



HW Series Cylinders

Industrial Grade Welded



HYDRO-LINE, INC.

An IMC Company

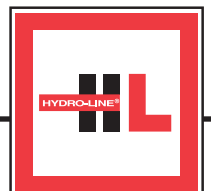
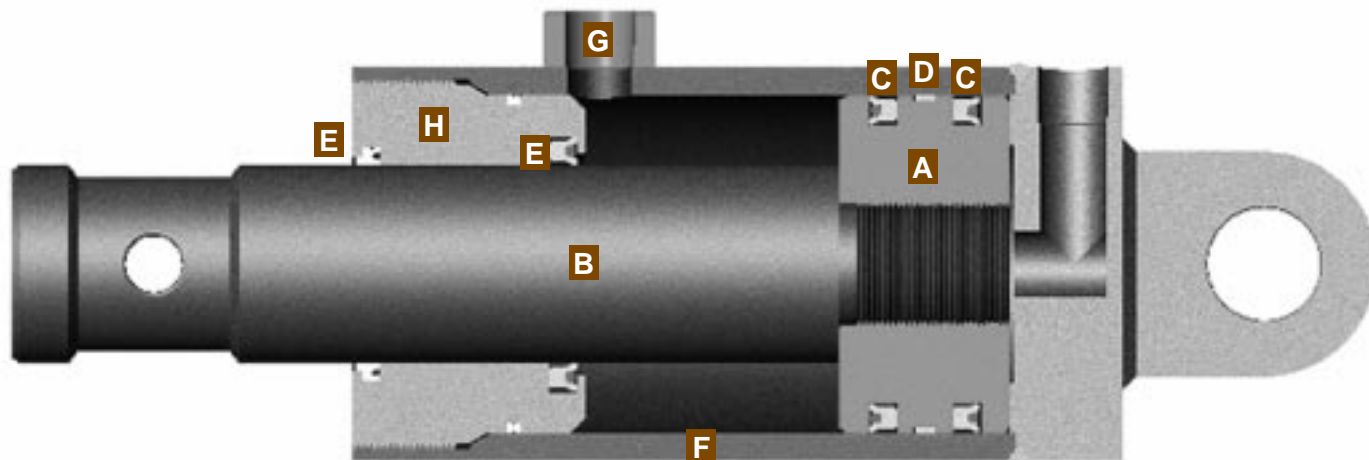


Table Of Contents

HW Design Featurespage 2
How to Orderpage 3
Application Data Sheetpage 4
Quality Statementpage 5
Custom Cylinderspage 5

HW Mounting Dimensionspages 6-9
Warrantypage 9
Rod End Stylespage 10
Technical Datapage 11

HW Design Features



A Pilot Fitted Piston

- One-piece, pilot fitted, ductile iron material.
- Secured to the rod by thread-locker in bores up to 6" and set screws in 7" bores and up to insure a positive, safe connection.

B Piston Rod

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

C Piston Seals

- Specially designed, mechanically loaded piston seals virtually eliminate any 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 Bands

- 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 duty life cylinders.

G Steel Port Boss

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

H Iron Gland

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

Specifications

Bore Sizes: 4" through 12"
Pressure Ratings: 3000 psi hydraulic service

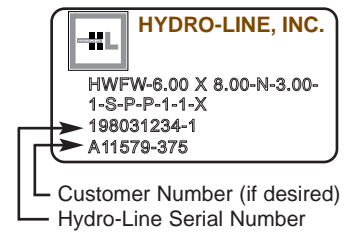
How to Order an HW Cylinder

Hydro-Line standard cylinders can be completely and accurately identified with a model number that encodes construction specifications. To develop the model number for ordering a cylinder, see the following example:

Feature	Description	Symbol
Rod Diameter	Specify in inches (2 position decimal)	1.75
		2.00
		2.50
		3.00
		3.50
		4.00
		5.00
		9.00
Cushions	Non-Cushioned	N
Stroke	Specify in inches (2 position decimal)	-
Bore	Specify in inches (2 position decimal)	4.00
		5.00
		6.00
		7.00
		8.00
		10.00
		12.00
		Mounting Style
Clevis Mount	CW	
Special	X	
Model Series	3000 psi Hydraulic	HW
Rod End Style	Male, Full Rod Dia.	6
	Male, Small	2
	Female	4
	Plain End	5
	Male, Large	1
	Male, For Rod End Coupling	10
	Pin Hole	7
	Modified	M
Ports	NPT	N
	Flange	F
	SAE	S
Rod Seals	PolyPak	P
	Viton PolyPak	F
	Urethane Ultra Seal	H
	Ultra Seal with Scraper	J
	Viton PolyPak with Scraper	G
	Special	X
Piston Seals	PolyPak	P
	Low Breakaway Teflon Radial w/ Wearbands	B
	Special	X
Port Locations	Head end position	1-4
	Cap end position	1-5
Special Modifications	Include ONLY if special modifications are required	X

HOW TO ORDER

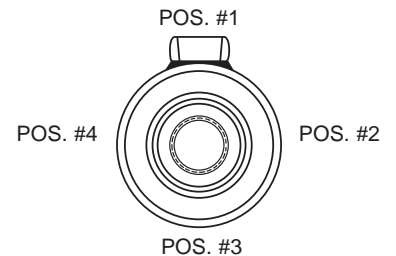
- Quantity
- Model number
- Special modifications if required
- Required ship date



HWFW - 6.00 X 8.00 - N - 3.00 - 1 - S - P - P - 1 - 1 - X



National
FLUID POWER
Association
MEMBER



Port & Cushion Locations
Port location 5 is on the center of the back face of the end cap.

