

# Cunningham

SINCE 1949

## HYDRAULIC CYLINDERS



### MODEL HS

3,000 P.S.I. OPERATING PRESSURE (5,000 P.S.I. Non-Shock)

### HEAVY DUTY CYLINDERS

1½ THRU 8" BORES

Cunningham Heavy-Duty Cylinders are ruggedly built, and are recommended where "pull" and "thrust" impact loads are above average, and where operation is continuous, and under "full" load operation.

#### HEAVY DUTY SPECIFICATIONS

- Steel Ends
- High Tensile Steel Piston Rods (Hard Chrome Plated)
- Precision Honed Steel Tubing
- High Tensile Tie Rods, and Grade 8 Nuts
- Urethane Piston and Rod Seals
- Cushions Optional
- JIC Standard Construction and Dimensions
- NFPA Standards
- For 10, 12, & 14" Bores, See Catalog 602 HS

CATALOG NO. 402 HS

## Cunningham Manufacturing Co.

318 SOUTH WEBSTER STREET • SEATTLE, WASHINGTON 98108 • (206) 767-3713 • FAX (206) 762-3457

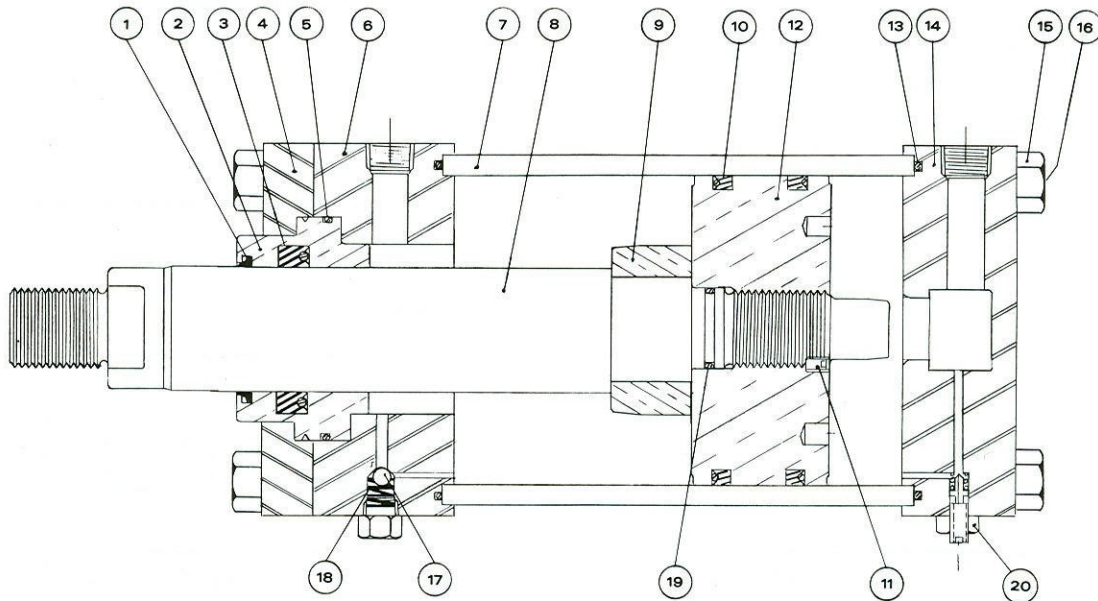
[www.cunninghamcylinders.com](http://www.cunninghamcylinders.com)



# Ordering Data Required for Model HS

1. QUANTITY
2. MOUNTING TYPE
3. BORE DIAMETER
4. STROKE LENGTH
5. ROD DIAMETER
6. ROD THREAD ("KK" STANDARD)
7. CUSHIONS
8. PORT LOCATION
9. ROD END ATTACHMENT
10. SPECIAL FEATURES AS:
  - ROD BOOTS
  - STAINLESS ROD
  - SPECIAL SEALS
  - STOP TUBE
  - DUAL PISTON

**SEE KEY SHEET HS 3 FOR MODEL NUMBERING SYSTEM.**



## MODEL HS — PARTS LIST

- |         |                     |         |   |
|---------|---------------------|---------|---|
| HS - 1  | Rod Wiper           | HS - 11 | Piston Lock Screw                                 |
| HS - 2  | Rod Guide Bushing   | HS - 12 | Piston  |
| HS - 3  | Rod Packing         | HS - 13 | Tube Seals  |
| HS - 4  | Clamp Plate         | HS - 14 | Blind End Cap                                     |
| HS - 5  | Bushing Seal        | HS - 15 | Tie Rod Nut                                       |
| HS - 6  | Rod End Cap         | HS - 16 | Tie Rod   |
| HS - 7  | Cylinder Tube       | HS - 17 | Stainless Ball (Each end)                         |
| HS - 8  | Piston Rod          | HS - 18 | Ball Check Spring (Each end)                      |
| HS - 9  | Rod Cushion Bushing | HS - 19 | Piston ID Seal                                    |
| HS - 10 | Piston Seals        | HS - 20 | Cushion Adjusting Assembly<br>(Each end optional) |

**IMPORTANT:** When ordering parts, please give complete nameplate data as to bore, stroke, rod diameter, and if cushioned. Every cylinder has a Serial Number metal stamped on the Rod End Cap.

