

# Class 1, 2, M

Hydraulic and Pneumatic Cylinders

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# NOPAK

First in Manufacturing. Engineered to Last.

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**NOPAK LOW PRESSURE CAST HEAD CYLINDERS**

**CLASS 1 CAST HEAD CYLINDERS**

For normal applications where low-cost, rugged air cylinders are required. Our exclusive design has been “user-proven” with over 80 years of experience as the work horse of industry.

**CLASS 2 CAST HEAD CYLINDERS**

For higher operating air pressures and hydraulic use. These cylinders incorporate recessed gasketed tube seals and piston to rod O-ring seals as standard features.

**CLASS M CAST HEAD MILL TYPE CYLINDERS**

These cylinders have all the features of NOPAK Class 2 cylinders plus oversize rods and steel tubing with welded flanges and bolted cylinder heads. See page 15.

**CL1/SVR CAST HEAD/SEVERE SERVICE CYLINDERS**

See the Class 1 SVR Section. These extra-rugged units feature “over-” over-size rods (as compared against competitive models) and extra-heavy duty rod bearing for the most abusive of service.

The aforesaid designs, evolving from the evermore challenging demands for gigantic Mill types, now place NOPAK in the forefront.

We welcome the opportunity to quote your most challenging applications.

PRESSURE RATINGS (PSI) RECOMMENDED MAXIMUM			
AIR		HYDRAULIC	
CYL. DIA.	CLASS 1, 2, M	CLASS 2	CLASS M
1-1/2	250	450	650
2	250	450	650
2-1/2	250	450	650
3	250	450	650
4	250	450	650
5	250	450	450
6	250	450	450
8	250	450	450
10	250	450	450
12	250	450	450
14	250	450	450

APPROXIMATE UNCRATED CLASS 1, 2, M CAST HEAD CYLINDER WEIGHTS (LBS.)													
		CYLINDER BORE	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14
Add Per Inch of Stroke	Zero Stroke		4.5	6.8	10.6	13.5	23.4	30.6	52.2	113	175	321	415
	Class 1, 2		.38	.44	.65	.75	1.1	1.3	1.6	2.7	4.5	5.9	6.5
	Class M		.45	.45	.75	.75	1.2	1.5	2	2.5	4.5	7.1	8.5

# OPTIONS, MODIFICATIONS AND ORDERING INFORMATION

## OPTIONS

### BORE SIZE

The bore size of an air cylinder should be selected to supply from 125% to 200% of the required force. The excess of force versus load will result in a faster cylinder speed assuming there is an adequate supply of air into and out of the cylinder.

The bore size of a hydraulic cylinder should be selected to supply sufficient force to exceed the load by approximately 20%. The cylinder speed is the result of flow into and out of the cylinder. Force tables to aid in cylinder sizing are on page 16.

### MOUNTINGS

Select the cylinder mounting which will keep the line of force as close as possible to the centerline of the piston rod and free of misalignment. This will maximize seal and bearing life.

### DOUBLE ROD END

NOPAK Class 1, 2 and M cylinders when ordered as double rod end are designated by prefixing the model with letter "X." Mounting dimensions may vary from standard because two rod end heads are used. The rod sizes or head models may be interchanged.

### CUSHIONS

Unless specified otherwise NOPAK Class 1, 2 and M cylinders are furnished with self-regulating cushions on both ends. Adjustable cushions or non-cushion cylinders are also available. See page 9.

The purpose of a cushion is to slow up piston speed at the end of the stroke, eliminating shock. The mass to be cushioned should be limited to one-half the cylinder force unless other provisions are made for deceleration or special cushioning.

### SPECIAL MATERIALS AND PLATING

Special materials, metals and/or platings are available for various applications including AWWA Specifications.

## CUSTOM MODIFICATIONS

### STOP TUBES

In long cylinders used on push applications, internal stop tubes may be necessary to prevent excessive bearing wear. When stop tubes are required with a cushioned air cylinder, a dual or wider piston or similar arrangement is recommended to reduce the trapped air volume and provide the necessary cushion back pressure.

### OVERSIZE RODS

An oversize piston rod, 1/4" larger than normal, is available for all Class 1 and Class 2 cylinder diameters except for the 8" which has an oversize rod as standard. Specify rod diameter when ordering. The rod end threading, the rod extension, and related dimensions are shown in Table 2.

The oversize rod is a standard feature on NOPAK Class M mill type cylinders.

### PISTON ROD EXTENSION AND ROD THREADING

Longer than standard piston rod extensions may be required to accommodate load fastening. Depending upon the details of rod engagement to load, special threading on rod end configuration may be required.

### CYLINDER PORTS

To increase cylinder speed, increased fluid volume is necessary. This can be done by using enlarged or additional ports.

## HOW TO ORDER

### All orders should include the following information:

1. Class of cylinder (1, 2 or M).
2. Bore or cylinder diameter size.
3. Stroke length in inches.
4. NOPAK model.
5. Type of cushioning.
6. Piston rod diameter and type of rod end threading as 1, 3, 5 or special.
7. Operating medium (air, oil or water).

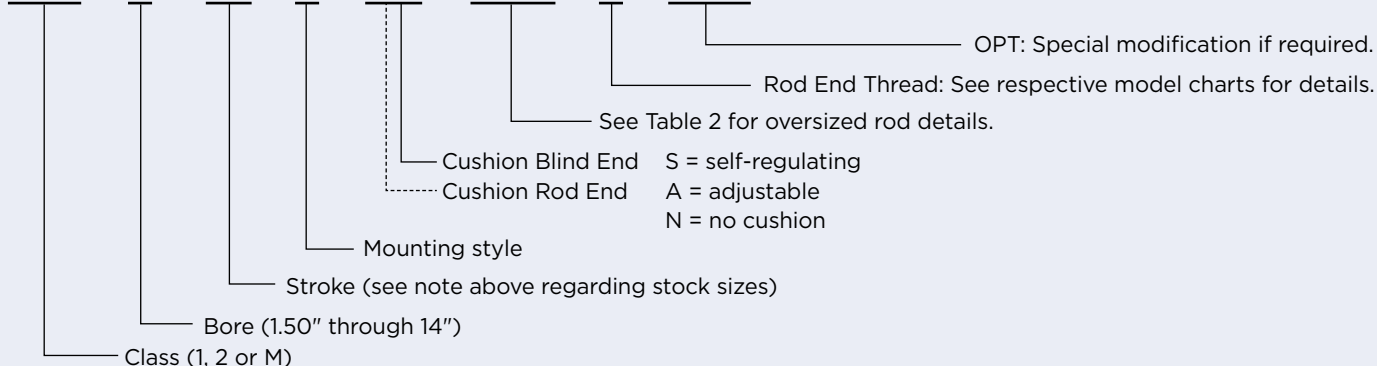
### Also specify:

1. Extreme temperatures (below -20°F or above +250°F).
2. Minimum pressure (if less than 20 PSI).
3. Type of fluid (if other than air, oil or water).
4. Unusual operating conditions.

