



a division of Magnum Integrated Technologies Inc.

Heavy Duty Hydraulic Cylinders

S E R I E S
3TH



How to Select and Specify Viceroy Fluid Power Cylinders

SERIES
3TH

Follow these steps to find the information you will need to specify and order the correct style of cylinder for your application. You will need to specify these items:

1. Quantity.

2. Series.

Decide which Series of cylinders best suits your application and refer to the catalog for that series. The selection will depend upon whether you want air or hydraulic and the size and capacity you need. A summary of the various Series can be found on the back cover of this catalog.

3. Mounting Style.

A series of diagrams illustrating mounting styles is on the reverse of this cover page. It is not at all uncommon to furnish cylinders with mixed mounts. For example, a cylinder may have a flange mount on the head end and some form of foot mounting on the cap end.

4. Operating Fluid. Cylinders are designed to use clean, good grade hydraulic mineral oil. Special packings are required for use with most synthetic fluids. Refer to the Standard Cylinders paragraph under Design and Construction Features on page 5 for a discussion of these and cylinders for water.

5. Bore Size. This will depend on the amount of force your application requires.

6. Stroke Length. The distance of travel required by your application determines this.

7. Cushions. Specify whether without cushions, cushioned head, cap or both ends. These are described in the Design and Construction Features on pages 4, 5 and 30.

8. Rod Diameter. The standard diameter for any given bore size is identified throughout this catalog. It will be furnished if not otherwise specified. For optional rod sizes, specify the desired piston rod diameter. Refer to the Piston Rod Selector Chart on page 4 to be sure you have selected the proper rod diameter for your application. Male rod ends Style 1 as shown on page 3 are furnished unless otherwise specified. Other styles shown are available at no additional cost, but must be specified by "Style" code letters. If special rod ends are required, specify clearly: (A) "KK" thread diameter and pitch, whether male or

female. (B) "A" length or depth of thread. (C) "WF" dimension. Dimension "WF" can be increased without difficulty, but cannot be decreased if standard wrench flats are to be supplied. "WF" equals "C" plus "VB" which is a fixed dimension. "C" is the minimum dimension that will permit standard wrench flats.

9. Rod End Thread. (See above)

10. Piston Type. Piston rings are furnished as standard. Block-Vee is offered as an option.

11. Port Location. Ports will be located at "Position 1", as shown, unless otherwise specified. If desired in a position other than "Position 1", please specify by position number, as shown on data sheets, for both head and cap end. NOTE: Change of port location requires that cushion adjusting needle position be specified.

12. Cushion Adjusting Needle Location. Cushion adjusting needles and ball checks are furnished in the positions shown on the sheets. If desired in other than standard position, please specify by position number. NOTE: Cushion adjusting needles and ball check valves are interchangeable.

13. Double Rod Cylinders. See Tie Rod Mounting cylinder pages. If both ends are not to be the same, be sure to specify requirements in detail. If cylinder is to be cushioned at one end only, be sure to state clearly which end is to be cushioned (e.g. cushioned at end opposite flange end of cylinder).

14. Trunnion Location. On styles "E" and "DE" customer must specify "XI" dimension.

15. Tie Rod Extensions. If other than standard see Tie Rod Mounting cylinder pages and specify "BB" dimension.

16. Stop Tube. When application calls for a stop tube, as described in the Piston Rod Selector Chart please specify: (A) Actual working stroke required. (B) Length of stop tube required ("Plus stroke" dimensions in Bulletin will be determined on basis of actual stroke plus length of stop tube).

17. Special Features. For any special features such as special mounts, piston rods, materials, etc., please furnish sketches with detailed information or specifications.

18. Special Operating Conditions.

The seals and packings furnished as standard in cylinders operate most satisfactorily within a temperature range of -40°F to +200°F. Baffles are recommended to shield cylinders from heat whenever practical. Consult local representative or factory when confronted with special problems such as unusually high or low temperatures, long strokes, corrosive atmosphere, especially dirty conditions, etc.

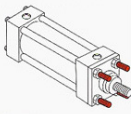
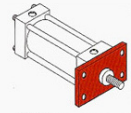
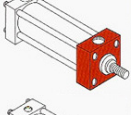
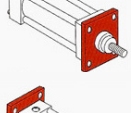
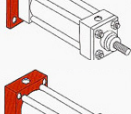
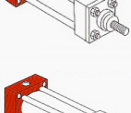
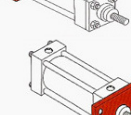
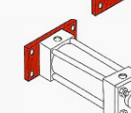
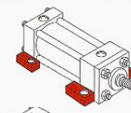
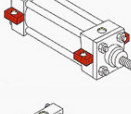
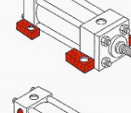
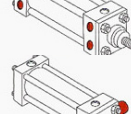
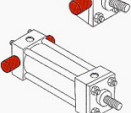
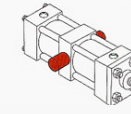
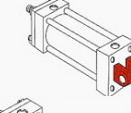


19. Accessories. See the accessories pages 31-31A.

20. Air Bleeds. Air bleeds are at slight additional cost, and are recommended when cylinders are not mounted in self-bleeding position. Please specify by position number, as shown on data sheets, for either or both ends. Air Bleeds are located in cylinder tube, tube can be rotated to place bleeders at top regardless of mounting position.

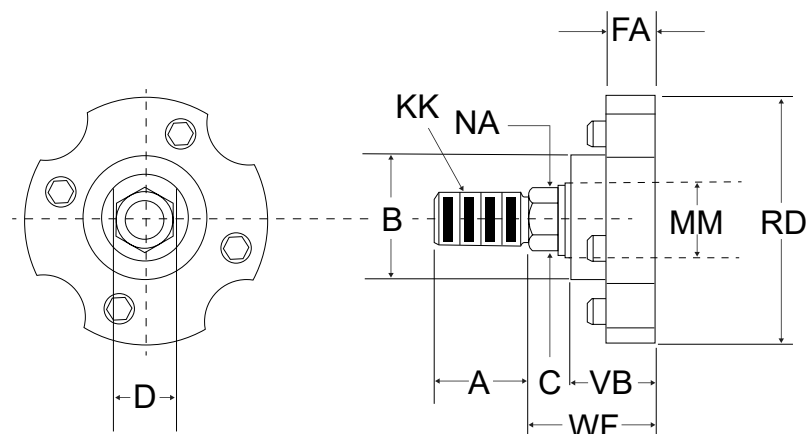
Styles of Mounting

Rod End Styles

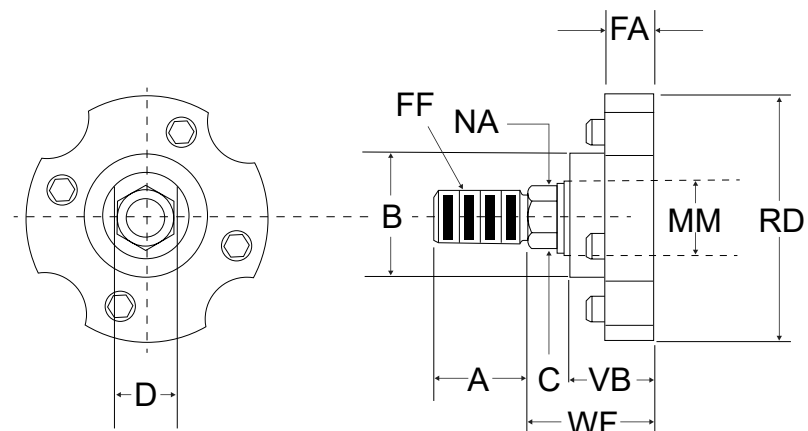
These diagrams illustrate the various styles of mounting cylinders and identifies the Industry Standard description and code letters along with corresponding Viceroy Fluid Power Style letter codes.

Mounting Description	NFPA Mounting Code	Viceroy Fluid Power Mounting Code
 Txt Rods Ext	MX1 MDX2 MX2 MX3	Style L Style DL Style N Style M
 Head Rectangular Flange	MF1	Style B
 Head Square Flange	MF5	Style BB
 Head Square	ME3	Style QQ
 Cap Rectangular Flange	MF2	Style A
 Cap Square Flange	MF6	Style AA
 Cap Square	ME4	Style PP
 Head Rectangular	ME5	Style Q
 Cap Rectangular	ME6	Style P
 Side Lugs	MS2	Style J
 Centerline Lugs	MS3	Style K
 Side End Lugs	MS7	Style CC
 Side Trapped	MS4	Style H
 Head Turnnion	MT1	Style ER
 Cap Turnnion	MT2	Style EB
 Intermediate Fixed Turnnion	MT4	Style E
 Cap Fixed Clevis	MP1	Style G
Cap Single Lug		Style GG

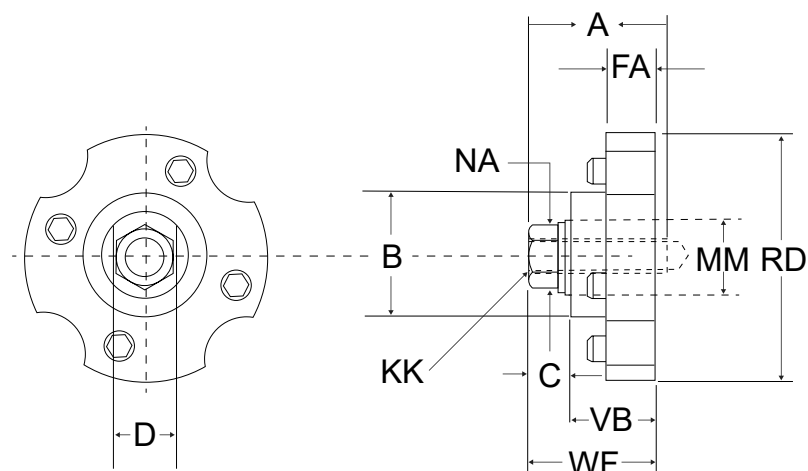
NFPA Style SM (VFP Style 1) Standard Male Rod End (Furnished unless otherwise specified)



NFPA Style IM (VFP Style 2) Optional Male Rod End



NFPA Style SF (VFP Style 3) Female Thread Rod End



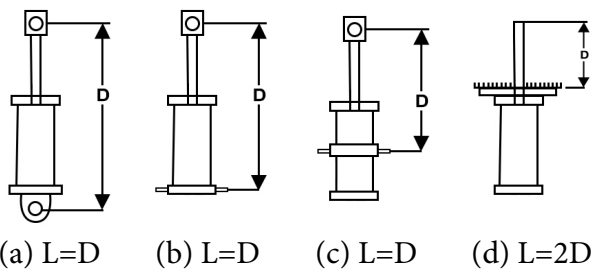
SPECIALS (VFP Style 4) Also available: Special Thread, Ex-tension, etc. Give desired dimensions or furnish dimensional sketch.

**In 10" thru 20" bores dimension "FA" is identical to dimension "F" Socket screw heads do not protrude beyond dimension "FA".*

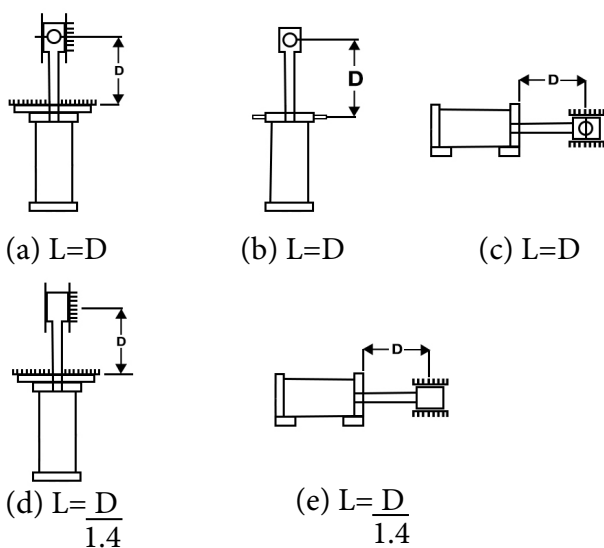
NOTE: Certain bore sizes and diameters will be furnished with round retainers (not scalloped) but dimensions are the same.

Piston Rod Selector Chart

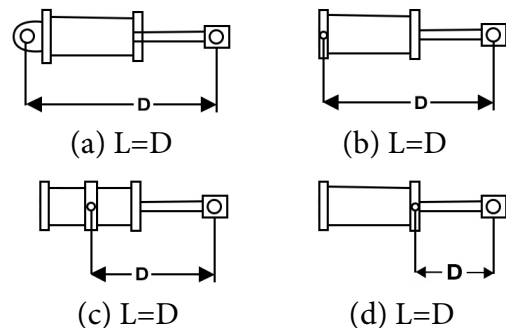
Case 1



Case 2



Case 3



The Piston Rod in a cylinder acts as a column and, as such, is subjected not only to compressive stresses, but also buckling stresses which are a function of the moment of inertia for a constant modulus of elasticity. The "column strength" of a piston rod cannot be increased by using higher tensile strength or heat treated materials. For this reason, it is sometimes necessary to use an oversize piston rod strictly for the purpose of achieving the necessary "column strength." Data shown in chart form is based on Euler's equation for a vertical column with both ends rounded (see Case I illustration). The values of "L" shown in the chart are approximately one-half of the theoretical limit of "L" as determined by this equation. Factors such as vertical or horizontal mounting, shock or non-shock loading, frequency of operation, etc., should be taken into consideration in selecting a permissible value of "L".

The values of "L" shown in the shaded area of the table can be used when the attitude

VALUE OF "L" IN INCHES PISTON ROD DIAMETERS															
Thrust load in Lbs	5/8	1	1 1/8	1 3/4	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	7	8 1/2	10
700	28	72													
800	27	68													
900	25	64													
1,000	24	61													
1,200	22	55	104												
1,400	20	48	97												
1,600	19	45	90												
1,800	18	43	85												
2,000	17	41	81	131											
2,200	16	38	77	125											
2,600	15	35	71	115	150										
3,000	14	30	66	107	139										
4,000	12	27	57	93	121	189									
5,000	11	25	50	83	108	169									
6,000		23	47	76	99	154	222								
7,000		22	43	70	91	143	205								
8,000		20	41	66	85	133	192	261							
9,000		19	38	62	81	126	181	246							
10,000		17	36	59	76	119	172	234	305						
12,500			32	52	68	107	154	209	273						
15,000			30	48	63	98	140	191	249	315					
17,500			27	44	58	90	130	177	231	292	360				
20,000			26	42	54	84	121	165	216	273	337				
25,000			23	37	48	76	109	148	193	244	302	365			
30,000				34	44	69	99	136	176	223	275	333			
40,000				29	38	60	86	117	153	193	238	289			
50,000					34	54	77	105	137	173	213	258			
60,000						49	70	96	125	158	195	236	375		
80,000						42	61	83	108	137	169	204	322		
100,000							55	74	97	122	151	182	291		
120,000							50	68	88	112	138	167	266		
150,000								61	79	100	123	149	238		
200,000									63	87	107	129	206	344	
250,000										77	96	115	184	307	383
300,000											86	106	168	281	348
350,000												98	156	260	
400,000												91	146	243	302
450,000													137	229	284
500,000													132	196	270
550,000													126	187	257
600,000													120	179	246
650,000														172	236
700,000														166	228
800,000														154	213
900,000														145	201
1,000,000															191

of the piston rod is horizontal or vertical. The values of "L" beyond the shaded area can be used with the piston rod in vertical position only.

Example:

Determine rod size required for a horizontal stroke of 130". Maximum cylinder force required in both push and pull directions is 8,000 lbs. The desired cylinder mounting in Case II (c), L=130. Enter chart at thrust load 8,000 lbs. and move horizontally until "L" dimension over 130 is reached. This would be L=133, reading vertically up, shows that 2 1/2" diameter rod is required. However, the "L" dimension is outside the shaded area of the chart which means that this rod size stroke combination is suitable for vertical mounting only.

Go to the next rod size and observe that the highest "L" dimension in the coloured area is 140. Therefore, 3" diameter is a suitable

rod and it will carry a load of 15,000 lbs. with approximately 2:1 factor of safety. Stop Tubes. The function of a stop tube is to act as a spacer to increase the distance between the piston and piston rod bearing when the piston rod is in its fully extended position. This increase in spacing serves to reduce bearing loads and, at the same time, increases the structural rigidity of the assembly to prevent buckling and jack-knifing.

A Stop Tube is required for cylinders mounted as shown in Case I whenever "L" exceeds 40". Length of stop tube (Inches), = $\frac{L-40}{10}$ to the nearest full inch.

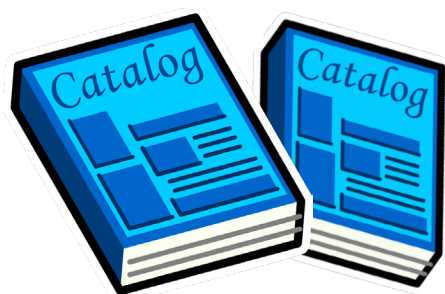
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*Cylinder mountings shown in Case II do not need stop tubes.

*Cylinder mountings shown in Case III should be referred to factory tube requirements.

How to use This catalog Index

SERIES 3TH

This catalog has been organized for maximum convenience in designing with and specifying Viceroy Fluid Power cylinders. Both the front and back covers fold out to display information common to all mounting styles and bore sizes of cylinders.

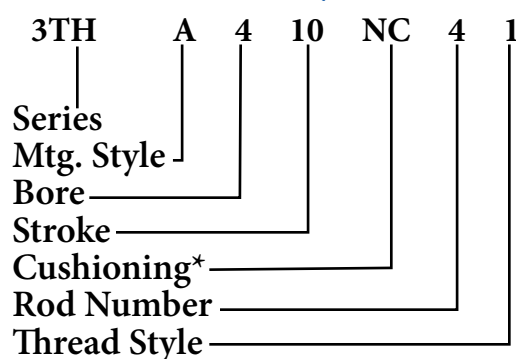


Inside the front cover you will find a guide to the different types of mounting and the rod end styles for all cylinder pages. The back cover contains information on accessories.

Fold out the front and back cover. These pages will be available for reference alongside any of the dimension tables which follow.

A review of the checklist of information headed "How To Select and Specify Viceroy Fluid Power Cylinders" and the page opposite will help you in considering all essential details.

How to use Viceroy Fluid Power codes



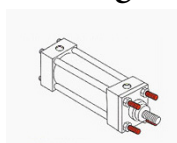
* NC - non-cushioned, CF - cushioned front end, CR - cushioned rear end, CC - cushioned both ends.

The diagram above illustrates the information given by a Viceroy Fluid Power cylinder code. The rod number references the rod diameter. The thread style refers to the rod end. (See Rod End Styles and matching code numbers, page 3.) When Viceroy Fluid Power Style 4 is specified, all rod and cylinder modifications must also be specified.

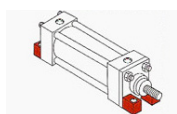
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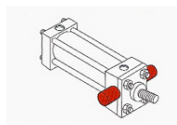
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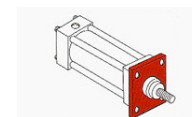


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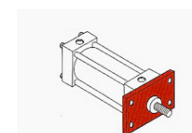


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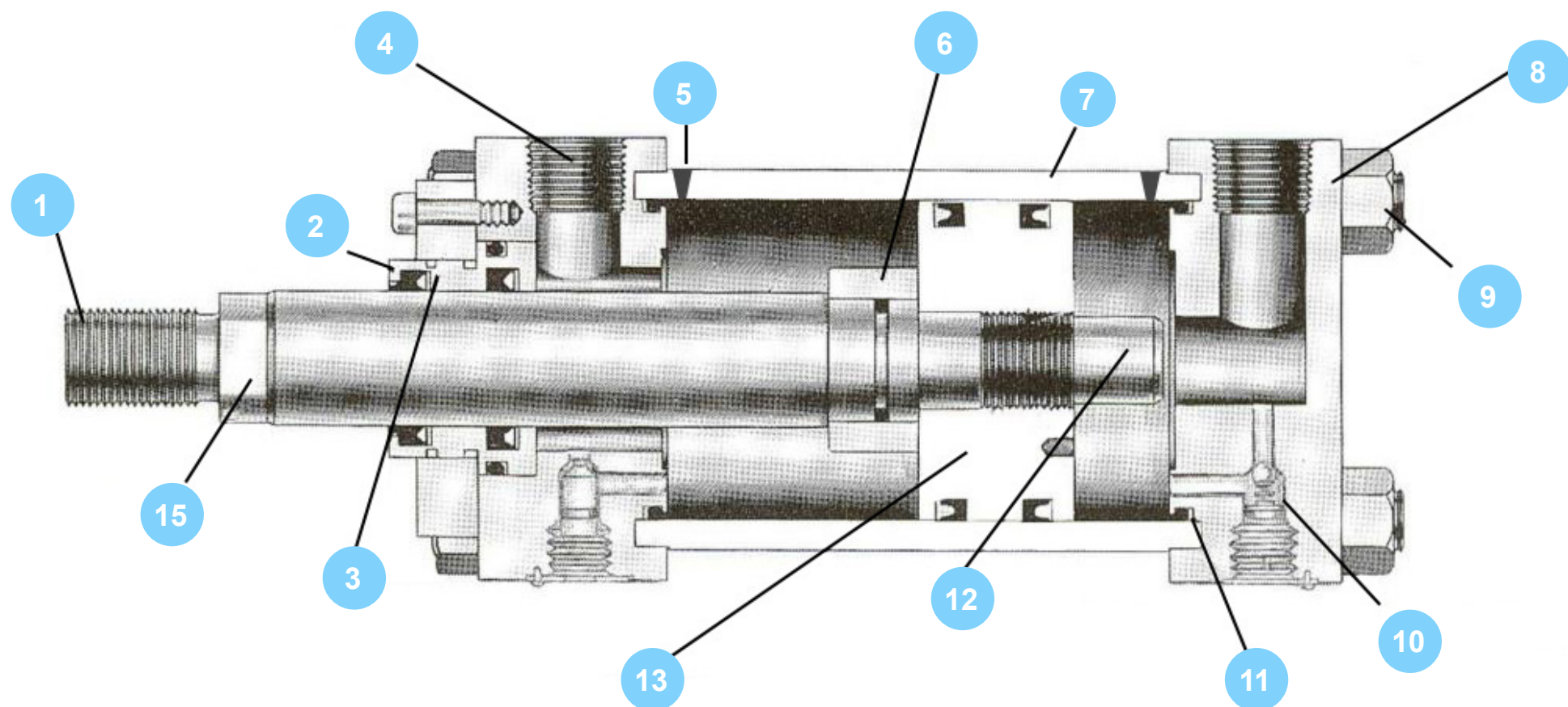
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Quality Design and Construction Features



Cylinder Parts

1. Piston Rods
2. Rod Wiper
3. Bolted Rod Gland Cartridge
4. Ports
5. Air Bleeds
6. Head End Cushion
7. Cylinder Barrel
8. Heads
9. Tie Rods and Nuts
10. Needle valves and Check Valves
11. Tube Seal
12. Cap End Cushion Plunger
13. Polyurethane U-Cup Type Piston
14. Ring Type Piston
15. Vee-type Piston
16. Wrench Flats

Quality Design and Construction Features

1. Piston Rods - Piston rods are 100,000 psi minimum yield, medium carbon steel. Sizes 5/8" thru 3 1/2" diameter are induction case hardened to 54 Rockwell C. All piston rods are hardchrome plated and highly polished.

