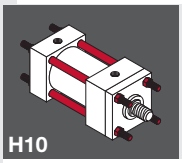
milwaukee Cylinder

Series H



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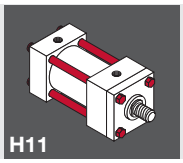

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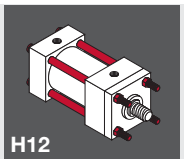

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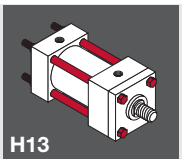

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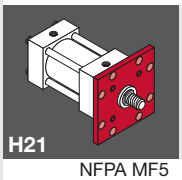

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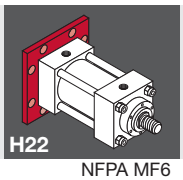

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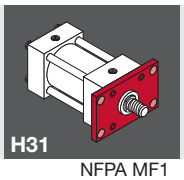

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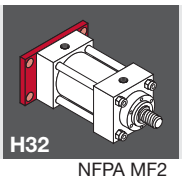

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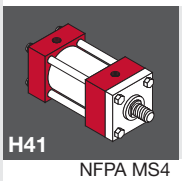

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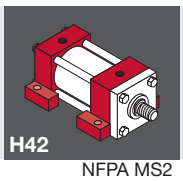

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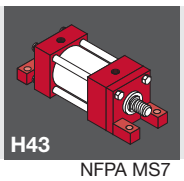

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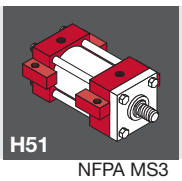

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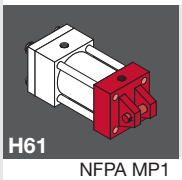

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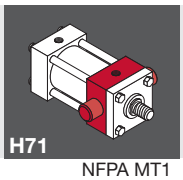

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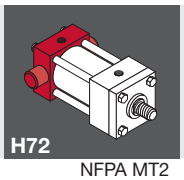

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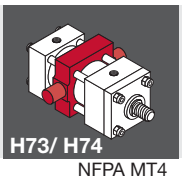

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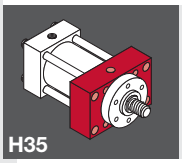
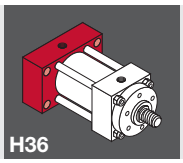


NFPA ME5



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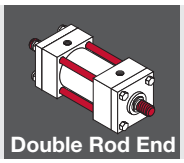
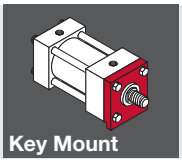


NFPA MDX



***Milwaukee Cylinder* Series H Hydraulic Cylinders** are built to perform on the toughest applications. Series H is a complete line of NFPA standard hydraulic tie rod cylinders, with maximum operating pressures up to 3000 psi on all standard bore sizes. If your application requires higher operating pressures, consult our engineers. Incorporating a variety of *Milwaukee Cylinder* exclusive advanced features proven through the years, these cylinders will provide a long, maintenance-free service life.

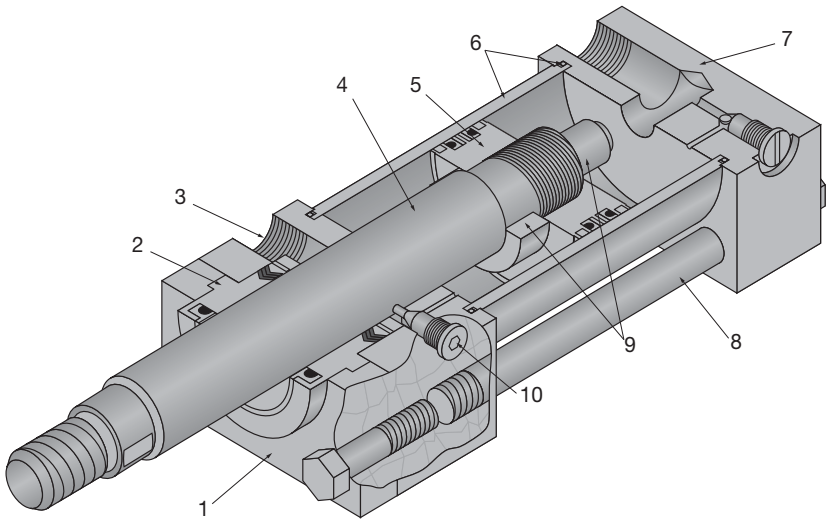
STANDARD SPECIFICATIONS

- Standard construction – square head – tie-rod design
- Nominal pressure – 3000 psi (See info box below for pressures higher than 3000 psi)
- Standard fluid-hydraulic oil
- Standard temperature – -20° F to +200° F
- Standard bore sizes – 1½" To 18"
- Standard piston rod diameters ⅝" thru 7"
- Standard mounting styles– 18 standard styles and custom designs to suit your needs
- Strokes – available in any practical stroke length
- Cushions – available at either end or both ends of stroke
- Standard 7 rod end styles and specials designed to order
- Rod end style KK_2 is studded as standard for ⅝" and 1" diameter rods. Studded rod end style is available for all rod sizes

If your hydraulic operating pressure exceeds 3000 psi, send your application data for engineering evaluation and design recommendations.

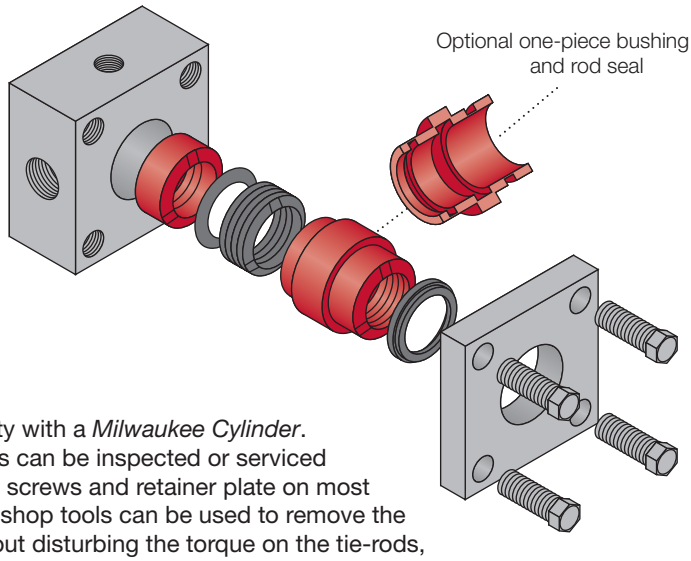
***MilCad* Cylinder Configurator**

Visit **milwaukeecylinder.com** to configure and download CAD files of your cylinders.



STANDARD FEATURES

1. **Removable Retainer Plate**
   The retainer plate and rod bushing are externally removable without disassembling the cylinder on most standard models. Four capscrews securely hold and lock the retainer plate in place.
2. **Rod Bushing and Seals**
   A combination of spring loaded multiple lip vee rings with a supporting bronze bushing is standard in *Milwaukee Cylinder* Series H Cylinders.
3. **Ports**
   Large NPTF cylinder ports are standard and can be located to customer requirements. SAE ports optional.
4. **Piston Rod**
   The piston rod is of high strength steel, hardened and plated to resist scoring and corrosion, assuring maximum life.
5. **Piston**
   The piston is of fine grained alloy iron, incorporating a combination of u-cup seals and cast iron rings, ensuring non-leak Hi-Lo pressure performance. The piston is pilot fitted and threaded to the rod.
6. **Cylinder Barrel and Seals**
   The barrel is of steel tubing, honed to a fine finish to assure superior sealing, minimum friction and maximum seal life. It is step cut on the O.D. of both ends for an O-Ring and molded back-up washer. *Milwaukee Cylinder*'s unique non-extrusion barrel seal design provides a positive leak tight seal.
7. **End Caps**
   End caps and mountings are of high quality steel, precision machined for accurate mounting.
8. **Tie-Rods and Nuts**
   The tie-rods are constructed from a high quality medium carbon steel. On most sizes the threads are rolled for rigid engagement of the self-locking nuts.
9. **Cushions**
   Cushions are machined to close tolerance to provide positive, smooth deceleration at the end of stroke. On all bore sizes, we provide the longest cushion possible based on the rod size and blind end caps. Longer cushions are available; for further information, consult factory.
10. **Cushion Needle Adjustment and Ball Check**
    The cushion needle adjustment valve and cushion-check ball retainer screw are specifically designed to provide full cushion adjustment.



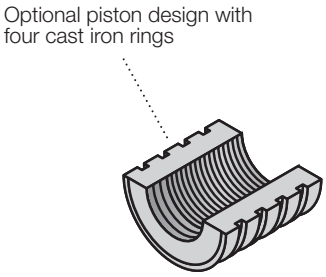
Simple Maintenance…

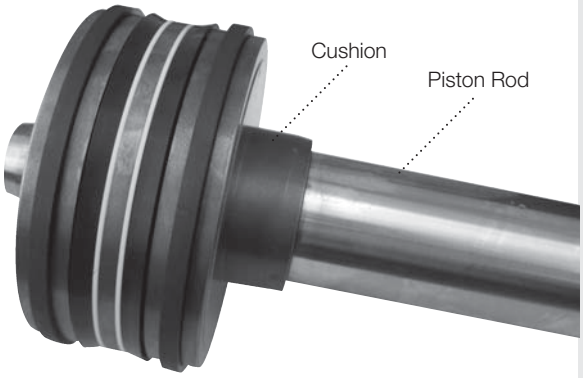
Simple maintenance is reality with a *Milwaukee Cylinder*. The rod bushing or rod seals can be inspected or serviced by merely removing the cap screws and retainer plate on most models. Standard available shop tools can be used to remove the rod bushing and seals without disturbing the torque on the tie-rods, assuring performance quality with maintenance ease.

COMBINATION ROD SEAL DESIGN…

The Series H cylinder combines spring loaded multiple lip vee rings with a supporting bronze bearing ring bushing and a double lip wiper as a secondary seal. This proven rod seal design combination is effective at both high and low pressures. It affords maximum sealing and an extra long bearing support.

As an optional design, a one-piece rod bushing with a double lip u-cup rod seal and a double lip wiper is available. Metallic rod scrapers may be supplied on request, in place of the double lip wiper with either rod bushing design.





Cushions…

The cushion is of a high-grade alloy, precision machined and specially tapered to provide smooth deceleration of the piston at the end of stroke.

A standard manufacturing process at *Milwaukee Cylinder* is to assemble the piston, cushion, and the piston rod; placing the assembly between centers and checking the critical diameters for concentricity.

Piston Rod…

The piston rod is hardened, plated high strength steel, machined and processed to resist scoring and corrosion, assuring maximum life. *Milwaukee Cylinder* offers seven rod end styles as standard. **The style #2 rod end with two wrench flats is furnished as standard** unless otherwise specified. Special rod ends and extra wrench flats are also available. They must be specified at the time of order, giving the dimensional requirements and the location of additional wrench flats.

COMBINATION SEALING ROD

The Series H Cylinder combines two bi-directional sealing cast iron piston rings, with u-cup seals with back-up rings and a fine grained alloy iron piston. This proven piston seal design is effective at both high and low pressures. The design gives the wear and shock absorbing quantities of cast iron and the near zero leakage of the u-cup seals.

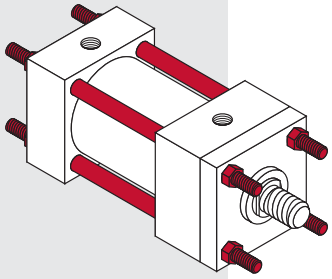
As an optional design, a piston using four low friction cast iron rings is available.

For Package and Mounting Dimension see Tables 1H and 2H.

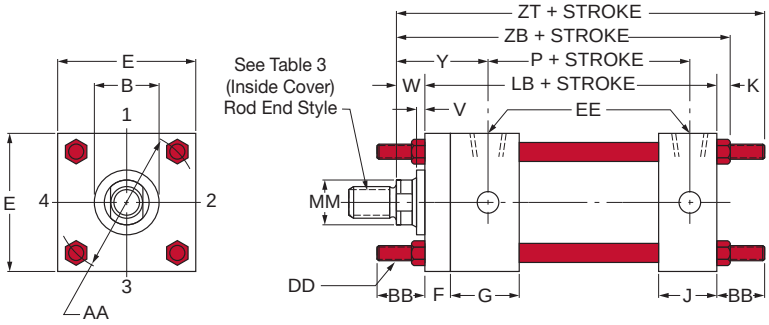
TIE-ROD MOUNTED CYLINERS

Tie-rod mounts are suited for many applications and are similar to flange mounts, but tie-rod mounts are not as rigid as the flange type of mounting. The best use of tie rods extended on the blind end is in a thrust load application. When using tie rods extended on the rod end, the best application is a tension load. When long strokes are required, the free end should be supported to prevent misalignment, sagging or possible binding of the cylinder.

