



Danfoss

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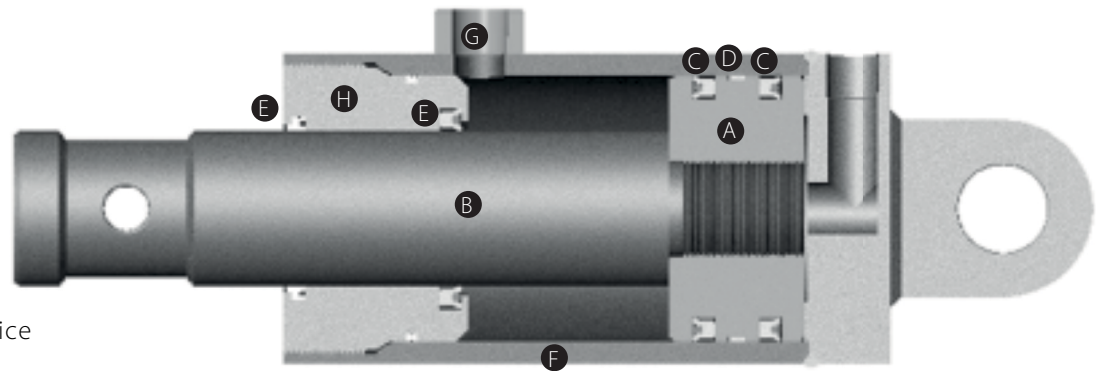
Design Features and Specifications

Specifications

Bore Sizes: 4" - 12"

Pressure Ratings:

3,000 psi Hydraulic Service



A Piloted Ductile Iron Piston

- One-piece, ductile iron piston, piloted to ensure concentricity.
- Secured to the rod by threadlocker in bores up to 6" and set screws in 7" bores and up to insure a positive connection.

B Piston Rod

- Piston rod is machined from high yield, turned, ground and polished C-1045/50 micro alloy steel.
- Piston Rods are hard chrome plated a minimum of .001" diametrically, to insure superior cylinder operation and life.
- Heavy plating, stainless steel, or chrome over nickel plating are available options.

C Piston Seals

- Specially designed, mechanically loaded piston seals minimize piston bypass.
- Bi-directional piston seal with outboard wear bands is standard on 9" and above.
- Bi-directional piston seal is optional for smaller bore sizes.

D Piston Wear Band

- Nonmetallic wear band provides side load protection.

E Rod Seal/Wiper

- Specially designed, high durometer, mechanically loaded rod seal virtually eliminates rod seal leakage.
- Urethane rod wiper is abrasion resistant and provides exclusion protection.

F High Yield Steel Tubing

- High yield strength steel tubing is produced to exceed the ASTM-513 specifications, and is hydraulically straightened before honing.
- This combination of superb base material and superior processing insures straight, smooth, and long life cylinders.

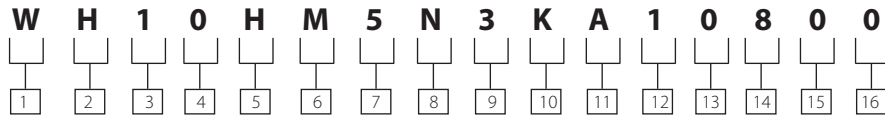
G Steel Port Boss

- Steel port boss insures a full thread, pressure-tight porting connection.

H Iron Rod Gland

- Standard gland is constructed of high strength ductile iron.
- Optional SAE 660 bronze material or wear bands are available to provide additional side load protection.
- All welded cylinders have a precision fit body seal and backup on the gland O.D.

How to Order Series WH Cylinders



1 2 Series designation

WH – Welded Hydraulic Cylinder

3 4 Mounting Style

Code Mounting Style

08	–	Head Flange
10	–	Cap Clevis
47	–	Cap Fixed Eye

5 6 Bore and Rod Diameter

Code	Bore	Rod
HL	4	1-3/4
HM	4	2
HP	4	2-1/2
KU	5	3
KV	5	3-1/2
LV	6	3-1/2
LW	6	4
MW	7	4
MZ	7	5
NZ	8	5
N1	8	5-1/2
R1	10	5-1/2
R4	10	7
S4	12	7
S7	12	9

7 Rod End Type

Code Rod End Style

2	Short Female UN Thread	
4	Full Male UN Thread	
5	Small Male UN Thread	
6	Plain-No Attachment	
9	Intermediate Male UN Thread	
G	Grooved End	
K	Extended Small Male UN Thread	
M	Extended Int. Male UN Thread	
P	Pin Hole	