STANDARD PRESSURE, 3,000 P.S.I.  
(5000 P.S.I. NON-SHOCK)

CMC does not authorize the approval of CMC cylinders in any of the following applications:  
aircraft, personnel lifts, aerial ladders, or amusement park devices.

# MOUNTING ACCESSORIES

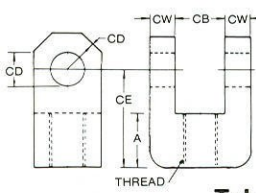
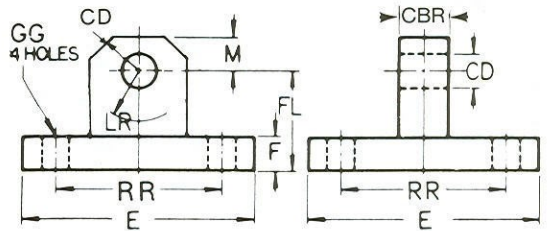


Table 5—C

## ROD CLEVIS DIMENSIONS

CL NO.	THREAD	A	CE	CD	CB	CW
211	7/16-20	3/4	1 1/2	1/2	13/16	1/2
212	1/2 - 20	3/4	1 1/2	1/2	13/16	1/2
221	3/4 - 16	1 1/8	2 1/8	3/4	1 5/16	5/8
222	7/8 - 14	1 1/8	2 1/8	3/4	1 5/16	5/8
223	1 - 14	1 1/8	2 1/8	3/4	1 5/16	5/8
231	1 - 14	1 5/8	2 15/16	1	1 9/16	3/4
232	1 1/4 - 12	1 5/8	2 15/16	1	1 9/16	3/4
233	1 1/2-12	1 5/8	2 15/16	1	1 9/16	3/4
241	1 1/4 - 12	2	3 3/4	1 3/8	2 1/16	1
242	1 1/2 - 12	2	3 3/4	1 3/8	2 1/16	1
243	1 3/4 - 12	2	3 3/4	1 3/8	2 1/16	1
251	1 1/2 - 12	2 1/4	4 1/2	1 3/4	2 9/16	1 1/4
252	1 3/4 - 12	2 1/4	4 1/2	1 3/4	2 9/16	1 1/4
253	1 7/8 - 12	2 1/4	4 1/2	1 3/4	2 9/16	1 1/4
254	2 - 12	2 1/4	4 1/2	1 3/4	2 9/16	1 1/4
261	1 7/8 - 12	3	5 1/2	2	2 9/16	1 1/4
262	2 1/4 - 12	3	5 1/2	2	2 9/16	1 1/4
271	2 1/4 - 12	3 1/2	6 1/2	2 1/2	3 1/16	1 1/2
272	2 1/2 - 12	3 1/2	6 1/2	2 1/2	3 1/16	1 1/2
273	2 3/4 - 12	3 1/2	6 1/2	2 1/2	3 1/16	1 1/2
281	2 1/2 - 12	3 1/2	6 3/4	3	3 1/16	1 1/2
282	3 - 12	3 1/2	6 3/4	3	3 1/16	1 1/2
2101	3 1/4 - 12	3 1/2	7 3/4	3 1/2	4 1/16	2
2121	3 1/2 - 12	4	8 13/16	4	4 9/16	2 1/4
2122	4 - 12	4	8 13/16	4	4 9/16	2 1/4



Pivot Bracket Base — Table 5B

Table 5—B

## PIVOT BRACKET BASE DIMENSIONS

BRKT. NO.	CD	CBR	F	FL	M	E	RR	LR	GG
1	1/2	3/4	3/8	1 1/8	1/2	2 1/2	1.63	3/4	13/32
2	3/4	1 1/4	5/8	1 7/8	3/4	3 1/2	2.55	1 1/4	17/32
3	1	1 1/2	3/4	2 1/4	1	4 1/2	3.25	1 1/2	21/32
4	1 3/8	2	7/8	3	1 3/8	5	3.82	2 1/8	21/32
5	1 3/4	2 1/2	7/8	3 1/8	1 3/4	6 1/2	4.95	2 1/4	29/32
6	2	2 1/2	1	3 1/2	2	7 1/2	5.73	2 1/4	1 1/16
7	2 1/2	3	1	4	2 1/2	8 1/2	6.58	2 1/2	1 3/16
8	3	3	1	4 1/4	3	9 1/2	7.50	2 3/4	1 5/16
10	3 1/2	4	1 11/16	5 11/16	3 1/2	12 5/8	9.62	4	1 13/16
12	4	4 1/2	1 15/16	6 7/16	4	14 7/8	11.45	4 1/2	2 1/16

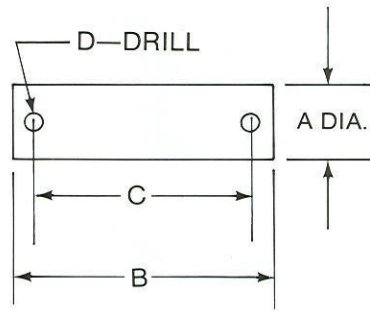
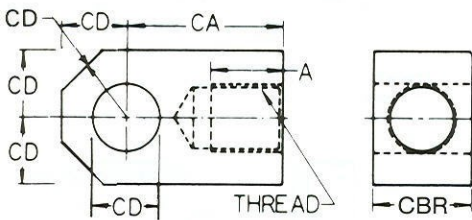