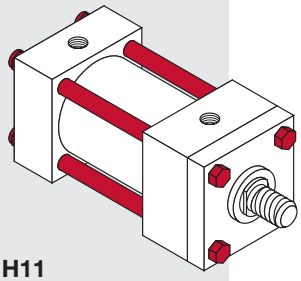
TIE RODS EXTENDED BOTH ENDS



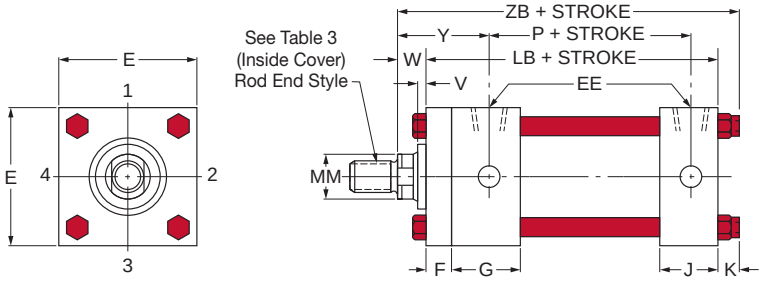
MODEL H10
NFPA STYLE MX1



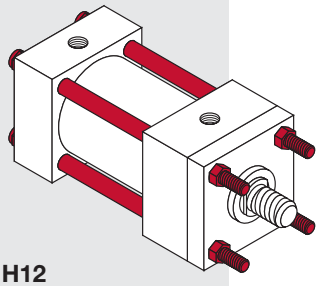
NO TIE ROD EXTENSION



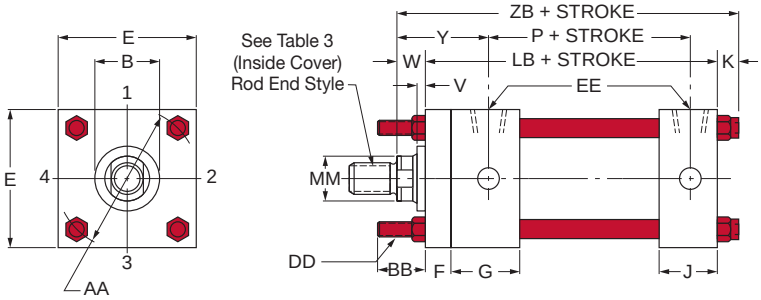
MODEL H11
NFPA STYLE MX0



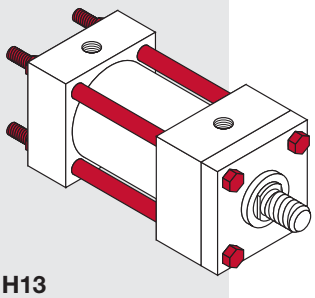
TIE RODS EXTENDED ROD END



MODEL H12
NFPA STYLE MX3



TIE RODS EXTENDED BLIND END



MODEL H13
NFPA STYLE MX2

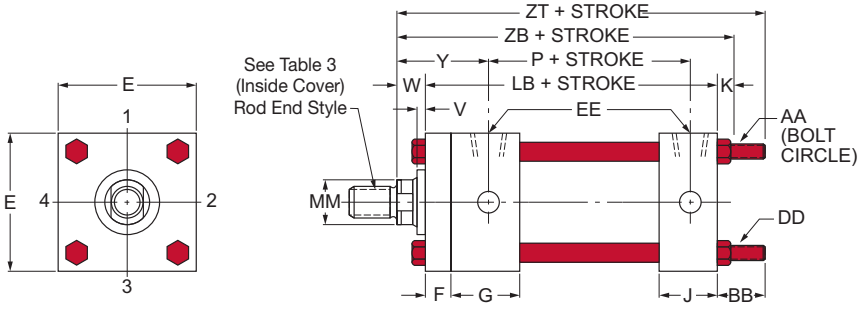


TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	B	LB	P	V	W	Y	ZB	ZT
1½	5/8	H00151	1 1/8	5	2 7/8	1/4	5/8	2	6 1/8	7
	1	H00152	1 1/2			1/2	1	2 3/8	6 1/2	7 3/8
2	1	H01510	1 1/2	5 1/4	2 7/8	1/4	3/4	2 3/8	6 5/8	7 13/16
	1 3/8	H01511	2			3/8	1	2 5/8	6 7/8	8 1/16
2½	1	H01520	1 1/2	5 3/8	3	1/4	3/4	2 3/8	6 3/4	7 15/16
	1 3/8	H01521	2			3/8	1	2 5/8	7	8 3/16
	1 3/4	H01522	2 3/8			1/2	1 1/4	2 7/8	7 1/4	8 7/16
3¼	1 3/8	H01530	2	6 1/4	3 19/32	1/4	7/8	2 23/32	7 7/8	9 7/16
	1 3/4	H01531	2 3/8			3/8	1 1/8	2 31/32	8 1/8	9 11/16
	2	H01532	2 5/8			3/8	1 1/4	3 3/32	8 1/4	9 13/16
4	1 3/4	H01540	2 3/8	6 5/8	3 7/8	1/4	1	2 15/16	8 3/8	9 15/16
	2	H01541	2 5/8			1/4	1 1/8	3 1/16	8 1/2	10 1/16
	2 1/2	H01542	3 1/8			3/8	1 3/8	3 5/16	8 3/4	10 5/16
5	2	H01550	2 5/8	7 1/8	4 3/8	1/4	1 1/8	3 1/16	9 1/4	11 7/16
	2 1/2	H01551	3 1/8			3/8	1 3/8	3 5/16	9 1/2	11 11/16
	3	H01552	3 3/4			3/8	1 3/8	3 5/16	9 1/2	11 11/16
	3 1/2	H01553	4 1/4			3/8	1 3/8	3 5/16	9 1/2	11 11/16
6	2 1/2	H01560	3 1/8	8 3/8	5	1/4	1 1/4	3 7/16	10 3/4	13 1/4
	3	H01561	3 3/4							
	3 1/2	H01562	4 1/4							
	4	H01563	4 3/4							
7	3	H01570	3 3/4	9 1/2	5 1/2	1/4	1 1/4	3 3/4	12	14 7/8
	3 1/2	H01571	4 1/4							
	4	H01572	4 3/4							
	4 1/2	H01573	5 1/4							
	5	H01574	5 3/4							
8	3 1/2	H01580	4 1/4	10 1/2	6 1/4	1/4	1 1/4	3 7/8	13 1/4	16 1/4
	4	H01581	4 3/4							
	4 1/2	H01582	5 1/4							
	5	H01583	5 3/4							
	5 1/2	H01584	6 1/4							
10	4 1/2	H15100	5 1/4	13 13/16	8 1/2	1/4	1 1/4	4 3/4	16 11/16	21 1/16
	5	H15101	5 3/4			1/2	1 1/2	5	16 15/16	21 5/16
	5 1/2	H15102	6 1/4			1/2	1 1/2	5	16 15/16	21 5/16
12	5 1/2	H15120	6 1/4	16 7/16	9 7/8	1/4	1 1/4	5 1/2	19 9/16	24 11/16
	7	H15121	8							

For bore diameter sizes 14" to 18" see next page.

TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	AA	BB	DD	E	EE NPT	EE SAE	F	G	J	K
1½	2.3	1 3/8	3/8-24	2 1/2	1/2	#10	3/8	1 3/4	1 1/2	1/2
2	2.9	1 13/16	1/2-20	3	1/2	#10	5/8	1 3/4	1 1/2	5/8
2½	3.6	1 13/16	1/2-20	3 1/2	1/2	#10	5/8	1 3/4	1 1/2	5/8
3¼	4.6	2 5/16	5/8-18	4 1/2	3/4	#12	3/4	2	1 3/4	3/4
4	5.4	2 5/16	5/8-18	5	3/4	#12	7/8	2	1 3/4	3/4
5	7.0	3 3/16	7/8-14	6 1/2	3/4	#12	7/8	2	1 3/4	1
6	8.1	3 5/8	1-14	7 1/2	1	#16	1	2 1/4	2 1/4	1 1/8
7	9.3	4 1/8	1 1/8-12	8 1/2	1 1/4	#20	1	2 3/4	2 3/4	1 1/4
8	10.6	4 1/2	1 1/4-12	9 1/2	1 1/2	#24	1	3	3	1 1/2
10	13.62	6	1 3/4-12	12 5/8	2	#24	1 11/16	3 11/16	3 11/16	1 5/8
12	16.25	7	2-12	14 7/8	2 1/2	#32	1 15/16	4 7/16	4 7/16	1 7/8

HOW TO ORDER

For ordering information refer to Page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DH00151. (Refer to page 26.)

Rod End Styles and Dimensions

For rod end styles and dimensions see Table 3 in the inside cover of catalog.

Page ii

***MilCad* Cylinder Configurator**

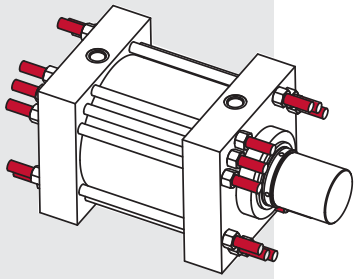
Visit **milwaukeecylinder.com** to configure and download CAD files of your cylinders.

For Package and Mounting Dimension see Tables 1H and 2H.

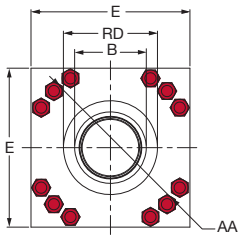
TIE ROD MOUNTED CYLINDERS

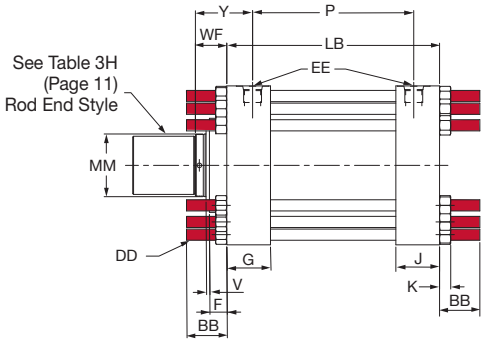
Tie rod mounts are suited for many applications and are similar to flange mounts, but tie-rod mounts are not as rigid as the flange type of mounting. The best use of tie rods extended on the blind end is in a thrust load application. When using tie rod extended on the rod end, the best application is a tension load. When long strokes are required, the free end should be supported to prevent misalignment, sagging or possible binding of the cylinder.

TIE RODS EXTENDED BOTH ENDS

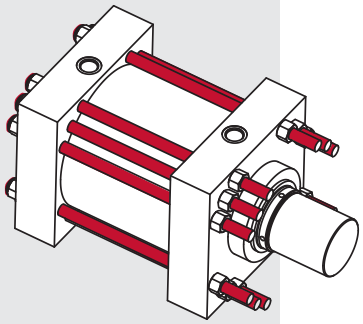


MODEL HM10

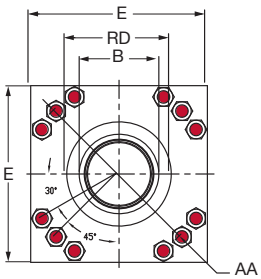


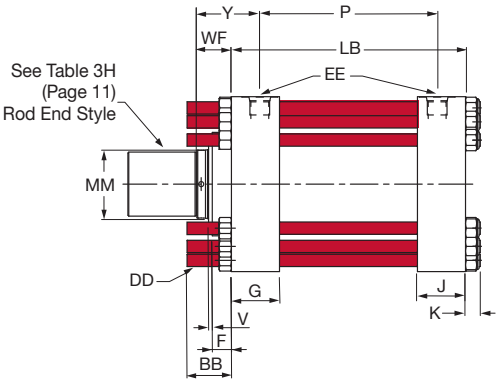


TIE RODS EXTENDED ROD END

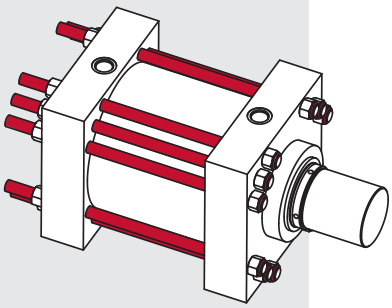


MODEL HM12

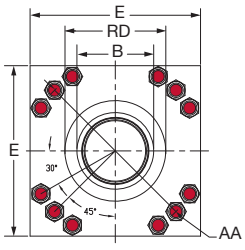


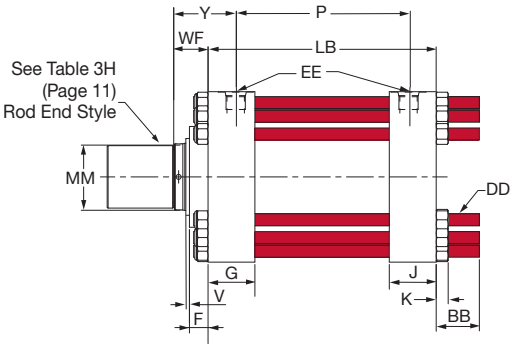


TIE RODS EXTENDED BLIND END



MODEL HM13





▼ TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	B	LB	P	V	WF	Y	RD
14	7	HM15140	8	15⅝	10⅝	¼	3½	6	10½
	8	HM15141	9			¼	4	6½	11½
	10	HM15142	-			-	6	8½	14½
16	8	HM15160	9	18⅝	11⅞	¼	4	7⅜	11½
	9	HM15161	-			-	5⅝	9	13⅞
	10	HM15162	-			-	6	9⅜	14½
18	9	HM15180	-	22	13¾	-	5⅝	9¾	13⅞
	10	HM15181	-			-	6	10⅛	14½

▼ TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	AA	BB	DD	E	EE SAE	G	J	K
14	17.88	4½	1¼-12	17¾	#24	4⅞	4⅞	1½
16	20.25	5	1⅜-12	20¼	#24	5⅞	5⅞	1⅝
18	22.63	5½	1½-12	22¼	#24	6⅞	6⅞	1⅞

LARGE BORE CYLINDERS

NOTE: Large bore Series H cylinders (14", 16" and 18") must use Table 3H for accurate piston rod end dimensions.

▼ TABLE 3H - Piston Rod Ends

Bore Ø	Rod MM	Thread KK	A	B +.000 -.005	F	NA	V	WF
14	7	5½-12	7	8	1 15/16	6⅞	¼	3½
	8	5¾-12	8	9	1 15/16	7⅞	¼	4
	10	7¼-12	10	-	3½	9⅞	-	6
16	8	5¾-12	8	9	1 15/16	7⅞	¼	4
	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6
18	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6

HOW TO ORDER

For ordering information refer to Page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DHM15140. (Refer to page 26.)

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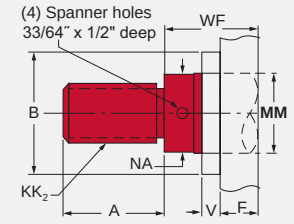
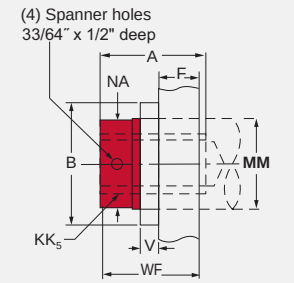
PISTON ROD END STYLES

STYLE KK2



ROD END STYLE CODE NO. 2

STYLE KK5



ROD END STYLE CODE NO. 5

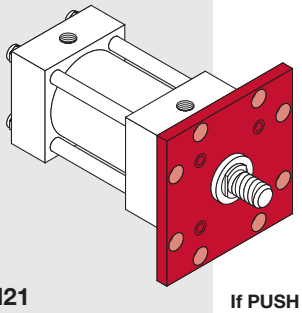
For Package and Mounting Dimension see Tables 1H and 2H.

FLANGE MOUNTED CYLINDERS

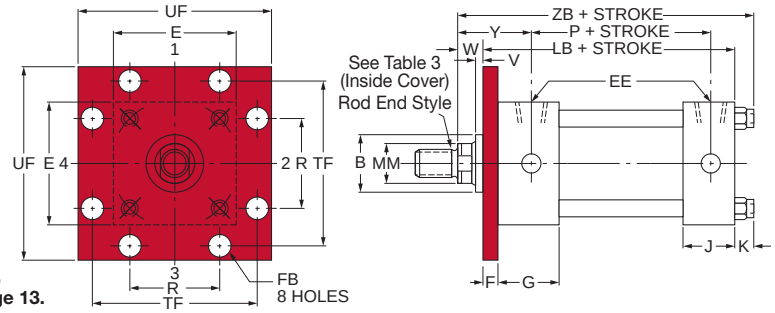
The flange mount is one of the strongest, most rigid methods of mounting. With this type of mount there is little allowance for misalignment, though when long strokes are required, the free end opposite the mounting should be supported to prevent sagging and possible binding of the cylinder. The best use of a blind end flange is in a thrust load application (rod in compression).

Rod end flange mounts are best used in tension applications. If an application exceeds the rectangular flange rating, requiring an extra heavy flange, a solid flange style end cap mount is available for all bore sizes (refer to page 22). When a less rigid mount can be used and the cylinder can be attached to a panel or bulkhead, an extended tie-rod mounting could be considered.

ROD SQUARE FLANGE MOUNTING



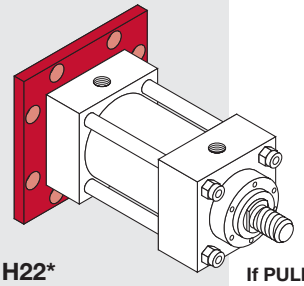
MODEL H21
NFPA STYLE MF5



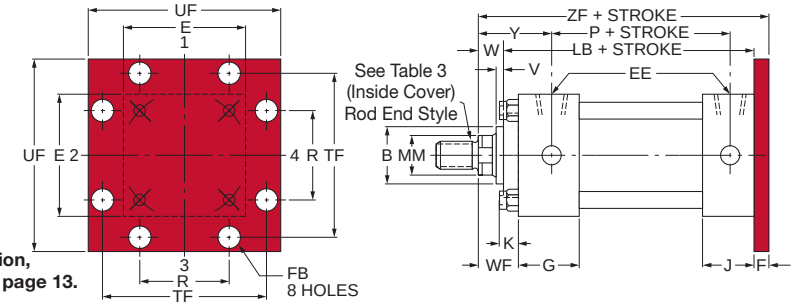
If PUSH application, see Table 3H on page 13.

Shown with circular retainer.
Retainer is square <3¼" bore.

BLIND SQUARE FLANGE MOUNTING

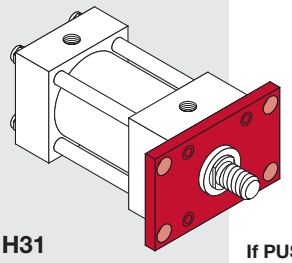


MODEL H22*
NFPA STYLE MF6

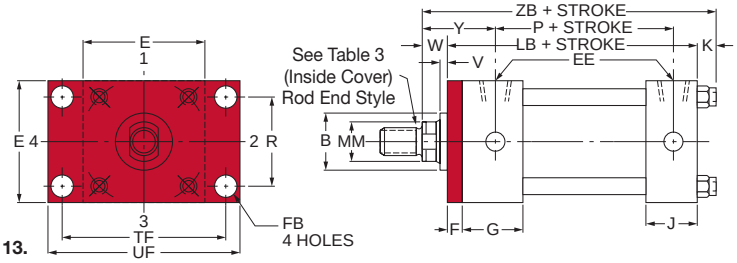


If PULL application, see Table 3H on page 13.

ROD RECTANGULAR FLANGE MOUNTING

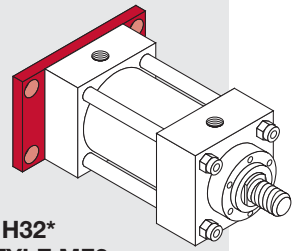


MODEL H31
NFPA STYLE MF1

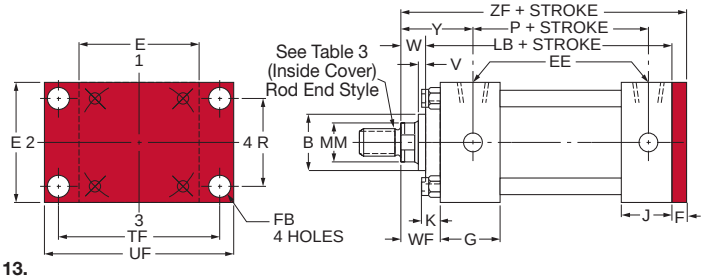


If PUSH application, see Table 3H on page 13.

BLIND RECTANGULAR FLANGE MOUNTING



MODEL H32*
NFPA STYLE MF2



If PULL application, see Table 3H on page 13.