**NOTE:** Dimensions in inches of ALL Piston Rod Extensions must be taken with the rod retracted. For other than standard piston rod end length dimensions, locate the extreme outboard end of the piston rod in relation to the mounting dimensions of that particular model. Variations in length should be indicated in reference to this dimension. (Related to "C" dimension designation.)

### ORDERING CODE EXAMPLE

**CL1 - 4 x 12 - E - AS - 1.00 - 1 - OPT**

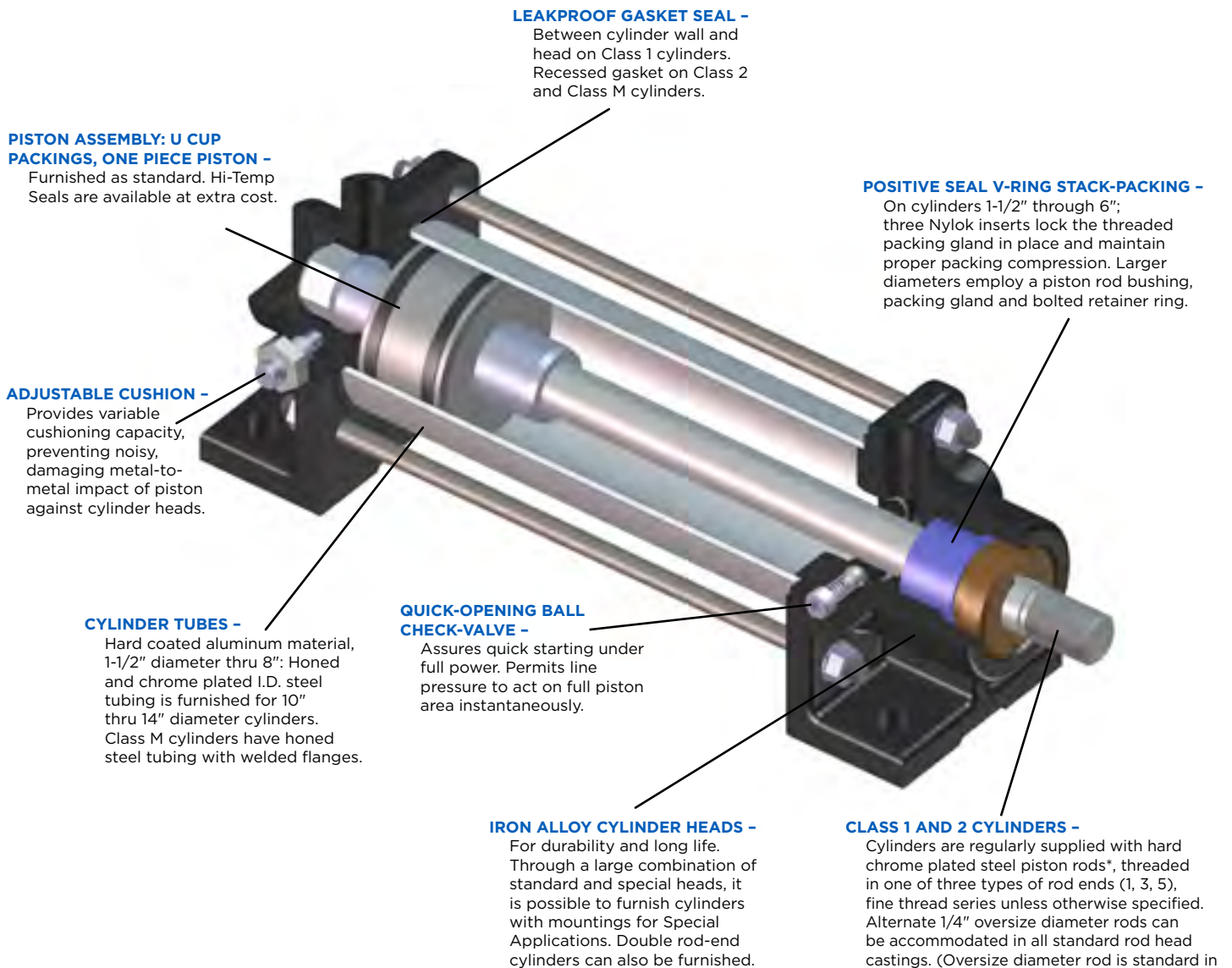


## CLASS 1, 2 & M CAST HEAD CYLINDER CUTAWAY VIEW

Sectional view of a NOPAK Double-Acting Cylinder with Adjustable Cushions. It graphically illustrates 8 other features of NOPAK Cylinder construction which contribute to smooth, efficient performance under severe operating conditions.

### MOUNTINGS

Classes 1, 2 and M are available in the five standard mountings designated as Models A, C, D, E and F, illustrated on pages 10 to 15 inclusive.



\* Standard piston rod material is high tensile 100,000 PSI minimum yield, ground, polished, and flash chrome plated .0003/0.005 to provide a hard long-wearing surface with low friction. Consult factory for other than air applications.

# CYLINDER DESIGN AND CONSTRUCTION FEATURES

## TYPES OF CUSHIONING ACTION (CLASSES 1, 2 AND M)

### SELF-REGULATING CUSHION TYPE (Operates Automatically)

The self-regulating cylinder head requires no adjustment. Once the cylinder is assembled, its operation is entirely automatic. As the cushion sleeve enters the bore in the cylinder head, the air or fluid is trapped between the piston and the cylinder head, forming a pneumatic or hydraulic cushion.

Predetermined taper on the cushion sleeve and tolerance between it and bore in the cylinder head provide the self-regulating, positive cushion action. This maximum cushion effect remains constant at all times without needing adjustment.

