNION MOUNT



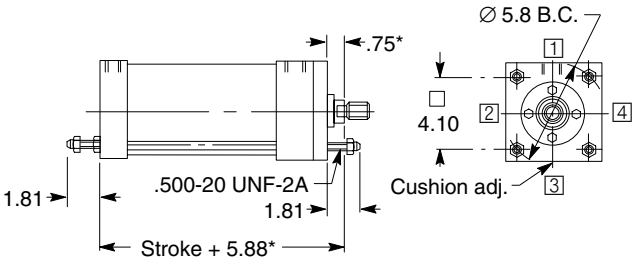
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

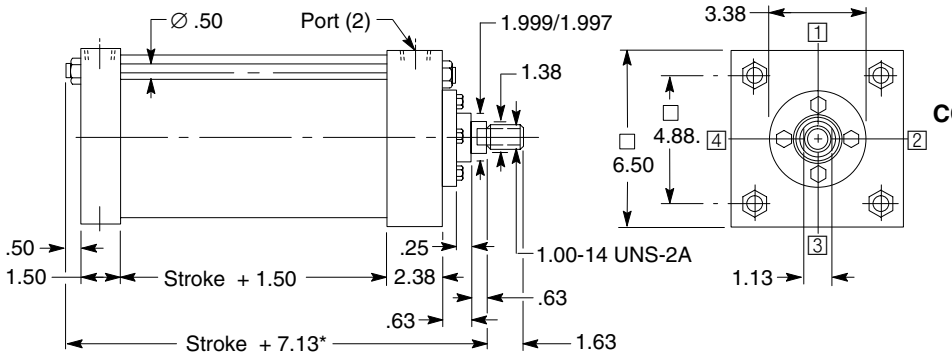


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



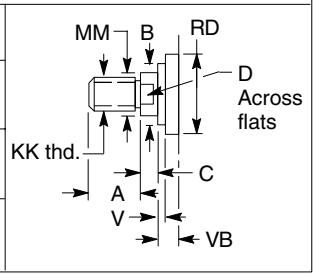
†Maximum working pressure 800 PSI (for minimum flange deflection)

6 inch Cylinder Bore

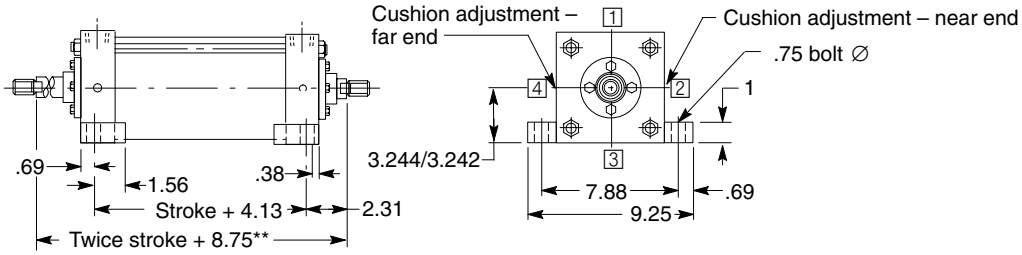


CODE 24 BASIC CYLINDER

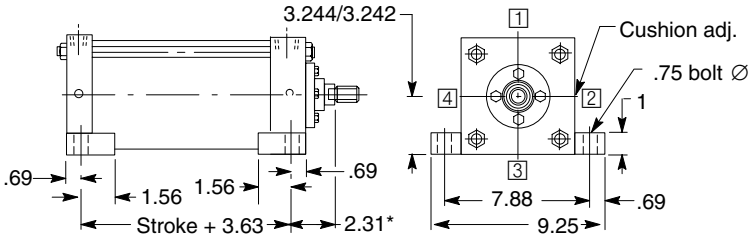
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.38	1.250–12 UNF–2A
	2 1/2	.63	3	3.124/ 3.122	1	2.06	4.50	.88	.50	1.875–12 UN–2A
	4	.63	4	4.749/ 4.746	1	3.38	6	.88	.50	3.000–12 UN–2A



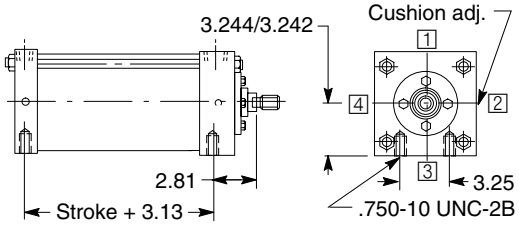
CODE 25 DOUBLE ROD SIDE LUG MOUNT



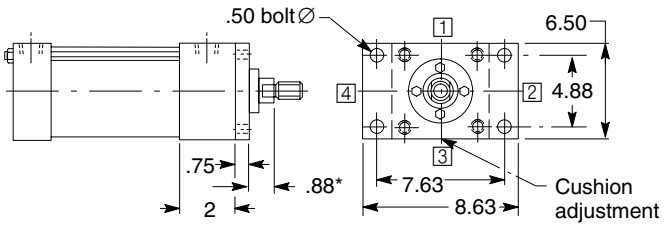
CODE 01 SIDE LUG MOUNT



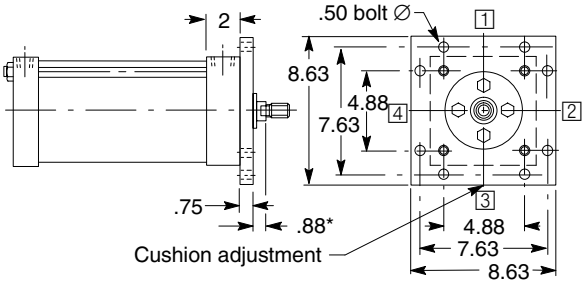
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

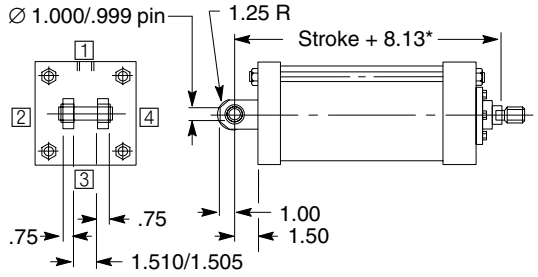


CODE 08 HEAD SQUARE FLANGE MOUNT

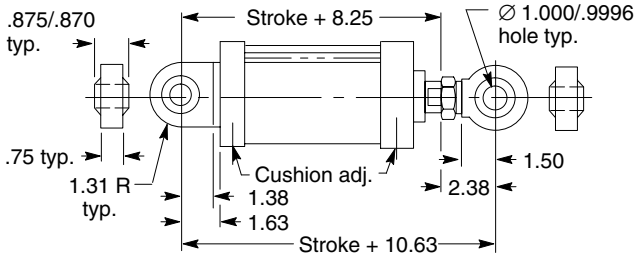


†Maximum working pressure 800 PSI (for minimum flange deflection)

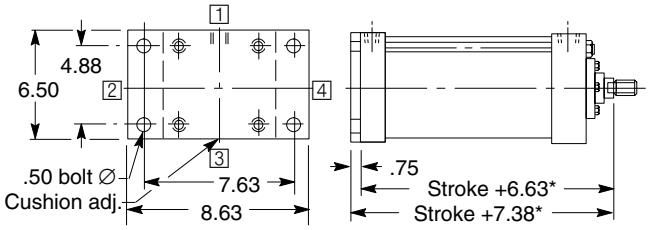
CODE 10 CLEVIS MOUNT



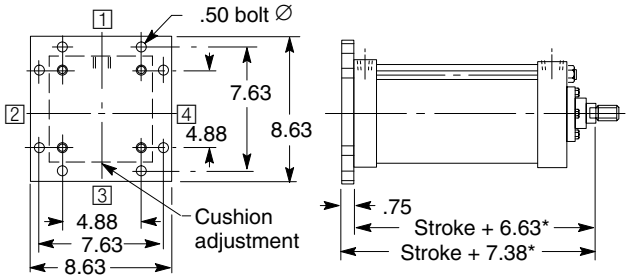
CODE 11 SPHERICAL BEARING MOUNT



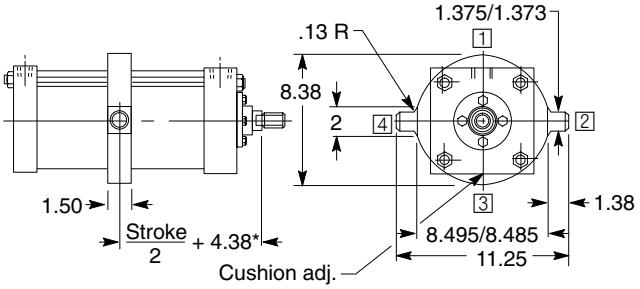
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



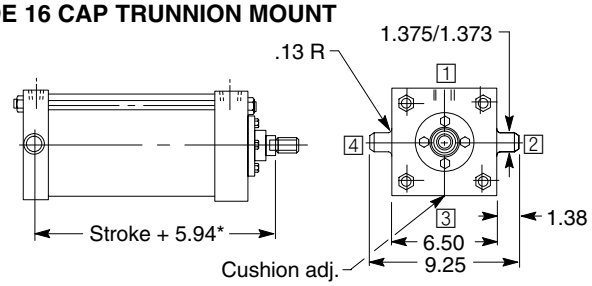
CODE 13 CAP SQUARE FLANGE MOUNT



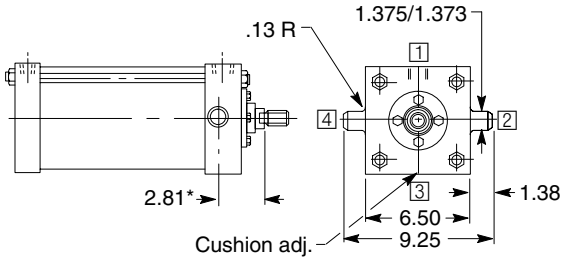
CODE 15 INTERMEDIATE TRUNNION MOUNT



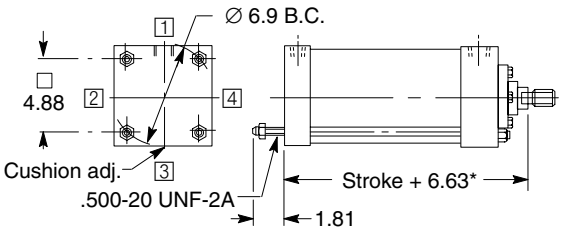
CODE 16 CAP TRUNNION MOUNT



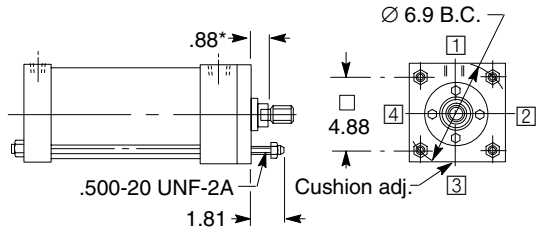
CODE 17 HEAD TRUNNION MOUNT



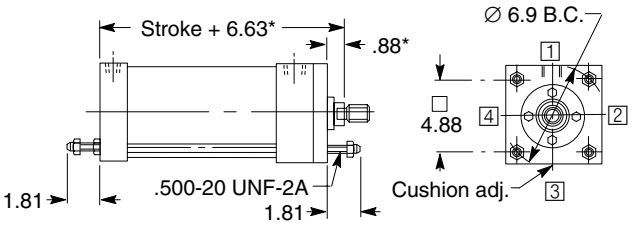
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

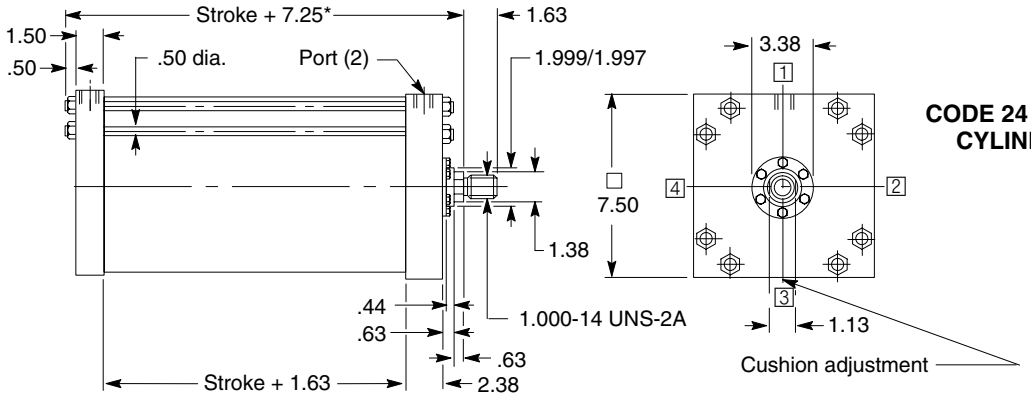


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



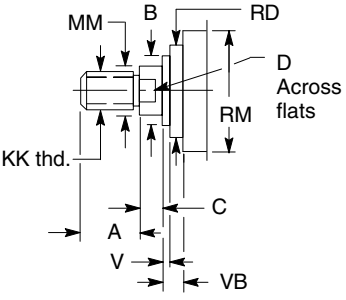
†Maximum working pressure 800 PSI (for minimum flange deflection)

7 inch Cylinder Bore

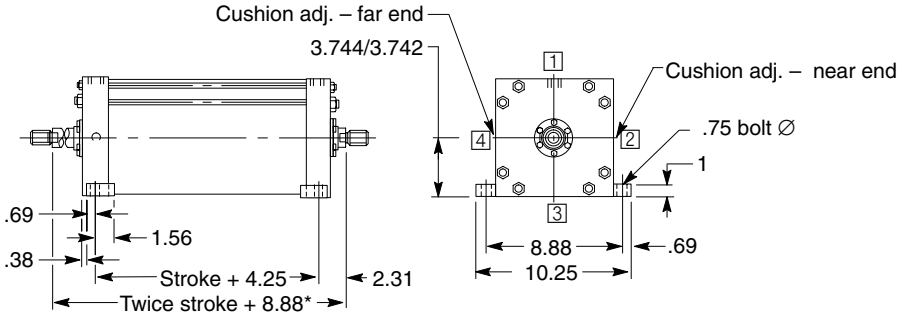


CODE 24 BASIC CYLINDER

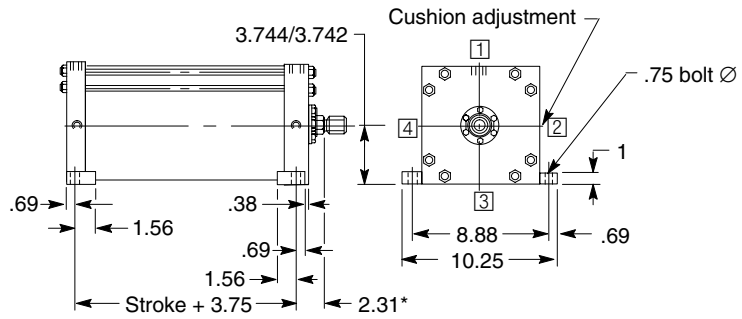
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.63	1.250–12 UNF–2A	4.499
	3	.63	3.50	3.749/ 3.747	1	2.63	5.50	.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



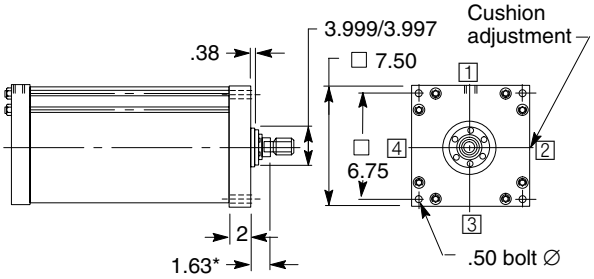
CODE 25 DOUBLE ROD SIDE LUG MOUNT



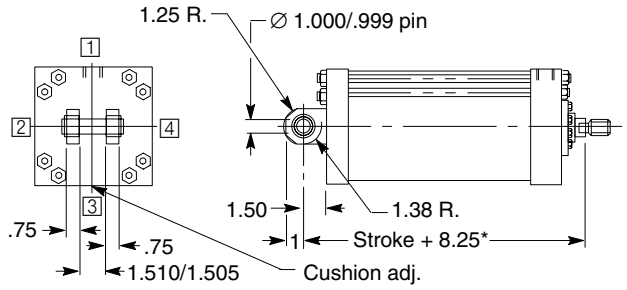
CODE 01 SIDE LUG MOUNT



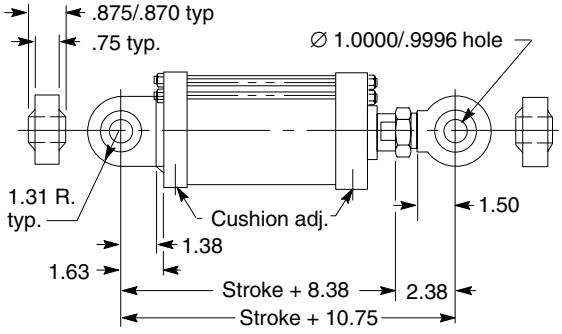
CODE 07 HEAD FLANGE MOUNT



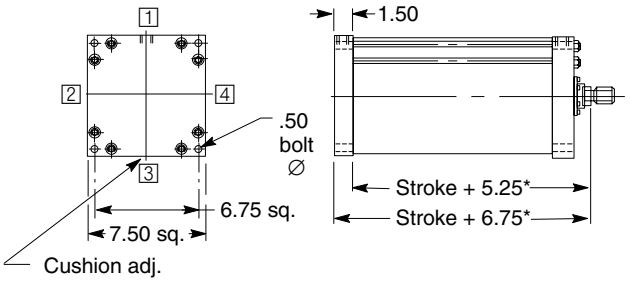
CODE 10 CLEVIS MOUNT



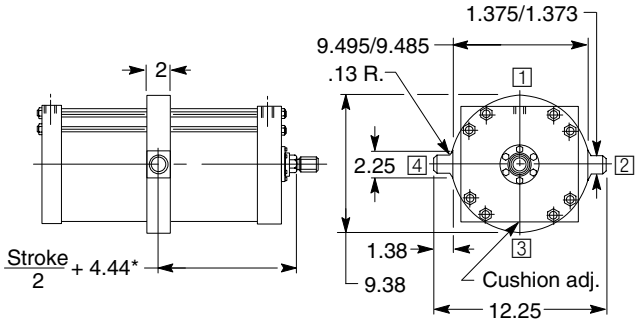
CODE 11 SPHERICAL BEARING MOUNT



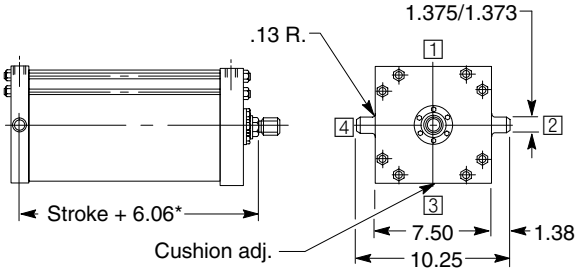
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



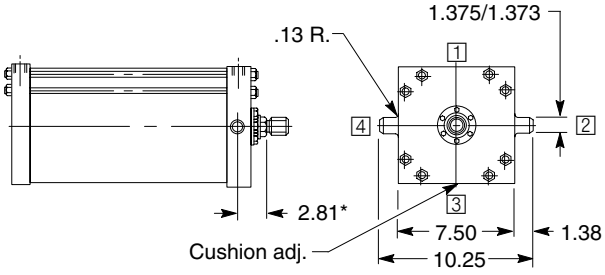
CODE 15 INTERMEDIATE TRUNNION MOUNT



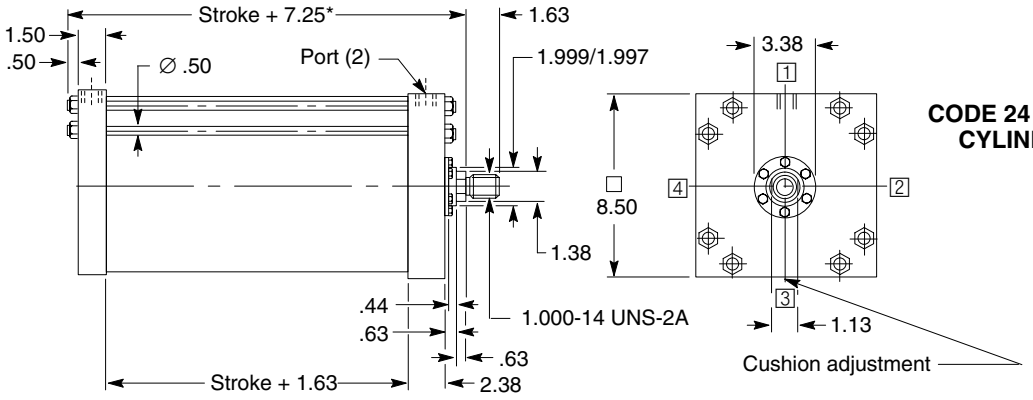
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

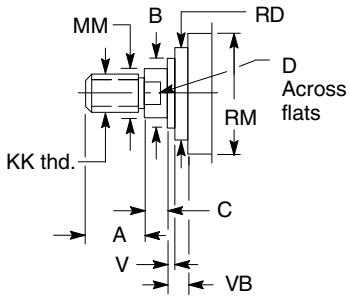


8 inch Cylinder Bore



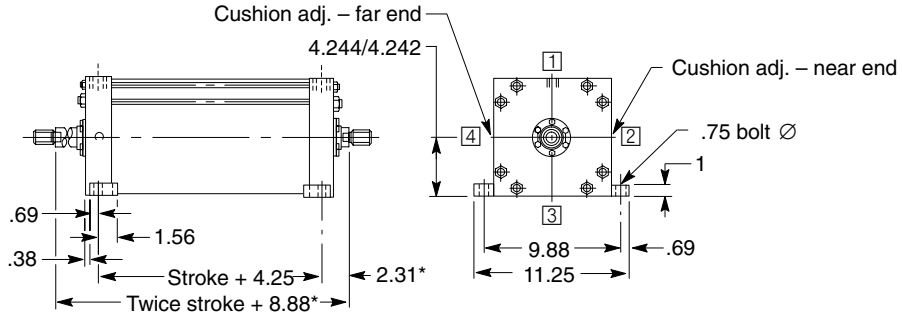
CODE 24 BASIC CYLINDER

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

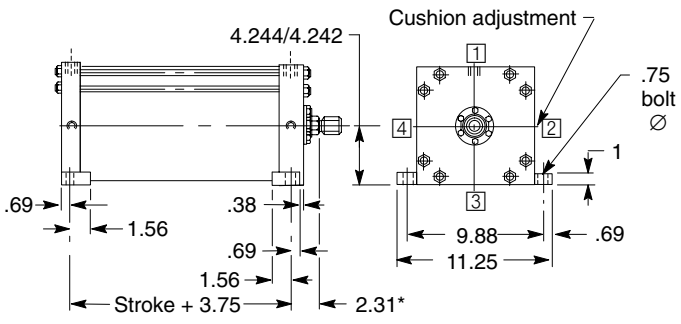


† Applies to Code 07 mount only

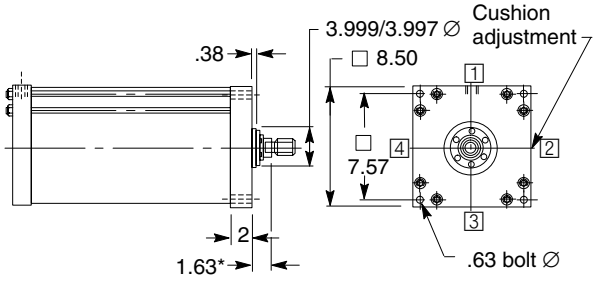
CODE 25 DOUBLE ROD SIDE LUG MOUNT



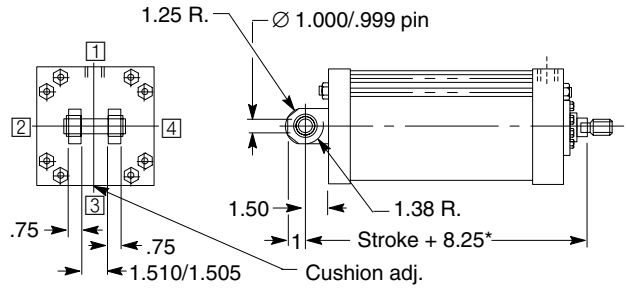
CODE 01 SIDE LUG MOUNT



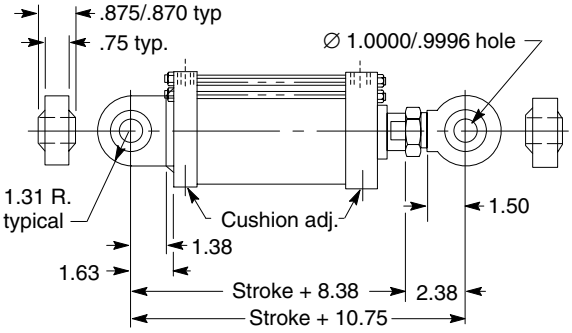
CODE 07 HEAD FLANGE MOUNT



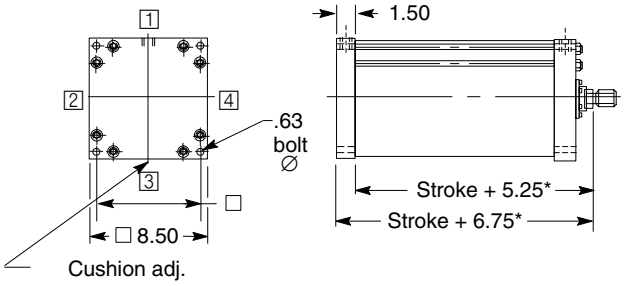
CODE 10 CLEVIS MOUNT



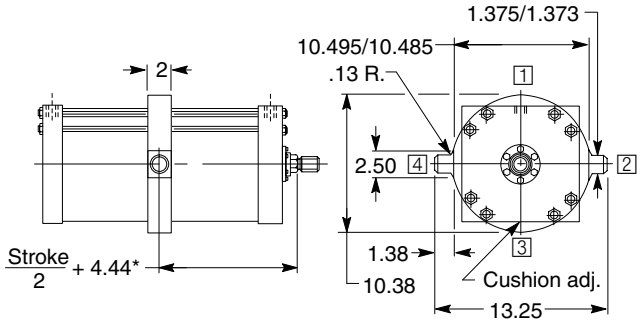
CODE 11 SPHERICAL BEARING MOUNT



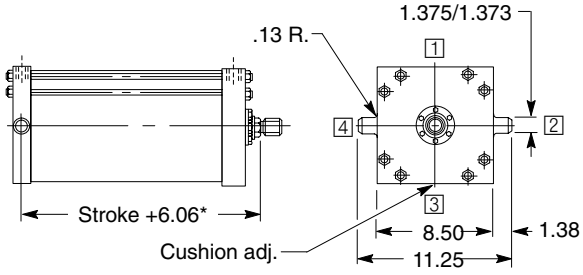
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



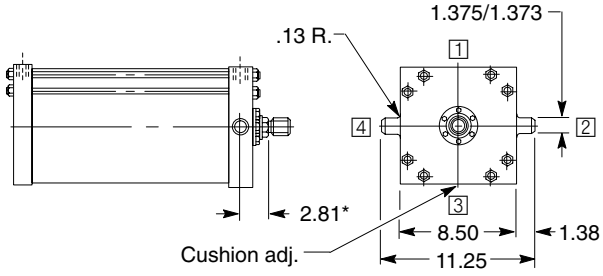
CODE 15 INTERMEDIATE TRUNNION MOUNT



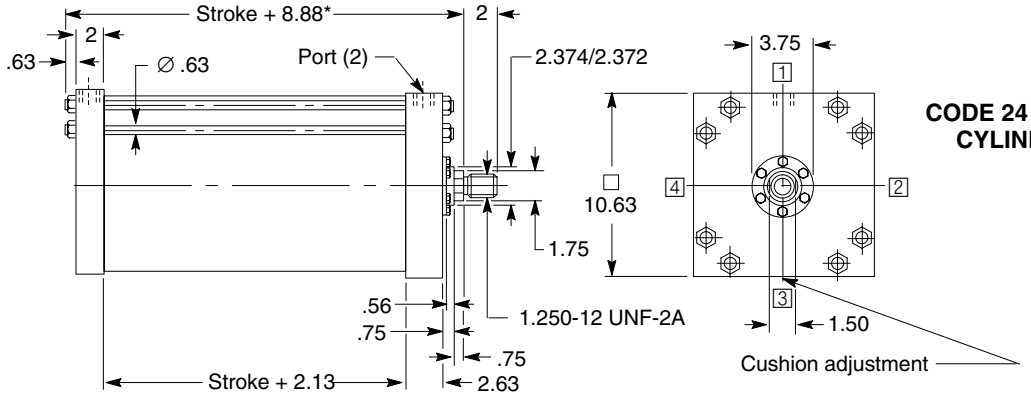
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

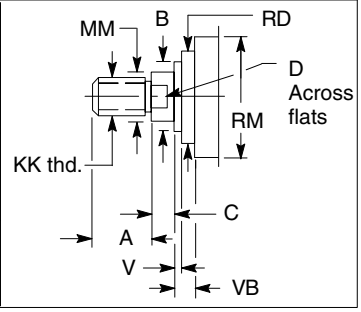


10 inch Cylinder Bore



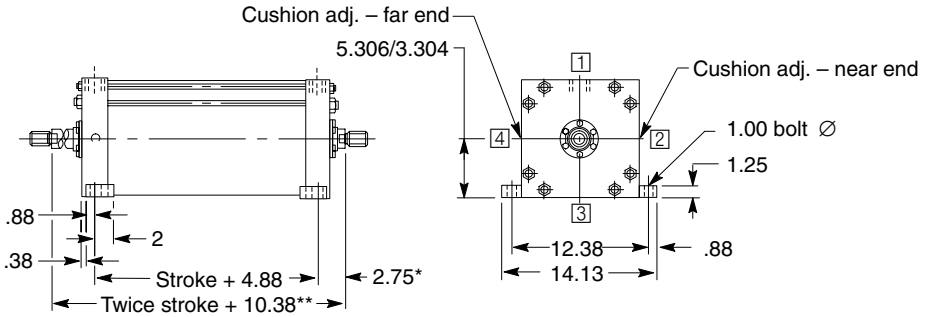
CODE 24 BASIC CYLINDER

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

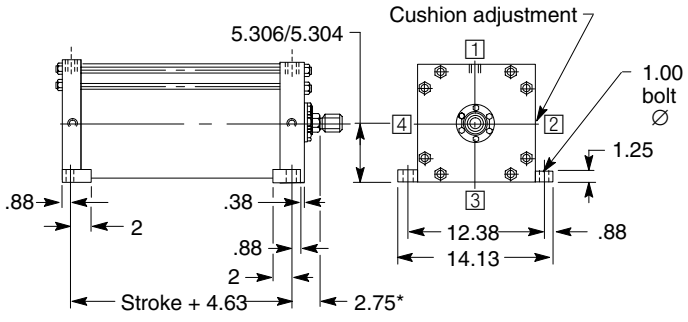


† Applies to Code 07 mount only

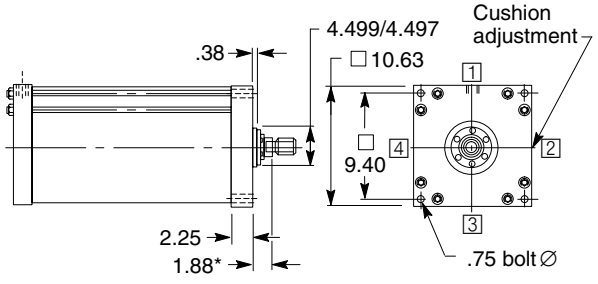
CODE 25 DOUBLE ROD SIDE LUG MOUNT



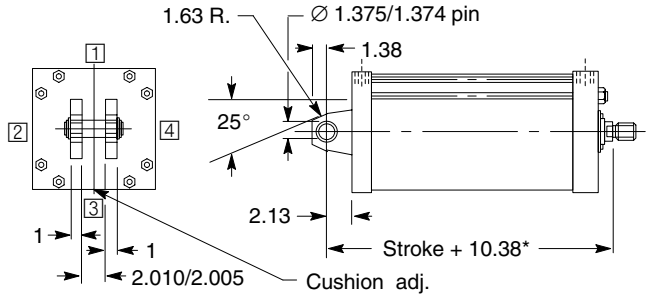
CODE 01 SIDE LUG MOUNT



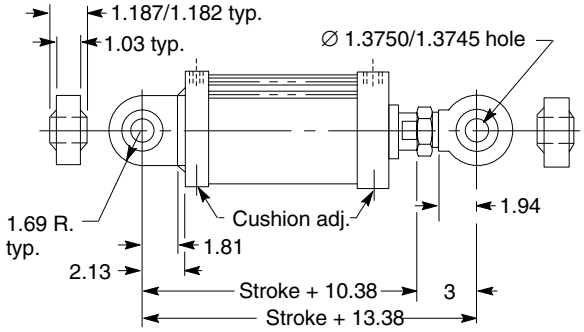
CODE 07 HEAD FLANGE MOUNT



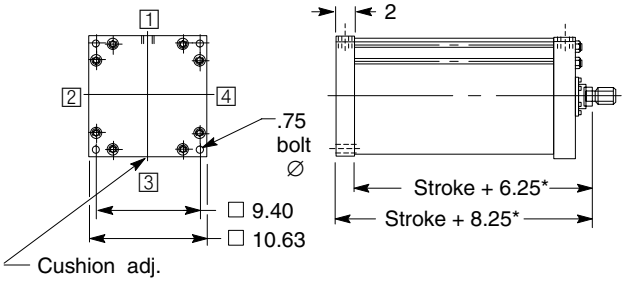
CODE 10 CLEVIS MOUNT



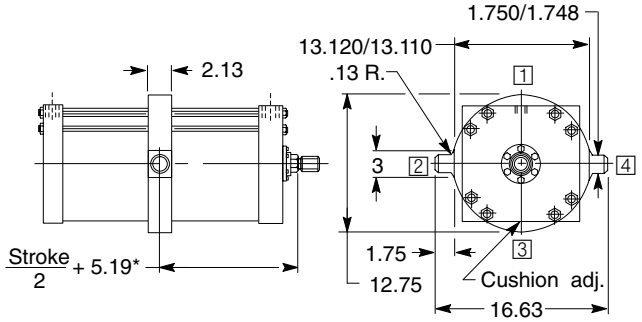
CODE 11 SPHERICAL BEARING MOUNT



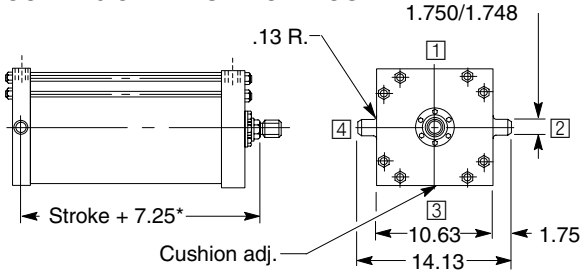
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



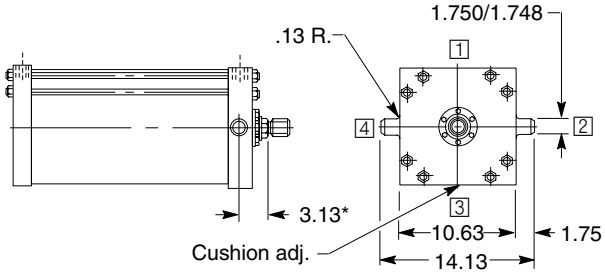
CODE 15 INTERMEDIATE TRUNNION MOUNT



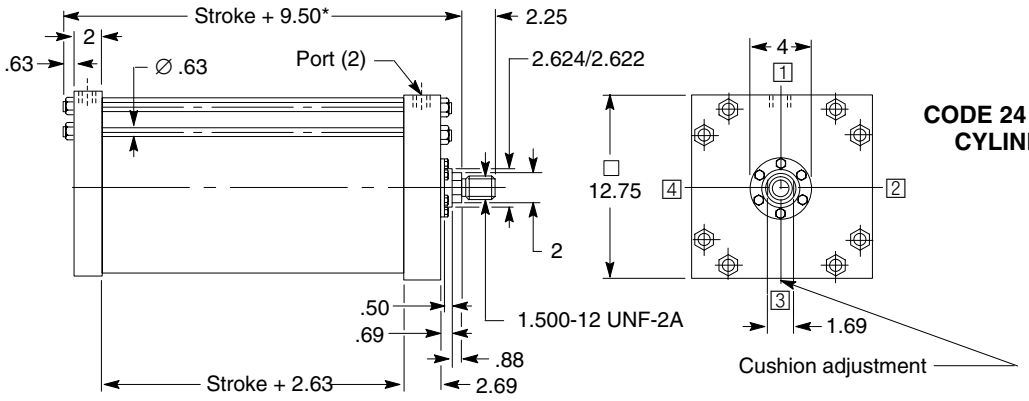
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

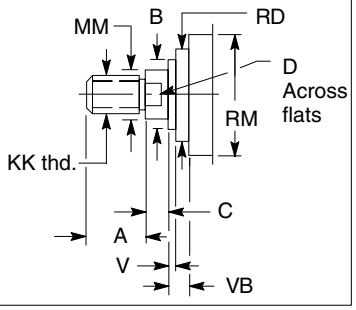


12 inch Cylinder Bore



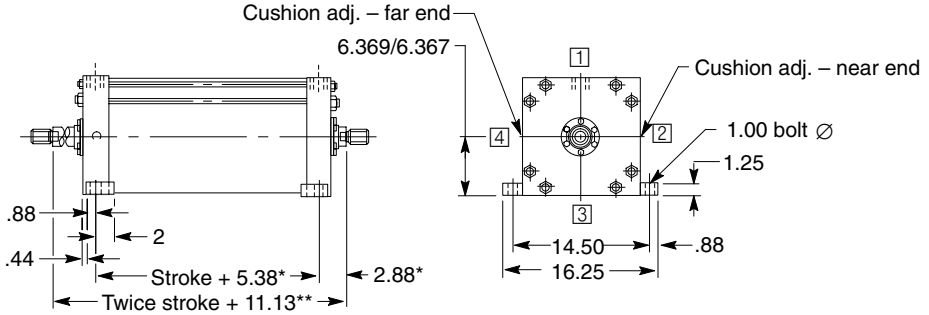
CODE 24 BASIC CYLINDER

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

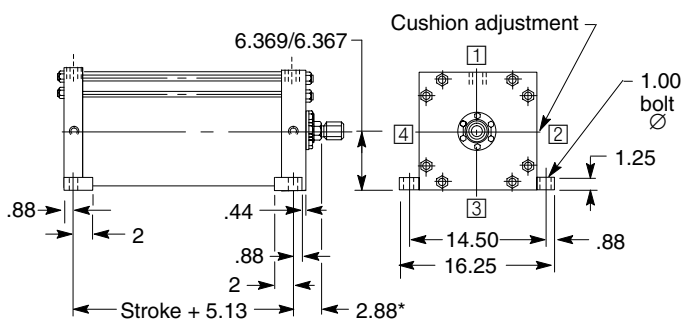


† Applies to Code 07 mount only

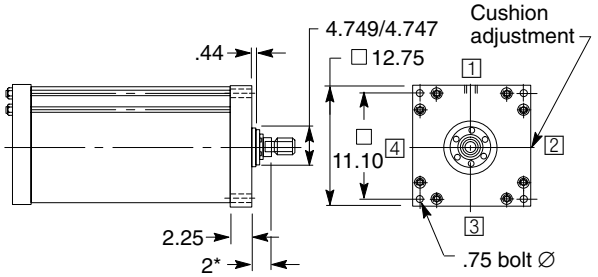
CODE 25 DOUBLE ROD SIDE LUG MOUNT



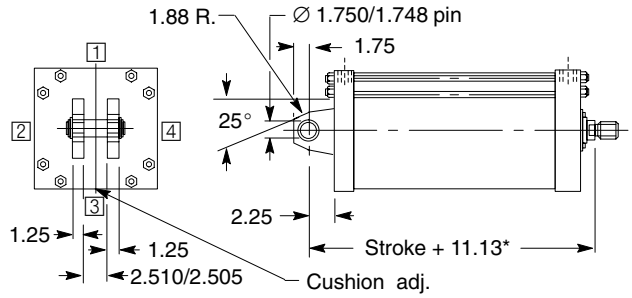
CODE 01 SIDE LUG MOUNT



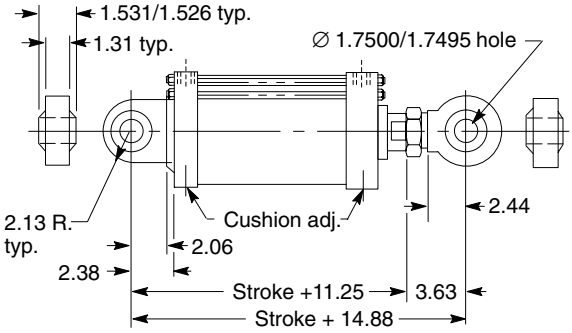
CODE 07 HEAD FLANGE MOUNT



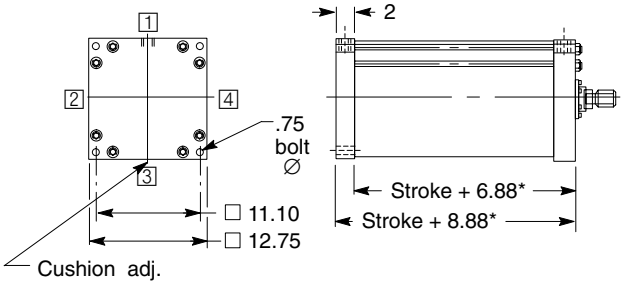
CODE 10 CLEVIS MOUNT



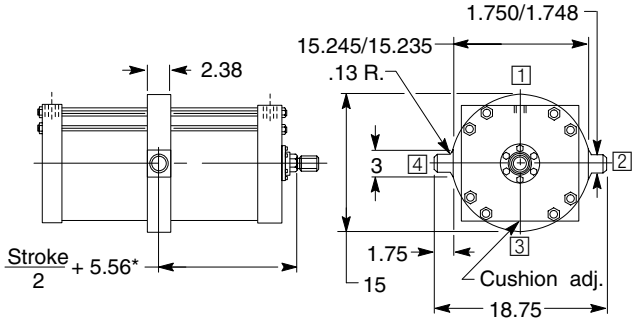
CODE 11 SPHERICAL BEARING MOUNT



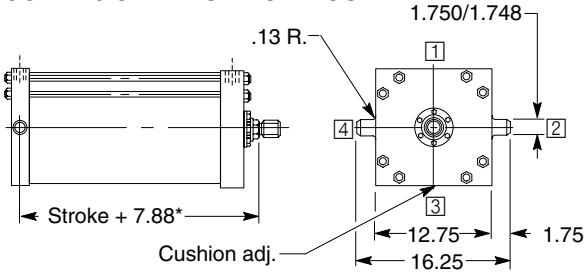
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