▼ TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	B	LB	P	V	W	WF	Y	ZB	ZF
1½	5/8	H00151	1 1/8	5	2 7/8	1/4	5/8	–	2	6 1/8	6
	1*	H00152	1½			½	1		2 3/8	6½	6 3/8
2	1	H01510	1½	5 1/4	2 7/8	1/4	3/4	–	2 3/8	6 5/8	6 5/8
	1 3/8*	H01511	2			3/8	1		2 5/8	6 7/8	6 7/8
2½	1	H01520	1½	5 3/8	3	1/4	3/4	–	2 3/8	6 3/4	6 3/4
	1 3/8	H01521	2			3/8	1		2 5/8	7	7
	1 3/4*	H01522	2 3/8			½	1 1/4		2 7/8	7 1/4	7 1/4
3¼	1 3/8	H01530	2	6 1/4	3 19/32	1/4	7/8	1 5/8	2 23/32	7 7/8	7 7/8
	1 3/4	H01531	2 3/8			3/8	1 1/8	1 7/8	2 31/32	8 1/8	8 1/8
	2	H01532	2 5/8			3/8	1 1/4	2	3 3/32	8 1/4	8 1/4
4	1 3/4	H01540	2 3/8	6 5/8	3 7/8	1/4	1	1 7/8	2 15/16	8 3/8	8½
	2	H01541	2 5/8			1/4	1 1/8	2	3 1/16	8½	8 5/8
	2½	H01542	3 1/8			3/8	1 3/8	2 1/4	3 5/16	8 3/4	8 7/8
5	2	H01550	2 5/8	7 1/8	4 3/8	1/4	1 1/8	2	3 1/16	9 1/4	9 1/8
	2½	H01551	3 1/8			3/8	1 3/8	2 1/4	3 5/16	9½	9 3/8
	3	H01552	3 3/4			3/8	1 3/8	2 1/4	3 5/16	9½	9 3/8
	3½	H01553	4 1/4			3/8	1 3/8	2 1/4	3 5/16	9½	9 3/8
6	2½	H01560	3 1/8	8 3/8	5	1/4	1 1/4	2 1/4	3 7/16	10 3/4	10 5/8
	3	H01561	3 3/4								
	3½	H01562	4 1/4								
	4	H01563	4 3/4								
7	3	H01570	3 3/4	9½	5½	1/4	1 1/4	2 1/4	3 3/4	12	11 3/4
	3½	H01571	4 1/4								
	4	H01572	4 3/4								
	4½	H01573	5 1/4								
	5	H01574	5 3/4								
8	3½	H01580	4 1/4	10½	6 1/4	1/4	1 1/4	2 1/4	3 7/8	13 1/4	12 3/4
	4	H01581	4 3/4								
	4½	H01582	5 1/4								
	5	H01583	5 3/4								
	5½	H01584	6 1/4								
10	4½	H15100	5 1/4	13 13/16	8½	1/4	1 1/4	–	4 3/4	16 11/16	16 3/4
	5	H15101	5 3/4			½	1½		5	16 15/16	17
	5½	H15102	6 1/4			½	1½		5	16 15/16	17
12	5½	H15120	6 1/4	16 7/16	9 7/8	1/4	1 1/4	–	5½	19 9/16	19 5/8
	7	H15121	8								

For bore diameter sizes 14" to 18" see pages 24 and 25 (solid end cap mount).

▼ TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	E	EE NPT	EE SAE	F	FB	G	J	K	R	TF	UF
1½	2½	½	#10	3/8	7/16	1 3/4	1½	½	1.63	3 7/16	4 1/4
2	3	½	#10	5/8	9/16	1 3/4	1½	5/8	2.05	4 1/8	5 1/8
2½	3½	½	#10	5/8	9/16	1 3/4	1½	5/8	2.55	4 5/8	5 5/8
3¼	4½	3/4	#12	3/4	11/16	2	1 3/4	3/4	3.25	5 7/8	7 1/8
4	5	3/4	#12	7/8	11/16	2	1 3/4	3/4	3.82	6 3/8	7 5/8
5	6½	3/4	#12	7/8	15/16	2	1 3/4	1	4.95	8 3/16	9 3/4
6	7½	1	#16	1	1 1/16	2 1/4	2 1/4	1 1/8	5.73	9 7/16	11 1/4
7	8½	1 1/4	#20	1	1 3/16	2 3/4	2 3/4	1 1/4	6.58	10 5/8	12 5/8
8	9½	1½	#24	1	1 5/16	3	3	1½	7.50	11 13/16	14
10	12 5/8	2	#24	1 11/16	1 13/16	3 11/16	3 11/16	1 5/8	9.62	15 7/8	19
12	14 7/8	2½	#32	1 15/16	2 1/16	4 7/16	4 7/16	1 7/8	11.45	18½	22

HOW TO ORDER

For ordering information refer to Page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DH00151. (Refer to page 26.)

* Removable retainer not available for these bore and rod combinations in the H22 and H32 mounting styles.

Rod End Styles and Dimensions

For rod end styles and dimensions see Table 3 in the inside cover of catalog.

Page ii

▼ TABLE 3H

Recommended Pressure Rating

Bore Ø	Standard Flange PSI Rating	3000 PSI Required Flange Thickness
1½-4	3000	Standard
5	2200	1
6	1500	1½
7	1100	1¾
8	800	2
10	1300	2½
12	1000	3

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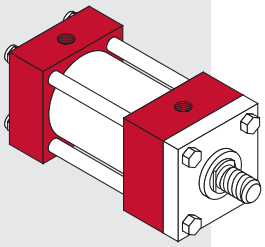
For Package and Mounting Dimension see Tables 1H and 2H.

SIDE OR LUG MOUNTED CYLINDERS

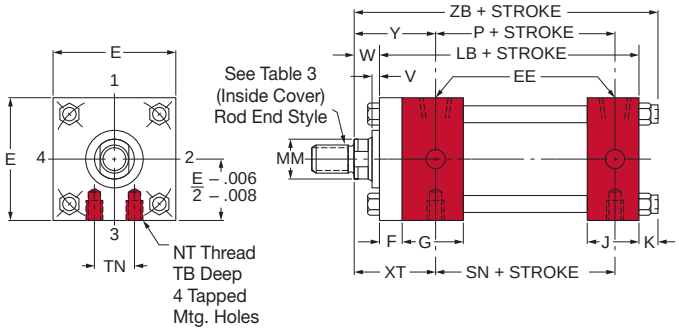
The side or lug mounted cylinder provides a fairly rigid mount. These types of cylinders can tolerate a slight amount of misalignment when the cylinder is at full stroke, but as the piston moves toward the blind end, the tolerance for misalignment decreases. It is important to note that if the cylinder is used properly (without misalignment), the mounting bolts are either in simple shear or tension without any compound stresses.

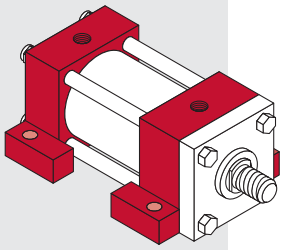
Shown with square retainer. Retainer is circular on bore size 3¼" and larger.



MODEL H41
NFPA STYLE MS4

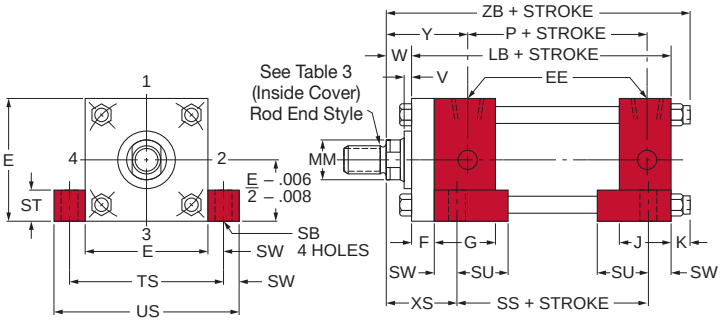
TAPPED HOLES IN CAPS FLUSH MOUNTING



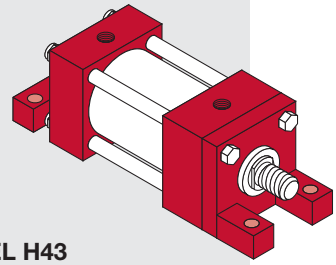


MODEL H42
NFPA STYLE MS2

SIDE LUG MOUNTING

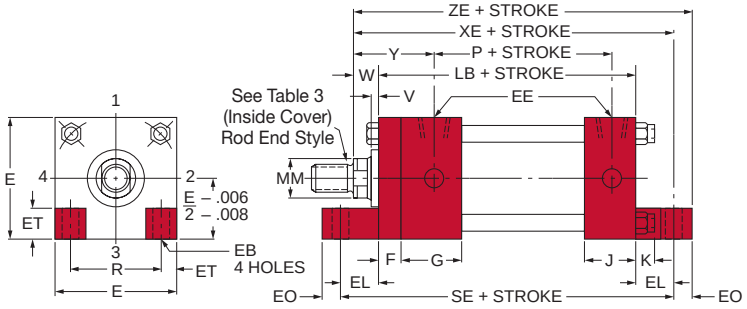


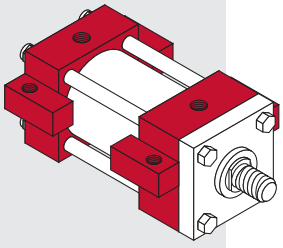
Not Available With Removable Retainers.



MODEL H43
NFPA STYLE MS7

FOOT MOUNTING





MODEL H51
NFPA STYLE MS3

CENTERLINE LUG MOUNTING

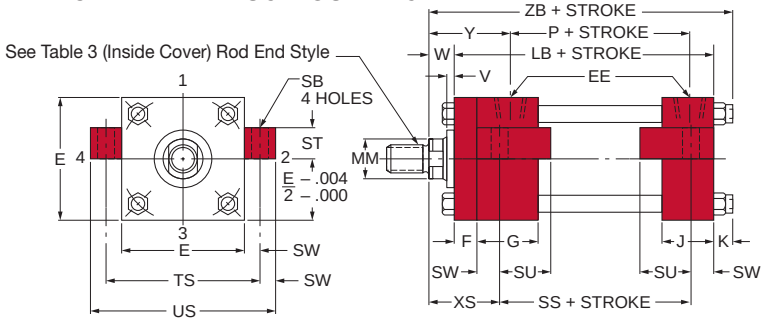


TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	P	LB	SE ▲	SN	SS ■	V	W	XE	XS	XT	Y	ZB	ZE
1½	⅝	H00151	2⅞	5	6¾	2⅞	3⅞	¼	⅝	6½	1⅜	2	2	6⅛	6⅞
	†1*	H00152						½	1	6⅞	1¾	2⅜	2⅜	6½	7¼
2	1	H01510	2⅞	5¼	7⅛	2⅞	3⅝	¼	¾	6 15/16	1⅞	2⅜	2⅜	6⅝	7 7/16
	†1⅜*	H01511						⅜	1	7 3/16	2⅛	2⅝	2⅝	6⅞	7 11/16
2½	1	H01520	3	5⅜	7¼	3	3⅜	¼	¾	7 1/16	2 1/16	2⅜	2⅜	6¾	7 9/16
	1⅜*	H01521						⅜	1	7 15/16	2 5/16	2⅝	2⅝	7	7 13/16
	†1¾*	H01522						½	1¼	7 9/16	2 9/16	2⅞	2⅞	7¼	8 1/16
3¼	1⅜	H01530	3 19/32	6¼	8½	3½	4⅛	¼	⅞	8¼	2 5/16	2¾	2 23/32	7⅞	8⅞
	1¾	H01531						⅜	1⅛	8½	2 9/16	3	2 31/32	8⅛	9⅛
	†2*	H01532						⅜	1¼	8⅝	2 11/16	3⅛	3 3/32	8¼	9¼
4	1¾	H01540	3⅞	6⅝	8⅞	3¾	4	¼	1	8¾	2¾	3	2 15/16	8⅜	9⅜
	2*	H01541						¼	1⅛	8⅞	2⅞	3⅛	3 1/16	8½	9½
	2½*	H01542						⅜	1⅜	9⅛	3⅛	3⅞	3 5/16	8¾	9¾
5	2	H01550	4⅜	7⅛	10⅛	4⅜	4½	¼	1⅛	9¾	2⅞	3⅛	3 1/16	9¼	10½
	2½	H01551						⅜	1⅜	10	3⅛	3⅜	3 5/16	9½	10¾
	3	H01552						⅜	1⅜	10	3⅛	3⅜	3 5/16	9½	10¾
	3½*	H01553						⅜	1⅜	10	3⅛	3⅜	3 5/16	9½	10¾
6	2½	H01560	5	8⅜	10¾	5	5⅛	¼	1¼	11 5/16	3⅜	3½	3 7/16	10¾	12 13/16
	3	H01561													
	3½	H01562													
	4*	H01563													
7	3	H01570	5½	9½	13⅛	5½	5¾	¼	1¼	12 9/16	3⅝	3 13/16	3¾	12	13½
	3½	H01571													
	4	H01572													
	4½*	H01573													
	5*	H01574													
8	3½	H01580	6¼	10½	14½	6¼	6¾	¼	1¼	13¾	3⅝	3 15/16	3⅞	13¼	14⅞
	4	H01581													
	4½	H01582													
	5	H01583													
	5½*	H01584													
10	4½	H15100	8½	13 13/16	–	8½	8⅞	¼	1¼	–	4 9/16	5	4¾	16 11/16	–
	5	H15101						½	1½		4 13/16	5¼	5	16 15/16	
	5½	H15102						½	1½		4 13/16	5¼	5	16 15/16	
12	5½	H15120	9⅞	16 7/16	–	10⅛	10½	¼	1¼	–	5 3/16	5¾	5½	19 9/16	–
	7	H15121													

HOW TO ORDER

For ordering information refer to page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DH00151. (Refer to page 26.)

* Tapped holes on H41 rod end cap have a shallower TB depth in these sizes.

† The standard rod eye or rod clevis will interfere with foot lugs on Model H43. When these rod end accessories are required, use additional rod extension.

▲ For double rod end cylinders from 1½" thru 5" bore, add ¼ + F to this dimension.

■ For double rod end cylinders from 1½" thru 5" bore, add ¼ to this dimension.

Rod End Styles and Dimensions

For rod end styles and dimensions see Table 3 in the inside cover of catalog.

Page ii

***MilCad* Cylinder Configurator**

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▼ TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

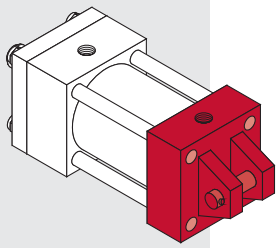
Bore Ø	E	EB	EE NPT	EE SAE	EL	EO	ET	F	G	J	K	NT	R	SB	ST	SU	SW	TB	TN	TS	US
1½	2½	7/16	½	#10	⅞	⅜	¾	⅜	1¾	1½	½	⅜-16	1.63	7/16	½	15/16	⅜	9/16	¾	3¼	4
2	3	9/16	½	#10	15/16	½	⅞	⅝	1¾	1½	⅝	½-13	2.05	9/16	¾	1¼	½	⅝	15/16	4	5
2½	3½	9/16	½	#10	15/16	½	⅞	⅝	1¾	1½	⅝	⅝-11	2.55	13/16	1	1 9/16	1 1/16	⅞	1 5/16	4⅞	6¼
3¼	4½	1 1/16	¾	#12	1⅛	⅝	1⅛	¾	2	1¾	¾	¾-10	3.25	13/16	1	1 9/16	1 1/16	1	1½	5⅞	7¼
4	5	1 1/16	¾	#12	1⅛	⅝	1⅛	⅞	2	1¾	¾	1-8	3.82	1 1/16	1¼	2	⅞	1⅜	2 1/16	6¾	8½
5	6½	15/16	¾	#12	1½	¾	1½	⅞	2	1¾	1	1-8	4.95	1 1/16	1¼	2	⅞	1½	2 15/16	8¼	10
6	7½	1 1/16	1	#16	1 11/16	13/16	1⅝	1	2¼	2¼	1⅛	1¼-7	5.73	1 5/16	1½	2½	1⅛	1¾	3 5/16	9¾	12
7	8½	1 3/16	1¼	#20	1 13/16	15/16	1¾	1	2¾	2¾	1¼	1½-6	6.58	1 9/16	1¾	2⅞	1⅜	1⅞	3¾	11¼	14
8	9½	1 5/16	1½	#24	2	1⅛	2	1	3	3	1½	1½-6	7.50	1 9/16	1¾	2⅞	1⅜	1⅞	4¼	12¼	15
10	12⅝	–	2	#24	–	–	–	1 11/16	3 11/16	3 11/16	1⅝	1½-6	9.62	1 9/16	2¼	3½	1⅝	2¼	5¾	15⅞	19⅛
12	14⅞	–	2½	#32	–	–	–	1 15/16	4 7/16	4 7/16	1⅞	1½-6	11.45	1 9/16	3	4¼	2	2¼	7¼	18⅞	22⅞

For Package and Mounting Dimension see Tables 1H and 2H.