### ADJUSTABLE CUSHION TYPE

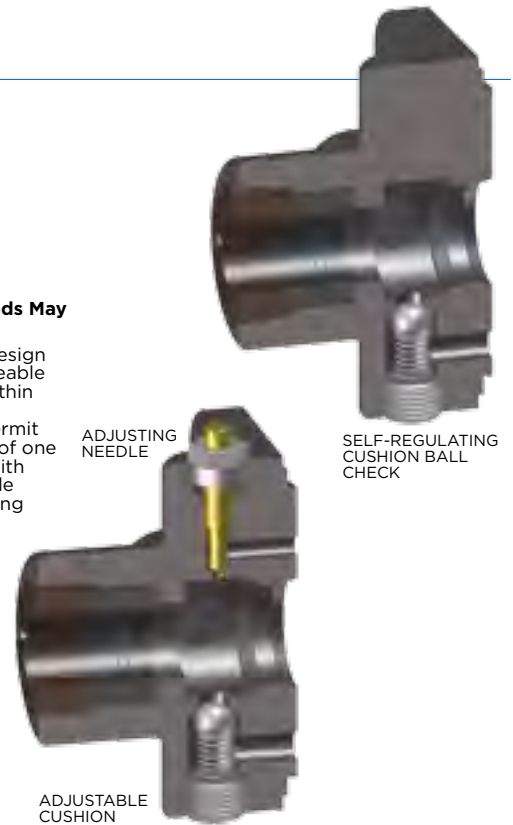
The adjustable cushion is often desirable where load relations to cylinder capacity are apt to vary a great deal. After the cushion is adjusted, by means of the needle valve, the speed at which the piston continues to the end of its stroke is governed by the foregoing adjustment.

### NON-CUSHIONED CYLINDERS

NOPAK cylinders can also be furnished with non-cushioned stroke, providing motion at constant speed for full travel. As there is no provision for cushioning, this type is recommended only where the piston speed is very slow, where the stroke is very short, or where the piston is stopped on the work before it reaches the end of full stroke.

#### One or Both Ends May Be Cushioned

Standardized design and interchangeable components within each class of construction permit the cushioning of one or both ends, with either Adjustable or Self-Regulating Cushions.



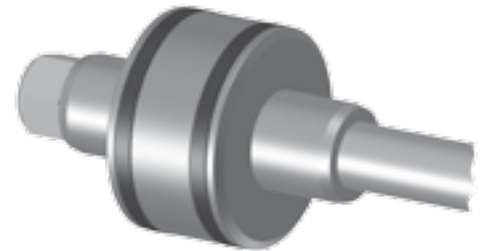
## PISTON ASSEMBLY

### U CUP PACKING

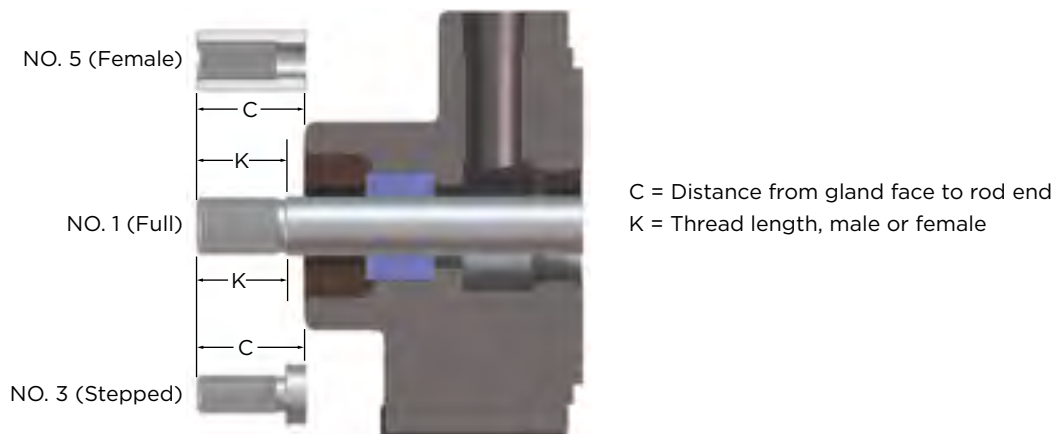
U Cup packings, self-sealing by line pressure, are furnished as standard equipment in Class 1, 2 and M Mill Type cylinders. Different types of cups are recommended for different types of service, as follows:

1. **Type A** - For low pressure air, oil or water. (Water, Glycol, Fire Resistant Fluids.) Temperature -20°F to +225°F.
2. **Type B** - Higher Temperatures -20°F to +325°F oil or air service. (Phosphate, Ester, Fire Resistant Fluids.)

The above is a simplified statement for general purpose and average conditions. Information on specific media and temperatures exceeding the above ratings should be referred to the NOPAK Engineering Department.



## ROD END DETAIL



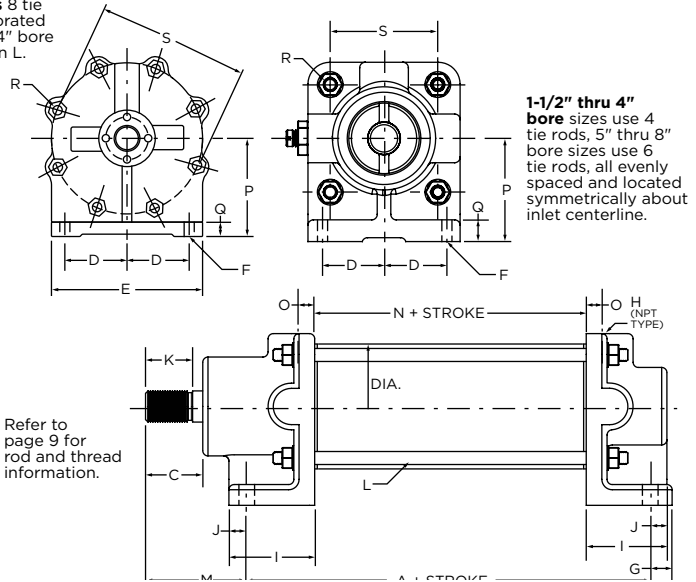
**MODEL A**



**CLASS 1 or 2** Double Acting Cylinder

**FOR 16" DIAMETER AND LARGER, REFER TO THE CLASS 6 SECTION.**

End view illustrates 8 tie rod spacing incorporated in the 10", 12" and 14" bore sizes. See dimension L.



Model "A" is used primarily in applications requiring straight-line push-pull motion where cylinder can be mounted on a flat surface. Intermediate supports can be furnished in cases where ratio of cylinder stroke to bore is large, to prevent excessive deflection and resulting wear on cups and packings.

**Table 1** BASIC DIMENSIONS MODEL A CLASS 1 OR 2

- = A 1/4" oversize rod, standard in the 8" bore size, can be furnished using standard head castings. Rod end extension and related dimensions will therefore vary accordingly. See Table 2. Dimensions shown in this catalog may be altered without notice.
- = These are rough dimensions and should not be used for locating purposes.