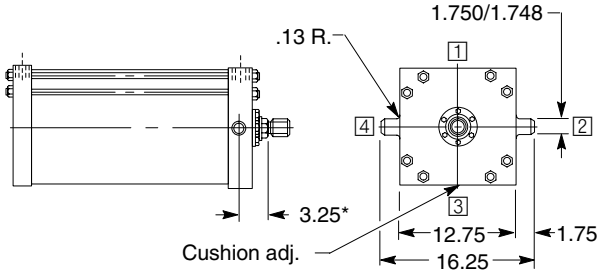
CODE 15 INTERMEDIATE TRUNNION MOUNT



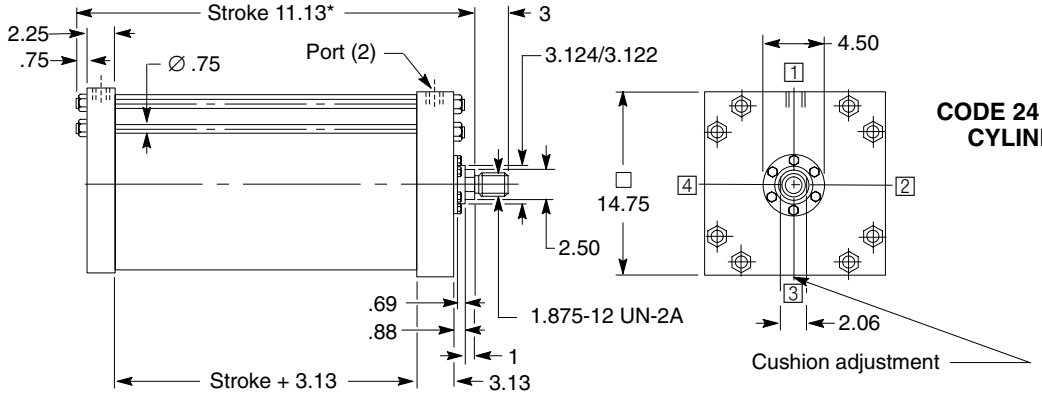
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

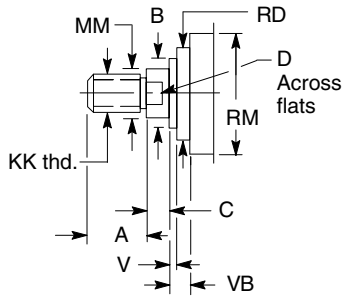


14 inch Cylinder Bore



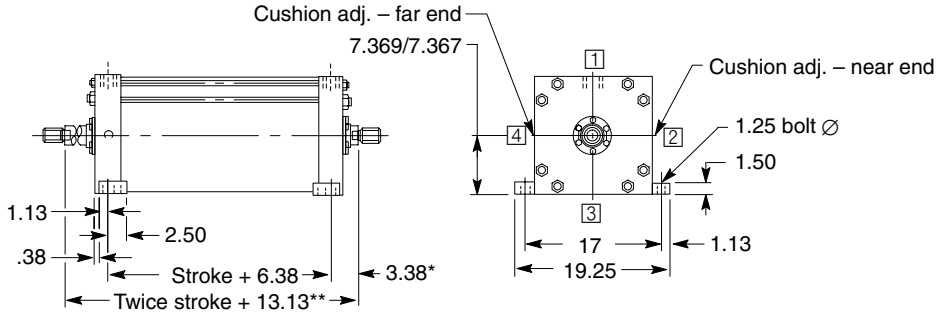
CODE 24 BASIC CYLINDER

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

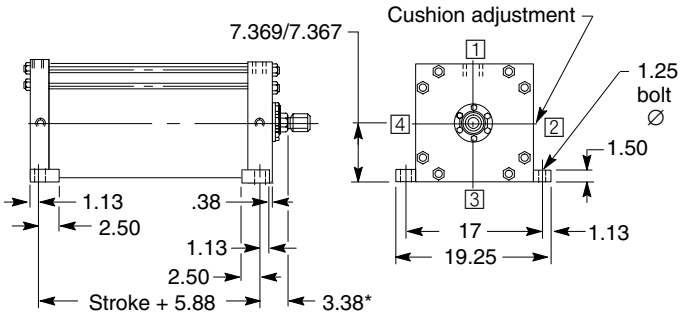


† Applies to Code 07 mount only

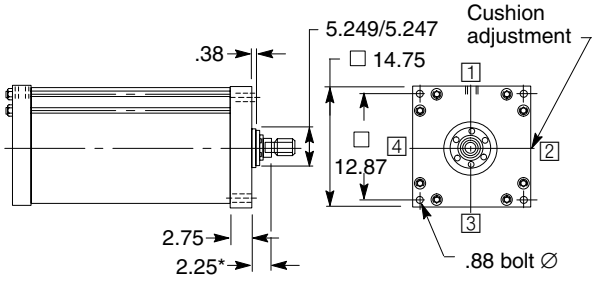
CODE 25 DOUBLE ROD SIDE LUG MOUNT



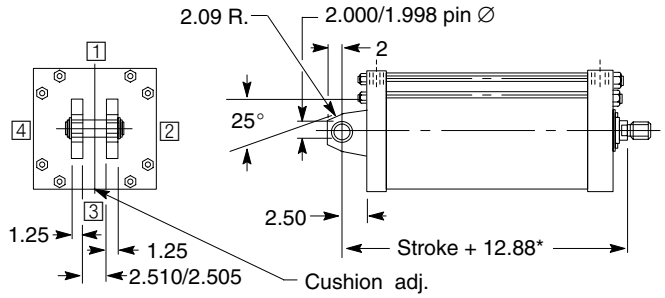
CODE 01 SIDE LUG MOUNT



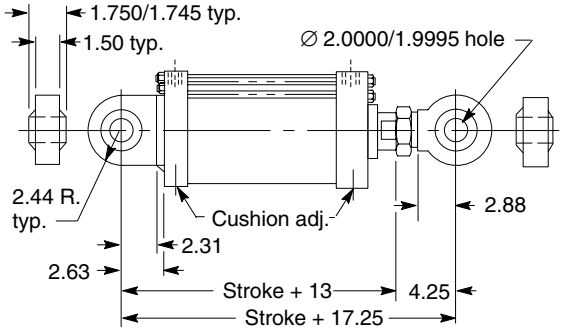
CODE 07 HEAD FLANGE MOUNT



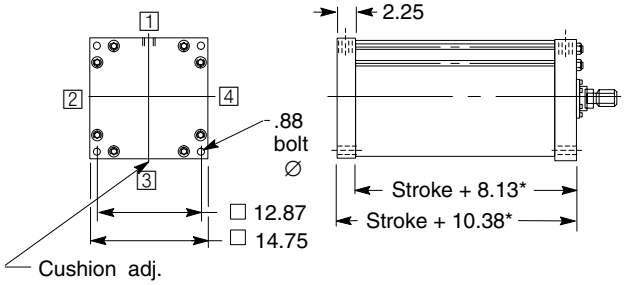
CODE 10 CLEVIS MOUNT



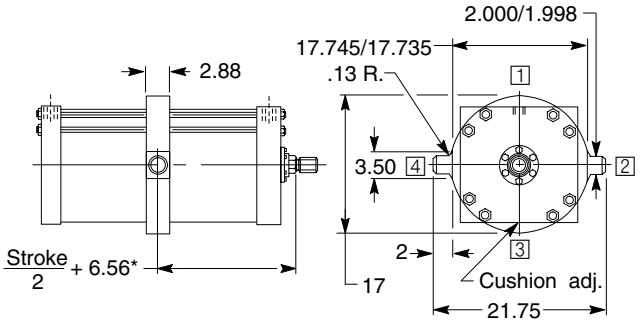
CODE 11 SPHERICAL BEARING MOUNT



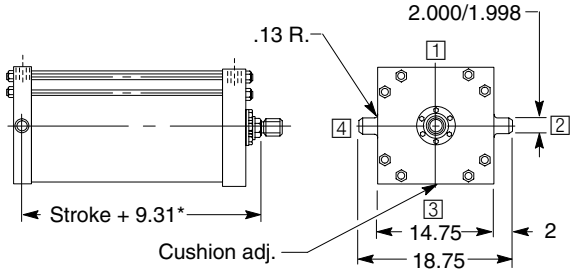
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



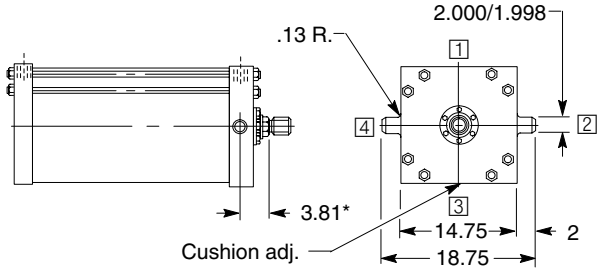
CODE 15 INTERMEDIATE TRUNNION MOUNT



CODE 16 CAP TRUNNION MOUNT



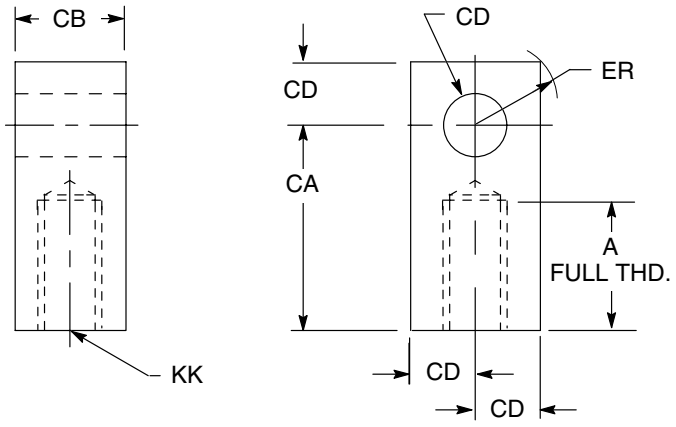
CODE 17 HEAD TRUNNION MOUNT



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

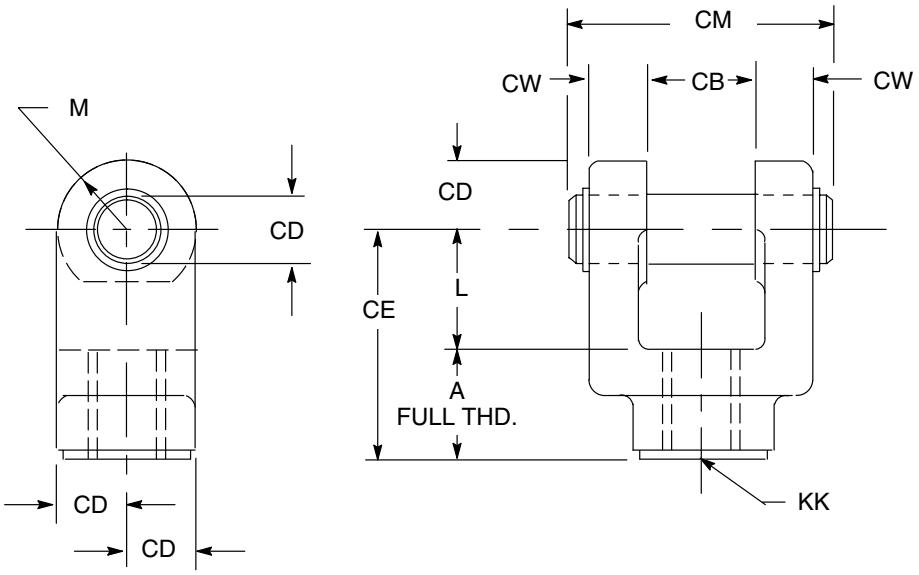


Bore dia.	A	CA	CB	CD	ER	KK thread Size	KK thread Torque (ft. lbs)*	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	1.50	.75	.50	.70	.4375-20 UNF-2B	36	S-1-560	.38
3 1/4, 4, 5	1.13	2.06	1.25	.75	1.06	.750-16 UNF-2B	125	S-460	1.25
6, 7, 8	1.63	2.81	1.50	1.00	1.42	1.000-14 NS-2B	250	S-660	2.50
10	2.00	3.44	2.00	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)



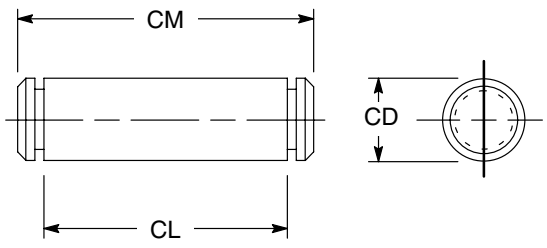
Bore dia.	A	CB	CD	CE	CM	CW
1 1/2, 2, 2 1/2	.75	.75	.50	1.50	2.00	.50
3 1/4, 4, 5	1.13	1.25	.75	2.38	2.75	.63
6, 7, 8	1.63	1.50	1.00	3.13	3.28	.75
10	2.00	2.00	1.38	4.13	4.28	1.00
12	2.25	2.50	1.75	4.50	5.44	1.25
14	3.00	2.50	2.00	5.50	5.44	1.25

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)

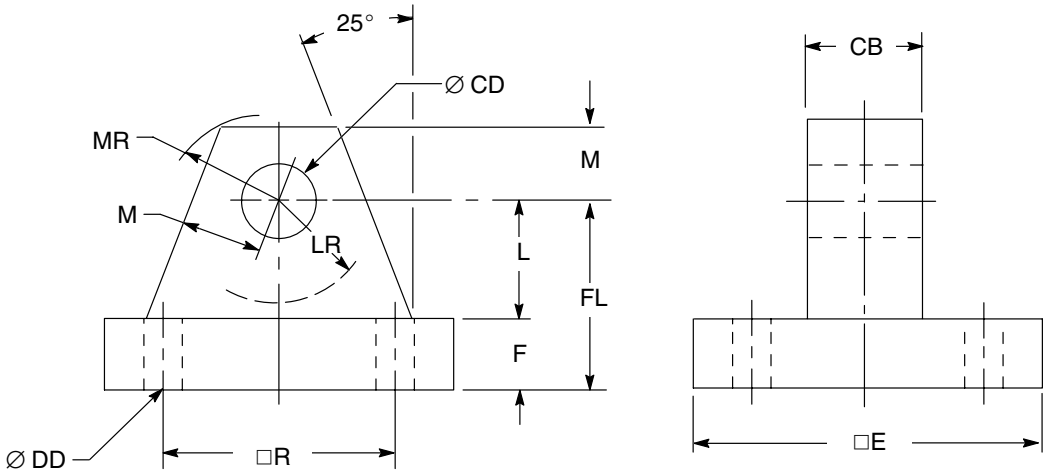
Bore dia.	CD	CL	CM	Part no.
1 1/2, 2, 2 1/2	.500/.499	1.82	2.00	S-1-583-10
3 1/4, 4, 5	.750/.749	2.57	2.75	S-483-10
6, 7, 8	1.000/.999	3.06	3.28	S-683-10
10	1.375/1.374	4.06	4.28	SH-483-10
12	1.750/1.748	5.06	5.44	SH-583-10
14	2.000/1.998	5.06	5.44	SH-683-10



Accessories

Mounting Eye Bracket

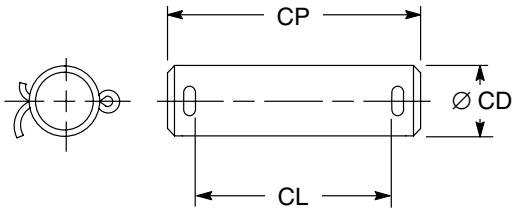
(for clevis mount cylinders)



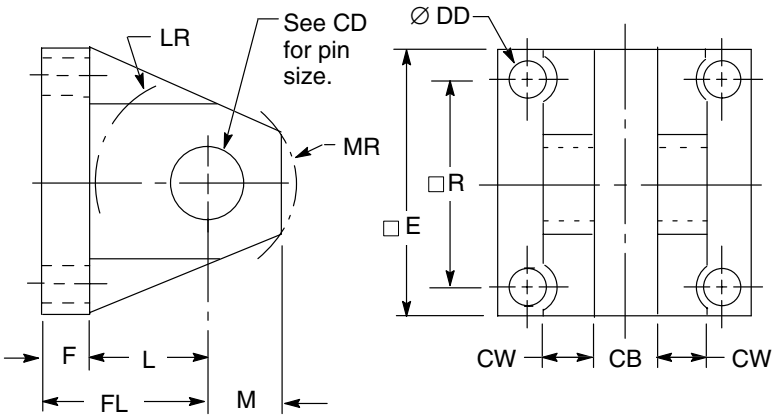
Bore diameter	CB	CD	DD	E	F	FL	L (ref.)	LR	M	MR	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	.50	.38	2.50	.38	1.13	.75	.69	.50	.59	S-1-552-M	.94
3 1/4, 4, 5	1.25	.75	.50	3.50	.63	1.88	1.25	1.13	.75	.88	S-452-M	3.19
6, 7, 8	1.50	1.00	.63	4.50	.75	2.25	1.50	1.38	1.00	1.25	S-652-M	6.50
10	2.00	1.38	.63	5.00	.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

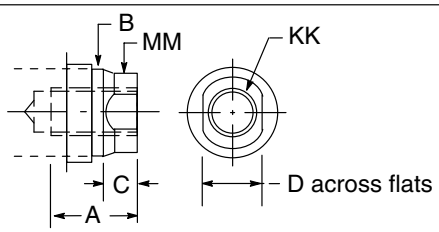
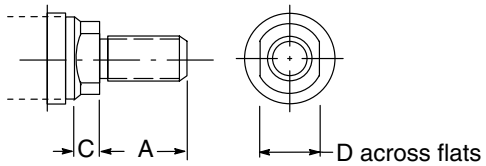
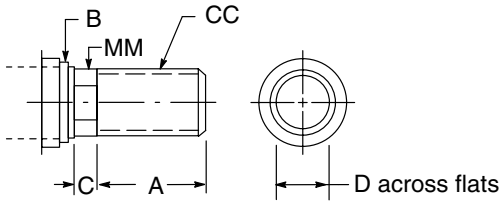
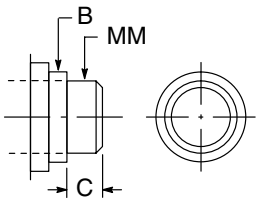
* Included in assembly
† Order separately.
‡ Use jam nut to lock rod eye to piston rod.

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

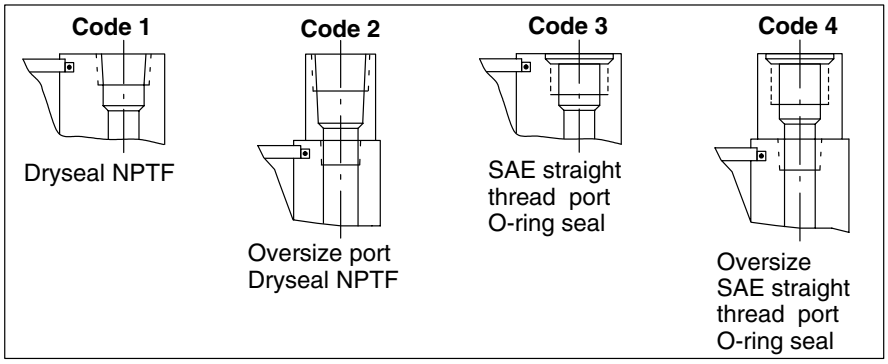
Port Types, Sizes and Locations

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

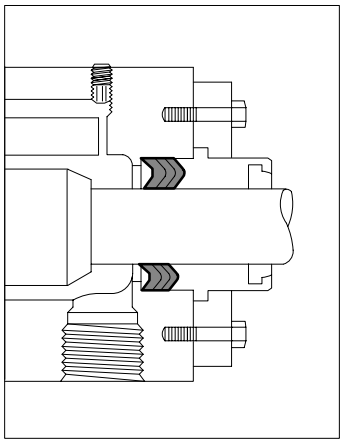
Seal Options

Select the type of piston seal for your application, then select the seal compound from the compatibility chart below.

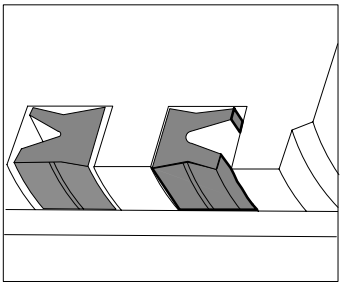
Determine the correct seal code for your application, then enter it as item 8 in the model code.

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

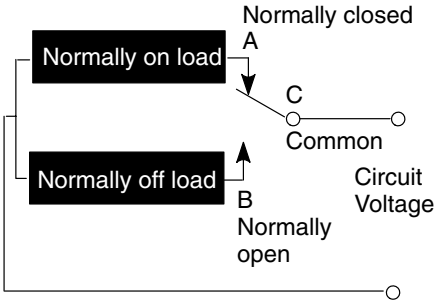
● Except certain aircraft and commercial fluids.
▪ Maximum ratings for continuous exposure of sealing system only.
The above technical data represents generally accepted design parameters.
Consult Vickers Engineering for more specific application data.

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.

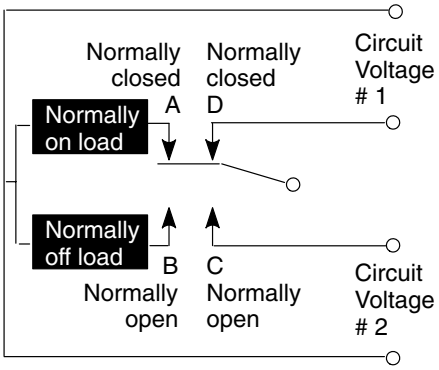
A quick disconnect plug, factory wired to the limit switch, is an option. In addition, air-pilot valves (3-way and 2-way) can be fitted to the cylinders. See Bulletin 4098 for complete information on limit switches and valves.

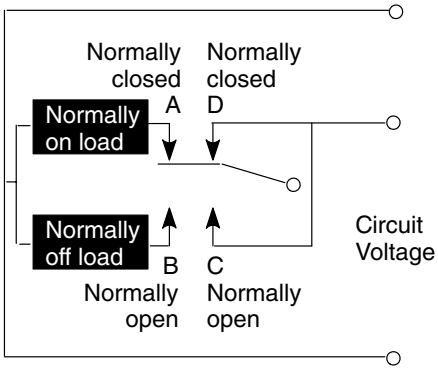
Switch "01" single pole, double throw (standard)



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)

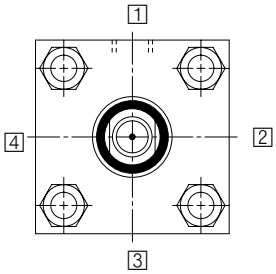




15 Amperes	125 Volts AC
	250 Volts AC
1 Ampere	125 Volts AC
1/2 Ampere	250 Volts AC
1/4 H.P.	125 Volts AC
1/2 H.P.	250 Volts AC

Switch positions

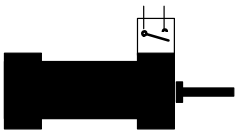
Type 01 and type 03 switches are positioned as shown below when viewing the cylinder from the head end (mounting end of double rod cylinder).



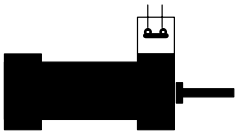
Switch type 01		
Code	Head end position	Cap end position
B	1	–
C	2	–
D	3	–
E	4	–
F	1	1
G	2	2
H	3	3
J	4	4
K	0	1
L	0	2
M	0	3
N	0	4

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

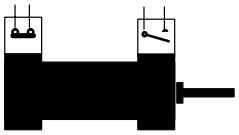


Piston rod retracted or in motion – switch open

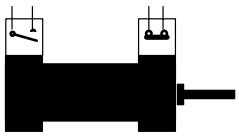


Piston rod fully extended – switch closed

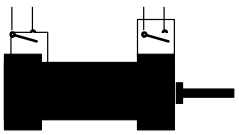
Switches mounted on both head end and cap end



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.

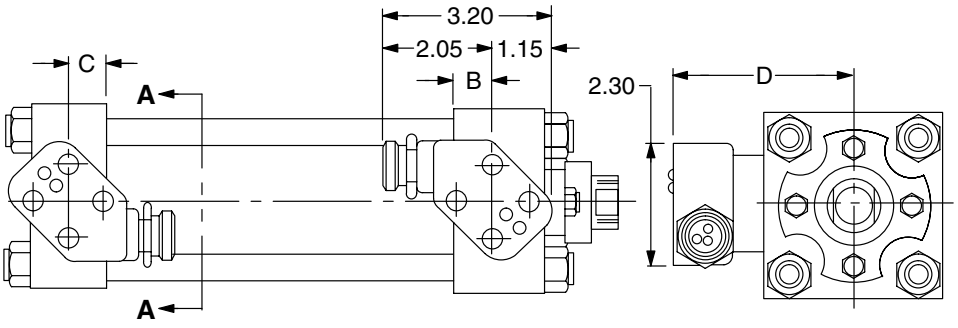
Short circuit protection is a standard feature on the PS 200 proximity switch. It protects the switch from shorts in the load or line. Upon sensing a short condition, the switch assumes a non-conducting mode. The fault condition must be removed and power turned off in order to reset the switch. This 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.

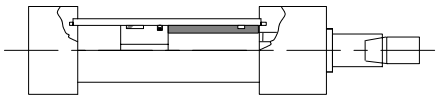
	Type of cylinder mounting		
Bore dia. (inch)	**Pivot** (clevis & trunnion)	**Rigid** (no rod support)	**Rigid** (with rod support)
1 1/2 and 2	24 in.	30 in.	48 in.
2 1/2 to 4	30 in.	38 in.	
5 to 14	36 in.	40 in.	

Stop Tube Designs

Three typical stop tube designs are illustrated below.

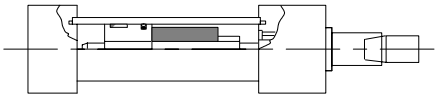
Design A

Used for cylinders not cushioned on the rod end.



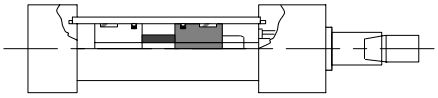
Design B

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

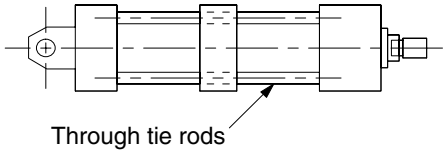
Tie rod spacers and center supports are used to improve the structural rigidity of long stroke tie rod cylinders.

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.

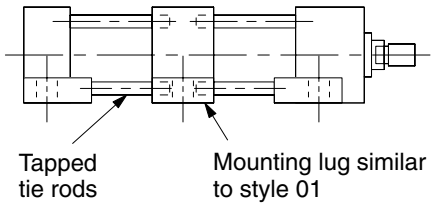
The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).



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)

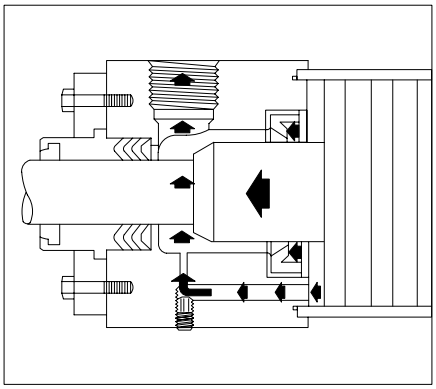
Maximum Allowable Push Strokes

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	–	–

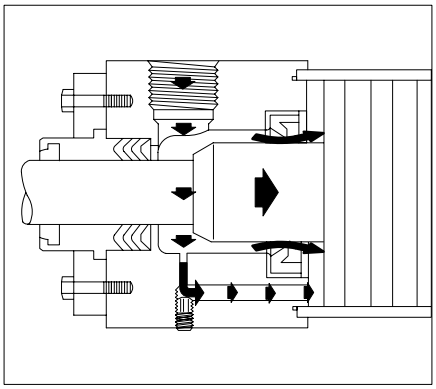
Cushioning System

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

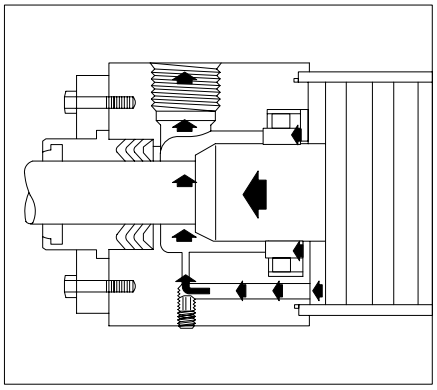


Series TE/TL cylinders employ a *flexible lip ring* at the cushion chamber entrance. As the cushion collar enters the cushion chamber, the flexible lip of the super cushion blocks the direct flow of air to the exhaust port. Exhausting air must now flow through a metered by-pass. Adjustment of the needle valve in the by-pass controls the cushioning action.

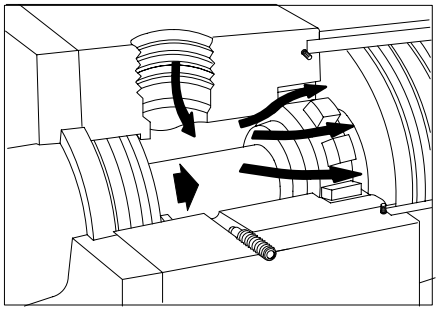


On the return stroke, air pressure blows the flexible lip of the super cushion away from the cushion collar, permitting a large volume of air to immediately reach the piston face. This allows quick acceleration and eliminates ball checks and binding between the cushion collar and cushion chamber.

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

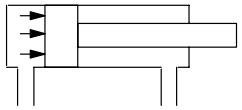
$HP = K \times P \times Q = \frac{lb/in^2 \times gpm \times 231}{12 \times 33000 \times E}$

$= \frac{.000583 \times P \times Q}{E} = \frac{PSI \times GPM}{1714 \times E}$

Hydraulic Cylinder Formulas

Pressure and force

P = psi
A = area
$= in^2$

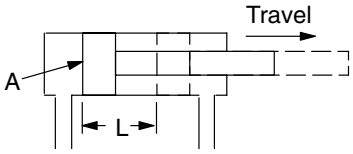


Force = pressure x area

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

$Q = pump\ capacity = \frac{cu\ in}{sec}$

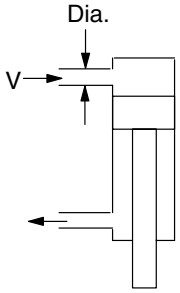
$T = time = \frac{volume\ traversed}{pump\ capacity} = \frac{V}{Q} = \frac{in^3}{in^3/sec} = sec$

$= sec$

$R = rate\ of\ piston\ travel = \frac{in}{sec} = \frac{L}{T}$

$R = \frac{L}{T} = \frac{L}{V/Q} = \frac{QL}{V} = \frac{QL}{LA} = \frac{Q}{A}$

Quantity of flow



V = fluid velocity = ft/sec
D = pipe diameter = inches
Q = quantity of flow = gpm

$\frac{ft}{sec} \times 12 = \frac{inches}{sec}$

$gpm \times \frac{231}{60} = \frac{cu\ in}{sec}$

$\frac{\pi D^2}{4} = pipe\ area = in^2 = A$

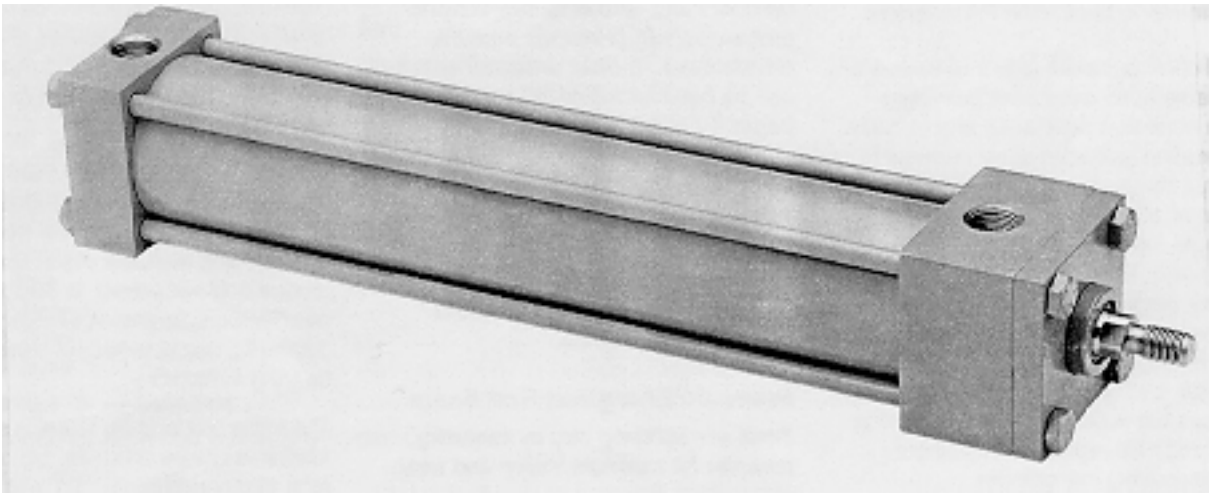
$Q = AV = in^2 \times \frac{in}{sec} = \frac{cu\ in}{sec}$

Vickers®

Cylinders

Series TE/TF/TL Cylinders

Nominal Pressure: 250 psi Air / 1000 psi Hydraulic



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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.

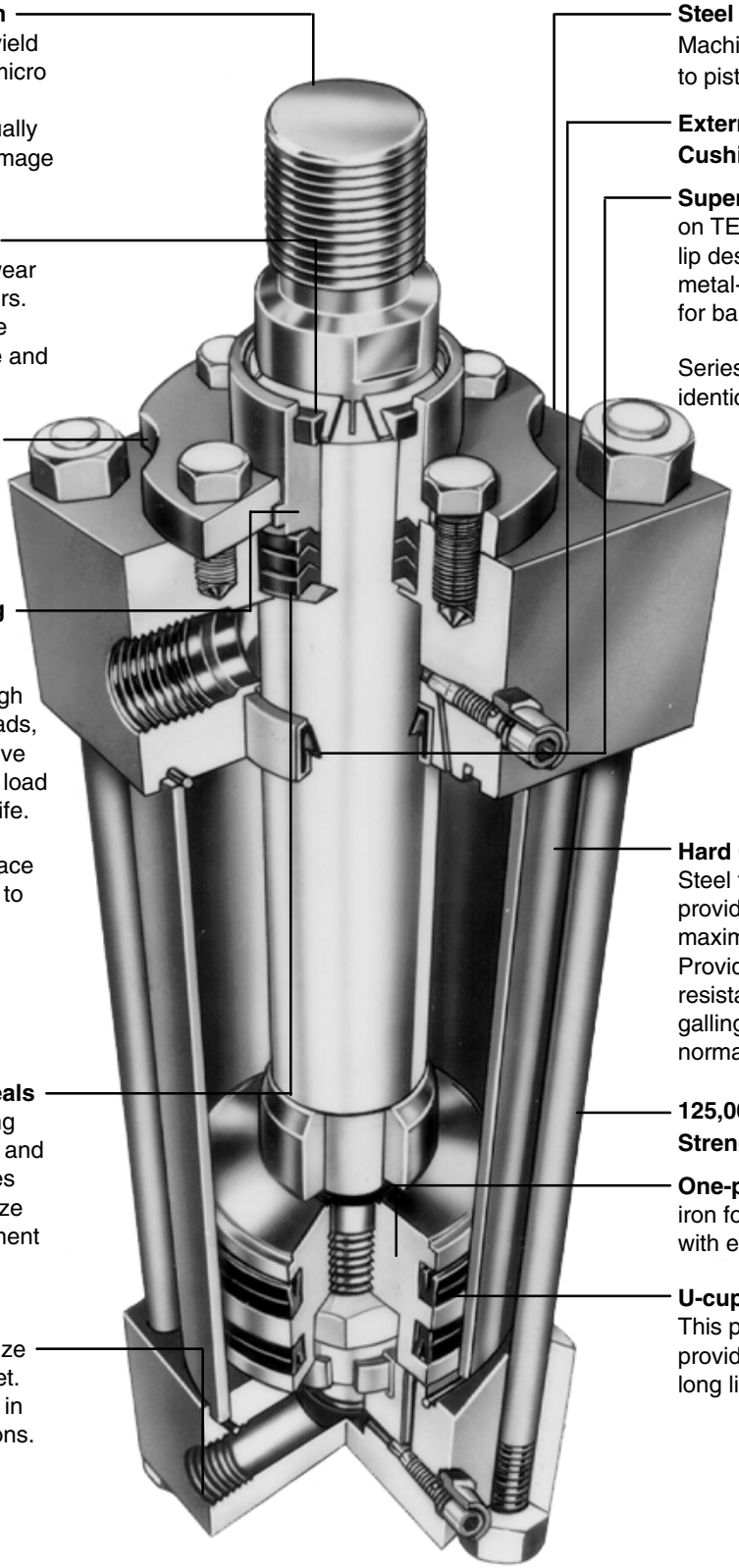
QC-100 Quick-change Rod Bearing Assembly permits easy replacement of rod seals without disassembling cylinder.

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

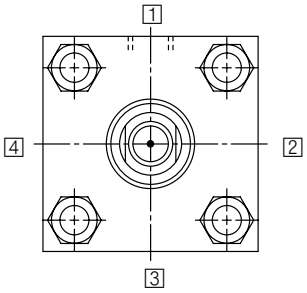
5 Bore size (in inches)

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

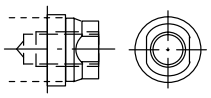
1, 2	3, 4	5	6	7	8	9	10	11	12, 13, 14	15, 16

7 Rod size and rod end type

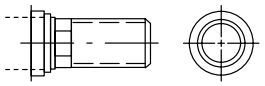
Bore size (inch)	Rod size (inch)	Code (for rod size *and* rod end type) "2" rod end type	"4" rod end type	"5" rod end type	"6" rod end type
1 1/2	5/8	**A**	**B**	**C**	**D**
	1*	**E**	**F**	**G**	**H**
2	5/8	**A**	**B**	**C**	**D**
	1	**E**	**F**	**G**	**H**
	1 3/8	**J**	**K**	**L**	**M**
2 1/2	5/8	**A**	**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.

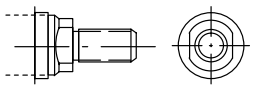
Type 2 rod end
Short female UN thread



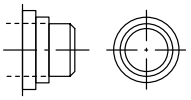
Type 4 rod end
Full male UN thread



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.)