Hydro-Line Application Data Sheet

Company Name: _____	Distributor Name: _____
Contact: _____	Contact: _____
Phone Number: _____ Fax Number: _____	Phone Number: _____ Fax Number: _____

QUANTITY	MODEL NUMBERING SYSTEM
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
MODEL/SERIES MOUNT	BORE
STROKE	CUSHION
ROD DIA.	ROD STY
PORTS	ROD
PSTN	SEALS
H	PORT LOC
C	MOD.
MOD.	
DOUBLE END ROD STYLE	ADDITIONAL ROD LENGTH
NEEDLE LOCATION	4-FLAT
HEAD	CAP
MODEL PREFIX	
STOP TUBE LENGTH	TRUNNION XI DIMENSION
STAINLESS STEEL ROD TYPE	

Please fill in all available information above. Refer to the Hydro-Line Model Numbering System on Page 2.

WHAT IS THE OPERATING ENVIRONMENT?			WHAT IS THE WORK BEING PERFORMED?		
<u>Fluid Media</u>	<u>Operating Pressure</u>	<u>Temperature at Cylinder</u>	<u>Load</u>	<u>Rod Speed</u>	<u>Cycles per minute</u>
Air _____	Minimum _____ P.S.I.	Minimum _____ °F	Push _____ lbs.	Extend _____ in./sec.	
Oil _____	Typical _____ P.S.I.	Typical _____ °F	Pull _____ lbs.	Retract _____ in./sec.	_____ (in and out)
Other _____	Maximum _____ P.S.I.	Maximum _____ °F			
Fluid Type _____					

WHAT IS THE MOUNTING?					
Attitude		Rod End Connection		Known Side Load	
Vertical _____	Angle _____	Firmly Guided _____	_____ lbs.		
	Degrees From Vertical _____	Supported _____			
Rod Up _____	Rod Up _____	Unsupported _____			
Rod Down _____	Rod Down _____				

WHAT ENVIRONMENTAL CONDITIONS IS THE CYLINDER SUBJECTED TO?

Standard Factory _____ Corrosive Washdown _____ Chemical _____ Outdoors _____ Other _____

WHAT IS THE PRESENT CYLINDER TYPE AND MODEL NUMBER?

WHAT IS THE PRESENT PROBLEM?

WHAT INDUSTRY IS THE CYLINDER USED IN?	WHAT TYPE OF MACHINE IS THE CYLINDER USED ON?	WHAT IS THE CYLINDER NAME USED IN THE APPLICATION?
--	---	--

APPLICATION SKETCH:	DESCRIPTION OF APPLICATION OR SPECIAL REQUIREMENT:
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PREPARED BY:	DATE:	REVIEWED BY:	DATE:
CUSTOMER DRAWING NUMBER:	REVISION DATES:		HYDRO-LINE QUOTE NUMBER:

Commitment to Quality

It is the policy of Hydro-Line, Inc. to design, produce and deliver defect-free products and provide superior services, the first time and every time, that consistently meet the needs of our customers. Our philosophy calls upon every employee to strive for excellence in customer satisfaction through continuous improvement.



Custom Cylinders

For Special Applications

Hydro-Line's full line of cylinder products and options fit most customers' application requirements, however, a special cylinder is often required to meet custom specifications. These custom cylinders are often needed to solve difficult application problems, upgrade existing equipment or are designed into new machinery.

Hydro-Line's Sales, Engineering and Manufacturing groups are cylinder specialists and have many years of experience in the interpretation of requirements, design and manufacture of custom cylinder products.



Our capabilities include:

- Bore diameters to 48"
- Stroke lengths to 300"
- Operating pressures to 10,000 psi or higher
- Operating mediums ranging from shop air to nitrogen, or from standard hydraulic fluid to special synthetic fluids
- Tie rod, threaded, bolted, and welded cylinder construction
- Finite element analysis
- Application simulation in our testing laboratories

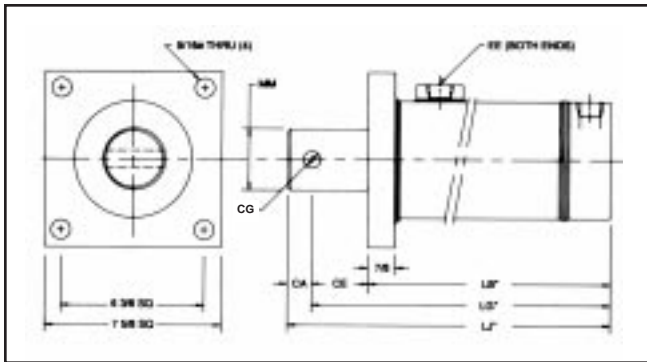


= Solutions

Hydro-Line would appreciate an opportunity to submit a proposal to solve your application problem or fulfill your current cylinder requirements. Simply copy and complete the Application Data Sheet on page 4 and fax to your authorized Hydro-Line distributor.