PIN AND TRUNNION MOUNTED CYLINDERS

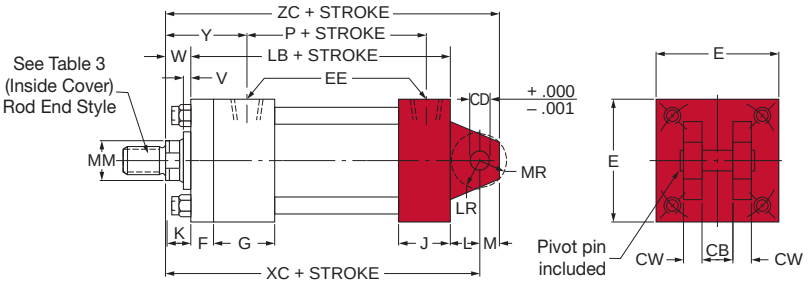
All pin and trunnion cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

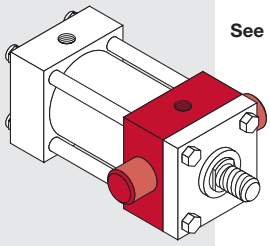
Shown with square retainer.
Retainer is circular on bore sizes of 3¼" and larger.



MODEL H61
NFPA STYLE MP1

CLEVIS MOUNT

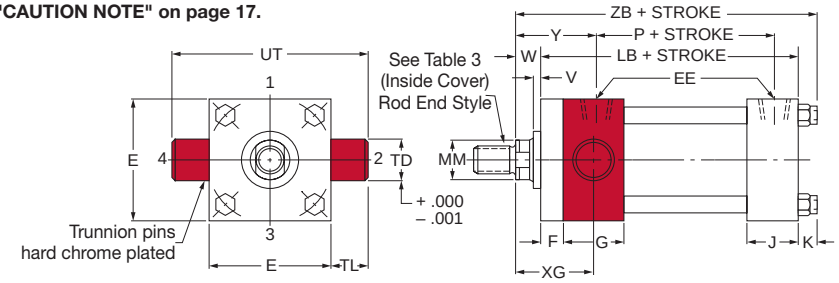


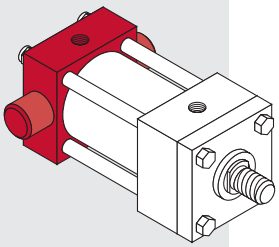


MODEL H71
NFPA STYLE MT1

ROD END TRUNNION MOUNT

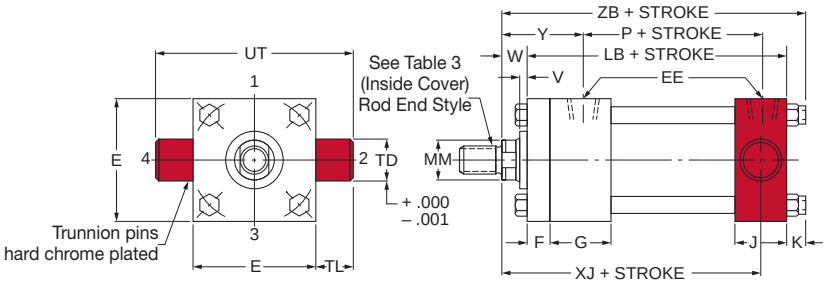
See "CAUTION NOTE" on page 17.

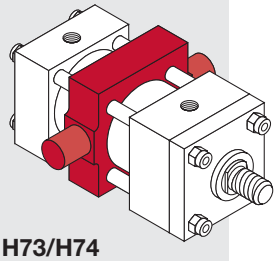




MODEL H72
NFPA STYLE MT2

BLIND END TRUNNION MOUNT

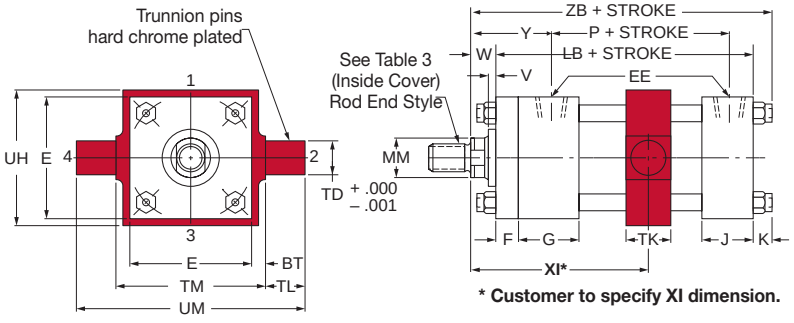




MODEL H73/H74
NFPA STYLE MT4

H73 is an exclusive Milwaukee Cylinder design.
H74 is the Industry "Standard" design.

CENTER TRUNNION MOUNT



*** Customer to specify XI dimension.**

▼ TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	P	LB	V	W	XC	XG	XJ	Y	ZB	ZC
1½	5/8	H00151	2 7/8	5	1/4	5/8	6 3/8	1 7/8	4 7/8	2	6 1/8	6 7/8
	1*	H00152			1/2	1	6 3/4	2 1/4	5 1/4	2 3/8	6 1/2	7 1/4
2	1	H01510	2 7/8	5 1/4	1/4	3/4	7 1/4	2 1/4	5 1/4	2 3/8	6 5/8	8
	1 3/8*	H01511			3/8	1	7 1/2	2 1/2	5 1/2	2 5/8	6 7/8	8 1/4
2½	1	H01520	3	5 3/8	1/4	3/4	7 3/8	2 1/4	5 3/8	2 3/8	6 3/4	8 1/8
	1 3/8	H01521			3/8	1	7 5/8	2 1/2	5 5/8	2 5/8	7	8 3/8
	1 3/4*	H01522			1/2	1 1/4	7 7/8	2 3/4	5 7/8	2 7/8	7 1/4	8 5/8
3¼	1 3/8	H01530	3 19/32	6 1/4	1/4	7/8	8 5/8	2 5/8	6 1/4	2 23/32	7 7/8	9 5/8
	1 3/4	H01531			3/8	1 1/8	8 7/8	2 7/8	6 1/2	2 31/32	8 1/8	9 7/8
	2	H01532			3/8	1 1/4	9	3	6 5/8	3 3/32	8 1/4	10
4	1 3/4	H01540	3 7/8	6 5/8	1/4	1	9 3/4	2 7/8	6 3/4	2 15/16	8 3/8	11 1/8
	2	H01541			1/4	1 1/8	9 7/8	3	6 7/8	3 1/16	8 1/2	11 1/4
	2 1/2	H01542			3/8	1 3/8	10 1/8	3 1/4	7 1/8	3 5/16	8 3/4	11 1/2
5	2	H01550	4 3/8	7 1/8	1/4	1 1/8	10 1/2	3	7 3/8	3 1/16	9 1/4	12 1/8
	2 1/2	H01551			3/8	1 3/8	10 3/4	3 1/4	7 5/8	3 5/16	9 1/2	12 3/8
	3	H01552			3/8	1 3/8	10 3/4	3 1/4	7 5/8	3 5/16	9 1/2	12 3/8
	3 1/2	H01553			3/8	1 3/8	10 3/4	3 1/4	7 5/8	3 5/16	9 1/2	12 3/8
6	2 1/2	H01560	5	8 3/8	1/4	1 1/4	12 1/8	3 3/8	8 3/8	3 7/16	10 3/4	14 1/8
	3	H01561										
	3 1/2	H01562										
	4	H01563										
7	3	H01570	5 1/2	9 1/2	1/4	1 1/4	13 3/4	3 5/8	9 3/8	3 3/4	12	16 1/8
	3 1/2	H01571										
	4	H01572										
	4 1/2	H01573										
	5	H01574										
8	3 1/2	H01580	6 1/4	10 1/2	1/4	1 1/4	15	3 3/4	10 1/4	3 7/8	13 1/4	17 3/4
	4	H01581										
	4 1/2	H01582										
	5	H01583										
	5 1/2	H01584										
10	4 1/2	H15100	8 1/2	13 13/16	1/4	1 1/4	19 1/16	4 3/4	13 1/4	4 3/4	16 11/16	22 9/16
	5	H15101			1/2	1 1/2	19 5/16	5	13 1/2	5	16 15/16	22 13/16
	5 1/2	H15102			1/2	1 1/2	19 5/16	5	13 1/12	5	16 15/16	22 13/16
12	5 1/2	H15120	9 7/8	16 7/16	1/4	1 1/4	22 3/16	5 3/8	15 1/2	5 1/2	19 9/16	26 3/16
	7	H15121										

For bore diameter sizes 14" to 18" see next page.

HOW TO ORDER

For ordering information refer to Page 32.

CAUTION NOTES:

Rod end trunnion mount cylinders in bore sizes 5" through 8" with oversize piston rods, and bore sizes 10" through 18" with all piston rod diameters should not be used over 1500 PSI. If your application requires higher pressure, consult the factory.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DHM00151. (Refer to page 26.) Double rod ends are not available on clevis mount Series H cylinders.

* Removable retainer not available for these bore and rod combinations: H61 and H73/ H74 mounting styles.

Rod End Styles and Dimensions

For rod end styles and dimensions see Table 3 in the inside cover of catalog.

Page ii

***MilCad* Cylinder Configurator**

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TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

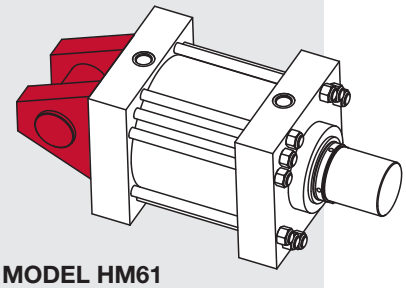
Bore Ø	CB	CD	CW	E	EE NPT	EE SAE	F	G	J	K	L	LR	M	MR	TD	TL	H73 TK	H73 TM	H73 UH	H73 UM	H74 TK	H74 TM	H74 UH	H74 UM	H74 UT
1½	3/4	1/2	1/2	2 1/2	1/2	#10	3/8	1 3/4	1 1/2	1/2	3/4	5/8	1/2	21/32	1	1	1 1/2	4	2 1/2	6	1 1/2	3	3	5	4 1/2
2	1 1/4	3/4	5/8	3	1/2	#10	5/8	1 3/4	1 1/2	5/8	1 1/4	1 1/8	3/4	15/16	1 3/8	1 3/8	2	5	3 3/8	7 3/4	1 3/4	3 1/2	3 1/2	6 1/4	5 3/4
2½	1 1/4	3/4	5/8	3 1/2	1/2	#10	5/8	1 3/4	1 1/2	5/8	1 1/4	1 1/8	3/4	15/16	1 3/8	1 3/8	2	5 1/2	4 1/8	8 1/4	1 3/4	4	4	6 3/4	6 1/4
3¼	1 1/2	1	3/4	4 1/2	3/4	#12	3/4	2	1 3/4	3/4	1 1/2	1 1/4	1	1 3/16	1 3/4	1 3/4	2 1/2	7	5	10 1/2	2 1/4	5	5	8 1/2	8
4	2	1 3/8	1	5	3/4	#12	7/8	2	1 3/4	3/4	2 1/8	1 7/8	1 3/8	1 3/8	1 3/4	1 3/4	2 1/2	7 1/2	6 1/2	11	2 1/4	5 1/2	6 1/2	9	8 1/2
5	2 1/2	1 3/4	1 1/4	6 1/2	3/4	#12	7/8	2	1 3/4	1	2 1/4	2	1 5/8	1 5/8	1 3/4	1 3/4	3	9	7 1/2	12 1/2	3	7	7 1/4	10 1/2	10
6	2 1/2	2	1 1/4	7 1/2	1	#16	1	2 1/4	2 1/4	1 1/8	2 1/2	2 1/16	2	2	2	2	3 1/2	10 1/2	8 3/4	14 1/2	3 1/4	8 1/2	8 3/4	12 1/2	11 1/2
7	3	2 1/2	1 1/2	8 1/2	1 1/4	#20	1	2 3/4	2 3/4	1 1/4	3	2 5/8	2 3/8	2 3/8	2 1/2	2 1/2	4	12	10	17	3 1/2	9 3/4	10	14 3/4	13 1/2
8	3	3	1 1/2	9 1/2	1 1/2	#24	1	3	3	1 1/2	3 1/4	2 7/8	2 3/4	2 3/4	3	3	4 1/2	13	11	19	4	11	11 3/4	17	15 1/2
10	4	3 1/2	2	12 5/8	2	#24	1 11/16	3 11/16	3 11/16	1 5/8	4	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	5	17 1/8	15 1/4	24 1/8	5	14	15 1/4	21	19 5/8
12	4 1/2	4	2 1/4	14 7/8	2 1/2	#32	1 15/16	4 7/16	4 7/16	1 7/8	4 1/2	4	4	4	4	4	5 1/2	20 7/8	19 1/4	28 7/8	5 1/2	16 1/2	19 1/4	24 1/2	22 7/8

For Package and Mounting Dimension see Tables 1H and 2H.

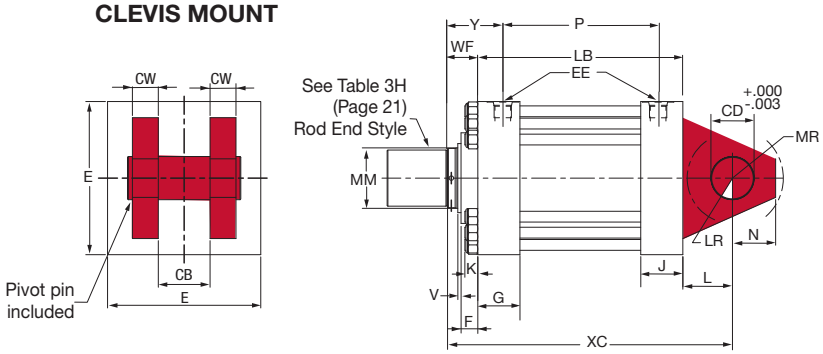
PIN AND TRUNNION MOUNTED CYLINDERS

All pin and trunnion cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

CLEVIS MOUNT

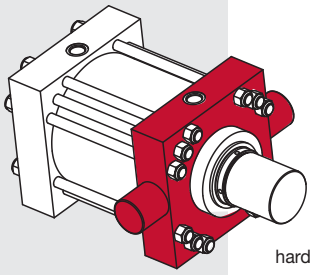


MODEL HM61

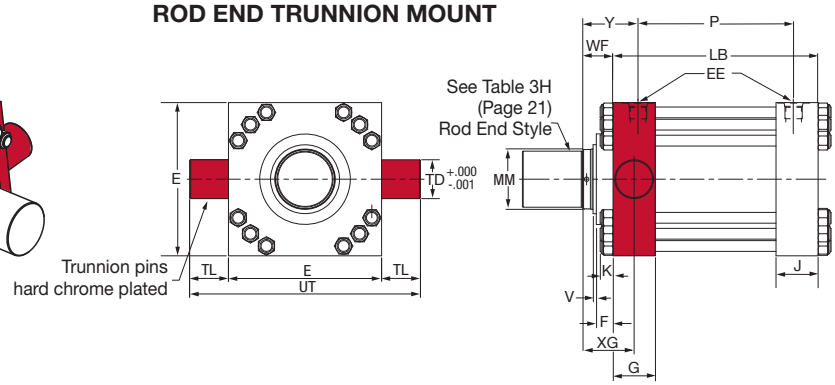


See "CAUTION NOTE" on page 19.