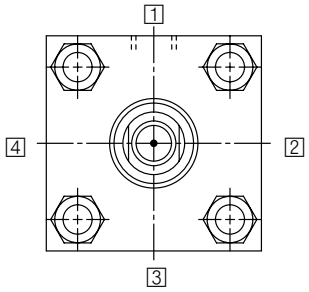
TE 01 E A C A 3 A A 108 00

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

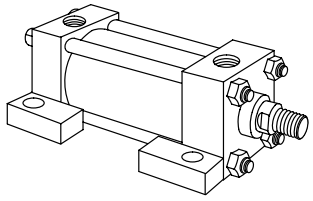
Just as the cylinder bore must be sized to provide the proper force for an application, a cylinder mounting that can absorb these application forces must also be specified. All mounts are designed to absorb the full rated force of the cylinder when properly applied. For applications where the motion 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

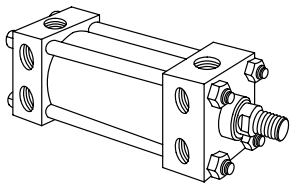
The variety of standard ANSI and NFPA mountings available gives you a broad selection to match the proper mount to your application. Vickers offers rigid mounts (including side lug, flange, and extended tie rod) and swivel mounts (including clevis and trunnion). A guide to proper mount selection is provided 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

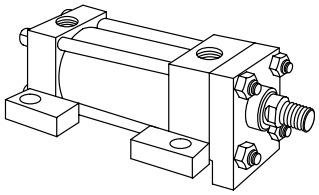
Code 01
Side lug
ANSI MS2



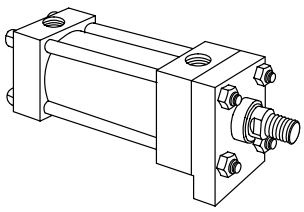
Code 02
Tapped
ANSI MS4



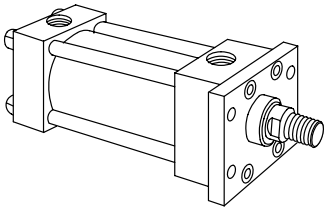
Code 04
Keyed side lug



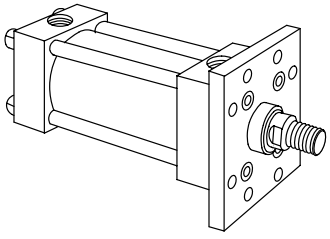
Code 05
Keyed tapped



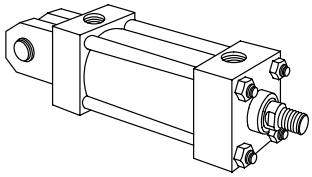
Code 07
Head rectangular flange
ANSI MF1 & ME3



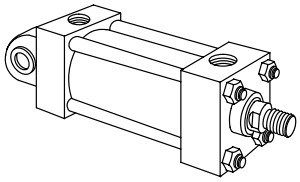
Code 08
Rod end square flanged
ANSI MF5



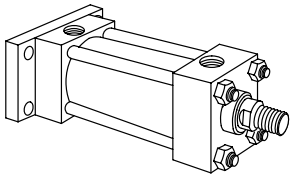
Code 10
Cap clevis
ANSI MP1



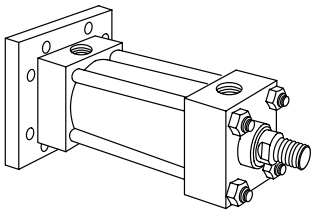
Code 11
Spherical bearing



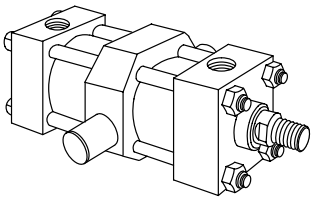
Code 12
Cap rectangular flange
ANSI MF2 & ME4



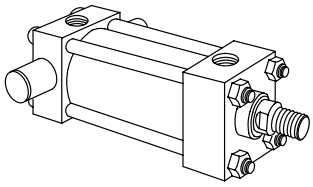
Code 13
Cap square flange
ANSI MF6



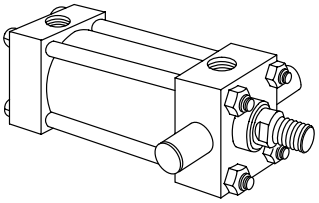
Code 15
Intermediate trunnion
ANSI MT4



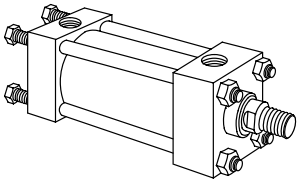
Code 16
Cap trunnion
ANSI MT2



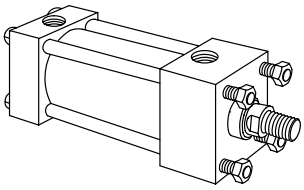
Code 17
Head trunnion
ANSI MT1



Code 21
Cap extended tie rod
ANSI MX2



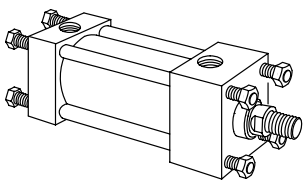
Code 22
Head extended tie rod
ANSI MX3



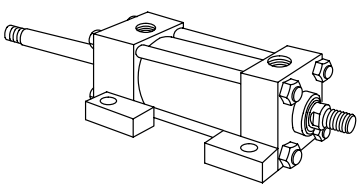
Mounting Styles Not Shown:

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

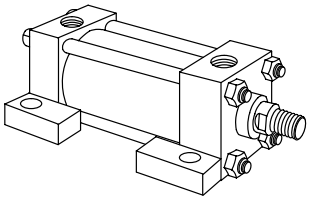


Code 25
Double rod, side lug

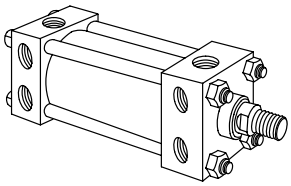


Application Guide for Mountings

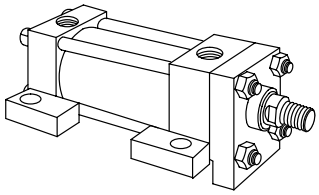
Code 01 Side Lug (ANSI MS2)



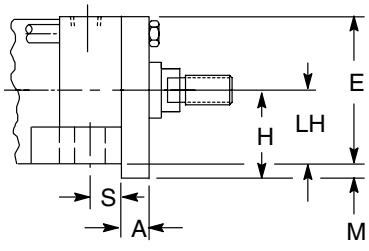
Code 02 Tapped



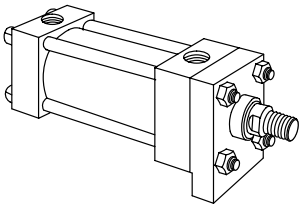
Code 04 Keyed Side Lug



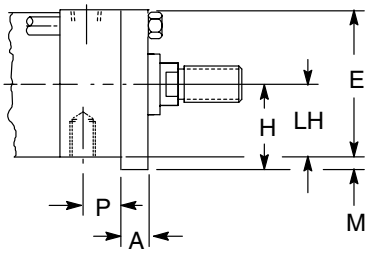
The drawing below shows the modification of a Code 01 mount to convert it to a Code 04. Use drawings for Code 01, pages 16–39, for dimensions not shown.



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).

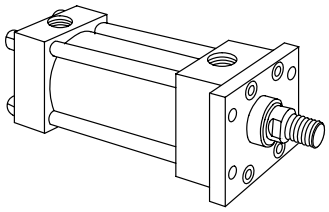
For severe side load applications, consult your local Vickers sales engineer.

See individual bore size drawings for maximum allowable pressure ratings.

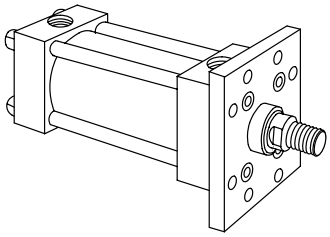
NOTE

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.

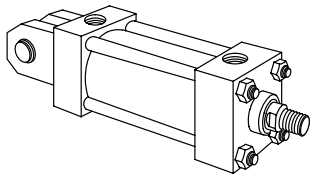
Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

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.

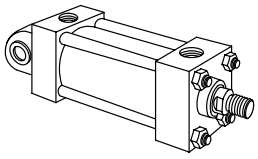
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excessive side loading on the bearing and piston. This will lead to premature failure. For applications 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

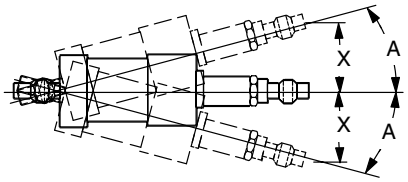
Code 11 Spherical Bearing



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.

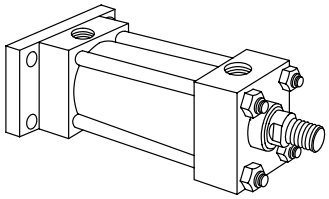
To find the maximum recommended X distance, multiply the distance between pivot mounting holes (see bore size drawing) by the tangent of angle A.

NOTE

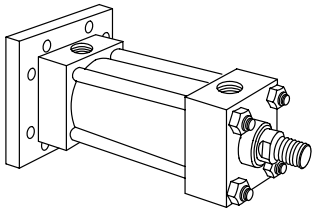
For strokes in excess of 24", see "Stop tube selection" on page 50.

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.

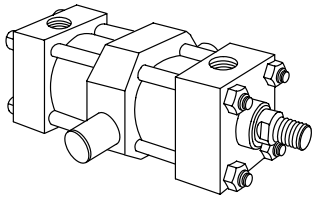
The cap square flange mount (code 13) is recommended for heavy duty applications.

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.

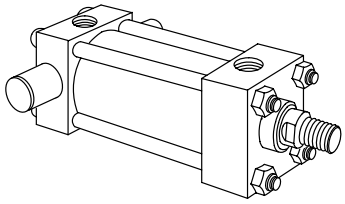
This mount can be used both in compression (push) and tension (pull) applications.

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.

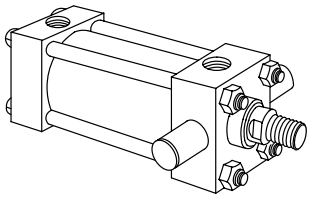
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.

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.

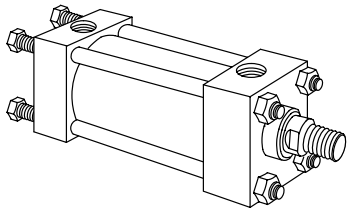
The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.

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.

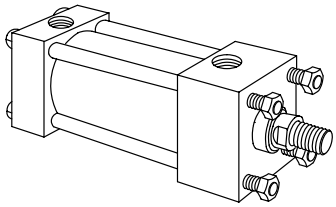
Bore dia. (inch)	**Tie rods** **Dia.** (inch)	**Torque** (ft. lbs.)
1 1/2	1/4	8
2, 2 1/2	5/16	16
3 1/4, 4	3/8	28
5, 6, 7, 8	1/2	66
10, 12	5/8	150
14	3/4	225

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.

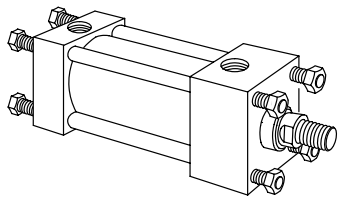
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on the previous page.

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.

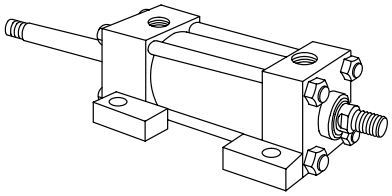
Once fitted into the application framework, the nuts which are provided should be torqued to the values listed in the table on page 14.

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)

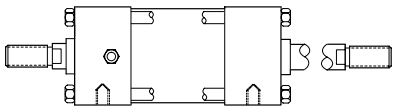


Double rod cylinders are specified when equal displacement is desired on both sides of the piston, or when the application is such that another function can be performed simultaneously with a second rod.

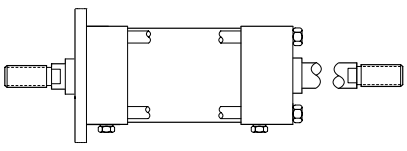
The single rod mount application data is also applicable to double rod cylinders.

In addition to the side lug mount illustrated above, the following mounts are also available for double rod end cylinders.

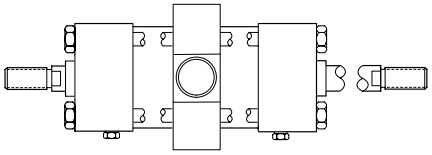
Code 26 Double Rod, Tapped



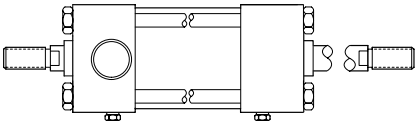
Code 31 Double Rod, Rectangular Flange and Code 32 Double Rod, Square Flange



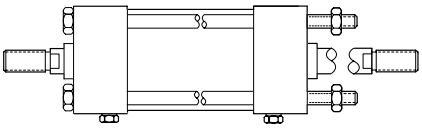
Code 34 Double Rod, Intermediate Trunnion



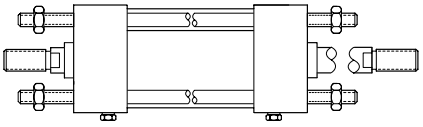
Code 35 Double Rod, Head Trunnion



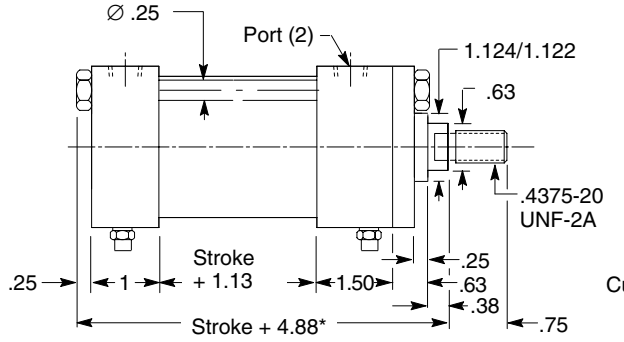
Code 39 Double Rod, Head Extended Tie Rod

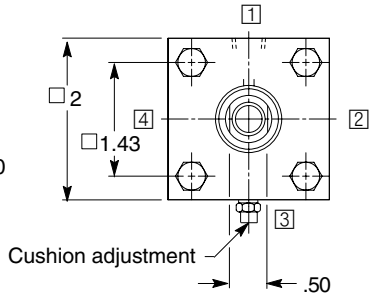


Code 40 Double Rod, Both Ends Extended Tie Rod



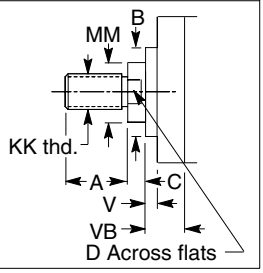
1 1/2 inch Cylinder Bore



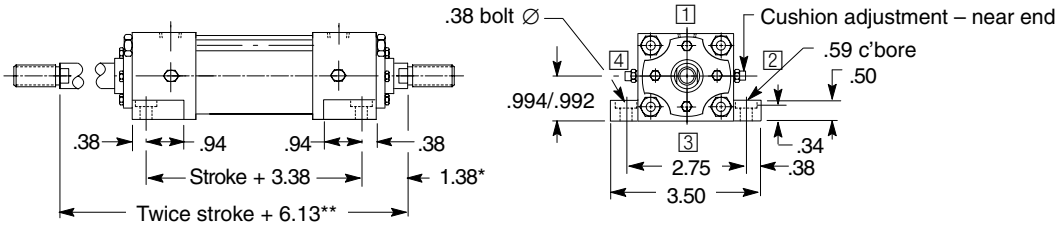


CODE 24 BASIC CYLINDER

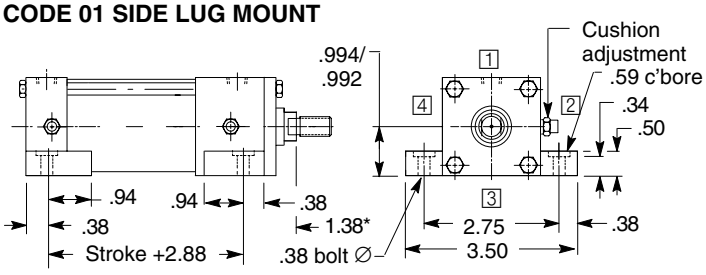
ALTERNATE ROD SIZES AVAILABLE	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
(in inches)	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A



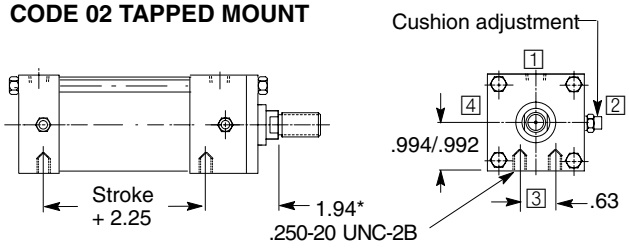
CODE 25 DOUBLE ROD SIDE LUG MOUNT



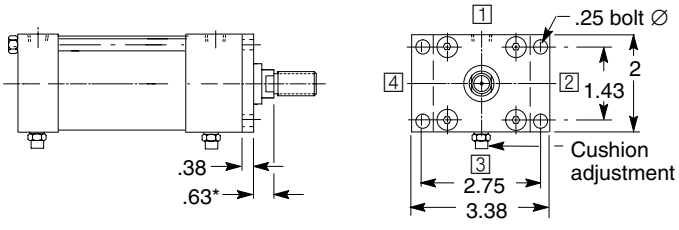
CODE 01 SIDE LUG MOUNT



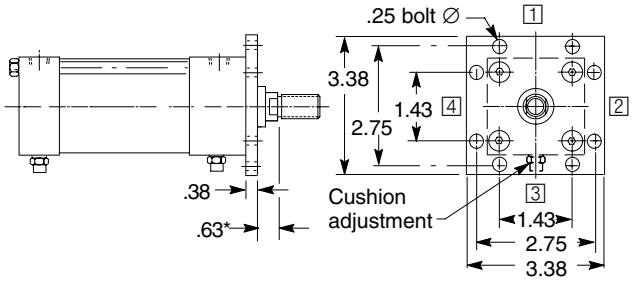
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

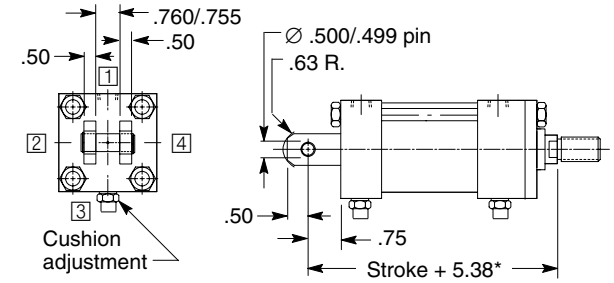


CODE 08 HEAD SQUARE FLANGE MOUNT

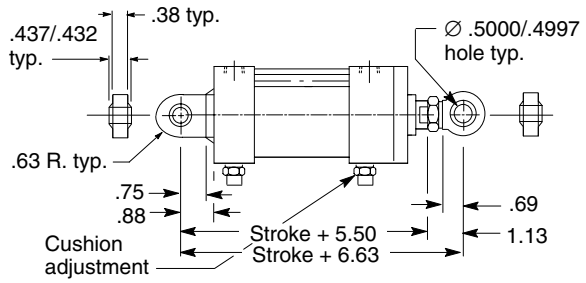


†Maximum working pressure 800 PSI (for minimum flange deflection)

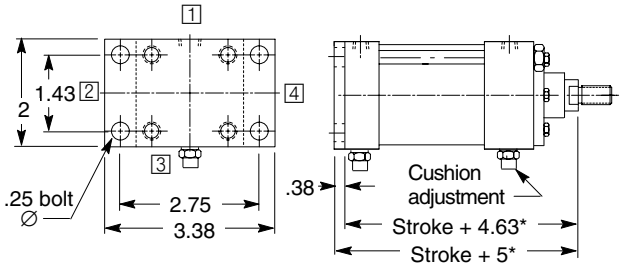
CODE 10 CLEVIS MOUNT



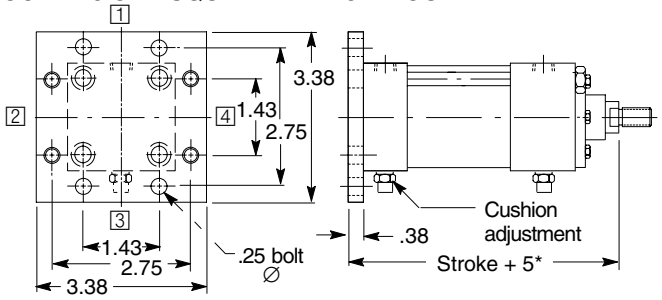
CODE 11 SPHERICAL BEARING MOUNT



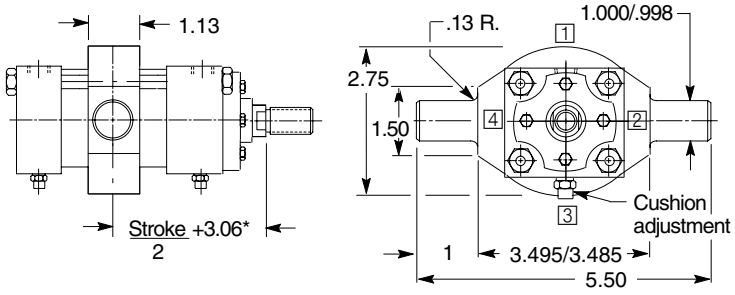
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



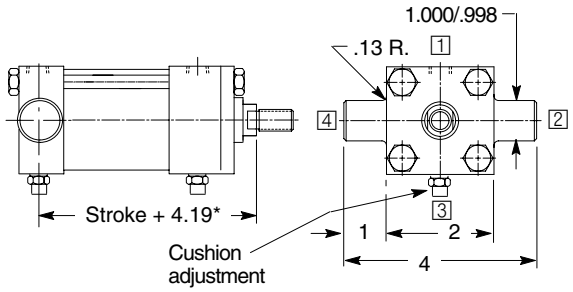
CODE 13 CAP SQUARE FLANGE MOUNT



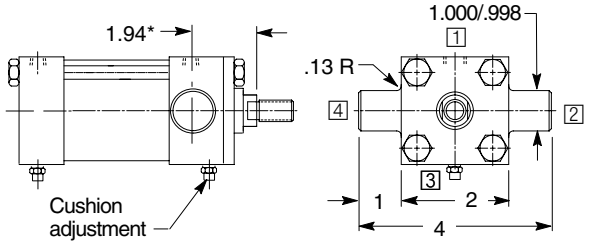
CODE 15 INTERMEDIATE TRUNNION MOUNT



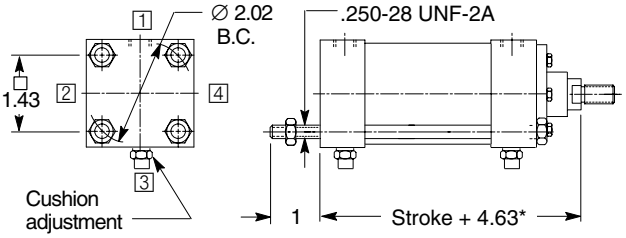
CODE 16 CAP TRUNNION MOUNT



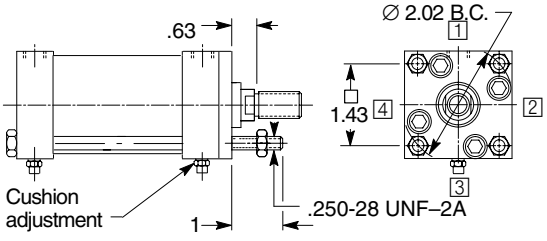
CODE 17 HEAD TRUNNION MOUNT



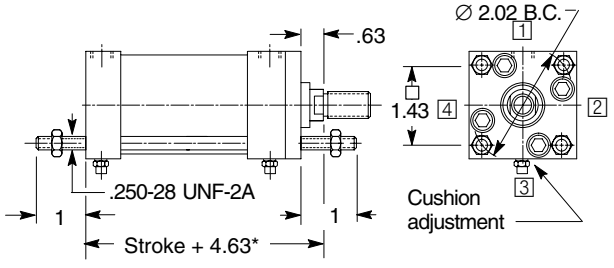
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

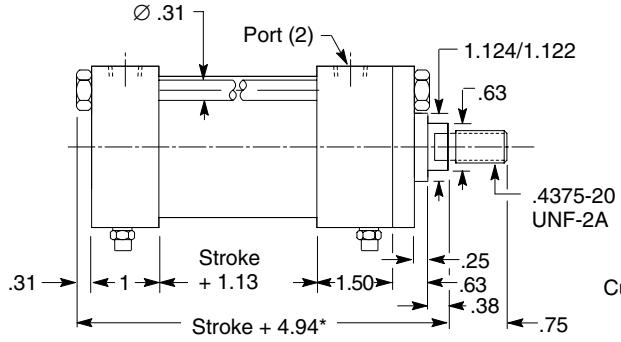


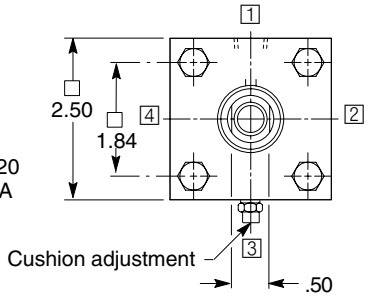
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

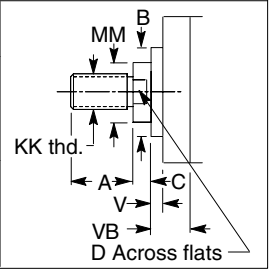
2 inch Cylinder Bore



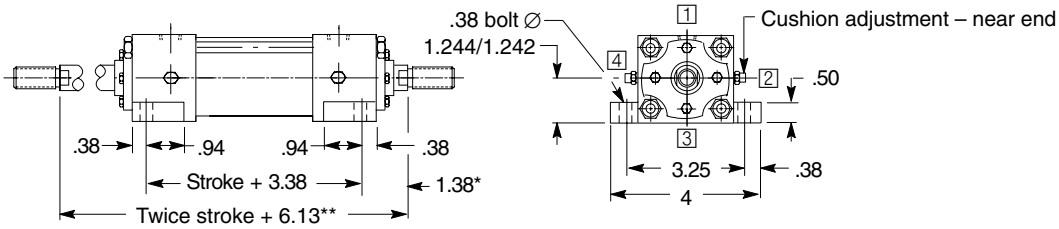


CODE 24 BASIC CYLINDER

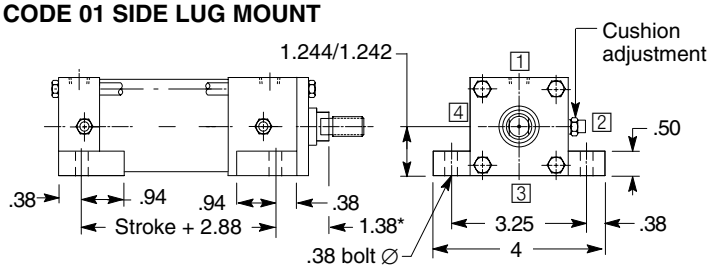
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *. N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1 3/8	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A



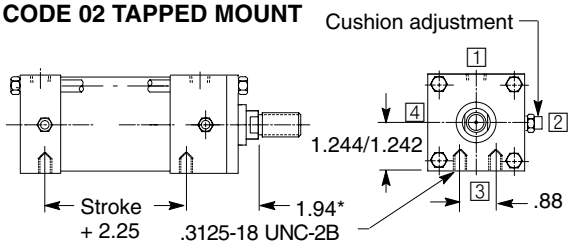
CODE 25 DOUBLE ROD SIDE LUG MOUNT



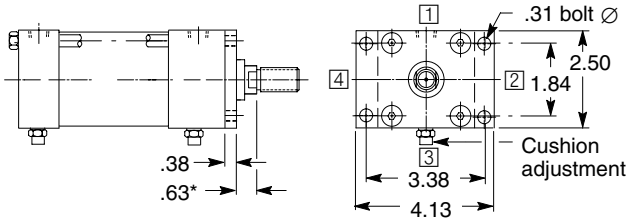
CODE 01 SIDE LUG MOUNT



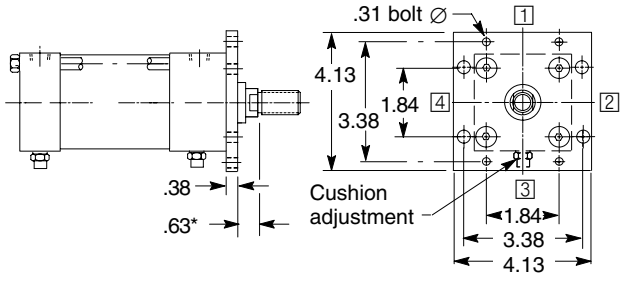
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

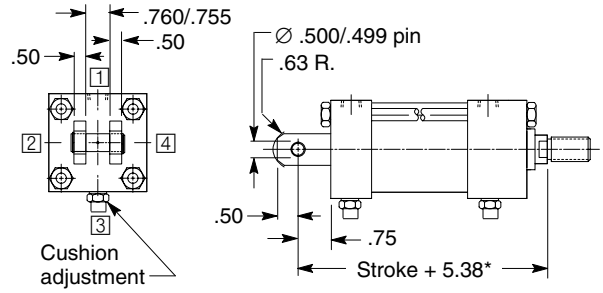


CODE 08 HEAD SQUARE FLANGE MOUNT

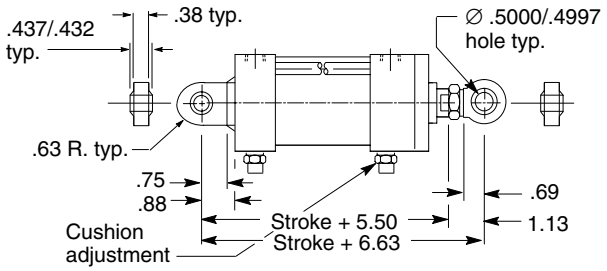


†Maximum working pressure 800 PSI (for minimum flange deflection)

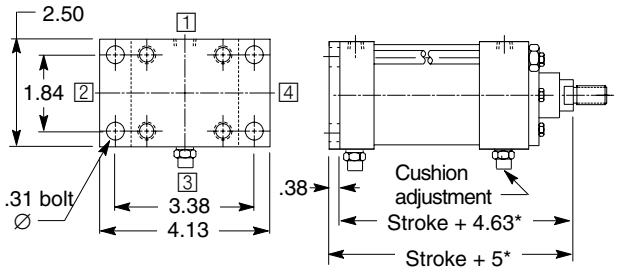
CODE 10 CLEVIS MOUNT



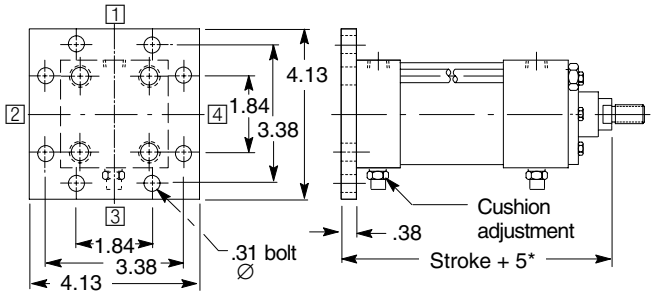
CODE 11 SPHERICAL BEARING MOUNT



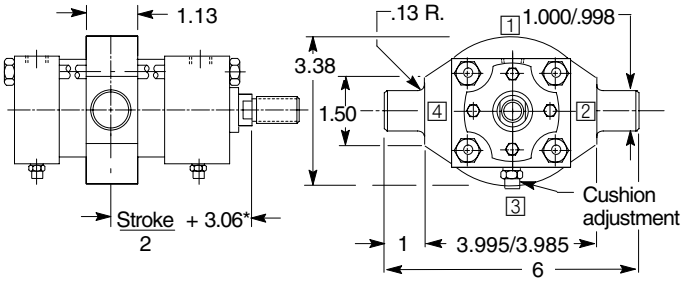
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



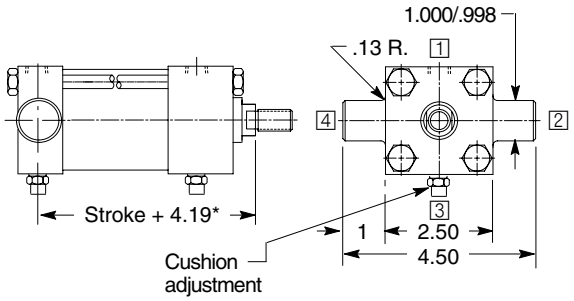
CODE 13 CAP SQUARE FLANGE MOUNT



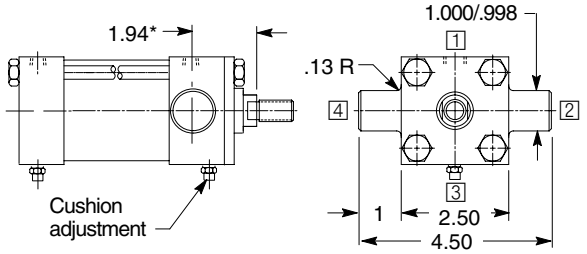
CODE 15 INTERMEDIATE TRUNNION MOUNT



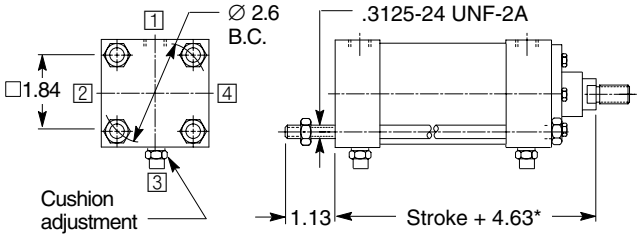
CODE 16 CAP TRUNNION MOUNT



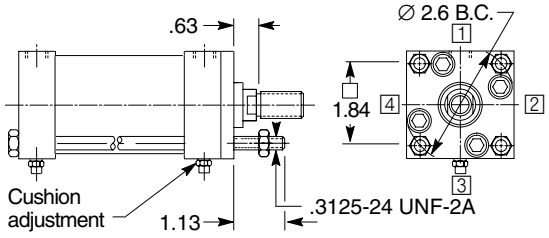
CODE 17 HEAD TRUNNION MOUNT



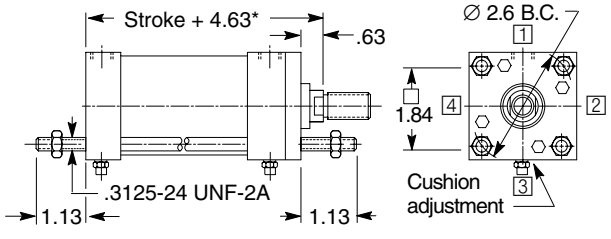
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

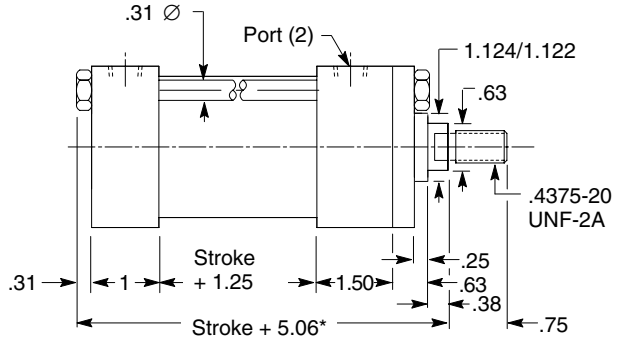


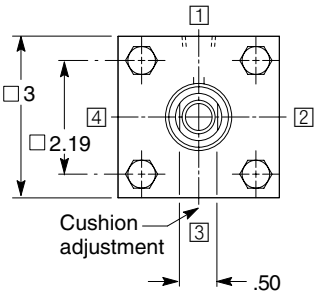
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

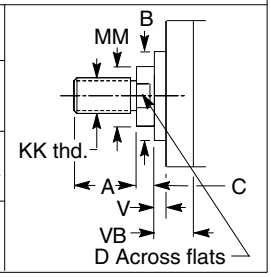
2 1/2 inch Cylinder Bore



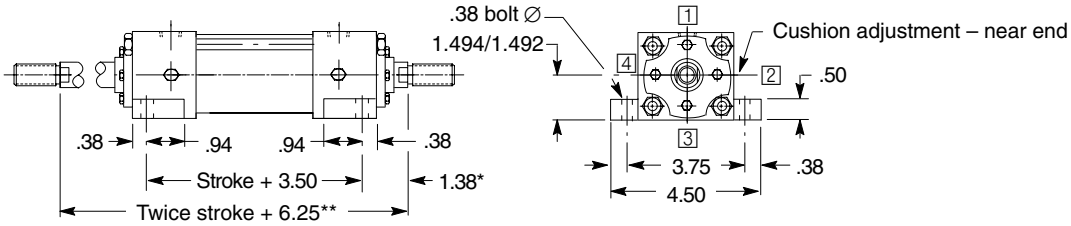


CODE 24 BASIC CYLINDER

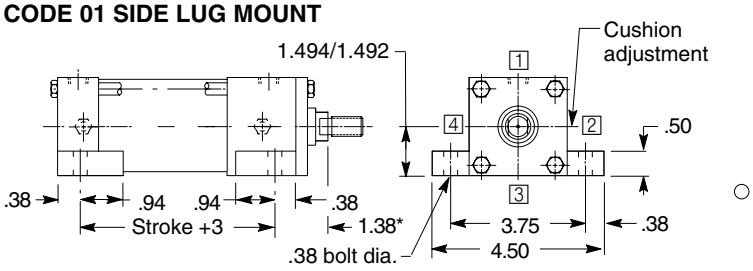
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1	.38	1.13	1.499/ 1.497	.50	.88	.88	.50	.750–16 UNF–2A
	1.38	.63	1.63	1.999/ 1.997	.63	1.13	1	.63	1.000–14 UNS–2A
	1.75	.88	2	2.374/ 2.372	.75	1.50	1.13	.75	1.250–12 UNF–2A



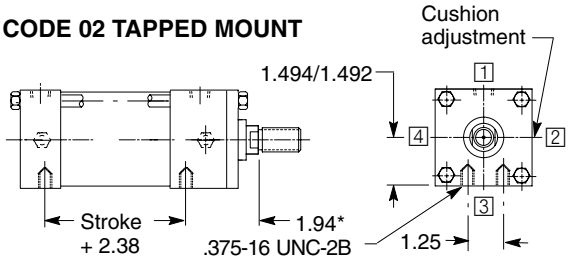
CODE 25 DOUBLE ROD SIDE LUG MOUNT



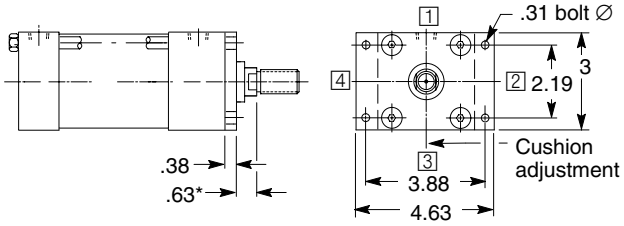
CODE 01 SIDE LUG MOUNT



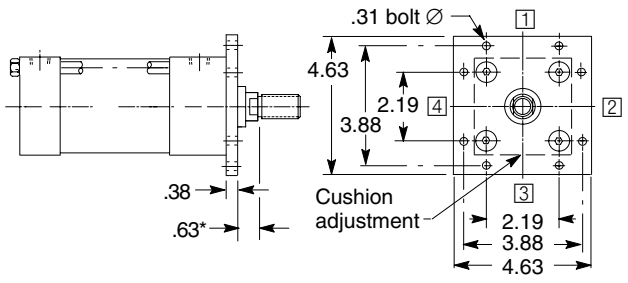
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

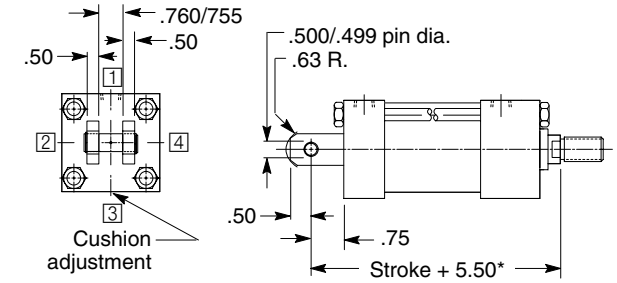


CODE 08 HEAD SQUARE FLANGE MOUNT

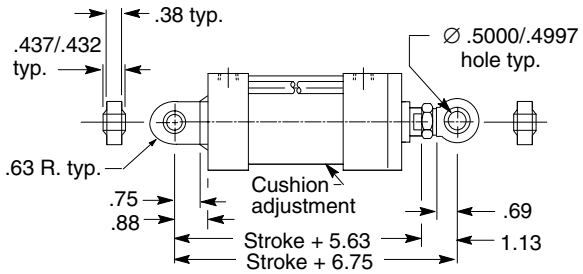


†Maximum working pressure 800 PSI (for minimum flange deflection)

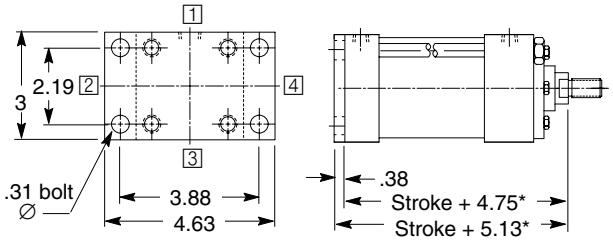
CODE 10 CLEVIS MOUNT



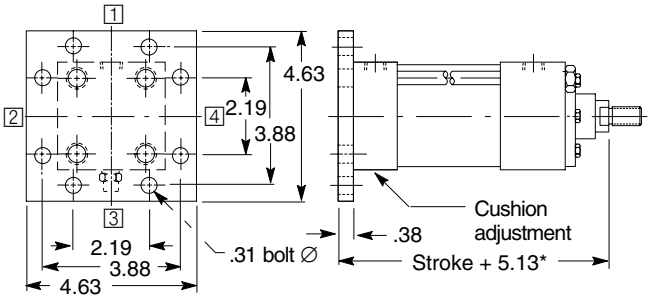
CODE 11 SPHERICAL BEARING MOUNT



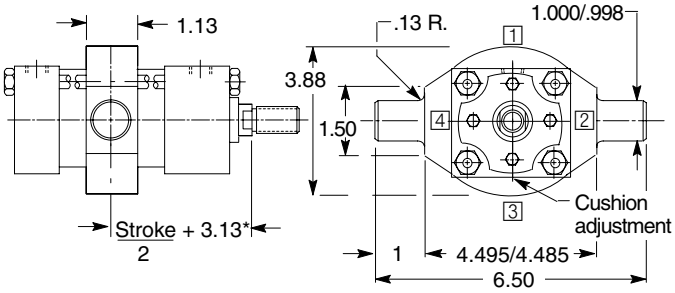
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



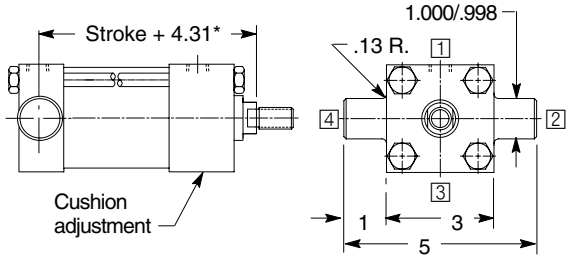
CODE 13 CAP SQUARE FLANGE MOUNT



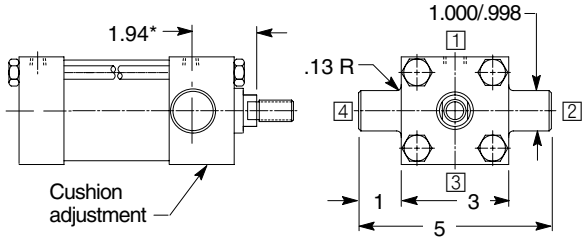
CODE 15 INTERMEDIATE TRUNNION MOUNT



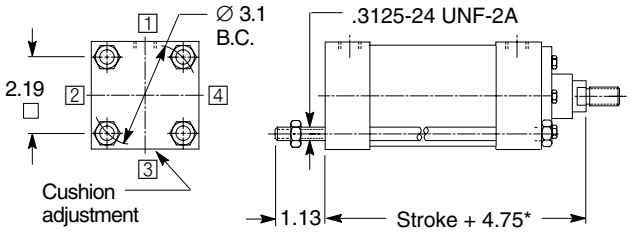
CODE 16 CAP TRUNNION MOUNT



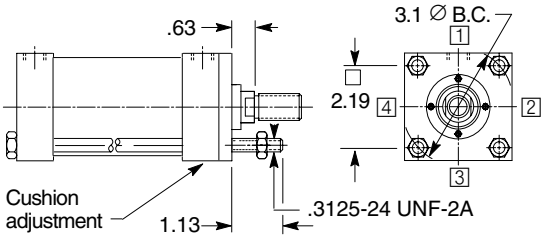
CODE 17 HEAD TRUNNION MOUNT



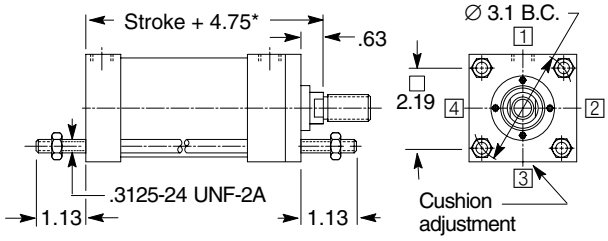
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