HW Mounting Dimensions

4" - 5" bore cylinders

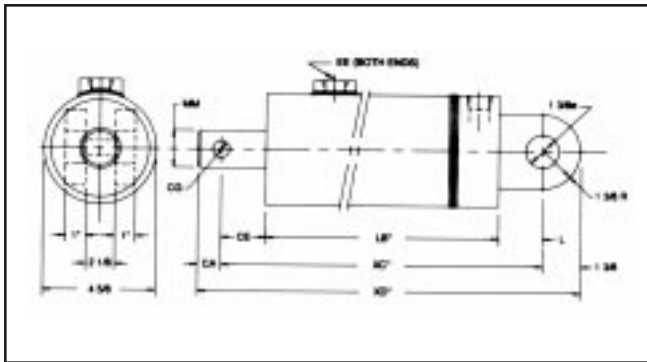


HWFW – 4" Bore

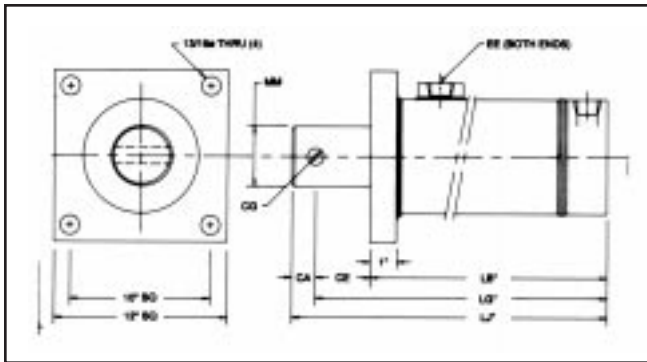
MM ROD DIA.	1 [★] / ₂	2	2 [★] / ₃
CA	2 1/2	2 1/2	2 1/2
CE	3	3	3
CG	3/4	1	1
EE (NPT)	3/4	3/4	3/4
EE (SAE)	#12	#12	#12
L	1 7/8	2 1/8	2
LB	6 1/4	6 1/4	6 1/4
LG	9 1/4	9 1/4	9 1/4
LJ	11 3/4	11 3/4	11 3/4
XC	11 1/8	11 3/8	11 3/8
XD	15	15 1/4	15 1/4

Dimensions shown in brown are mounting dimensions.

★ Add stroke to all starred dimensions.



HWCW – 4" Bore

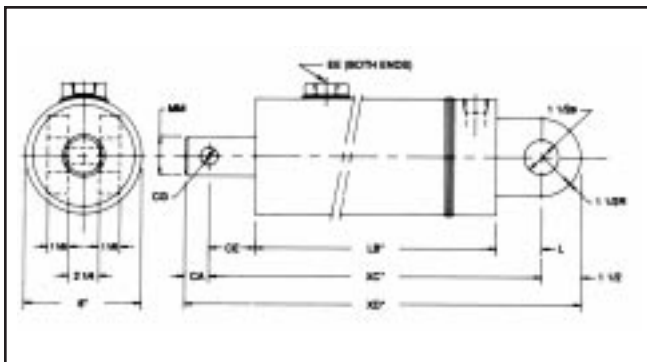


HWFW – 5" Bore

MM ROD DIA.	3	3 [★] / ₂
CA	2 1/2	2 1/2
CE	3 1/8	3 1/2
CG	1	1 1/2
EE (NPT)	3/4	3/4
EE (SAE)	#12	#12
L	2	2 1/4
LB	7 1/2	7 1/2
LG	10 5/8	11
LJ	13 1/8	13 3/4
XC	12 5/8	13 1/4
XD	16 5/8	17 1/4

Dimensions shown in brown are mounting dimensions.

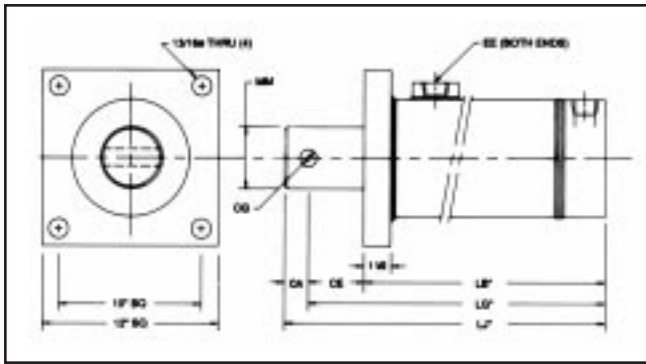
★ Add stroke to all starred dimensions.