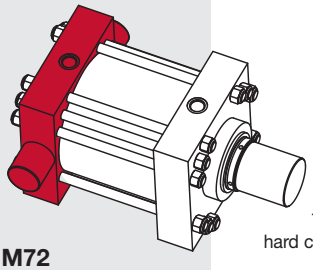
ROD END TRUNNION MOUNT



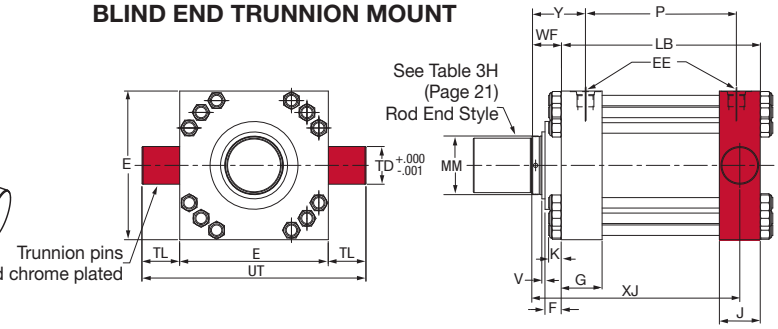
MODEL HM71



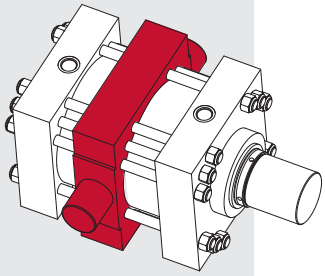
BLIND END TRUNNION MOUNT



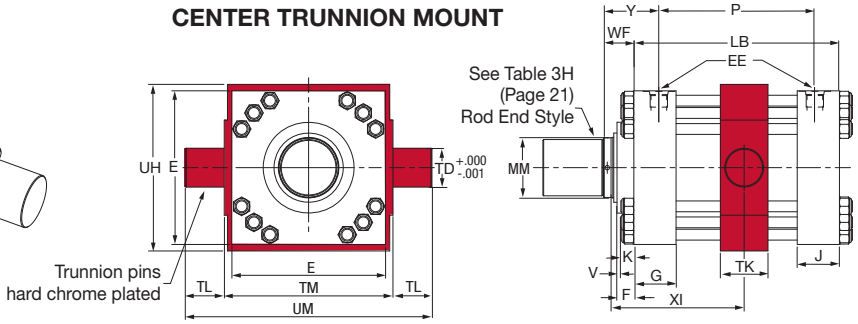
MODEL HM72



CENTER TRUNNION MOUNT



MODEL HM74



▼ TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	B	LB	P	V	WF	Y	XC	XG	XJ
14	7	HM15140	8	15⅝	10⅝	¼	3½	6	24⅞	5 15⁄16	16 1⁄16
	8	HM15141	9			¼	4	6½	25⅜	6 7⁄16	17 3⁄16
	10	HM15142	-			-	6	8½	27⅜	8 7⁄16	19 3⁄16
16	8	HM15160	9	18⅝	11⅞	¼	4	7⅜	29⅝	-	-
	9	HM15161	-			-	5⅝	9	31¼	-	-
	10	HM15162	-			-	6	9⅜	31⅝	-	-
18	9	HM15180	-	22	13¾	-	5⅝	9¾	35¼	-	-
	10	HM15181	-			-	6	10⅛	35⅝	-	-

▼ TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	CB	CD	CW	E	EE SAE	G	J	K	L	LR	M	MR	TD	TL	TK	TM	UH	UM	UT
14	6	5	3	17¾	#24	4⅞	4⅞	1½	5¾	4⅛	5	5 15⁄32	4½	4½	5½	19½	19¼	28½	26⅛
16	7	6	3½	20¼	#24	5⅞	5⅞	1⅝	7	6¼	6	6	-	-	-	-	-	-	-
18	8	6½	4	22¼	#24	6⅞	6⅞	1⅞	7⅝	6¾	6½	6½	-	-	-	-	-	-	-

LARGE BORE CYLINDERS

NOTE: Large bore Series H cylinders (14", 16" and 18") must use Table 3H for accurate piston rod end dimensions.

▼ TABLE 3H - Piston Rod Ends

Bore Ø	Rod MM	Thread KK	A	B +.000 -.005	F	NA	V	WF
14	7	5½-12	7	8	1 15⁄16	6⅞	¼	3½
	8	5¾-12	8	9	1 15⁄16	7⅞	¼	4
	10	7¼-12	10	-	3½	9⅞	-	6
16	8	5¾-12	8	9	1 15⁄16	7⅞	¼	4
	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6
18	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6

HOW TO ORDER

For ordering information refer to Page 32.

CAUTION NOTES:

Rod end trunnion mount cylinders in bore sizes 5" through 8" with oversize piston rods, and bore sizes 10" through 18" with all piston rod diameters should not be used over 1500 PSI. If your application requires higher pressure, consult the factory.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DHM15140. (Refer to page 26.) Double rod ends are not available on clevis mount Series H cylinders.

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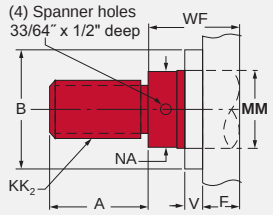
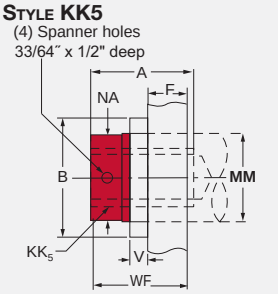
PISTON ROD END STYLES

STYLE KK2



ROD END STYLE CODE NO. 2

STYLE KK5



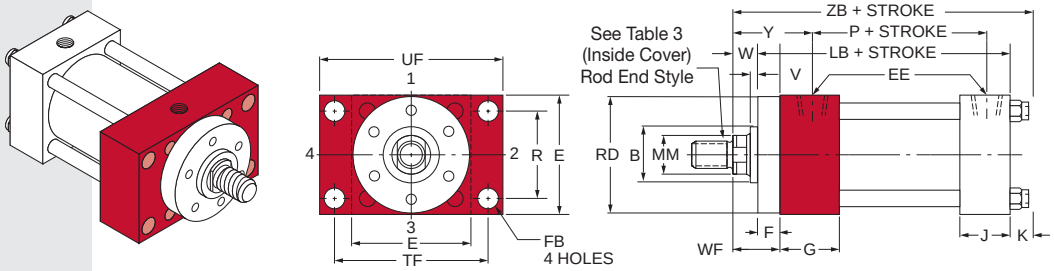
ROD END STYLE CODE NO. 5

For Package and Mounting Dimension see Tables 1H and 2H.

SOLID ROD END CAP MOUNTED CYLINDERS

Milwaukee Cylinder's solid rod end cap mount is one of the strongest, most rigid methods of mounting. This type of mounting is best in a tension application.

Flange rated for 3,000 PSI operation.

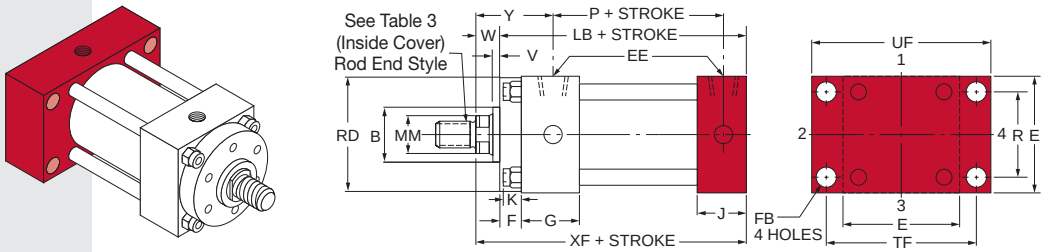


MODEL H35
NFPA STYLE ME5

SOLID BLIND END CAP MOUNTED CYLINDERS

Milwaukee Cylinder's solid blind end cap mount is one of the strongest, most rigid methods of mounting. This type of mounting is best in a thrust load application.

Flange rated for 3,000 PSI operation.



MODEL H36
NFPA STYLE ME6

TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	B	P	LB	RD	V	W	WF	XF	Y	ZB
1½	5/8	H00151	1 1/8	2 7/8	5	2.38	1/4	5/8	1	5 5/8	2	6 1/8
	1	H00152	1 1/2			2.50	1/2	1	1 3/8	6	2 3/8	6 1/2
2	1	H01510	1 1/2	2 7/8	5 1/4	3.00	1/4	3/4	1 3/8	6	2 3/8	6 5/8
	1 3/8	H01511	2			3.00	3/8	1	1 5/8	6 1/4	2 5/8	6 7/8
2½	1	H01520	1 1/2	3	5 3/8	3.00	1/4	3/4	1 3/8	6 1/8	2 3/8	6 3/4
	1 3/8	H01521	2			3.00	3/8	1	1 5/8	6 3/8	2 5/8	7
	1 3/4	H01522	2 3/8			3.50	1/2	1 1/4	1 7/8	6 5/8	2 7/8	7 1/4
3¼	1 3/8	H01530	2	3 19/32	6 1/4	3.50	1/4	7/8	1 5/8	7 1/8	2 23/32	7 7/8
	1 3/4	H01531	2 3/8			3.50	3/8	1 1/8	1 7/8	7 3/8	2 31/32	8 1/8
	2	H01532	2 5/8			4.00	3/8	1 1/4	2	7 1/2	3 3/32	8 1/4
4	1 3/4	H01540	2 3/8	3 7/8	6 5/8	3.50	1/4	1	1 7/8	7 5/8	2 15/16	8 3/8
	2	H01541	2 5/8			4.00	1/4	1 1/8	2	7 3/4	3 1/16	8 1/2
	2 1/2	H01542	3 1/8			4.50	3/8	1 3/8	2 1/4	8	3 5/16	8 3/4
5	2	H01550	2 5/8	4 3/8	7 1/8	4.00	1/4	1 1/8	2	8 1/4	3 1/16	9 1/4
	2 1/2	H01551	3 1/8			4.50	3/8	1 3/8	2 1/4	8 1/2	3 5/16	9 1/2
	3	H01552	3 3/4			5.12	3/8	1 3/8	2 1/4	8 1/2	3 5/16	9 1/2
	3 1/2	H01553	4 1/4			5.50	3/8	1 3/8	2 1/4	8 1/2	3 5/16	9 1/2
6	2 1/2	H01560	3 1/8	5	8 3/8	4.50	1/4	1 1/4	2 1/4	9 5/8	3 7/16	10 3/4
	3	H01561	3 3/4			5.50						
	3 1/2	H01562	4 1/4			5.88						
	4	H01563	4 3/4			6.38						
7	3	H01570	3 3/4	5 1/2	9 1/2	5.50	1/4	1 1/4	2 1/4	10 3/4	3 3/4	12
	3 1/2	H01571	4 1/4			5.88						
	4	H01572	4 3/4			6.38						
	4 1/2	H01573	5 1/4			6.88						
	5	H01574	5 3/4			7.31						
8	3 1/2	H01580	4 1/4	6 1/4	10 1/2	5.88	1/4	1 1/4	2 1/4	11 3/4	3 7/8	13 1/4
	4	H01581	4 3/4			6.38						
	4 1/2	H01582	5 1/4			6.88						
	5	H01583	5 3/4			7.31						
	5 1/2	H01584	6 1/4			8.43						
10	4 1/2	H15100	5 1/4	8 1/2	13 13/16	6.88	1/4	1 1/4	2 15/16	15 1/16	4 3/4	16 11/16
	5	H15101	5 3/4			7.31	1/2	1 1/2	3 3/16	15 5/16	5	16 15/16
	5 1/2	H15102	6 1/4			8.43	1/2	1 1/2	3 3/16	15 5/16	5	16 15/16
12	5 1/2	H15120	6 1/4	9 7/8	16 7/16	8.43	1/4	1 1/4	3 3/16	17 11/16	5 1/2	19 9/16
	7	H15121	8			10.50						

For bore diameter sizes 14" to 18" see next page.

▼ TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	E	EE NPT	EE SAE	F	FB	G	J	K	PA	PD	R	TF	UF
1½	2½	½	#10	3/8	7/16	1 3/4	1½	½	3/16	1 7/16	1.63	3 7/16	4¼
2	3	½	#10	5/8	9/16	1 3/4	1½	5/8	5/16	1 13/16	2.05	4⅛	5⅛
2½	3½	½	#10	5/8	9/16	1 3/4	1½	5/8	5/16	2 1/16	2.55	4⅝	5⅝
3¼	4½	¾	#12	¾	11/16	2	1¾	¾	3/8	2⅝	3.25	5⅞	7⅛
4	5	¾	#12	⅞	11/16	2	1¾	¾	7/16	2 15/16	3.82	6⅜	7⅝
5	6½	¾	#12	⅞	15/16	2	1¾	1	7/16	3 11/16	4.95	8 3/16	9¾
6	7½	1	#16	1	1 1/16	2¼	2¼	1⅛	½	4¼	5.73	9 7/16	11¼
7	8½	1¼	#20	1	1 3/16	2¾	2¾	1¼	½	4¾	6.58	10⅝	12⅝
8	9½	1½	#24	1	1 5/16	3	3	1½	½	5¼	7.50	11 13/16	14
10	12⅝	2	#24	1 11/16	1 13/16	3 11/16	3 11/16	1⅝	13/16	7⅛	9.62	15⅞	19
12	14⅞	2½	#32	1 15/16	2 1/16	4 7/16	4 7/16	1⅞	15/16	8⅜	11.45	18½	22

HOW TO ORDER

For ordering information refer to Page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DH00151. (Refer to page 26.)

Rod End Styles and Dimensions

For rod end styles and dimensions see Table 3 in the inside cover of catalog.

Page ii

***MilCad* Cylinder Configurator**

Visit **milwaukeecylinder.com** to configure and download CAD files of your cylinders.

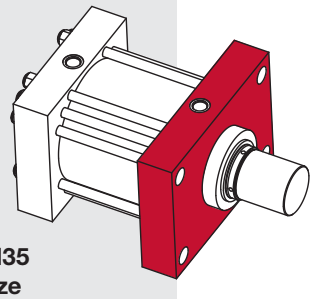
For Package and Mounting Dimension see Tables 1H and 2H.

SOLID END CAP MOUNTED CYLINDERS

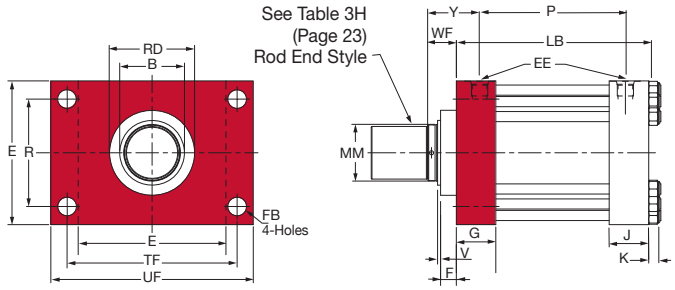
Milwaukee Cylinder's solid end cap mount is one of the strongest, most rigid methods of mounting. This type of rod end cap mounting is best in a tension application. A solid blind end cap mounting is best in a thrust application.

SOLID ROD END CAP MOUNT (14" Bore)

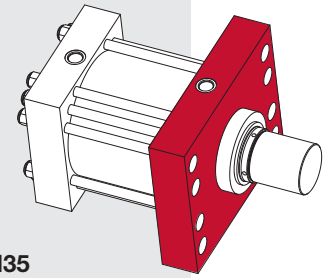
Flange rated for 3,000 PSI operation.



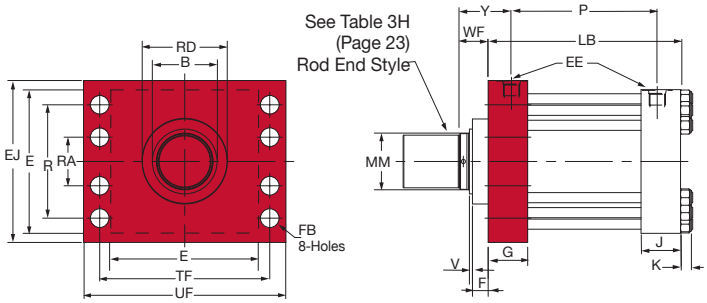
MODEL HM35
14" Bore Size



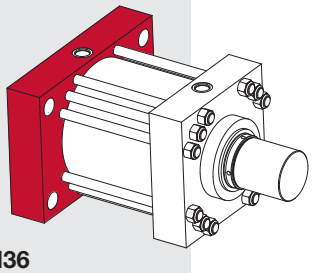
SOLID ROD END CAP MOUNT (16" and 18" Bore)



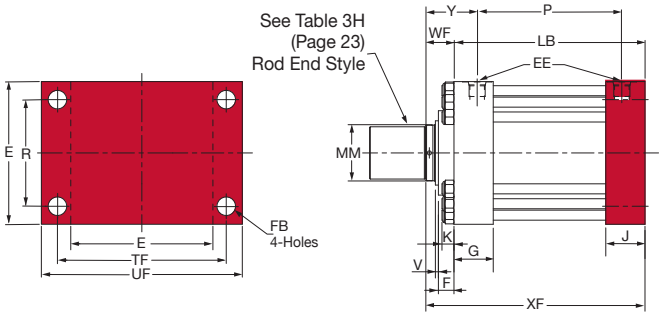
MODEL HM35
16"and 18" Bore Sizes



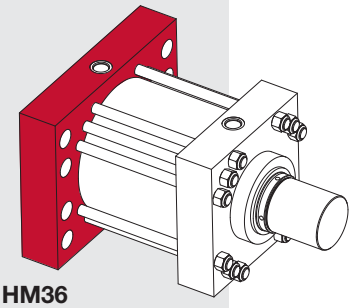
SOLID BLIND END CAP MOUNT (14" BORE)



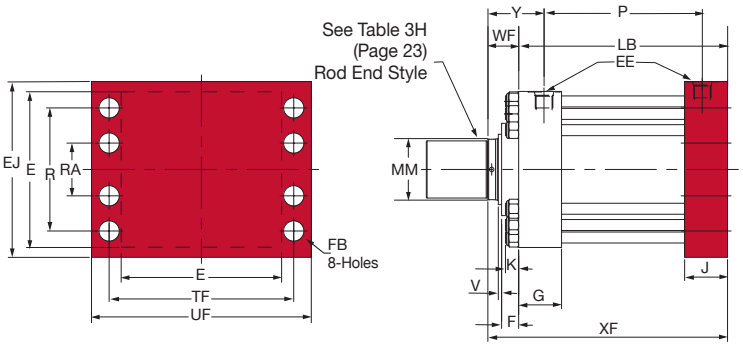
MODEL HM36
14" Bore Size



SOLID BLIND END CAP MOUNT (16" AND 18" BORE)



MODEL HM36
16"and 18" Bore Sizes



▼ TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke. (H21, H22)

Bore Ø	Rod MM	Cylinder Code ♦	B	LB	P	V	WF	Y	RD	XF
14	7	HM15140	8	15⅝	10⅝	¼	3½	6	10½	19⅛
	8	HM15141	9			¼	4	6½	11½	19⅝
	10	HM15142	-			-	6	8½	14½	21⅝
16	8	HM15160	9	18⅝	11⅞	¼	4	7⅜	11½	22⅝
	9	HM15161	-			-	5⅝	9	13⅞	24¼
	10	HM15162	-			-	6	9⅜	14½	24⅝
18	9	HM15180	-	22	13¾	-	5⅝	9¾	13⅞	27⅝
	10	HM15181	-			-	6	10⅛	14½	28

TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	E	EE SAE	EJ	FB	G	J	K	R	RA	TF	UF
14	17¾	#24	-	2 5/16	4⅞	4⅞	1½	13.26	-	21.00	25
16	20¼	#24	20	1 13/16	5⅞	5⅞	1⅝	15.50	8	21.00	24½
18	22¼	#24	23	2 1/16	6⅞	6⅞	1⅞	18.00	7¼	24.25	28¼

LARGE BORE CYLINDERS

NOTE: Large bore Series H cylinders (14", 16" and 18") must use Table 3H for accurate piston rod end dimensions.