8 Seals

Code Application Type

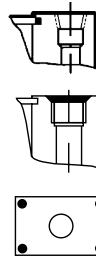
N	Normal
L	Low Friction
T	High Temperature
D	Dirty/ Dusty Environment

9 Ports

Code

1	NPTF
3	SAE/UN O-ring
6	SAE4-bolt Manifold

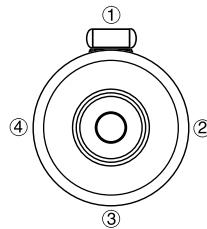
Port Style



10 Port Location

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

BF = Back Face center of cap



Code

K
L
M
N
P
R
S
T
U
V
W
Y
1
2
3
4
5
6
7
8

Head

1
1
1
1
2
2
2
2
3
3
3
4
4
4
4
4
4
4
4

Cap

1
2
3
4
1
2
3
4
1
2
3
4
4
4
4
BF
BF
BF
BF

11 Cushions

Code

A	Noncushioned (both ends)
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12 13 14 Cylinder Stroke

Items 12 & 13 indicate total cylinder stroke length from 00 through 99 inches. body text.

Item 14 indicates fraction of an inch as follows:

Code	Fraction	Code	Fraction
0	0	8	1/2
1	1/16	9	9/16
2	1/8	A	5/8
3	3/16	B	11/16
4	1/4	C	3/4
5	5/16	D	13/16
6	3/8	E	7/8
7	7/16	F	15/16

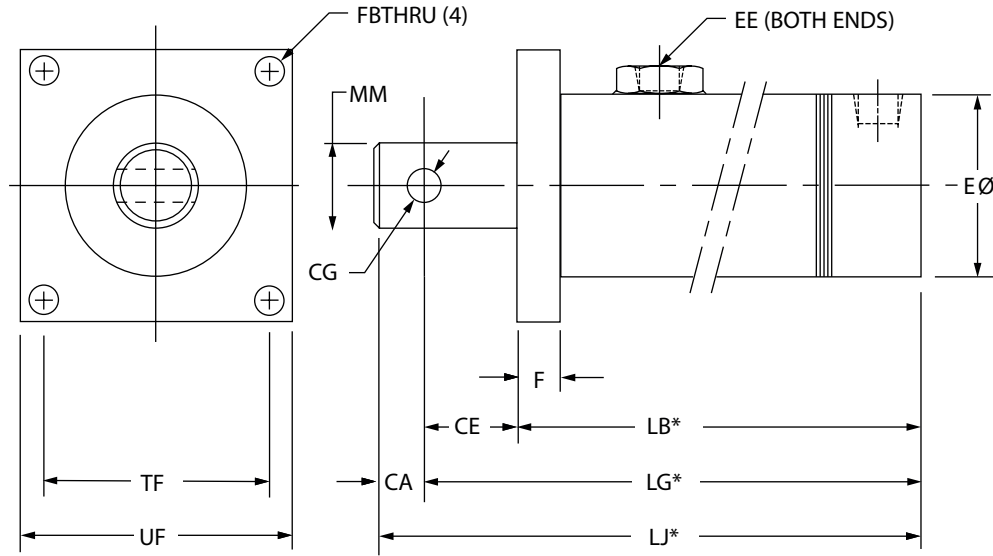
15 16 Extra Rod Projection

("C" dimension)

Item 15 indicates inches from 0 through 9.