Table 5—D

## CLEVIS PIN

A DIA.	PIN NO.	B	C	D
1/2	1	2 5/8	2	5/64
3/4	2	3 1/8	2 3/4	9/64
1	3	3 3/4	3 1/4	1 3/64
1 1/8	4	4 3/4	4 1/4	1 3/64
1 1/4	5	6	5 1/2	1 3/64
2	6	6	5 1/2	1 3/64
2 1/2	7	7	6 3/8	9/32
3	8	7 1/4	6 1/2	9/32
3 1/2	10	9 1/8	8 1/2	9/32
4	12	11	9 1/2	1 1/32



Rod End Eye — Table 5A

## Table 5 - A PIVOT ROD EYE DIMENSIONS

EYE NO.	THREAD	A	CA	CD	CBR
112	1/2 - 20	3/4	1 1/2	1/2	3/4
121	3/4 - 16	1 1/8	2 1/16	3/4	1 1/4
122	7/8 - 14	1 1/8	2 1/16	3/4	1 1/4
132	7/8 - 14	1 1/8	2 3/8	1	1 1/2
133	1 - 14	1 5/8	2 13/16	1	1 1/2
141	1 1/4 - 12	2	3 7/16	1 3/8	2
142	1 1/2 - 12	2	3 7/16	1 3/8	2
151	1 1/2 - 12	2 1/4	4	1 3/4	2 1/2
152	1 3/4 - 12	2 1/4	4	1 3/4	2 1/2
161	1 7/8 - 12	3	5	2	2 1/2
171	2 1/4 - 12	3 1/2	5 13/16	2 1/2	3
172	2 1/2 - 12	3 1/2	5 13/16	2 1/2	3
181	2 1/2 - 12	3 1/2	6 1/8	3	3
192	3 - 12	3 1/2	6 1/2	3	3 1/2
1101	3 1/4 - 12	3 1/2	7 5/8	3 1/2	4
1121	3 1/2 - 12	4	9 1/8	4	4 1/2

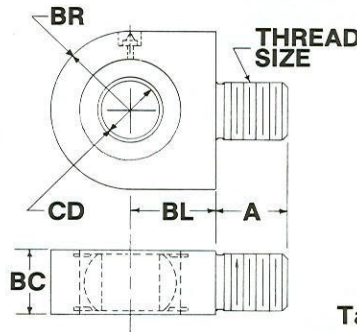


Table 5—E

## SPHERICAL BUSHING — B1

EYE NO.	CYL. BORE	BEARING (SKF)	BC	BL	BR	CD PIN	THREAD SIZE	'A' THD. LENGTH
2B1T	1 1/2-2	012	1	1 1/4	1	3/4	3/4 - 16	1
2B1T	2 1/2	012	1	1 1/4	1	3/4	3/4 - 16	1
3B1T	3 1/4	100	1 1/8	1 1/2	1 3/8	1	1 - 14	1 1/4
4B1T	4	106	1 3/8	2 1/4	1 13/16	1 3/8	1 1/4-12	1 5/8
5B1T	5	112	1 3/4	2 1/2	2 5/16	1 3/4	1 1/2-12	2
6B1T	6	200	1 7/8	3	2 3/4	2	1 7/8-12	2 1/4
7B1T	7	208	2 1/4	3 1/2	3 1/4	2 1/2	2 1/4-12	2 1/2
8B1T	8	300	2 3/4	4 1/4	3 7/8	3	2 1/2-12	3
10B1T	10	308	3 1/8	5	4 5/8	3 1/2	3 1/2-12	4
12B1T	12	400	3 1/2	6	5 1/2	4	4 - 12	4 1/2



# CONSTRUCTION FEATURES

## CUSHION OPTIONS:

Tapered cushions are provided for gradual deceleration and to eliminate shock upon entering the cushion bushings. A cushion check provides rapid acceleration out of cushioning. Cushioning is designed to properly cushion the cylinder, and is not intended to cushion large inertial loads. Adjustable cushions are available as an option.

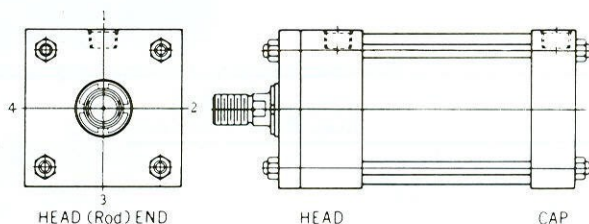
## PORTING:

NPT PORTS located in position 1 is standard.

SAE STRAIGHT THREAD ports optional, at no extra cost.

SAE FLANGE PORTS available at additional cost.

OVERSIZE PORTS available, check with factory.



## AIR BLEEDS:

Are available in the tube close to the heads as an option.

## STOP TUBE:

A stop tube provides a spread between piston and rod bearing in the extended position of the cylinder. It reduces bearing pressure but does not add any additional bearing area. Check with factory for recommendation.

## DUAL PISTON:

Acts as a stop tube, but also increases bearing area. For severe side loading conditions, contact the factory.

## TIE ROD SUPPORTS:

Long stroke cylinders will be provided with intermediate tie rod supports, as recommended by the factory.

TIE ROD TORQUE FOR MODEL HS HYDRAULIC CYLINDERS

BORE	1½	2	2½	3¼	4	5	6	7	8
TORQUE (Foot Lbs.)	30	50	50	130	150	450	650	900	1100
TIE ROD DIA.	¾	½	½	¾	¾	¾	1	1½	1¼

## TIE ROD TORQUE:

## ROD WIPERS:

Are hytrel the projecting-lip type. Brass rod scrapers are available at no extra cost.