2. Rod Wiper- Polyurethane, double lip type wiper designed to protect the piston rod, bearing and rod seal, is standard for all rod sizes. Also, metallic scrapers and Viton wipers are available for all rod sizes.

3. Bolted Rod Gland Cartridge - Heavy wall, ductile iron bearing is accurately piloted in head to assure perfect alignment, designed to accept a variety of seal styles. With certain exceptions, the cartridges can be removed without removing mounts or tie rod nuts. This eliminates the necessity of cylinder disassembly to replace the rod seals or rod bearing. Bearings are held in place with bolted steel retainer plates.

Bearings used for a given rod size are interchangeable into any cylinder bore with the same rod diameter.

a. **Rod Seal** - Polyurethane compound, flexible lip type rod seal has excellent abrasion resistance and is wear compensating. Inherent characteristics of the material and design assure leak-proof performance and long life.

b. **Rod Bearing** - Ductile iron material insures low friction, high load capabilities and long life.

4. Ports - Large unrestricted ports permit maximum flow with minimum pressure drop. Heads may be rotated independently at 90° intervals for convenient port location. SAE straight thread ports are optional. Oversize ports, one size larger than standard, can be furnished on most bore sizes by welding a half-coupling to the standard head or cap.

5. Air Bleeds - Ball and setscrews are provided in the barrel when specified. The barrel can be rotated to place bleeders at top regardless of mounting position.

6. Head End Cushion - Floating type head end cushions are retained by shoulder on the rod.

7. Cylinder Barrel - The barrel is constructed of carefully selected, heavy wall steel tubing. The tubing is microhoned to assure smooth operation with minimum friction.

8. Heads - Rolled-steel heads are accurately machined to assure perfect alignment of piston rod and cylinder bore. Heads pilot on bore of tube and confine O.D. to prevent breathing. This provides additional insurance against leakage.

9. Tie Rods and Nuts - Tie rods are made from 100,000 psi minimum yield, medium carbon steel. They are prestressed at assembly with self-locking nuts.

10. Needle valves and Check Valves - Flush type, self-locking needle valves and check valves are interchangeable. Large drilled passages provide maximum control of cushioning effect, and assure rapid, full power start of return stroke. As an added safety feature, leakage will occur prior to thread disengagement to eliminate the possibility of valve blow-out.

11. Tube Seal - O-ring with back up washer assures a positive seal between head and barrel.

12. Cap End Cushion Plunger - Accurately machined cap end is an integral part of the piston rod.

13. Polyurethane U-Cup Type Piston - This type piston with polyurethane seals is standard in 3TH series cylinders and will be furnished unless otherwise specified. The piston, one-piece high grade alloy iron is pilot fitted to the piston rod and locked. Polyurethane flexible lip type piston seals have excellent abrasion resistance and are wear compensating. Inherent characteristics of the material and design assure leak-proof performance and long life.

14. Ring Type Piston - This type piston, one piece high grade alloy iron is pilot fitted to the piston rod and locked. Ring type piston provides long life with trouble-free service. Application however, must tolerate a moderate amount of by-pass.

15. Vee-type Piston - Fabric-reinforced synthetic rubber, Vee-type multiple lip, non-adjustable, self-compensating packing provide maximum sealing efficiency and long life. Bronze piston support bearing provides maximum support with minimum friction. Available at an additional cost.

NOTE: All three types of pistons use the same rods and are interchangeable.

16. Wrench Flats - Large wrench flats are chamfered to protect rod gland packing in installation. Standard piston rods thru 5 1/2" diameter are furnished with two wrench flats, and additional flats are available upon request. Spanner holes are furnished in place of flats of 7" thru 10" diameter rods.

Mounts - All mounts are of steel plate or fabricated steel, accurately machined for precise mounting.

JIC - These cylinders are designed to conform to JIC standards. **NFPA** - The dimensioning and identification of the cylinders in this Bulletin are in accordance with the NFPA recommended dimension code for fluid power cylinders.

Endurance Pressure Rating - The pressure containing envelope of cylinders (tube, tie rods, and covers) are fatigue pressure rated at 3000 psi. For endurance pressure rating of mounts and other cylinder components consult the sales department.

For additional information contact your nearest distributor or the factory sales department.

Cylinders for Special Operating Conditions

Optional Features

SERIES 3TH

1. Hydraulic Cylinder for High Temperature and Synthetic Fluids

(Phosphate ester base and chlorinated hydrocarbon fire-resistant fluids) - Series 3THT.

Furnished with viton compound rod and piston seals or long wearing cast iron piston rings. Suitable for operation with most phosphate ester base fluids and temperatures within the range of -20°F to +400°F.

2. Hydraulic Cylinder for Water, Water Glycols, Water-oil Emulsions

Series 3THW (water), and Series 3THG (water glycols and water-oil emulsions). Viton compound seals furnished to give long and reliable service when operated on water.* Standard chrome-plated steel piston rods are used (chrome-plated stainless steel piston rods available). For cylinders Series 3THW, the tubes are chrome-plated steel.

Also, miscellaneous steel parts are cadmium-plated.

3. Hydraulic Cylinders for Air Service

Cylinders in Series 3TH are designed to function as hydraulic cylinders. These cylinders can be safely used for air pressures up to 750 psi, but we cannot be responsible for their operation unless our sales department has been consulted.

4. Stainless Steel Piston Rods

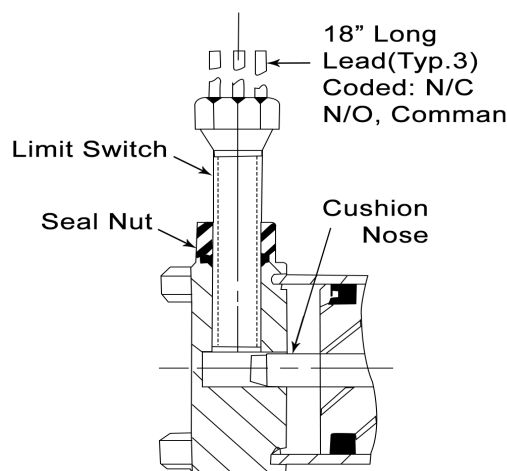
Whenever stainless steel piston rods are required for 3TH cylinders, it is important that Viceroy Fluid Power is advised of the working pressure.

*Because the mineral content of water is not known and can vary, the cylinders of this series are not guaranteed against premature failure due to excessive wear caused by corrosion, electrolysis, or for premature failure of plating.

As product improvement is a continuous process, specifications are subject to change without notice.

1. Hydraulic Cylinders With Limit Switches

Our 3TH cylinder can be furnished with built-in limit switches. They provide electrical signal at the end of the cylinder stroke for any secondary operations or actuations. The switch is insensitive to transients.



Ordering Information: In addition to the cylinder specifications, specify the Limit Switch by following coding:

LS	H	1
	C	2
		3
		4

Where:
 LS = Limit Switch
 H = Switch at Head End
 C = Switch at Cap End
 1,2,3,4 = Switch Position

Enclosure NEMA Specifications

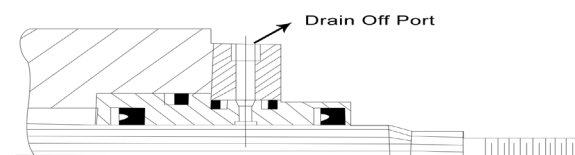
1	
2	7
3	9
3R	12
3S	13
4	
4X	

Switch electrical specifications

Single pole, double throw. Form "C"
 2 amps-120/240 VAC-resistive load
 ½ amp-50 VAC-inductive load
 50 MA-24 VDC
 (Greater capacities possible with proper arc quenching circuitry-DC volts only.) 0.008 second-max response time.
 Housing is 300 series stainless steel.

2. Hydraulic Cylinders With Rod Gland Drain-Off

When weepage cannot be tolerated, a cylinder with rod gland drain-off should be considered.



3. Cylinders with Limit Switch-Proximity type switch, port mounted, requiring no mechanical contact for actuation. It is hermetically sealed and explosion proof.

4. Tandem Cylinders

In hydraulic applications can be used as force multipliers in locations where space limitation prevents use of larger bore cylinders.

5. Adjustable Stroke Cylinders

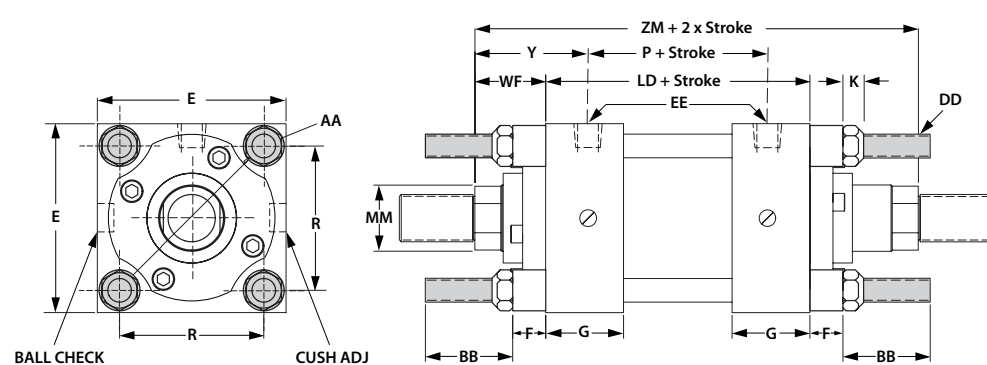
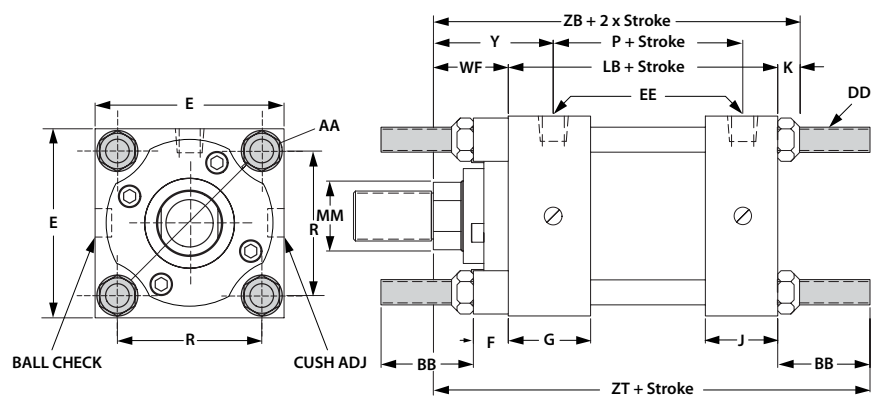
Ideal for use in applications requiring operation at easily adjustable stroke lengths

Pressure Rating (PSI).

Bore Size (Inches)	Operating Pressures Estimated Safety Factors (Based on Yield) Shown			
	Recommended	4/1/	2/1	Proof* Pressure
1½	3000	2030	4060	5000
2	3000	2340	4680	5000
2½	3000	2130	4260	5000
3¼	3000	2375	4750	5000
4	3000	1910	3820	5000
5	3000	2300	4600	5000
6	3000	2125	4250	5000
7	3000	1960	3920	5000
8	3000	1980	3960	5000
10	3000	2190	4380	5000
12	3000	2100	4200	5000
14	3000	2010	4020	5000
16	3000	1980	3965	5000
18	3000	2000	3995	5000
20	3000	1570	3140	5000

*Proof-pressure may also be considered as maximum operating pressure under non-shock conditions. For applications where operating pressures are in excess of 3000 psi consult factory for recommendations, also see appropriate mounting styles for operating pressure limitations.

Tie Rod Mounted Cylinders 1" to 8" Bores



STYLE L

(NFPA Mounting Style MX1)

STYLE DL

(NFPA Mounting Style MDX1)

Double rod cylinders are available in all styles* except A, AA, EB, and G. Dimensions for other styles are the same as above with mounting added. Add prefix D to style when ordering. Example: DB HYD. CYL.

BB is standard tie rod extension on Styles L, M, N, DL and DM, but will be increased or decreased when specified. To do this, specify BB to be (so many) inches. Extra nuts are available for tie rod ends.

*Consult factory on availability of Style DCC cylinder.

VFP Mounting style	NFPA Mounting style	Description
L	MX1	Tie rods extended both ends(above left)
M	MX3	Tie rods extended head end(rod end)
N	MX2	Tie rods extended cap end(blind end)
DL	MDX1	Tie rods extended both ends(above right)
DM	MDX3	Tie rods extended one end

Envelope and Mounting Dimensions

Bore	AA	BB	DD	E	EE		F	G	J	K	R	ADD STROKE		
					NPTF	SAE						LB	LD	
1½	2.3	1¾	¾-24	2½	½	8	¾	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	¾	1.63	4 ⁵ / ₈	4 ⁷ / ₈	2 ⁷ / ₈
2	2.9	1 ¹³ / ₁₆	½-20	3	½	8	5 ⁸ / ₈	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7 ¹⁶ / ₁₆	2.05	4 ⁵ / ₈	4 ⁷ / ₈	2 ⁷ / ₈
2½	3.6	1 ¹³ / ₁₆	½-20	3½	½	8	5 ⁸ / ₈	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7 ¹⁶ / ₁₆	2.55	4¾	5	3
3¼	4.6	2 ⁵ / ₁₆	5 ⁸ / ₈ -18	4½	¾	12	¾	2 ¹ / ₁₆	1 ¹³ / ₁₆	9 ¹⁶ / ₁₆	3.25	5½	5¾	3½
4	5.4	2 ⁵ / ₁₆	5 ⁸ / ₈ -18	5	¾	12	7 ⁸ / ₈	2 ¹ / ₁₆	1 ¹³ / ₁₆	9 ¹⁶ / ₁₆	3.82	5¾	6	3¾
5	7.0	3 ³ / ₁₆	7 ⁸ / ₈ -14	6½	¾	12	7 ⁸ / ₈	2 ¹ / ₈	1 ⁷ / ₈	13 ¹⁶ / ₁₆	4.95	6¼	6½	4¼
6	8.1	3 ⁵ / ₈	1-14	7½	1	16	1	2¼	2¼	15 ¹⁶ / ₁₆	5.73	7¾	7¾	5
7	9.3	4 ¹ / ₈	1½-12	8½	1¼	20	1	2¾	2¾	1	6.58	8½	8½	5½
8	10.6	4½	1¼-12	9½	1½	24	1	3	3	1½	7.50	9½	9½	6¼

Head end cushions are non-available on 1½"-2½" bore cylinders with max. size rods. NPTF ports furnished as std. unless otherwise specified. SAE straight thread ports optional.

Viceroy Fluid Power Pressure Rated 3TH Series Cylinders anticipate the ever increasing demands of industry for cylinders with higher pressure ratings, longer service life and reduced maintenance. For greater cylinder dependability, rely on the fluid power specialists.

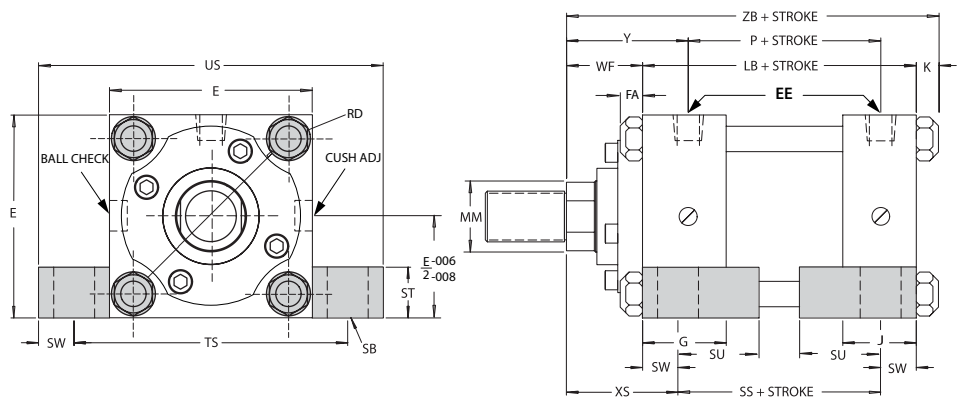
SERIES 3TH

Rod and Dimensions

Envelope and Mounting Dimensions

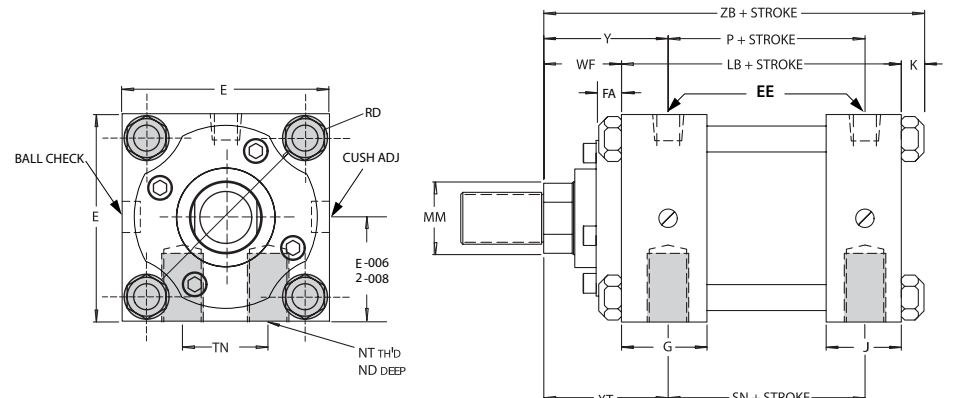
BORE	Rod Code No.	Rod Dia MM	Thread Size		Rod Extensions And Pilot Dimensions								WF	Y	Add Stroke		Add 2x Stk. ZM
			KK	FF	A	+000 -002 B	C	D	NA	FA	RD	VB			ZB	ZT	
1½	1(Std)	¾	7/16-20	½-20	¾	1.124	¾	½	9/16	¾	2	5/8	1	2	6	7	6¾
	2	1	¾-16	7/8-14	1½	1.499	½	7/8	15/16	¾	-	7/8	1¾	2¾	6¾	7¾	7½
2	2(Std)	1	¾-16	7/8-14	1½	1.499	½	7/8	15/16	¾	2¾	7/8	1¾	2¾	67/16	713/16	7½
	3	1¾	1-14	1¼-12	1½	1.999	5/8	1½	15/16	5/8	-	1	1½	2½	611/16	81/16	8½
2½	2(Std)	1	¾-16	7/8-14	1½	1.499	½	7/8	15/16	¾	2¾	7/8	1¾	2¾	69/16	715/16	7¾
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	111/16	5/8	-	1½	17/8	27/8	71/16	87/16	8¾
	3	1¾	1-14	1¼-12	1½	1.999	5/8	1½	15/16	5/8	3¼	1	1½	2½	613/16	83/16	8¼
3¼	3(Std)	1¾	1-14	1¼-12	1½	1.999	5/8	1½	15/16	5/8	3¼	1	1½	2¾	711/16	97/16	9
	5	2	1½-12	1¾-12	2¼	2.624	7/8	111/16	115/16	5/8	4½	1½	2	3½	81/16	913/16	9¾
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	111/16	5/8	3¾	1½	17/8	3	715/16	911/16	9½
4	4(Std)	1¾	1¼-12	1½-12	2	2.374	¾	1½	111/16	5/8	3¾	1½	17/8	3	83/16	915/16	9¾
	6	2½	17/8-12	2¼-12	3	3.124	1	21/16	2¾	5/8	4½	1¼	2¼	3¾	89/16	105/16	10½
	5	2	1½-12	1¾-12	2¼	2.624	7/8	111/16	115/16	5/8	4½	1½	2	3¾	85/16	101/16	10
5	5(Std)	2	1½-12	1¾-12	2¼	2.624	7/8	111/16	115/16	5/8	4½	1½	2	3¾	91/16	117/16	10½
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	3¾	95/16	1111/16	11
	6	2½	17/8-12	2¼-12	3	3.124	1	21/16	2¾	5/8	4½	1¼	2¼	3¾	95/16	1111/16	11
	7	3	2¼-12	2¾-12	3½	3.749	1	25/8	27/8	5/8	5¼	1¼	2¼	3¾	95/16	1111/16	11
6	6(Std)	2½	17/8-12	2¼-12	3	3.124	1	21/16	2¾	5/8	4½	1¼	2¼	37/16	109/16	13¼	117/8
	9	4	3-12	3¾-12	4	4.749	1	3¾	3¾	¾	6	1¼	2¼	37/16	109/16	13¼	117/8
	7	3	2¼-12	2¾-12	3½	3.749	1	25/8	27/8	5/8	5¼	1¼	2¼	37/16	109/16	13¼	117/8
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	37/16	109/16	13¼	117/8
7	7(Std)	3	2¼-12	2¾-12	3½	3.749	1	25/8	27/8	5/8	5¼	1¼	2¼	3¾	1¾	47/8	13
	11	5	3½-12	4¾-12	5	5.749	1	4¼	47/8	¾	7¼	1¼	2¼	3¾	11¾	147/8	13
	8	3½	2½-12	3½-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	3¾	1¾	47/8	13
	9	4	3-12	3¾-12	4	4.749	1	3¾	3¾	¾	6	1¼	2¼	3¾	1¾	147/8	13
	10	4½	3¼-12	4¼-12	4½	5.249	1	37/8	4¾	¾	67/8	1¼	2¼	3¾	11¾	147/8	13
8	8(Std)	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	37/8	127/8	16¼	14
	12	5½	4-12	5½	6.249	1	45/8	53/8	¾	8	1¼	2¼	37/8	127/8	16¼	14	14
	9	4	3-12	3¾-12	4	4.749	1	3¾	3¾	¾	6	1¼	2¼	37/8	127/8	16¼	14
	10	4½	3¼-12	4¼-12	4½	5.249	1	37/8	4¾	¾	67/8	1¼	2¼	37/8	127/8	16¼	14
	11	5	3½-12	4¾-12	5	5.749	1	4¼	47/8	¾	7¼	1¼	2¼	37/8	127/8	16¼	14

Foot Mounted Cylinders 1½" to 8" Bores

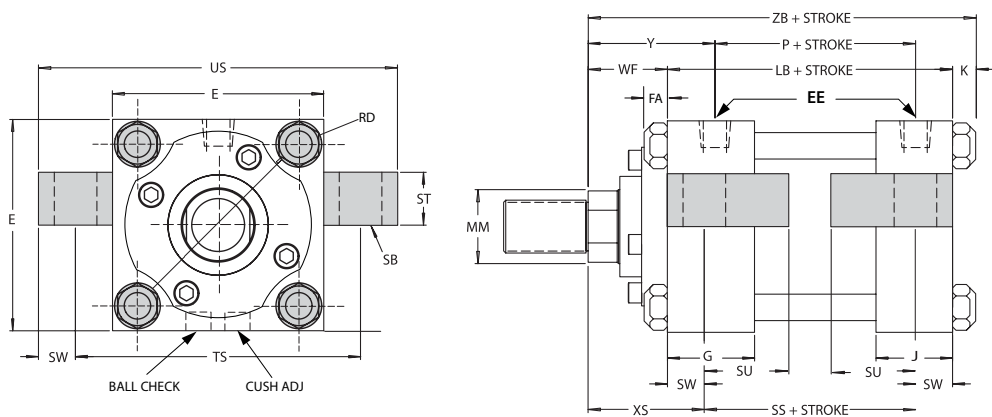


STYLE J - Side Lug Mount
(NFPA Mounting Style MS2)

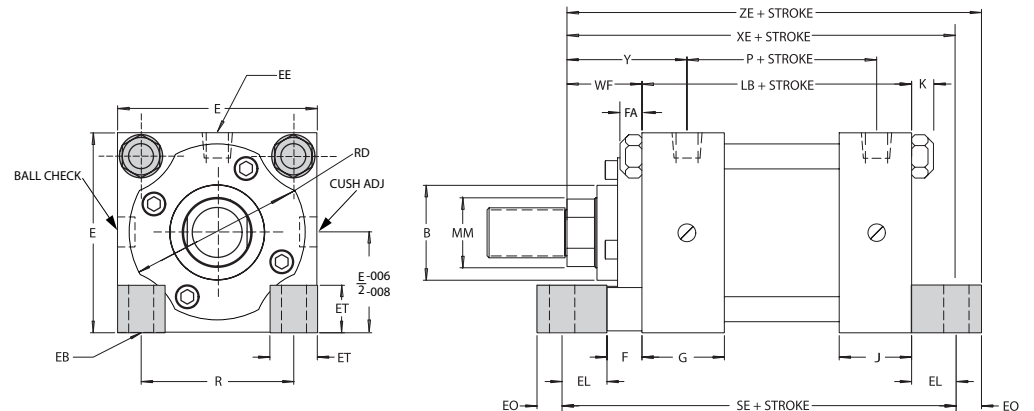
NOTE: Do not specify ports in #2 or #4 position without checking clearance between pipe fitting and mounting bolt head.