▼ TABLE 3H - Piston Rod Ends

Bore Ø	Rod MM	Thread KK	A	B +.000 -.005	F	NA	V	WF
14	7	5½-12	7	8	1 15/16	6⅞	¼	3½
	8	5¾-12	8	9	1 15/16	7⅞	¼	4
	10	7¼-12	10	-	3½	9⅞	-	6
16	8	5¾-12	8	9	1 15/16	7⅞	¼	4
	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6
18	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6

HOW TO ORDER

For ordering information refer to Page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DHM15140. (Refer to page 26.)

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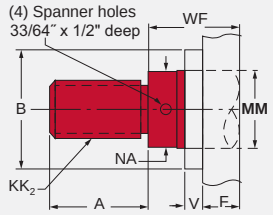
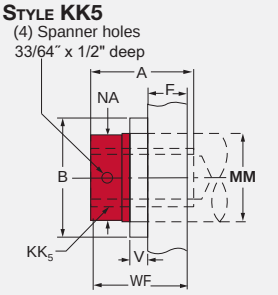
PISTON ROD END STYLES

STYLE KK2



ROD END STYLE CODE NO. 2

STYLE KK5



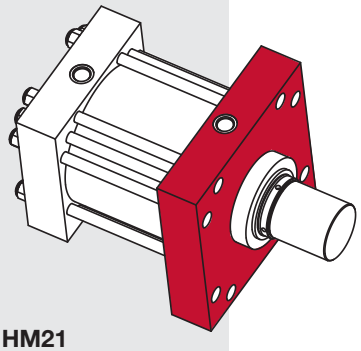
ROD END STYLE CODE NO. 5

For Package and Mounting Dimension see Tables 1H and 2H.

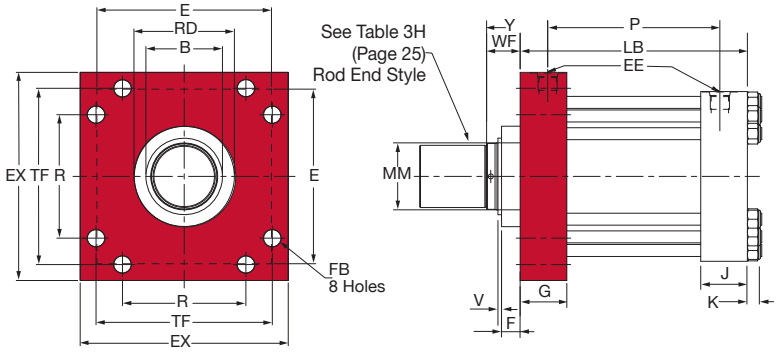
SOLID END CAP MOUNTED CYLINDERS

Milwaukee Cylinder's solid end cap mount is one of the strongest, most rigid methods of mounting. This type of rod end cap mounting is best in a tension application. A solid blind end cap mounting is best in a thrust application.

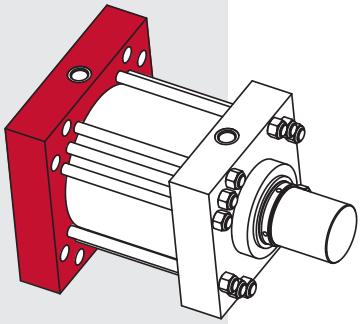
SOLID ROD END CAP SQUARE MOUNTING



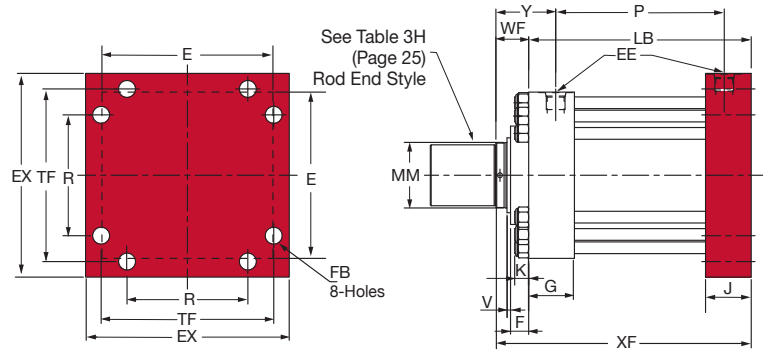
MODEL HM21



SOLID BLIND END CAP SQUARE MOUNTING



MODEL HM22



▼ TABLE 1H

The dimensions given on this table are affected by the piston rod diameter and the stroke.

Bore Ø	Rod MM	Cylinder Code ♦	B	LB	P	V	WF	Y	RD	XF
14	7	HM15140	8	15⅝	10⅝	¼	3½	6	10½	19⅛
	8	HM15141	9			¼	4	6½	11½	19⅝
	10	HM15142	-			-	6	8½	14½	21⅝
16	8	HM15160	-	18⅝	11⅞	-	4	7⅜	11½	22⅝
	9	HM15161	-			-	5⅝	9	13⅞	24¼
	10	HM15162	-			-	6	9⅜	14½	24⅝
18	9	HM15180	-	22	13¾	-	5⅝	9¾	13⅞	27⅝
	10	HM15181	-			-	6	10⅛	14½	28

▼ TABLE 2H

The dimensions are constant regardless of rod diameter or stroke.

Bore Ø	E	EE SAE	EX	FB	G	J	K	R	TF
14	17¾	#24	21¾	1 13/16	4⅞	4⅞	1½	12.90	18.43
16	20¼	#24	24½	1 13/16	5⅞	5⅞	1⅝	15.28	21.03
18	22¼	#24	26½	2 1/16	6⅞	6⅞	1⅞	16.45	22.65

LARGE BORE CYLINDERS

NOTE: Large bore Series H cylinders (14", 16" and 18") must use Table 3H for accurate piston rod end dimensions.

▼ TABLE 3H - Piston Rod Ends

Bore Ø	Rod MM	Thread KK	A	B +.000 -.005	F	NA	V	WF
14	7	5½-12	7	8	1 15/16	6⅞	¼	3½
	8	5¾-12	8	9	1 15/16	7⅞	¼	4
	10	7¼-12	10	-	3½	9⅞	-	6
16	8	5¾-12	8	9	1 15/16	7⅞	¼	4
	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6
18	9	6½-12	9	-	3⅜	8⅞	-	5⅝
	10	7¼-12	10	-	3½	9⅞	-	6

HOW TO ORDER

For ordering information refer to Page 32.

NOTES:

♦ For double rod end cylinders, add prefix letter D to cylinder code. Example: DHM15140. (Refer to page 26.)

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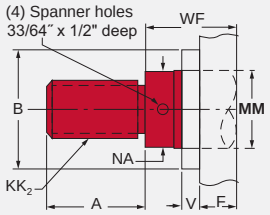
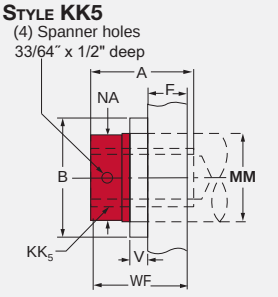
PISTON ROD END STYLES

STYLE KK2

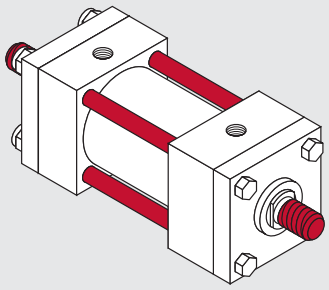


ROD END STYLE CODE NO. 2

STYLE KK5



ROD END STYLE CODE NO. 5



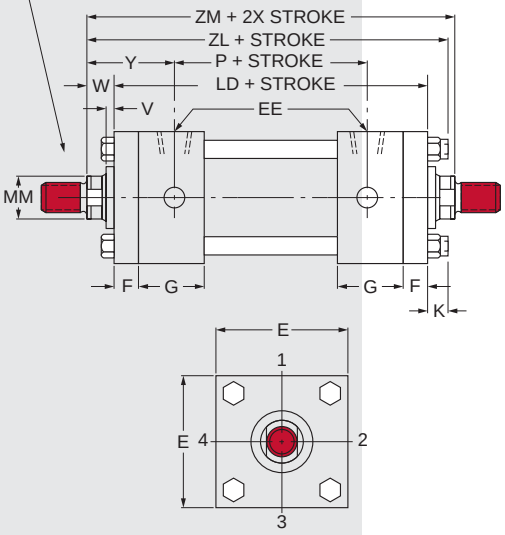
DOUBLE ROD END CYLINDERS

Milwaukee Cylinder's Double Rod End Cylinders are available with all the standard types of Series H mountings, except the clevis mount (H61).

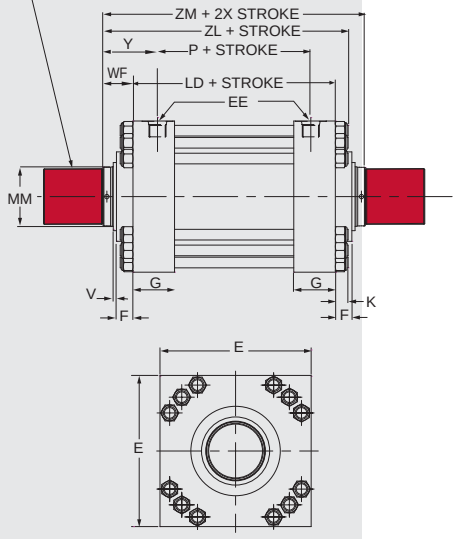
To obtain dimensional information on a double rod end cylinder, first select the desired mounting style and refer to the corresponding single rod end cylinder model shown on the preceding pages. After you have determined all necessary dimensions from the previous page covering the desired mounting, turn back to this page. Supplement those dimensions with additional ones from the drawings below and the table at the right. These added dimensions differ from, or are in addition to, those shown on the preceding pages and provide the additional information needed to completely dimension a double rod end cylinder model.

On a double rod end cylinder where two different rod ends are required, or two different rod sizes are required, or cushions on one end are required, be sure to state clearly which rod is to go at which end of the cylinder. When two types of mounting styles are required, be sure to specify their relationship to the piston rods, if they are not the same.

BORE SIZES 1" to 12".
See Table 3 (Inside cover)
Rod End Styles.



BORE SIZES 14" to 18". See
Table 3H (on previous page)
Rod End Styles.



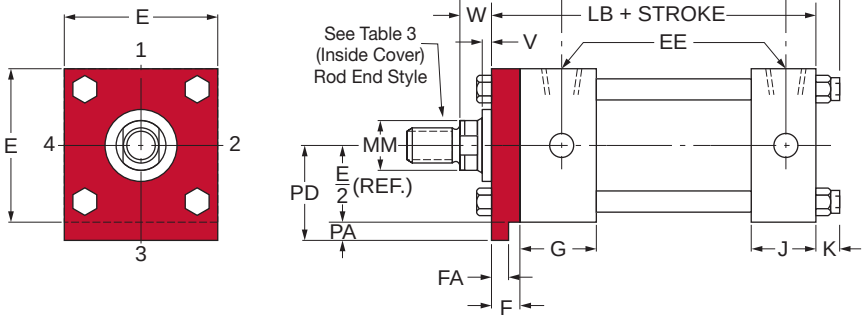
▼ DOUBLE ROD END CYLINDERS

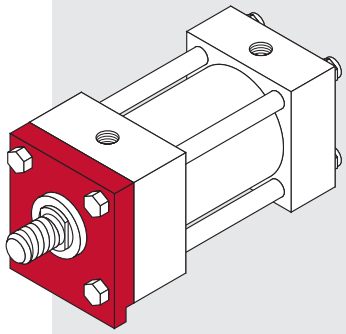
Bore Ø	Rod MM	Cylinder Code	LD*	SE*	SS*	ZL	ZM
1½	⅝	DH00151	5⅝	7⅜	4⅛	6¾	6⅞
	1*	DH00152		7⅜	4⅛	7⅛	7⅝
2	1	DH01510	6⅛	8	3⅞	7½	7⅝
	1⅜*	DH01511		8	3⅞	7¾	8⅛
2½	1	DH01520	6¼	8⅛	3⅝	7⅝	7¾
	1⅜	DH01521		8⅛	3⅝	7⅞	8¼
	1¾*	DH01522		8⅛	3⅜	8⅛	8¾
3¼	1⅜	DH01530	7¼	9½	4⅜	8⅞	9
	1¾	DH01531		9½	4⅜	9⅛	9½
	2	DH01532		9½	4⅜	9¼	9¾
4	1¾	DH01540	7¾	10	4¼	9½	9¾
	2	DH01541		10	4¼	9⅝	10
	2½	DH01542		10	4¼	9⅞	10½
5	2	DH01550	8¼	11¼	4¾	10⅜	10½
	2½	DH01551		11¼	4¾	10⅝	11[8]
	3	DH01552		11¼	4¾	10⅝	11
	3½	DH01553		11¼	4¾	10⅝	11
6	2½	DH01560	9⅜	11¾	5⅛	11¾	11⅞
	3	DH01561		11¾	5⅛		
	3½	DH01562		11¾	5⅛		
	4	DH01563		11¾	5⅛		
7	3	DH01570	10½	13⅛	5¾	13	13
	3½	DH01571		13⅛	5¾		
	4	DH01572		13⅛	5¾		
	4½	DH01573		13⅛	5¾		
	5	DH01574		13⅛	5¾		
8	3½	DH01580	11½	14½	6¾	14¼	14
	4	DH01581		14½	6¾		
	4½	DH01582		14½	6¾		
	5	DH01583		14½	6¾		
	5½	DH01584		14½	6¾		
10	4½	DH15100	15½	—	8⅞	18⅜	18
	5	DH15101		—	8⅞	18⅜	18½
	5½	DH15102		—	8⅞	18⅜	18½
12	5½	DH15120	18⅜	—	10½	21¼	20⅞
	7	DH15121		—	10½		
14	7	DHM15140	15⅝	—		20⅝	22⅝
	8	DHM15141		—	—	21⅛	23⅝
	10	DHM15142		—	—	23⅛	27⅝
16	8	DHM15160	18⅝	—	—	24¼	26⅝
	9	DHM15161		—	—	25⅞	29⅞
	10	DHM15162		—	—	26¼	30⅝
18	9	DHM15180	22	—	—	29½	33¼
	10	DHM15181		—	—	29⅞	34

*Note: These dimensions are to be substituted for the related mounting dimensions given on the preceding pages. All dimensions given on this table are plus stroke.

KEY MOUNT CYLINDERS

The *Milwaukee Cylinder* Key Mount retainer plate is a mounting option designed to add rugged stability to foot and side mount cylinders. The retainer plate is extended below the mounting surface of the cylinder. This extension may be fitted into a milled keyway in your mounting pad, eliminating the need for welded keys or locator pins.





KEY MOUNT CYLINDERS

Bore Ø	E	F	FA	G	PA	PD
1½	2½	⅜	.312/.310	1¾	3/16	1 7/16
2	3	⅝	.562/.560	1¾	5/16	1 13/16
2½	3½	⅝	.562/.560	1¾	5/16	2 1/16
3¼	4½	¾	.687/.684	2	⅜	2⅝
4	5	⅞	.812/.809	2	7/16	2 15/16
5	6½	⅞	.812/.809	2	7/16	3 11/16
6	7½	1	.937/.934	2¼	½	4¼
7	8½	1	.937/.934	2¾	½	4¾
8	9½	1	.937/.934	3	½	5¼
10	12⅝	1 11/16	1.625/1.620	3 11/16	13/16	7⅛
12	14⅞	1 15/16	1.875/1.870	4 7/16	13/16	8⅜

Key Mount is not available on larger bore cylinders.