BORE	ROD• DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C	D	E■	F	G	H	I■	J	K	L	M	N	O	P	Q	R	S
1-1/2	5/8	5/8-18	3/8-24	1/2-20	4-1/8	1-1/8	7/8	2-3/4	13/32	1/2	1/4	1-3/4	7/16	7/8	(4) 5/16	1-7/8	1-3/8	5/8	1-3/4	3/8	3/8	2-5/8
2	5/8	5/8-18	1/2-20	1/2-20	4-3/8	1-1/8	1	3	13/32	1/2	1/4	2	1/2	7/8	(4) 5/16	1-3/4	1-3/8	5/8	2-1/8	1/2	1/2	2-7/8
2-1/2	3/4	3/4-16	1/2-20	1/2-20	4-3/4	1-3/8	1-1/8	3-1/2	17/32	5/8	3/8	2-1/8	5/8	1-1/8	(4) 3/8	2-5/8	1-3/4	5/8	2-3/8	1/2	1/2	3-1/2
3	3/4	3/4-16	5/8-18	1/2-20	4-7/8	1-3/8	1-5/16	3-7/8	17/32	3/4	3/8	2-1/8	5/8	1-1/8	(4) 3/8	2-9/16	1-3/4	3/4	2-1/2	1/2	1/2	3-7/8
4	1	1-14	3/4-16	5/8-18	5-1/2	1-3/4	1-15/16	4-7/8	17/32	7/8	1/2	2-3/8	5/8	1-1/2	(4) 1/2	3-3/8	2	1	3	1/2	5/8	5-1/8
5	1	1-14	3/4-16	5/8-18	5-3/4	1-3/4	2-3/16	5-5/8	17/32	7/8	1/2	2-1/2	5/8	1-1/2	(6) 1/2	3-1/4	2	1	3-3/4	5/8	1/2	6-1/8
6	1-1/4	1-1/4-12	1-14	3/4-16	5-5/8	2-1/8	2-15/16	7-1/8	17/32	1-5/8	3/4	2-1/8	5/8	1-7/8	(6) 1/2	4-1/4	2-5/8	1	4-7/16	5/8	5/8	7-1/8
8	1-3/4	1-3/4-12	1-1/2-12	1-14	7-1/4	2-1/2	4-1/8	9-3/4	21/32	3/4	1	2-1/2	3/4	2-1/4	(6) 5/8	4-7/8	3-1/2	1-1/8	6-3/8	3/4	11/16	9-1/2
10	2	2-12	1-1/2-12	1-1/4-12	8-3/8	3-1/4	4-9/16	11-5/8	25/32	1-3/4	1-1/4	3-5/8	1-1/4	3	(8) 3/4	5-7/8	3-5/8	1-1/8	7-1/2	1	1	11-5/8
12	2-1/2	2-1/2-12	2-12	1-1/2-12	10	4	5-1/4	14-3/4	1-1/16	2-3/8	1-1/2	5	1-7/8	3-3/4	(8) 7/8	7-1/8	3-3/4	1-3/8	9	1-1/4	1-1/8	14-3/4
14	2-3/4	2-3/4-12	2-1/2-12	1-3/4-12	10-1/4	4	6-1/2	17	1-5/16	3	2	5-1/4	2	3-3/4	(8) 7/8	7-1/8	3-3/4	2	10-1/4	1-1/2	1-1/8	17

**Table 2** DIMENSION CHANGES FOR 1/4" OVERSIZE ROD DIAMETER & CLASS M

BORE	ROD• DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C NO. 1 THREAD	C NO. 3 & 5 THREAD	K NO. 1 THREAD	K NO. 3 THREAD	K NO. 5 THREAD (FEMALE)	M NO. 1 THREAD	M NO. 3 THREAD	M NO. 5 THREAD (FEMALE)
1-1/2	7/8	7/8-14	5/8-18	1/2-20	4-1/8	1-1/2	1-1/8	1-1/4	7/8	7/8	2-1/4	1-7/8	1-7/8
2	7/8	7/8-14	5/8-18	1/2-20	4-3/8	1-1/2	1-1/8	1-1/4	7/8	7/8	2-1/8	1-3/4	1-3/4
2-1/2	1	1-14	3/4-16	1/2-20	4-3/4	1-3/4	1-3/8	1-1/2	1-1/8	7/8	3	2-5/8	2-5/8
3	1	1-14	3/4-16	1/2-20	4-7/8	1-3/4	1-3/8	1-1/2	1-1/8	7/8	2-15/16	2-9/16	2-9/16
4	1-1/4	1-1/4-12	1-14	5/8-18	5-1/2	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	3-3/4	3-3/8	3-3/8
5	1-1/4	1-1/4-12	1-14	5/8-18	5-3/4	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	3-5/8	3-1/4	3-1/4
6	1-1/2	1-1/2-12	1-1/4-12	3/4-16	5-5/8	2-1/2	2-1/8	2-1/4	1-7/8	1-1/4	4-5/8	4-1/4	4-1/4
8	1-3/4	1-3/4-12	1-1/2-12	1-14	7-1/4	2-1/2	2-1/2	2-1/4	2-1/4	2-1/4	4-7/8	4-7/8	4-7/8
10	2-1/4	2-1/4-12	2-12	1-1/4-12	8-3/8	3-5/8	3-1/4	3-3/8	3	2	6-1/4	5-7/8	5-7/8
12	2-3/4	2-3/4-12	2-1/2-12	1-1/2-12	10	4-3/8	4	4-1/8	3-3/4	2-3/8	7-1/2	7-1/8	7-1/8
14	3	3-12	2-1/2-12	1-3/4-12	10-1/4	4-3/4	4	4-1/2	3-3/4	2-3/4	7-7/8	7-1/8	7-1/8



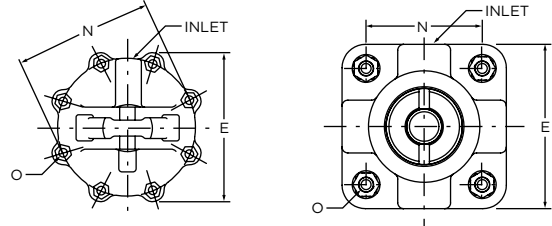
## MODEL E



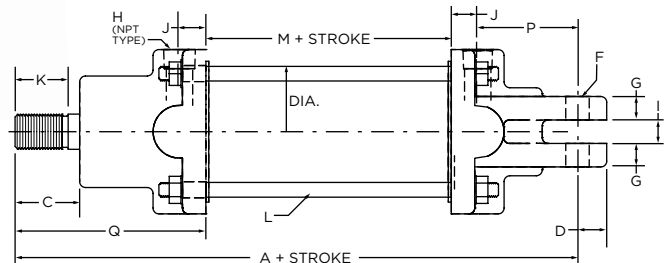
CLASS 1 or 2 Double Acting Cylinder

End view illustrates 8 tie rod spacing incorporated in the 10", 12" and 14" bore sizes. See dimension L.