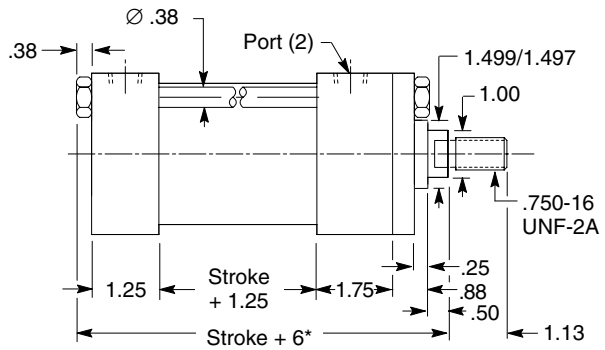


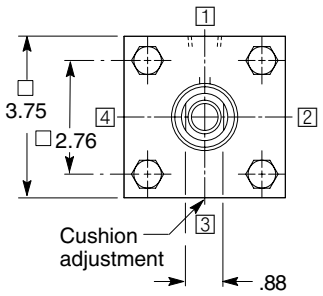
CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



†Maximum working pressure 800 PSI (for minimum flange deflection)

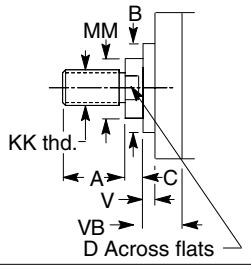
3 1/4 inch Cylinder Bore



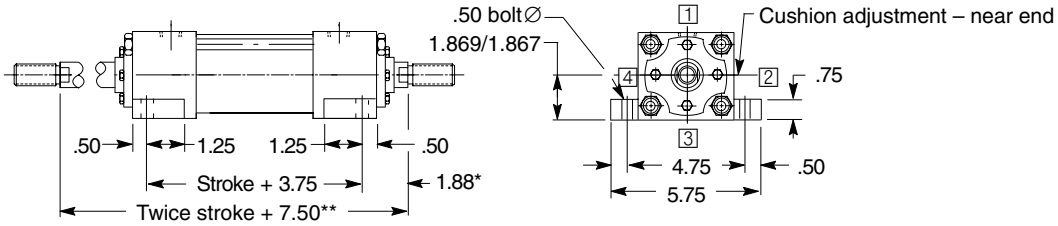


CODE 24 BASIC CYLINDER

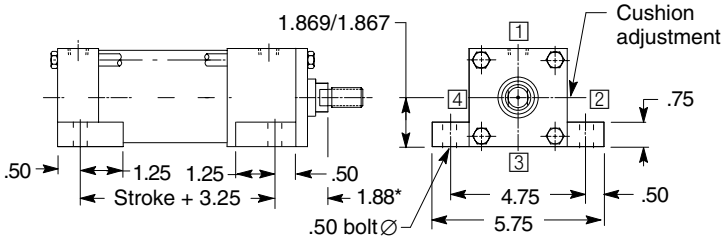
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.							
		N*	A	B	C	D	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	1.13	.50	1.250–12 UNF–2A
	2	.63	2.25	2.624/ 2.622	.88	1.69	1.13	.50	1.500–16 UNF–2A



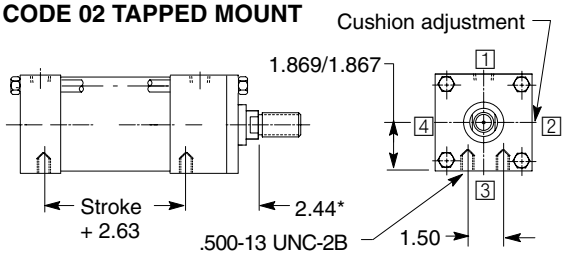
CODE 25 DOUBLE ROD SIDE LUG MOUNT



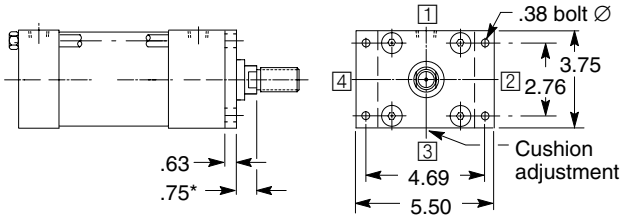
CODE 01 SIDE LUG MOUNT



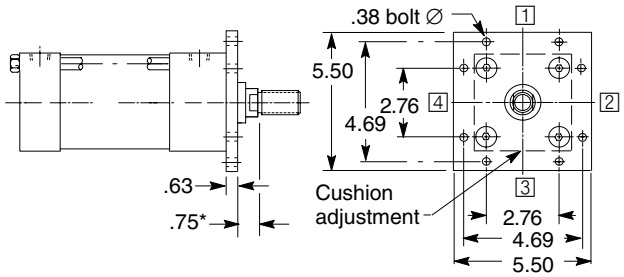
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

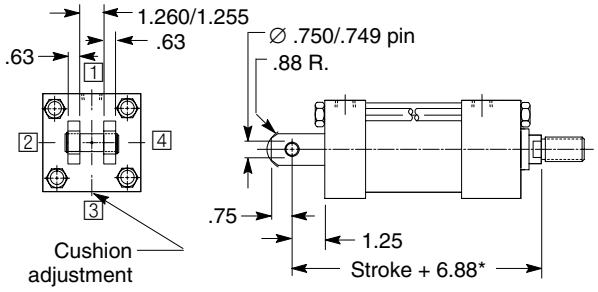


CODE 08 HEAD SQUARE FLANGE MOUNT

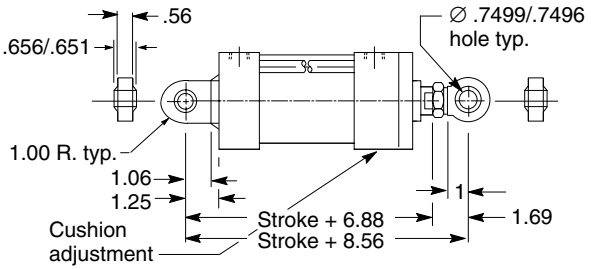


†Maximum working pressure 800 PSI (for minimum flange deflection)

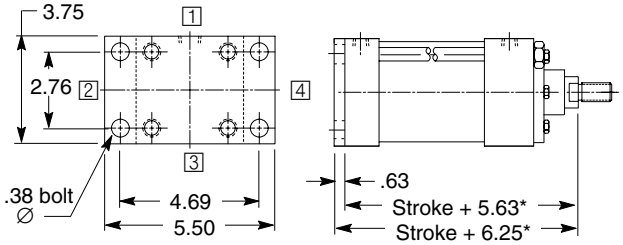
CODE 10 CLEVIS MOUNT



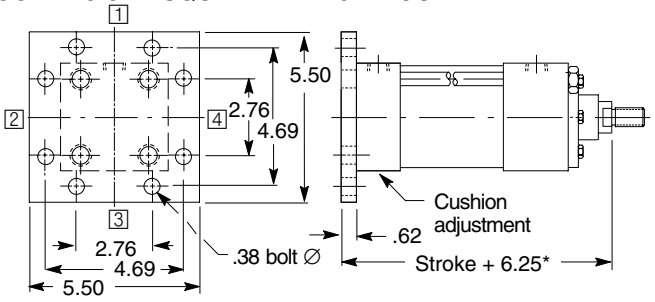
CODE 11 SPHERICAL BEARING MOUNT



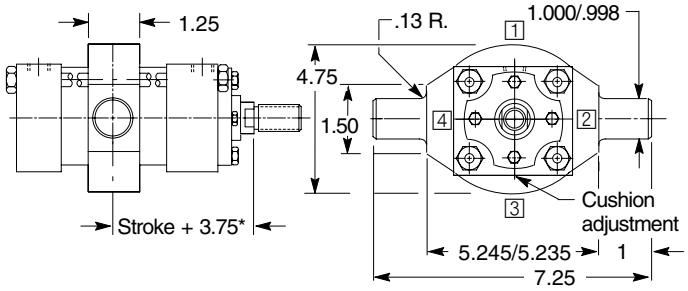
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



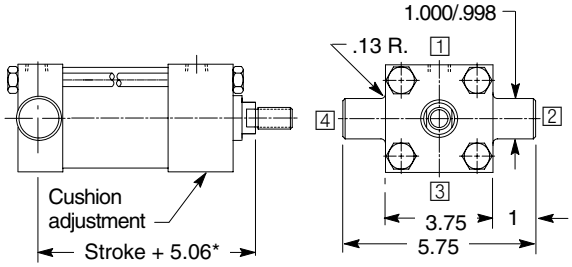
CODE 13 CAP SQUARE FLANGE MOUNT



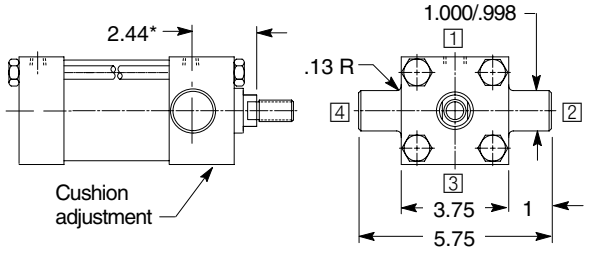
CODE 15 INTERMEDIATE TRUNNION MOUNT



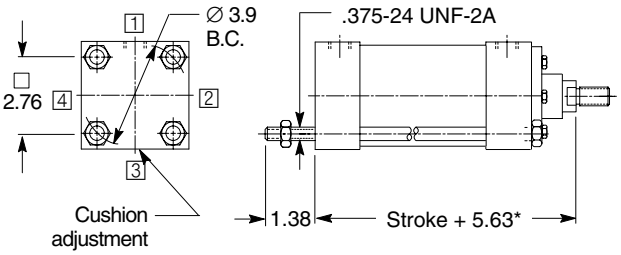
CODE 16 CAP TRUNNION MOUNT



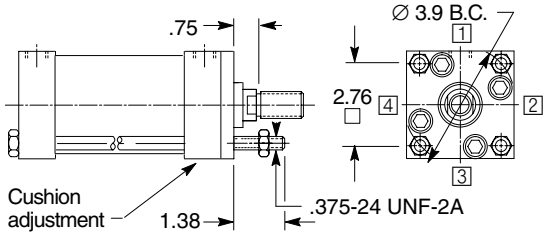
CODE 17 HEAD TRUNNION MOUNT



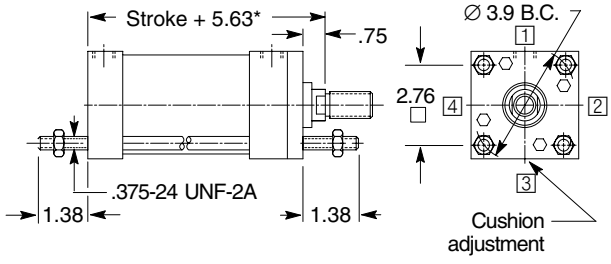
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

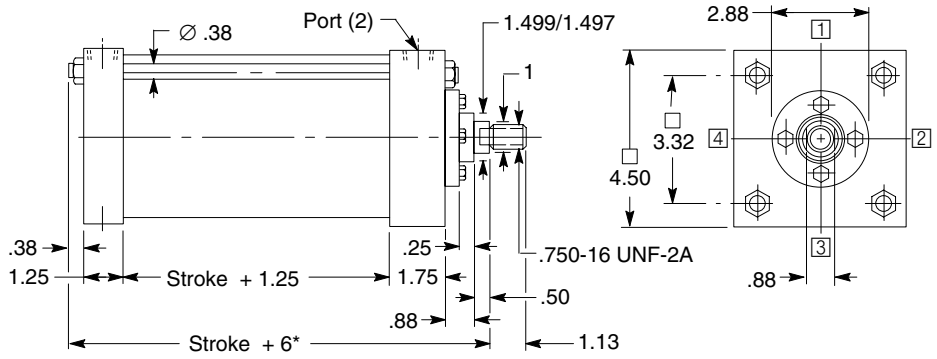


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



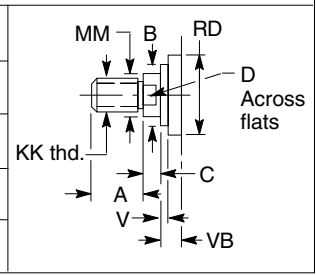
†Maximum working pressure 800 PSI (for minimum flange deflection)

4 inch Cylinder Bore

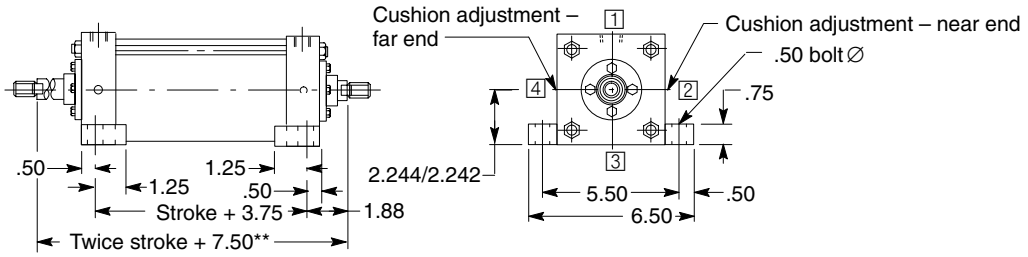


CODE 24 BASIC CYLINDER

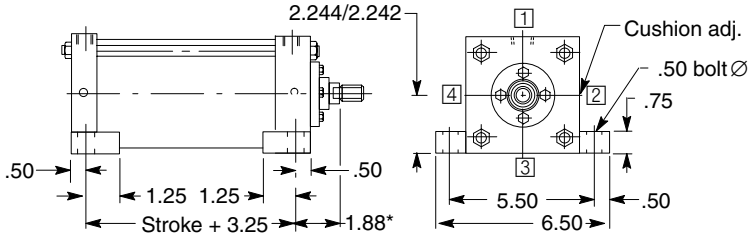
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999/ 1.997	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374/ 2.372	.75	1.50	3.38	1.13	.50	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



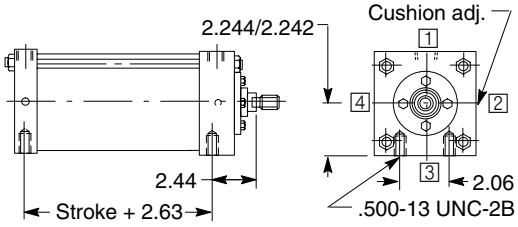
CODE 25 DOUBLE ROD SIDE LUG MOUNT



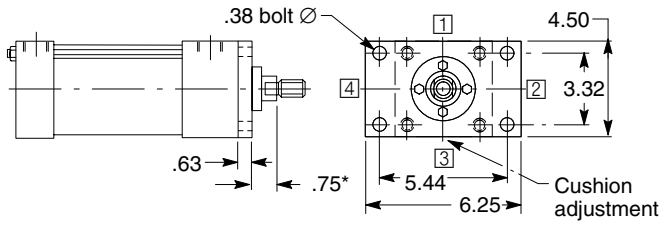
CODE 01 SIDE LUG MOUNT



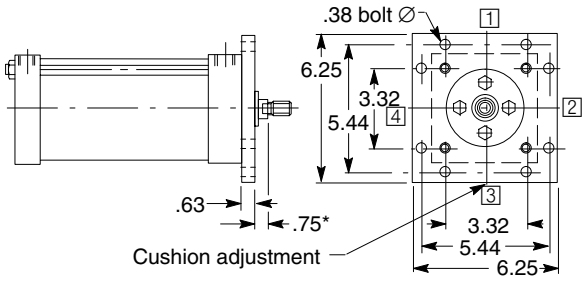
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

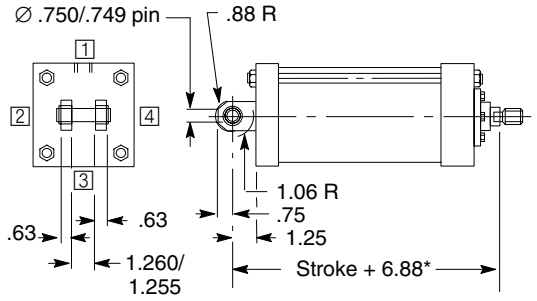


CODE 08 HEAD SQUARE FLANGE MOUNT

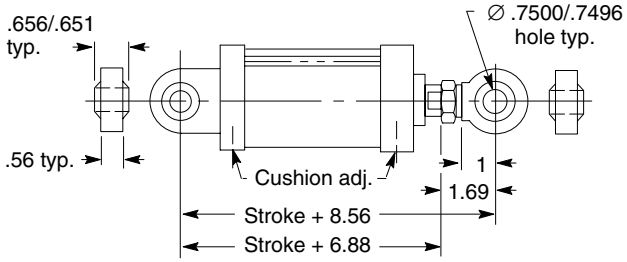


†Maximum working pressure 800 PSI (for minimum flange deflection)

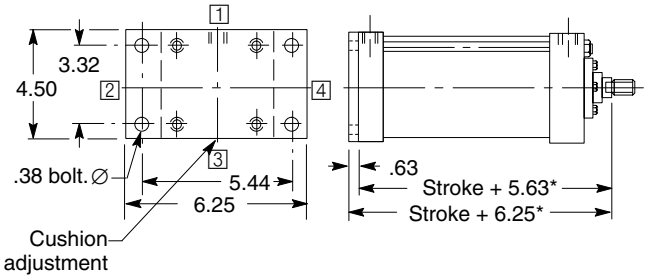
CODE 10 CLEVIS MOUNT



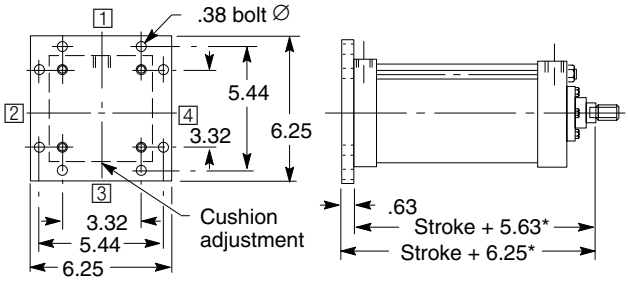
CODE 11 SPHERICAL BEARING MOUNT



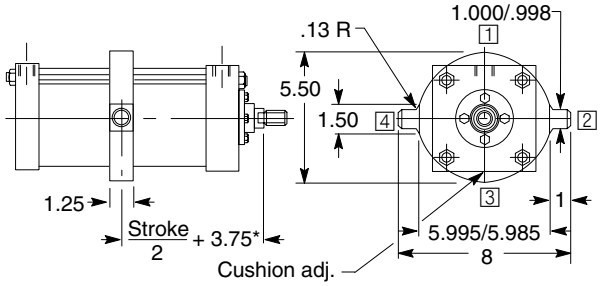
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



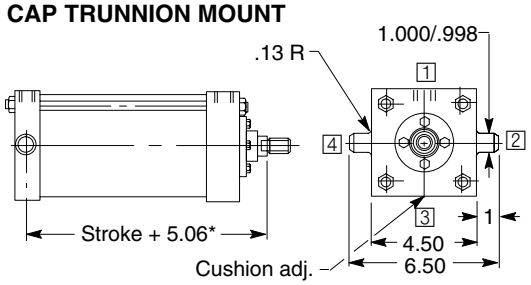
CODE 13 CAP SQUARE FLANGE MOUNT



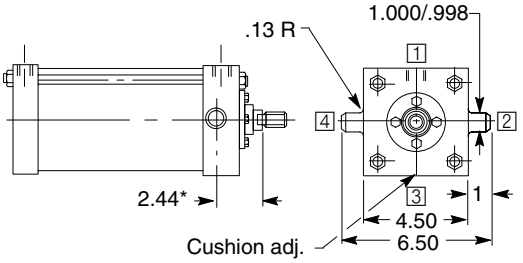
CODE 15 INTERMEDIATE TRUNNION MOUNT



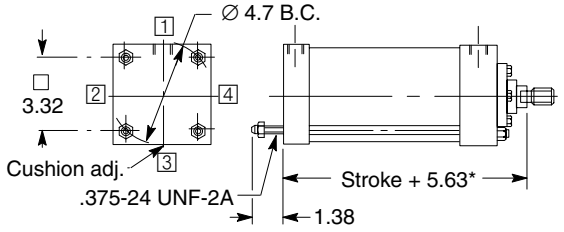
CODE 16 CAP TRUNNION MOUNT



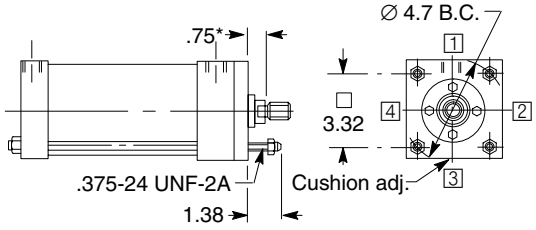
CODE 17 HEAD TRUNNION MOUNT



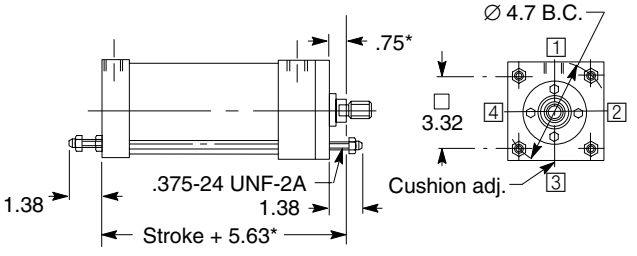
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

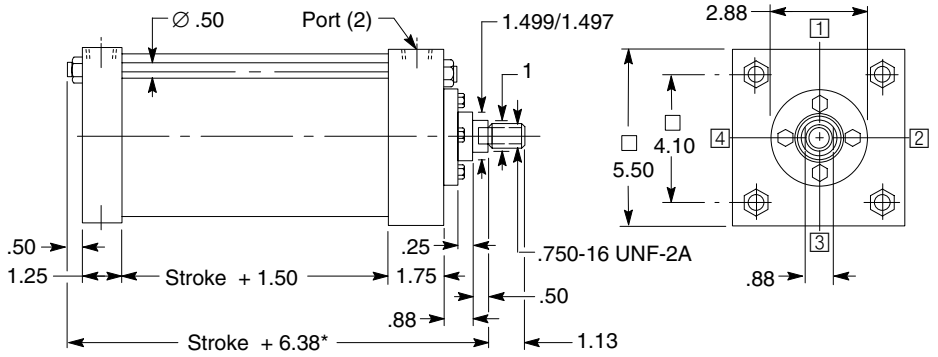


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



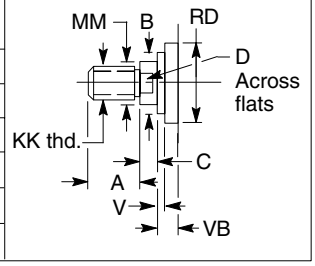
†Maximum working pressure 800 PSI (for minimum flange deflection)

5 inch Cylinder Bore

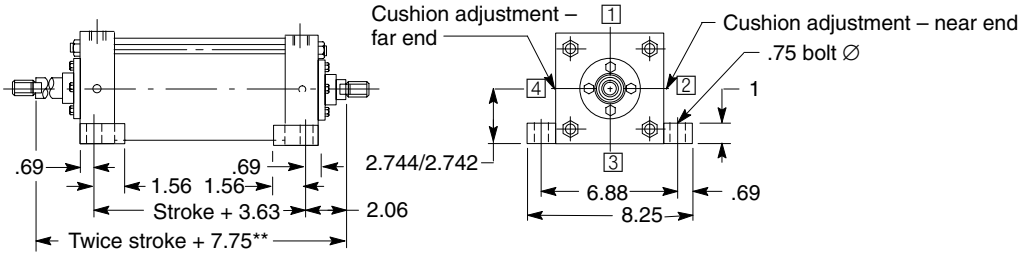


CODE 24 BASIC CYLINDER

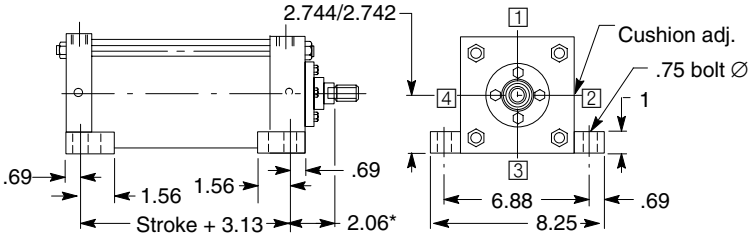
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B +.000 –.002	C	D	RD	VB	V	KK thd.
	1 3/8	.25	1.63	1.999	.63	1.13	3.38	1	.38	1.000–14 UNS–2A
	1 3/4	.50	2	2.374	.75	1.50	3.38	1.13	.50	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



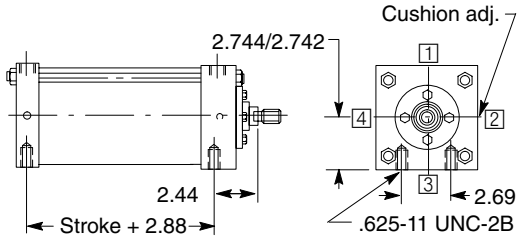
CODE 25 DOUBLE ROD SIDE LUG MOUNT



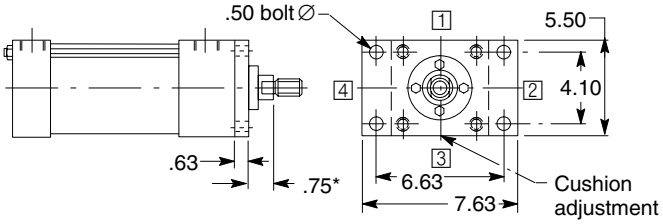
CODE 01 SIDE LUG MOUNT



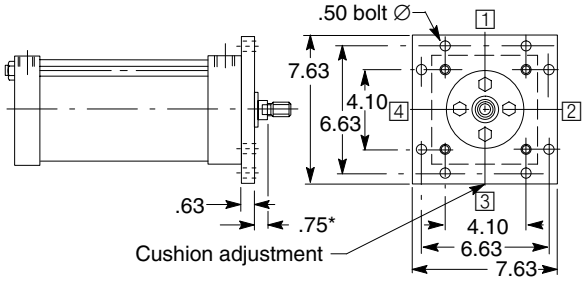
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

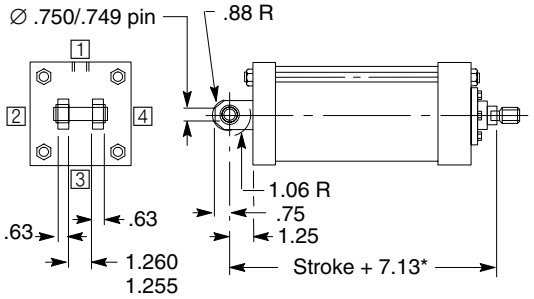


CODE 08 HEAD SQUARE FLANGE MOUNT

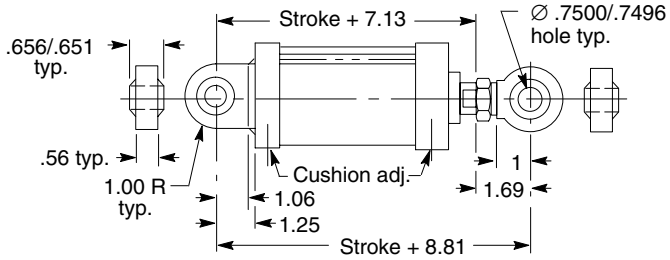


†Maximum working pressure 800 PSI (for minimum flange deflection)

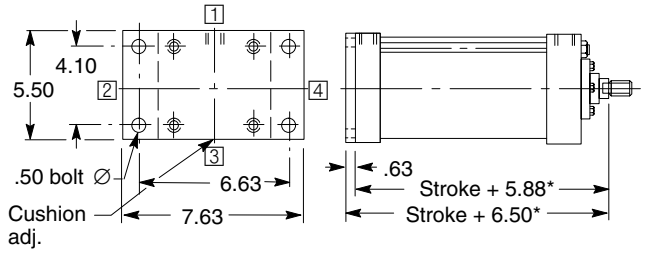
CODE 10 CLEVIS MOUNT



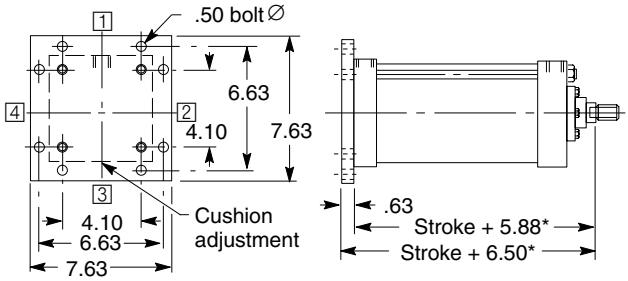
CODE 11 SPHERICAL BEARING MOUNT



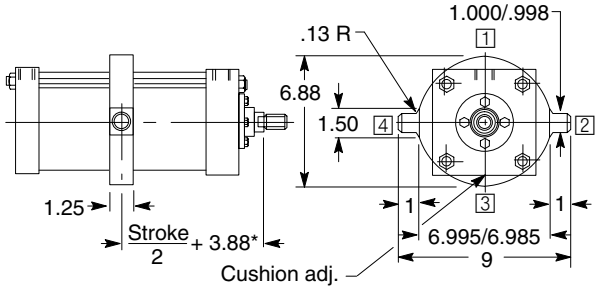
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



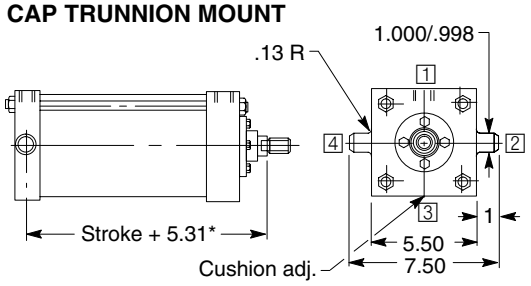
CODE 13 CAP SQUARE FLANGE MOUNT



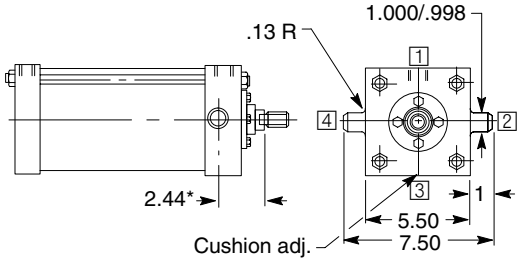
CODE 15 INTERMEDIATE TRUNNION MOUNT



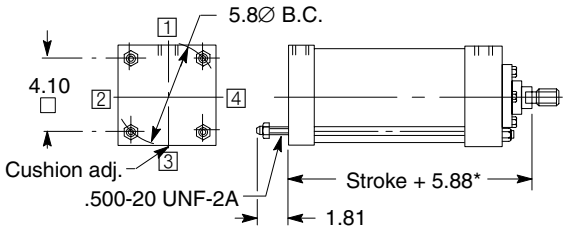
CODE 16 CAP TRUNNION MOUNT



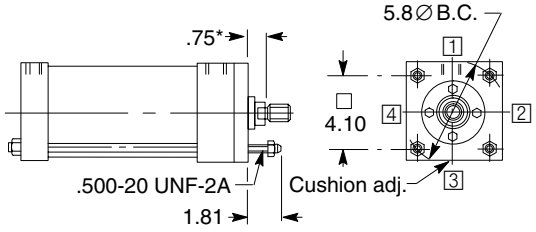
CODE 17 HEAD TRUNNION MOUNT



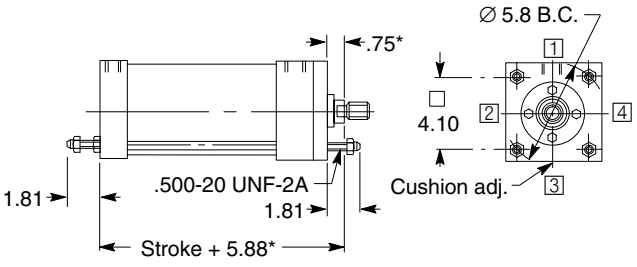
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

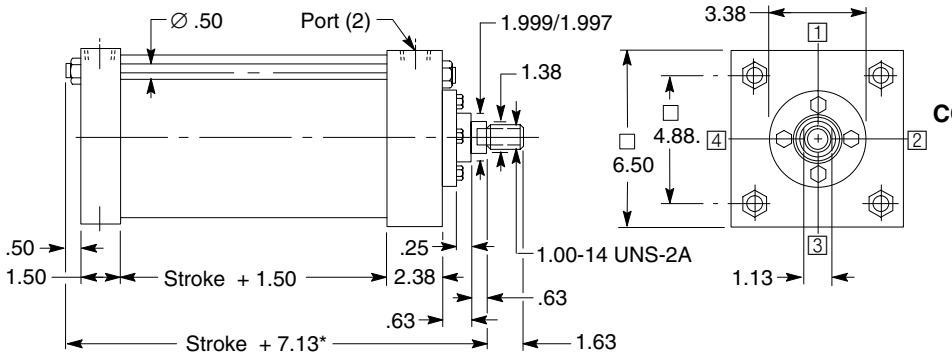


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



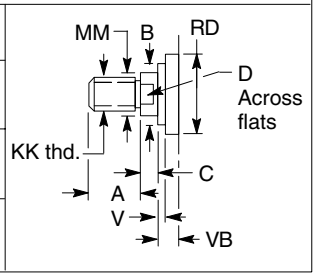
†Maximum working pressure 800 PSI (for minimum flange deflection)

6 inch Cylinder Bore

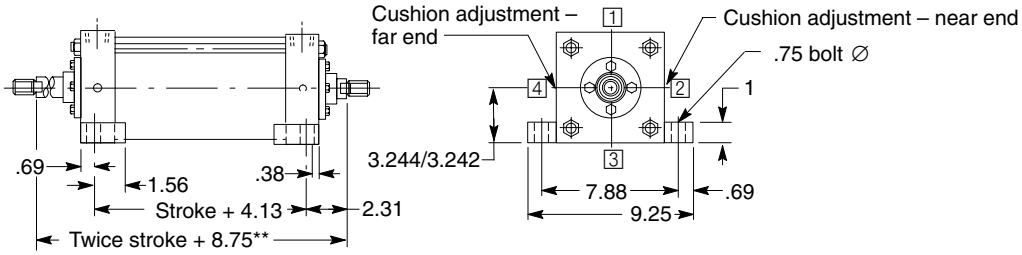


CODE 24 BASIC CYLINDER

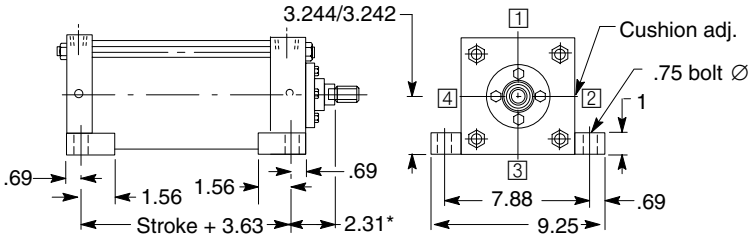
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.								
		N*	A	B	C	D	RD	VB	V	KK thd.
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.38	1.250–12 UNF–2A
	2 1/2	.63	3	3.124/ 3.122	1	2.06	4.50	.88	.50	1.875–12 UN–2A
	4	.63	4	4.749/ 4.746	1	3.38	6	.88	.50	3.000–12 UN–2A



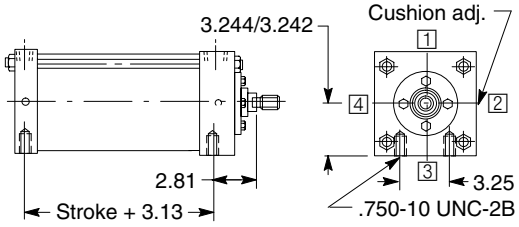
CODE 25 DOUBLE ROD SIDE LUG MOUNT



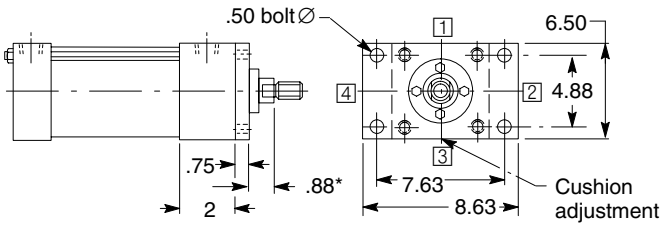
CODE 01 SIDE LUG MOUNT



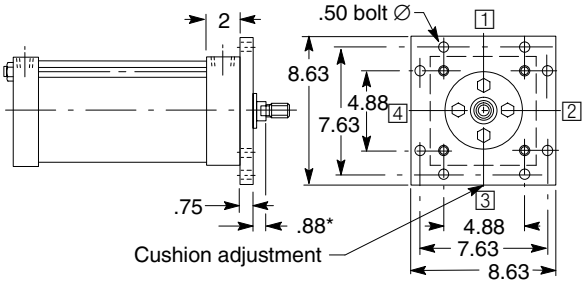
CODE 02 TAPPED MOUNT



CODE 07 HEAD RECTANGULAR FLANGE MOUNT †

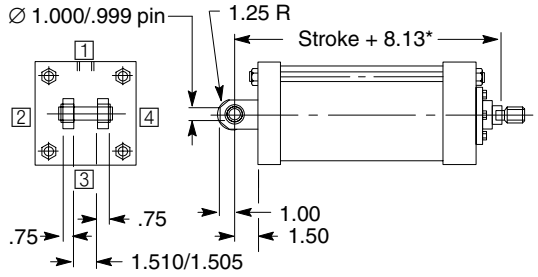


CODE 08 HEAD SQUARE FLANGE MOUNT

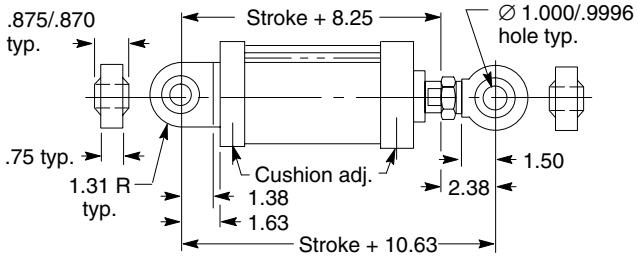


†Maximum working pressure 800 PSI (for minimum flange deflection)

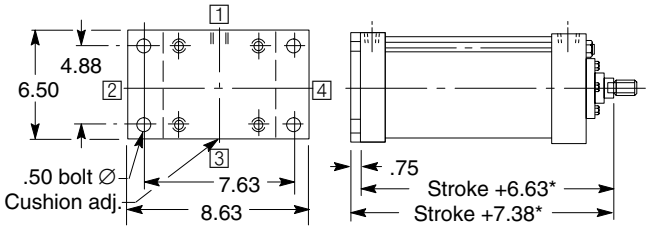
CODE 10 CLEVIS MOUNT



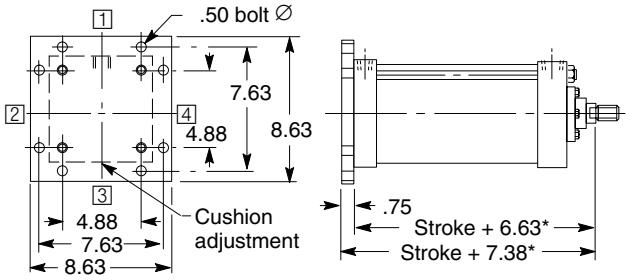
CODE 11 SPHERICAL BEARING MOUNT



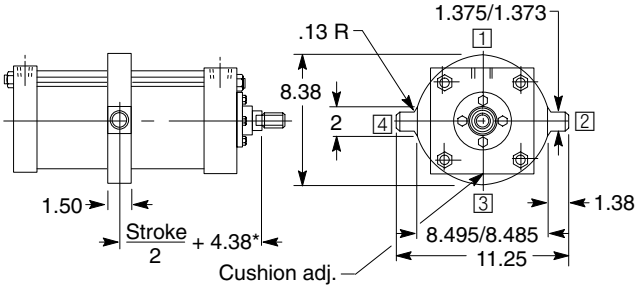
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