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

Mounting Dimensions - WH08 Head Square Flange Mounts



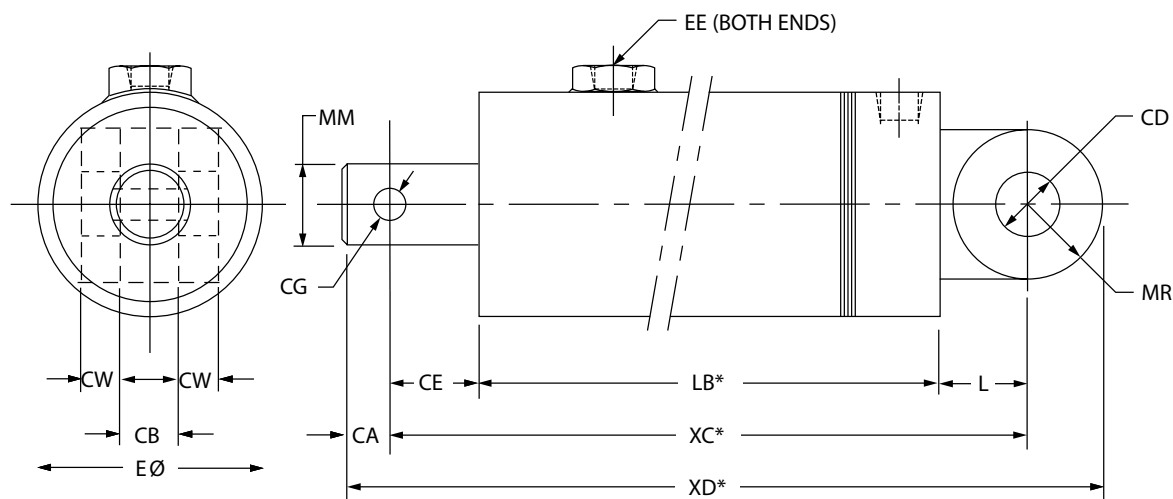
BORE SIZE	ROD DIA (MM)	CA	CE	CG	E	EE (NPTF)	EE (SAE)	F	FB	LB*	LG*	LJ*	TF	UF
4"	1.75	2.50	3.00	.75	4.62	.75	#12	.88	.56	6.25	9.25	11.75	6.38	7.62
4"	2	2.50	3.00	1.00	4.62	.75	#12	.88	.56	6.25	9.25	11.75	6.38	7.62
4"	2.5	2.50	3.00	1.00	4.62	.75	#12	.88	.56	6.25	9.25	11.75	6.38	7.62
5"	3	2.50	3.12	1.00	6.00	.75	#12	1.00	.81	7.50	10.62	13.12	10.00	12.00
5"	3.5	2.50	3.50	1.50	6.00	.75	#12	1.00	.81	7.50	11.00	13.75	10.00	12.00
6"	3.5	2.50	3.50	1.00	7.00	1.00	#16	1.50	.81	7.62	11.12	13.62	10.00	12.00
6"	4	2.50	3.50	1.50	7.00	1.00	#16	1.50	.81	8.12	11.62	14.12	10.00	12.00
7"	4	2.50	3.63	1.50	8.00	1.25	#20	1.50	1.03	9.00	12.88	15.38	14.25	18.00
7"	5	2.50	3.88	1.50	8.00	1.25	#20	1.50	1.03	9.00	12.88	15.38	14.25	18.00
8"	5	2.50	3.63	1.50	9.25	1.25	#20	2.50	1.03	10.50	14.12	16.62	14.25	18.00
8"	5.5	2.50	3.63	1.50	9.25	1.25	#20	2.50	1.03	10.50	14.12	16.62	14.25	18.00
10"	5.5	2.50	3.50	1.50	11.75	2.00	#32	3.50	1.81	14.44	17.94	20.44	18.38	22.00
10"	7	3.00	3.75	3.00	11.75	2.00	#32	3.50	1.81	14.69	18.44	21.44	18.38	22.00
12"	7	3.00	3.75	3.00	14.00	2.00	#32	3.50	2.06	15.63	19.38	22.38	18.38	22.00
12"	9	3.00	4.63	3.00	14.00	2.00	#32	3.50	2.06	15.63	20.25	23.25	18.38	22.00

Dimensions shown are mounting dimensions.

* Add stroke to all starred dimensions.