STYLE H - Side Flush Mount
(NFPA Mounting Style MS4)



STYLE K - Center Line Mount
(NFPA Mounting Style MS3)



STYLE CC - Foot Mount
(NFPA Mounting Style MS7)

NOTE: Foot lugs may interfere with accessories such as the rod eye and rod clevis. "WF" dimension must be increased to provide clearance for mating part.

Envelope and Mounting Dimensions

Bore	E	EB*	EE		EL	EO	ET	F	G	J	K	NT	R	SB*	ST	SU	SW	TN	TS	US	Add Stroke				
			NTPF	SAE																	LB	P	SE	SN	SS
1½	2½	¾	½	8	⅞	¾	⅞	¾	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	¾	⅝-16	1.63	¾	½	1 ⁵ / ₁₆	¾	¾	3¼	4	4 ⁵ / ₈	2 ⁷ / ₈	6¼	2 ⁷ / ₈	3 ³ / ₈
2	3	½	½	8	1 ⁵ / ₁₆	½	1 ⁵ / ₁₆	⅝	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	½-13	2.05	½	¾	1¼	½	1 ⁵ / ₁₆	4	5	4 ⁵ / ₈	2 ⁷ / ₈	7 ⁷ / ₈	2 ⁷ / ₈	3 ⁵ / ₈
2½	3½	½	½	8	1 ⁵ / ₁₆	½	1 ⁵ / ₁₆	⅝	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	⅝-11	2.55	¾	1	1 ¹ / ₁₆	1 ¹¹ / ₁₆	1 ⁵ / ₁₆	4 ⁷ / ₈	6¼	4 ³ / ₄	3	7¼	3	3 ³ / ₈
3¼	4½	⅝	¾	12	1 ¹ / ₈	⅝	1¼	¾	2 ¹ / ₁₆	1 ¹³ / ₁₆	⅞	¾-10	3.25	¾	1	1 ¹ / ₁₆	1 ¹¹ / ₁₆	1½	5 ⁷ / ₈	7¼	5½	3½	8½	3½	4 ¹ / ₈
4	5	⅝	¾	12	1 ¹ / ₈	⅝	1 ³ / ₁₆	⅞	2 ¹ / ₁₆	1 ¹³ / ₁₆	⅞	1-8	3.82	1	1¼	2	⅞	2 ¹ / ₁₆	6¾	8½	5¾	3¾	8 ⁷ / ₈	3¾	4
5	6½	⅞	¾	12	1½	¾	1 ¹ / ₁₆	⅞	2 ¹ / ₈	1 ⁷ / ₈	1 ³ / ₁₆	1-8	4.95	1	1¼	2	⅞	2 ¹⁵ / ₁₆	8¼	10	6¼	4¼	10 ¹ / ₈	4¼	4½
6	7½	1	1	16	1 ¹¹ / ₁₆	⅞	1¾	1	2¼	2¼	1 ⁵ / ₁₆	1¼-7	5.73	1¼	1½	2½	1 ¹ / ₈	3 ⁵ / ₁₆	9¾	12	7 ³ / ₈	5	11¾	5 ⁵ / ₈	5 ⁵ / ₈
7	8½	1 ¹ / ₈	1¼	20	1 ¹³ / ₁₆	1	1 ¹⁵ / ₁₆	1	2¾	2¾	1	1½-6	6.58	1½	1¾	2 ⁷ / ₈	1 ³ / ₈	3¾	11¼	14	8½	5½	13 ³ / ₈	5 ⁷ / ₈	5¾
8	9½	1¼	1½	24	2	1 ¹ / ₈	2	1	3	3	1 ¹ / ₈	1½-6	7.50	1½	1¾	2 ⁷ / ₈	1 ³ / ₈	4¼	12¼	15	9½	6¼	14½	6 ⁵ / ₈	6¾

Head end cushions are non-available on 1½"-2"-2½" bore cylinders with max. size rods. NPTF ports furnished as standard unless otherwise specified. SAE straight thread ports optional. Styles J, H, K and CC should be pinned or keyed to prevent shifting at one end only. *Mounting holes are 1/16" larger than screw size shown.

Extended Retainer Plate

This accurately machined extension is an extra cost option on Styles J, CC, and H in bore sizes 1½" thru 8". It fits into a machined slot on the mounting surface to provide a simple method of positively locking cylinder to prevent shifting.

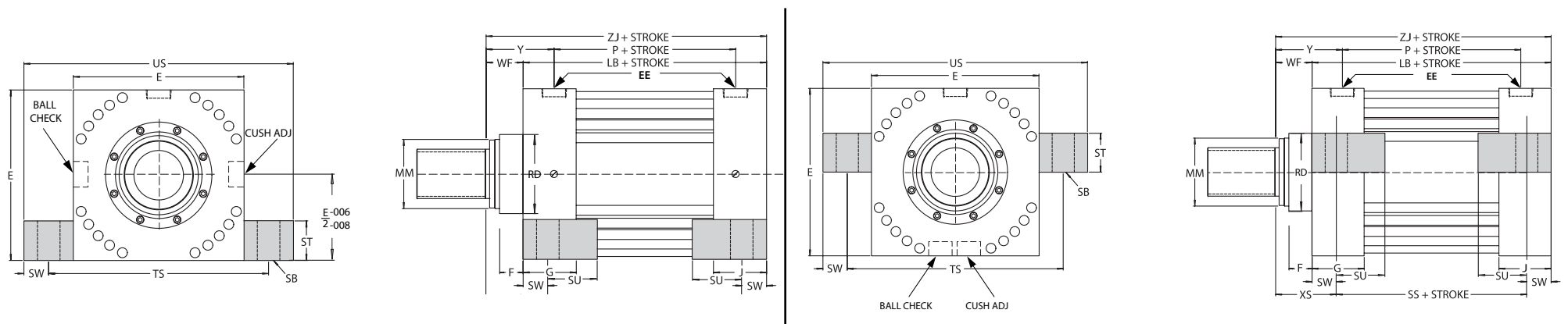
SERIES 3TH

Envelope and Mounting Dimensions

Rod and Dimensions

Bore	Rod Code No	Rod. Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions								WF	Y	ND	XS	XT	Add Stroke		
			KK	FF	A	+002 -002 B	C	D	NA	FA	RD	VB						XE	ZB	ZE
1½	1 (Std)	⅝	7/16-20	½-20	¾	1.124	⅜	½	9/16	⅜	2	⅝	1	2	9/16	1⅜	2	6½	6	6⅞
	2	1	¾-16	7/8-14	1⅝	1.499	½	7/8	15/16	⅜	-	7/8	1⅜	2⅜	7/16	1¾	2⅜	6⅞	6⅞	7¼
2	2 (Std)	1	¾-16	7/8-14	1⅝	1.499	½	7/8	15/16	⅜	2¾	7/8	1⅜	2⅜	¾	1⅞	2⅜	6 ¹⁵ / ₁₆	6 ⁷ / ₁₆	7 ⁷ / ₁₆
	3	1⅜	1-14	1¼-12	1⅝	1.999	⅝	1⅝	15/16	⅝	-	1	1⅝	2⅝	7/16	2⅞	2⅝	7 ³ / ₁₆	6 ¹¹ / ₁₆	7 ¹¹ / ₁₆
2½	2 (Std)	1	¾-16	7/8-14	1⅝	1.499	½	7/8	15/16	⅜	2¾	7/8	1⅜	2⅜	15/16	2 ¹ / ₁₆	2⅜	7 ¹ / ₁₆	6 ⁹ / ₁₆	7 ⁹ / ₁₆
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	1 ¹¹ / ₁₆	⅝	-	1⅝	1⅞	2⅞	7/16	2 ⁹ / ₁₆	2⅞	7 ⁹ / ₁₆	7 ¹ / ₁₆	8 ¹ / ₁₆
	3	1⅜	1-14	1¼-12	1⅝	1.999	⅝	1⅝	15/16	⅝	3¼	1	1⅝	2⅝	¾	2 ⁵ / ₁₆	2⅝	7 ⁵ / ₁₆	6 ¹³ / ₁₆	7 ¹³ / ₁₆
3¼	3 (Std)	1⅜	1-14	1¼-12	1⅝	1.999	⅝	1⅝	15/16	⅝	3¼	1	1⅝	2¾	1⅞	2 ⁵ / ₁₆	2¾	8¼	7 ¹¹ / ₁₆	8⅞
	5	2	1½-12	1¾-12	2¼	2.624	7/8	1 ¹¹ / ₁₆	1 ¹⁵ / ₁₆	⅝	4⅞	1⅞	2	3⅞	½	2 ¹¹ / ₁₆	3⅞	8⅞	8 ¹ / ₁₆	9¼
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	1 ¹¹ / ₁₆	⅝	3¾	1⅞	1⅞	3	1 ¹¹ / ₁₆	2 ⁹ / ₁₆	3	8½	7 ¹⁵ / ₁₆	9⅞
4	4 (Std)	1¾	1¼-12	1½-12	2	2.374	¾	1½	1 ¹¹ / ₁₆	⅝	3¾	1⅞	1⅞	3	1	2¾	3	8¾	8 ³ / ₁₆	9⅞
	6	2½	1⅞-12	2¼-12	3	3.124	1	2 ¹ / ₁₆	2⅜	⅝	4½	1¼	2¼	3⅞	9/16	3⅞	3⅞	9⅞	8 ⁹ / ₁₆	9¾
	5	2	1½-12	1¾-12	2¼	2.624	7/8	1 ¹¹ / ₁₆	1 ¹⁵ / ₁₆	⅝	4⅞	1⅞	2	3⅞	¾	2⅞	3⅞	8⅞	8 ⁵ / ₁₆	9½
5	5 (Std)	2	1½-12	1¾-12	2¼	2.624	7/8	1 ¹¹ / ₁₆	1 ¹⁵ / ₁₆	⅝	4⅞	1⅞	2	3⅞	1½	2⅞	3⅞	9¾	9 ¹ / ₁₆	10½
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3⅞	¾	3⅞	3⅞	10	9 ⁵ / ₁₆	10¾
	6	2½	1⅞-12	2¼-12	3	3.124	1	2 ¹ / ₁₆	2⅜	⅝	4½	1¼	2¼	3⅞	1½	3⅞	3⅞	10	9 ⁵ / ₁₆	10¾
	7	3	2¼-12	2¾-12	3½	3.749	1	2⅝	2⅞	⅝	5¼	1¼	2¼	3⅞	1⅞	3⅞	3⅞	10	9 ⁵ / ₁₆	10¾
6	6 (Std)	2½	1⅞-12	2¼-12	3	3.124	1	2 ¹ / ₁₆	2⅜	⅝	4½	1¼	2¼	3 ⁷ / ₁₆	1⅞	3⅞	3½	11 ⁵ / ₁₆	10 ⁹ / ₁₆	12 ³ / ₁₆
	9	4	3-12	3¾-12	4	4.749	1	3⅞	3⅞	¾	6	1¼	2¼	3 ⁷ / ₁₆	15/16	3⅞	3½	11 ⁵ / ₁₆	10 ⁹ / ₁₆	12 ³ / ₁₆
	7	3	2¼-12	2¾-12	3½	3.749	1	2⅝	2⅞	⅝	5¼	1¼	2¼	3 ⁷ / ₁₆	1⅝	3⅞	3½	11 ⁵ / ₁₆	10 ⁹ / ₁₆	12 ³ / ₁₆
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3 ⁷ / ₁₆	1¼	3⅞	3½	11 ⁵ / ₁₆	10 ⁹ / ₁₆	12 ³ / ₁₆
7	7 (Std)	3	2¼-12	2¾-12	3½	3.749	1	2⅝	2⅞	⅝	5¼	1¼	2¼	3¾	1⅞	3⅝	3 ¹³ / ₁₆	12 ⁹ / ₁₆	11¾	13 ⁹ / ₁₆
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	¾	7¼	1¼	2¼	3¾	7/8	3⅝	3 ¹³ / ₁₆	12 ⁹ / ₁₆	11¾	13 ⁹ / ₁₆
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3¾	1¾	3⅝	3 ¹³ / ₁₆	12 ⁹ / ₁₆	11¾	13 ⁹ / ₁₆
	9	4	3-12	3¾-12	4	4.749	1	3⅞	3⅞	¾	6	1¼	2¼	3¾	1½	3⅝	3 ¹³ / ₁₆	12 ⁹ / ₁₆	11¾	13 ⁹ / ₁₆
	12	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅜	¾	6⅞	1¼	2¼	3¾	1¼	3⅝	3 ¹³ / ₁₆	12 ⁹ / ₁₆	11¾	13 ⁹ / ₁₆
8	8 (Std)	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3⅞	2¼	3⅝	3 ¹⁵ / ₁₆	13¾	12⅞	14⅞
	12	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅝	¾	8	1¼	2¼	3⅞	1¼	3⅝	3 ¹⁵ / ₁₆	13¾	12⅞	14⅞
	9	4	3-12	3¾-12	4	4.749	1	3⅞	3⅞	¾	6	1¼	2¼	3⅞	2⅞	3⅝	3 ¹⁵ / ₁₆	13¾	12⅞	14⅞
	10	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅜	¾	6⅞	1¼	2¼	3⅞	1⅞	3⅝	3 ¹⁵ / ₁₆	3¾	12⅞	14⅞
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	¾	7¼	1¼	2¼	3⅞	1½	3⅝	3 ¹⁵ / ₁₆	13¾	12⅞	14⅞

Foot Mounted Cylinders 10" to 14" Bores



STYLE J - Side Lug Mount
(NFPA Mounting Style MS2)

STYLE K - Center Line Mount
(NFPA Mounting Style MS3)

Envelope and Mounting Dimensions

Bore	E	EE	F	G	J	SB*	ST	SU	SW	TS	US	Add Stroke		
												LB	P	SS
10	12 ⁵ / ₈	2	1 ¹¹ / ₁₆	3 ¹¹ / ₁₆	3 ¹¹ / ₁₆	1 ¹ / ₂	2 ¹ / ₄	3 ¹ / ₂	1 ⁵ / ₈	15 ⁵ / ₈	19 ⁵ / ₈	12 ³ / ₈	8 ¹ / ₂	8 ⁷ / ₈
12	14 ⁷ / ₈	2 ¹ / ₂	1 ¹⁵ / ₁₆	4 ⁷ / ₁₆	4 ⁷ / ₁₆	1 ¹ / ₂	3	4 ¹ / ₄	2	18 ⁷ / ₈	22 ⁷ / ₈	14 ¹ / ₂	10 ¹ / ₈	10 ¹ / ₂
14	17 ¹ / ₄	2 ¹ / ₂	2 ³ / ₈	5 ³ / ₈	5 ³ / ₈	2 ¹ / ₄	4	5	2 ¹ / ₂	22 ¹ / ₄	27 ¹ / ₄	16 ⁵ / ₈	10 ³ / ₈	11 ⁵ / ₈

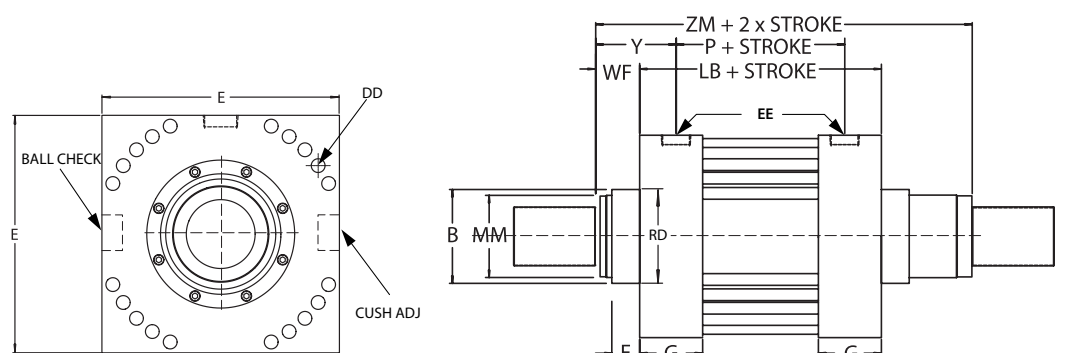
NPTF ports furnished as std. unless otherwise specified. For Bolted Flange Port Connections see page 29.

*Mounting holes are 1/16" larger than screw size shown. Styles J and K should be pinned or keyed to prevent shifting at one end only.

Double Rod Cylinder

Envelope Dimensions

BORE	AA	DD	E	EE	F	Add Stroke		
						G	LB	P
10	12 ⁷ / ₈	1-14	12 ⁵ / ₈	2	1 ¹¹ / ₁₆	3 ¹¹ / ₁₆	12 ¹ / ₈	8 ¹ / ₂
12	15 ¹ / ₁₆	1-14	14 ⁷ / ₈	2 ¹ / ₂	1 ¹⁵ / ₁₆	4 ⁷ / ₁₆	14 ¹ / ₂	10 ¹ / ₈
14	17 ⁵ / ₁₆	1-14	17 ¹ / ₄	2 ¹ / ₂	2 ³ / ₈	5 ³ / ₈	16 ⁵ / ₈	10 ³ / ₈



NPTF ports furnished as std. unless otherwise specified. For Bolted Flange Port Connections see page 29.

Double Rod Cylinder

Double Rod cylinders are available in all styles except A, AA, EB and G. Dimensions for other styles are same as above with mounting added. When ordering add prefix D to style.

Example: DB HYD. CYL.

The exclusive Viceroy Fluid Power Cartridge is standard on every 3TH cylinder to help eliminate most causes of cylinder failure. This cartridge provides the ultimate in sealing plus greater bearing area and resistance to side load stress. For better bearings, rely on the fluid power specialists.