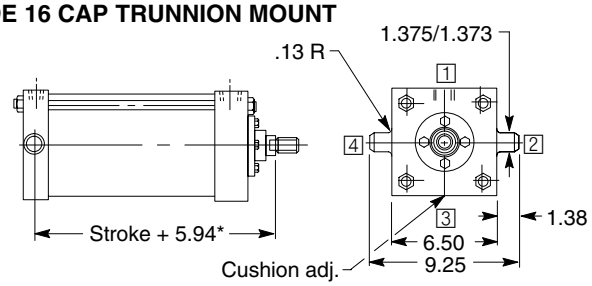
CODE 13 CAP SQUARE FLANGE MOUNT



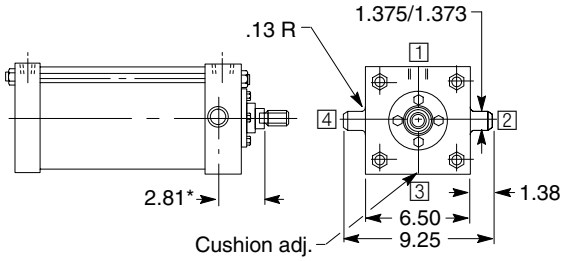
CODE 15 INTERMEDIATE TRUNNION MOUNT



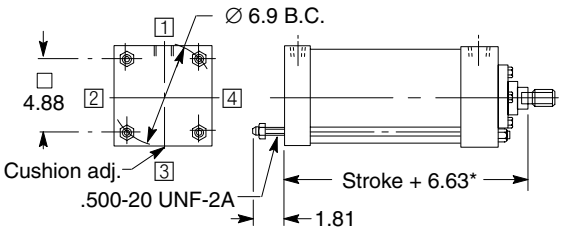
CODE 16 CAP TRUNNION MOUNT



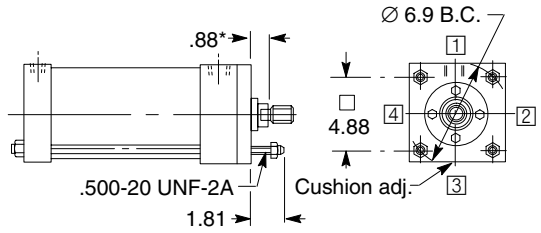
CODE 17 HEAD TRUNNION MOUNT



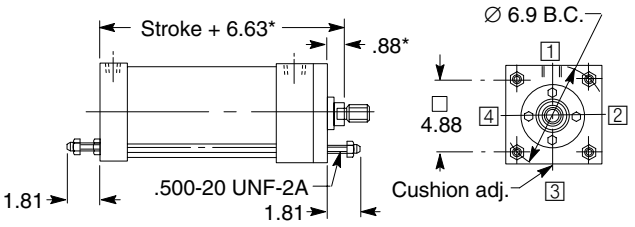
CODE 21 CAP EXTENDED TIE ROD MOUNT



CODE 22 HEAD EXTENDED TIE ROD MOUNT

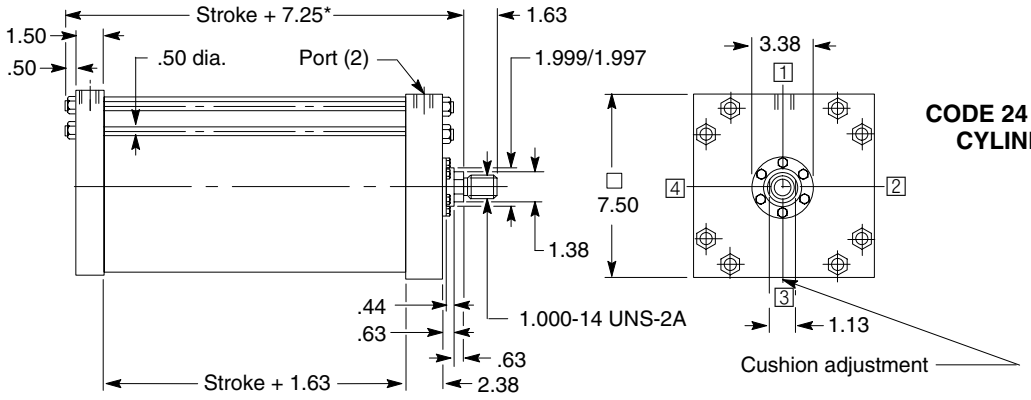


CODE 23 BOTH ENDS EXTENDED TIE ROD MOUNT



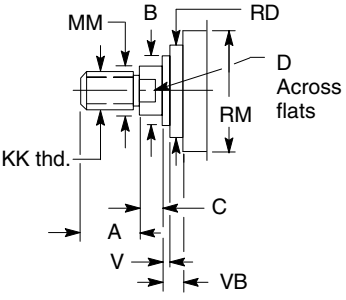
†Maximum working pressure 800 PSI (for minimum flange deflection)

7 inch Cylinder Bore

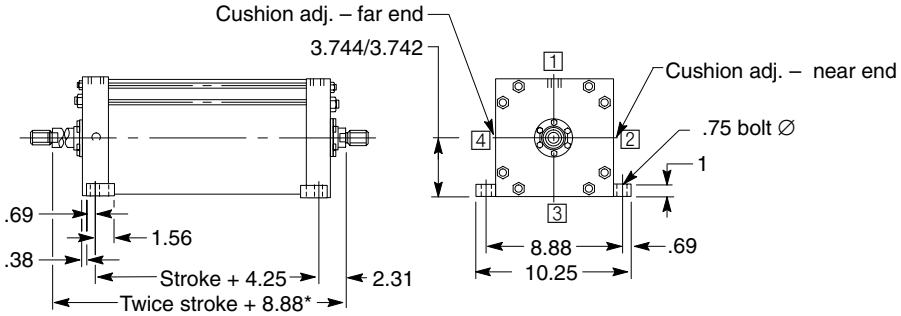


CODE 24 BASIC CYLINDER

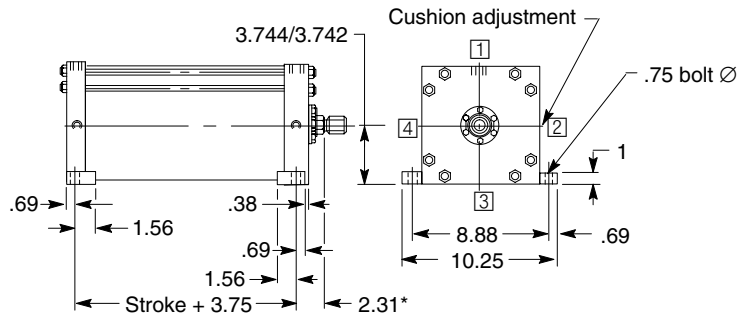
ALTERNATE ROD SIZES AVAILABLE (in inches)	ROD DIA. MM	DIMENSIONAL CHANGES THAT OCCUR AS ROD DIAMETER IS CHANGED Add "N" to all dimensions marked with *.									
		N*	A	B	C	D	RD	VB	V	KK thd.	RM
	1 3/4	.25	2	2.374/ 2.372	.75	1.50	3.75	.75	.63	1.250–12 UNF–2A	4.499
	3	.63	3.50	3.749/ 3.747	1	2.63	5.50	.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



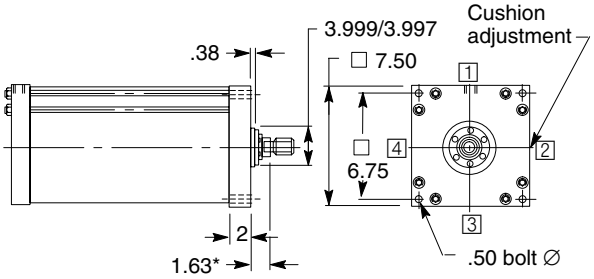
CODE 25 DOUBLE ROD SIDE LUG MOUNT



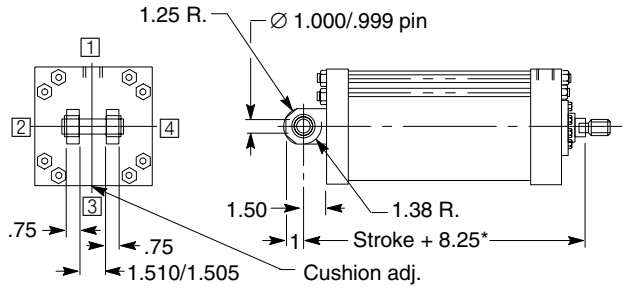
CODE 01 SIDE LUG MOUNT



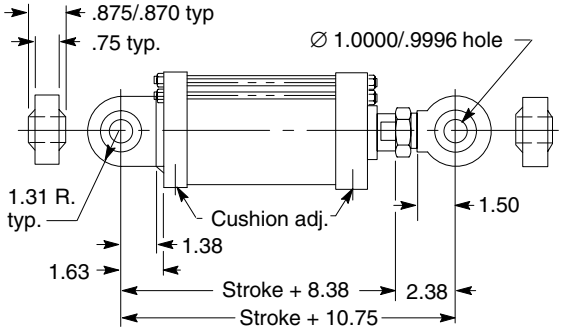
CODE 07 HEAD FLANGE MOUNT



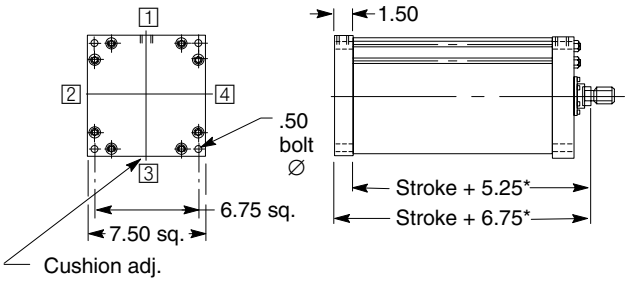
CODE 10 CLEVIS MOUNT



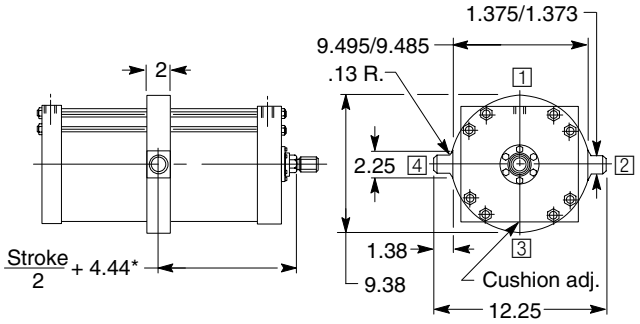
CODE 11 SPHERICAL BEARING MOUNT



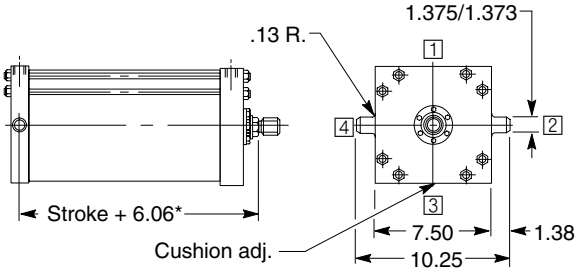
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



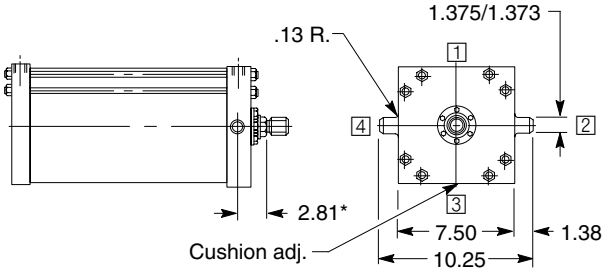
CODE 15 INTERMEDIATE TRUNNION MOUNT



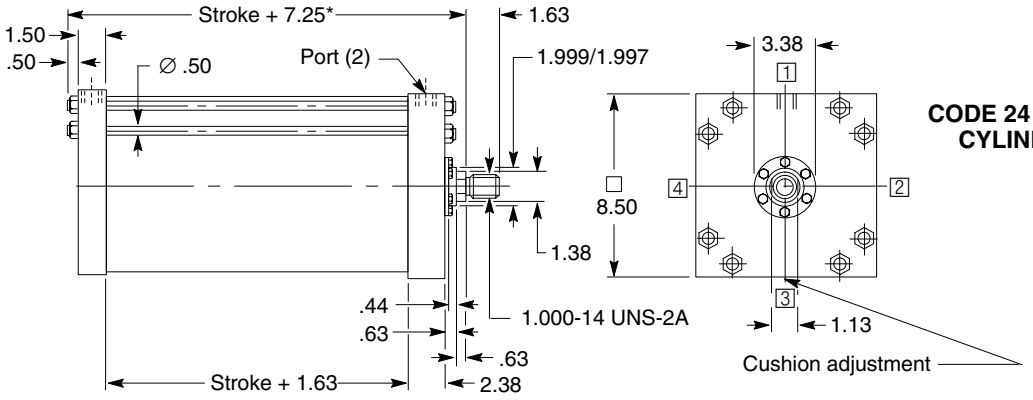
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

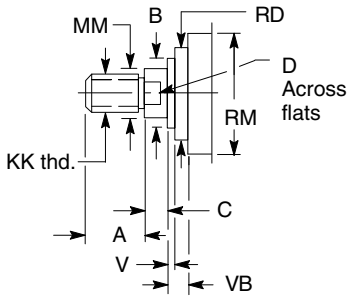


8 inch Cylinder Bore



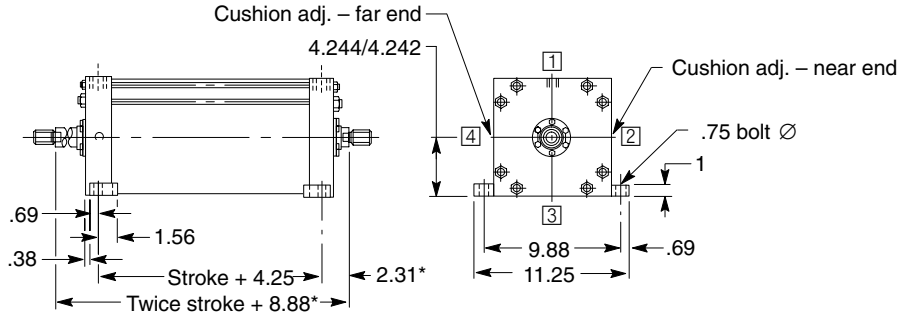
CODE 24 BASIC CYLINDER

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

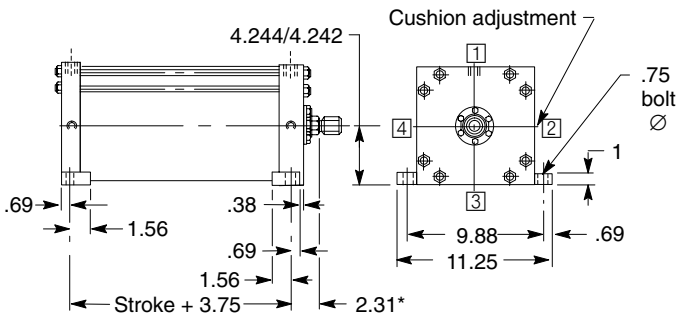


† Applies to Code 07 mount only

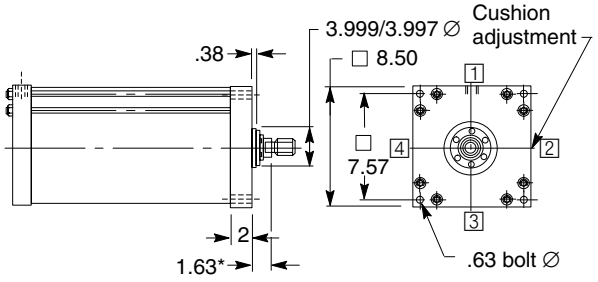
CODE 25 DOUBLE ROD SIDE LUG MOUNT



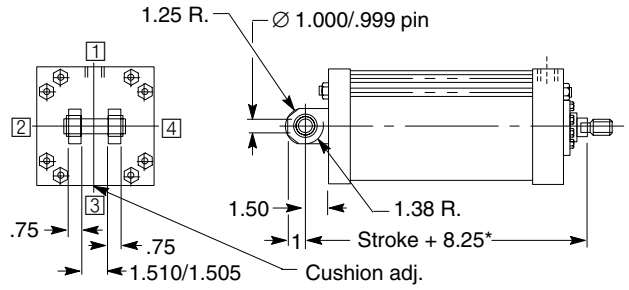
CODE 01 SIDE LUG MOUNT



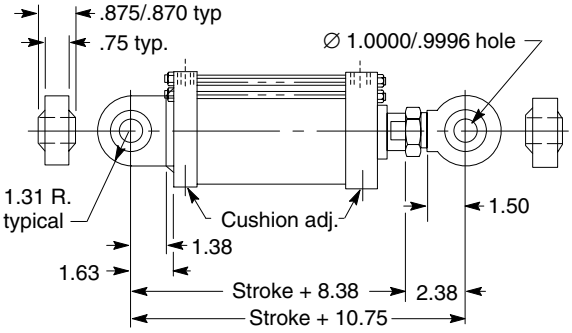
CODE 07 HEAD FLANGE MOUNT



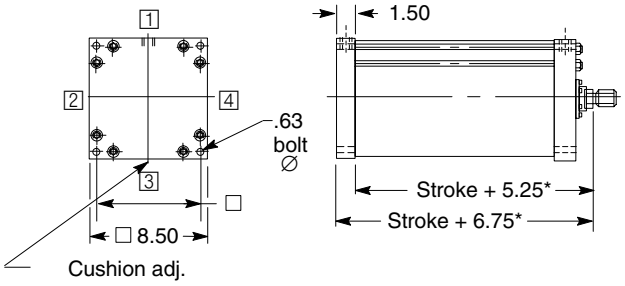
CODE 10 CLEVIS MOUNT



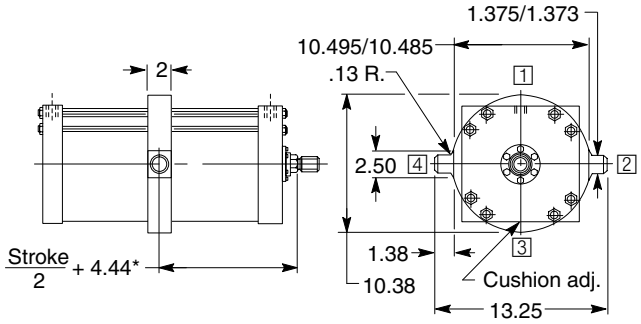
CODE 11 SPHERICAL BEARING MOUNT



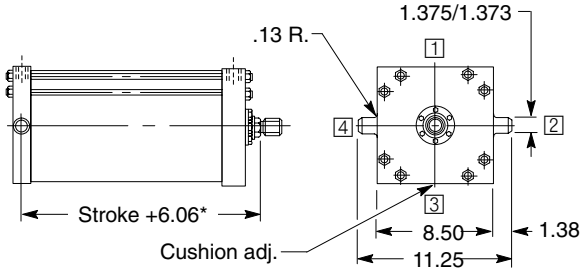
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



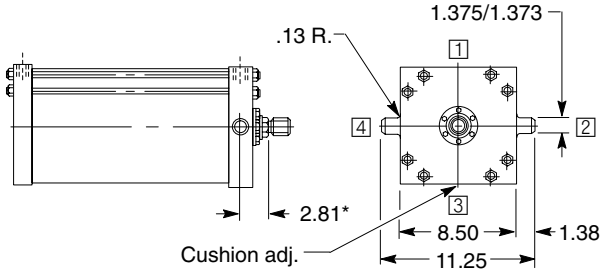
CODE 15 INTERMEDIATE TRUNNION MOUNT



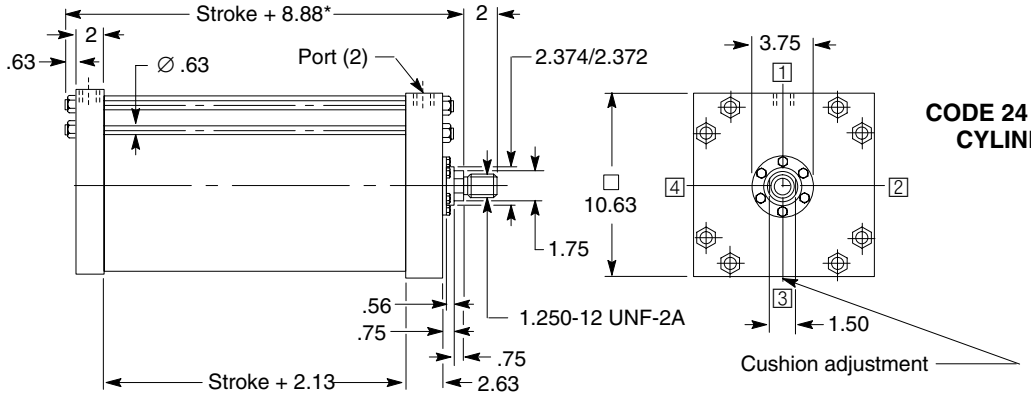
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

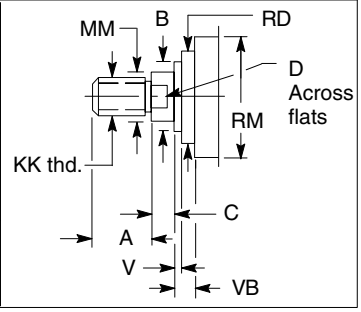


10 inch Cylinder Bore



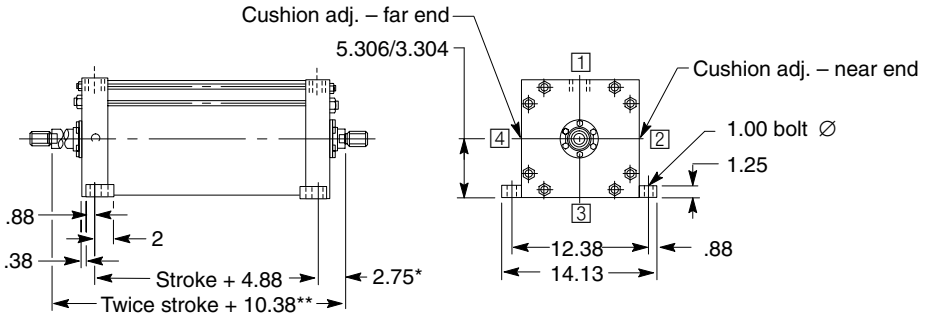
CODE 24 BASIC CYLINDER

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

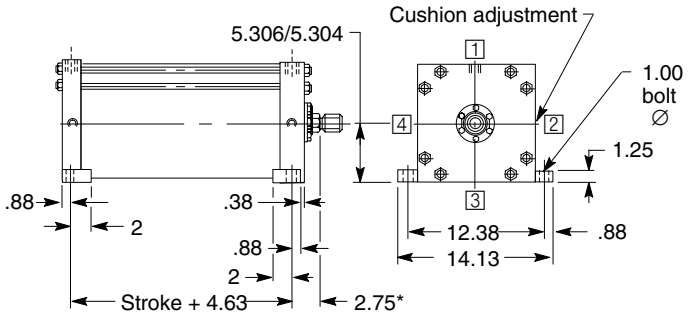


† Applies to Code 07 mount only

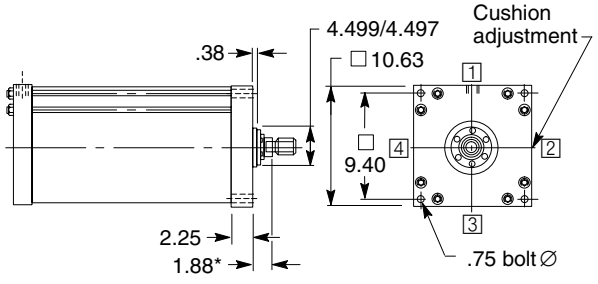
CODE 25 DOUBLE ROD SIDE LUG MOUNT



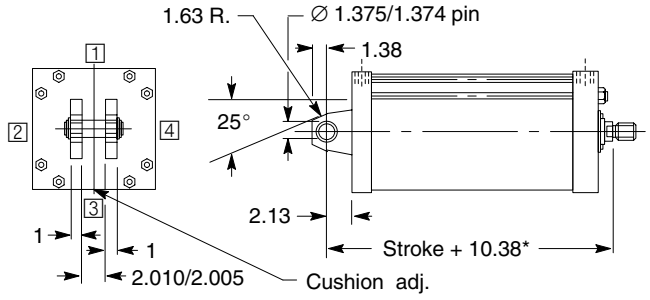
CODE 01 SIDE LUG MOUNT



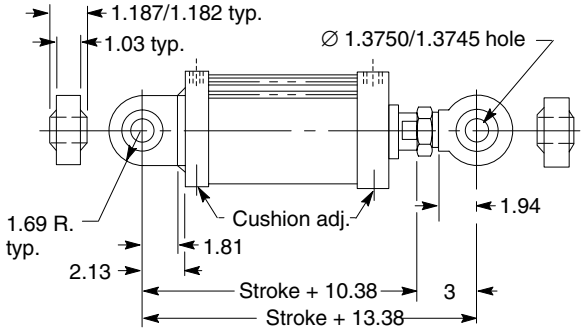
CODE 07 HEAD FLANGE MOUNT



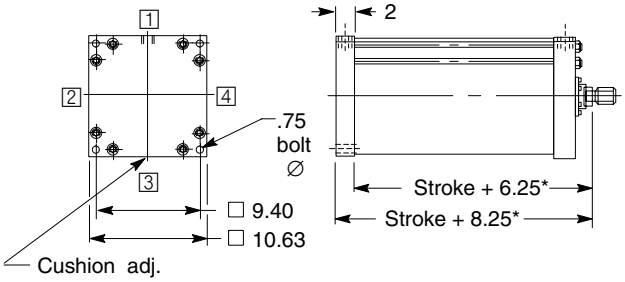
CODE 10 CLEVIS MOUNT



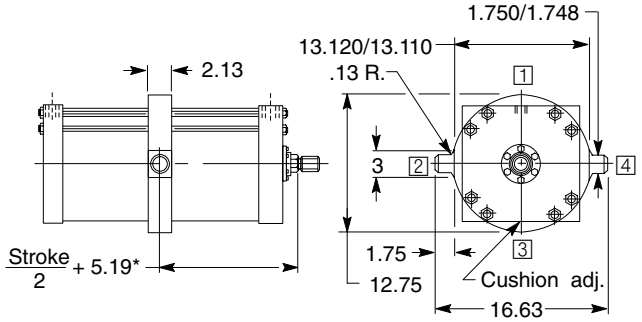
CODE 11 SPHERICAL BEARING MOUNT



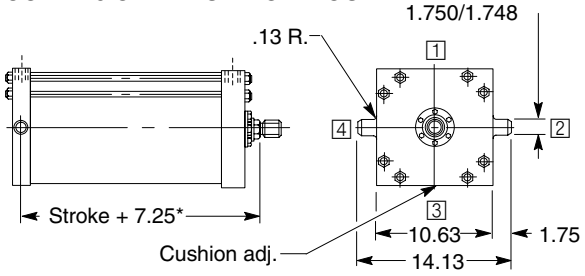
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



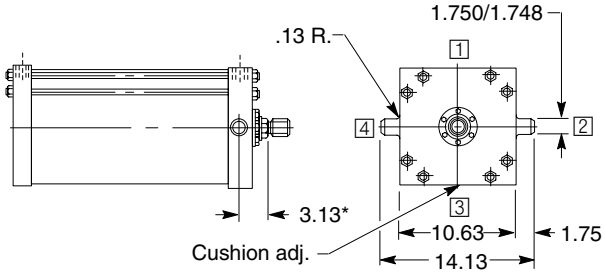
CODE 15 INTERMEDIATE TRUNNION MOUNT



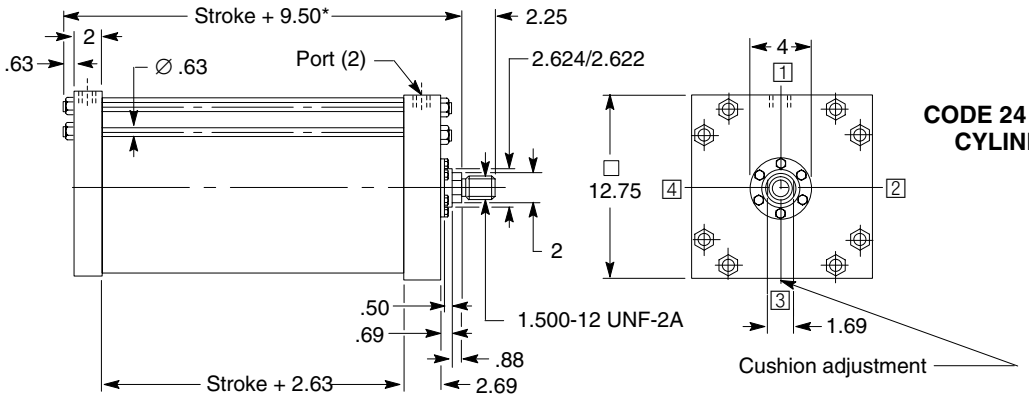
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

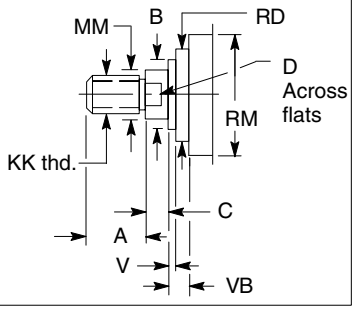


12 inch Cylinder Bore



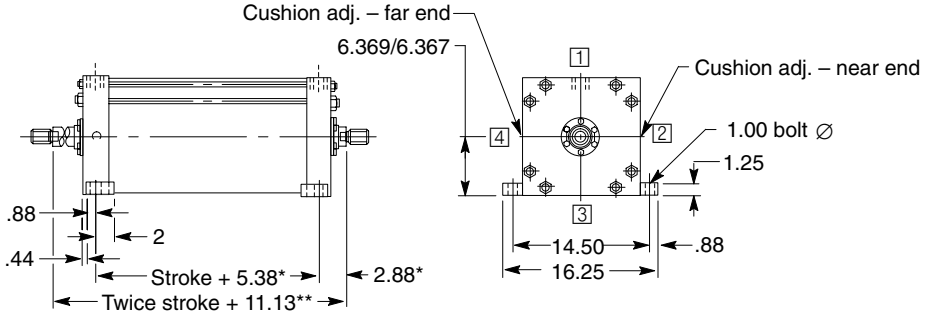
CODE 24 BASIC CYLINDER

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

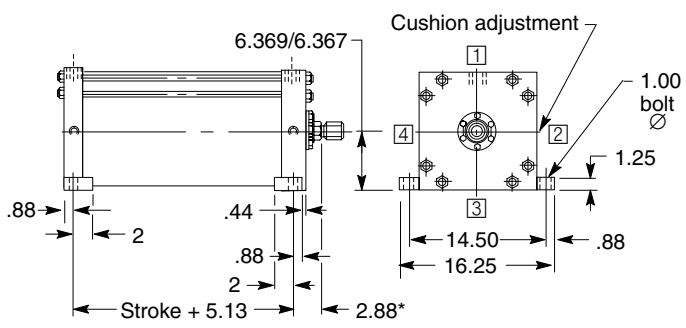


† Applies to Code 07 mount only

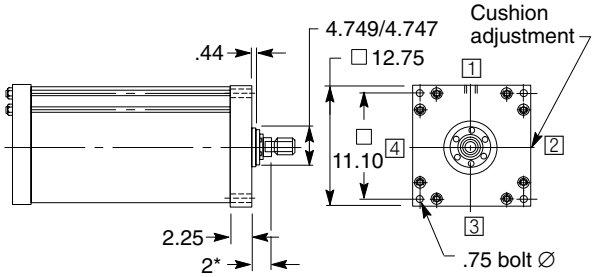
CODE 25 DOUBLE ROD SIDE LUG MOUNT



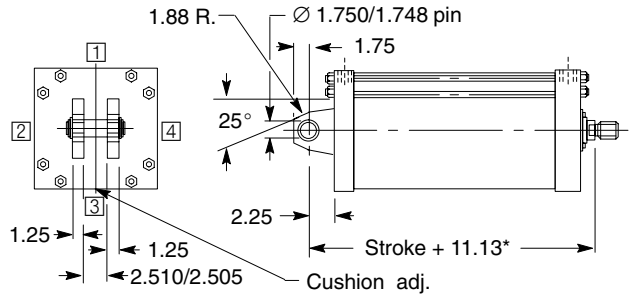
CODE 01 SIDE LUG MOUNT



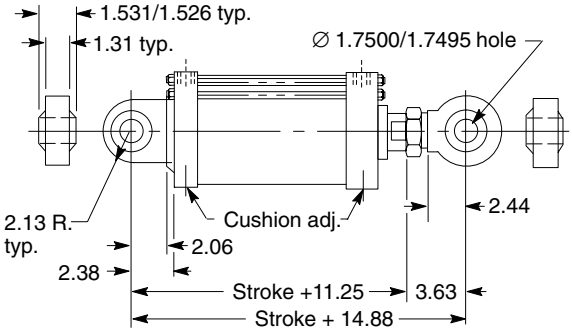
CODE 07 HEAD FLANGE MOUNT



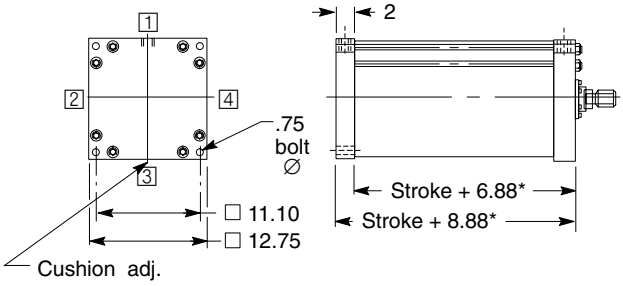
CODE 10 CLEVIS MOUNT



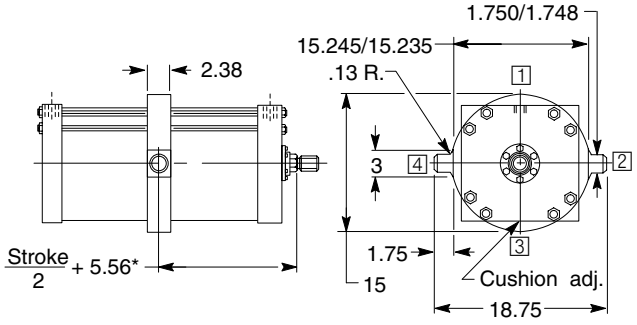
CODE 11 SPHERICAL BEARING MOUNT



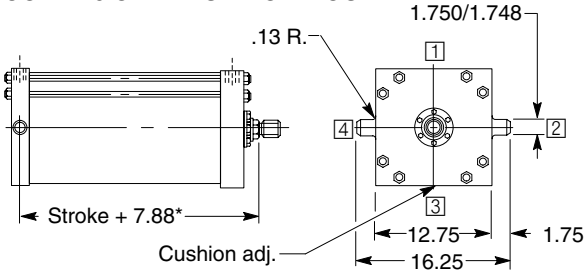
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



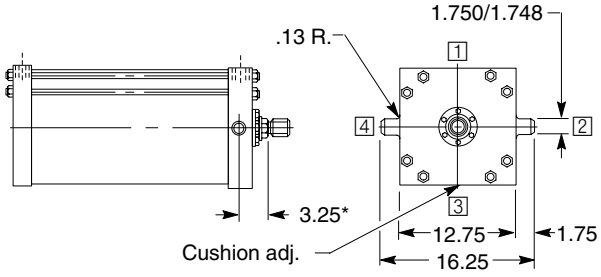
CODE 15 INTERMEDIATE TRUNNION MOUNT



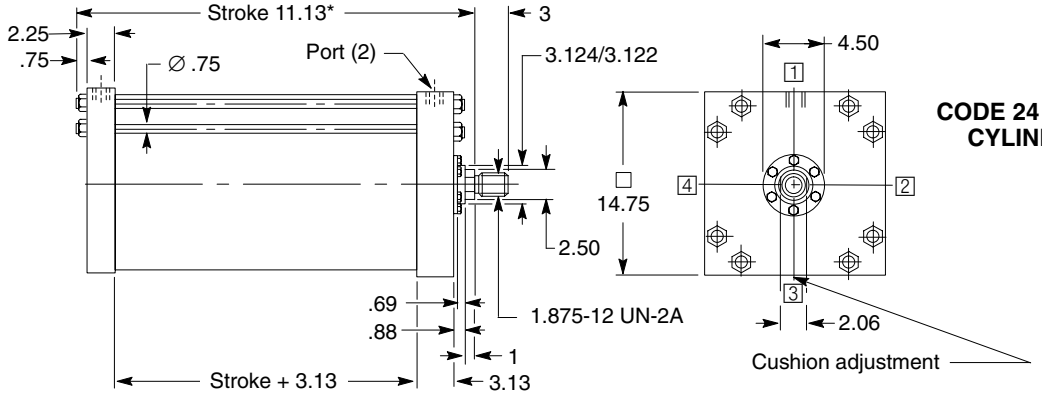
CODE 16 CAP TRUNNION MOUNT



CODE 17 HEAD TRUNNION MOUNT

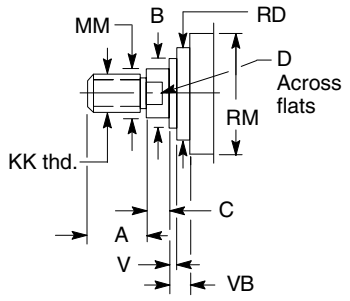


14 inch Cylinder Bore



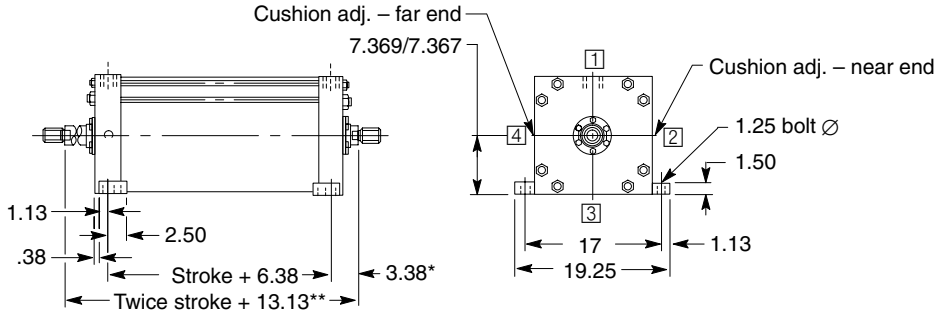
CODE 24 BASIC CYLINDER

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

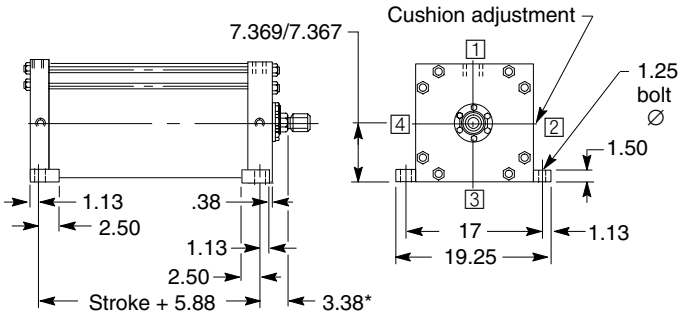


† Applies to Code 07 mount only

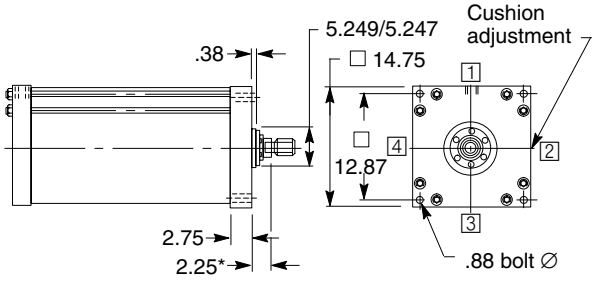
CODE 25 DOUBLE ROD SIDE LUG MOUNT



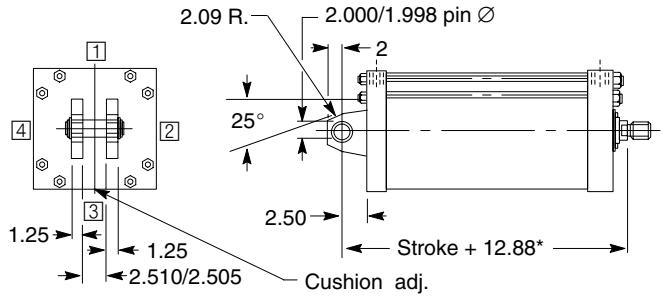
CODE 01 SIDE LUG MOUNT



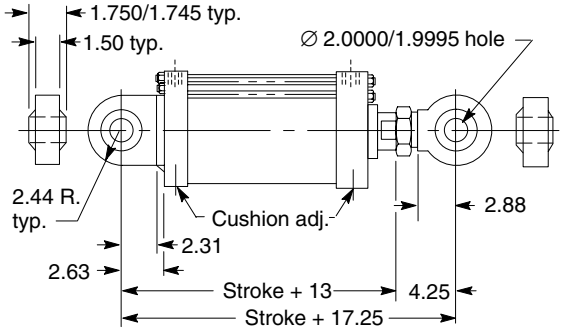
CODE 07 HEAD FLANGE MOUNT



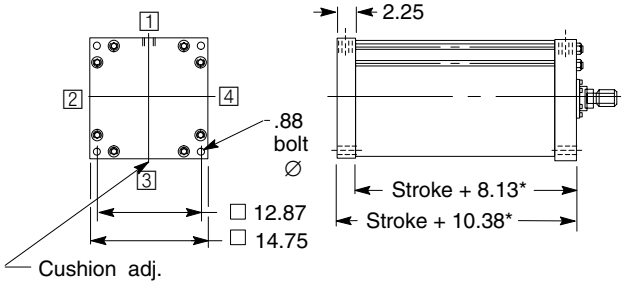
CODE 10 CLEVIS MOUNT



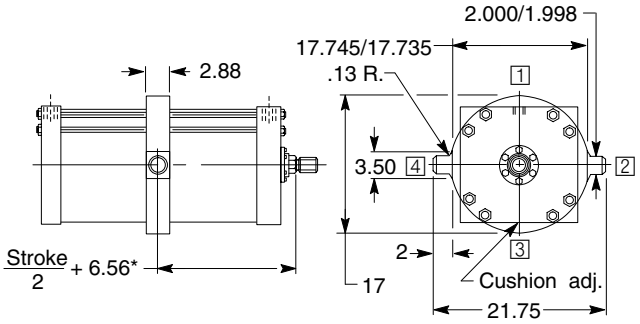
CODE 11 SPHERICAL BEARING MOUNT



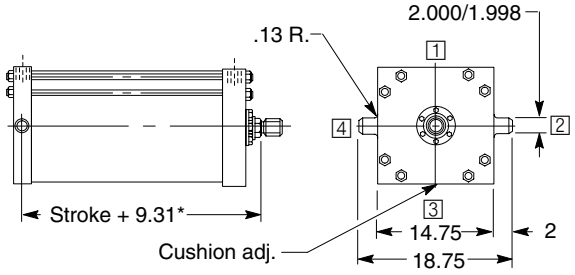
CODE 12 CAP RECTANGULAR FLANGE MOUNT†



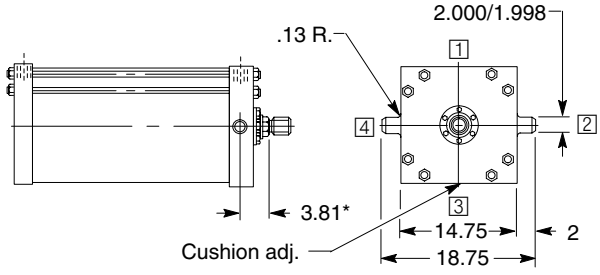
CODE 15 INTERMEDIATE TRUNNION MOUNT



CODE 16 CAP TRUNNION MOUNT



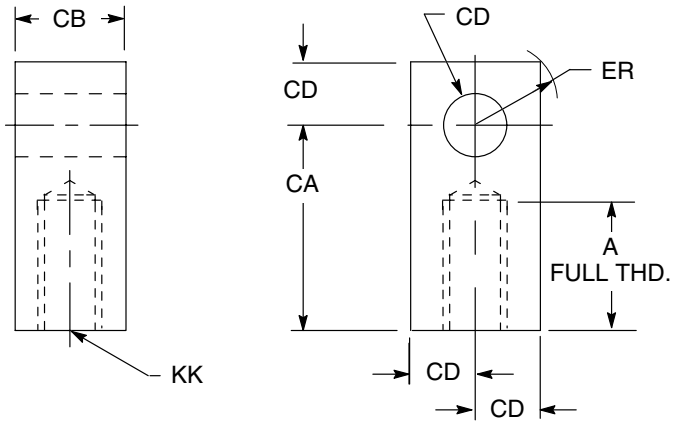
CODE 17 HEAD TRUNNION MOUNT



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

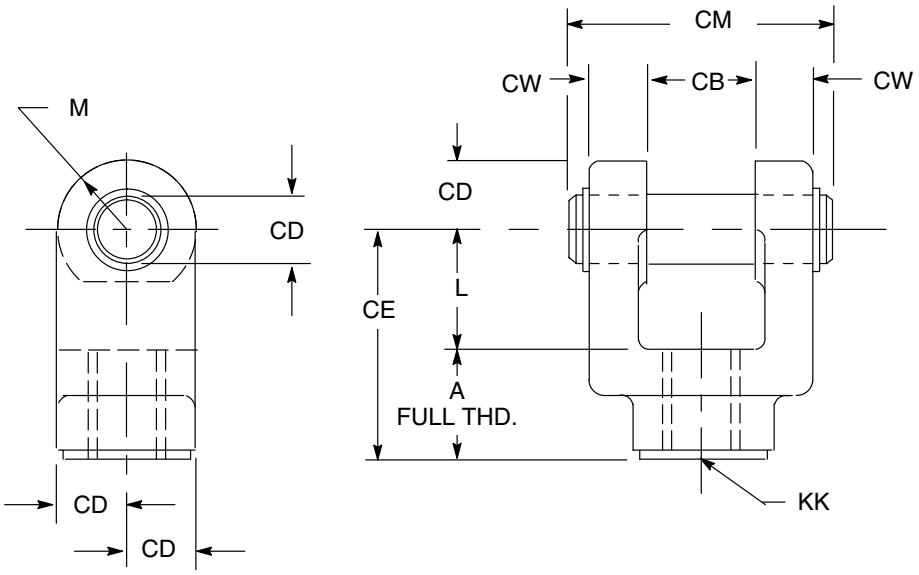


Bore dia.	A	CA	CB	CD	ER	KK thread Size	KK thread Torque (ft. lbs)*	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	1.50	.75	.50	.70	.4375-20 UNF-2B	36	S-1-560	.38
3 1/4, 4, 5	1.13	2.06	1.25	.75	1.06	.750-16 UNF-2B	125	S-460	1.25
6, 7, 8	1.63	2.81	1.50	1.00	1.42	1.000-14 NS-2B	250	S-660	2.50
10	2.00	3.44	2.00	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)