## SEALS:

Urethane "U" cups with expander "O" ring are used on the piston and rod seals. They are accepted as being the best seal for cylinders, as they are rugged, wear compensated, pressure actuated, and give complete reliability after millions of cycles.

# QUALITY FEATURES

1. 660 Bronze rod bearing.
2. 100,000 min. yield, hard chrome plated rod.
3. 100,000 psi min. yield tie rods with grade 8 hardware.
4. Non-ferrous pistons for excellent wear and strength.
5. 65,000 min. yield steel tube, honed on ID to 16 RMS.
6. Hytrel or brass rod wiper.
7. Urethane rod seal and piston seals with expander "O" ring.
8. Precision finished steel endcaps machined on CNC turret lathes.
9. Straight thread ports, no cost option.

Many special features and options available — Contact factory for particulars.

**Table 3  
ROD END DIMENSIONS**

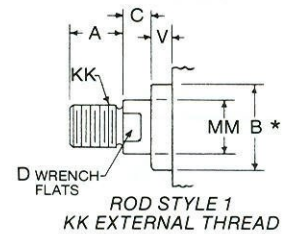
BORE	ROD MM	STD. KK	CC	A	+ .000 B - .002	D *	C	V
1 1/2	5/8	7/16 - 20	1/2 - 20	3/4	1.085	1/4	3/8	1/4
	1	3/4 - 16	7/8 - 14	1 1/8	1.499	3/8	1/2	1/2
2	1	3/4 - 16	7/8 - 14	1 1/8	1.499	3/8	1/2	1/4
	1 3/8	1 - 14	1 1/4 - 12	1 5/8	1.875	1/2	5/8	3/8
2 1/2	1	3/4 - 16	7/8 - 14	1 1/8	1.499	3/8	1/2	1/4
	1 3/8	1 - 14	1 1/4 - 12	1 5/8	1.990	1/2	5/8	3/8
	1 3/4	1 1/4 - 12	1 1/2 - 12	2	2.374	5/8	3/4	1/2
3 1/4	1 3/8	1 - 14	1 1/4 - 12	1 5/8	1.990	1/2	5/8	1/4
	1 3/4	1 1/4 - 12	1 1/2 - 12	2	2.374	5/8	3/4	3/8
	2	1 1/2 - 12	1 3/4 - 12	2 1/4	2.624	3/4	7/8	3/8
4	1 3/4	1 1/4 - 12	1 1/2 - 12	2	2.374	5/8	3/4	1/4
	2	1 1/2 - 12	1 3/4 - 12	2 1/4	2.624	3/4	7/8	1/4
	2 1/2	1 7/8 - 12	2 1/4 - 12	3	3.124	3/4	1	3/8
5	2	1 1/2 - 12	1 3/4 - 12	2 1/4	2.624	3/4	7/8	1/4
	2 1/2	1 7/8 - 12	2 1/4 - 12	3	3.124	3/4	1	3/8
	3	2 1/4 - 12	2 3/4 - 12	3 1/2	3.749	7/8	1	3/8
	3 1/2	2 1/2 - 12	3 1/4 - 12	3 1/2	4.249	7/8	1	3/8
6	2 1/2	1 7/8 - 12	2 1/4 - 12	3	3.124	3/4	1	1/4
	3	2 1/4 - 12	2 3/4 - 12	3 1/2	3.749	7/8	1	1/4
	3 1/2	2 1/2 - 12	3 1/4 - 12	3 1/2	4.249	7/8	1	1/4
7	3	2 1/4 - 12	2 3/4 - 12	3 1/2	3.749	7/8	1	1/4
	3 1/2	2 1/2 - 12	3 1/4 - 12	3 1/2	4.249	7/8	1	1/4
	4	3 - 12	3 3/4 - 12	4	4.749	1	1	1/4
	5	3 1/2 - 12	4 3/4 - 12	5	5.749	1	7/8	3/8
8	3 1/2	2 1/2 - 12	3 1/4 - 12	3 1/2	4.249	7/8	1	1/4
	4	3 - 12	3 3/4 - 12	4	4.749	1	1	1/4
	5	3 1/2 - 12	4 3/4 - 12	5	5.749	1	7/8	3/8
	5 1/2	4 - 12	5 1/4 - 12	5 1/2	6.249	1	7/8	3/8

\*Rods 3" dia. and larger have spanner holes.

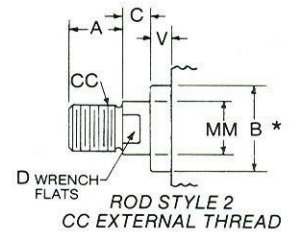
## PISTON ROD THREADS IMPORTANT:

Style 1 Rod Thread (KK) is standard and will be furnished unless otherwise specified. Alternate Rod Ends 2 and 3 are available at no extra charge.

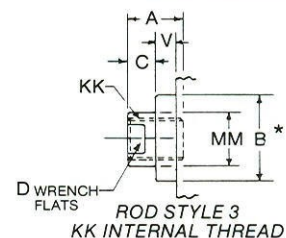
Special Rod Ends will be made to customers specifications and designated as a style 4 rod end.