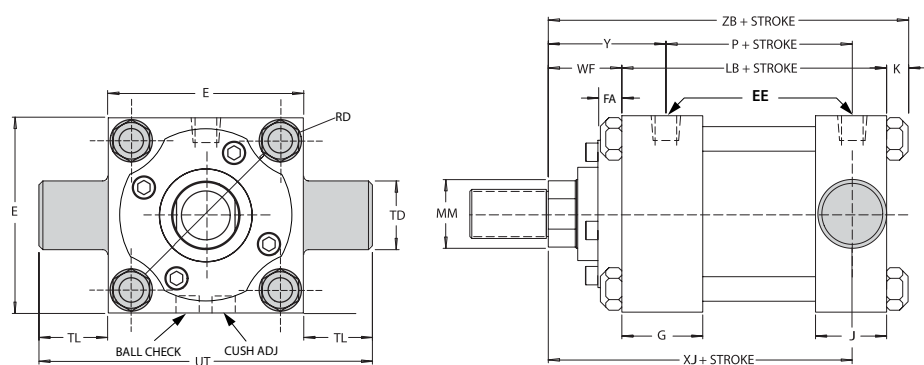
SERIES 3TH

Rod and Dimensions

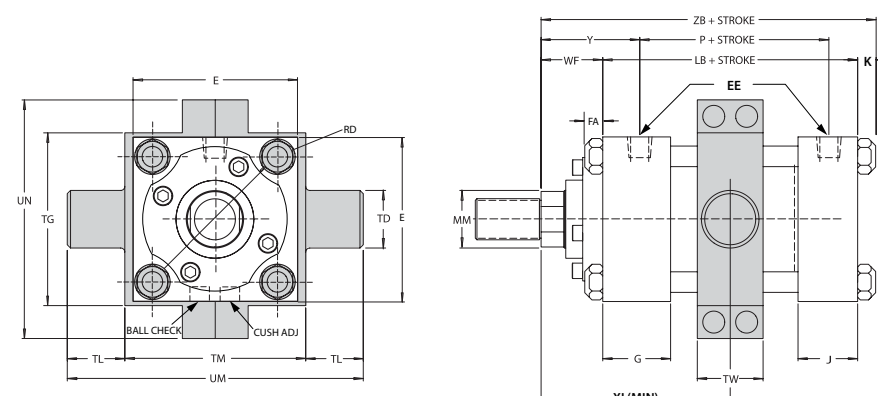
Envelope and Mounting Dimensions

Bore	Rod Code No	Rod dia.	Thread Size		Rod Extensions and Pilot Dimensions							WF	Y	XS	Add Str. ZJ	Add 2X Str. ZM
		MM	KK	FF	A	+000 -002 B	C	D	NA	RD	V					
10	10(Std)	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅜	8	¼	2 ¹⁵ / ₁₆	4¾	4 ⁹ / ₁₆	15 ¹ / ₁₆	18
	13	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	½	3 ³ / ₁₆	5	4 ¹³ / ₁₆	15 ⁵ / ₁₆	18½
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	8½	¼	2 ¹⁵ / ₁₆	4¾	4 ⁹ / ₁₆	15 ¹ / ₁₆	18
	12	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅜	9	½	3 ³ / ₁₆	5	4 ¹³ / ₁₆	15 ⁵ / ₁₆	18½
12	12(Std)	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅜	9	¼	3 ³ / ₁₆	5⅜	5 ³ / ₁₆	17 ¹¹ / ₁₆	20⅞
	14	8½	6-12	8¼-12	8½	9.499	1	—	8⅜	12¾	½	3 ⁷ / ₁₆	5⅝	5 ⁷ / ₁₆	17 ¹⁵ / ₁₆	21⅜
	13	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	⅜	3 ⁵ / ₁₆	5½	5 ⁵ / ₁₆	17 ¹³ / ₁₆	21⅞
14	13(Std)	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	⅜	3¾	6⅞	6¼	20⅜	24⅞
	15	10	7-12	9¾-12	10	10.999	1	—	9⅞	14¼	½	3⅞	7	6⅜	20½	24⅜
	14	8½	6-12	8¼-12	8½	9.499	1	—	8⅜	12¾	½	3⅞	7	6⅜	20½	24⅜

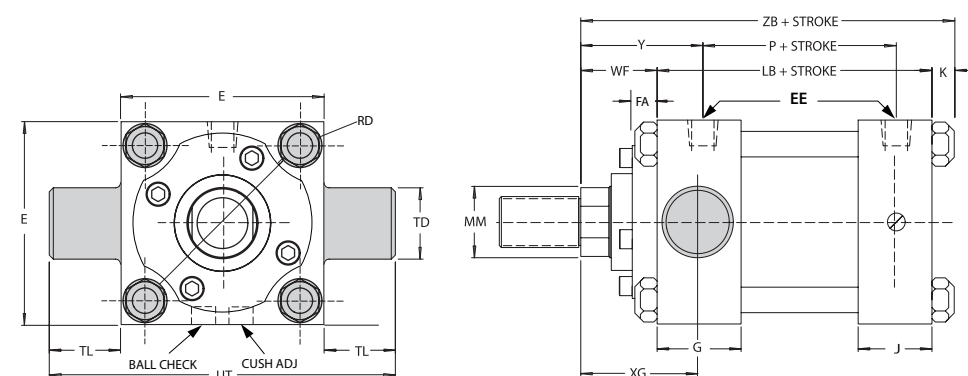
Trunnion and Clevis Mounted Cylinders 1½" to 8" Bores



STYLE EB - Trunnion Mount Cap End
(NFPA Mounting Style MT2)



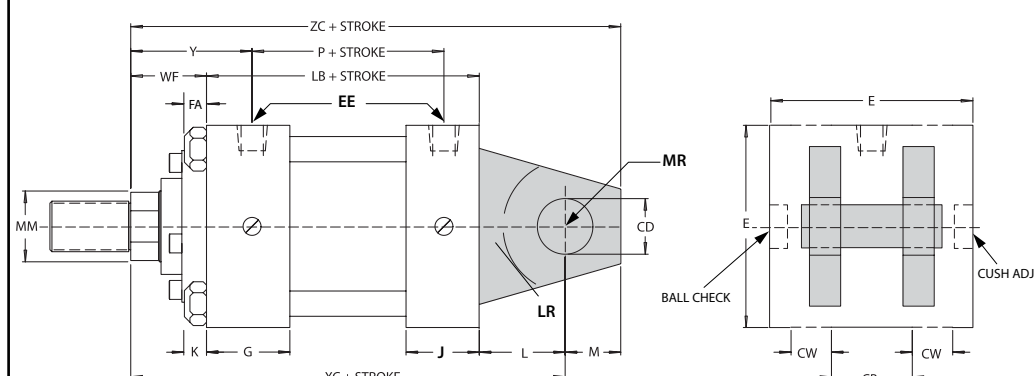
STYLE E - Intermediate Trunnion Mount
(NFPA Mounting Style MT4)



STYLE ER - Trunnion Mount Head End
(NFPA Mounting Style MT1)

The trunnion pintles on Styles ER and EB are not removable. For information on removable pintles, please consult the engineering department. On all intermediate trunnion mounts the trunnion pintles are an integral part of the mount. All intermediate trunnion mounts are closely fitted into a groove on the cylinder barrel. The position of the intermediate trunnion mount is not adjustable.

NOTE : *Cylinders with "ER" mounts in bores 5.0" thru 8" with piston rods other than standard should not be used for pressures in excess of 2000 psi.*



STYLE G - Clevis Mount
(NFPA Mounting Style MP1)

Chrome-plated Clevis Pin Assembly (with Snap Rings) is furnished with all Style G Cylinders.

Pintles on trunnion mounted cylinders are designed to withstand shear loads, but not high bending loads. Pillow blocks must be rigidly mounted to provide full support with minimum clearances.

Envelope and Mounting Dimensions

Bore	CB	±001 CD	CW	E	EE		G	J	K	L	LR	M	MR	TD	TL	TG	TM	TW	UM	UN	UT	Add Stroke	
					NPTF	SAE																LB	P
1½	¾	½	½	2½	½	8	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	¾	¾	⅝	½	1 ⁹ / ₃₂	1	1	2¾	3	1¼	5	4	4½	4⅝	2⅞
2	1¼	¾	⅝	3	½	8	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	1¼	15/16	¾	2 ⁹ / ₃₂	1⅜	1⅜	3¼	3½	1½	6¼	4¾	5¾	4⅝	2 ¹³ / ₁₆
2½	1¼	¾	⅝	3½	½	8	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	1¼	15/16	¾	2 ⁹ / ₃₂	1⅜	1⅜	3¾	4	1½	6¾	5¼	6¼	4¾	2 ¹⁵ / ₁₆
3¼	1½	1	¾	4½	¾	12	2 ¹ / ₁₆	1 ¹³ / ₁₆	9/16	1½	15/16	1	1 ³ / ₁₆	1¾	1¾	4¾	5	2	8½	6¾	8	5½	3½
4	2	1⅜	1	5	¾	12	2 ¹ / ₁₆	1 ¹³ / ₁₆	9/16	2⅞	1¾	1⅜	1 ²¹ / ₃₂	1¾	1¾	5¼	5½	2	9	7¼	8½	5¾	3¾
5	2½	1¾	1¼	6½	¾	12	2⅞	1⅞	13/16	2¼	2	1¾	1 ²⁹ / ₃₂	1¾	1¾	6¾	7	2	10½	9	10	6¼	4¼
6	2½	2	1¼	7½	1	16	2¼	2¼	15/16	2½	2¼	2	2 ³ / ₁₆	2	2	7¾	8½	3	12½	10¼	11½	7⅞	5
7	3	2½	1½	8½	1¼	20	2¾	2¾	1	3	2¾	2½	2 ⁵ / ₈	2½	2½	8¾	9¾	3	14¾	11½	13½	8½	5½
8	3	3	1½	9½	1½	24	3	3	1⅞	3¼	3 ¹ / ₁₆	2¾	2⅞	3	3	10	11	3½	17	12¾	15½	9½	6¼

Head end cushions are non-available on 1½"-2"-2½" bore cylinders with max. size rods. NPTF ports furnished as standard unless otherwise specified. SAE straight thread ports optional.

Viceroy Fluid Power's Cartridge features include the most advanced rod seal and wiper configurations in the industry. And, the Cartridge's one-piece construction with bolted retainer permits fast removal without disassembly of the cylinder. For reduced downtime and convenience, rely on the fluid power specialists.

SERIES 3TH

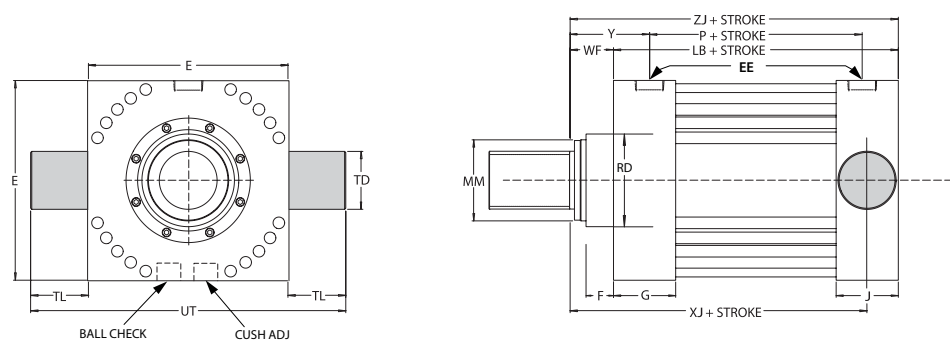
Rod and Dimensions

Envelope and Mounting Dimensions

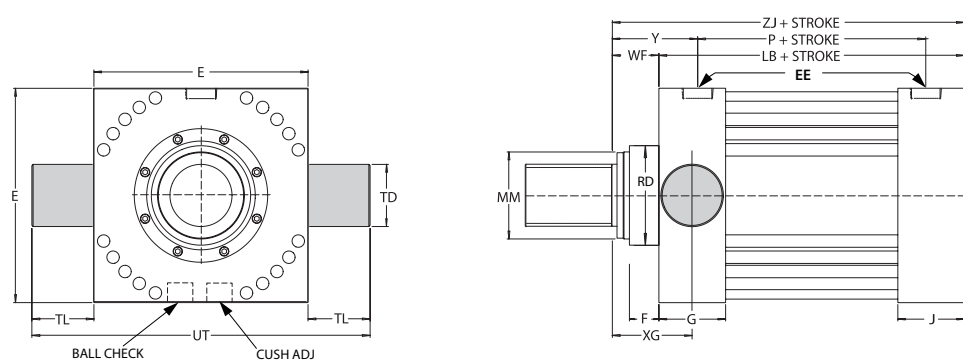
Bore	Rod Code No	Rod. Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions								WF	Y	XG	XI MIN	Add Stroke			
			LL	FF	A	+002 -002 B	C	D	NA	FA	RD	VB					XC	XJ	ZB	ZC
1½	1 (Std)	⅝	7/16-20	½-20	¾	1.124	⅜	½	9/16	⅜	2	⅝	1	2	1⅞	3¾	6⅜	4⅞	6	6⅞
	2	1	¾-16	⅞-14	1⅞	1.499	½	⅞	15/16	⅜	-	⅞	1⅞	2⅜	2¼	4⅞	6¾	5¼	6⅜	7¼
2	2 (Std)	1	¾-16	⅞-14	1⅞	1.499	½	⅞	15/16	⅜	2¾	⅞	1⅞	2⅜	2¼	4¼	7¼	5¼	6⅞	8
	3	1⅜	1-14	1¼-12	1⅞	1.999	⅝	1⅞	15/16	⅝	-	1	1⅞	2⅝	2½	4½	7½	5½	6⅞	8¼
2½	2 (Std)	1	¾-16	⅞-14	1⅞	1.499	½	⅞	15/16	⅜	2¾	⅞	1⅞	2⅜	2¼	4¼	7⅞	5⅞	6⅞	8⅞
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	1⅞	⅝	-	1⅞	1⅞	2⅞	2¾	4¾	7⅞	5⅞	7⅞	8⅞
	3	1⅜	1-14	1¼-12	1⅞	1.999	⅝	1⅞	15/16	⅝	3¼	1	1⅞	2⅝	2½	4½	7⅞	5⅞	6⅞	8⅞
3¼	3 (Std)	1⅜	1-14	1¼-12	1⅞	1.999	⅝	1⅞	15/16	⅝	3¼	1	1⅞	2¾	2⅝	5	8⅞	6¼	7⅞	9⅞
	5	2	1½-12	1¾-12	2¼	2.624	⅞	1⅞	1⅞	⅝	4⅞	1⅞	2	3⅞	3	5⅞	9	6⅞	8⅞	10
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	1⅞	⅝	3¼	1⅞	1⅞	3	2⅞	5¼	8⅞	6½	7⅞	9⅞
4	4 (Std)	1¾	1¼-12	1½-12	2	2.374	¾	1½	1⅞	⅝	3¼	1⅞	1⅞	3	2⅞	5¼	9¾	6¾	8⅞	11⅞
	6	2½	1⅞-12	2¼-12	3	3.124	1	2⅞	2⅞	⅝	4½	1¼	2¼	3⅞	3¼	5⅞	10⅞	7⅞	8⅞	11½
	5	2	1½-12	1¾-12	2¼	2.624	⅞	1⅞	1⅞	⅝	4⅞	1⅞	2	3⅞	3	5⅞	9⅞	6⅞	8⅞	11¼
5	5 (Std)	2	1½-12	1¾-12	2¼	2.624	⅞	1⅞	1⅞	⅝	4⅞	1⅞	2	3⅞	3	5⅞	10½	7⅞	9⅞	12¼
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅞	⅝	5½	1¼	2¼	3⅞	3¼	5⅞	10¾	7⅞	9⅞	12½
	6	2½	1⅞-12	2¼-12	3	3.124	1	2⅞	2⅞	⅝	4½	1¼	2¼	3⅞	3¼	5⅞	10⅞	7⅞	9⅞	12½
	7	3	2¼-12	2¾-12	3½	3.749	1	2⅞	2⅞	⅝	5¼	1¼	2¼	3⅞	3¼	5⅞	10¾	7⅞	9⅞	12½
6	6 (Std)	2½	1⅞-12	2¼-12	3	3.124	1	2⅞	2⅞	⅝	4½	1¼	2¼	3⅞	3¼	6⅞	12⅞	8⅞	10⅞	14⅞
	9	4	3-12	3¾-12	4	4.749	1	3⅞	3⅞	¾	6	1¼	2¼	3⅞	3¼	6⅞	12⅞	8⅞	10⅞	14⅞
	7	3	2¼-12	2¾-12	3½	3.749	1	2⅞	2⅞	⅝	5¼	1¼	2¼	3⅞	3¼	6⅞	12⅞	8⅞	10⅞	14⅞
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅞	⅝	5½	1¼	2¼	3⅞	3¼	6⅞	12⅞	8⅞	10⅞	14⅞
7	7 (Std)	3	2¼-12	2¾-12	3½	3.749	1	2⅞	2⅞	⅝	5¼	1¼	2¼	3¾	3⅞	6⅞	13¾	9⅞	11¾	16¼
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	¾	7¼	1¼	2¼	3¾	3⅞	6⅞	13¾	9⅞	11¾	16¼
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅞	⅝	5½	1¼	2¼	3¾	3⅞	6⅞	13¾	9⅞	11¾	16¼
	9	4	3-12	3¾-12	4	4.749	1	3⅞	3⅞	¾	6	1¼	2¼	3¾	3⅞	6⅞	13¾	9⅞	11¾	16¼
	12	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅞	¾	6⅞	1¼	2¼	3¾	3⅞	6⅞	13¾	9⅞	11¾	16¼
8	8 (Std)	3½	2½-12	3¼-12	3½	4.249	1	3	3⅞	⅝	5½	1¼	2¼	3⅞	3¼	7⅞	15	10¼	12⅞	17¾
	12	5½	4-12	5½	6.249	1	4⅞	5⅞	¾	8	1¼	2¼	3⅞	12⅞	3¼	7⅞	15	10¼	12⅞	17¾
	9	4	3-12	3¾-12	4	4.749	1	3⅞	3⅞	¾	6	1¼	2¼	3⅞	3¼	7⅞	15	10¼	12⅞	17¾
	10	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅞	¾	6⅞	1¼	2¼	3⅞	3¼	7⅞	15	10¼	12⅞	17¾
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	¾	7¼	1¼	2¼	3⅞	3¼	7⅞	15	10¼	12⅞	17¾

Trunnion and Clevis Mounted Cylinders 10" to 14" Bores

SERIES 3TH



STYLE EB - Trunnion Mount Cap End
(NFPA Mounting Style MT2)



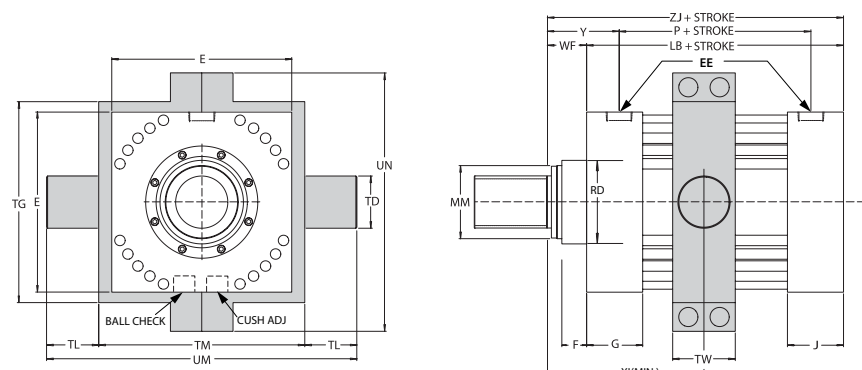
STYLE ER - Trunnion Mount Head End
(NFPA Mounting Style MT1)

The trunnion pintles on Styles ER and EB are not removable. For information on removable pintles, please consult the engineering department. On all intermediate trunnion mounts the trunnion pintles are an integral part of the mount. All intermediate trunnion mounts are closely fitted into a groove on the cylinder barrel. The position of the intermediate trunnion mount is not adjustable.

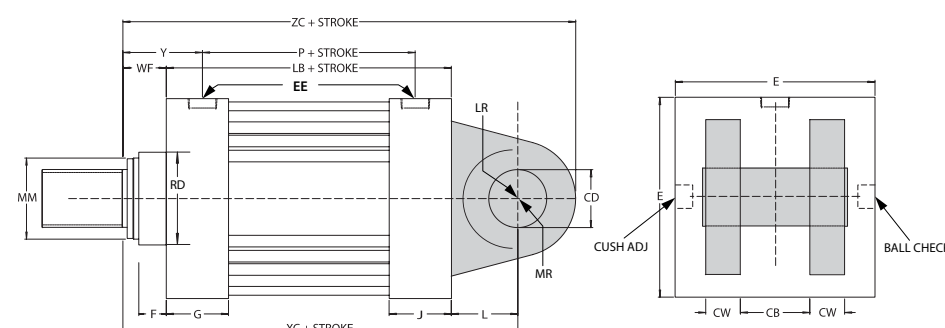
Envelope and Mounting Dimensions

Bore	CB	±001 CD	CW	E	EE	F	G	J	L	LR	MR	+001 -001 TD	TL	TG	TM	TW	UM	UN	UT	Add Stroke	
																				LB	P
10	4	3½	2	12⅝	2	1⅛	3⅛	3⅛	4	3⅝	3½	3½	3½	13½	14	4½	21	17½	19⅝	12⅛	8½
12	4½	4	2¼	14⅞	2½	1⅝	4⅞	4⅞	4½	4⅛	4	4	4	16	16½	5½	24½	20¾	22⅞	14½	10⅝
14	6	5	3	7¼	2⅞	2⅝	5⅝	5⅝	5¾	5⅛	5	5	5	19¼	19¾	6	29¾	24¾	27¼	16⅝	10⅝

NPTF ports furnished as standard unless otherwise specified. Pintles on trunnion mounted cylinders are designed to withstand shear loads, but not high bending loads. Pillow blocks must be rigidly mounted to provide full support with minimum clearances.



STYLE E - Intermediate Trunnion Mount
(NFPA Mounting Style MT4)
Customer to Specify Trunnion Location (XI Dim.)



STYLE G - Clevis Mount
(NFPA Mounting Style MP1)
Chrome-plated Clevis Pin Assembly

Chrome-plated Clevis Pin Assembly (with Snap Rings) is furnished with all Style G Cylinders.

NOTE : Cylinders with "ER" mounts in bores 5.0" thru 8" with piston rods other than standard should not be used for pressures in excess of 2000 psi.

Viceroy Fluid Power uses only precision machined and ground, rolled steel heads and caps to assure squareness. This, plus Viceroy's unique sealing system assure a leak-free cylinder. For trouble-free cylinders, rely on the fluid power specialists.