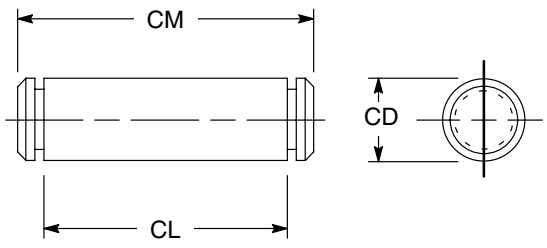
Bore dia.	A	CB	CD	CE	CM	CW
1 1/2, 2, 2 1/2	.75	.75	.50	1.50	2.00	.50
3 1/4, 4, 5	1.13	1.25	.75	2.38	2.75	.63
6, 7, 8	1.63	1.50	1.00	3.13	3.28	.75
10	2.00	2.00	1.38	4.13	4.28	1.00
12	2.25	2.50	1.75	4.50	5.44	1.25
14	3.00	2.50	2.00	5.50	5.44	1.25

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)

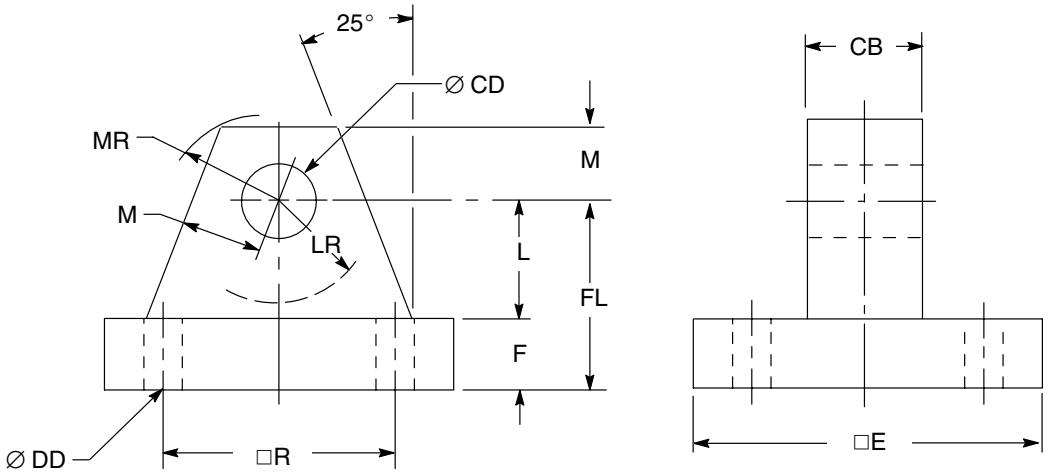
Bore dia.	CD	CL	CM	Part no.
1 1/2, 2, 2 1/2	.500/.499	1.82	2.00	S-1-583-10
3 1/4, 4, 5	.750/.749	2.57	2.75	S-483-10
6, 7, 8	1.000/.999	3.06	3.28	S-683-10
10	1.375/1.374	4.06	4.28	SH-483-10
12	1.750/1.748	5.06	5.44	SH-583-10
14	2.000/1.998	5.06	5.44	SH-683-10



Accessories

Mounting Eye Bracket

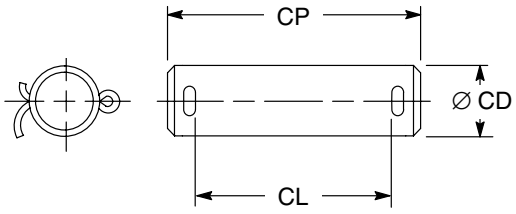
(for clevis mount cylinders)



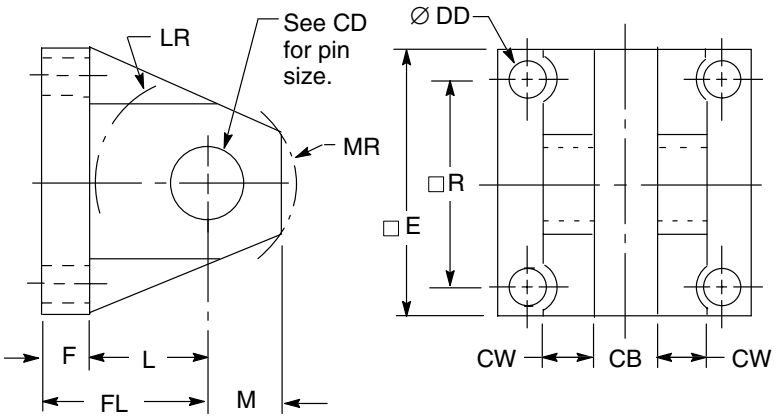
Bore diameter	CB	CD	DD	E	F	FL	L (ref.)	LR	M	MR	Part no.	Weight (lbs.)
1 1/2, 2, 2 1/2	.75	.50	.38	2.50	.38	1.13	.75	.69	.50	.59	S-1-552-M	.94
3 1/4, 4, 5	1.25	.75	.50	3.50	.63	1.88	1.25	1.13	.75	.88	S-452-M	3.19
6, 7, 8	1.50	1.00	.63	4.50	.75	2.25	1.50	1.38	1.00	1.25	S-652-M	6.50
10	2.00	1.38	.63	5.00	.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

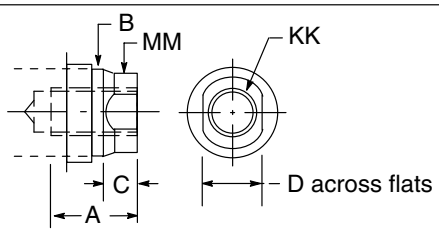
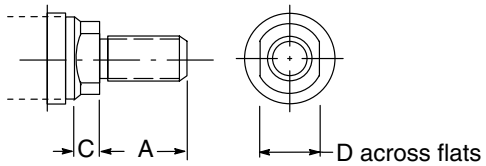
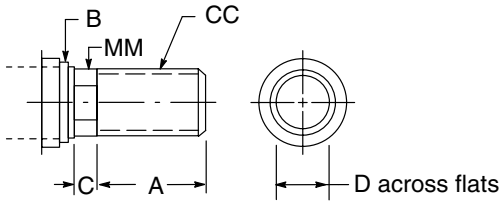
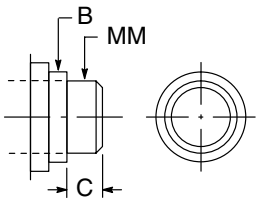
* Included in assembly
† Order separately.
‡ Use jam nut to lock rod eye to piston rod.

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

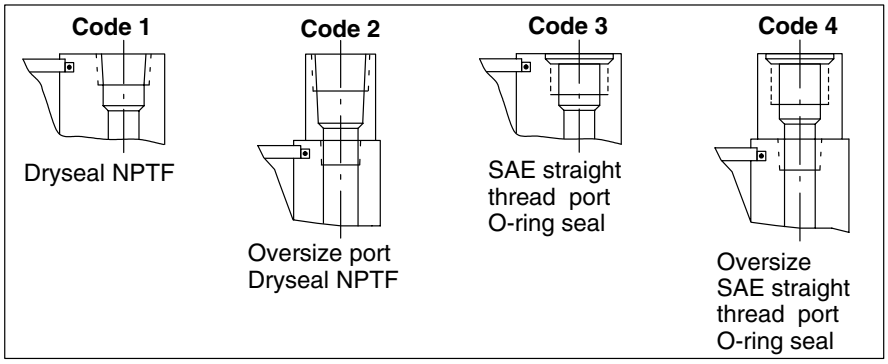
Port Types, Sizes and Locations

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

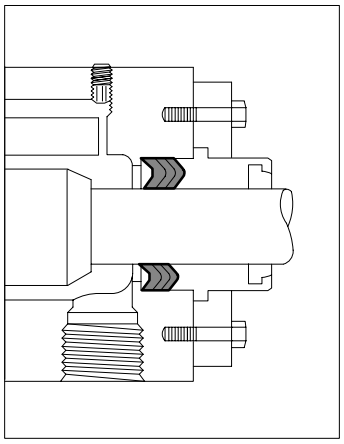
Seal Options

Select the type of piston seal for your application, then select the seal compound from the compatibility chart below.

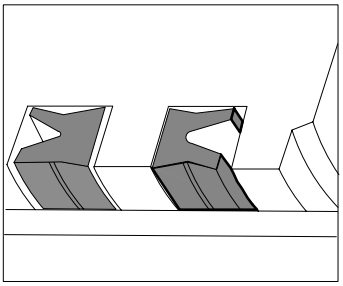
Determine the correct seal code for your application, then enter it as item 8 in the model code.

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

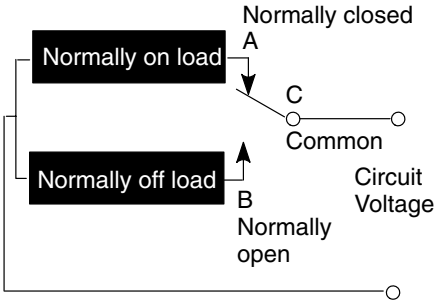
● Except certain aircraft and commercial fluids.
▪ Maximum ratings for continuous exposure of sealing system only.
The above technical data represents generally accepted design parameters.
Consult Vickers Engineering for more specific application data.

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.

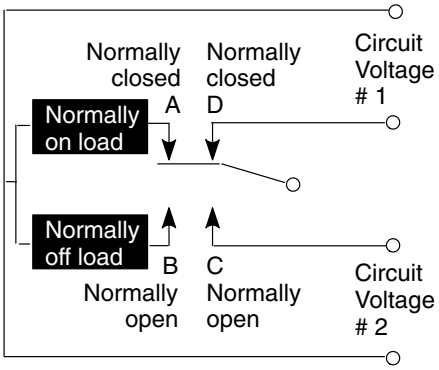
A quick disconnect plug, factory wired to the limit switch, is an option. In addition, air-pilot valves (3-way and 2-way) can be fitted to the cylinders. See Bulletin 4098 for complete information on limit switches and valves.

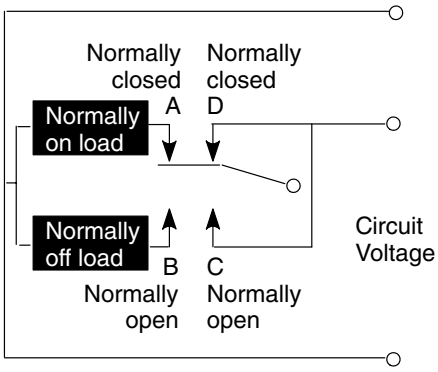
Switch "01" single pole, double throw (standard)



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)

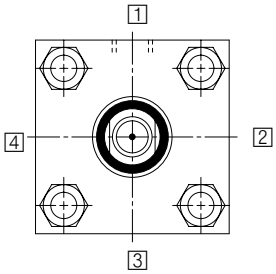




15 Amperes	125 Volts AC
	250 Volts AC
1 Ampere	125 Volts AC
1/2 Ampere	250 Volts AC
1/4 H.P.	125 Volts AC
1/2 H.P.	250 Volts AC

Switch positions

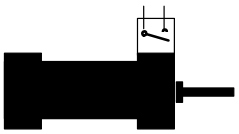
Type 01 and type 03 switches are positioned as shown below when viewing the cylinder from the head end (mounting end of double rod cylinder).



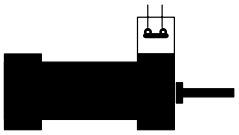
Switch type 01		
Code	Head end position	Cap end position
B	1	–
C	2	–
D	3	–
E	4	–
F	1	1
G	2	2
H	3	3
J	4	4
K	0	1
L	0	2
M	0	3
N	0	4

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

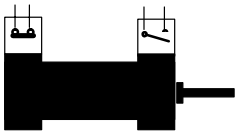


Piston rod retracted or in motion – switch open

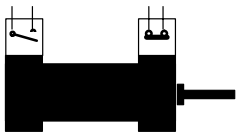


Piston rod fully extended – switch closed

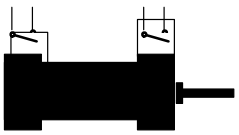
Switches mounted on both head end and cap end



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.

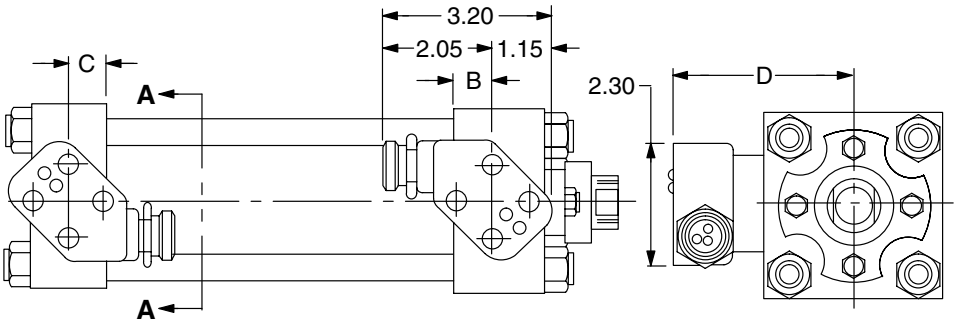
Short circuit protection is a standard feature on the PS 200 proximity switch. It protects the switch from shorts in the load or line. Upon sensing a short condition, the switch assumes a non-conducting mode. The fault condition must be removed and power turned off in order to reset the switch. This 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.

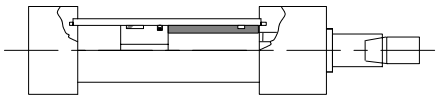
	Type of cylinder mounting		
Bore dia. (inch)	**Pivot** (clevis & trunnion)	**Rigid** (no rod support)	**Rigid** (with rod support)
1 1/2 and 2	24 in.	30 in.	48 in.
2 1/2 to 4	30 in.	38 in.	
5 to 14	36 in.	40 in.	

Stop Tube Designs

Three typical stop tube designs are illustrated below.

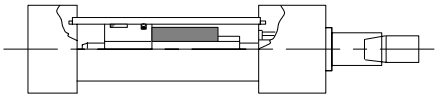
Design A

Used for cylinders not cushioned on the rod end.



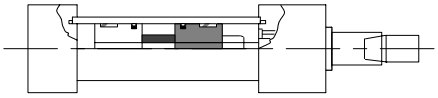
Design B

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

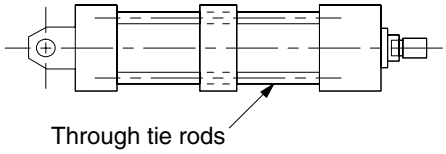
Tie rod spacers and center supports are used to improve the structural rigidity of long stroke tie rod cylinders.

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.

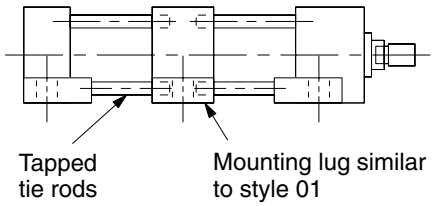
The spacer keeps the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (clevis mount, etc.).



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)

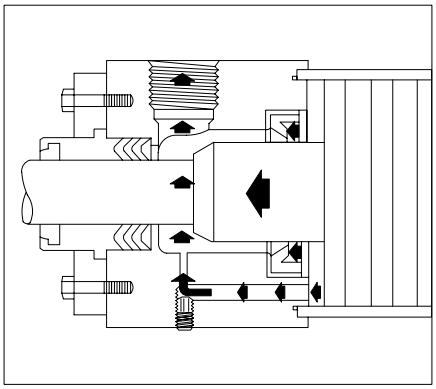
Maximum Allowable Push Strokes

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	–	–

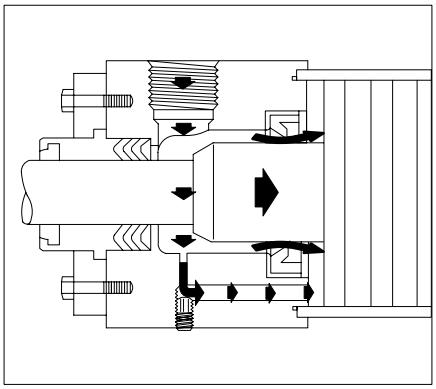
Cushioning System

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

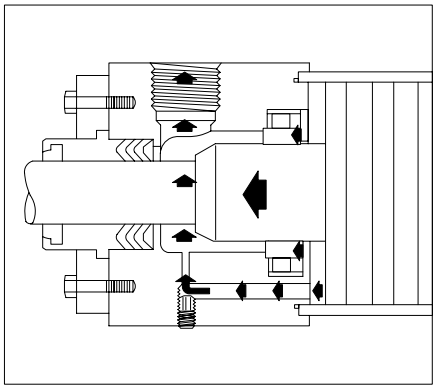


Series TE/TL cylinders employ a *flexible lip ring* at the cushion chamber entrance. As the cushion collar enters the cushion chamber, the flexible lip of the super cushion blocks the direct flow of air to the exhaust port. Exhausting air must now flow through a metered by-pass. Adjustment of the needle valve in the by-pass controls the cushioning action.

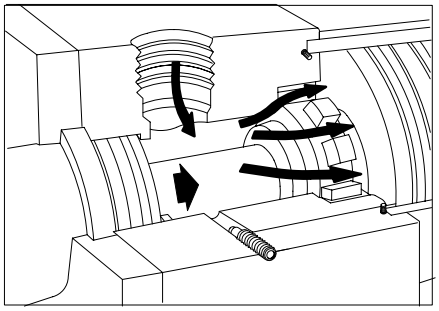


On the return stroke, air pressure blows the flexible lip of the super cushion away from the cushion collar, permitting a large volume of air to immediately reach the piston face. This allows quick acceleration and eliminates ball checks and binding between the cushion collar and cushion chamber.

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

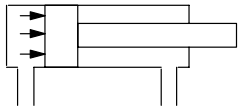
$HP = K \times P \times Q = \frac{lb/in^2 \times gpm \times 231}{12 \times 33000 \times E}$

$= \frac{.000583 \times P \times Q}{E} = \frac{PSI \times GPM}{1714 \times E}$

Hydraulic Cylinder Formulas

Pressure and force

P = psi
A = area
$= in^2$

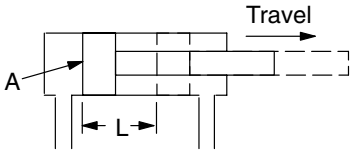


Force = pressure x area

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

$Q = pump\ capacity = \frac{cu\ in}{sec}$

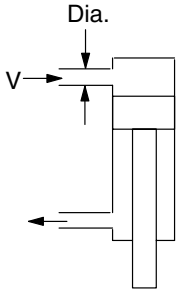
$T = time = \frac{volume\ traversed}{pump\ capacity} = \frac{V}{Q} = \frac{in^3}{in^3/sec} = sec$

$= sec$

$R = rate\ of\ piston\ travel = \frac{in}{sec} = \frac{L}{T}$

$R = \frac{L}{T} = \frac{L}{V/Q} = \frac{QL}{V} = \frac{QL}{LA} = \frac{Q}{A}$

Quantity of flow



V = fluid velocity = ft/sec
D = pipe diameter = inches
Q = quantity of flow = gpm

$\frac{ft}{sec} \times 12 = \frac{inches}{sec}$

$gpm \times \frac{231}{60} = \frac{cu\ in}{sec}$

$\frac{\pi D^2}{4} = pipe\ area = in^2 = A$

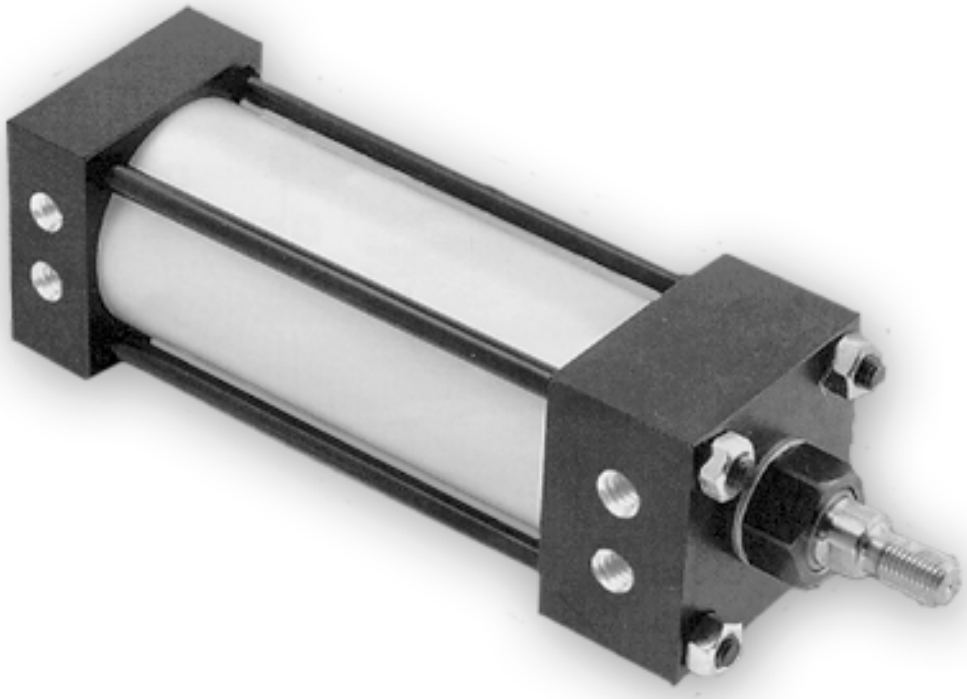
$Q = AV = in^2 \times \frac{in}{sec} = \frac{cu\ in}{sec}$

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.

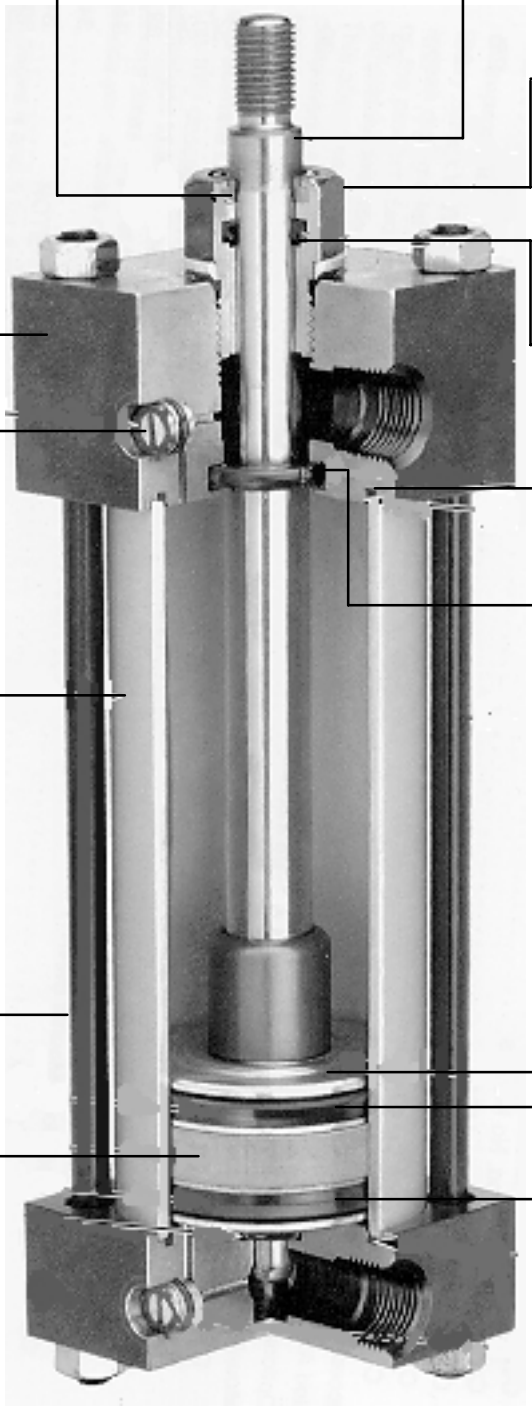
Head/Cap.
Precision machined from alloy aluminum, then black anodized for corrosion resistance in Series VP, and electroless nickel plated for Series VN option.

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)

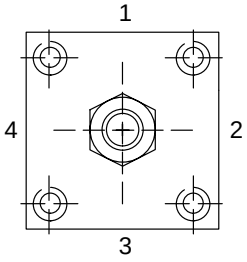
Vickers Code	Style	ANSI Code
	1-1/2″ thru 8″ Bore	
01 –	Side lug	**MS2**
02 –	Side tapped	**MS4**
03 –	End lug	**MS7**
07 –	Head rectangular flange	**MF1**
08 –	Head square	**ME3**
10 –	Cap fixed clevis	**MP1**
12 –	Cap rectangular flange	**MF2**
13 –	Cap square	**ME4**
16 –	Cap trunnion	**MT2**
17 –	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.



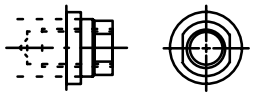
Code	Head	Cap
A	–	–
B	–	1
C	–	2
D	–	3
E	–	4
F	1	–
G	2	–
H	3	–
J	4	–
K	1	1
R	2	2
S	2	3
T	2	4
V	3	2
W	3	3
Y	3	4
4	4	4

Double Rod Cylinders:
"Head" = "Mounting End"
"Cap" = Non-mounting End

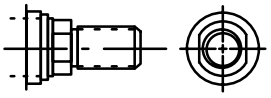
7 **Rod size and type**

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**

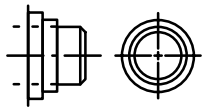
Type 2
Female
UN Thread



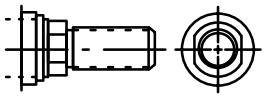
Type 5
Small Male
UN Thread



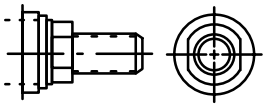
Type 6
Plain
No Attachment



Type 9
Intermediate Male
UN Tread



Type S
Studded Female
UN Tread



8 **Seal options**

	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

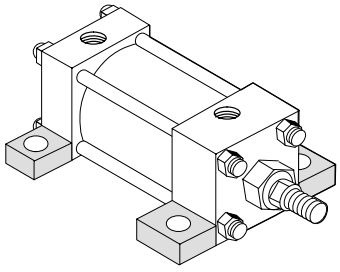
Available Mountings

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.

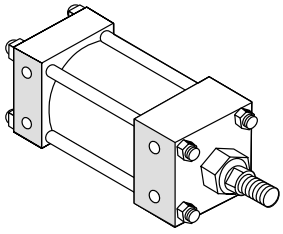
Selecting the Proper Mounting

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.

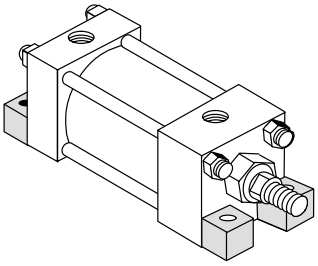
Code 01 (MS2)
Side Lug



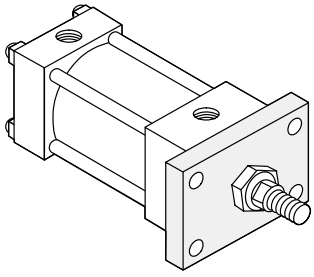
Code 02 (MS4)
Tapped



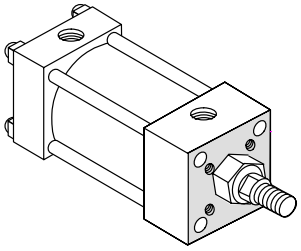
Code 03 (MS7)
End Lug



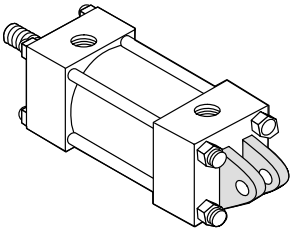
Code 07 (MF1)
Head Rectangular Flange



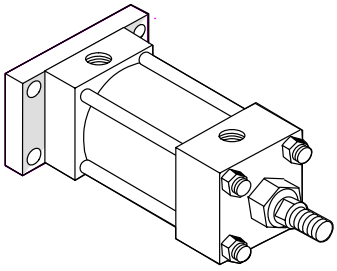
Code 08 (ME3)
Head Square



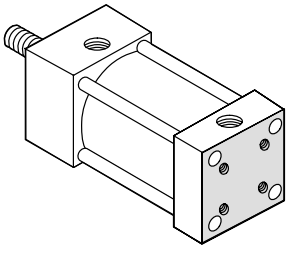
Code 10 (MP1)
Cap Fixed Clevis



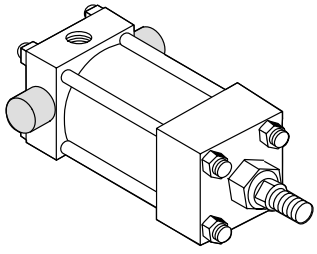
Code 12 (MF2)
Cap Rectangular Flange



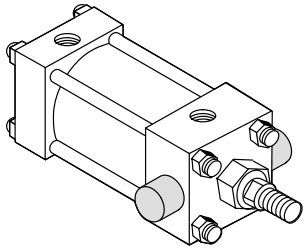
Code 13 (ME4)
Cap Square



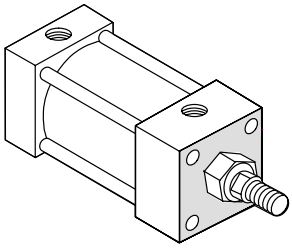
Code 16 (MT2)
Cap Trunnion



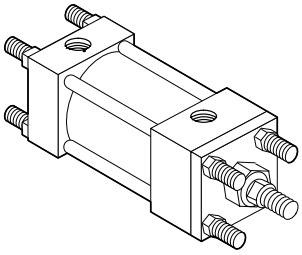
Code 17 (MT2)
Head Trunnion



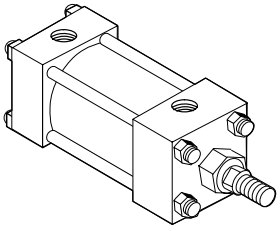
Code 18 Sleeve Nut
Construction for
Tapped Faces



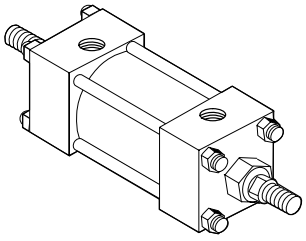
Codes 21 (MX2) Cap, 22 (MX3)
head, 23 (MX1) Extended Tie Rod



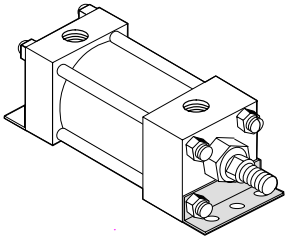
Code 24 (MX0)
No Mounts



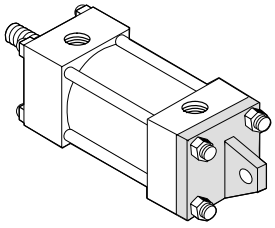
Double Rod
Code 41 (MX0)
No Mounts



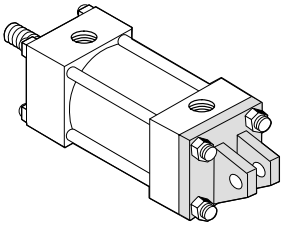
Code 45 (MS1)
Angle



Code 48 (MP4)
Cap Detachable Eye

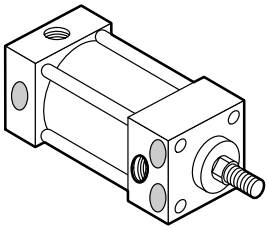


Code 50 (MP2)
Cap Detachable Clevis

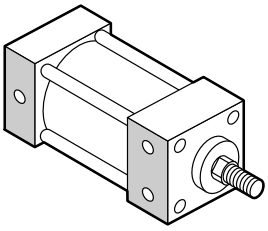


Mounting Style: 3/4 & 1-1/8 inch Bores

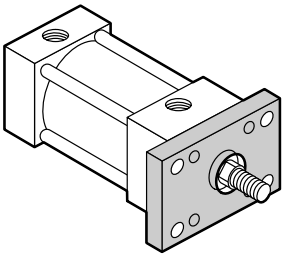
Code 01 (MS8)
Bolt Thru



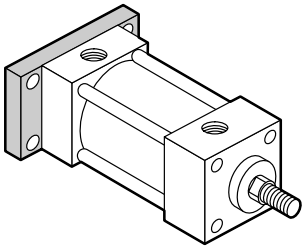
Code 02 (MS9)
Tapped



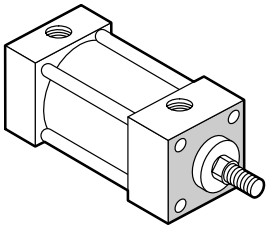
Code 07 (MF1)
Head Rectanular Flange



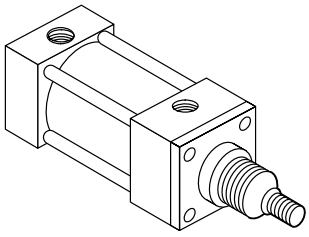
Code 12 (MF2)
Cap Rectangular Flange



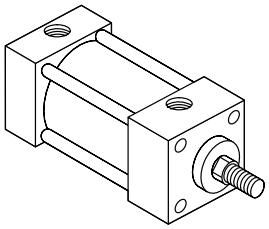
Code 18 (MR1)
Head Tapped Face



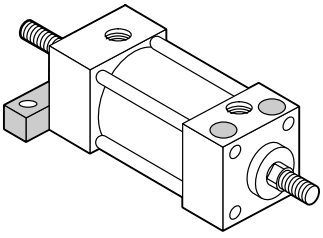
Code 20 (MNR1)
Threaded Nose Mounts



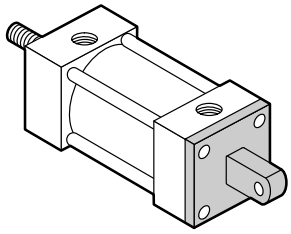
Code 24 (MX0)
No Mounts



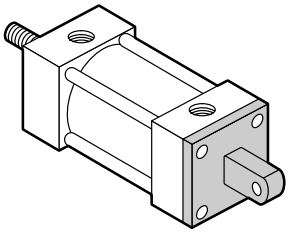
Code 25 Double Rod,
Bolt Thru



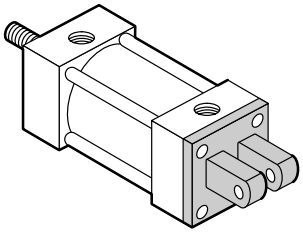
Code 47 (MP3)
Fixed Eye



Code 48 (MP4)
Detachable Eye

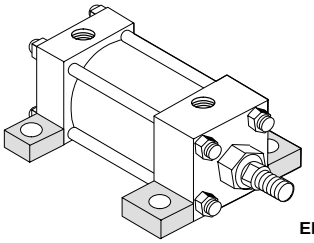


Code 50 (MP2)
Detachable Clevis



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.

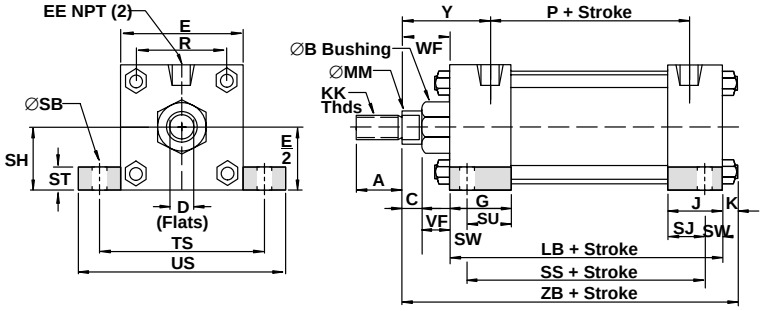
The mounting surface should be flat and parallel to the centerline of the piston rod.

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.

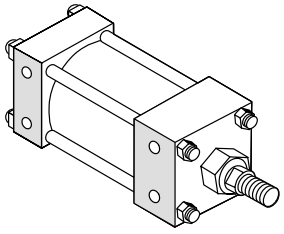
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.



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)



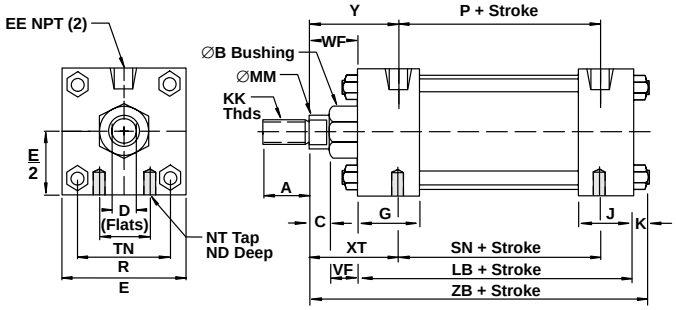
Tapped mounts are for moving loads along a flat guided surface as in a carriage along rails. The mounting surface should be flat and parallel to the centerline of the piston rod.

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.

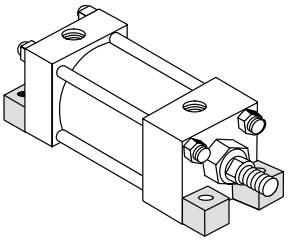


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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.

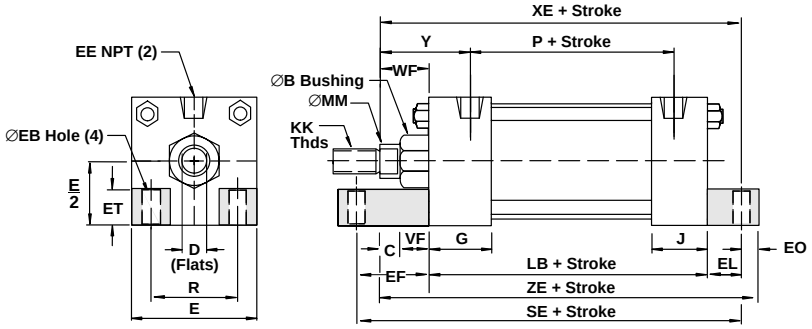
The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

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.

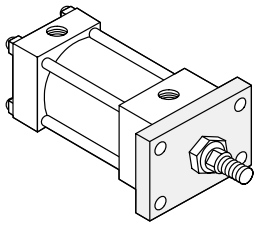
With unsupported loads, the bearing must absorb more force. For these applications, the larger available rod is recommended, and stop tubes should be considered.