NOTE: Rod sleeve available, specify I.D. x O.D. x Total Length

Mounting Dimensions - WH10 Cap Clevis Mounts



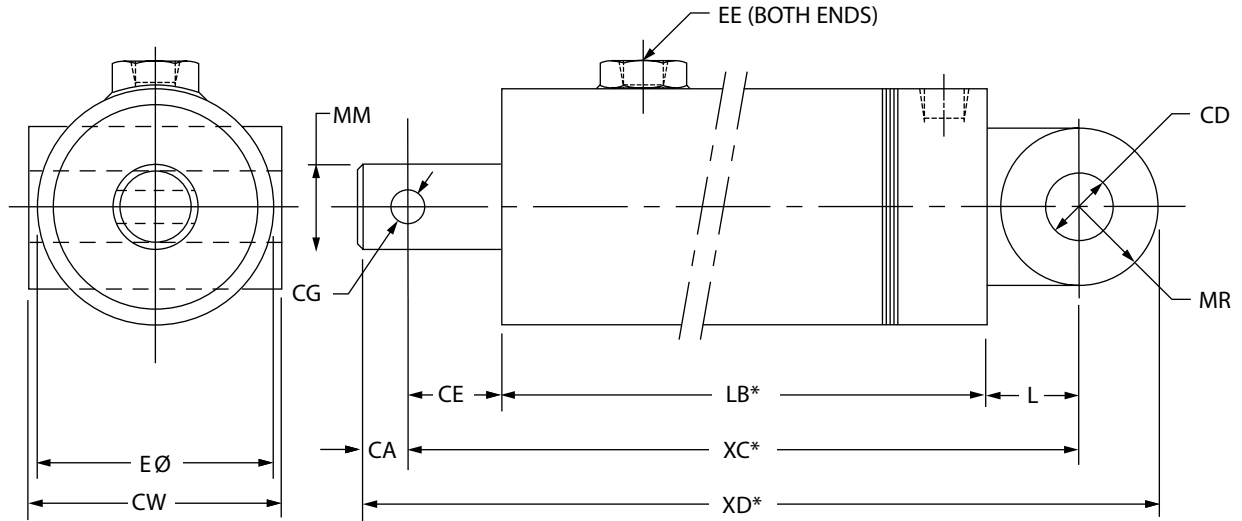
BORE SIZE	ROD DIA (MM)	CA	CB	CD	CE	CG	CW	E	EE (NPTF)	EE (SAE)	L	LB*	MR	XC*	XD*
4"	1.75	2.50	2.12	1.375	3.00	1.00	.75	.63	.75	#12	1.88	6.25	1.38	11.12	15.00
4"	2	2.50	2.12	1.375	3.00	1.00	.75	.50	.75	#12.63	2.12	6.25	1.38	11.38	15.25
4"	2.5	2.50	2.12	1.375	3.00	1.00	.75	.50	.75	#12.63	2.00	6.25	1.38	11.38	15.25
5"	3	2.50	2.25	1.500	3.12	1.00	.75	.2	.75	#12.00	2.00	7.50	1.50	12.62	16.62
5"	3.5	2.50	2.25	1.500	3.50	1.50	.75	.2	.75	#12.00	2.25	7.50	1.50	13.25	17.25
6"	3.5	2.50	2.62	2.000	3.50	1.00	1.00	.5	1.00	#12.00	2.50	7.62	2.00	13.62	18.12
6"	4	2.50	2.62	2.000	3.50	1.50	1.00	.5	1.00	#12.00	2.50	8.12	2.00	14.12	18.62
7"	4	2.50	3.12	2.500	3.62	1.50	1.00	.5	1.00	#20.00	3.12	9.00	2.50	16.00	21.00
7"	5	2.50	3.12	2.500	3.88	1.50	1.00	.5	1.00	#20.00	3.12	9.00	2.50	16.00	21.00
8"	5	2.50	3.12	3.000	3.62	1.50	1.00	.5	1.00	#20.25	2.88	10.50	3.00	17.00	22.50
8"	5.5	2.50	3.12	3.000	3.62	1.50	1.00	.5	1.00	#20.25	2.88	10.50	3.00	17.00	22.50
10"	5.5	2.50	4.25	3.500	3.50	1.50	1.00	.5	2.00	#321.75	4.00	2.00	4.44	3.50	21.94
10"	7	3.00	4.25	3.500	3.75	3.00	1.00	.5	2.00	#321.75	4.00	2.00	4.69	3.50	22.44
12"	7	3.00	4.62	4.000	3.75	3.00	1.00	.5	2.25	#324.00	4.50	2.00	5.62	4.00	23.88
12"	9	3.00	4.62	4.000	4.62	3.00	1.00	.5	2.25	#324.00	6.19	2.00	5.62	4.00	26.44

Dimensions shown are mounting dimensions.

* Add stroke to all starred dimensions.