ROD STYLE 1  
KK EXTERNAL THREAD



ROD STYLE 2  
CC EXTERNAL THREAD

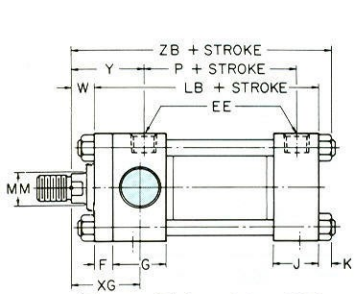


ROD STYLE 3  
KK INTERNAL THREAD

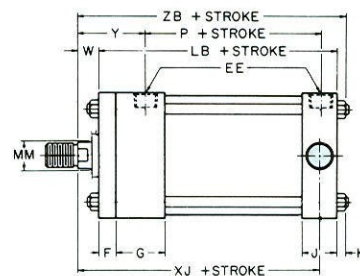
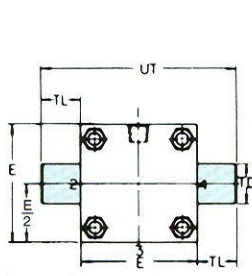
\* 'B' = ROD BEARING PILOT DIA.

\* 'V' = BEARING PROJECTION

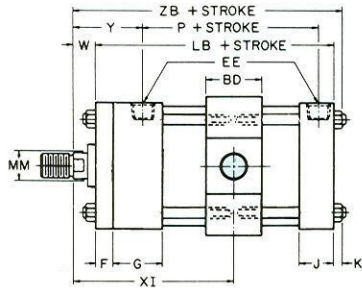
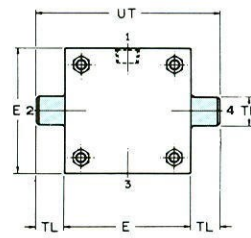




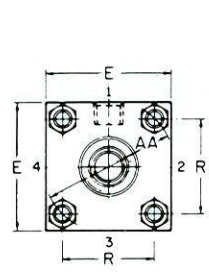
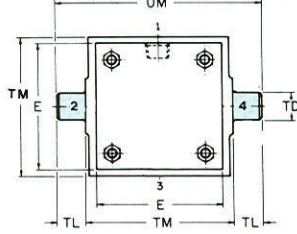
**Type T-1 – Head Trunnion Mounting**



**Type T-2 – Cap Trunnion Mounting**



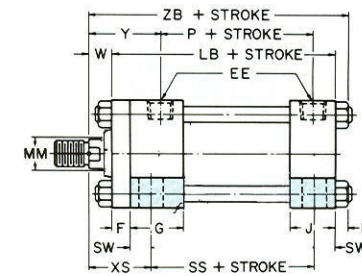
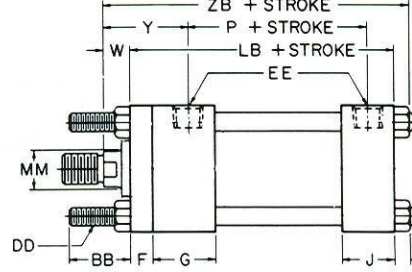
**Type T-4 – Intermediate Fixed Trunnion Mounting**



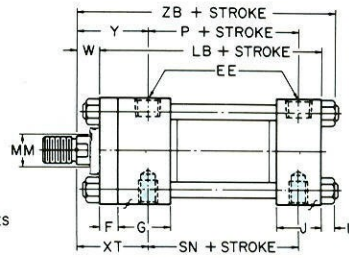
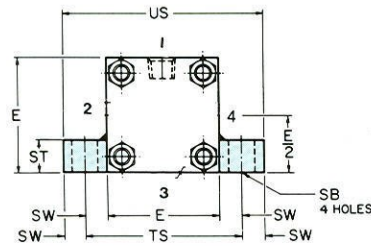
**Type X3 – Head Tie Rods Extended Mounting**

Type X1 – BOTH ENDS

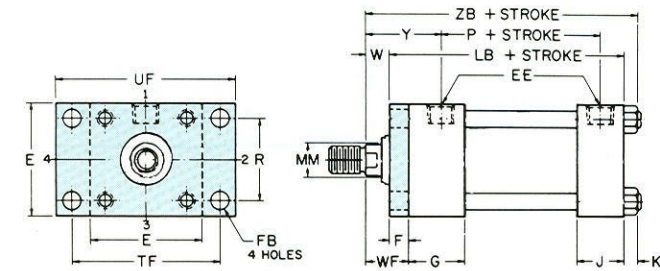
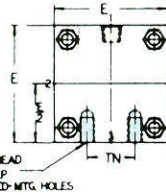
Type X2 – CAP END



**Type S-2 – Side Lugs Mounting**

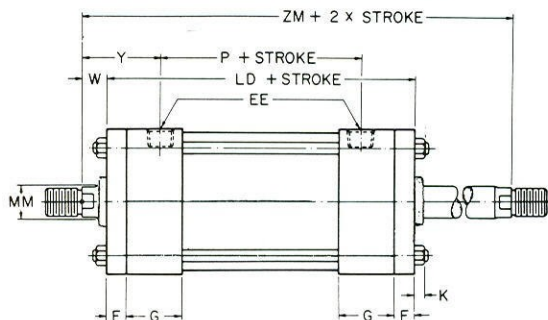


**Type S-4 – Side Tapped Mounting**



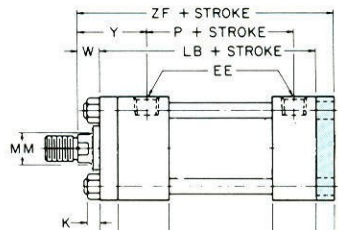
**Type F-1 – Head Rectangular Flange Mounting**