HWCW – 5" Bore

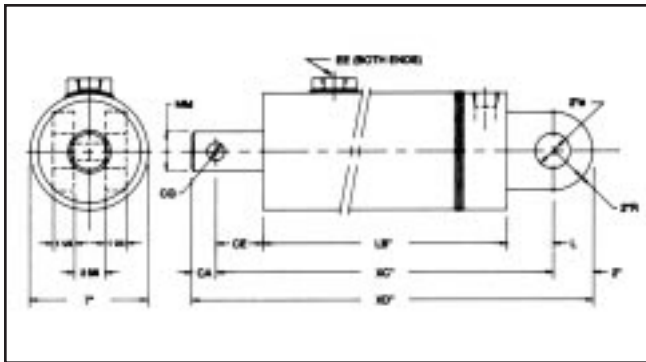
HW Mounting Dimensions

6" - 7" bore cylinders



HWFW – 6" Bore

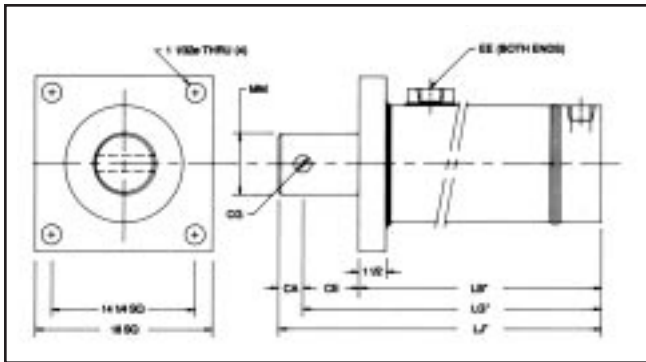
MM ROD DIA.	3/8	4
CA	2 1/2	2 1/2
CE	3 1/2	3 1/2
CG	1	1 1/2
EE (NPT)	1	1
EE (SAE)	#16	#16
L	2 1/2	2 1/2
LB	7 5/8	8 1/8
LG	11 1/8	11 5/8
LJ	13 5/8	14 1/8
XC	13 5/8	14 1/8
XD	18 1/8	18 5/8



HWCW – 6" Bore

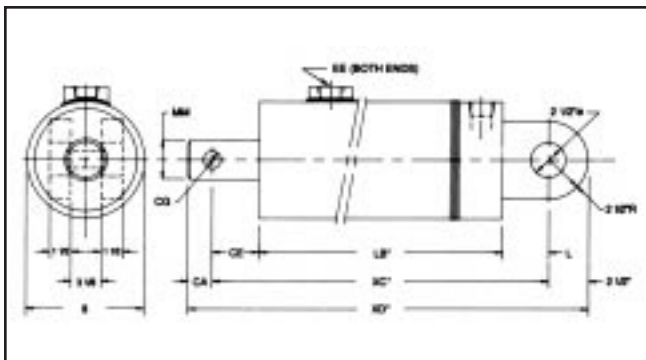
Dimensions shown in brown are mounting dimensions.

★ Add stroke to all starred dimensions.



HWFW – 7" Bore

MM ROD DIA.	4	5
CA	2 1/2	2 1/2
CE	3 7/8	3 7/8
CG	1 1/2	1 1/2
EE (NPT)	1 1/4	1 1/4
EE (SAE)	#20	#20
L	3 1/8	3 1/8
LB	9	9
LG	12 7/8	12 7/8
LJ	15 5/8	15 5/8
XC	16	16
XD	21	21



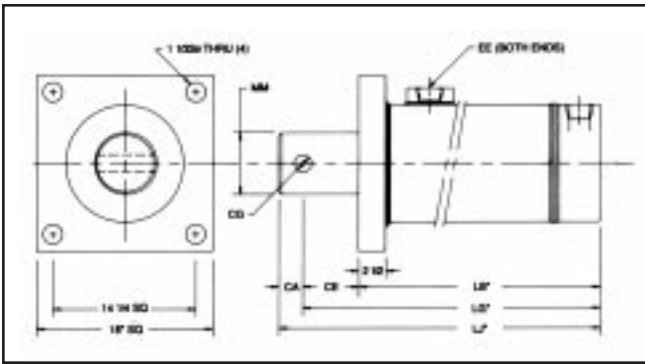
HWCW – 7" Bore

Dimensions shown in brown are mounting dimensions.

★ Add stroke to all starred dimensions.

HW Mounting Dimensions

8" - 10" bore cylinders

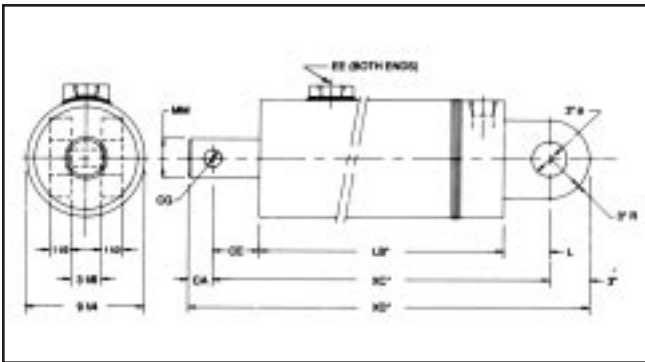


HWFW – 8" Bore

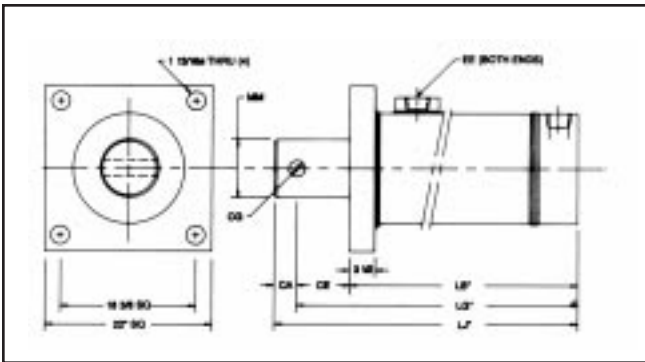
MM ROD DIA.	5	5 $\frac{1}{2}$
CA	2 $\frac{1}{2}$	2 $\frac{1}{2}$
CE	3 $\frac{5}{8}$	3 $\frac{5}{8}$
CG	1 $\frac{1}{2}$	1 $\frac{1}{2}$
EE (NPT)	1 $\frac{1}{4}$	1 $\frac{1}{4}$
EE (SAE)	#20	#20
L	2 $\frac{7}{8}$	2 $\frac{7}{8}$
LB	10 $\frac{1}{2}$	10 $\frac{1}{2}$
LG	14 $\frac{1}{8}$	14 $\frac{1}{8}$
LJ	16 $\frac{5}{8}$	16 $\frac{5}{8}$
XC	17	17
XD	22 $\frac{1}{2}$	22 $\frac{1}{2}$

Dimensions shown in brown are mounting dimensions.