1-1/2" thru 4" bore sizes use 4 tie rods, 5" thru 8" bore sizes use 6 tie rods, all evenly spaced and located symmetrically about inlet centerline.



Refer to page 9 for rod and thread information.



**FOR 16" DIAMETER AND LARGER, REFER TO THE CLASS 6 SECTION.**

Model E is designed expressly for use in hoist service or where articulated or oscillating movement is required. It is often attached to ceiling, beam or other overhead surfaces, with rod end down, but is also used in the opposite position for upward pushing or tilting operations.

**Table 1** BASIC DIMENSIONS MODEL E CLASS 1 OR 2

• = A 1/4" oversize rod, standard in the 8" bore size, can be furnished using standard head castings. Rod end extension and related dimensions will therefore vary accordingly. See Table 2. Dimensions shown in this catalog may be altered without notice.

BORE	ROD DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1-1/2	5/8	5/8-18	3/8-24	1/2-20	6-3/4	1-1/8	1/2	2-3/4	3/8	3/8	1/4	1/2	5/8	7/8	(4) 5/16	1-3/8	2-5/8	3/8	1-1/2	3-1/4
2	5/8	5/8-18	1/2-20	1/2-20	7-1/4	1-1/8	5/8	3	1/2	1/2	1/4	1/2	5/8	7/8	(4) 5/16	1-3/8	2-7/8	1/2	2	3-1/4
2-1/2	3/4	3/4-16	1/2-20	1/2-20	8-5/8	1-3/8	5/8	3-1/2	1/2	1/2	3/8	1/2	5/8	1-1/8	(4) 3/8	1-3/4	3-1/2	1/2	2-1/8	4-1/8
3	3/4	3/4-16	5/8-18	1/2-20	8-7/8	1-3/8	5/8	3-3/4	1/2	1/2	3/8	1/2	3/4	1-1/8	(4) 3/8	1-3/4	3-7/8	1/2	2-5/16	4-1/8
4	1	1-14	3/4-16	5/8-18	10-3/4	1-3/4	7/8	4-7/8	3/4	3/4	1/2	3/4	1	1-1/2	(4) 1/2	2	5-1/8	5/8	2-5/8	5-1/8
5	1	1-14	3/4-16	5/8-18	10-7/8	1-3/4	7/8	6-3/8	3/4	3/4	1/2	3/4	1	1-1/2	(6) 1/2	2	6-1/8	1/2	2-3/4	5-1/8
6	1-1/4	1-1/4-12	1-14	3/4-16	12-3/4	2-1/8	1-1/8	7-1/4	7/8	1	3/4	1	1	1-7/8	(6) 1/2	2-5/8	7-1/8	5/8	3-3/8	5-3/4
8	1-3/4	1-3/4-12	1-1/2-12	1-14	14	2-1/2	1-1/4	9-5/8	1	1	1	1-1/4	1-1/8	2-1/4	(6) 5/8	3-1/2	9-1/2	11/16	2-5/8	6-3/4
10	2	2-12	1-1/2-12	1-1/4-12	17-3/4	3-1/4	1-1/2	12-3/4	1-1/4	1-1/4	1-1/4	1-1/2	1-1/8	3	(8) 3/4	3-5/8	11-5/8	1	4-3/4	8-1/4
12	2-1/2	2-1/2-12	2-12	1-1/2-12	21-3/4	4	1-3/4	15-7/8	1-1/2	1-1/2	1-1/2	2	1-3/8	3-3/4	(8) 7/8	3-3/4	14-3/4	1-1/8	6-3/8	10-1/4
14	2-3/4	2-3/4-12	2-1/2-12	1-3/4-12	22-7/8	4	2	17-3/4	1-3/4	1-3/4	2	2-1/2	2	3-3/4	(8) 7/8	3-3/4	17	1-1/8	6-3/4	10-3/8

**Table 2** DIMENSION CHANGES FOR 1/4" OVERSIZE ROD DIAMETER & CLASS M

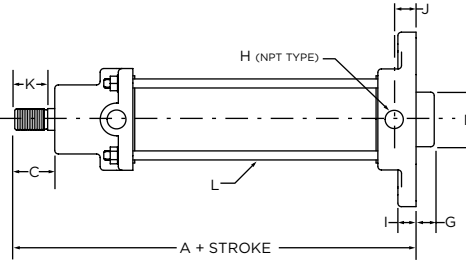
BORE	ROD DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A NO. 1 THREAD	A NO. 3 & 5 THREAD	C NO. 1 THREAD	C NO. 3 & 5 THREAD	K NO. 1 THREAD	K NO. 3 THREAD	K NO. 5 THREAD (FEMALE)	Q NO. 1 THREAD	Q NO. 3 THREAD	Q NO. 5 THREAD (FEMALE)
1-1/2	7/8	7/8-14	5/8-18	1/2-20	7-1/8	6-3/4	1-1/2	1-1/8	1-1/4	7/8	7/8	2-1/4	3-1/4	3-1/4
2	7/8	7/8-14	5/8-18	1/2-20	7-5/8	7-1/4	1-1/2	1-1/8	1-1/4	7/8	7/8	2-1/8	3-1/4	3-1/4
2-1/2	1	1-14	3/4-16	1/2-20	9	8-5/8	1-3/4	1-3/8	1-1/2	1-1/8	7/8	3	4-1/8	4-1/8
3	1	1-14	3/4-16	1/2-20	9-1/4	8-7/8	1-3/4	1-3/8	1-1/2	1-1/8	7/8	2-15/16	4-1/8	4-1/8
4	1-1/4	1-1/4-12	1-14	5/8-18	11-1/8	10-3/4	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	3-3/4	5-1/8	5-1/8
5	1-1/4	1-1/4-12	1-14	5/8-18	11-1/4	10-7/8	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	3-5/8	5-1/8	5-1/8
6	1-1/2	1-1/2-12	1-1/4-12	3/4-16	13-1/8	12-3/4	2-1/2	2-1/8	2-1/4	1-7/8	1-1/4	4-5/8	5-3/4	5-3/4
8	1-3/4	1-3/4-12	1-1/2-12	1-14	14	14	2-1/2	2-1/2	2-1/4	2-1/4	2-1/4	4-7/8	6-3/4	6-3/4
10	2-1/4	2-1/4-12	2-12	1-1/4-12	18-1/8	17-3/4	3-5/8	3-1/4	3-3/8	3	2	6-1/4	8-1/4	8-1/4
12	2-3/4	2-3/4-12	2-1/2-12	1-1/2-12	22-1/8	21-3/4	4-3/8	4	4-1/8	3-3/4	2-3/8	7-1/2	10-1/4	10-1/4
14	3	3-12	2-1/2-12	1-3/4-12	23-5/8	22-7/8	4-3/4	4	4-1/2	3-3/4	2-3/4	7-7/8	10-3/8	10-3/8