SERIES 3TH

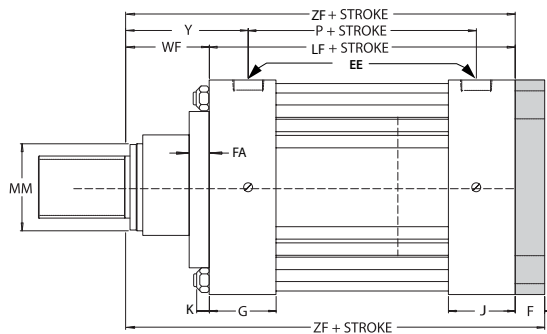
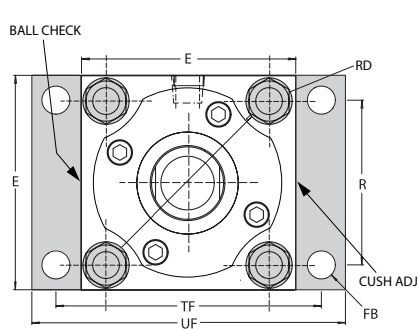
Rod and Dimensions

Envelope and Mounting Dimensions

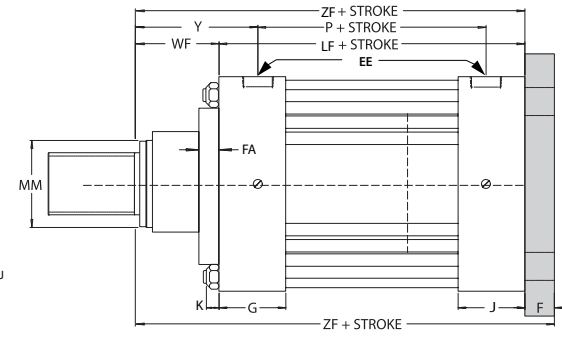
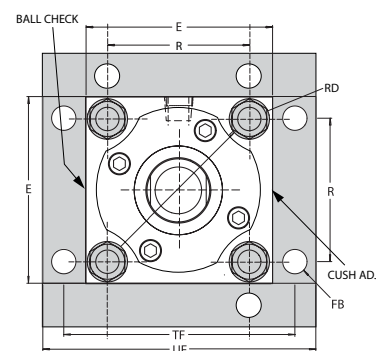
Bore	Rod Code No.	Rod Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions							WF	Y	XG	XI MIN	Add Stroke			
			KK	FF	A	+000 -002 B	C	D	NA	RD	V					XC	XJ	ZJ	ZC
10	10(Std)	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅞	8	¼	2 ¹⁵ / ₁₆	4¾	4¾	9 ³ / ₁₆	19 ¹ / ₁₆	13¼	15 ¹ / ₁₆	22 ⁹ / ₁₆
	13	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	½	3 ³ / ₁₆	5	5	9 ⁷ / ₁₆	19 ⁵ / ₁₆	13½	15 ⁵ / ₁₆	22 ¹³ / ₁₆
11	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	8½	¼	2 ¹⁵ / ₁₆	4¾	4¾	9 ³ / ₁₆	19 ¹ / ₁₆	13¼	15 ¹ / ₁₆	22 ⁹ / ₁₆
	12	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅞	9	½	3 ³ / ₁₆	5	5	9 ⁷ / ₁₆	19 ⁵ / ₁₆	13½	15 ⁵ / ₁₆	22 ¹³ / ₁₆
12	12(Std)	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅞	9	¼	3 ³ / ₁₆	5⅞	5⅞	10 ¹¹ / ₁₆	22 ³ / ₁₆	15½	17 ¹¹ / ₁₆	26 ³ / ₁₆
	14	8½	6-12	8¼-12	8½	9.499	1	—	8⅞	12¾	½	3 ⁷ / ₁₆	5⅞	5⅞	10 ¹⁵ / ₁₆	22 ⁷ / ₁₆	15¾	17 ¹⁵ / ₁₆	26 ⁷ / ₁₆
	13	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	⅜	3 ⁵ / ₁₆	5½	5½	10 ¹³ / ₁₆	22 ⁵ / ₁₆	15⅝	17 ¹³ / ₁₆	26 ⁵ / ₁₆
14	13(Std)	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	⅜	3¾	6⅞	6 ⁷ / ₁₆	12 ⁷ / ₁₆	26⅞	17 ¹¹ / ₁₆	20⅜	31⅞
	15	10	7-12	9¾-12	10	10.999	1	—	9⅞	14¼	½	3⅞	7	6 ⁹ / ₁₆	12 ⁹ / ₁₆	26¼	17 ¹³ / ₁₆	20½	31¼
	14	8½	6-12	8¼-12	8½	9.499	1	—	8⅞	12¾	½	3⅞	7	6 ⁹ / ₁₆	12 ⁹ / ₁₆	26¼	17 ¹³ / ₁₆	20½	31¼

Flange Mounted Cylinders

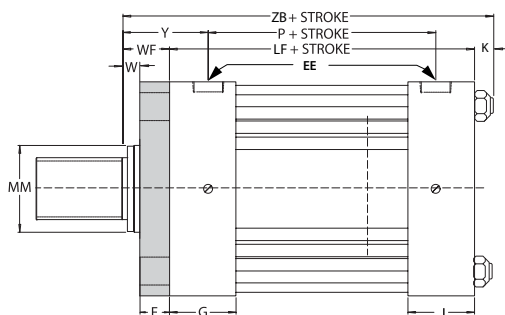
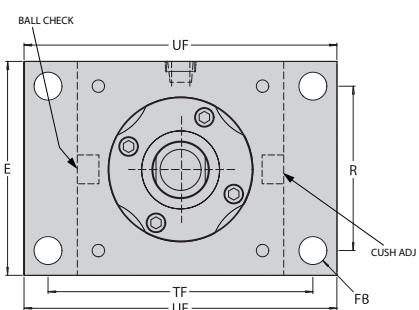
1½" to 8" Bores



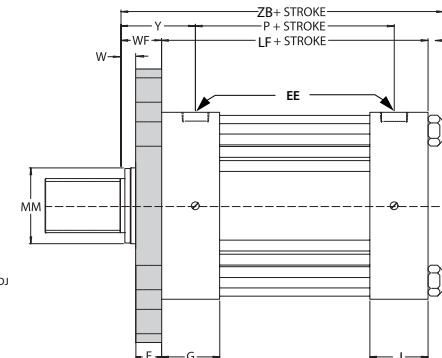
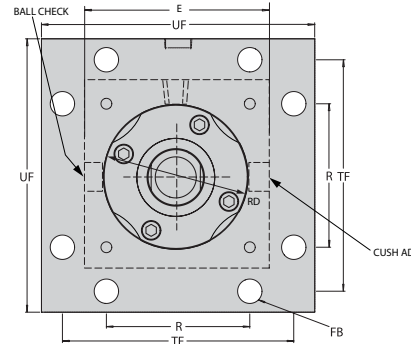
STYLE A - Rectangular Flange Mount Cap End
(NFFPA Mounting Style MF2)



STYLE AA - Square Flange Mount Cap End
(NFFPA Mounting Style MF6)



STYLE B - Rectangular Flange Mount Head End
(NFFPA Mounting Style MF1)



STYLE BB - Square Flange Mount Head End
(NFFPA Mounting Style MF5)

Styles A and B, particularly those above the 4" bore size, are not recommended for maximum operating pressures. For operating pressures above 1500 psi on the 5" and 6" bore cylinders, and 1000 psi on the 7" and 8" bore cylinders, we re-commend the use of styles AA and BB. Maximum operating pressure for AA and BB

style flanges, in bores 5" thru 8", should not exceed 3000 psi. We recommend the use of high tensile mounting bolts on all flange mounted cylinders subjected to maximum pressures and shock loads.

Envelope and Mounting Dimensions

Bore	E	EE		F	FB	G	J	K	R	TF	UF	Add Stroke	
		NPTF	SAE									LF	P
1½	2½	½	8	¾	¾	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	¾	1.63	3 ⁷ / ₁₆	4¼	5	2 ⁷ / ₈
2	3	½	8	5/8	½	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	2.05	4½	5½	5¼	2 ¹³ / ₁₆
2½	3½	½	8	5/8	½	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	2.55	4 ⁵ / ₈	5 ⁵ / ₈	5 ³ / ₈	2 ¹⁵ / ₁₆
3¼	4½	¾	12	¾	5/8	2 ¹ / ₁₆	1 ¹³ / ₁₆	9/16	3.25	5 ⁷ / ₈	7 ¹ / ₈	6¼	3½
4	5	¾	12	7/8	5/8	2 ¹ / ₁₆	1 ¹³ / ₁₆	9/16	3.82	6 ³ / ₈	7 ⁵ / ₈	6 ⁵ / ₈	3¾
5	6½	¾	12	7/8	7/8	2 ¹ / ₈	1 ⁷ / ₈	1 ³ / ₁₆	4.95	8 ³ / ₁₆	9¾	7 ¹ / ₈	4¼
6	7½	1	16	1	1	2¼	2¼	1 ⁵ / ₁₆	5.73	9 ⁷ / ₁₆	11¼	8 ³ / ₈	5
7	8½	1¼	20	1	1½	2¾	2¾	1	6.58	10 ⁵ / ₈	12 ⁵ / ₈	9½	5½
8	9½	1½	24	1	1¼	3	3	1½	7.50	1 ¹³ / ₁₆	14	10½	6¼

Head end cushions are non-available on 1½"-2"-2½" bore cylinders with max. size rods. NPTF ports furnished as standard unless otherwise specified. SAE straight thread ports optional.

*Mounting holes are 1/16" larger than screw size shown.

3TH Piston Rods have rolled thread studs for maximum strength and service life. Studs are piloted for true alignment and concentricity; and held securely with LOCTITE. For high strength piston rods, rely on the fluid power specialists.

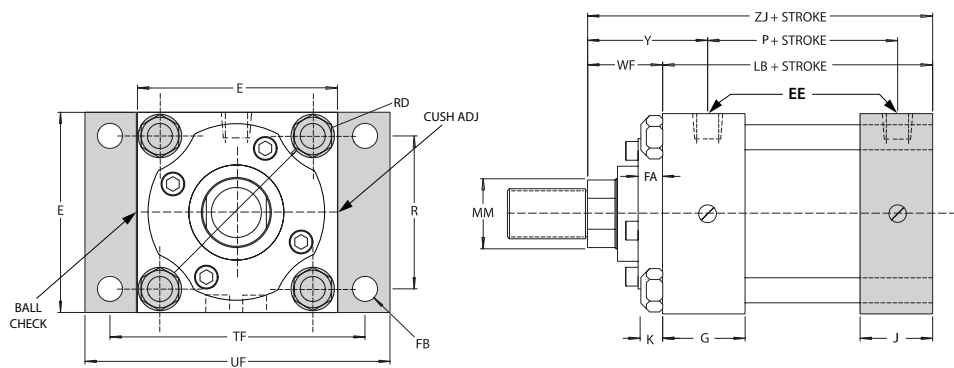
SERIES
3TH

Rod and Dimensions

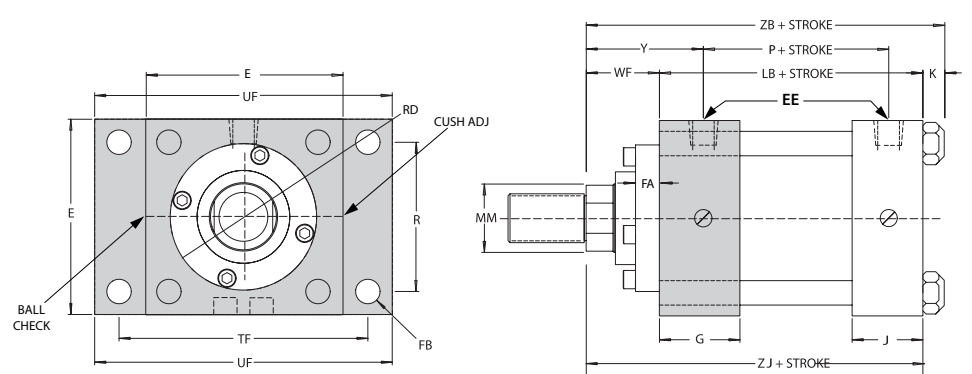
Envelope and Mounting Dimensions

Bore	Rod Code No	Rod. Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions								WF	Y	W	Add Stoke		
			KK	FF	A	+002 -002 B	C	D	NA	FA	RD	VB				ZJ	ZB	ZF
1½	1 (Std)	¾	7/16-20	½-20	¾	1.124	¾	½	9/16	¾	2	¾	1	2	5/8	5½	6	6
	2	1	¾-16	7/8-14	1½	1.499	½	7/8	15/16	¾	-	7/8	1¾	2¾	1	6	6¾	6¾
2	2 (Std)	1	¾-16	7/8-14	1½	1.499	½	7/8	15/16	¾	2¾	7/8	1¾	2¾	¾	6	67/16	6½
	3	1¾	1-14	1¼-12	1½	1.999	5/8	1½	15/16	5/8	-	1	1½	2½	1	6¼	611/16	6¾
2½	2 (Std)	1	¾-16	7/8-14	1½	1.499	½	7/8	15/16	¾	2¾	7/8	1¾	2¾	¾	6½	69/16	6¾
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	111/16	5/8	-	1½	1¾	2¾	1¼	6¾	71/16	7¼
	3	1¾	1-14	1¼-12	1½	1.999	5/8	1½	15/16	5/8	3¼	1	1½	2½	1	6¾	613/16	7
¾	3 (Std)	1¾	1-14	1¼-12	1½	1.999	5/8	1½	15/16	5/8	3¼	1	1½	2¾	7/8	7½	711/16	7¾
	5	2	1½-12	1¾-12	2¼	2.624	7/8	111/16	115/16	5/8	4½	1½	2	3¾	1¼	7½	81/16	8¼
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	111/16	5/8	3¾	1½	1¾	3	1½	7¾	715/16	8½
4	4 (Std)	1¾	1¼-12	1½-12	2	2.374	¾	1½	111/16	5/8	3¾	1½	1¾	3	1	7½	83/16	8½
	6	2½	1¾-12	2¼-12	3	3.124	1	21/16	2¾	5/8	4½	1¼	2¼	3¾	1¾	8	89/16	8¾
	5	2	1½-12	1¾-12	2¼	2.624	7/8	111/16	115/16	5/8	4½	1½	2	3¾	1½	7¾	85/16	8½
5	5 (Std)	2	1½-12	1¾-12	2¼	2.624	7/8	111/16	115/16	5/8	4½	1½	2	3¾	1½	8¼	91/16	9½
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	3¾	1¾	8½	95/16	9¾
	6	2½	1¾-12	2¼-12	3	3.124	1	21/16	2¾	5/8	4½	1¼	2¼	3¾	1¾	8½	95/16	9¾
	7	3	2¼-12	2¾-12	3½	3.749	1	25/8	2¾	5/8	5¼	1¼	2¼	3¾	1¾	8½	95/16	9¾
6	6 (Std)	2½	1¾-12	2¼-12	3	3.124	1	21/16	2¾	5/8	4½	1¼	2¼	37/16	1¼	9½	109/16	105/8
	9	4	3-12	3¾-12	4	4.749	1	3¾	3¾	¾	6	1¼	2¼	37/16	1¼	9½	109/16	105/8
	7	3	2¼-12	2¾-12	3½	3.749	1	25/8	2¾	5/8	5¼	1¼	2¼	37/16	1¼	9½	109/16	105/8
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	37/16	1¼	9½	109/16	105/8
7	7 (Std)	3	2¼-12	2¾-12	3½	3.749	1	25/8	2¾	5/8	5¼	1¼	2¼	3¾	1¼	10¾	11¾	11¾
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4¾	¾	7¼	1¼	2¼	3¾	1¼	10¾	11¾	11¾
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	3¾	1¼	10¾	11¾	11¾
	9	4	3-12	3¾-12	4	4.749	1	33/8	3¾	¾	6	1¼	2¼	3¾	1¼	10¾	11¾	11¾
	12	4½	3¼-12	4¼-12	4½	5.249	1	3¾	4¾	¾	6¾	1¼	2¼	3¾	1¼	10¾	11¾	11¾
8	8 (Std)	3½	2½-12	3¼-12	3½	4.249	1	3	3¾	5/8	5½	1¼	2¼	3¾	1¼	11¾	12¾	12¾
	12	5½	4-12	5½	6.249	1	45/8	5¾	¾	8	1¼	21/4	3¾	12¾	1¼	1¾	12¾	12¾
	9	4	3-12	3¾-12	4	4.749	1	3¾	3¾	¾	6	1¼	2¼	3¾	1¼	11¾	12¾	12¾
	10	4½	3¼-12	4¼-12	4½	5.249	1	3¾	4¾	¾	6¾	1¼	2¼	3¾	1¼	11¾	12¾	12¾
	11	5	3½-12	4¾-12	5	5.749	1	1¼	4¾	¾	7¼	1¼	2¼	3¾	1¼	11¾	12¾	12¾

Heavy Duty Flange Mounted Cylinders 1½" to 8" Bores



**STYLE P - Rectangular Heavy Duty
Flange Mount Cap End
(NFPA Mounting Style ME6)**



**STYLE Q - Rectangular Heavy Duty
Flange Mount Head End
(NFPA Mounting Style ME5)**

These mounts can be used at full rated pressure except as indicated in the chart beside

Bore	Rod Dia.	Mount Style	Port Position	Max. Oper. Pressure-PSI
5	3½	Q	1 or 3	2500
6	3½	Q	1 or 3	2500
6	4	Q	1 or 3	1500
7	4½	Q	1 or 3	2500
7	5	Q	1 or 3	1500
8	5	Q	1 or 3	2500
8	5½	Q	1 or 3	1500

Envelope and Mounting Dimensions

Bore	E	EE		FB*	G	J	K	R	TF	UF	Add Stroke	
		NPTF	SAE								LB	P
1½	2½	½	8	¾	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	¾	1.63	3 ⁷ / ₁₆	4¼	4 ⁵ / ₈	2 ⁷ / ₈
2	3	½	8	½	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	2.05	4½	5½	4 ⁵ / ₈	2 ⁷ / ₈
2½	3½	½	8	½	1 ²⁷ / ₃₂	1 ¹⁹ / ₃₂	7/16	2.55	4 ⁵ / ₈	5 ⁵ / ₈	4¾	3
3¼	4½	¾	12	5/8	2 ¹ / ₁₆	1 ¹³ / ₁₆	9/16	3.25	5 ⁷ / ₈	7 ⁷ / ₈	5½	3½
4	5	¾	12	5/8	2 ¹ / ₁₆	1 ¹³ / ₁₆	9/16	3.82	6 ³ / ₈	7 ⁵ / ₈	5¾	3¾
5	6½	¾	12	7/8	2 ¹ / ₈	1 ⁷ / ₈	1 ³ / ₁₆	4.95	8 ³ / ₁₆	9¾	6¼	4¼
6	7½	1	16	1	2¼	2¼	1 ⁵ / ₁₆	5.73	9 ⁷ / ₁₆	11¼	7 ³ / ₈	5
7	8½	1¼	20	1 ¹ / ₈	2¾	2¾	1	6.58	10 ⁵ / ₈	12 ⁵ / ₈	8½	5½
8	9½	1½	24	1¼	3	3	1 ¹ / ₈	7.50	11 ¹³ / ₁₆	14	9½	6¼

Head end cushions are non-available on 1½"-2"-2½" bore cylinders with max. size rods. NPTF ports furnished as standard unless otherwise specified. SAE straight thread ports optional.

*Mounting holes are 1/16" larger than screw size shown.

Viceroy Fluid Power offers a wide range of piston designs and seal packings to meet your requirements. Choose from standard Piston Ring, Block-Vee, Viton or other seals. For maximum flexibility, rely on the fluid power specialists.

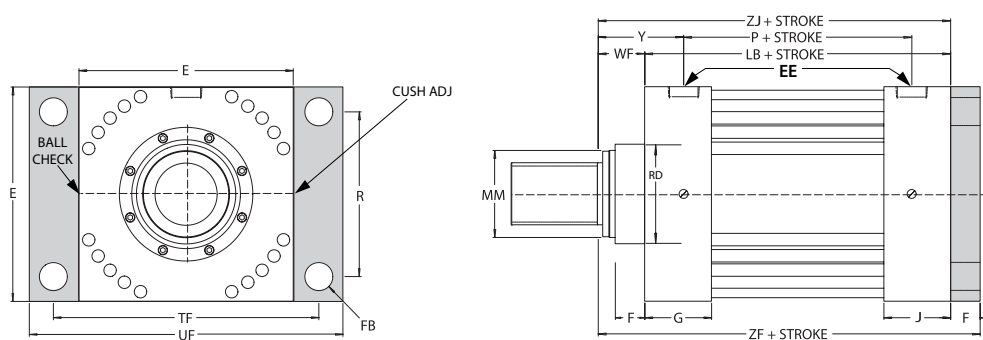
SERIES 3TH

Rod and Dimensions

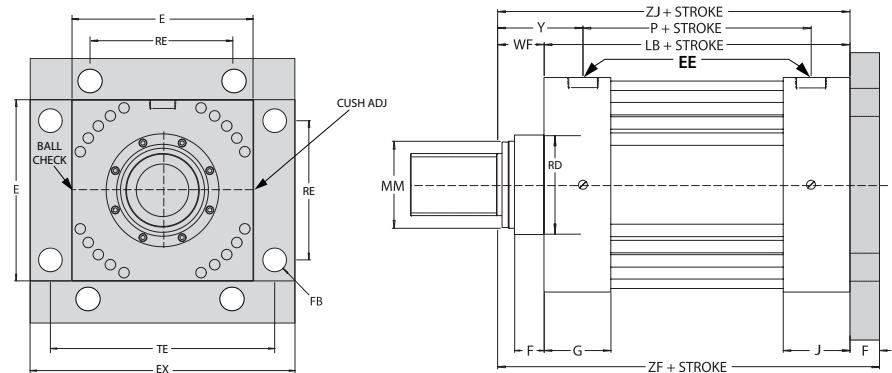
Envelope and Mounting Dimensions

Bore	Rod Code No	Rod. Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions								WF	Y	Add Stoke	
			KK	FF	A	+002 -002 B	C	D	NA	FA	RD	VB			ZJ	ZB
1½	1 (Std)	⅝	⅞-20	½-20	¾	1.124	⅜	½	⅑/16	⅜	2	⅝	1	2	5⅝	6
	2	1	¾-16	⅞-14	1⅝	1.499	½	⅞	1⅕/16	⅜	-	⅞	1⅜	2⅜	6	6⅜
2	2 (Std)	1	¾-16	⅞-14	1⅝	1.499	½	⅞	1⅕/16	⅜	2¾	⅞	1⅜	2⅜	6	6⅞/16
	3	1⅜	1-14	1¼-12	1⅝	1.999	⅝	1⅞	1⅕/16	⅝	-	1	1⅝	2⅝	6¼	6⅞/16
2½	2 (Std)	1	¾-16	⅞-14	1⅝	1.499	½	⅞	1⅕/16	⅜	2¾	⅞	1⅜	2⅜	6⅞	6⅑/16
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	1⅞/16	⅝	-	1⅞	1⅞	2⅞	6⅝	7⅑/16
	3	1⅜	1-14	1¼-12	1⅝	1.999	⅝	1⅞	1⅕/16	⅝	3¼	1	1⅝	2⅝	6⅝	6⅓/16
3¼	3 (Std)	1⅜	1-14	1¼-12	1⅝	1.999	⅝	1⅞	1⅕/16	⅝	3¼	1	1⅝	2¾	7⅞	7⅑/16
	5	2	1½-12	1¾-12	2¼	2.624	⅞	1⅞/16	1⅕/16	⅝	4⅞	1⅞	2	3⅞	7½	8⅑/16
	4	1¾	1¼-12	1½-12	2	2.374	¾	1½	1⅞/16	⅝	3¾	1⅞	1⅞	3	7⅞	7⅑/16
4	4 (Std)	1¾	1¼-12	1½-12	2	2.374	¾	1½	1⅞/16	⅝	3¾	1⅞	1⅞	3	7⅞	8⅑/16
	6	2½	1⅞-12	2¼-12	3	3.124	1	2⅑/16	2⅓/16	⅝	4½	1¼	2¼	3⅞	8	8⅑/16
	5	2	1½-12	1¾-12	2¼	2.624	⅞	1⅞/16	1⅕/16	⅝	4⅞	1⅞	2	3⅞	8⅑/16	8⅑/16
5	5 (Std)	2	1½-12	1¾-12	2¼	2.624	⅞	1⅞/16	1⅕/16	⅝	4⅞	1⅞	2	3⅞	8¼	9⅑/16
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3⅞	8½	9⅑/16
	6	2½	1⅞-12	2¼-12	3	3.124	1	2⅑/16	2⅓/16	⅝	4½	1¼	2¼	3⅞	8½	9⅑/16
	7	3	2¼-12	2¾-12	3½	3.749	1	2⅝	2⅞	⅝	5¼	1¼	2¼	3⅞	8½	9⅑/16
6	6 (Std)	2½	1⅞-12	2¼-12	3	3.124	1	2⅑/16	2⅓/16	⅝	4½	1¼	2¼	3⅞/16	9⅝	10⅑/16
	9	4	3-12	3¾-12	4	4.749	1	3⅜	3⅞	¾	6	1¼	2¼	3⅞/16	9⅝	10⅑/16
	7	3	2¼-12	2¾-12	3½	3.749	1	2⅝	2⅞	⅝	5¼	1¼	2¼	3⅞/16	9⅝	10⅑/16
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3⅞/16	9⅝	10⅑/16
7	7 (Std)	3	2¼-12	2¾-12	3½	3.749	1	2⅝	2⅞	⅝	5¼	1¼	2¼	3¾	10¾	11¾
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	¾	7¼	1¼	2¼	3¾	10¾	11¾
	8	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3¾	10¾	11¾
	9	4	3-12	3¾-12	4	4.749	1	3⅜	3⅞	¾	6	1¼	2¼	3¾	10¾	11¾
	12	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅜	¾	6⅞	1¼	2¼	3¾	10¾	11¾
8	8 (Std)	3½	2½-12	3¼-12	3½	4.249	1	3	3⅜	⅝	5½	1¼	2¼	3⅞	11¾	12⅞
	12	5½	4-12	5½	6.249	1	4⅝	5⅜	¾	8	1¼	2¼	3⅞	12⅞	11¾	12⅞
	9	4	3-12	3¾-12	4	4.749	1	3⅜	3⅞	¾	6	1¼	2¼	3⅞	11¾	12⅞
	10	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅜	¾	6⅞	1¼	2¼	3⅞	11¾	12⅞
	11	5	3½-12	4¾-12	5	5.749	1	1¼	4⅞	¾	7¼	1¼	2¼	3⅞	11¾	12⅞