★ Add stroke to all starred dimensions.



HWCW – 8" Bore

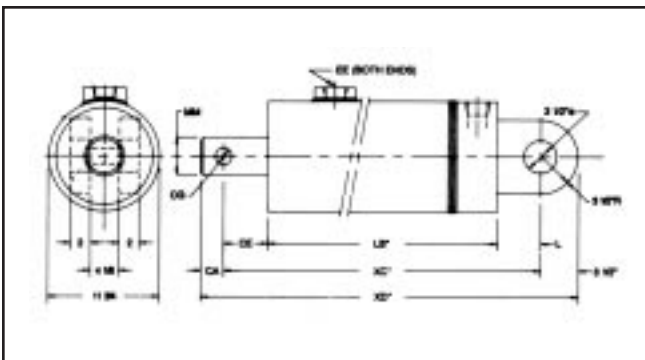


HWFW – 10" Bore

MM ROD DIA.	5 $\frac{1}{2}$	7
CA	2 $\frac{1}{2}$	3
CE	3 $\frac{1}{2}$	3 $\frac{3}{4}$
CG	1 $\frac{1}{2}$	3
EE (NPT)	2	2
EE (SAE)	#32	#32
L	4	4
LB	14 $\frac{7}{16}$	14 $\frac{11}{16}$
LG	17 $\frac{15}{16}$	18 $\frac{7}{16}$
LJ	20 $\frac{7}{16}$	21 $\frac{7}{16}$
XC	21 $\frac{15}{16}$	22 $\frac{7}{16}$
XD	27 $\frac{15}{16}$	28 $\frac{15}{16}$

Dimensions shown in brown are mounting dimensions.

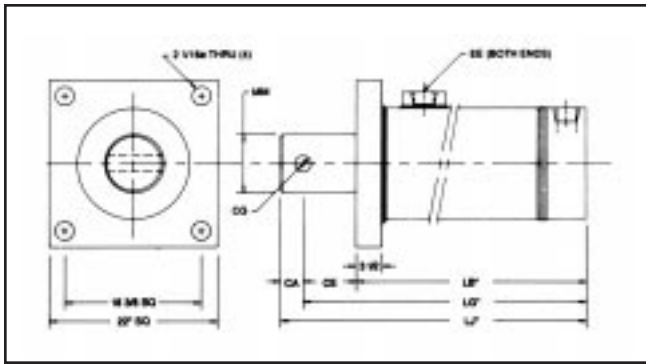
★ Add stroke to all starred dimensions.



HWCW – 10" Bore

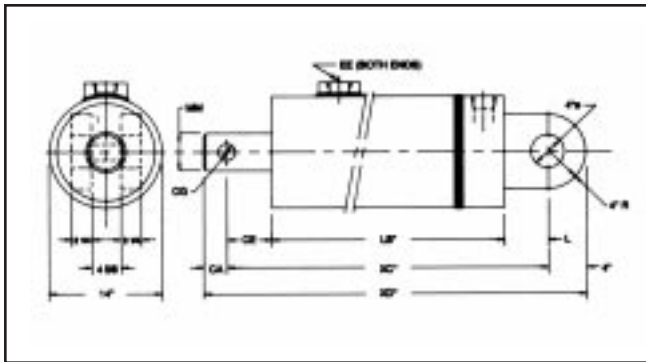
HW Mounting Dimensions

12" bore cylinders



HWFW – 12" Bore

MM ROD DIA.	7	9
CA	3	3
CE	3 ³ / ₄	4 ⁵ / ₈
CG	3	3
EE (NPT)	2	2
EE (SAE)	#32	#32
L	4 ¹ / ₂	6 ³ / ₁₆
LB	15 ⁵ / ₈	15 ⁵ / ₈
LG	19 ⁹ / ₈	20 ¹ / ₄
LJ	22 ³ / ₈	23 ¹ / ₄
XC	23 ³ / ₈	26 ⁷ / ₁₆
XD	30 ⁵ / ₈	33 ⁷ / ₁₆



HWCW – 12" Bore

Dimensions shown in brown are mounting dimensions.

★ Add stroke to all starred dimensions.

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

ONE YEAR LIMITED WARRANTY

One Year Normal Use

Hydro-Line Products are warranted for a period of one year from date of shipment from our plant to be free from defects in workmanship and material under correct use, normal operating conditions and proper applications. This warranty does not extend to goods damaged, or subjected to accident, abuse, or misuse after shipment from our factory, nor to goods altered or repaired by anyone other than authorized Hydro-Line representatives.