**MODEL C BLANK END MOUNTING**

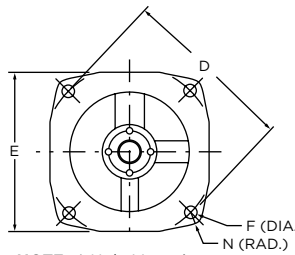
**CLASS 1 or 2**  
Double Acting Cylinder



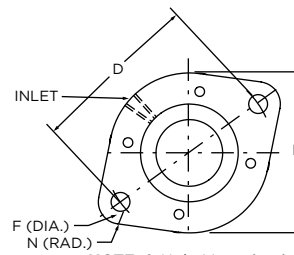
Refer to page 9 for rod and thread information.



**FOR 16" DIAMETER AND LARGER, REFER TO THE CLASS 6 SECTION.**



**NOTE:** 4-Hole Mounting is used on Model C Cylinders from 4" to 14" in diameter.



**NOTE:** 2-Hole Mounting is used on Model C Cylinders from 1-1/2" to 3" in diameter.

Model C may be mounted on any flat base with provision for protruding cushion boss\*. It is used in applications of upward pushing power; also for cantilever action when mounted at right angles to a wall or other vertical surface.

\* Flush mounting available at extra charge on blank end, if not cushioned.

**Table 1** BASIC DIMENSIONS MODEL C CLASS 1 OR 2

- = A 1/4" oversize rod, standard in the 8" bore size, can be furnished using standard head castings. Rod end extension and related dimensions will therefore vary accordingly. See Table 2. Dimensions shown in this catalog may be altered without notice.
- = These are rough dimensions and should not be used for locating purposes. Allow approximately 1/4" for clearance. Can be machined at extra charge if specified.

BORE	ROD• DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C	D	E■	F	G	H	I	J	K	L	M■	N
1-1/2	5/8	5/8-18	3/8-24	1/2-20	5-3/4	1-1/8	3-1/4	3-3/8	13/32	3/8	1/4	1/2	1/2	7/8	(4) 5/16	1-1/2	1/2
2	5/8	5/8-18	1/2-20	1/2-20	5-7/8	1-1/8	3-3/4	3-7/8	13/32	5/8	1/4	5/8	5/8	7/8	(4) 5/16	1-3/4	1/2
2-1/2	3/4	3/4-16	1/2-20	1/2-20	7-1/4	1-3/8	4-3/4	4-1/2	17/32	5/8	3/8	5/8	3/4	1-1/8	(4) 3/8	1-7/8	5/8
3	3/4	3/4-16	5/8-18	1/2-20	7-3/8	1-3/8	5-1/4	4-7/8	17/32	3/4	3/8	5/8	3/4	1-1/8	(4) 3/8	2-1/8	5/8
4	1	1-14	3/4-16	5/8-18	8-7/8	1-3/4	7-3/4	6-3/4	17/32	7/8	1/2	5/8	3/4	1-1/2	(4) 1/2	2-5/8	5/8
5	1	1-14	3/4-16	5/8-18	8-7/8	1-3/4	7-3/4	7-1/4	17/32	7/8	1/2	3/4	7/8	1-1/2	(6) 1/2	2-5/8	5/8
6	1-1/4	1-1/4-12	1-14	3/4-16	10-1/2	2-1/8	9	8-3/8	17/32	1-1/8	3/4	3/4	7/8	1-7/8	(6) 1/2	3	5/8
8	1-3/4	1-3/4-12	1-1/2-12	1-14	12-5/8	2-1/2	10-3/4	10-7/8	25/32	-	1	7/8	1-1/4	2-1/4	(6) 5/8	-	7/8
10	2	2-12	1-1/2-12	1-1/4-12	14-3/4	3-1/4	13-1/4	12-1/2	29/32	2	1-1/4	1-1/8	1-1/8	3	(8) 3/4	4-1/2	1
12	2-1/2	2-1/2-12	2-12	1-1/2-12	17-7/8	4	17-1/2	16	1-1/16	2-1/2	1-1/2	1-1/2	1-3/8	3-3/4	(8) 7/8	5-1/2	1-1/4
14	2-3/4	2-3/4-12	2-1/2-12	1-3/4-12	18-3/8	4	20	18-3/4	1-5/16	2-1/4	2	1-3/4	2	3-3/4	(8) 7/8	5-7/8	1-1/2

**Table 2** DIMENSION CHANGES FOR 1/4" OVERSIZE ROD DIAMETER & CLASS M

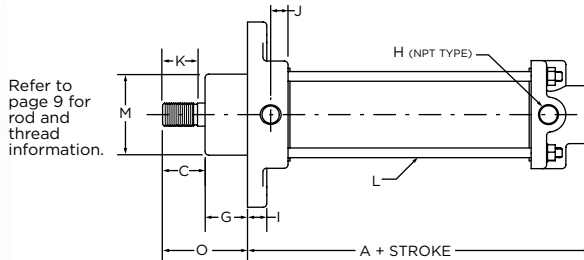
BORE	ROD• DIA.	A NO. 1 THREAD	A NO. 3 & 5 THREAD	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	C NO. 1 THREAD	C NO. 3 & 5 THREAD	K NO. 1 THREAD	K NO. 3 THREAD	K NO. 5 THREAD (FEMALE)
1-1/2	7/8	6-1/8	5-3/4	7/8-14	5/8-18	1/2-20	1-1/2	1-1/8	1-1/4	7/8	7/8
2	7/8	6-1/4	5-7/8	7/8-14	5/8-18	1/2-20	1-1/2	1-1/8	1-1/4	7/8	7/8
2-1/2	1	7-5/8	7-1/4	1-14	3/4-16	1/2-20	1-3/4	1-3/8	1-1/2	1-1/8	7/8
3	1	7-3/4	7-3/8	1-14	3/4-16	1/2-20	1-3/4	1-3/8	1-1/2	1-1/8	7/8
4	1-1/4	9-1/4	8-7/8	1-1/4-12	1-14	5/8-18	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8
5	1-1/4	9-1/4	8-7/8	1-1/4-12	1-14	5/8-18	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8
6	1-1/2	10-7/8	10-1/2	1-1/2-12	1-1/4-12	3/4-16	2-1/2	2-1/8	2-1/4	1-7/8	1-1/4
8	1-3/4	12-5/8	12-5/8	1-3/4-12	1-1/2-12	1-14	2-1/2	2-1/2	2-1/4	2-1/4	2-1/4
10	2-1/4	15-1/8	14-3/4	2-1/4-12	2-12	1-1/4-12	3-5/8	3-1/4	3-3/8	3	2
12	2-3/4	18-1/4	17-7/8	2-3/4-12	2-1/2-12	1-1/2-12	4-3/8	4	4-1/8	3-3/4	2-3/8
14	3	19-1/8	18-3/8	3-12	2-1/2-12	1-3/4-12	4-3/4	4	4-1/2	3-3/4	2-3/4