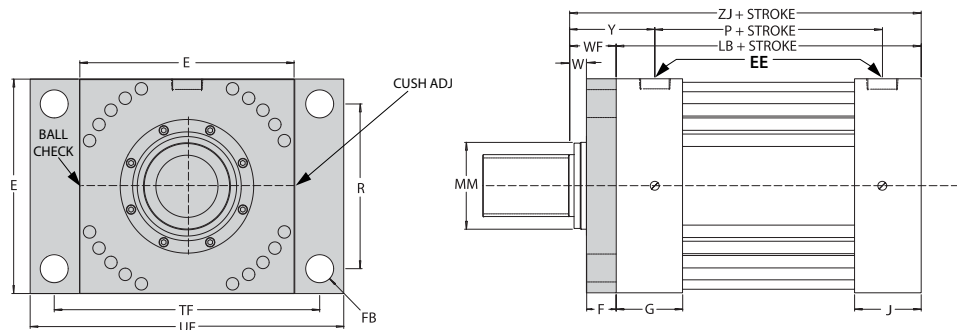
Flange Mounted Cylinders 10" to 14" Bores



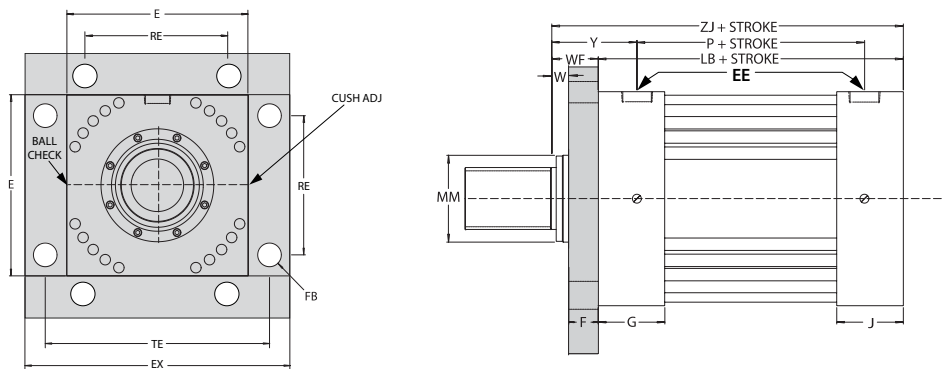
STYLE A - Rectangular Flange Mount Cap End
(NFPA Mounting Style MF2)



STYLE AA - Square Flange Mount Cap End
(NFPA Mounting Style MF6)



STYLE B - Rectangular Flange Mount Head End
(NFPA Mounting Style MF1)



STYLE BB - Square Flange Mount Head End
(NFPA Mounting Style MF5)

Styles A, B, AA, and BB are not recommended for maximum operating pressures. Styles A and B and be used for 1000 psi maximum; styles AA and BB should be limited to 2500 psi maximum operating pressure. We recommend the use of high tensile mounting bolts on all flange mounted cylinders subjected to maximum pressures and shock loads.

Envelope and Mounting Dimensions

Bore	E	EE	F	FB*	G	J	R	TF	UF	Add Stroke	
										LB	P
10	12 ⁵ / ₈	2	1 ¹¹ / ₁₆	1 ³ / ₄	3 ¹¹ / ₁₆	3 ¹¹ / ₁₆	9.62	15 ⁵ / ₈	19	12 ⁵ / ₈	8 ¹ / ₂
12	14 ⁷ / ₈	2 ¹ / ₂	1 ¹⁵ / ₁₆	2	4 ⁷ / ₁₆	4 ⁷ / ₁₆	11.45	18 ¹ / ₂	22	14 ¹ / ₂	10 ³ / ₈
14	17 ¹ / ₄	2 ¹ / ₂	2 ³ / ₈	2 ¹ / ₄	5 ³ / ₈	5 ³ / ₈	13.25	21 ³ / ₈	25 ¹ / ₄	16 ⁵ / ₈	10 ³ / ₈

NPTF ports furnished as standard unless otherwise specified. For Bolted Flange Port Connections see page 29.

*Mounting holes are ¹/₁₆" larger than screw size shown.

All 3TH Series Cylinders feature self-centering floating cushions on head ends. Self-locking, adjustable needle and check valves are interchangeable and standard; mount flush with end covers. For the most effective cushioning, rely on the fluid power specialists.

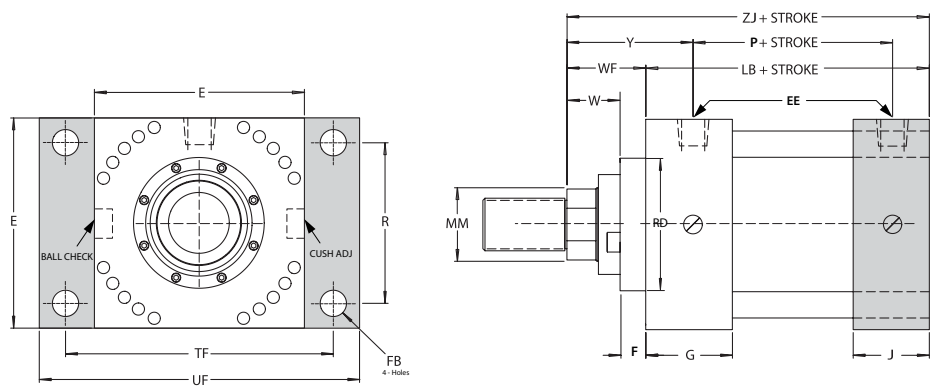
SERIES 3TH

Rod and Dimensions

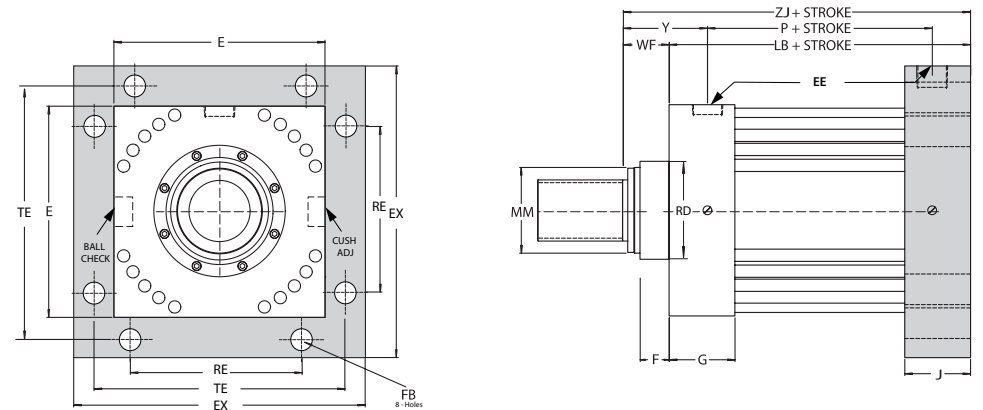
Envelope and Mounting Dimensions

Bore	Rod Code No.	Rod Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions							Add Stroke				
			KK	FF	A	+000 -002 B	C	D	NA	RD	V	WF	Y	W	ZJ	ZF
10	10(Std)	4½	3¼-12	4¼-12	4½	5.249	1	3⁄8	4³⁄₈	8	¼	2¹⁵⁄₁₆	4¾	¼	15¹⁄₁₆	16¾
	13	7	5-12	6¾-12	7	7.999	1	—	6⁷⁄₈	10¾	½	3³⁄₁₆	5	½	15⁵⁄₁₆	17
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⁷⁄₈	8½	¼	2¹⁵⁄₁₆	4¾	¼	15¹⁄₁₆	16¾
	12	5½	4-12	5¼-12	5½	6.249	1	4⁵⁄₈	5³⁄₈	9	½	3³⁄₁₆	5	½	15⁵⁄₁₆	17
12	12(Std)	5½	4-12	5¼-12	5½	6.249	1	4⁵⁄₈	5³⁄₈	9	¼	3³⁄₁₆	5³⁄₈	¼	17¹¹⁄₁₆	19⁵⁄₈
	14	8½	6-12	8¼-12	8½	9.499	1	—	8³⁄₈	12¾	½	3⁷⁄₁₆	5⁵⁄₈	½	17¹⁵⁄₁₆	19⁷⁄₈
	13	7	5-12	6¾-12	7	7.999	1	—	6⁷⁄₈	10¾	¾	3⁵⁄₁₆	5½	1³⁄₈	17¹³⁄₁₆	19¾
14	13(Std)	7	5-12	6¾-12	7	7.999	1	—	6⁷⁄₈	10¾	¾	3¾	6⁷⁄₈	1³⁄₈	20³⁄₈	22¾
	15	10	7-12	9¾-12	10	10.999	1	—	9⁷⁄₈	14¼	½	3⁷⁄₈	7	1½	20½	22⁷⁄₈
	14	8½	6-12	8¼-12	8½	9.499	1	—	8³⁄₈	12¾	½	3⁷⁄₈	7	1½	20½	22⁷⁄₈

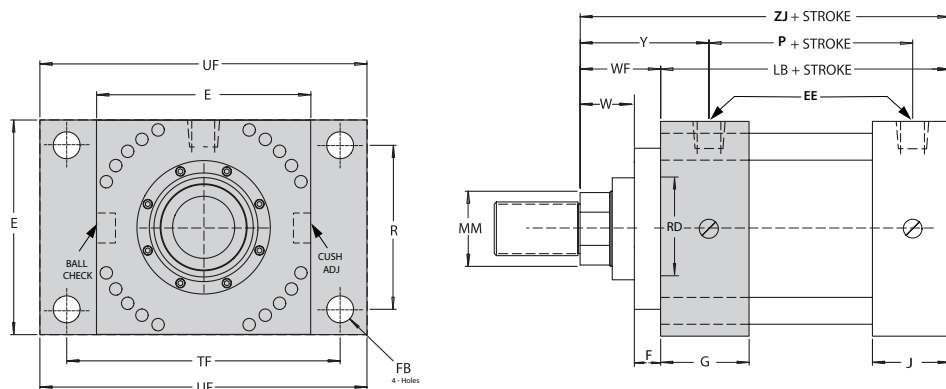
Heavy Duty Flange Mounted Cylinders 10" to 14" Bores



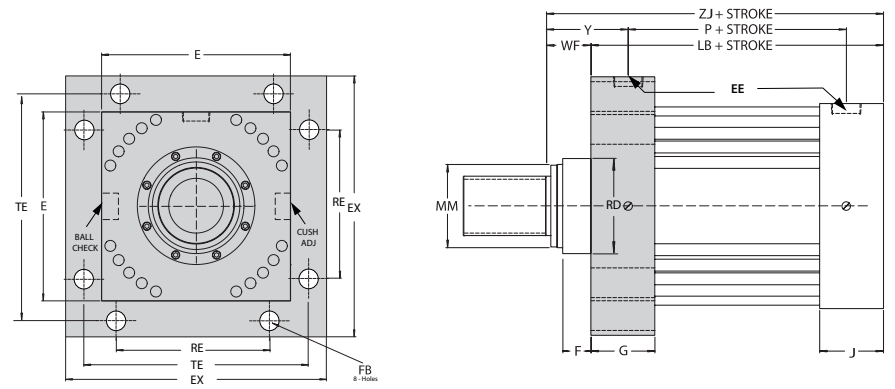
**STYLE P - Rectangular Heavy Duty
Flange Mount Cap End
(NFPA Mounting Style ME6)**



**STYLE PP - Square Heavy Duty
Flange Mount Cap End
(NFPA Mounting Style ME4)**



**STYLE Q - Rectangular Heavy Duty
Flange Mount Head End
(NFPA Mounting Style ME5)**



**STYLE QQ - Square Heavy Duty
Flange Mount Head End
(NFPA Mounting Style ME3)**

These mounts can be used at full rated pressure except as indicated in the chart beside

Bore	Rod Dia.	Mount Style	Port Position	Max. Operating Pressure-PSI
10	5½	Q	1 or 3	2500
	7	Q	1 or 3	1500
12	7	Q	1 or 3	2500
	8½	Q	1 or 3	1500
14	8½	Q	1 or 3	2500
	10	Q	1 or 3	1500

Envelope and Mounting Dimensions

Bore	CB	±001 CD	CW	E	EE	F	G	J	L	LR	MR	+000 -001 TD	TL	TG	TM	TW	UM	UN	UT	Add Stroke	
																				LB	P
10	4	3½	2	12⅝	2	1⅛	3⅛	3⅛	4	3⅝	3½	3½	3½	13½	14	4½	21	17½	19⅝	12⅝	8½
12	4½	4	2¼	14⅞	2½	1⅝	4⅞	4⅞	4½	4⅞	4	4	4	16	16½	5½	24½	20¾	22⅞	14½	10⅞
14	6	5	3	17¼	2½	2⅝	5⅝	5⅝	5¾	5⅝	5	5	5	19¼	19¾	6	29¾	24¾	27¼	16⅝	10⅝

NPTF ports furnished as standard unless otherwise specified. For Bolted Flange Port Connections see page 29.

*Mounting holes are 1/16" larger than screw size shown.

Viceroy offers a wide variety of mounting styles. In particular, heavy duty flanges styles: P, PP, Q and QQ provide excellent rigidity and strength for most rugged applications. For the greatest strength and operational dependability, rely on the fluid power specialists.

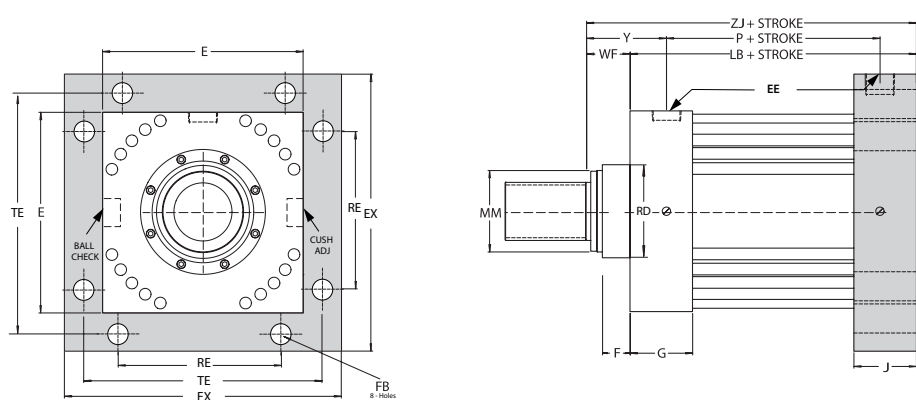
SERIES 3TH

Rod and Dimensions

Envelope and Mounting Dimensions

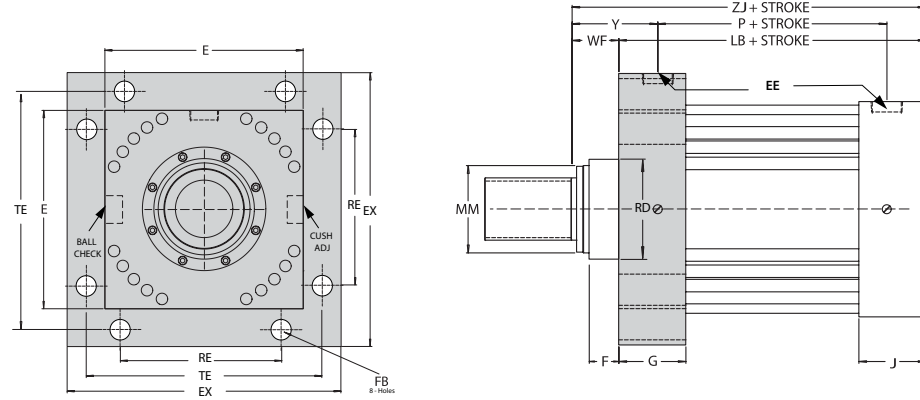
Bore	Rod Code No.	Rod Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions							WF	Y	W	Add Stroke
			KK	FF	A	+000 -002 B	C	D	NA	RD	V				ZJ
10	10(Std)	4½	3¼-12	4¼-12	4½	5.249	1	3⅞	4⅞	8	¼	2 ¹⁵ / ₁₆	4¾	¼	15 ¹ / ₁₆
	13	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	½	3 ³ / ₁₆	5	½	15 ⁵ / ₁₆
	11	5	3½-12	4¾-12	5	5.749	1	4¼	4⅞	8½	¼	2 ¹⁵ / ₁₆	4¾	¼	15 ¹ / ₁₆
	12	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅞	9	½	3 ³ / ₁₆	5	½	15 ⁵ / ₁₆
12	12(Std)	5½	4-12	5¼-12	5½	6.249	1	4⅝	5⅞	9	¼	3 ³ / ₁₆	5⅞	¼	17 ¹¹ / ₁₆
	14	8½	6-12	8¼-12	8½	9.499	1	—	8⅞	12¾	½	3 ⁷ / ₁₆	5⅞	½	17 ¹⁵ / ₁₆
	13	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	⅜	3 ⁵ / ₁₆	5½	1⅜	17 ¹³ / ₁₆
14	13(Std)	7	5-12	6¾-12	7	7.999	1	—	6⅞	10¾	⅜	3¾	6⅞	1⅜	20⅞
	15	10	7-12	9¾-12	10	10.999	1	—	9⅞	14¼	½	3⅞	7	1½	20½
	14	8½	6-12	8¼-12	8½	9.499	1	—	8⅞	12¾	½	3⅞	7	1½	20½

Heavy Duty Flange and Centerline Mounted Cylinders 16" to 20" Bores

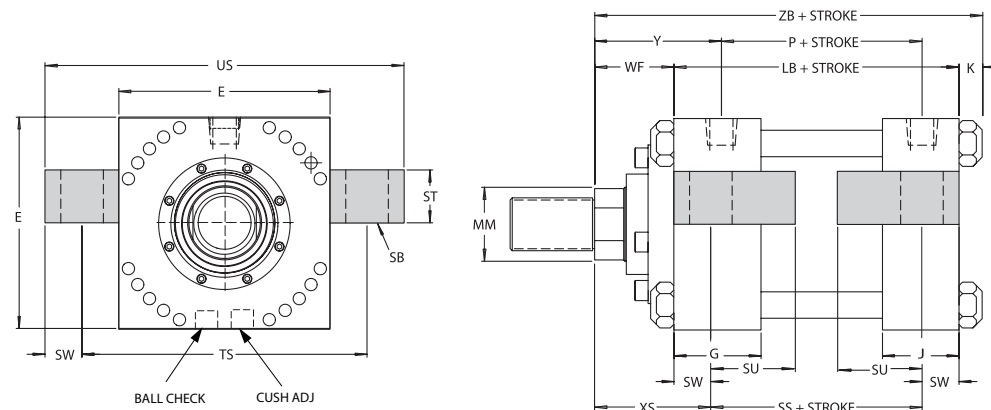


STYLE PP - Square Heavy Duty Flange Mount Cap End (NFPA Mounting Style ME4)

Use Socket Head Cap Screws for Mounting Styles "QQ" and "PP" because of Tie Rod interference with Hex Bolt Heads. Mounting Holes are 1/16" larger than screw size shown.



STYLE QQ - Square Heavy Duty Flange Mount Head End (NFPA Mounting Style ME3)



STYLE K - Center Line Mount (NFPA Mounting Style MS3)

Envelope and Mounting Dimensions

Bore	E	EB	EE	F	G	J	K	RE	SB	ST	SU	SW	TE	TS	US	Add Stroke		
																LB	P	SS
16	19 1/4	1 3/4	3	2 3/8	5 7/8	5 7/8	1 1/2	15.28	2 1/2	4 1/2	5 1/4	2 3/4	21.03	24 1/4	29 1/4	18 1/8	11 7/8	12 5/8
18	22	2	3	2 3/8	6 3/8	6 3/8	1 1/8	16.45	2 3/4	5 1/4	5 1/2	3 1/4	22.65	27 1/2	33	20 1/8	12 7/8	13 5/8
20	24 3/4	2	3	2 3/8	7 3/8	7 3/8	1 1/8	15.19	3	6 1/2	6 3/8	3 3/8	25.62	31 1/4	37 1/4	23 1/8	13 3/8	15 3/8

Rod and Dimensions

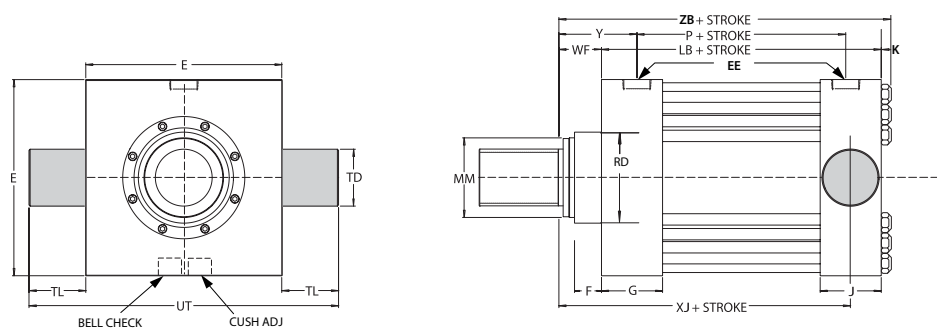
Bore	Rod Code No.	Rod Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions							Add Stroke				
			KK	FF	A	+000 -002 B	C	NA	RD	V	WF	Y	W	XS	ZB	ZJ
16	14(Std)	8 1/2	6-12	8 1/4-12	8 1/2	9.499	1	8 3/8	12 3/4	1/4	3 3/8	7	1 1/2	6 5/8	23 1/2	22
16	15	10	7-12	9 3/4-12	10	10.999	1	9 7/8	14 1/4	1/2	3 3/8	7	1 1/2	6 5/8	23 1/2	22
18	15	10	7-12	9 3/4-12	10	10.999	1	9 7/8	14 1/4	1/4	3 3/8	7 1/2	1 1/2	7 1/8	25 1/8	24
20	15	10	7-12	9 3/4-12	10	10.999	1	9 7/8	14 1/4	1/2	3 3/8	8 1/2	1 1/2	7 3/4	28 1/8	20

Envelope and Mounting Dimensions

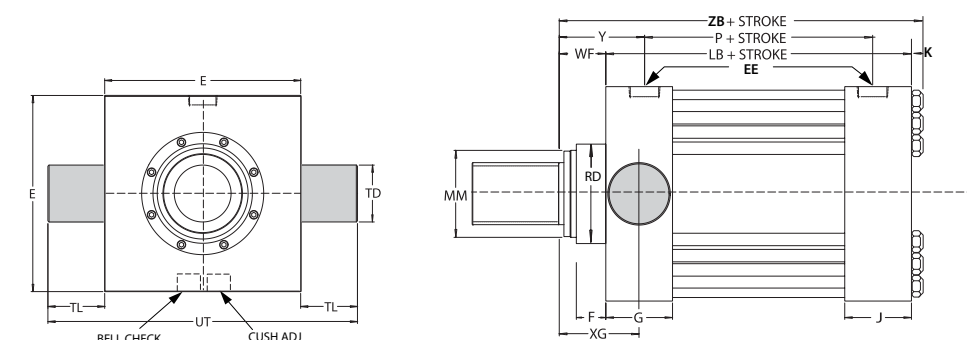
For information on availability of accesories,consult factory.