1,000 PSI MAX. RECOMMENDED PRESSURE  
WITH AN UNSUPPORTED MOUNT PLATE



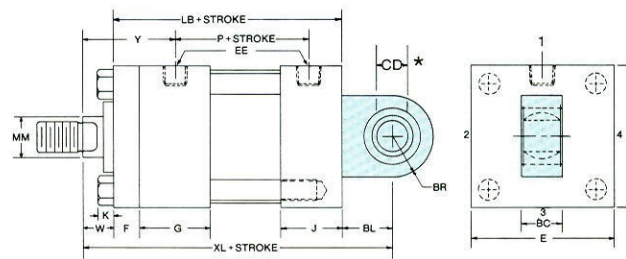
**Basic Double Rod Extension**

Double Rod End Cylinders are available  
in every mounting style except P.1 and P.3



**Type F-2 – Cap Rectangular Flange Mounting**

1,000 PSI MAX. RECOMMENDED PRESSURE  
WITH AN UNSUPPORTED MOUNT PLATE

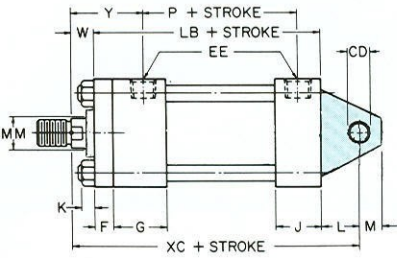


**Type B-1 – Spherical Bushing Mount**

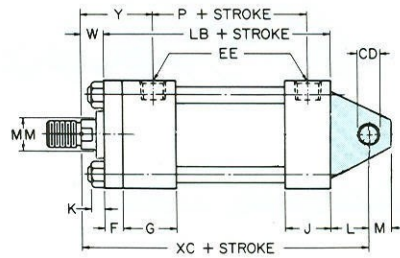
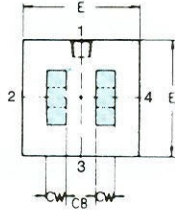
\* 1 1/2" Bore CD = 3/4"

# Cunningham HYDRAULIC CYLINDERS

SEE CATALOG 602 HS FOR 10" - 14" BORES



Type P-1 — Cap Fixed Clevis Mounting (Pin Supplied)



Type P-3 — Cap Fixed Pivot Mounting

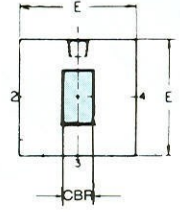


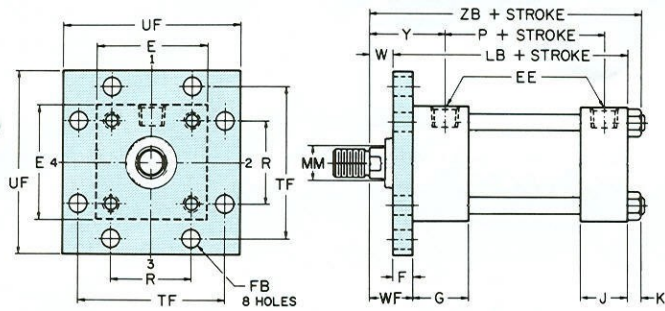
Table 1  
ENVELOPE & MOUNTING DIMENSIONS