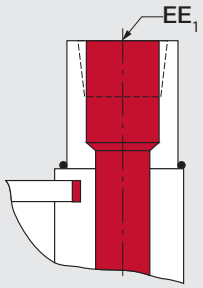
HOW TO ORDER

For ordering information refer to Page 32.

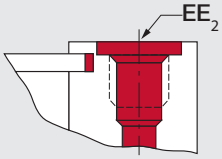
***MilCad* Cylinder Configurator**

Visit **milwaukeecylinder.com** to configure and download CAD files of your cylinders.

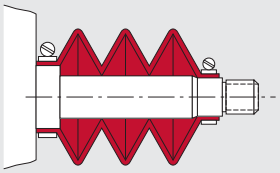
Port Locations



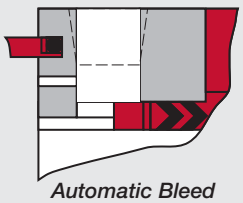
Oversize Port Welded Boss



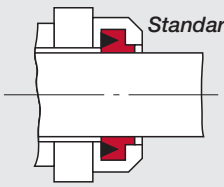
SAE Straight Thread O-ring Port



Rod Boots



Automatic Bleed



Metallic Rod Wipers

DESIGN OPTIONS

Standard Ports

The *Milwaukee Cylinder* Series H cylinders are manufactured as standard, with the largest possible NPTF tapered thread ports that will fit in both the rod and blind ends of a given bore size. Upon request, extra ports can be provided on the sides of the end caps not occupied by mountings or cushion adjusters.

Oversize Ports

On most bore sizes, welded bosses may be provided for oversize NPTF ports. These bosses protrude from the sides of the end caps. For information as to the boss height in relation to your bore and port requirements, contact the factory. Also, special heavier end caps can be provided to accommodate oversize ports without the use of a welded boss.

Straight Thread Ports

On request, an SAE straight thread O-Ring port can be used on the Series H cylinders. In addition to the standard oversize NPTF ports, welded bosses may also be used for oversize SAE straight thread O-Ring ports. For further information contact the factory.

Note: Flange and manifold style ports are available.

Bleeder Ports

Bleeder ports are not regularly furnished with Series H cylinders. Automatic air bleeds are standard on non-cushion cylinders. Bleeder ports are available upon request. They will be placed on either end cap or on the tube.

▼ PORT SIZES

Bore Ø	Standard NPTF Port EE	Oversized NPTF Port EE_1	SAE Straight O-Ring Port	
			EE_2	SAE Standard Thread Series
1½	½	¾	#10	⅞-14
2	½	¾	#10	⅞-14
2½	½	¾	#10	⅞-14
3¼	¾	1	#12	1 1/16-12
4	¾	1	#12	1 1/16-12
5	¾	1	#12	1 1/16-12
6	1	1¼	#16	1 5/16-12
7	1¼	1½	#20	1⅝-12
8	1½	2	#24	1⅞-12
10	2	2½	#24	1⅞-12
12	2½	3	#32	2½-12

▼ 4-Bolt Flange Ports
Heavy-duty Hydraulic Cylinders

Bore Ø	Rod Ø	Nominal Flange Size (in)
3¼	1.38	.75
	1.75	.75
	2.00	.75
4	1.75	.75
	2.00	.75
	2.50	.75
5	2.00	.75
	2.50	.75
	3.00	.75
	3.50	.75
6	2.50	1.00
	3.00	1.00
	3.50	1.00
	4.00	1.00
7	3.00	1.25
	35.00	1.25
	4.00	1.25
	4.50	1.25
	5.00	1.25
8	3.50	1.50
	4.00	1.50
	4.50	1.50
	5.00	1.50
	5.50	1.50

NOTE: Some flange overhang will occur on heads or caps in most cylinder designs. Overhang may interfere with some end mountings.

Rod Boots

When cylinders are used in areas of high contamination or where contaminants have an air hardening property, the exposed piston rod should be covered with a rod boot to protect the rod bearing and seals. A rod boot is simply a collapsible cover. It is of sewn construction made from a neoprene coated fabric. The rod boots are impervious to oil, grease and water.
They will operate effectively from 0° F to +200° F without cracking. For additional details on Rod Boots, please see page 186.

Metallic Rod Wipers

If requested metallic rod wipers will be supplied in place of the standard synthetic rubber wiper. This type of seal is recommended for applications where contaminants would tend to cling to the rod and damage a standard synthetic rubber rod wiper.

DESIGN OPTIONS FOR SPECIAL CYLINDERS

Special Rod Ends

Modifications of standard or entirely special rod ends are available from *Milwaukee Cylinder*. When your requirements call for a special rod end style, your order should include a sketch if it is to be an entirely special rod end or note reference as to which letter dimensions you wish to have modified (see inside cover).

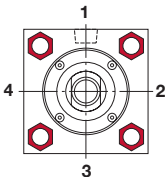
Special Assemblies from Standard Parts

Each style of the various standard cylinder mountings is illustrated, using the commonly recognized cylinder dimensional symbols of the National Fluid Power Association. Each side of the end views are numbered to aid in communication when referring to the relationship between the ports and the mountings. When requesting information or placing an order that requires a dimension other than standard, always make reference to the given dimensional symbol in the catalog and then give your requirements.

Cushion Adjustment Locations

A ball check and a cushion adjustment needle are supplied as standard in position #2 on most models. The cushion needle and ball check are interchangeable as far as location and may be put in any side not occupied by a port or mounting.

Port Locations



Ports are located in position #1 as standard unless otherwise specified. By using the position numbers given with the end views in the dimensional data section of this catalog, ports can be arranged in any one of four 90° positions in relation to the cylinder mounting. When ports are relocated on a cushioned cylinder, the cushion needle and ball check are automatically relocated to hold their relationship to the port as on a standard cylinder, unless otherwise specified at the time of the order.

Removable Trunnion Pins

Removable trunnion pins are available on models H71 and H72 at a nominal extra charge. They can be used on all bore and rod combinations, except on the largest oversize rods offered with each bore size on all model H71 cylinders.

Single-Acting Cylinders

Series H cylinders are designed for either single or double action. When used as a single acting cylinder, hydraulic power drives the piston in one direction, only relying on either the load or an external force to return the piston after the pressure is exhausted.

Single-Acting Spring Cylinders

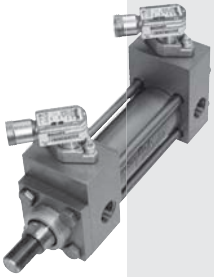
Single-acting spring return cylinders normally have a spring inside of the cylinder to return the piston to its original position. The application load and friction conditions must be specified when placing an order to properly size the spring. Also specify whether the spring is to return or advance the piston. A spring return cylinder is designed with a stop tube to act as spring guide, which prevents binding of the cylinder due to misalignment of the spring. To accurately determine the cylinder length and mounting dimensions for your application, contact your local *Milwaukee Cylinder* representative or the factory.

Water Service Cylinders

Series H cylinders can be used with water as an operating fluid with some standard modifications to the types of material and the manufacturing processes used. These modifications will include, at some additional cost, bronze piston, nickel plated end caps, a hard chrome plated cylinder barrel and a chrome plated piston or stainless steel piston rod at extra cost. Due to the increased factors of corrosion, electrolysis and mineral deposits acting within a water fitted cylinder, *Milwaukee Cylinder* cannot warrant or make any guarantees other than a water service cylinder will be free of defects in workmanship or materials.

Proximity Switches

End of Stroke Limit Switches:

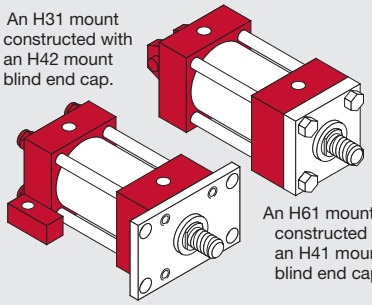


We provide inductive proximity switches for end of stroke sensing. These non-contact switches detect the presence of the spud/ cushion bushing. See page 185 for more information.

Combined Mountings

Standard mountings may be combined when specified by the customer. Some examples of this are:

▼ An H31 mount constructed with an H42 mount blind end cap.



An H61 mount constructed with an H41 mount blind end cap.

These and other combinations can be readily made from standard parts. If you are unsure of a possible combination or if it will suit your particular needs, consult with your local *Milwaukee Cylinder* representative or contact the factory.

Adjustable Stroke Cylinders

When a cylinder application requires stroke adjustment, *Milwaukee Cylinder* offers a number of designs, the most common of which is illustrated below. This particular design is externally adjustable, incorporating a threaded rod (of piston rod quality) with the standard hydraulic rod end multiple lip vee seal and bushing design. This provides a proven-effective high and low pressure seal, affording maximum sealing on the stroke adjustment rod.

Further information concerning design limitations, cushioning or alternate designs can be obtained by contacting the factory.

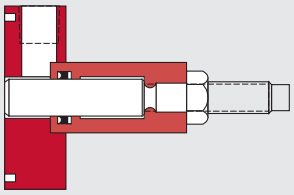
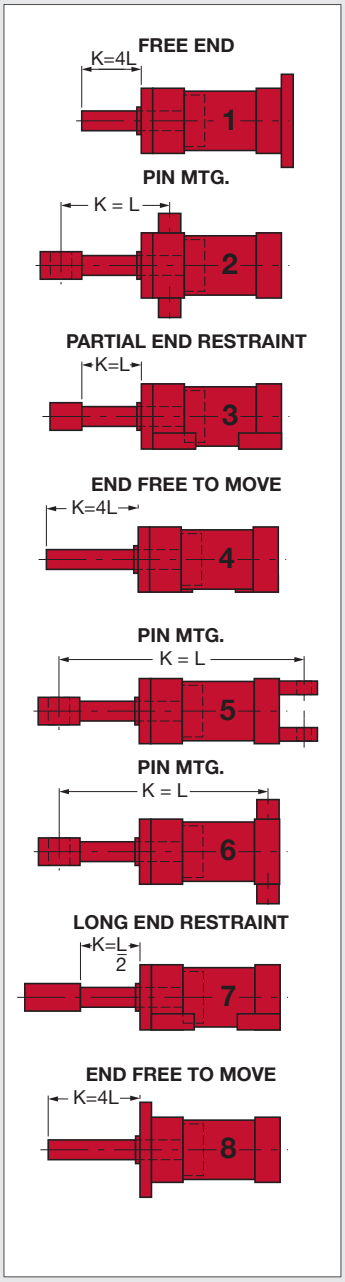


FIGURE 1



Stop Tubes

For more information on Stop Tubes, see page 181 in the Design Engineer's Guide.

STOP TUBES

Stop tubes are used to maintain bearing pressure within acceptable limits and are recommended on cylinders with long strokes or poorly guided rods.

The stop tube is a spacer between the rod end cap and the piston, which provides separation between the piston and the rod bearing. This separation reduces the moment forces developed between the rod bearing and piston when the rod is extended.

To determine if stop tube is necessary for your cylinder requirements, you have to solve for "K" (refer to Figure 1). If your required cylinder has a "K" dimension in excess of 40 inches, stop tube is required. For each 10 inch increment or fraction thereof in excess of 40 inches, one inch of stop tube is recommended. When stop tube is required, the overall length of the cylinder will be increased by the length of the stop tube to be used.

To determine "K" (see to Figure 1)
*Note: W = the rod stick out
(refer to pages 8-27)

Cylinder #1, #4, #8 – see Figure 1

K = 4L= 4 (stroke + W*)

Cylinder #2 - see Figure 1

K = L = (CA or CE) + XG + Stroke

Note:
CA = rod eye dimension (back inside cover)
CE = rod clevis dimension (back inside cover)
XG = mounting dimension page 18

Cylinder #3 – see Figure 1

K = L = W* + Stroke

Cylinder #5 – see Figure 1

K = L = (CA or CE) + XC + (2 x Stroke)

Note:
CA = rod eye dimension (back inside cover)
CE = rod clevis dimension (back inside cover)
XC = mounting dimension page 18

Cylinder #6 – see Figure 1

K = L = (CA or CE) + XJ + (2 x Stroke)

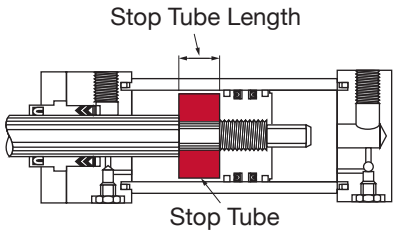
Note:
CA = rod eye dimension (back inside cover)
CE = rod clevis dimension (back inside cover)
XJ = mounting dimension page 18

Cylinder #7 – see Figure 1

K = L/2 =(W* + Stroke)/2

When mounting long stroke cylinders, care should be taken to assure cylinder alignment over the entire length of stroke. The use of external guides or swivel bushings is recommended to reduce side load conditions and prolong the cylinder's service life.

Note: Stop tube length must be added to "K" factor before making final selection of rod size. This is primarily true in No. 5 long stroke applications.



The stop tube is located between the piston and the rod end cap. It limits the extended stroke of the cylinder, providing additional strength for less cost and reduced weight than the use of an oversize rod.

▼ TABLE 1 - VALUE OF "K" IN INCHES

Thrust Force (in-lbs)	Piston Rod Diameter (in)															
	⅝	1	1⅜	1¾	2	2½	3	3½	4	4½	5	5½	7	8	9	10
400	35	84	134	–	–	–	–	–	–	–	–	–	–	–	–	–
700	30	68	119	–	–	–	–	–	–	–	–	–	–	–	–	–
1,000	26	60	105	156	190	–	–	–	–	–	–	–	–	–	–	–
1,400	24	54	93	144	175	244	308	–	–	–	–	–	–	–	–	–
1,800	23	48	84	127	160	230	294	366	–	–	–	–	–	–	–	–
2,400	18	45	75	114	145	214	281	347	–	–	–	–	–	–	–	–
3,200	16	40	68	103	131	196	262	329	398	–	–	–	–	–	–	–
4,000	12	38	63	93	119	174	240	310	373	446	–	–	–	–	–	–
5,000	9	36	60	87	112	163	225	289	359	426	–	–	–	–	–	–
6,000	–	30	56	82	102	152	209	274	342	411	476	–	–	–	–	–
8,000	–	25	51	76	93	136	186	244	310	375	448	–	–	–	–	–
10,000	–	21	45	70	89	125	172	221	279	349	412	–	–	–	–	–
12,000	–	17	41	64	85	117	155	210	270	326	388	455	–	–	–	–
16,000	–	–	35	57	75	110	141	188	233	291	350	421	–	–	–	–
20,000	–	–	28	52	66	103	136	173	218	270	325	385	–	–	–	–
30,000	–	–	–	39	56	87	120	156	190	232	285	330	–	–	–	–
40,000	–	–	–	24	43	75	108	142	177	210	248	293	–	–	–	–
50,000	–	–	–	–	30	66	97	131	165	201	234	268	408	–	–	–
60,000	–	–	–	–	–	57	88	119	154	190	226	256	384	–	–	–
80,000	–	–	–	–	–	36	71	104	136	170	204	240	336	–	–	–
100,000	–	–	–	–	–	–	56	91	120	154	199	224	324	400	–	–
120,000	–	–	–	–	–	–	45	76	108	146	174	207	313	377	–	–
140,000	–	–	–	–	–	–	–	64	98	129	162	194	301	365	–	–
160,000	–	–	–	–	–	–	–	47	87	118	149	182	279	350	421	–
200,000	–	–	–	–	–	–	–	–	65	98	131	160	260	330	402	–
250,000	–	–	–	–	–	–	–	–	–	72	109	143	236	301	375	–
300,000	–	–	–	–	–	–	–	–	–	–	85	120	212	281	351	420
350,000	–	–	–	–	–	–	–	–	–	–	53	100	195	261	328	396
400,000	–	–	–	–	–	–	–	–	–	–	–	72	182	241	309	374
500,000	–	–	–	–	–	–	–	–	–	–	–	–	152	212	274	341
600,000	–	–	–	–	–	–	–	–	–	–	–	–	114	183	247	310
700,000	–	–	–	–	–	–	–	–	–	–	–	–	70	162	221	280