Disclaimers

This one year limited warranty is the only warranty extended by Hydro-Line in connection with any sale by Hydro-Line. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, notwithstanding disclosure to Hydro-Line of the product's intended use. An affirmation of fact or promise made on behalf of Hydro-Line shall not be deemed to create an expressed warranty that the goods shall conform to the affirmation of promise; any description of the goods is for the sole purpose of identifying them and shall not be deemed to create an expressed warranty that the goods shall conform to such description; any sample or model is for illustrative purposes only and shall not be deemed to create an expressed warranty that the goods shall conform to the sample or model; and no affirmation or promise, or description, or sample or model, shall be deemed part of the basis of the bargain.

Exclusive Remedy

Hydro-Line's obligation upon breach of warranty shall be limited to replacing or

repairing at our option, free of charge, but not including installation, dismantling, reassembling or any other charge, the particular product or part which inspection discloses to have been defective at time of shipment. Inspection may be at the place of installation and use, or at our plant if requested (if returned to us at our expense including lowest transportation cost). Written notice of such defect shall be given by customer to Hydro-Line within 30 days after such defect(s) appear. Written permission for any warranty claim return must be first obtained from authorized Hydro-Line representatives. All returns must be accompanied with a complete written explanation of claimed defects and the circumstances of operational failure. Replacement of cylinders or parts thereof repaired under this warranty shall be warranted under the terms of this warranty for the remainder of the term of the original warranty or for a period of six months after such repair or replacement, whichever is longer. Upon expiration of the warranty, all of Hydro-Line's obligations hereunder shall terminate.

IN NO EVENT SHALL HYDRO-LINE HAVE ANY LIABILITY FOR PAYMENT OF ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL OR TORT DAMAGES OF ANY KIND INCLUDING, BUT NOT LIMITED TO, ANY LOSS OF PROFITS, TO THE EXTENT EXCLUSION IS PERMITTED BY LAW.

This warranty states our entire and exclusive liability and buyer's exclusive remedy for any claim of damages in connection with the sale or furnishing of Hydro-Line's products or parts, their design, suitability for use, installations or operation, or for any claimed defects therein. Goods not manufactured by Hydro-Line are furnished subject only to the Manufacturer's warranties, if any, and without warranties, expressed or implied, by Hydro-Line.

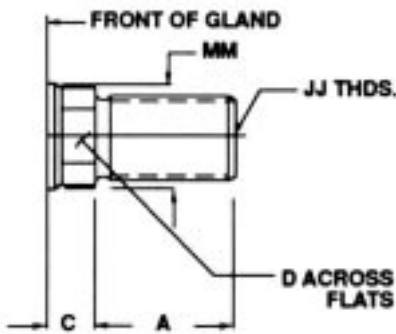
HW Series Rod End Selection

All Dimensions in inches

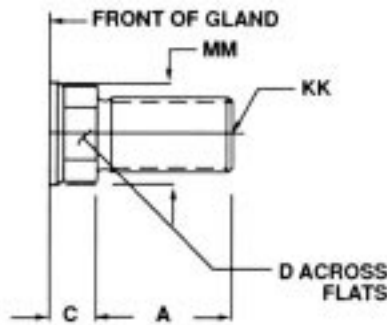
ROD DIA.	1 $\frac{1}{8}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	5	5 $\frac{1}{2}$	7	9
A	2	2 $\frac{1}{4}$	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	4	5	5 $\frac{1}{2}$	7	9
C	$\frac{3}{4}$	$\frac{7}{8}$	1	1	1	1	1	1	1	1
D	1 $\frac{1}{2}$	1 $\frac{1}{16}$	2 $\frac{1}{16}$	2 $\frac{5}{8}$	3	3 $\frac{3}{8}$	4 $\frac{1}{4}$	4 $\frac{5}{8}$	6	8
CC										
THREAD	1 $\frac{1}{4}$ -12	2-12	2 $\frac{1}{2}$ -12	3-12	3 $\frac{1}{2}$ -12	4-12	5-12	5 $\frac{1}{2}$ -12	7-12	9-12
JJ										
THREAD	1 $\frac{1}{2}$ -12	1 $\frac{3}{4}$ -12	2 $\frac{1}{4}$ -12	2 $\frac{3}{4}$ -12	3 $\frac{1}{4}$ -12	3 $\frac{3}{4}$ -12	4 $\frac{3}{4}$ -12	5 $\frac{1}{4}$ -12	6 $\frac{1}{2}$ -12	8 $\frac{1}{2}$ -12
KK										
THREAD	1 $\frac{1}{4}$ -12	1 $\frac{1}{2}$ -12	1 $\frac{7}{8}$ -12	2 $\frac{1}{4}$ -12	2 $\frac{1}{2}$ -12	3-12	3 $\frac{1}{2}$ -12	4-12	5 $\frac{1}{2}$ -12	6 $\frac{1}{2}$ -12
AC	1 $\frac{1}{4}$	2 $\frac{5}{8}$	3 $\frac{1}{4}$	3 $\frac{3}{8}$	4 $\frac{3}{8}$	4 $\frac{1}{2}$	5 $\frac{3}{8}$	6 $\frac{1}{4}$	6 $\frac{1}{2}$	6 $\frac{3}{4}$
AD	1 $\frac{5}{16}$	1 $\frac{1}{16}$	1 $\frac{15}{16}$	2 $\frac{1}{16}$	2 $\frac{1}{16}$	2 $\frac{1}{16}$	3 $\frac{3}{16}$	3 $\frac{15}{16}$	4 $\frac{1}{16}$	4 $\frac{1}{8}$
AE	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	1	1 $\frac{1}{2}$	1 $\frac{7}{8}$	2	2
AF	1 $\frac{1}{8}$	1 $\frac{3}{8}$	1 $\frac{1}{4}$	2 $\frac{1}{4}$	2 $\frac{1}{2}$	3	3 $\frac{3}{8}$	4 $\frac{3}{8}$	5 $\frac{3}{4}$	7 $\frac{1}{4}$

NOTE: For Rod End Pin Hole dimensions, see cylinder mounting dimensional drawings on pages 4-7.