NOTE: Rod sleeve available, specify I.D. x O.D. x Total Length

Mounting Dimensions - WH47 Cap Eye Mounts



BORE SIZE	ROD DIA (MM)	CA	CD	CE	CG	CW	E	EE (NPT)	EE (SAE)	L	LB*	MR	XC*	XD*
4"	1.75	2.50	1.390	3.00	.75	5.00	4.63	.75	#12	1.19	6.25	1.19	10.44	14.13
4"	2	2.50	1.390	3.00	1.00	5.00	4.63	.75	#12	1.19	6.25	1.19	10.44	14.13
4"	2.5	2.50	1.390	3.00	1.00	5.00	4.63	.75	#12	1.19	6.25	1.19	10.44	14.13
5"	3	2.50	1.515	3.12	1.00	6.00	6.00	.75	#12	1.25	7.50	1.25	11.88	15.62
5"	3.5	2.50	1.515	3.50	1.50	6.00	6.00	.75	#12	1.25	7.50	1.25	12.25	16.00
6"	3.5	2.50	1.515	3.50	1.00	7.00	7.00	1.00	#16	1.25	7.50	1.25	12.38	16.12
6"	4	2.50	1.515	3.50	1.50	7.00	7.00	1.00	#16	1.25	8.12	1.25	12.88	16.62
7"	4	2.50	2.015	3.62	1.50	8.00	8.00	1.25	#20	1.88	9.00	1.88	14.50	18.88
7"	5	2.50	2.015	3.88	1.50	8.00	8.00	1.25	#20	1.88	9.00	1.88	14.75	19.12
8"	5	2.50	2.515	3.62	1.50	9.00	9.25	1.25	#20	2.25	10.50	2.25	16.38	21.12
8"	5.5	2.50	2.515	3.62	1.50	9.00	9.25	1.25	#20	2.25	10.50	2.25	16.38	21.12
10"	5.5	2.50	3.515	3.50	1.50	11.75	11.75	2.00	#32	2.75	14.44	2.75	20.69	25.94
10"	7	3.00	3.515	3.75	3.00	11.75	11.75	2.00	#32	2.75	14.69	2.75	21.19	26.94
12"	7	3.00	4.015	3.75	3.00	14.00	14.00	2.00	#32	3.00	15.62	3.00	22.38	28.38
12"	9	3.00	4.015	4.62	3.00	14.00	14.00	2.00	#32	3.00	15.62	3.00	23.25	29.25

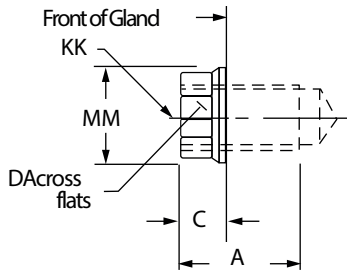
Dimensions shown are mounting dimensions.

* Add stroke to all starred dimensions.

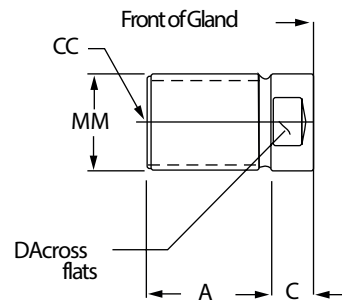
NOTE: Rod sleeve available,
specify I.D. x O.D. x Total Length