Trunnion and Clevis Mounted Cylinders 16" to 20" Bores

SERIES 3TH



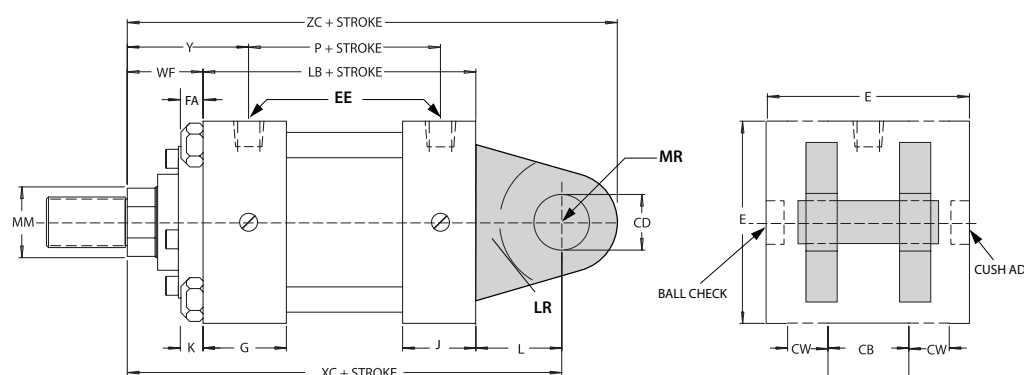
STYLE EB - Trunnion Mount Cap End
(NFPA Mounting Style MT2)



STYLE ER - Trunnion Mount Head End
(NFPA Mounting Style MT1)

NOTES FOR STYLES "EB" AND "ER"

1. The trunnion pintles are not removable.
2. The trunnion pintles are designed to withstand shear loads but not high bending loads. Pillow blocks must be rigidly mounted to provide full support with minimum clearances.
3. Maximum operating pressure for cylinders with these mounts is 3000 psi non-shock.



STYLE G - Clevis Mount
(NFPA Mounting Style MP1)

Chrome-plated Clevis Pin Assembly (with snap Rings) is furnished with all style G Cylinders.

Envelope and Mounting Dimensions

Bore	CB	±001 CD	CW	E	EE	F	G	J	K	L	LR	MR	+000 -001 TD	TL	UT	Add Stroke	
																LB	P
16	7	6	3½	19¼	3	2¾	5⅞	5⅞	1½	7	6⅞	6	5	5	29¼	18⅞	11⅞
18	8	6½	4	22	3	2¾	6⅞	6⅞	1⅞	7⅞	6⅞	6½	5¾	5¾	33½	20⅞	12⅞
20	9	7½	4½	24¾	3	2¾	7⅞	7⅞	1⅞	8¾	7⅞	7½	6¼	6¼	37¼	23⅞	13⅞

Rod and Dimensions

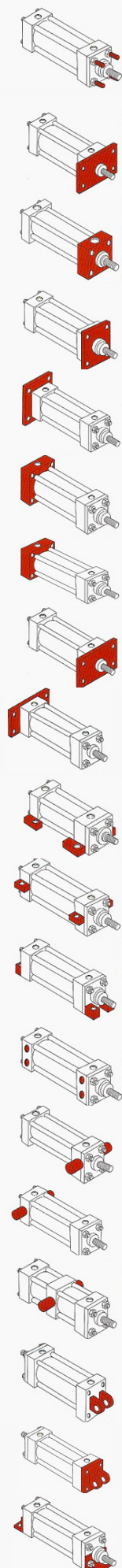
Bore	Rod Code No.	Rod Dia. MM	Thread Size		Rod Extensions and Pilot Dimensions							Add Stroke					
			KK	FF	A	+000 -002 B	C	NA	RD	V	WF	Y	XG	XC	XJ	ZB	ZC
16	14(Std)	8½	6-12	8¼-12	8½	9.499	1	8⅞	12¾	¼	3⅞	7	6 ¹³ / ₁₆	29	19 ¹ / ₁₆	23½	35
16	15	10	7-12	9¾-12	10	10.999	1	9⅞	14¼	½	3⅞	7	6 ¹³ / ₁₆	29	19 ¹ / ₁₆	23½	35
18	15	10	7-12	9¾-12	10	10.999	1	9⅞	14¼	¼	3⅞	7½	7 ¹ / ₁₆	31⅞	20 ¹³ / ₁₆	25⅞	38⅞
20	15	10	7-12	9¾-12	10	10.999	1	9⅞	14¼	½	3⅞	8½	7 ⁹ / ₁₆	35¾	23 ⁵ / ₁₆	28⅞	43¼

Envelope and Mounting Dimensions

For information on availability of accessories, consult factory.

NFPA Cylinder Interchange Comparison

These diagrams illustrate the various styles of cylinder mounting as they interchange with other cylinder manufacturers.



Mounting Description	NFPA Mounting Code	Viceroy Fluid Power	Parker Hannifin	Miller Fluid Power	Hydro-line
		Series 3TH Hyd.	Series 2H Hyd.	Model H Hyd.	Series N2 Hyd.
Tie Rods Ext.	MX1 MDX1 MX2 MX3	Style L Style DL Style N Style M	Style TD Style KTD Style TC Style TB	Model H51 Model DH51 Model TC Model H53	L LD N M
Head Rectangular Flange	MF1	Style B	Style J	Model H61	F
Head Square Flange	MF5	Style BB	Style JB	Model H65	J
Head Square	ME3*	Style QQ	-	Model H63	J
Cap Rectangular Flange	MF2	Style A	Style H	Model H62	R
Cap Square Flange	MF6	Style AA	Style HB	Model H66	S
Cap Square	ME4*	Style PP	-	Model H64	S
Head Rectangular	ME5*	Style Q	Style JJ	Model H67	G
Cap Rectangular	ME6*	Style P	Style HH	Model H68	P
Side Lugs	MS2	Style J	Style C	Model H72	A
Centerline Lugs	MS3	Style K	Style E	Model H73	H
Side End Lugs	MS7	Style CC	Style G	Model H77	E
Side Tapped	MS4	Style H	Style F	Model H74	B
Head Trunnion	MT1*	Style ER	Style D	Model H81	U
Cap Trunnion	MT2*	Style EB	Style DB	Model H82	W
Intermediate Fixed Trunnion	MT4*	Style E	Style DD	Model H83	TT
Cap Fixed Clevis	MP1	Style G	Style BB	Model H84	C
Cap Detachable Clevis	MP2	-	-	Model H86	DC
End Angles	MS1	-	Style CB	-	-

*Check dimensional interchangeability before ordering.

SERIES 3TH

Milwaukee Cylinder	Sheffer Corp	Aeroquip (T-J)	Hanna	S-P Corp.	Carter Controls	Galland Henning No Pak
Series H. Hyd.	Series HH Hyd.	Series SH Hyd.	Series H Hyd.	Series B Hyd.	Series S Hyd.	Series 3 Hyd.
Model H10 Model H10D Model H13 Model H12	Style BX Style DBX Style RX Style FX	Model SH-9BE Model SH-9DBE Model SH-9B Model SH-9R	MX1 MDX1 MX2 MX3	Model BR Model DBR Model BS Model BT	Model T Model TDER Model Y Model Z	Model T Model XT Model TB Model TR
Model H31	Style FF	Model SH-2	MF1	Model BE	Model B	Model D
Model H21	Style FFX	Model SH-2B	MF5	Model BC	Model W	Model DD
-	-	-	-	-	-	-
Model H32	Style RF	Model SH-4	MF2	Model BD	Model A	Model C
Model H22	Style RFX	Model SH-4B	MF6	Model BA	Model V	Model CC
-	-	-	-	-	-	-
-	Style FHF	-	MF7	-	-	-
-	Style RHF	-	MF9	-	-	-
Model H42	Style SL	Model SH-1	MF2	Model BB	Model C	Model A
Model H51	Style CL	Model SH-7	MF3	Model BP	Model K	Model B
Model H43	Style EL	-	MF7	Model BLL	Model N	Model AL
Model H41	Style SF	Model SH-1A	MF4	Model BJ	Model F	Model S
Model H71	Style TF	Model SH-5R	MF1	Model BM	Model E	Model FR
Model H72	Style TR	Model SH-5B	MF2	Model BN	Model D	Model FB
Model H73	Style T	Model SH-5	MF4	-	Model M	Model F
Model H61	Style C	Model SH-3	MF1	Model BG	Model G	Model E
-	-	-	-	-	-	Model HE
-	Style FB	-	-	-	Model	Model AP

Seal Kits

Seal Kits for Viceroy cylinders are designed and packaged to provide the necessary software parts for the normal cylinder repair.

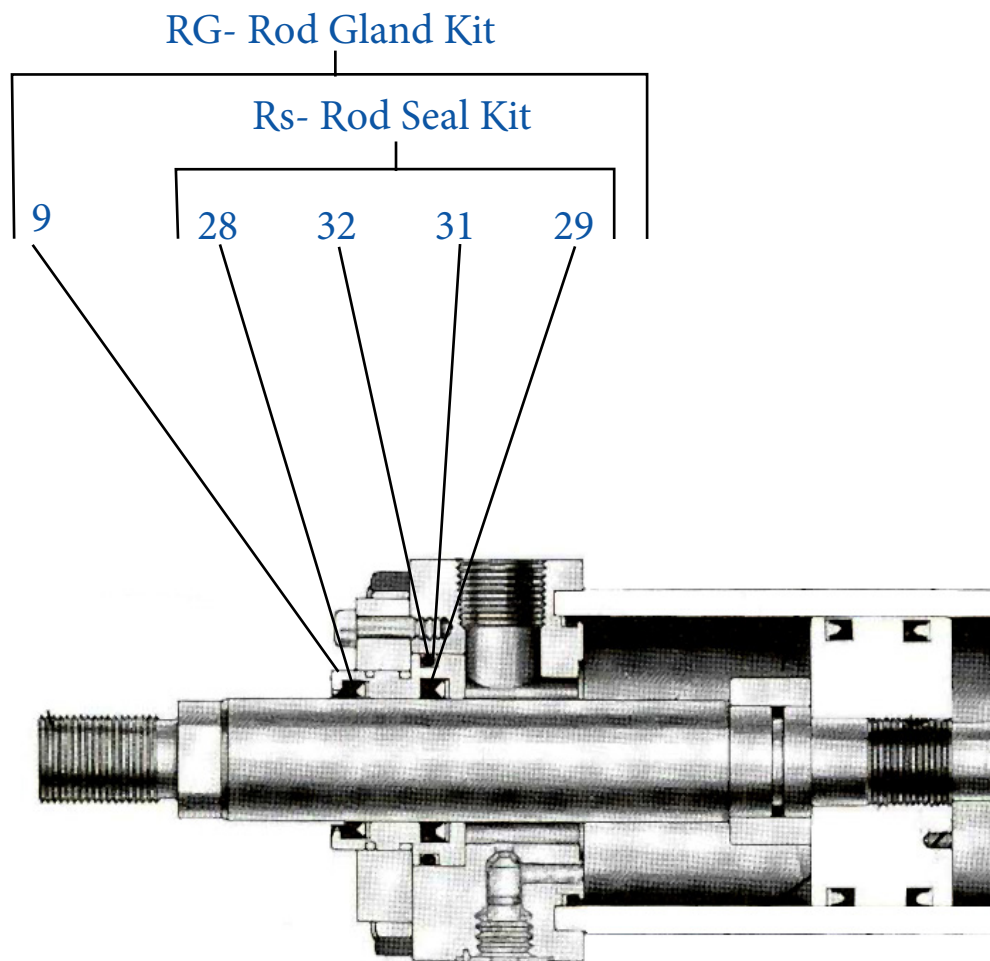
Ease of maintenance is provided through the kits shown, in that each type permits a specific cylinder repair.

A combination of these kits will give sufficient cylinder seals to permit a complete cylinder seal repair.

With the proper cylinder bore, an RG or RS rod kit will provide the proper kit for a specific rod diameter.

Item Numbers:

- 9-Rod Bearing Ring
- 28-Rod Wiper (Polyurethane)
- 29-Rod Seal (Polyurethane)
- 31-Cartridge "O" Ring
- 32-Cartridge Non-Extrusion Ring



Ordering Information

1. Order standard Seal Kits by appropriate number listed in the table, adding bore size.

2. When ordering Viton Seal Kits, specify Viton.

Rod Dia.	RG Rod Gland Kit (Items 9, 28, 29, 31, 32)
5/8	RG__3530-010
1	RG__3530-020
1 1/8	RG__3530-030
1 1/4	RG__3530-040
2	RG__3530-050
2 1/2	RG__3530-060
3	RG__3530-070
3 1/2	RG__3530-080
4	RG__3530-090
4 1/2	RG__3530-100
5	RG__3530-110
5 1/2	RG__3530-120

NOTE - Indicate bore size in __ above.

Rod Dia.	RS Rod Seal Kit (Items 28, 29, 31, 32)
5/8	RS__3540-010
1	RS__3540-020
1 1/8	RS__3540-030
1 1/4	RS__3540-040
2	RS__3540-050
2 1/2	RS__3540-060
3	RS__3540-070
3 1/2	RS__3540-080
4	RS__3540-090
4 1/2	RS__3540-100
5	RS__3540-110
5 1/2	RS__3540-120

NOTE - Indicate bore size in __ above.

1. General:

The parts drawing on Page 31 shows a listing of parts and is applicable to all standard Series 3TH hydraulic cylinders, (1 1/2 thru 8.00 bores only.) This parts drawing, when used in conjunction with the listed kits, should facilitate the ordering of kits.

2. Installation of Cylinders:

Standard cylinders are furnished with seals compatible with petroleum base fluids. These seals work best within the temperature range of -40°F to 200°F. For fluids other than petroleum base, different seal materials may have been used. (Reference Series 3THT, 3THW.)

For the cylinder to perform well, it must be properly installed. Alignment of the cylinder with load is most important. Forcing rod, clevis pins or mounting bolts into position indicates that the cylinder is not properly aligned, and permanent damage may result from such installation.

3. Procedure for replacement of rod seals and cartridge:

(Kits Type RG & RS)

A. Disconnect cylinder and drain oil from head end port.

B. In cases of circular cartridge retainer, remove socket head screws. In cases of square retainer remove tie rod nuts.

C. Remove circular or square retainer

D. Remove rod bearing cartridge from head. To facilitate removal, a screwdriver can be used to pry in the external groove.

E. Remove rod wiper, rod seal, rod cartridge O-ring and rod cartridge non-extrusion ring.

F. Reassemble the cartridge with corresponding replacement parts, cleaning all parts thoroughly. Swelling, shrinking, wear, nicks, cuts, and indentations are all signs of defective seals. Such seals should be replaced.

G. Prior to installation, all rubber parts must be well coated with lubricant. Place the cartridge with new replacement parts on the rod end, and use a twisting motion in starting it onto the rod.

H. Guide the cartridge over the rod and carefully insert it into the head end cover; replace cartridge retainer plate and screws. Tighten the screws with a hexagon key. In tightening the socket head screws for circular retainers, use the following torque:

Screw Size No.	10-32	.25-28	.31-24
Torque (Ft.-lbs.)	6	15	30

I. Square retainer (re-installation), see tie rod torque, Page 33.

4. Procedure for Repacking Cylinders (Kits Type TS)

A. Disconnect cylinder and drain oil from head and cap end ports.

B. Remove the tie rod nuts and tie rods.

C. Remove cap end and then head end. The rod bearing cartridge and cartridge retainer plate will come off with the head end.

Note: The piston and rod assembly should not require disassembly unless replacement of pistons or the piston rod or head end cushion nose is required

5. **Cleaning:** Clean all parts thoroughly. The packings and seals in this cylinder are compatible with hydraulic oils, air and neutral fluids. The cleaning agent must also be compatible to avoid damage to packings and seals. Whenever a particular lubricant is specified for an installation, do not deviate from this specification without checking for compatibility.

6. Inspection:

A. Inspect all packings, seals, and non-extrusion rings for swelling, shrinking, wear, nicks, cuts, and indentations. Discard all damaged packings, seals, and non-extrusion rings.

B. Check and inspect bore of tube for scratches, excessive wear, and any other defect that might damage piston packing or cause piston bypass.

C. Inspect piston rod for signs of wear, nicks, dents, scratches, or anything that may damage rod packing or rod bearing. Excessive wear on one side of piston rod or rod bearing usually indicates misalignment in installation and should be corrected.

D. Inspect all remaining items for evidence of damage or wear. In most cases, a little polishing of the various parts will restore them to like-new condition.

E. Replace all damaged packings, seals, rod wipers, and non-extrusion rings.

7. **Reassembly:** The procedure for reassembly is essentially the reverse of disassembly. However, the following exceptions and considerations should be noted:

A. All O-rings and non-extrusion rings should be well coated with lubricant after they are installed in their respective grooves and prior to reassembly with the mating part. Care must be taken when assembling O-rings and packings that they are not damaged, as this will cause leakage.

B. Tie rod threads and nut bearing faces should be well lubricated to allow tightening the nuts evenly for proper prestressing. To avoid twisting of the tie rods during tightening hold with vise grip or clamp. To assure equal prestressing of the tie rods, first turn on nuts even and snug to align assembly; then the nuts are to be tightened alternately. For proper tie rod prestressing, they should be torqued as recommended: (See tie rod torque chart Page 33.)

8. Testing:

A. After the cylinder has been completely reassembled, it should be tested, either on a test bench or in the regular installation, Watch for the following as the cylinder is cycled at operating pressure.

- Rod gland leakage.
- Leakage at end cover "O" rings.
- Leakage at cushion adjusting needle.
- Leakage at ball check plug.

Caution

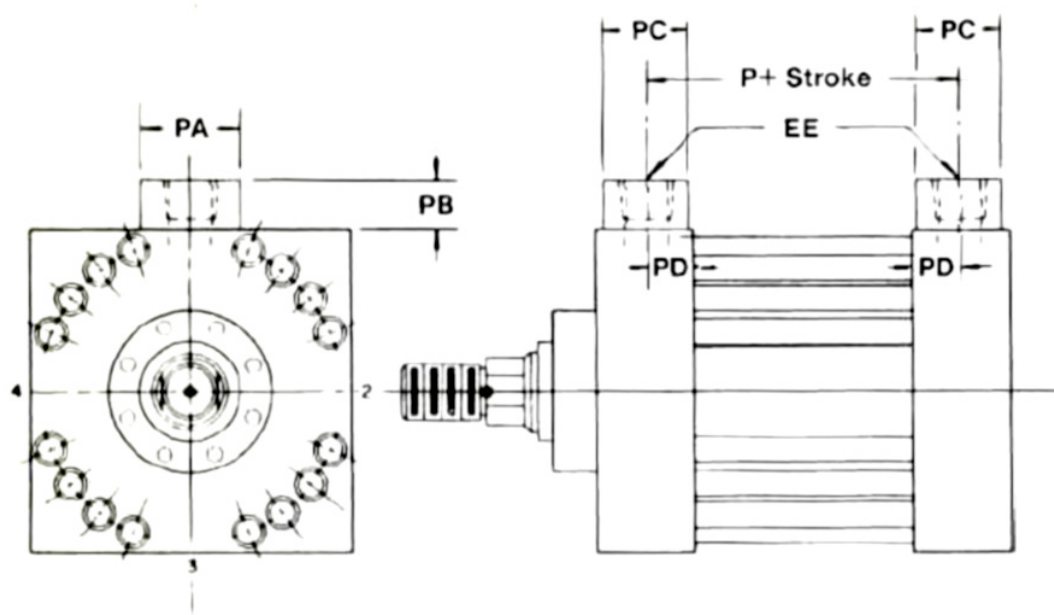
Cushion adjustment valve is provided for controlling cushioning effect of the cylinder.

It contains a safety feature in that during the backing off of the screws, leakage will occur prior to thread disengagement, thus preventing the possibility of valve blow-out.

Do not continue unscrewing the valve if leakage occurs. Ball Check Screw is non-adjustable.

"Neither seller nor manufacturer shall be liable for any injury, loss or damage, direct or consequential, arising out of the misuse or improper use of or the inability to use the product. Before using, user should determine the suitability of the product for his intended use and assumes all responsibility for such determination. The foregoing may not be altered except in writing signed by an authorized representative of seller and manufacturer."