▼ TABLE 2 - DEDUCTIONS FOR PULL STROKE FORCE & DISPLACEMENT

Piston Rod Ø	Piston Rod Area	Cylinder Force in Pounds for Various Pressures							Displacement /in of Stroke
		500 psi	750 psi	1000 psi	1250 psi	1500 psi	2000 psi	3000 psi	Gallons Oil Displaced
⅝	.307	154	230	307	384	461	614	921	.00133
1	.785	393	589	785	981	1178	1570	2355	.00340
1⅜	1.485	743	1114	1485	1856	2228	2970	4455	.00643
1¾	2.405	1203	1804	2405	3006	3608	4810	7215	.01041
2	3.142	1571	2357	3142	3928	4713	6284	9426	.01360
2½	4.909	2455	3682	4909	6137	7364	9818	14730	.02125
3	7.069	3535	5302	7069	8836	10600	14140	21210	.03060
3½	9.621	4811	7216	9621	12026	14430	19240	28860	.04165
4	12.57	6285	9428	12570	15708	18860	25140	37710	.05442
4½	15.90	7950	11920	15900	19880	23850	31800	47700	.06883
5	19.64	9818	14726	19635	24544	29452	39270	58905	.08500
5½	23.76	11880	17820	23760	29698	35640	47520	71280	.10286
7	38.48	19240	28860	38480	–	57720	76920	115400	.1668
8	50.27	25135	37700	50270	–	75400	100500	150810	.2177
9	63.62	31810	47720	63620	–	95430	127200	190860	.2753
10	78.54	39270	58900	78540	–	117810	157100	235620	.3396

▼ TABLE 3 - THRUST FORCE AND DISPLACEMENT

Cylinder Bore Ø	Piston Area	Cylinder Force in Pounds for Various Pressures							Displacement /in of Stroke
		500 psi	750 psi	1000 psi	1250 psi	1500 psi	2000 psi	3000 psi	Gallons Oil Displaced
1½	1.767	884	1325	1767	2209	2651	3534	5301	.00765
2	3.142	1571	2357	3142	3928	4713	6284	9426	.01360
2½	4.909	2455	3682	4909	6137	7364	9818	14730	.02125
3¼	8.296	4148	6222	8296	10370	12440	16590	24890	.03591
4	12.57	6285	9428	12570	15708	18860	25140	37710	.05442
5	19.64	9820	14730	19640	24544	29460	39280	58920	.08502
6	28.27	14140	21200	28270	35342	42400	56540	84810	.12230
7	38.49	19240	28870	38490	48106	57740	76980	115500	.16660
8	50.27	25140	37700	50270	62832	75400	100500	150800	.21760
10	78.54	39270	58900	78540	98175	117800	157100	235600	.34000
12	113.1	56550	84820	113100	141375	169600	226200	339300	.48960
14	153.9	76950	115400	153900	–	230800	307800	461700	.66620
16	201.1	100600	150800	201100	–	301600	402200	603300	.8706
18	254.5	127200	190900	254500	–	381800	509000	763500	1.102
20	314.2	157100	235600	314200	–	471300	628400	942600	1.306

CYLINDER SIZING

The selection of the correct rod size is one of the most important factors in sizing a cylinder. The standard rod for each bore size that *Milwaukee Cylinder* manufactures is sufficient to handle the maximum tension force that the cylinder is capable of producing. It is primarily in compression and long stroke, high thrust applications that the column strength needs to be considered.

The following steps should be used to determine the proper rod size for an application:

1. Select the cylinder bore size required from Table 3 based on the required cylinder thrust force and the operating line pressure at the cylinder.
2. Determine the length between mounting points or "L" as shown on Figure 1, page 30.
3. Based on the distance between mounting points ("L"), determine the value of "K" as shown on Figure 1, page 30.
4. Using the thrust force and the developed "K" dimension, refer to Table 1 to select the proper rod size.
5. If an oversized rod is required, re-check the overall length dimension ("K") in Step 1 and confirm your previous rod size selection.

To determine the cylinder pull (tension), stroke force, or displacement, deduct the force or displacement corresponding to the rod size in Table 2 from the force or displacement corresponding to the bore size shown in Table 3.

Feature	Description	Page Number	Code Number	Example
Double Rod End		26	D	H01541 – 31 – 1 4 – 7 × 14¾
Cylinder Code	Refer to Table 1H	9, 11, 13, 15, 17 19, 21, 23, 25	—	
Mounting Style	Model Number Only	8, 10, 12, 14, 16 18, 20, 22, 24	—	
Rod End Style	Code Number	inside front cover	—	
Cushions	None Rod End Blind End Both Ends	— — — —	1 2 3 4	
Cyllinder Modifications	Special		S	If Standard Leave Blank
Seals	BUNA-N (-20° to 200° F) Viton (-15° to 350° F) Special		7 8 S	*If Special Describe Requirements
Stroke	Specify in Inches Including Fractional Requirements		—	

***NOTE:** Use "S" if any special design features or seals are required, describe in detail on your order.

EXAMPLE: The code for a hydraulic cylinder 4" bore, 2" rod, rod end rectangular flange mounting, Style No. 1 rod end, cushion both ends, standard seals with a 14¾" stroke is: **H01541-31-14-7x14¾.**

DUPLICATE CYLINDERS

Duplicate cylinders can be ordered by giving the serial number from the nameplate of the original cylinder. Factory records supply a quick, positive identification.

HOW TO ORDER

Series H Cylinders

Standard Series H Cylinders can be completely and accurately described by a model number. If your requirements are completely standard, select the alphanumberic codes from above that represent your cylinder and place them in the sequence indicated by the example. Use of the cylinder model number will eliminate untimely delays in handling your order.

General Order Data

1. Bore & Rod Size or the Cylinder Code: (refer to pages 8-27)
2. Mounting Style: (refer to page 8-27)
3. Rod End Style: (refer to inside cover, page ii)
4. Cushion Requirements
5. Length of Stroke

Application Data

1. **Port Requirements**: refer to page 28.
2. **Operating Fluid or Medium:** Series H Cylinders are equipped with seals for use with hydraulic oil. If other than a quality grade hydraulic oil will be used, specify the type of fluid in your order. See page 184 for more details.
3. **Temperature Range:** Series H Hydraulic Cylinders contain seals of Nitrile (Buna-N) suitable to -20° F to +200° F. Specify your operating temperature if your application does not fall within this temperature range.
4. **Operating Pressure:** Series H Cylinders are rated for 3000 PSI. If your requirements are in excess of the rated pressure, describe your application in your order.
5. **Accessories**: Specify any accessories you require, using the part numbers given on the inside back cover.
6. **Special Requirements:** If you require special seals, rod material, stop tube, center support, adjustable stroke or any other special requirements not covered, specify in detail on your order.

***MilCad* Cylinder Configurator**

Visit **milwaukeecylinder.com** to configure and download CAD files of your cylinders.

REPLACEMENT SEALS OR CYLINDER PARTS

For replacement seals or cylinder parts, the serial number of your cylinder, the cylinder model number and the item number of the part you require (below) should appear on your order. To order entire seal kits for your cylinder, simply specify the serial number and the cylinder model number from page 32 on your request for service parts.

HOW TO ORDER COMPLETE SEAL KITS

When ordering complete seal kits, specify the following information on your order:

1. The serial number of the cylinder the seals will be used on.
2. The bore and rod size.
3. If the cylinder is cushioned.

To eliminate untimely delays in the handling of your order, please use the seal kit code as shown in the example below:

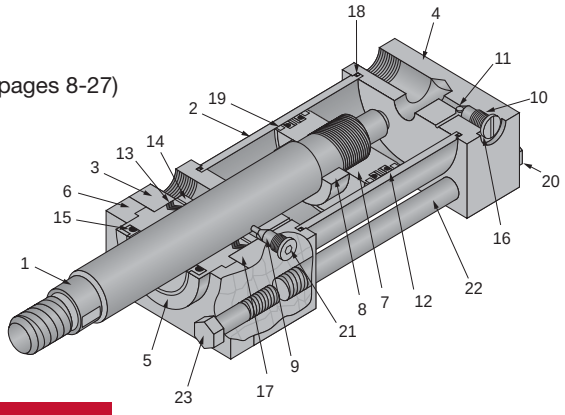
Example:

Buna-N Kit No. XXXXX-7-40

- cylinder code number (refer to pages 8-27)

Viton Kit No. XXXXX-8-40

- cylinder code number (refer to pages 8-27)



▼ STANDARD PARTS LIST

Item No.	Description
1	Piston Rod
2	Cylinder Barrel
3	Head End Cap
4	Cap End Cap
5	Rod Bushing
6	Retainer Plate
7	Piston
8	Cushion Plunger
9	Cushion Adj. Plunger
10	Ball Check Retainer
11	Ball Check
12	U-Cup Seal & Backup Washer for Piston
13	Rod Vee Ring Set
14	Rear Bearing Ring
15	Rod Wiper
16	O-Ring Seal for Ball Check Retainer
17	Wave Spring
18	Cylinder Barrel O-Ring & Backup Washer
19	Cast Iron Piston Ring, Standard
20	Tie Rod Flex Lock Nut
21	O-Ring Seal for Cushion Adj. Needle
22	Tie Rod
23	Self-Locking Cap Screw

Retainer Plate Cap Screw Torques

▼ For Square Retainers

Bore Ø	Torque (Ft-lbs)
1½	10
2	20
2½	20
3¼	40
4	40
5	75
6	100

▼ For Circular Retainers

Bore Ø	Rod	Torque (Ft-lbs)
1½	All	3
2	All	6
2½	1, 1⅜	6
	1¾	10
3¼	All	10
4	All	10
5	All	10
6	2½	10
	3, 3½, 4	30
7	All	30
8	3½ - 5	30
	5½	50
10	4½ - 5	30
12	5½	50
	All	50

Tie-rod Nut Torques

▼ Nut Torque Specifications

Bore Ø	Torque (Ft-lbs)
1½	25
2	45
2½	45
3¼	125
4	125
5	300
6	400
7	600
8	900
10	2500
12	3700

When it is necessary to remove the tie-rod nuts on a cylinder, they must be reassembled to the torque specifications given above. To prevent the tie-rods from twisting when tightened, use a vice grip or locking clamp. Note that the torque specification is based on lubricated threads.

INSTALLATION FOR SERIES H

General Information

Cleanliness

The most important consideration when installing the cylinder. When cylinders are shipped from *Milwaukee Cylinder*, the ports are securely plugged with plastic plugs which should not be removed until the piping is to be installed. All piping should be thoroughly clean, to include the removal of all threading and flaring burrs or chips, before making the connection to the cylinder ports. One chip can cause premature failure of the cylinder or other hydraulic system components.

Alignment

Improper alignment will result in excessive cylinder wear. Check to assure rod alignment between the cylinder and its mating component on your machine in both the extended and retracted positions.

Environment

Cylinders operating in areas where there is weld splatter, fast drying chemicals, paint, excessive heat or other hazardous conditions, should have covers or shields to prevent damage to the rod and rod seals.

Bleeding

Air within the cylinder or system will cause erratic operation of the cylinder. *Milwaukee Cylinders* generally do not require bleed ports if the cylinder ports are mounted in an upright position. Several full strokes of the cylinder will purge air from the cylinder into the circuit piping, where it can be bled off. Bleeder ports are available for applications where the cylinder is the high point of the circuit or where the cylinder does not complete a full stroke during its normal cycle.

MOUNTING RECOMMENDATIONS

Foot Mounted Cylinders

The use of high strength alloy steel mounting bolts 1/16" smaller than the hole size is recommended. After final alignment, foot mounted cylinders should be dowel pinned in place.

Trunnion Mounted Cylinders

Lubricated pillow blocks designed for close tolerance applications should be used. It is important to rigidly mount and align the pillow blocks so that the trunnion pins will not be subjected to any extreme bending moments The rod end should be pivoted with the pivot pin in line and parallel to the axis of the trunnion pins.

Flush Mount Cylinders

The use of high strength alloy steel mounting bolts is recommended. Shear keys should be used to reduce the stress on the mounting bolts created by the normal push and pull forces created by the cylinder cycle.

Flange Mount Cylinders

The controlled diameter rod bushing extension can be used as a pilot to locate the flange mount. Dowel pins should be used after the cylinder is mounted and aligned to prevent shifting.

Clevis Mount Cylinders

This type of cylinder must be pivoted at both ends and the pins must be in line and parallel to each other. After the cylinder is mounted, the customer should check to assure that the cylinder is free to swing through its working arc without interference from other machined parts.

STORAGE

Often times, cylinders are delivered before a customer is prepared to install them and must be stored for a period of time. When storage is required:

1. Select an area indoors for storage, which has dry and non-corrosive atmosphere. Take caution to protect the cylinder from both internal and external corrosion.
2. Cylinders to be stored should be kept in a vertical position (piston rod up) whenever possible.
3. Port protector plugs should be kept in the cylinder ports until the time of installation.

CYLINDER TROUBLE SHOOTING

1. **External leakage**

   If leaking occurs between the end cap and barrel, check tie-rod torque. Do not over torque. If the torque is correct, then replace the barrel seal. When leakage occurs in the rod bushing area, replace the rod seals. If leakage continues or reoccurs in short period of operation, check items 2 thru 5, page 33.

2. **Cylinder misalignment**

   Side load is a common problem which occurs when the cylinder application does not allow the piston rod to work in line during the extend and retract motions of the cylinder. Evidence of this is excessive seal failure, bushing wear or galling of the piston rod. Often, bending of the piston rod or complete failure (breakage) of the rod occurs.

3. **Contamination on the piston rod**

   Dirt and other material is often picked up when the piston rod is extended. When the rod is retracted in an excessive dirty application, it often carries the dirt back into the rod seal cavity of the cylinder, causing damage to the seals. With a slight modification of the cylinder rod end, a rod boot can be added to protect the rod bushing and seals for most applications.

4. **Bad mountings**

   Due to wear of pivot pins or mounting bolts working loose, a cylinder may have side load, even though the rod was in line when the cylinder was first installed. All cylinder mountings should be checked periodically.

5. **Damaged piston rod**

   An extended piston rod can be damaged by the impact of a hard object which could burr the rod. If this occurs, the rod should be checked immediately to prevent seal damage.

6. **Internal leakage**

   Inside the cylinder, leakage past the piston seals can cause sluggish movement or settling of the cylinder under load conditions. This occurs due to leakage of worn piston seals or rings.

7. **Creeping cylinder**

   When a cylinder is stopped in midstroke and it creeps, check for internal leakage. Creeping can also be caused by a worn control valve and this should be checked, even if the cylinder is found to have internal leakage.

8. **Erratic operation**

   When a cylinder is erratic or sluggish in operation, this may be caused by a number of problems. The most common cause of sluggish operation is air in the system. Internal leakage could also be a cause. If the system starts out sluggishly and, as it warms, speeds up, the oil may be of too high viscosity. The whole system should be checked for worn components if after these checks, the cylinder is still operating in a sluggish manner.

CYLINDER MAINTENANCE

Rod Seal Replacement

When changing rod seals, extend the piston rod 3" or more if possible, being sure to support the rod at all times. Remove the retainer plate screws (if tie-rod nuts have to be removed, refer to the nut torque specification on this page when reassembling the cylinder), retainer plate and outer bushing. Using an eye hook or thin screwdriver, pry the vees from the end cap cavity (if low pressure air is applied to the rod end port, this will help to force the vees from the cavity). The new set of vees should be assembled into the cavity separately and lubed with the soft vee in the center. Replace the rod wiper in the bushing and reassemble the cylinder.

Piston Seal Replacement

When changing piston seals, extend the piston rod 3" or more if possible, being sure to support the piston rod and the piston at all times. *Remove the tie-rod nuts, blind end cap, the barrel and then the piston seals. A light grease, compatible with the system fluid, should be used on the rings and block vee seals for smooth assembly. Install the block vee piston seals, scarf cutting on only the back-up washers. Then install the cast iron rings with the joints in opposite directions. To reassemble, start the piston into the tube, compressing the cast iron rings using twine or a ring compressor. When the piston block vee seal is to the edge of the barrel, use a thin rounded blade to start the lip of the block vee, making sure the entire lip is started before moving the piston further into the tube.

***Note:** When a cylinder has been disassembled this far, the barrel seals should at least be inspected, if not replaced.

Barrel Seal Replacement

When replacing barrel seals, use the same method of disassembling the cylinder as used when replacing piston seals. The barrel seal consists of a backup washer and O-Ring, which is assembled on the first step of both ends of the tube, with the backup washer going on first. The outer diameter of the tube groove on the end caps must be checked for nicks or burrs and then greased. Position the end caps squarely on the tube (check to make sure port location is correct) and firmly force or tap the end cap over the tube until it bottoms. Check to make sure the O-Ring did not shear and then finish assembling the cylinder.

Nut Torque Specifications

Cylinder Bore	Torque (Ft-lbs)
1½	25
2 - 2½	45
3¼ - 4	125
5	300
6	400
8	900
10	2500
12	3700

When it is necessary to remove the tie-rod nuts on a cylinder, they must be reassembled to the torque specifications given above. To prevent the tie-rods from twisting when tightened, use a vice grip or locking clamp. Note that the torque specification is based on lubricated threads.