Series WH Rod End Selection

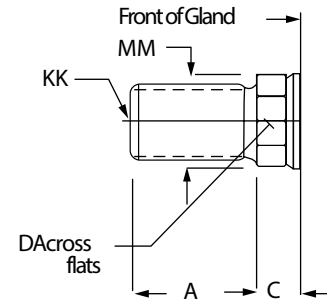
Rod End Style 2



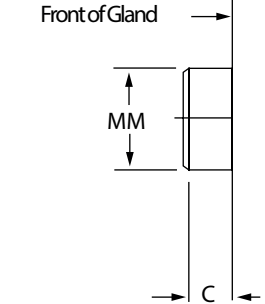
Rod End Style 4



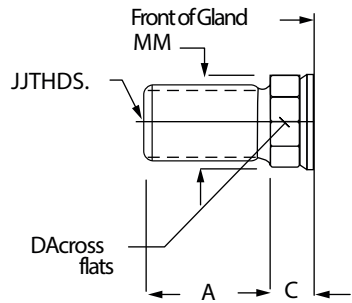
Rod End Style 5



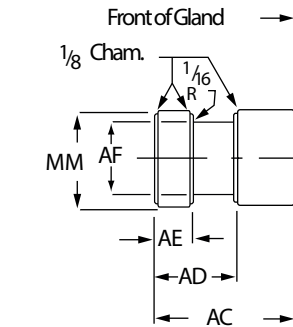
Rod End Style 6



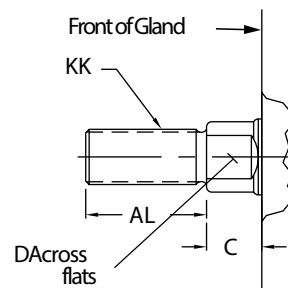
Rod End Style 9



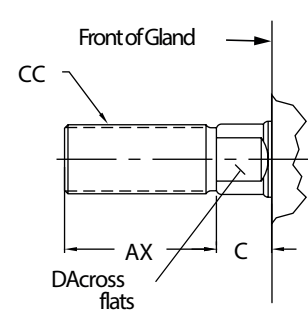
Rod End Style G



Rod End Style K



Rod End Style M



ROD DIA. (MM)	A	C	D	CC THREAD	JJ THREAD	KK THREAD	AC	AD	AE	AF	AL	AX
1.75	2.00	.75	1.50	1.750-12	1.500-12	1.250-12	1.75	1.31	.50	1.13	2.75	3.12
2	2.25	.88	1.69	2.000-12	1.750-12	1.500-12	2.63	1.69	.63	1.38	3.12	4.12
2.5	3.00	1.00	2.06	2.500-12	2.250-12	1.875-12	3.25	1.94	.75	1.75	4.12	4.75
3	3.50	1.00	2.63	3.000-12	2.750-12	2.250-12	3.63	2.44	.88	2.25	4.75	5.50
3.5	3.50	1.00	3.00	3.500-12	3.250-12	2.500-12	4.38	2.69	1.00	2.50	5.00	6.38
4	4.00	1.00	3.38	4.000-12	3.750-12	3.000-12	4.50	2.69	1.00	3.00	5.62	6.56
5	5.00	1.00	4.25	5.000-12	4.750-12	3.500-12	5.38	3.19	1.50	3.88	7.00	7.56
5.5	5.50	1.00	4.63	5.500-12	5.250-12	4.000-12	6.25	3.94	1.88	4.38	7.75	9.56
7	7.00	1.00	6.00	7.000-12	6.500-12	5.500-12	6.50	4.06	2.00	5.75	10.00	10.50
9	9.00	1.00	8.00	9.000-12	8.500-12	6.500-12	6.75	4.13	2.00	7.25	12.50	13.50

All dimensions in inches

***NOTE:** For Rod End Pin Hole dimensions, see cylinder mounting dimension drawings on pages 7-9.

Technical Data - Rod Size and Stop Tube Selection

Rod Size Selection

Standard rod sizes are normally suitable for all applications except for long stroke or high thrust applications. Proper selection of minimum rod size may be determined by the following steps:

1. With knowledge of bore size and operating pressure, thrust (T) may be determined. Refer to the graph in the next column.
2. Select from illustrations to the right the type of mounting to be used and determine the length of L with the piston rod in the fully extended position.
3. Find the value of L at the bottom of the graph and follow its line vertically until it intercepts the horizontal line representing the maximum push thrust that will be applied to your cylinder. The intersection of these two lines will fall within a stripe representing the minimum recommended piston rod diameter for your application.

Stop Tubes

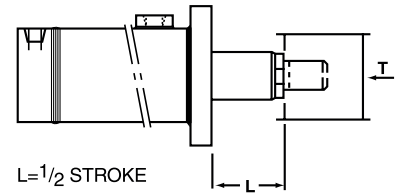
Stop tubes are located between the piston and the rod shoulder on the head end of the cylinder. Bearing loading is reduced by separating the piston and the rod bushing. Bearing wear and tendency to buckle is reduced.

To determine if a stop tube is required and the length of stop tube needed, use the following procedure:

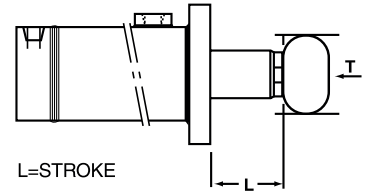
Determine the value of L with the piston rod in the fully extended position. If the value of L is under 40 inches, no stop tube is needed. If L is greater than 40 inches, one inch of stop tube is recommended for each 10 inches or fraction thereof beyond 40.

Special Note: When specifying stroke and stop tube lengths, please include net working stroke plus the stop tube length.

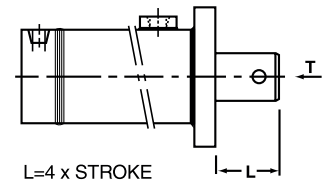
Firmly Guided Rod End



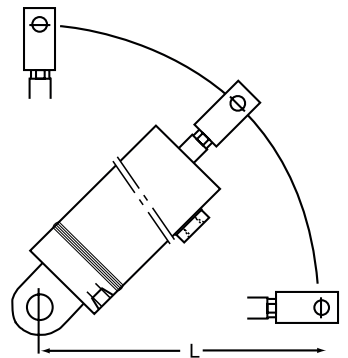
Supported Rod End



Unsupported Rod End



Clevis Mount



Stop Tube Graph