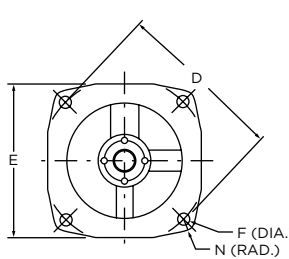
# RIGHT ANGLE FLAT BASE MOUNTING

## MODEL D ROD END MOUNTING

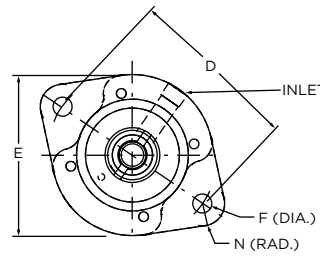
**CLASS 1 or 2**  
Double Acting Cylinder



**FOR 16" DIAMETER AND LARGER, REFER TO THE CLASS 6 SECTION.**



**NOTE: 4-Hole Mounting** is used on Model D Cylinders from 4" to 14" in diameter.



**NOTE: 2-Hole Mounting** is used on Model D Cylinders from 1-1/2" to 3" in diameter.

Model D is similar in construction to Model C, except that the piston rod is extended through the mounting base. It may be mounted on any flat surface in which an opening can be provided for the protruding cushion boss and extension of the rod. It is used extensively in applications of inward pulling power.

**Table 1** BASIC DIMENSIONS MODEL D CLASS 1 OR 2

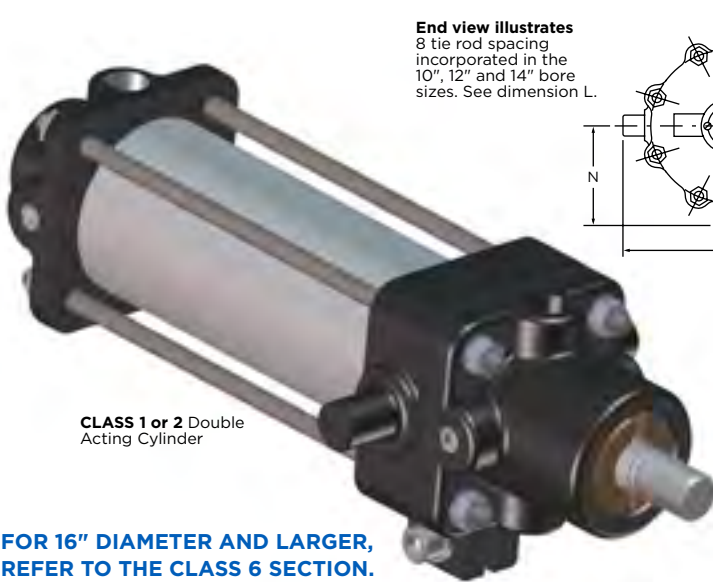
- = A 1/4" oversize rod, standard in the 8" bore size, can be furnished using standard head castings. Rod end extension and related dimensions will therefore vary accordingly. See Table 2. Dimensions shown in this catalog may be altered without notice.
- = These are rough dimensions, except on the 8" diameter cylinder. For locating purposes allow approximately 1/4" for clearance. Can be machined 1/4" smaller than diameter shown at extra charge. The 8" diameter includes a machined hub 4.250-.005 as standard.

BORE	ROD• DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C	D	E■	F	G	H	I	J	K	L	M■	N	O
1-1/2	5/8	5/8-18	3/8-24	1/2-20	4	1-1/8	3-1/4	3-3/8	13/32	1	1/4	1/2	1/2	7/8	(4) 5/16	2	1/2	2-1/8
2	5/8	5/8-18	1/2-20	1/2-20	4-1/2	1-1/8	3-3/4	3-7/8	13/32	7/8	1/4	5/8	5/8	7/8	(4) 5/16	2	1/2	2
2-1/2	3/4	3/4-16	1/2-20	1/2-20	5-1/8	1-3/8	4-3/4	4-1/2	17/32	1-3/8	3/8	5/8	3/4	1-1/8	(4) 3/8	2-5/8	5/8	2-3/4
3	3/4	3/4-16	5/8-18	1/2-20	5-1/2	1-3/8	5-1/4	4-7/8	17/32	1-1/4	3/8	5/8	3/4	1-1/8	(4) 3/8	2-5/8	5/8	2-5/8
4	1	1-14	3/4-16	5/8-18	6-1/2	1-3/4	7-3/4	6-3/4	17/32	1-5/8	1/2	5/8	3/4	1-1/2	(4) 1/2	3	5/8	3-3/8
5	1	1-14	3/4-16	5/8-18	6-5/8	1-3/4	7-3/4	7-1/4	17/32	1-1/2	1/2	3/4	7/8	1-1/2	(6) 1/2	3	3/4	3-1/4
6	1-1/4	1-1/4-12	1-14	3/4-16	7-3/4	2-1/8	9	8-1/4	17/32	1-5/8	3/4	3/4	1	1-7/8	(6) 1/2	3-1/2	5/8	3-3/4
8	1-3/4	1-3/4-12	1-1/2-12	1-14	8-1/8	2-1/2	10-3/4	10-7/8	25/32	1-7/8	1	7/8	1-1/4	2-1/4	(6) 5/8	4-1/4	7/8	4-3/8
10	2	2-12	1-1/2-12	1-1/4-12	10-3/4	3-1/4	13-1/4	12-1/2	29/32	2	1-1/4	1-1/8	1-1/8	3	(8) 3/4	4-1/2	1	5-1/4
12	2-1/2	2-1/2-12	2-12	1-1/2-12	13-1/8	4	17-1/2	16	1-1/16	2-3/8	1-1/2	1-1/2	1-3/8	3-3/4	(8) 7/8	5-1/2	1-1/4	6-3/8
14	2-3/4	2-3/4-12	2-1/2-12	1-3/4-12	14-1/4	4	20	18-3/4	1-5/16	2-1/8	2	1-3/4	2	3-3/4	(8) 7/8	5-7/8	1-1/2	6-1/8