Bolted Flange Port Connections

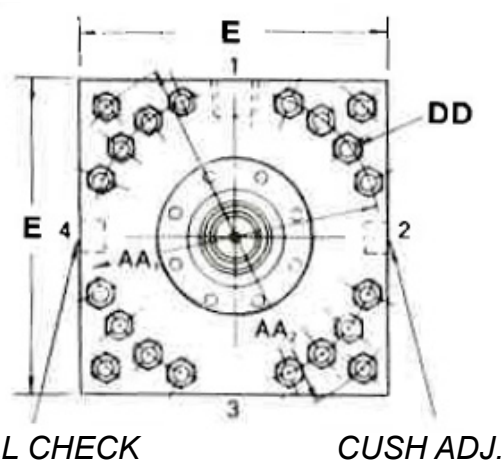


Bore	EE	Add Str	PA	PB	PC	PD
	NPTF	P				
10	2	8½	4	1⅝	3 ¹³ / ₁₆	1⅞
12	2½	10⅞	4½	2	4¼	2¼
14	2½	10⅜	4½	2	4¼	2¼
16	3	11⅞	5 ⁵ / ₁₆	2¼	5⅝	2¾
18	3	12⅞	5 ⁵ / ₁₆	2¼	5⅝	2¾
20	3	13⅞	5 ⁵ / ₁₆	2¼	5⅝	2¾

Cylinders can be furnished for use with bolted flanges, such as SAE 4-bolt type shown above. For more information contact Sales Department.

Cushion Information

Cyl. Bore	Rod Dia.	Cushion Length	
		Head End	Cap End
1½	⅝	27/32	27/32
2	1	27/32	27/32
2½	1	27/32	27/32
3¼	1⅜	15/16	15/16
4	1¾	15/16	15/16
5	2	1	1
6	2½	1⅛	1⅛
7	3	1 ⁵ / ₁₆	1 ⁵ / ₁₆
8	3½	1 ⁷ / ₁₆	1 ⁷ / ₁₆
10	4½	1 ⁷ / ₈	1 ⁷ / ₈
12	5½	2¼	2¼
14	7	2¼	2¼
16	8½	2¼	2¼
18	10	2¼	2¼
20	10	2¼	2¼



Tie Rod Information

Bore	E	AA ₁	AA ₂	DD	No. of Tie Rods
10	12 ⁵ / ₈	12.88	-	1-14	12
12	14½	15.06	-	1-14	16
14	17¼	17.31	-	1-14	20
16	19¼	19.62	22.50	1-14	28
18	22	22.38	26.75	1.25-12	20
20	24¼	24.62	29.62	1.25-12	24

Recommended Torque for Tie Rod Nuts

Cylinder Bore	1½	2-2½	3¼-4	5	6	7	8	10-12 14-16	18-20
Torque Ft. Lb.	29	60	148	282	374	560	690	374	690

NOTE: (1) Values shown above are for well lubricated tie rod threads and nut bearing surfaces.

(2) Avoid twisting of tie rods during tightening. Hold with vise grip pliers or clamp.

Mounting Recommendations

In addition to the standard mountings, the following information covers other mountings and mounting ideas that may prove helpful in your applications. When needed, special end covers, flanges or other mountings can be provided. Sketches, together with specifications relative to the application, and forces involved should be submitted.

Mounting Bolts - High tensile socket head screws are recommended for all mounting styles. Use 1/16" smaller than hole size.

Tie Rod Mountings - Styles L, M, &

N- Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in the tables. Longer or shorter extensions are also available.

Flange Mountings - Styles B, BB, Q, & QQ- Cylinders can be located by measuring from the cylinder mounting surface reference the "W" or "WF" dimension. The flanges can be drilled for pins or dowels to prevent shifting after proper alignment.

Lug and Side Tapped Mounting - Styles H, J, & K- Cylinders should be fixed at one end using fitted bolts, pins, in

the mounting lugs or shear keys located to resist the major load, whether push or pull.

Trunnion Mounting - Styles E, EB, & ER- Cylinders require lubricated pillow blocks with minimum bearing clearances. Pillow blocks should be carefully aligned and mounted so the trunnions are not subjected to bending moments. The rod end connection should also be pivoted, with the pivot in the piston rod eye or clevis parallel to the trunnions.

Clevis Mounting - Style G- Cylinders should be pivoted at both ends, with the pivot pin in the piston rod eye or clevis parallel to the pivot pin.

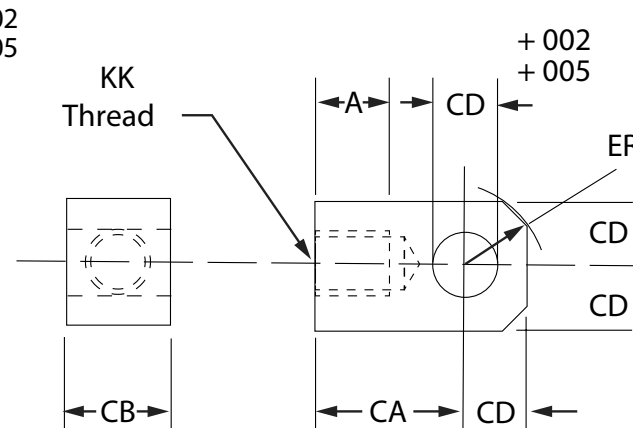
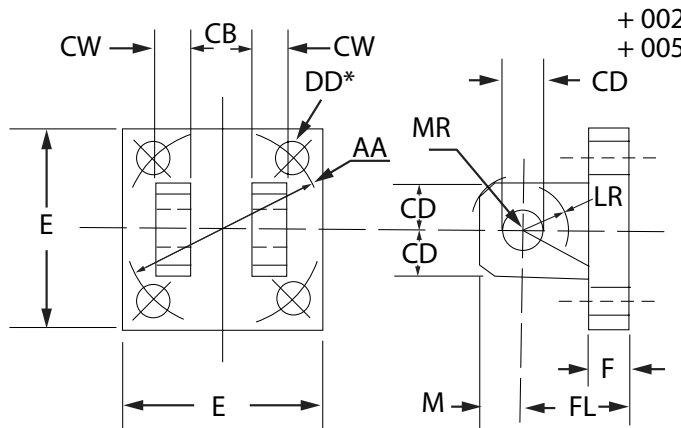
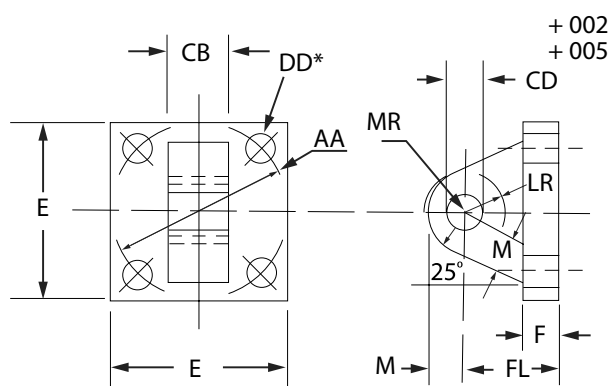
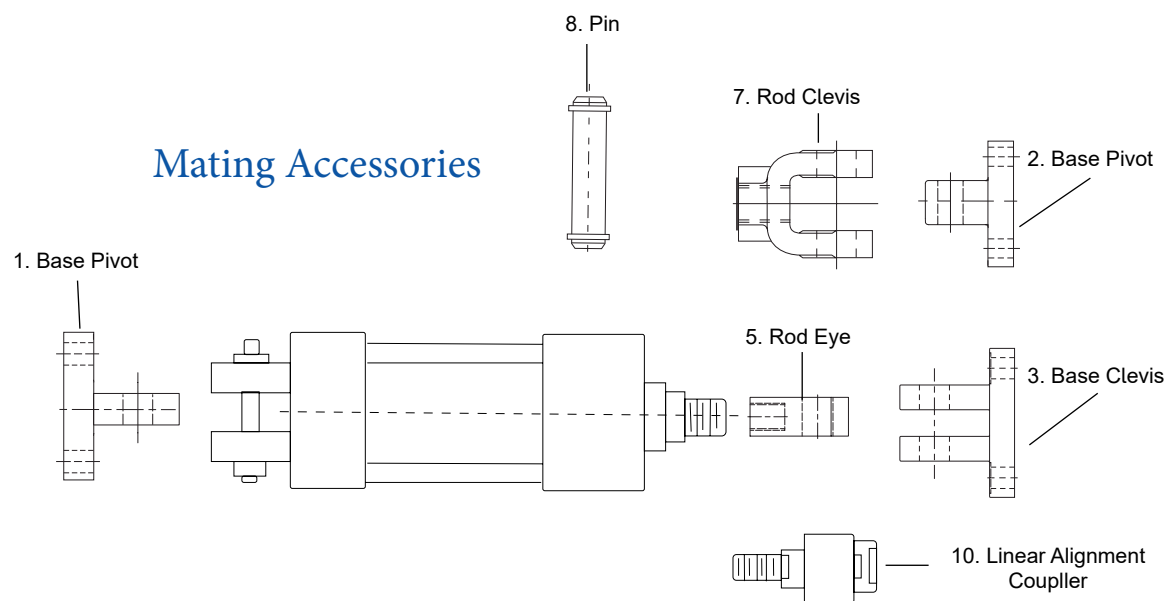
Accessories

How to specify accessories

Rod end accessories are selected by the thread diameter on the end of the rod. To specify a rod end accessory locate the thread diameter (KK) in the dimension tables for the mounting style and rod end style of the cylinder you are using. Locate the part number for the proper accessory by referring to the Parts Mating diagram and Table A for standard rod end cylinders.

Mounting accessories for the cap end of the cylinder are selected by bore size. Refer to Table B for the part number of the proper base pivot and pin for the bore size of the cylinder you are using.

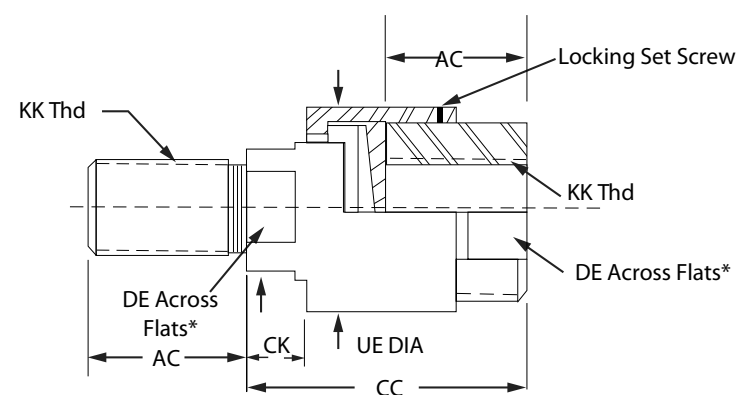
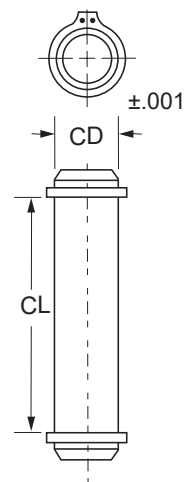
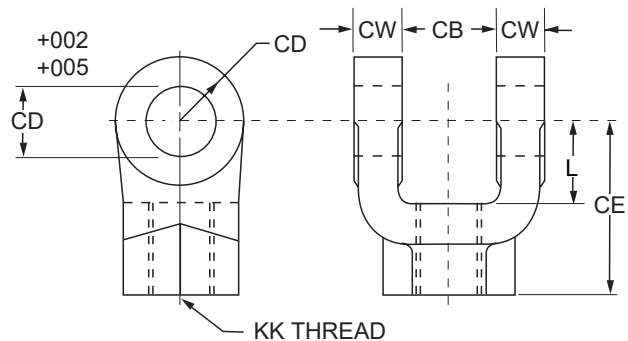
Mating Accessories



Base Pivot (1) (2)
*Mounting Screw Size

Base Clevis ** (3)
*Mounting Screw Size
(Use socket head cap screws)
**Complete with pin (not shown)

Rod Eye (standard) (5)



Rod Clevis (7)

Pin (standard) (8)

Linear Alignment Coupler (10)
*Spanner holes on 526301 and larger

SERIES 3TH

Table A

Table B

Mating Rod End Accessories with Base Mounts-Part Nos. Standard Rod End Cylinders							Mating Base Pivot to Cap Clevis Standard Rod End Cylinders		
Thread Size KK	Rod Eyes (5)	Base Clevis (3)	Rod Clevis (7)	Base Pivot (2)	Pin (8)	Coupler (10)	Bore	Base Pivot (1)	Pin (8)
7/13-20	8422	75940	82262	8430	8658-1	526301-07	1½	8430	8658-1
¾-16	8423	75941	82263	8431	8658-2	526301-12	2-2½	8431	8658-2
1-14	8424	75942	82264	8432	8658-3	526301-16	¾	8432	8658-3
1¼-12	8425	75943	82265	8433	8658-4	526301-20	4	8433	8658-4
1½-12	8426	75944	82266	8434	8658-5	526301-24	5	8434	8658-5
1⅞-12	8427	75945	82267	8435	8658-6	526301-30	6	8435	8658-6
2¼-12	8428	86170	82268	8436	8658-17	526301-36	7	8436	8658-17
2½-12	8429	86171	82269	8437	8658-18	526301-40	8	8437	8658-18
¾-12	8564	86172		92276	9658-19	526301-52	10	82276	8658-19
4-12	8565	86173		82277	8658-20	526301-64	12	82277	8658-20
5-12	8566	86174		82278	8658-21	526301-80	14	82278	8658-21

Base Pivot and Base Clevis Dimensions

Cyl. Bore	Base Pivot Part No.	Base Clevis Part No.	AA	CB	CD	CW	DD*	E	F	FL	LR	M	MR	NR
1½	8430	75940	2.31	¾	½	½	¾	2½	¾	1⅞	⅝	½	19/32	9/16
2-2½	8431	75941	3.61	1¼	¾	⅝	½	3½	⅝	1⅞	15/16	¾	29/32	27/32
¾	8432	75942	4.60	1½	1	¾	⅝	4½	¾	2¼	15/16	1	13/16	1⅞
4	8433	75943	5.40	2	1⅞	1	⅝	5	⅞	3	1¼	1⅞	121/32	1½
5	8434	75944	7.00	2½	1¾	1¼	⅞	6½	⅞	3⅞	2	1¾	129/32	15/16
6	8435	75945	8.10	2½	2	1¼	1	7½	1	3½	2¼	2	23/16	23/16
7	8436	86170	9.30	3	2½	1½	1⅞	8½	1	4	2¾	2½	2⅝	21/16
8	8437	86171	10.60	3	3	1½	1¼	9½	1	4¼	31/16	2¾	2⅞	3
10	82276	86172	13.60	4	3½	2	1¾	12⅝	11/16	51/16	3⅝	3½	3½	3½
12	82277	86173	16.20	4½	4	2¼	2	14⅞	115/16	67/16	4⅞	4	4	4
14	82278	86174	18.74	6	5	3	2¼	17¼	2⅝	8⅞	5⅞	5	5	5

Rod End Accessory Dimensions

Thread kk	Rod Eye Part No.	Rod Clevis Part No.	Pin Part No.	Coupler Part No.	A	AC	CA	CB	CC	CD	CE	CK	CL	CW	DC	DE	ER	L	UC	UE
7/13-20	8422	82262	8658-1	526301-07	¾	¾	1½	¾	2	½	1½	½	1¾	½	½	13/16	9/16	¾	⅝	1¼
¾-16	8423	82263	8658-2	526301-12	1⅞	1¼	21/16	1¼	25/16	¾	2⅞	½	2½	⅝	13/16	1⅞	27/32	1	31/32	1¾
1-14	8424	82264	8658-3	526301-16	1⅞	1⅞	213/16	1½	215/16	1	215/16	17/32	3	¾	15/32	1⅞	1⅞	15/16	111/32	2½
1¼-12	8425	82265	8658-4	526301-20	2	1⅞	37/16	2	215/16	1¾	17/32	4	1	15/32	1⅞	1½	1¼	111/32	2½	2½
1½-12	8426	82266	8658-5	526301-24	2¼	2¼	4	2½	4⅝	1¾	4½	⅞	5	1¼	1¾	2⅞	115/16	2¼	131/32	3¼
1⅞-12	8427	82267	8658-6	526301-30	3	3	5	2½	5⅝	2	5½	1	5	1¼			23/16	2½	215/32	3¾
2¼-12	8428	82268	8658-17	526301-36	3½	3½	513/16	3	6⅝	2½	6½	1	6	1½			211/16	3	211/32	4½
2½-12	8429	82269	8658-18	526301-40	3½	3½	6⅞	3	69/16	3	6¾	1	1½			3	¾	315/32	315/32	5
¾-12	8564		9658-19	526301-52	4½	4½	7⅞	4	8½	3½		1	8				3½		415/32	6¼
4-12	8565		8658-20	526301-64	5½	5½	9⅞	4½	9½	4		1	9				4		515/32	7½
5-12	8566		8658-21	526301-80	7	5½	11½	6	9½	5		1	12				5		515/32	7½

Rod end accessories are located by thread size on the rod end. Determine this dimension(kk) by referring to the dimension tables for the cylinder you are using if you are trying to locate dimensions for an accessory for which you have a part number, locate the thread size for that part in Table A above.

Viceroy Fluid Power "Time-Saver" Capacity Chart

Push Stroke Force and Displacement

Bore	Piston Area Sq. In.	Push Force in LBS. Obtained at Following Pressures							Gallons Per Inch of Stroke
		250 PSI	500 PSI	1000 PSI	1500 PSI	2000 PSI	2500 PSI	3000 PSI	
1½	1.767	442	884	1,767	2,651	3,534	4,420	5,301	.00765
2	3.142	785	1,571	3,142	4,712	6,283	7,855	9,425	.0136
2½	4.909	1,227	2,454	4,909	7,363	9,817	12,270	14,726	.0212
3¼	8.296	2,074	4,148	8,296	12,444	16,592	20,740	24,887	.0359
4	12.566	3,142	6,283	12,566	18,849	25,132	31,415	37,698	.0544
5	19.635	4,909	9,818	19,635	29,453	39,270	49,090	58,905	.0850
6	28.274	7,069	14,137	28,274	42,411	56,548	70,685	84,822	.1224
7	38.485	9,621	19,243	38,485	57,728	76,970	96,213	115,455	.1666
8	50.265	12,566	25,133	50,265	75,398	100,530	125,663	150,795	.2176
10	78.540	19,635	39,270	78,540	117,810	157,080	196,350	235,620	.3400
12	113.097	28,275	56,550	113,10	169,650	226,200	282,750	339,300	.4896
14	153.938	38,485	76,970	153,940	230,910	307,880	384,850	461,820	.6664
16	201.06	50,265	100,530	201,060	301,590	402,120	502,650	603,180	.8704
18	254.47	63,617	127,235	254,470	381,705	508,940	636,175	753,410	1.1016
20	314.16	78,540	157,080	314,160	471,240	628,320	785,400	942,480	1.3600

Deductions for Push Stroke Force and Displacement

Piston Rod Area Sq. In.	Piston Rod Dia.	For Pull Stroke Deduct from the Push Force, the Force Corresponding to Rod Size and Pressure							Gallons Per Inch of Stroke
		250 PSI	500 PSI	1000 PSI	1500 PSI	2000 PSI	2500 PSI	3000 PSI	
5/8	.307	77	153	460	307	614	767	920	.00133
1	.785	196	393	1,178	785	1,571	1,963	2,356	.0034
1 1/8	1.485	371	742	2,227	1,485	2,970	3,712	4,455	.0067
1 1/4	2.405	601	1,203	3,608	2,405	4,811	6,013	7,216	.0104
2	3.142	785	1,571	4,712	3,142	6,283	7,855	9,425	.0136
2 1/2	4.909	1,227	2,454	7,363	4,909	9,817	12,270	14,726	.0212
3	7.069	1,767	3,534	10,603	7,069	14,137	17,672	21,206	.0306
3 1/2	9.621	2,405	4,811	14,432	9,621	19,242	24,053	28,863	.0417
4	12.566	3,142	6,283	18,849	12,566	25,132	31,415	37,698	.0544
4 1/2	15.904	3,976	7,952	23,856	15,904	31,808	39,760	47,712	.0688
5	19.635	4,909	9,818	29,453	19,635	39,270	49,090	58,905	.0850
5 1/2	23.758	5,940	11,879	35,637	23,758	47,516	59,395	71,274	.1028
7	38.485	9,621	19,243	57,728	38,485	76,970	96,213	115,455	.1666
8 1/2	56.745	14,186	28,373	85,118	56,745	113,490	141,863	170,235	.2456
10	78.540	19,635	39,270	117,810	78,540	157,080	196,350	235,620	.3400

Force (lbs) = Effective Piston Area (sq.in) x Pressure (psi)

Piston Speed (In./Min.) = $\frac{\text{Delivery (GPM)}}{\text{Cylinder Displacement (Gal./In.)}}$

Hydraulic Cylinder Port Sizes, Piston Speed and Cushions

A major factor involved in determining the speed of a hydraulic cylinder piston is the flow through connecting lines, generally expressed in gallons per minute (GPM) and measured as the input/exhaust flow through the cylinder cap end cover port. Due to fluid displacement of the piston rod; flow through the head end port will be less than the cap end port. Fluid velocity in connecting lines should be limited to 15 feet per second to minimize fluid turbulence, pressure drop, and hydraulic shock. The chart at the right can be used as a guide in determining whether standard cylinder ports are adequate for the application.

The data gives piston speed in feet per minute, by bore size for standard and oversize ports, with connecting lines using Schedule 80 pipe and fluid flow velocity is at 15 feet per second. If piston speed results in fluid flow in excess of 15 feet per second for port sizes listed, consider the use of larger lines up to the port, with two ports per end cover connected to provide the fluid flow required.

If heavy loads are involved, or piston speeds are in excess of 20 feet per minute, and the piston completes full stroke, cushions are recommended. Cylinder cushions increase cylinder life, reduce piston impact speeds, and hydraulic shock.

*Based on extra strong (Schedule 80) Pipe

•Oversize ports available

Special End covers may be required.

Cyl. Bore in Inches	Catalogue Standard Port			Oversize Port		
	Port Size (NPTF)	*G.P.M. Flow At 15 Ft Second	Piston Speed Ft Min	Port Size (NPTF)	*G.P.M. Flow At 15 Ft Second	Piston Speed Ft Min
1½	½	10.95	119	¾	20.22	220
2	½	10.95	67	¾	20.22	124
2½	½	10.95	43	¾	20.22	79
3¼	¾	20.22	47	1	33.63	78
4	¾	20.22	31	1	33.63	52
5	¾	20.22	20	1	33.63	33
6	1	33.63	23	1¼	58.85	40
7	1¼	58.85	29	1½	82.65	41
8	1½	82.65	32	2	138	53
10	2	138	34	●	-	-
12	2½	198.33	34	●	-	-
14	2½	198.33	25	●	-	-
16	3	308.83	30	●	-	-
18	3	308.83	23	●	-	-
20	3	308.83	19	●	-	-

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Viceroy Fluid Power

a division of Magnum Integrated Technologies Inc.
200 First Gulf Blvd, Brampton, ON, Canada, L6W4T5
Tel: 905-455-0402 Fax: 905-455-0422,
www.viceroyfluidpower.com