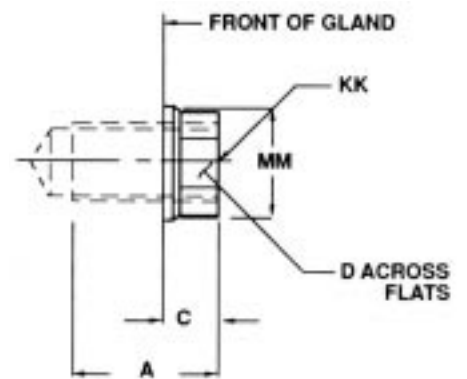
Rod End Style 1



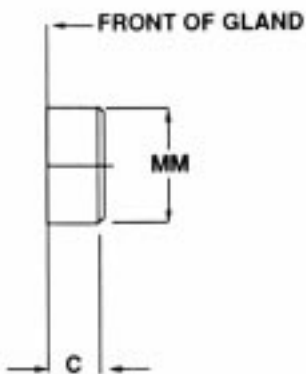
Rod End Style 2



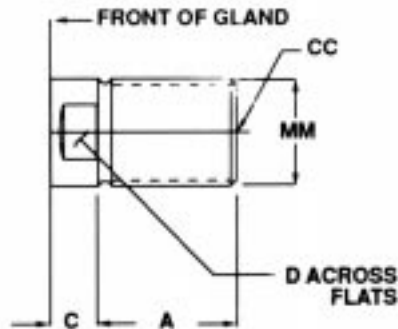
Rod End Style 4



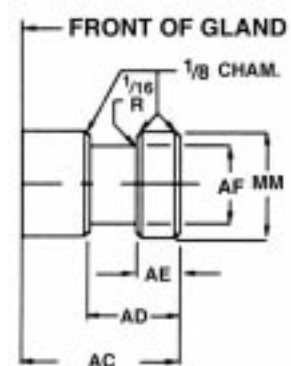
Rod End Style 5



Rod End Style 6



Rod End Style 10



Hydro-Line 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 above 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.