Dimension		1½″ Bore (38.10)	2″ Bore (50.80)	2½″ Bore (63.50)	3¼″ 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)



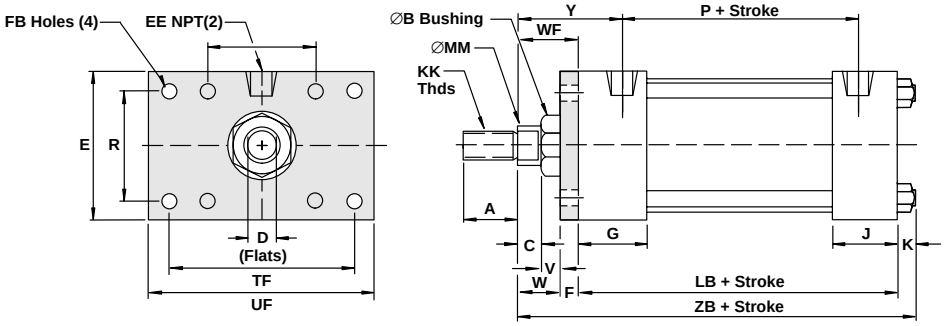
These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat and the rod end cartridge should be piloted into it.

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.

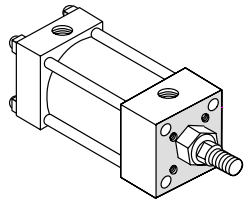
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.



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)



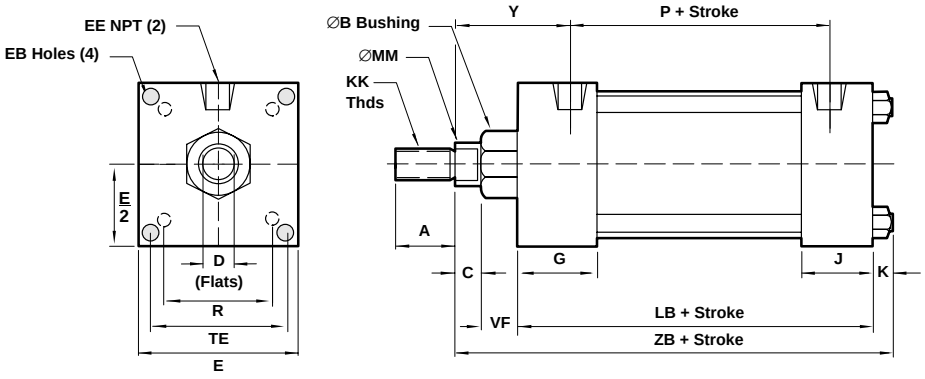
These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling). The mounting surface should be flat, and the rod end cartridge should be piloted into it.

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.

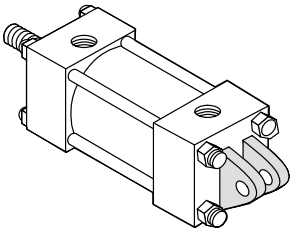


Dimension		7″ Bore (177.80)	8″ Bore (203.20)
∅ Rod	Std.	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
C	Std.	.625 (15.88)	.625 (15.88)
	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)

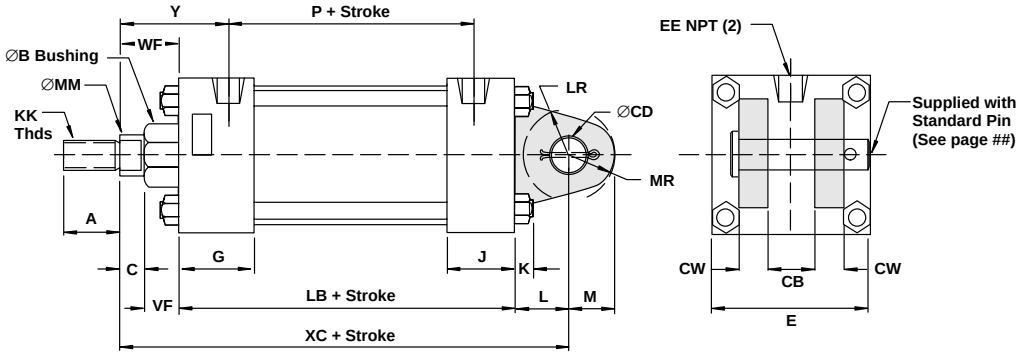


These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

NOTE

For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.

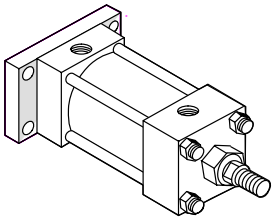
The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one place only. Any misalignment will cause excess side loading on the bearing and piston. This could lead to premature failure.



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)



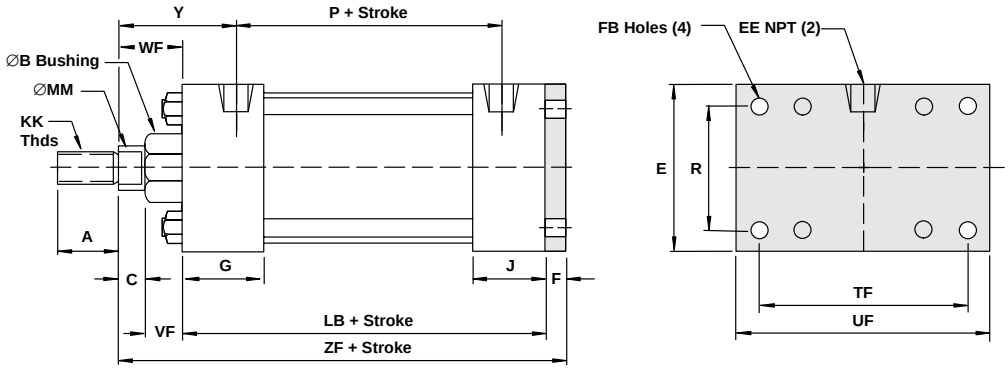
These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing), as in push presses. For tension applications (pulling), a head rectangular mount is more appropriate.

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.

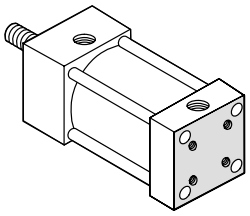
Cap rectangular mounts are recommended for heavy duty applications.



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)



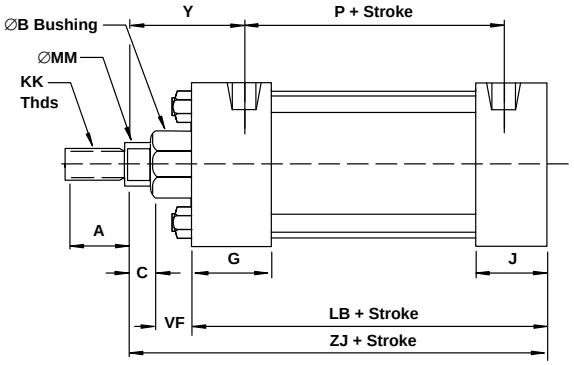
These mounts are ideal for straight line force transfer applications in which the cylinder is used in compression (pushing). The mounting surface should be flat and the rod end cartridge should be piloted into it.

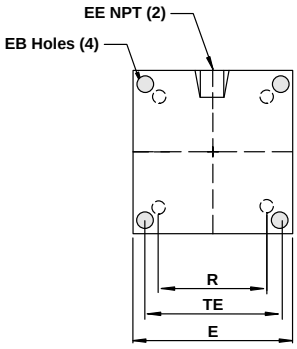
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

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.

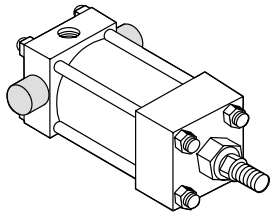




Dimension		7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	1-3/4″ (44.45)	1-3/4″ (44.45)
A	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
B +.000 −.002	Std.	1.625 (41.28)	1.625 (41.28)
	O.S.	2.000 (50.80)	2.000 (50.80)
C	Std.	.625 (15.88)	.625 (15.88)
	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)



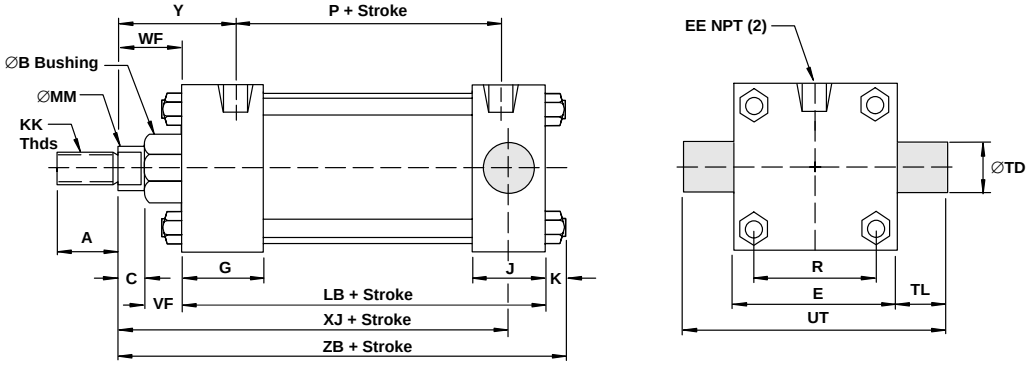
These mounts are for applications in which the machine member travels in a curved path in one plane.

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.

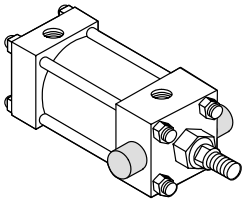
The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.



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)



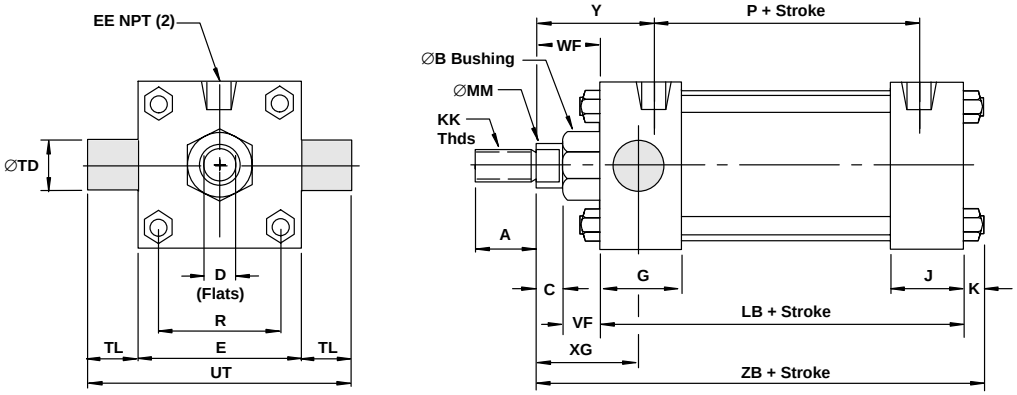
These mounts are for applications in which the machine member travels in a curved path in one plane.

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.

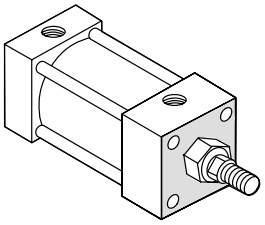
It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used. The pillow blocks should be installed as close to the shoulder of the trunnion as possible.



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).

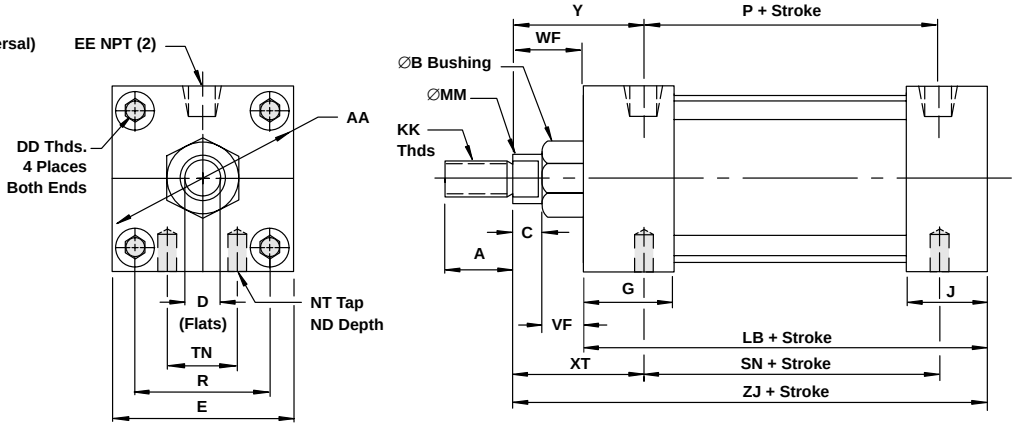
The mounting surface should be flat and the rod end cartridge should be piloted into it.

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.

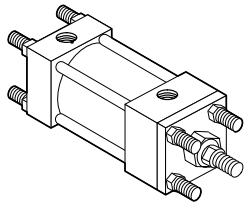
The force of the load should be perpendicular to the mounting surface and parallel to the centerline of the piston rod. For eccentric loads, the larger of the two available rods in each bore size is recommended. Stop tubes should also be considered.



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

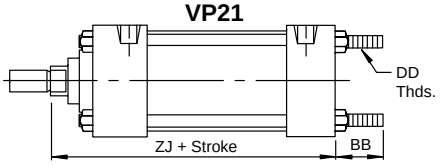
For strokes in excess of 30 inches, see "Stop Tube Selection" on page 45.

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.

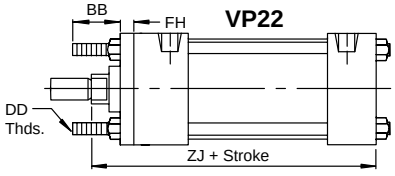
Recommended Torques for Tightening Tie Rods

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.

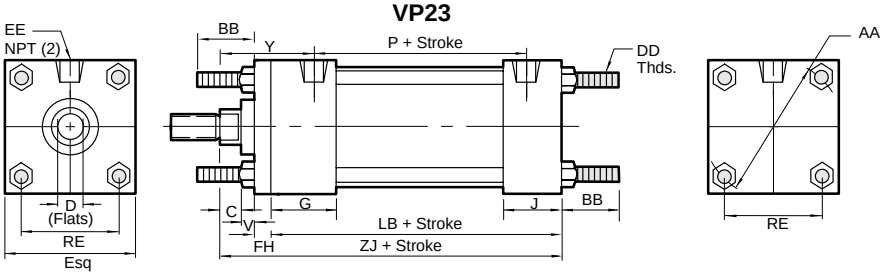
VP21



VP22



VP23

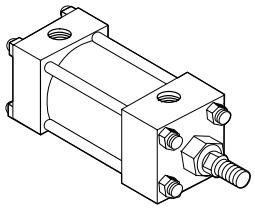


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
⌀Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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

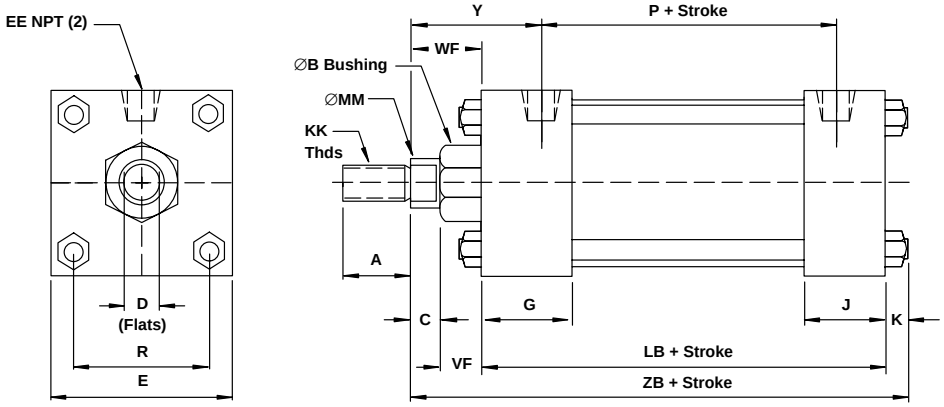
(ANSI MX0)



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

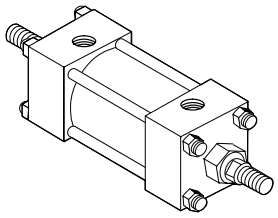
For strokes in excess of 30 inches, see “Stop Tube Selection” on page 45.



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)

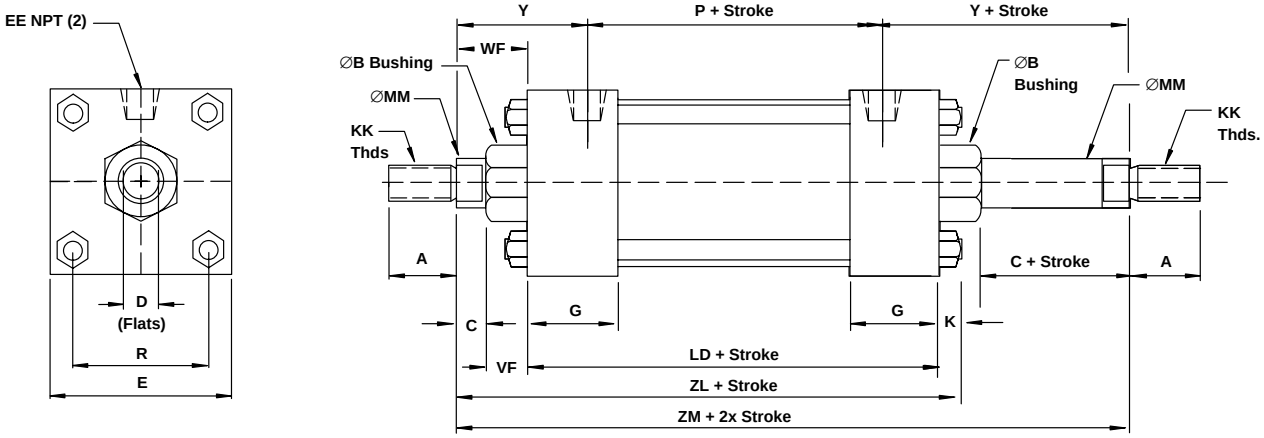
All dimensions in inches (mm)

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.

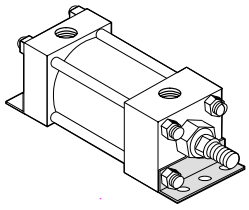


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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.

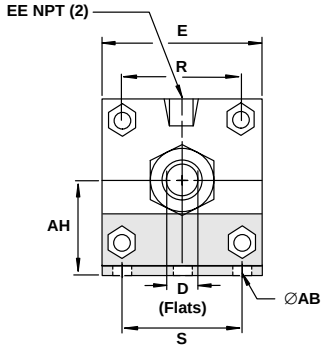
The load should be guided to traverse along the centerline of the piston rod. The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.

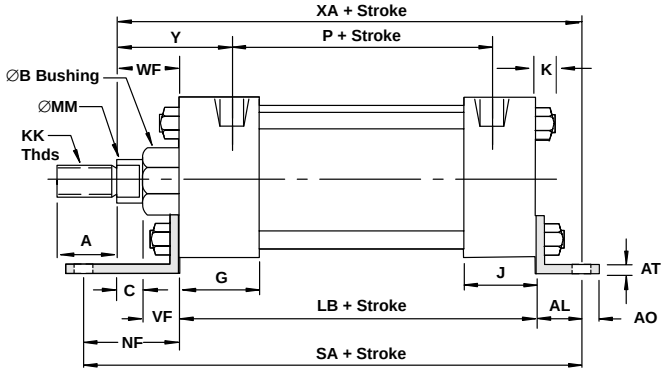
NOTE

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.

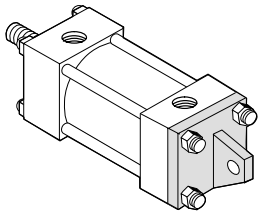




Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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)

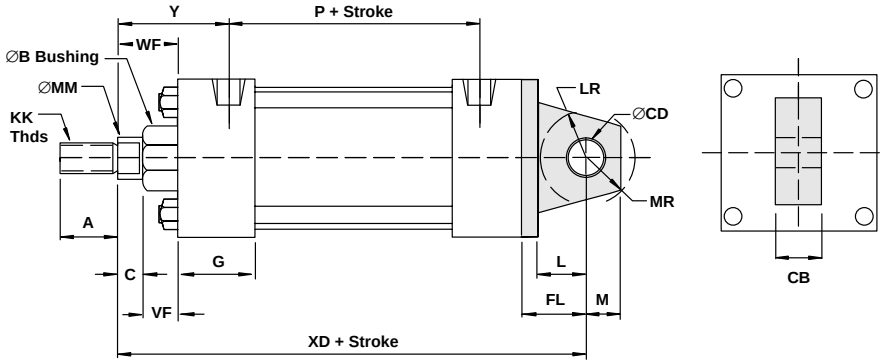


These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

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.

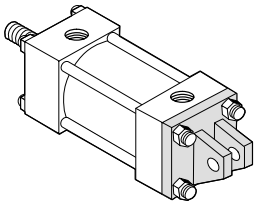


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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)

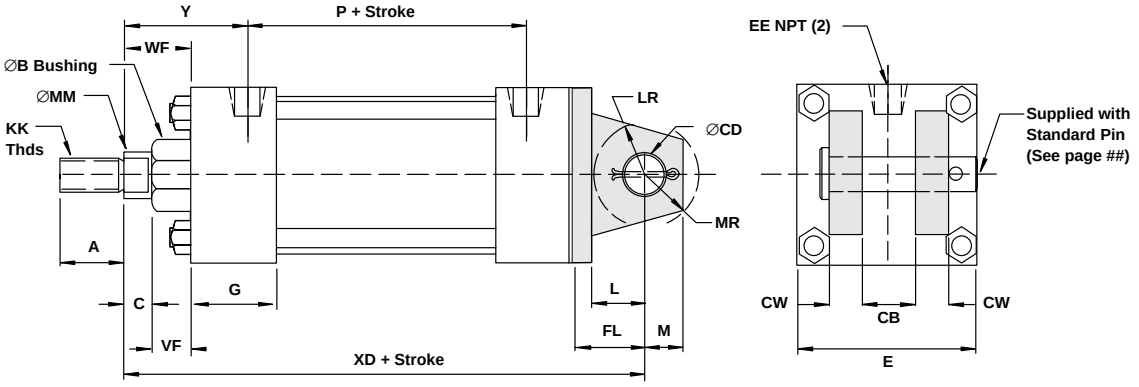


These mounts can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes.

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.

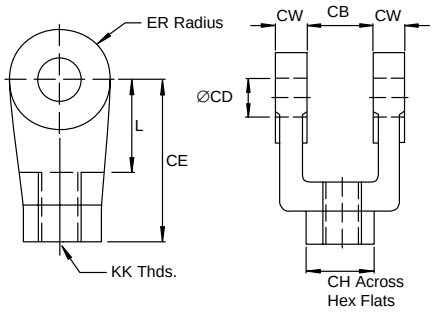


Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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)

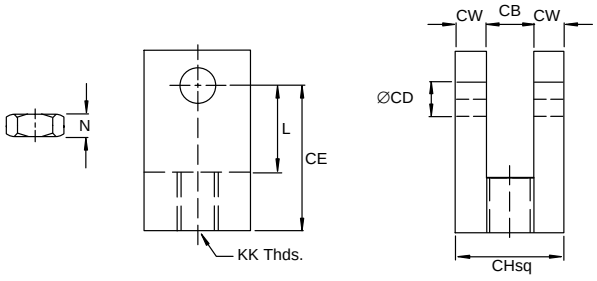
Accessories for 1-1/2 thru 8 inch Bore Cylinders

NFPA Rod Clevis



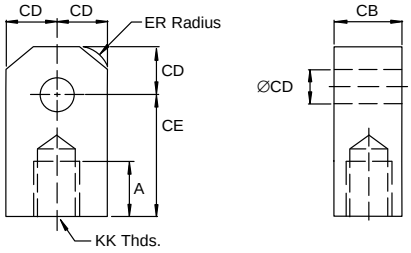
	VP62008A	VP62008B	VP6200CA	VP62010A	VP62016A
CB	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
CE	1.500 (38.10)	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)	4.125 (104.78)
CH	1.000 (25.40)	1.000 (25.40)	1.250 (31.75)	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



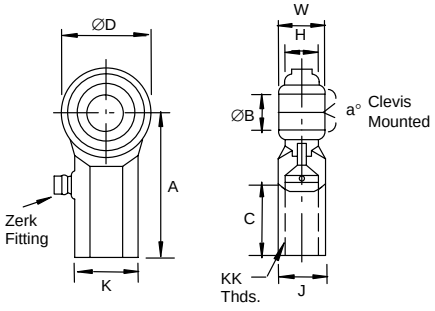
	VP62008C	VP6200CC
CB	.500 (12.70)	.750 (19.05)
CD	.500 (12.70)	.750 (19.05)
CE	1.375 (34.93)	1.750 (44.45)
CH	1.000 (25.40)	1.500 (38.10)
CW	.250 (6.35)	.375 (9.53)
KK	1/2–20	3/4–16
L	.750 (19.05)	1.000 (25.40)
N	.375 (9.53)	.500 (12.70)

NFPA Rod Eye



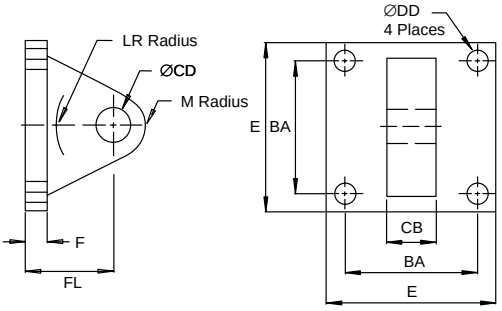
	VP60008A	VP60008C	VP6000CA	VP60010A	VP60016A
CB	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
CE	1.500 (38.10)	1.500 (38.10)	2.375 (60.33)	3.125 (79.38)	4.125 (104.78)
ER	.5)	.500 (12.70)	.750 (19.05)	1.000 (25.40)	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



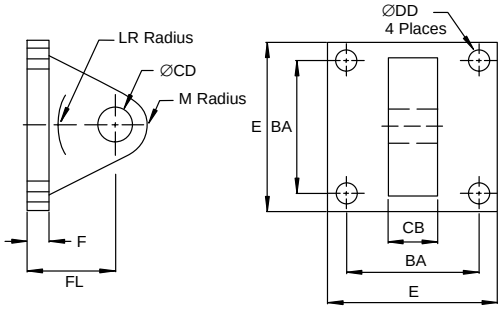
		VP62008C	VP6200CC	VP60010B
Bore		1-1/2 & 2-1/2	3-1/4 , 4 & 5	6 & 8
a°	Misalign. Angle	12	14	14
A	± .015	2.125 (53.98)	2.875 (73.03)	4.125 (104.78)
B	+.0025 / –.0005	.500 (12.70)	.750 (19.05)	1.000 (25.40)
C	+.062 / –.031	1.062 (26.97)	1.562 (39.67)	2.125 (53.98)
D	± .010	1.312 (33.32)	1.750 (44.45)	2.750 (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



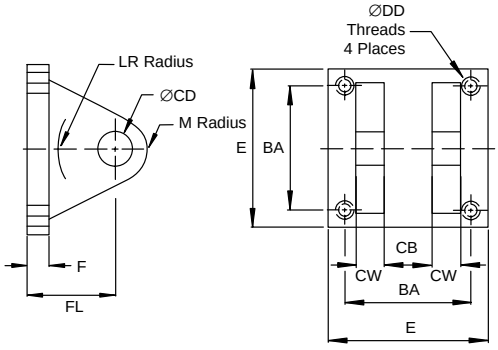
	VP62008A	VP62008B	VP6200CA	VP62010A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)	3.812 (96.82)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)	2.000 (50.80)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)	1.375 (60.33)
DD	.406 (10.31)	.531 (13.49)	.656 (16.66)	.656 (16.66)
E	2.500 (63.50)	3.500 (88.90)	4.500 (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



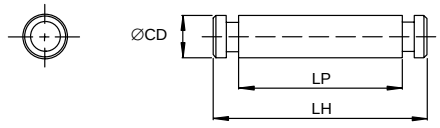
	VP78008B	VP78008C	VP78008D	VP7800CB	VP7800CC
BA	1.437 (36.50)	1.844 (46.84)	2.187 (55.55)	2.937 (74.60)	3.562 (90.47)
CB	.750 (19.05)	.750 (19.05)	.750 (19.05)	1.250 (31.75)	1.250 (31.75)
CD	.500 (12.70)	.500 (12.70)	.500 (12.70)	.750 (19.05)	.750 (19.05)
DD	.281 (7.14)	.343 (8.71)	.343 (8.71)	.469 (11.91)	.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



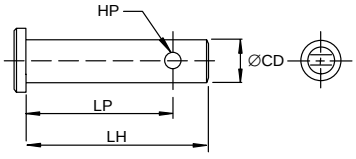
	VP61008A	VP6100CA	VP61010A
BA	1.625 (41.28)	2.562 (65.07)	3.250 (82.55)
CB	.750 (19.05)	1.250 (31.75)	1.500 (38.10)
CD	.500 (12.70)	.750 (19.05)	1.000 (25.40)
CW	.500 (12.70)	.625 (15.88)	.750 (19.05)
DD	3/8 – 24	1/2 – 20	5/8 – 18
E	2..500 (63.50)	3.500 (88.90)	4.500 (114.30)
F	.375 (9.53)	.625 (15.88)	.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)

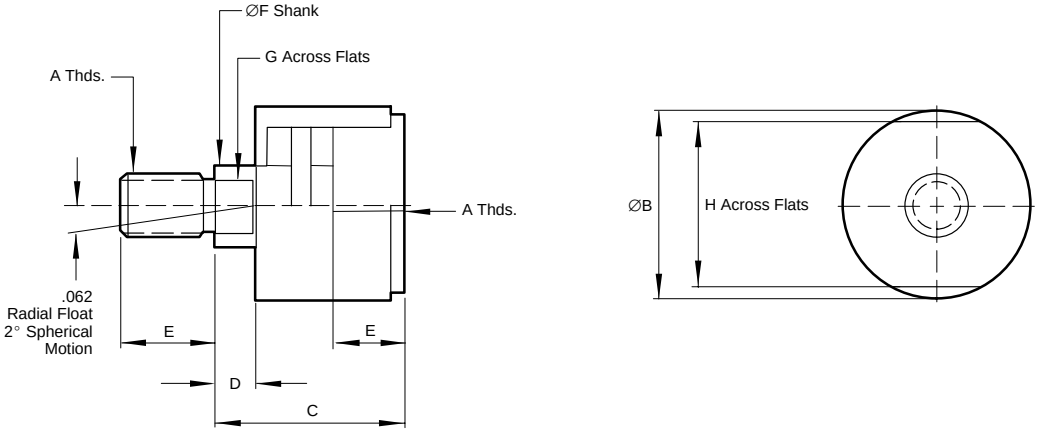
All dimensions in inches (mm)

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.



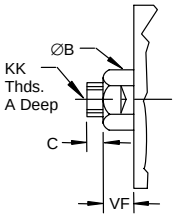
	7756A-1/4-28	7756A-5/16-24	7756A-3/8-24	7756A-7/16-20	7756A-1/2-20	7756A-5/8-18	7756A-3/4-16	7756A-7/8-14	7756A-1-14	7756A-1-1/4-12	7756A-1-1/2-12	7756A-1-3/4-12
A	1/4 – 28	5/16 – 24	3/8 – 24	7/16 – 20	1/2 – 20	5/8 – 18	3/4 – 16	7/8 – 14	1 – 14	1-1/4 – 12	1-1/2 – 12	1-3/4 – 12
B	.875 (22.23)	.875 (22.23)	.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

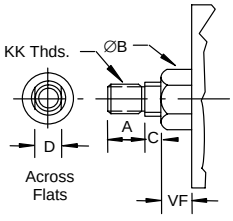
Rod End Types

In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

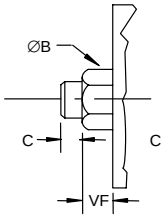
Five different inch rod end configurations are available. If a custom design is required, contact your local Vickers sales engineer, and define your requirements.



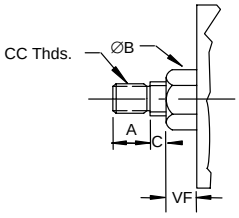
Type 2
Female
UN Thread



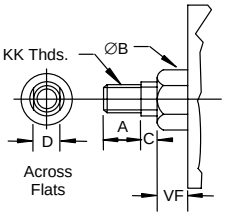
Type 5
Small Male
UN Thread



Type 6
Plain
No Attachment



Type 9
Intermediate Male
UN Thread



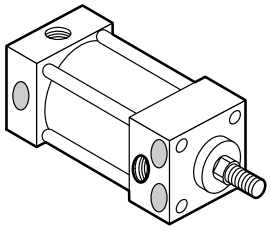
Type S
Studded Female
UN Thread

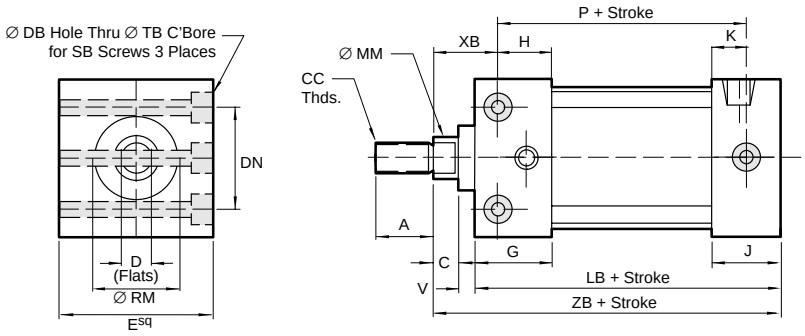
Dimension		1 1/2″ Bore (38.10)	2″ Bore (50.80)	2 1/2″ Bore (63.50)	3 1/4″ Bore (82.55)	4″ Bore (101.60)	5″ Bore (127.00)	6″ Bore (152.40)	7″ Bore (177.80)	8″ Bore (203.20)
∅Rod	Std.	5/8″ (15.88)	5/8″ (15.88)	5/8″ (15.88)	1″ (25.40)	1″ (25.40)	1″ (25.40)	1-3/8″ (34.93)	1-3/8″ (34.93)	1-3/8″ (34.93)
	O.S.	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)

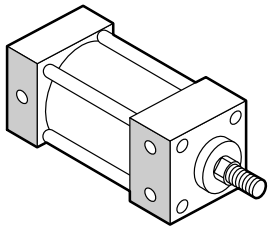
3/4 & 1-1/8 inch Bore Cylinders and Mounts

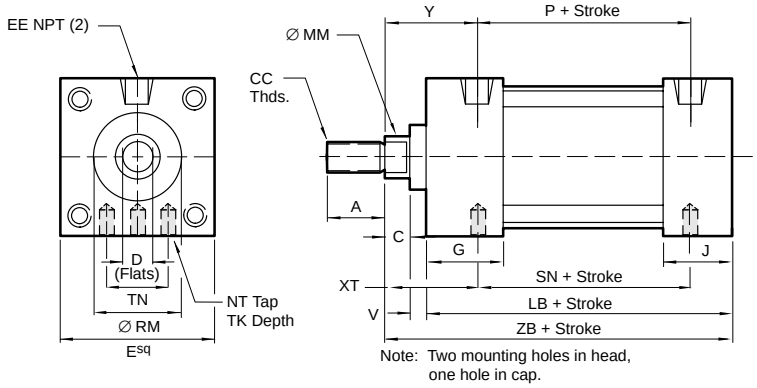
Code 01 Bolt Thru Mounts
(ANSI MS8)





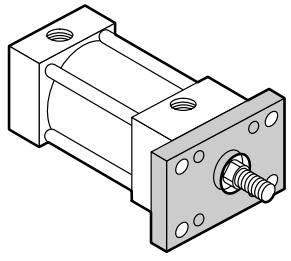
Code 02 Tapped Mounts
(ANSI MS9)

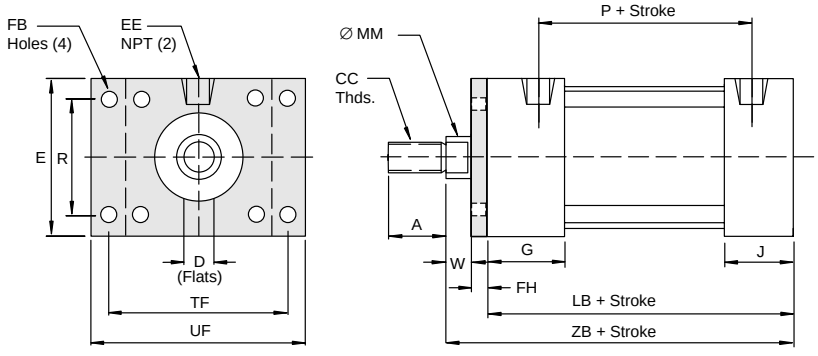




Note: Two mounting holes in head, one hole in cap.