BORE	1 1/2	2	2 1/2	3 1/4	4	5	6	7	8
AA	2.3	2.9	3.6	4.6	5.4	7.0	8.1	9.3	10.6
BB	1 3/8	1 13/16	1 13/16	2 5/16	2 5/16	3 3/16	3 5/8	4 1/8	4 1/2
BC	1	1	1	1 1/8	1 3/8	1 3/4	1 7/8	2 1/4	2 3/4
BD	1 1/4	1 1/2	1 1/2	2	2	2	3	3	3 1/2
BL	1 1/4	1 1/4	1 1/4	1 1/2	2 1/4	2 1/2	3	3 1/2	4 1/4
BR	1	1	1	1 3/8	1 13/16	2 5/16	2 3/4	3 1/4	3 7/8
CB	13/16	1 5/16	1 5/16	1 9/16	2 1/16	2 9/16	2 9/16	3 1/16	3 1/16
CBR	3/4	1 1/4	1 1/4	1 1/2	2	2 1/2	2 1/2	3	3
CD*	1/2	3/4	3/4	1	1 3/8	1 3/4	2	2 1/2	3
CW	1/2	5/8	5/8	3/4	1	1 1/4	1 1/4	1 1/2	1 1/2
DD	3/8-24	1/2 - 20	1/2 - 20	5/8 - 18	5/8 - 18	7/8 - 14	1 - 14	1 1/8 - 12	1 1/4 - 12
E	2 1/2	3	3 1/2	4 1/2	5	6 1/2	7 1/2	8 1/2	9 1/2
EE-NPTF	1/2	1/2	1/2	3/4	3/4	3/4	1	1 1/4	1 1/2
F	3/8	5/8	5/8	3/4	7/8	7/8	1	1	1
FB	7/16	9/16	9/16	11/16	11/16	15/16	1 1/16	1 3/16	1 5/16
G	1 3/4	1 3/4	1 3/4	2	2	2	2 1/2	3	3 1/4
J	1 1/2	1 1/2	1 1/2	1 3/4	1 3/4	1 3/4	2 1/4	2 3/4	3 1/4
K	3/8	7/16	7/16	9/16	9/16	3/4	7/8	1	1 1/16
L	3/4	1 1/4	1 1/4	1 1/2	2 1/8	2 1/4	2 1/2	3	3 1/4
LB	5	5 1/4	5 3/8	6 1/4	6 5/8	7 1/8	8 3/8	9 1/2	10 1/2
LD	5 5/8	6 1/8	6 1/4	7 1/4	7 3/4	8 1/4	9 5/8	10 3/4	11 1/2
M	1/2	3/4	3/4	1	1 3/8	1 3/4	2	2 1/2	3
ND-Min.	1/2	7/16	9/16	11/16	1 1/16	1	1 1/4	1 1/8	1 1/2
NT	3/8 - 16	1/2 - 13	5/8 - 11	3/4 - 10	1 - 8	1 - 8	1 1/4 - 7	1 1/2 - 6	1 1/2 - 6
P	2 7/8	2 7/8	3	3 1/2	3 3/4	4 3/8	5	5 3/8	6 1/8
R	1.63	2.05	2.55	3.25	3.82	4.95	5.73	6.58	7.50
SB	7/16	9/16	13/16	13/16	1 1/16	1 1/16	1 5/16	1 9/16	1 9/16
SN	2 7/8	2 7/8	3	3 1/2	3 3/4	4 1/4	5 1/8	5 7/8	6 5/8
SS	3 7/8	3 5/8	3 3/8	4 1/8	4	4 1/2	5 1/8	5 3/4	6 3/4
ST	1/2	3/4	1	1	1 1/4	1 1/4	1 1/2	1 3/4	1 3/4
SW	3/8	1/2	11/16	11/16	7/8	7/8	1 1/8	1 3/8	1 3/8
TD**	1.000	1.375	1.375	1.750	1.750	1.750	2.000	2.500	3.000
TF	3 7/16	4 1/8	4 5/8	5 7/8	6 3/8	8 3/16	9 7/16	10 5/8	11 13/16
TL	1	1 3/8	1 3/8	1 3/4	1 3/4	1 3/4	2	2 1/2	3
TM	3	3 1/2	4	5	5 1/2	7	8 1/2	9 3/4	11
TN	3/4	15/16	1 5/16	1 1/2	2 1/16	2 15/16	3 5/16	3 3/4	4 1/4
TS	3 1/4	4	4 7/8	5 7/8	6 3/4	8 1/4	9 3/4	11 1/4	12 1/4
UF	4 1/4	5 1/8	5 5/8	7 1/8	7 5/8	9 3/4	11 1/4	12 5/8	14
UM	5	6 1/4	6 3/4	8 1/2	9	10 1/2	12 1/2	14 3/4	17
US	4	5	6 1/4	7 1/4	8 1/2	10	12	14	15
UT	4 1/2	5 3/4	6 1/4	8	8 1/2	10	11 1/2	13 1/2	15 1/2

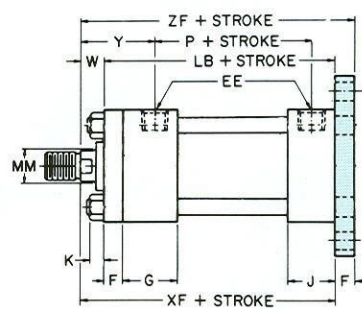
\* CD +.005  
-.000

\*\* TD +.000  
-.002

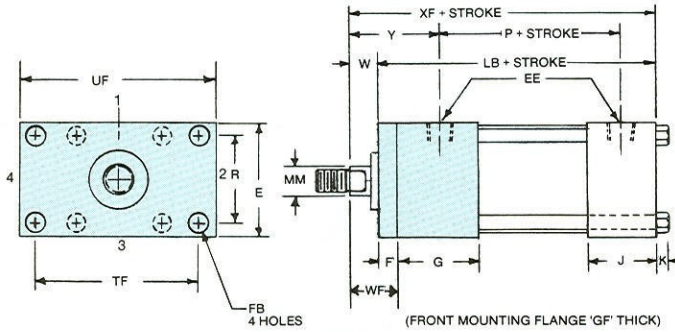




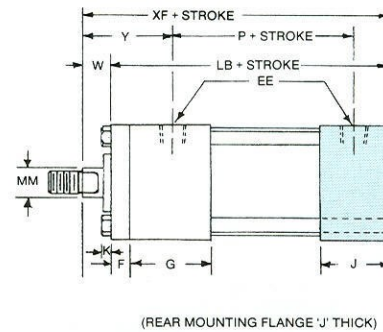
**Type F-5 — Head Square Flange Mounting**