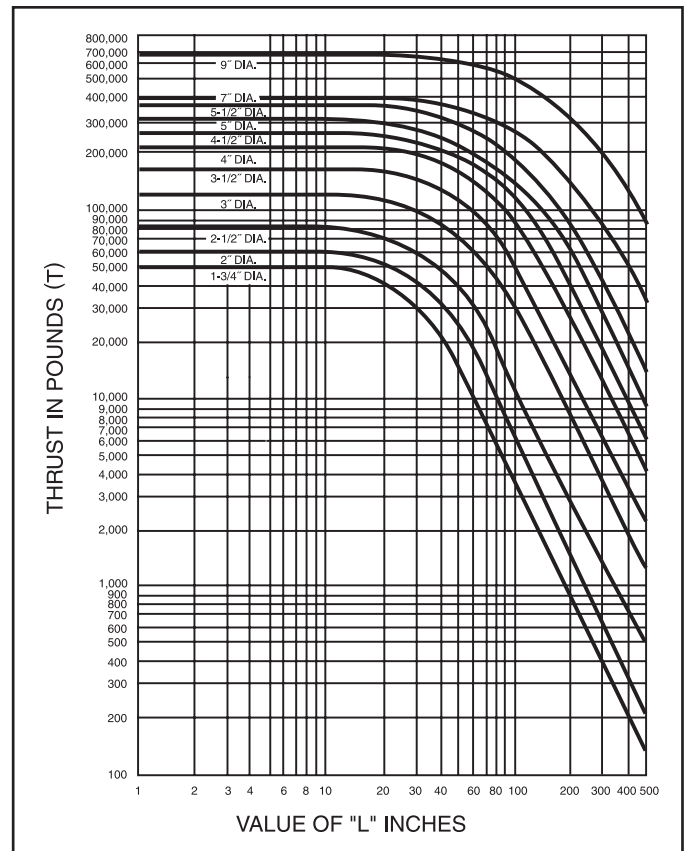
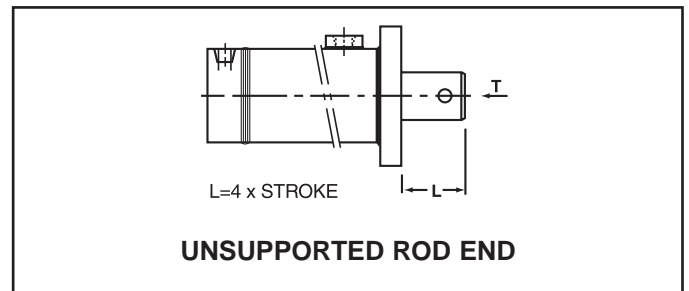
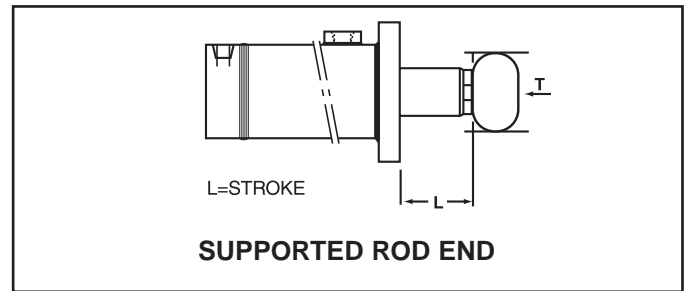
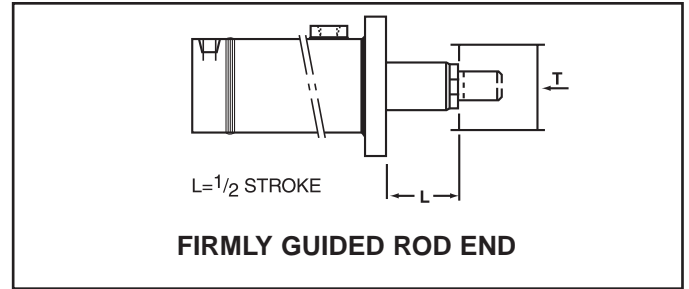
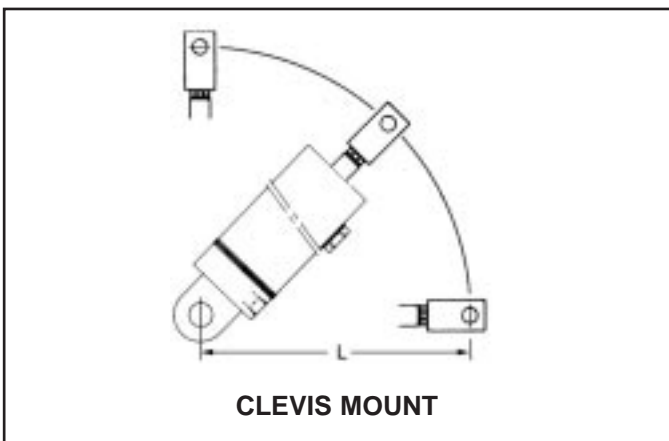
Stop Tubes

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", no stop tube is needed. If L is greater than 40", one inch of stop tube is recommended for each 10" or fraction thereof beyond 40".

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



HYDRO-LINE Actuation Products



- N5 SERIES CYLINDERS**
- NFPA interchangeable
 - **N5** – 3000 psi nominal hydraulic
 - **AN5** – to 250 psi very heavy-duty pneumatic
 - **LAN5** – to 250 psi very heavy-duty pneumatic – permanently lubricated
 - All steel construction



- R5 SERIES CYLINDERS**
- NFPA interchangeable
 - **A5/R5** – to 250 psi pneumatic
 - **LA5/LR5** – to 250 psi pneumatic – permanently lubricated
 - **HA5** – to 400 psi hydraulic
 - **HR5** – 1500 psi nominal hydraulic



- Q5 SERIES CYLINDERS**
- NFPA interchangeable
 - **Q5** – to 250 psi pneumatic
 - **LQ5** – to 250 psi pneumatic – permanently lubricated
 - **HQ5** – to 400 psi hydraulic
 - Aluminum construction



- HM SERIES CYLINDERS**
- Conform to international metric specifications ISO 6020/2 and DIN 24 554
 - 25 mm to 200 mm bore sizes
 - 210 BAR nominal hydraulic
 - All steel construction



- ROCKFORD SERIES CYLINDERS**
- ASAE interchangeable agricultural cylinders
 - **Rockford 2500**–2500 psi hydraulic
 - **Rockford 3000**–3000 psi hydraulic



- ELECTRONIC FEEDBACK CYLINDERS**
- Hydraulic or pneumatic cylinders which incorporate cylinder position sensing and feedback throughout the stroke. Available in N5, R5, A5, Q5, HM, HW, SM or special cylinders.



- SERIES 20/30 BOOSTERS**
- Standard series to 5000 psi output
 - Custom designs to 20,000 psi
- T SERIES AIR/OIL TANKS**
- All steel construction
- QT SERIES AIR/OIL TANKS**
- Aluminum end caps and translucent tubing



- V5 SERIES CYLINDERS**
- NFPA Interchangeable
 - To 200 psi pneumatic
 - Aluminum construction



- HW SERIES CYLINDERS**
- Welded construction
 - 3000 psi nominal hydraulic



- TSAYER CYLINDERS**
- Threaded body construction
 - To 200 psi pneumatic
 - To 1000 psi nominal hydraulic



- SM SERIES CYLINDERS**
- Steel mill type construction
 - **MSM**–2000 psi nominal hydraulic
 - **HSM**–3000 psi nominal hydraulic
 - **ASM**–Pneumatic



- CUSTOM CYLINDERS**
- Custom cylinders to meet special requirements
- Bores to 48"
 - Strokes to 300"
 - Pressures to 10,000 psi or higher

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