Code 07 Head Rectangular Flange Mounts (ANSI MF1)



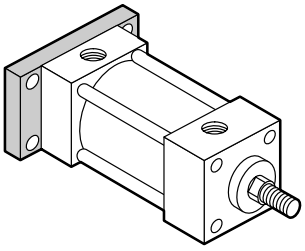


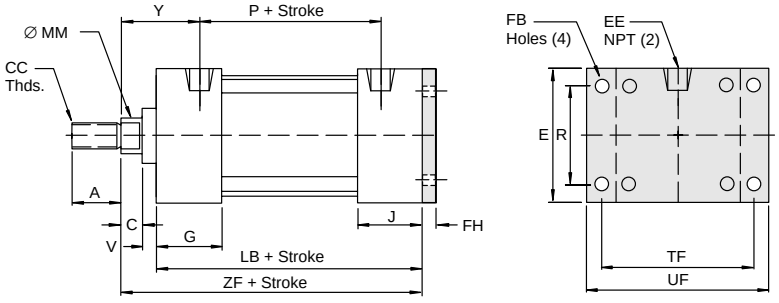
Dimension		01 Bolt Thru Mounts (MS8)		02 Bolt Thru Mounts (MS8)		07 Head Rect. Flange Mounts (MF1)	
		3/4″	1-1/8″	3/4″	1-1/8″	3/4″	1-1/8″
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.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)

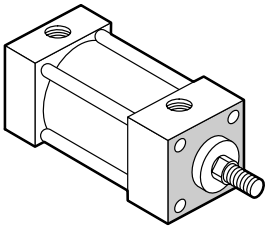
3/4 & 1-1/8 inch Bore Cylinders and Mounts

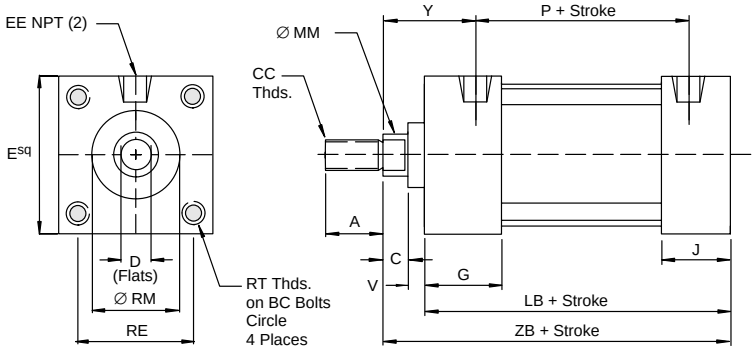
Code 12 Cap Rectangular Flange Mounts (ANSI MF2)



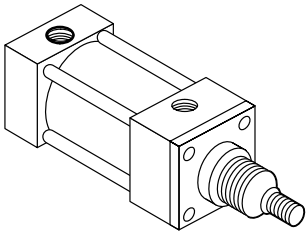


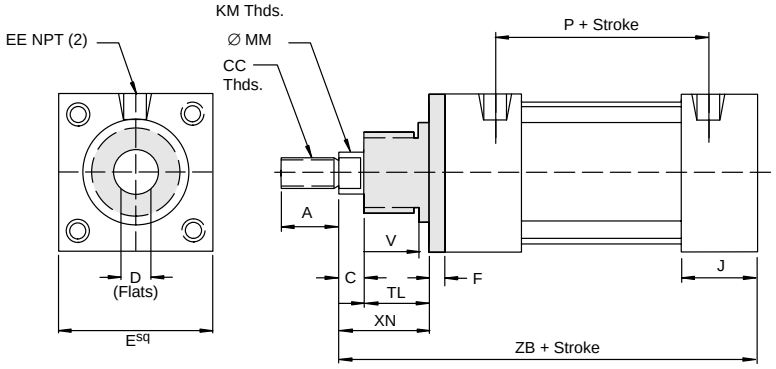
Code 18 Head Tapped Face Mounts (ANSI MR1)





Code 20 Threaded Nose Mounts (ANSI MNR1)



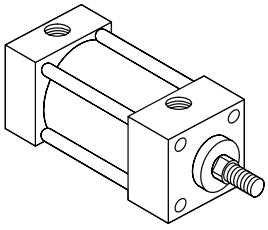


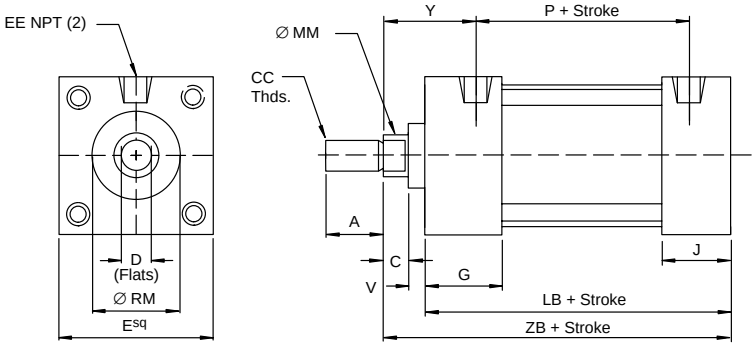
Dimension		12 Cap. Rect. Flange Mounts (MF2)		18 Head Tapped Face Mounts (MR1)		20 Threaded Nose Mounts (MNR1)	
		3/4″	**1-1/8″**	**3/4″**	**1-1/8″**	**3/4″**	**1-1/8″**
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)	–	.500 (12.70)
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)

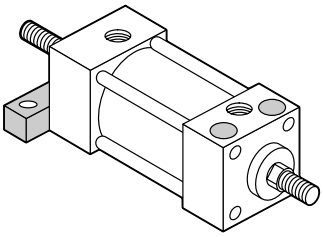
3/4 & 1-1/8 inch Bore Cylinders and Mounts

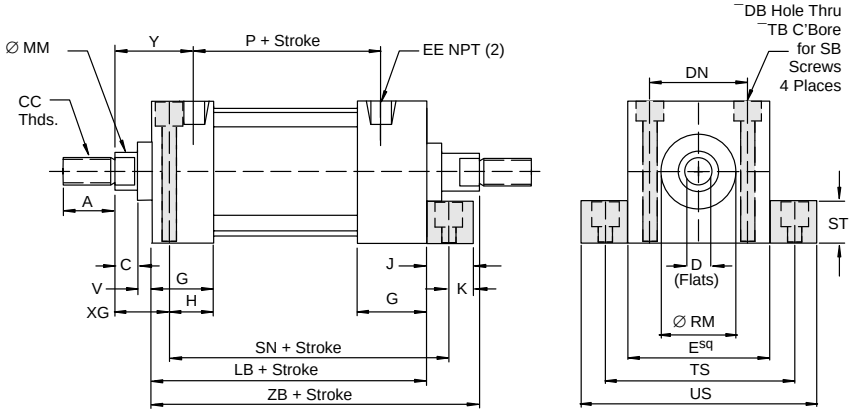
Code 24 No Mounts
(ANSI MX0)



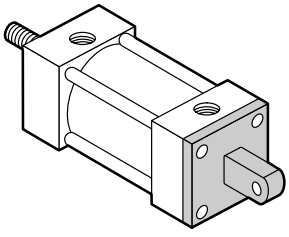


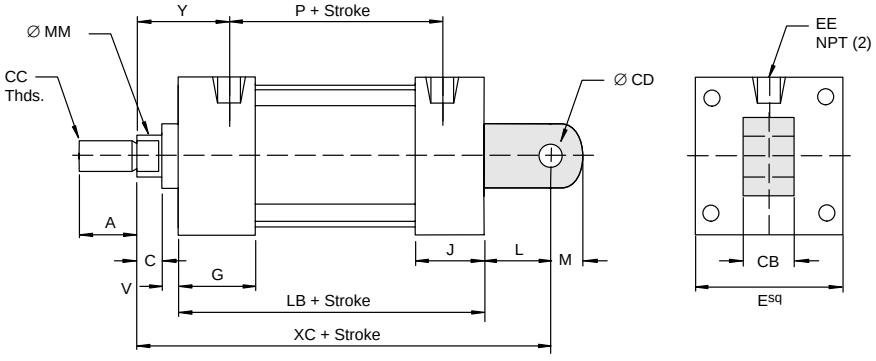
Code 25 Double Rod, Bolt Thru Mounts





Code 47 Fixed Eye Mounts
(ANSI MP3)



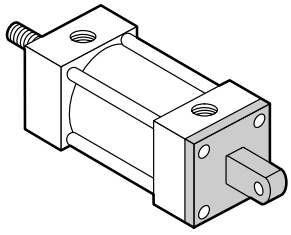


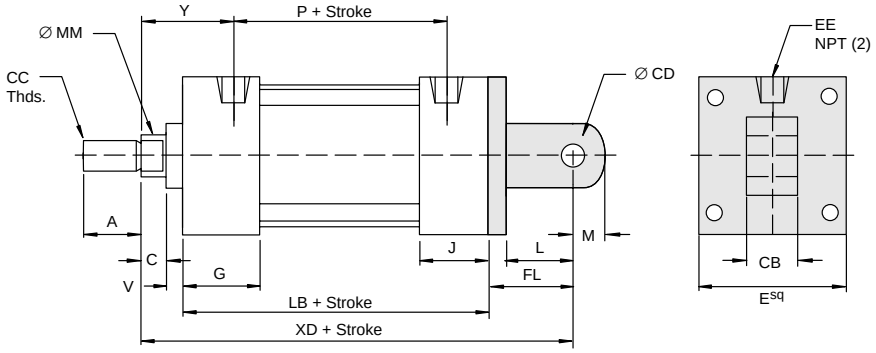
Dimension		24 No Mount (MX0)		25 Double Rod Bolt Thru Mounts (MS8)		47 Fixed Eye Mounts (MP3)	
		3/4″	1-1/8″	3/4″	1-1/8″	3/4″	1-1/8″
∅ Rod	Std.	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)	.312 (7.92)	.375 (9.53)
	O.S.	–	.500 (12.70)	–	.500 (12.70)	–	.500 (12.70)
A	Std.	.625 (15.88)	.625 (15.88)	.625 (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)

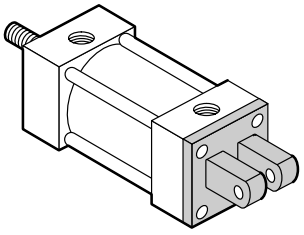
3/4 & 1-1/8 inch Bore Cylinders and Mounts

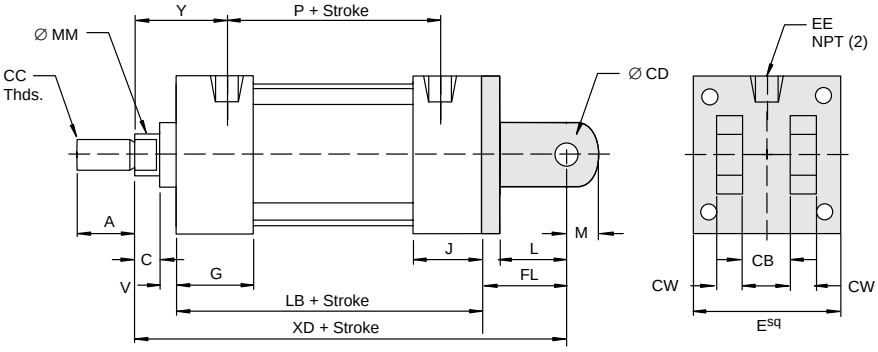
Code 48 Detachable Eye Mounts (ANSI MP4)





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)

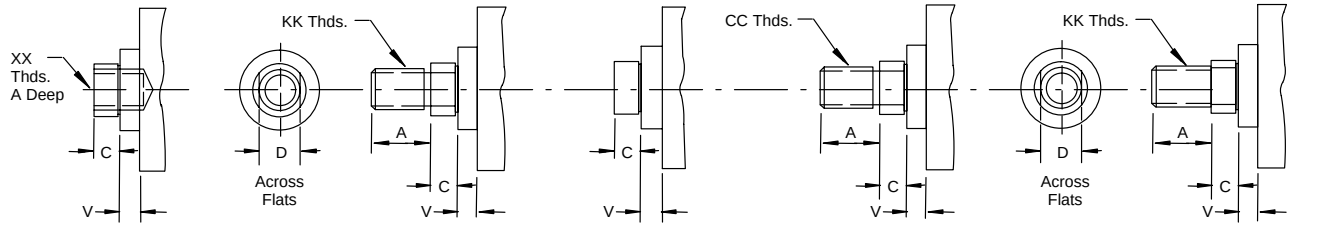
All dimensions in inches (mm)

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

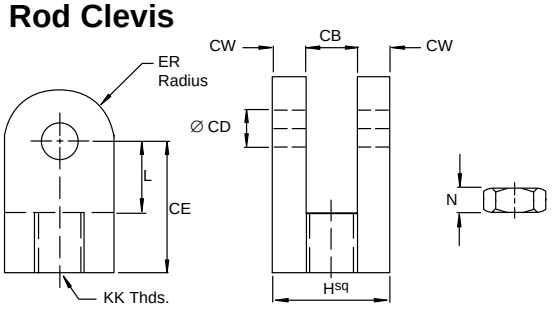
Type S
Optional Studded

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

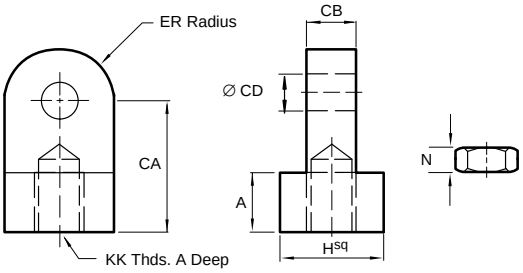
Rod Clevis



	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

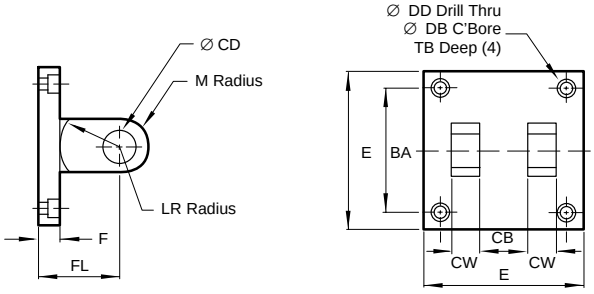
Rod Eye



	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)

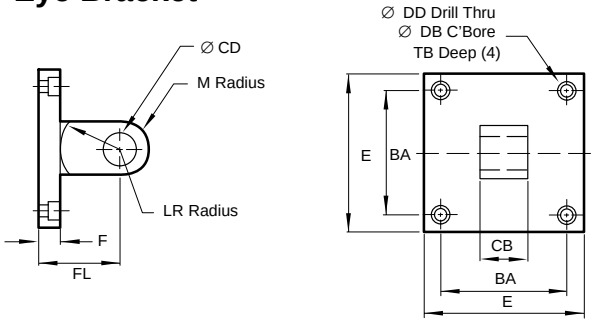
*Includes Jam Nut

Clevis Bracket



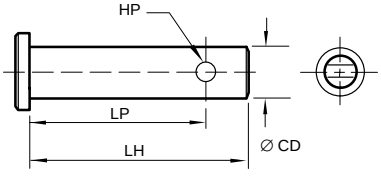
	3/4″	1-1/8″
	VP61004A	VP61006A
BA	.750 (19.05)	1.125 (28.58)
CB	.250 (6.35)	.375 (9.53)
CD	.250 (6.35)	.375 (9.53)
CW	.250 (6.35)	.250 (6.35)
DB	.250 (6.35)	.328 (8.33)
DD	.156 (3.96)	.203 (5.16)
E	1.000 (25.40)	1.500 (38.10)
F	.500 (12.70)	.500 (12.70)
FL	1.125 (28.58)	1.125 (28.58)
LR	.437 (11.10)	.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.

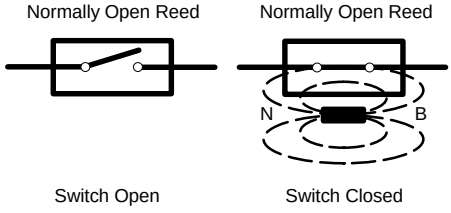
One or more switches may be mounted to provide an indication of piston position.

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.

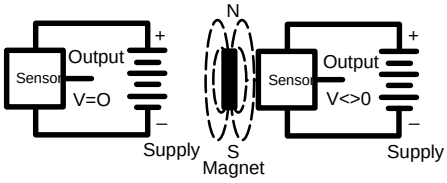
Reed Switch Working Principle

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.

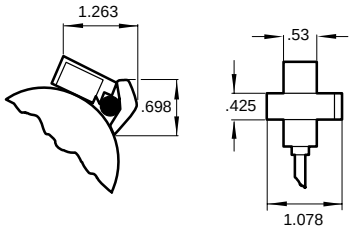
In order to obtain optimum performance and long life, magnetically operated limit switches should not be subjected to: (1) strong magnetic fields, (2) extreme temperature, and (3) excessive ferrous filing or chip buildup.

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.

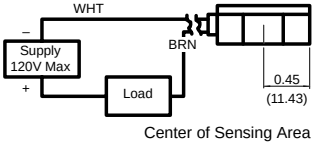
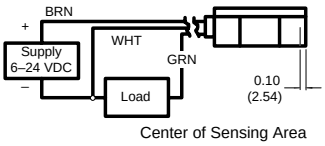
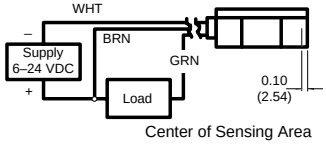
Switch and Mounting Bracket Dimensions

PS8-2 Series

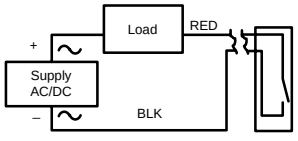
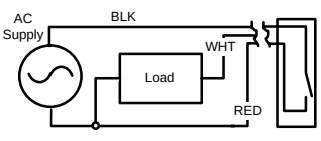
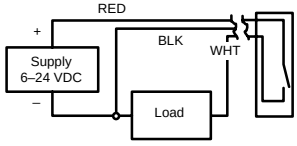
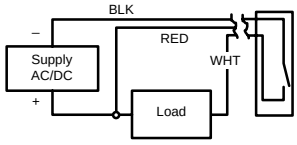


Specifications: 3/4 thru 2-1/2 inch Bores

*Metal Oxide Varsitor surge Suppression. **Note:** All PS7 and PS* Series Switches are supplied with 9 foot leads.

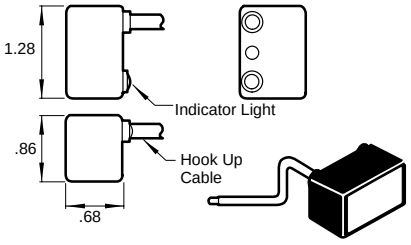
Switch Model	PS8-2-04 Reed	PS8-2-31 Hall	PS8-2-32 Hall
Bore Sizes	3/4″ thru 2-1/2″	3/4″ thru 2-1/2″	3/4″ thru 2-1/2″
Switch Type	Reed Switch *MOV & Light	Hall Effect & Light, Sourcing PNP	Hall Effect & Light, Sinking PNP
Function	SPST Normally Open	Normally Open	Normally Open
Switching Voltage	5-120 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			

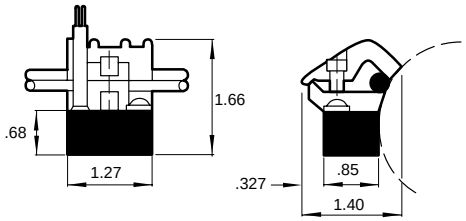
Specifications: 2 thru 8 inch Bores

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.

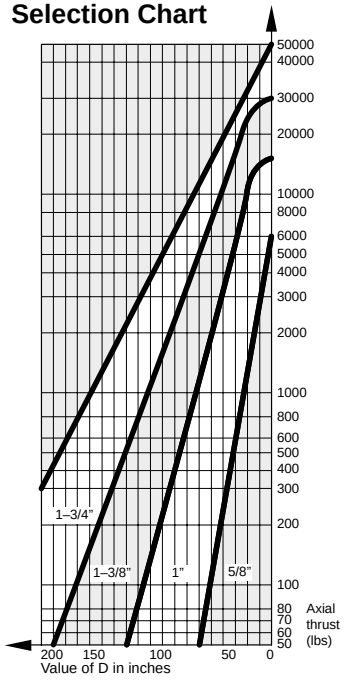
3. With the piston rod fully extended, calculate the value of D (in inches) using the formula shown or the cylinder mounting diagram selected in step #2.

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:

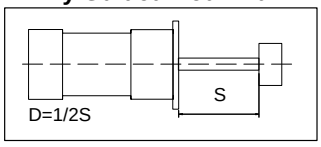
Stop tubes enhance the transverse load carrying capability of a long stroke cylinder by increasing the distance between the piston and rod bearing at full extension. When the value of D (calculated from the piston rod diameter selection instructions above) is less than 40″, a stop tube is not required. However, if D is 40″ or more, 1″ of stop tube is recommended for every 10″ (or fraction thereof) over 40″.

Selection Chart

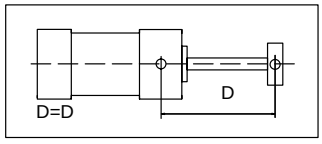


Cylinder Mounting Diagrams

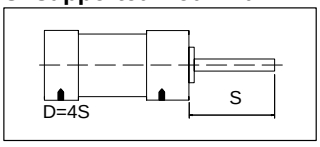
Firmly Guided Rod End



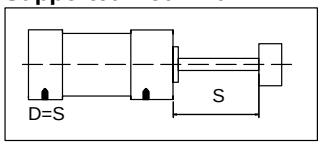
Head Trunnion



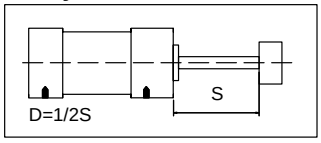
Unsupported Rod End



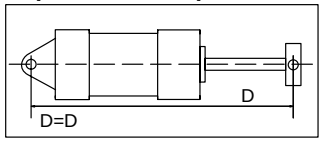
Supported Rod End



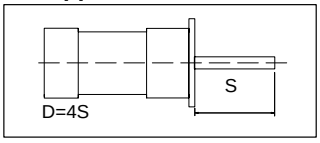
Firmly Guided Rod



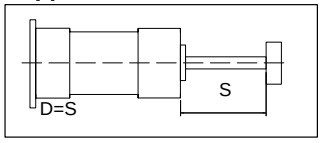
Cap Clevis or Cap Trunnion



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

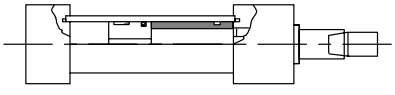
Used for cylinders non-cushioned on the rod.

Design B

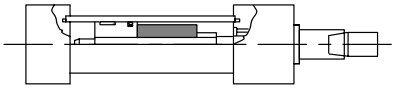
Used for cushioned hydraulic cylinders.

Design C

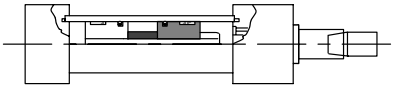
The best choice for a cylinder with an exceptionally long stop tube requirement. Note that the piston's effective bearing area is doubled. In addition to gaining the normal increased minimum distance between bearing points.



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)

Vickers®

Cylinders

LESA Series TT
Linear Electrohydraulic Servo Actuators

Designed specifically for wood products processing applications

Introduction

LESA Series TT Linear Electrohydraulic Servo Actuator

The Vickers LESA Series TT servo actuator, designed primarily for wood products processing applications, combines a high performance hydraulic cylinder and a control valve mounting manifold in one convenient package. Advanced, closed loop motion control is readily attainable with the simple addition of a proportional or servo valve and a precision non-contacting feedback transducer coupled with the appropriate electronic controls.

The LESA series servo actuators are designed to eliminate the need for separate hydraulic manifolds, plumbing between control valve and cylinder, transducer mounting brackets, and other complex arrangements typical of the cumbersome systems it replaces. With the option of the cast aluminum cover, a position transducer can be conveniently and safely contained within the cylinder assembly. All this allows the LESA Series TT servo actuator to work comfortably in harsh environments—like the wood products processing industry—that can easily damage most electric servo motors with ball screws and other types of actuators.

The available mounting styles provide the rigid connections required to achieve resolutions better than 0.001" (0.025mm). By using standard Vickers cylinder components, the Series TT servo actuator can offer a wide variety of NFPA interchangeable mountings, bores, and rod diameters, while providing significant cost savings over custom assemblies.

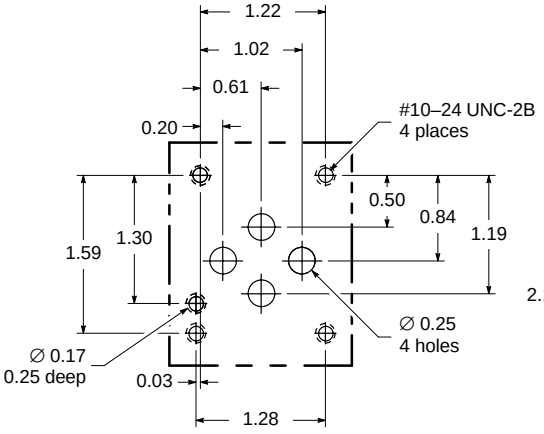
Typical Applications

- Veneer lathes
- Chippers
- Pickers
- Carriage headrigs
- Edgers
- Resaws
- Other setworks applications

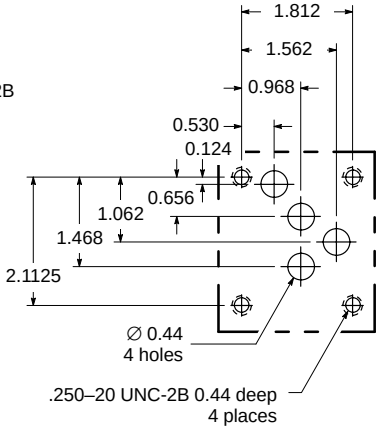
Features & Benefits

- Five standard bore sizes from 2 inches to 5 inches (larger sizes available on request).
- Five standard stroke lengths from 12 inches to 48 inches (other lengths available on request).
- Five standard mounting styles.
- Operating pressures up to 210 bar (3000 psi).
- Completely sealed non-corrosive environment.
- Low friction, "zero leakage" actuator design.

Valve Mounting Patterns

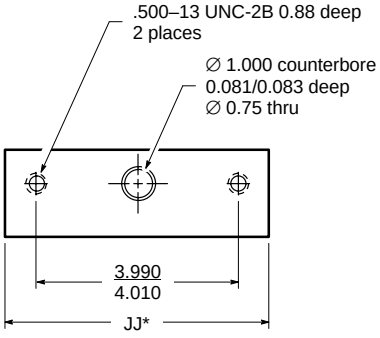


CETOP 3

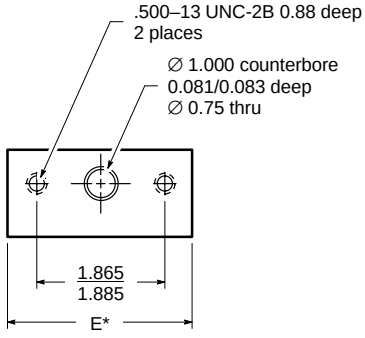


CETOP 5

PFS Cap Porting Information – Code "Z"



PFS200
2" and $2^1/_2$" bores



PFS325
$3^1/_4$", 4", and 5" bores

* See installation dimensions starting on page 2.

TT Model Series

Model Code* (Dimensions in inches)

TT ** ** * **L** * * **N** *** **

1, 2 | 3, 4 | 5, 6 | 7 | 8 | 9 | 10 | 11 | 12, 13, 14 | 15, 16

1, 2 Series

TT – LESA series linear electrohydraulic servo actuator

3, 4 Mounting style

Vickers Code	Style	NFPA Code
02 –	Tapped	MS4
09 –	Head rectangular	ME5
10 –	Clevis	MP1
15 –	Intermediate trunnion	MT4
17 –	Head trunnion	MT1

5, 6 Bore and rod diameters

Code	Bore	Rod
DH –	2	$1^3/_8$
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	$3^1/_2$

7 Rod end type

5 – Small male UN thread
9 – Intermediate male UN thread

8 Sealing system

L – Low friction, glass filled, Teflon™ dynamic seals with Nitrile energizers and static seals.

9 Valve mounting type

P – CETOP 5 with manifold and piping
Q – CETOP 3 with manifold and piping
Y – Standard SAE (same as “EE”)
Z – PFS style without manifold

10 Transducer cover

A – Without cover
B – With cover

11 Transducer type

N – Prepared for magnetostrictive transducer (Magnet installed. Transducer can be provided on request.)

12, 13, 14 Stroke length

Items 12 and 13 indicate stroke length from 00 inches through 99 inches. Standard stroke lengths are 12, 18, 24, 36, and 48 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 –	$^{15}/_{16}$

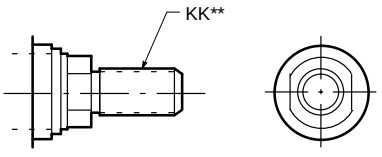
15, 16 Extra rod projection

Item 15 indicates extra rod projection from 0 inches through 9 inches.

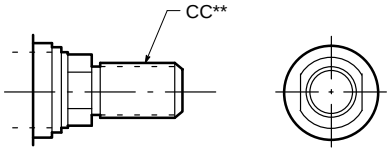
Item 16 indicates fractions of an inch per codes shown for item 14.

* Enter “X” in all spaces where the model code does not apply. Explain all “X” spaces.

Rod End Types



Type 5 – Small male UN thread



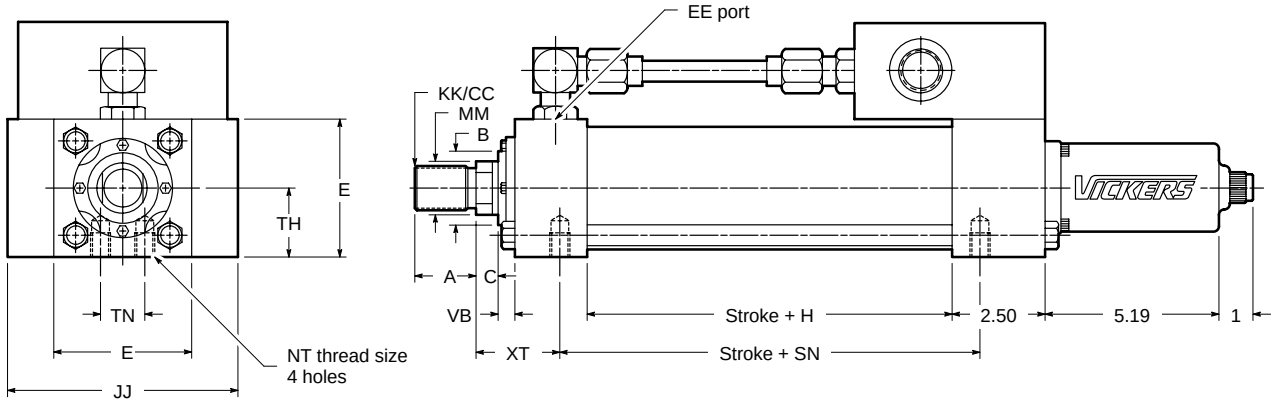
Type 9 – Intermediate male UN thread

** See installation dimensions starting on page 2.

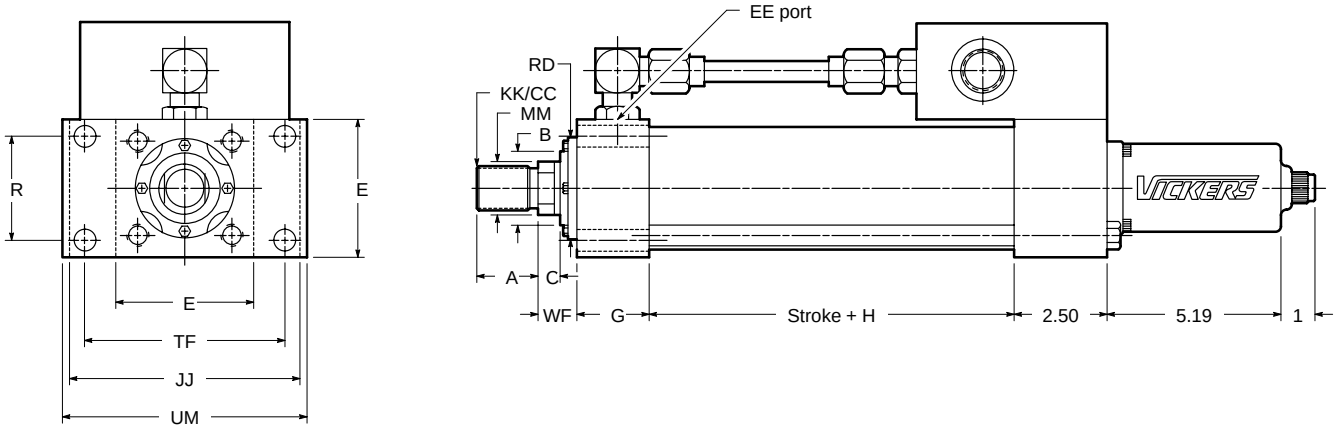
Installation Dimensions

Dimensions in inches

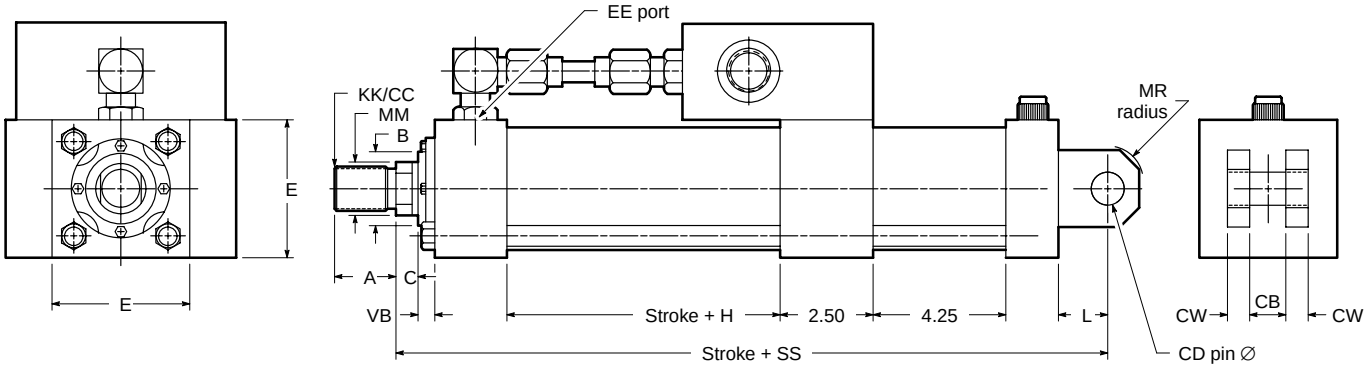
TT02 – MS4



TT09 – ME5



TT10 – MP1



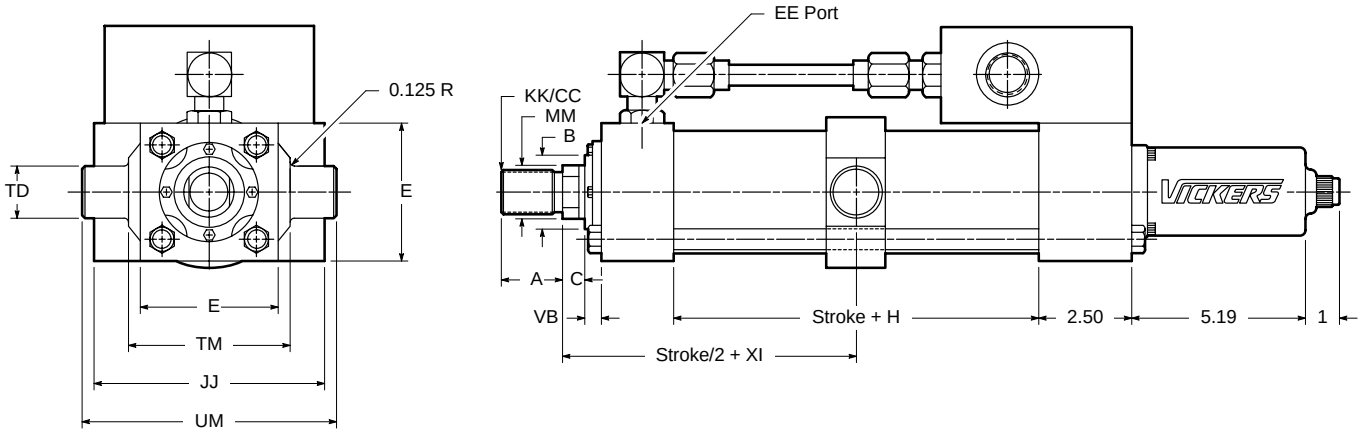
	Rod End Dimensions							Mounting Dimensions Affected by Rod Diameter			
Bore	**MM**	**KK**	**CC**	**A**	**B**	**C**	**VB**	**XT**	**RD**	**WF**	**SS**
2.00	1.38	1.000–14	1.250–12	1.62	1.999	0.62	1.00	2.62	2.88	1.62	14.25
2.50	1.38	1.000–14	1.250–12	1.62	1.999	0.62	1.00	2.62	3.38	1.62	14.38
	1.75	1.250–12	1.500–12	2.00	2.374	0.75	1.12	2.88	3.50	1.88	14.62
3.25	1.38	1.000–14	1.250–12	1.62	1.999	0.62	0.62	2.75	3.50	1.62	15.38
	1.75	1.250–12	1.500–12	2.00	2.374	0.75	0.75	3.00	3.75	1.88	15.62
	2.00	1.500–12	1.750–12	2.25	2.624	0.88	0.75	3.12	4.00	2.00	15.75
4.00	1.75	1.250–12	1.500–12	2.00	2.374	0.75	0.69	3.00	3.75	1.88	16.50
	2.00	1.500–12	1.750–12	2.25	2.624	0.88	0.69	3.12	4.00	2.00	16.62
	2.50	1.875–12	2.250–12	3.00	3.124	1.00	0.81	3.38	4.50	2.25	16.88
5.00	2.00	1.500–12	1.750–12	2.25	2.624	0.88	0.69	3.12	4.00	2.00	17.25
	2.50	1.875–12	2.250–12	3.00	3.124	1.00	0.81	3.38	4.50	2.25	17.50
	3.00	2.250–12	2.750–12	3.50	3.724	1.00	0.81	3.38	5.50	2.25	17.50
	3.50	2.500–12	3.250–12	3.50	4.249	1.00	0.81	3.38	5.88	2.25	17.50

	Constants				TT02 – MS4			
Bore	**EE**	**E**	**H**	**JJ**	**TN**	**TH** –0.006/–0.008	**NT**	**SN**
2.00	SAE #8	3.0	1.38	5.00	0.94	1.500	.500–13	2.88
2.50	SAE #8	3.5	1.50	6.25	1.31	1.750	.625–11	3.00
3.25	SAE #12	4.5	1.75	–	1.50	2.250	.750–10	3.50
4.00	SAE #12	5.0	2.00	–	2.06	2.500	1.000–8	3.75
5.00	SAE #12	6.5	2.50	–	2.94	3.250	1.000–8	4.25

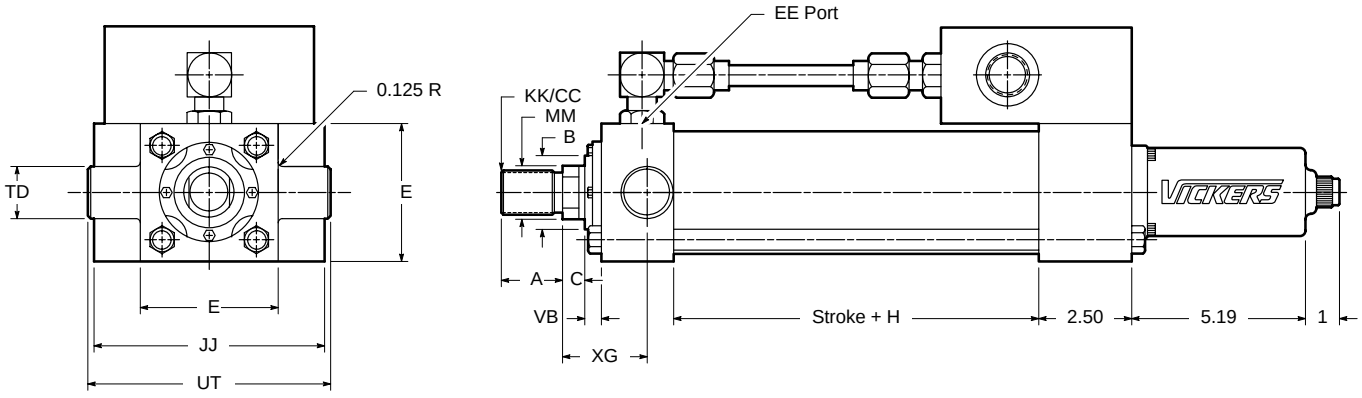
	TT09 – ME5					TT10 – MP1				
Bore	**R**	**TF**	**UF**	**SB**	**G**	**L**	**MR**	**CD**	**CB**	**CW**
2.00	2.06	4.12	5.12	0.500	1.75	1.25	0.88	0.750	1.255	0.62
2.50	2.56	4.62	5.62	0.500	1.75	1.25	0.88	0.750	1.255	0.62
3.25	3.25	5.88	7.12	0.625	2.00	1.50	1.25	1.000	1.505	0.75
4.00	3.81	6.38	7.62	0.625	2.00	2.12	1.62	1.375	2.005	1.00
5.00	4.94	8.19	9.75	0.875	2.00	2.12	1.88	1.750	2.505	1.25

Dimensions in inches

TT15 – MT4



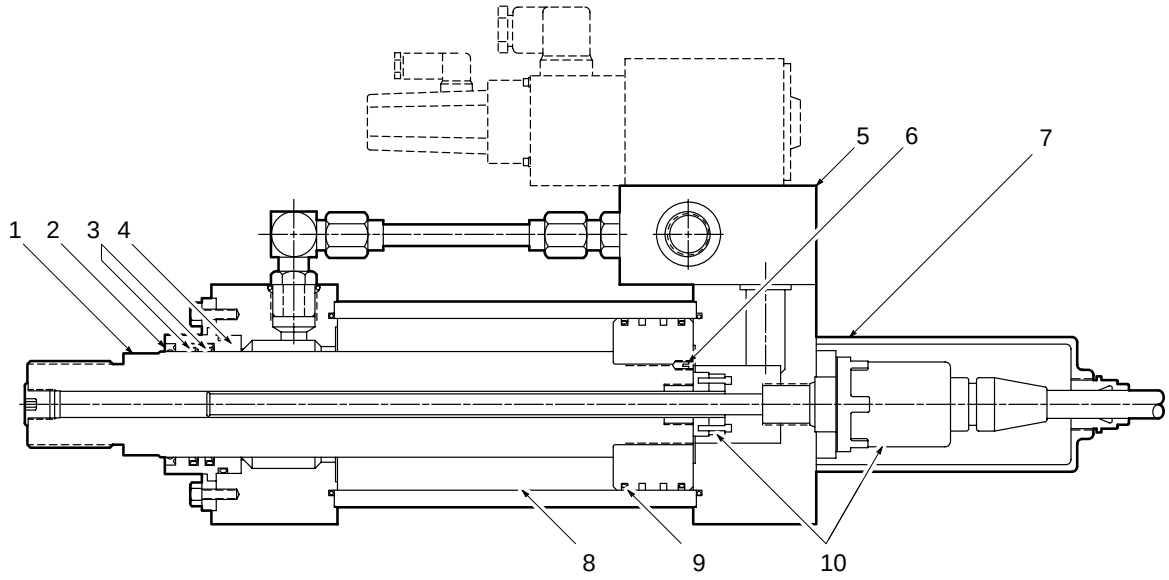
TT17 – MT1



	Rod End Dimensions							Mounting Dimensions Affected By Rod Diameter	
Bore	**MM**	**KK**	**CC**	**A**	**B**	**C**	**VB**	**XI**	**XG**
2.00	1.38	1.000–14	1.250–12	1.62	1.999	0.62	1.00	3.94	2.62
2.50	1.38	1.000–14	1.250–12	1.62	1.999	0.62	1.00	4.12	2.62
	1.75	1.250–12	1.500–12	2.00	2.374	0.75	1.12	4.38	2.88
3.25	1.38	1.000–14	1.250–12	1.62	1.999	0.62	0.62	4.50	2.75
	1.75	1.250–12	1.500–12	2.00	2.374	0.75	0.75	4.75	3.00
	2.00	1.500–12	1.750–12	2.25	2.624	0.88	0.75	4.88	3.12
4.00	1.75	1.250–12	1.500–12	2.00	2.374	0.75	0.69	4.88	3.00
	2.00	1.500–12	1.750–12	2.25	2.624	0.88	0.69	5.00	3.12
	2.50	1.875–12	2.250–12	3.00	3.124	1.00	0.81	5.25	3.38
5.00	2.00	1.500–12	1.750–12	2.25	2.624	0.88	0.69	5.25	3.12
	2.50	1.875–12	2.250–12	3.00	3.124	1.00	0.81	5.50	3.38
	3.00	2.250–12	2.750–12	3.50	3.724	1.00	0.81	5.50	3.38
	3.50	2.500–12	3.250–12	3.50	4.249	1.00	0.81	5.50	3.38

	Constants				TT15 – MT4 and TT17 – MT1			
Bore	**EE**	**E**	**H**	**JJ**	**TD**	**TM**	**UM**	**UT**
2.00	SAE #8	3.0	1.38	5.00	1.375	3.38	6.12	5.75
2.50	SAE #8	3.5	1.50	6.25	1.375	4.00	7.00	6.25
3.25	SAE #12	4.5	1.75	–	1.750	5.00	8.50	8.00
4.00	SAE #12	5.0	2.00	–	1.750	6.25	9.75	8.50
5.00	SAE #12	6.5	2.50	–	1.750	7.75	11.25	10.00

Design Features



1. **Actuator piston rod** of high strength (100,000 psi minimum yield) is precision drilled the full length to provide interference-free movement along the transducer probe.
2. **Rod wiper** protects rod seals by helping eliminate ingression of contaminants.
3. **Energized Teflon* rod seals** maintain positive seal contact regardless of system pressure, resulting in minimum friction and long life.
4. **Fe^{3}N rod bearing** is surface hardened for maximum wear resistance.
5. **Machined manifold** allows mounting of valve directly on cylinder cap. This eliminates leaks and piping problems and provides for simplified installation and maintenance.
6. **Piston connection** utilizes a full-length threaded one-piece piston, anaerobic adhesive bonding agent, and lock screw to allow the actuator to operate in high frequency cyclical applications with no danger of rod separation.
7. **Optional cast aluminum cover** protects transducer head from environmental and physical damage.
8. **Cylinder bore** is precision honed and hard chrome plated to provide optimum surface finish for contact with piston seal.
9. **Glass filled Teflon piston seal** provides minimum friction and long life while eliminating backlash—the perfect combination for servo system accuracy and response.
10. **Precision solid state position transducer**** generates digital or analog output feedback. Magnetostrictive design eliminates mechanical contact in operation.

* Teflon is a registered trademark of the DuPont Co.

** Transducer can be provided upon request