**Type F-6 — Cap Square Flange Mounting**



**Type FH-1 — Head Heavy Flange Mounting**



**Type FH-2 — Cap Heavy Flange Mounting**

**Table 2  
ENVELOPE & MOUNTING DIMENSIONS**

BORE	ROD	W	Y XT	XC	XG	XI MIN.	XF	XL	XJ	XS	WF	ZB	ZF	ZM
1 1/2	5/8*	5/8	2	6 3/8	1 7/8	3 3/8	5 5/8	6 7/8	4 7/8	1 3/8	1	6	6	6 7/8
	1**	1	2 3/8	6 3/4	2 1/4	3 3/4	6	7 1/4	5 1/4	1 3/4	1 3/8	6 3/8	6 3/8	7 5/8
2	1 *	3/4	2 3/8	7 1/4	2 1/4	3 7/8	6	7 1/4	5 1/4	1 7/8	1 3/8	6 7/16	6 5/8	7 5/8
	1 3/8**	1	2 5/8	7 1/2	2 1/2	4 1/8	6 1/4	7 1/2	5 1/2	2 1/8	1 5/8	6 11/16	6 7/8	8 1/8
2 1/2	1 *	3/4	2 3/8	7 3/8	2 1/4	3 7/8	6 1/8	7 3/8	5 3/8	2 1/16	1 3/8	6 9/16	6 3/4	7 3/4
	1 3/8	1	2 5/8	7 5/8	2 1/2	4 1/8	6 3/8	7 5/8	5 5/8	2 5/16	1 5/8	6 13/16	7	8 1/4
	1 3/4**	1 1/4	2 7/8	7 7/8	2 3/4	4 3/8	6 5/8	7 7/8	5 7/8	2 9/16	1 7/8	7 1/16	7 1/4	8 3/4
3 1/4	1 3/8*	7/8	2 3/4	8 5/8	2 5/8	4 5/8	7 1/8	8 5/8	6 1/4	2 5/16	1 5/8	7 11/16	7 7/8	9
	1 3/4	1 1/8	3	8 7/8	2 7/8	4 7/8	7 3/8	8 7/8	6 1/2	2 9/16	1 7/8	7 15/16	8 1/8	9 1/2
	2	1 1/4	3 1/8	9	3	5	7 1/2	9	6 5/8	2 11/16	2	8 1/16	8 1/4	9 3/4
4	1 3/4*	1	3	9 3/4	2 7/8	4 7/8	7 5/8	9 7/8	6 3/4	2 3/4	1 7/8	8 3/16	8 1/2	9 3/4
	2	1 1/8	3 1/8	9 7/8	3	5	7 3/4	10	6 7/8	2 7/8	2	8 5/16	8 5/8	10
	2 1/2	1 3/8	3 3/8	10 1/8	3 1/4	5 1/4	8	10 1/4	7 1/8	3 1/8	2 1/4	8 9/16	8 7/8	10 1/2
5	2 *	1 1/8	3	10 1/2	3	5	8 1/4	10 3/4	7 3/8	2 7/8	2	9 1/16	9 1/8	10 1/2
	2 1/2	1 3/8	3 1/4	10 3/4	3 1/4	5 1/4	8 1/2	11	7 5/8	3 1/8	2 1/4	9 5/16	9 3/8	11
	3	1 3/8	3 1/4	10 3/4	3 1/4	5 1/4	8 1/2	11	7 5/8	3 1/8	2 1/4	9 5/16	9 3/8	11
	3 1/2	1 3/8	3 1/4	10 3/4	3 1/4	5 1/4	8 1/2	11	7 5/8	3 1/8	2 1/4	9 5/16	9 3/8	11
6	2 1/2*	1 1/4	3 3/8	12 1/8	3 1/2	6	9 5/8	12 5/8	8 3/8	3 3/8	2 1/4	10 1/2	10 5/8	12 1/8
	3	1 1/4	3 3/8	12 1/8	3 1/2	6	9 5/8	12 5/8	8 3/8	3 3/8	2 1/4	10 1/2	10 5/8	12 1/8
	3 1/2	1 1/4	3 3/8	12 1/8	3 1/2	6	9 5/8	12 5/8	8 3/8	3 3/8	2 1/4	10 1/2	10 5/8	12 1/8
	4	1 1/4	3 3/8	12 1/8	3 1/2	6	9 5/8	12 5/8	8 3/8	3 3/8	2 1/4	10 1/2	10 5/8	12 1/8
7	3 *	1 1/4	3 3/4	13 3/4	3 3/4	6 1/2	10 3/4	14 1/4	9 3/8	3 5/8	2 1/4	11 3/4	11 3/4	13 1/4
	3 1/2	1 1/4	3 3/4	13 3/4	3 3/4	6 1/2	10 3/4	14 1/4	9 3/8	3 5/8	2 1/4	11 3/4	11 3/4	13 1/4
	4	1 1/4	3 3/4	13 3/4	3 3/4	6 1/2	10 3/4	14 1/4	9 3/8	3 5/8	2 1/4	11 3/4	11 3/4	13 1/4
	5	1 1/4	3 3/4	13 3/4	3 3/4	6 1/2	10 3/4	14 1/4	9 3/8	3 5/8	2 1/4	11 3/4	11 3/4	13 1/4
8	3 1/2*	1 1/4	3 7/8	15	3 7/8	7	11 3/4	16	10 1/4	3 5/8	2 1/4	12 13/16	12 3/4	14
	4	1 1/4	3 7/8	15	3 7/8	7	11 3/4	16	10 1/4	3 5/8	2 1/4	12 13/16	12 3/4	14
	5	1 1/4	3 7/8	15	3 7/8	7	11 3/4	16	10 1/4	3 5/8	2 1/4	12 13/16	12 3/4	14
	5 1/2	1 1/4	3 7/8	15	3 7/8	7	11 3/4	16	10 1/4	3 5/8	2 1/4	12 13/16	12 3/4	14

\*STANDARD ROD DIAMETER

\*\*NO CUSHION AVAILABLE ON ROD END