**Table 2** DIMENSION CHANGES FOR 1/4" OVERSIZE ROD DIAMETER & CLASS M

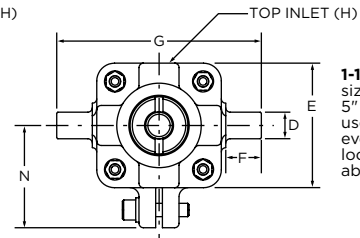
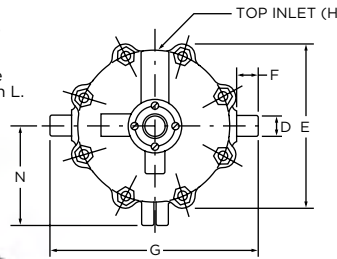
BORE	ROD• DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C NO. 1 THREAD	C NO. 3 & 5 THREAD	K NO. 1 THREAD	K NO. 3 THREAD	K NO. 5 THREAD (FEMALE)	O NO. 1 THREAD	O NO. 3 THREAD	O NO. 5 THREAD (FEMALE)
1-1/2	7/8	7/8-14	5/8-18	1/2-20	4	1-1/2	1-1/8	1-1/4	7/8	7/8	2-1/2	2-1/8	2-1/8
2	7/8	7/8-14	5/8-18	1/2-20	4-1/2	1-1/2	1-1/8	1-1/4	7/8	7/8	2-3/8	2	2
2-1/2	1	1-14	3/4-16	1/2-20	5-1/8	1-3/4	1-3/8	1-1/2	1-1/8	7/8	3-1/8	2-3/4	2-3/4
3	1	1-14	3/4-16	1/2-20	5-1/2	1-3/4	1-3/8	1-1/2	1-1/8	7/8	3	2-5/8	2-5/8
4	1-1/4	1-1/4-12	1-14	5/8-18	6-1/2	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	3-3/4	3-3/8	3-3/8
5	1-1/4	1-1/4-12	1-14	5/8-18	6-5/8	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	3-5/8	3-1/4	3-1/4
6	1-1/2	1-1/2-12	1-1/4-12	3/4-16	7-3/4	2-1/2	2-1/8	2-1/4	1-7/8	1-1/4	4-1/8	3-3/4	3-3/4
8	1-3/4	1-3/4-12	1-1/2-12	1-14	8-1/8	2-1/2	2-1/2	2-1/4	2-1/4	2-1/4	4-3/8	4-3/8	4-3/8
10	2-1/4	2-1/4-12	2-12	1-1/4-12	10-3/4	3-5/8	3-1/4	3-3/8	3	2	5-5/8	5-1/4	5-1/4
12	2-3/4	2-3/4-12	2-1/2-12	1-1/2-12	13-1/8	4-3/8	4	4-1/8	3-3/4	2-3/8	6-3/4	6-3/8	6-3/8
14	3	3-12	2-1/2-12	1-3/4-12	14-1/4	4-3/4	4	4-1/2	3-3/4	2-3/4	6-7/8	6-1/8	6-1/8

**MODEL F**



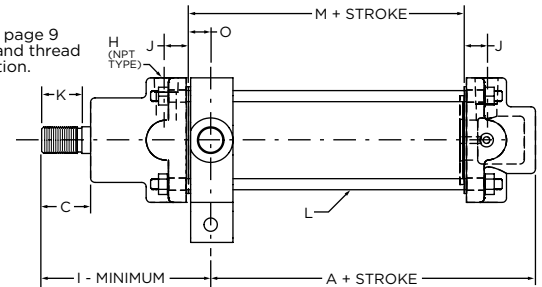
**CLASS 1 or 2** Double Acting Cylinder

End view illustrates 8 tie rod spacing incorporated in the 10", 12" and 14" bore sizes. See dimension L.



1-1/2" thru 4" bore sizes use 4 tie rods, 5" thru 8" bore sizes use 6 tie rods, all evenly spaced and located symmetrically about inlet centerline.

Refer to page 9 for rod and thread information.



**FOR 16" DIAMETER AND LARGER, REFER TO THE CLASS 6 SECTION.**

The Model F Trunnion Mounting provides smooth, dependable cylinder power where oscillating movement is necessary in connection with heavy side thrust. Trunnion location is indicated by dimension "I," which is minimum and furnished as shown unless otherwise specified; it may be increased within limits of cylinder tubing length.

**NOTE:** Model F available without trunnion - designated as Model H.

**Table 1** BASIC DIMENSIONS MODEL F CLASS 1 OR 2

- = A 1/4" oversize rod, standard in the 8" bore size, can be furnished using standard head castings. Rod end extension and related dimensions will therefore vary accordingly. See Table 2. Dimensions shown in this catalog may be altered without notice.
- = Dimension "I" will be furnished as shown unless otherwise specified. When ordering, please specify "I" dimension.

BORE	ROD DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A	C	D	E	F	G	H	I ■	J	K	L	M	N	O
1-1/2	5/8	5/8-18	3/8-24	1/2-20	6-1/8	1-1/8	5/8	2-3/4	5/8	4	1/4	3-3/4	5/8	7/8	(4) 5/16	1-3/8	2-3/16	1/2
2	5/8	5/8-18	1/2-20	1/2-20	6-1/2	1-1/8	5/8	3	3/4	4-5/8	1/4	3-3/4	5/8	7/8	(4) 5/16	1-3/8	2-3/8	1/2
2-1/2	3/4	3/4-16	1/2-20	1/2-20	7-7/8	1-3/8	3/4	3-1/2	1	5-3/4	3/8	4-3/4	5/8	1-1/8	(4) 3/8	1-3/4	2-7/8	5/8
3	3/4	3/4-16	5/8-18	1/2-20	8-1/8	1-3/8	3/4	3-7/8	1-1/8	6-1/2	3/8	4-3/4	3/4	1-1/8	(4) 3/8	1-3/4	3-1/16	5/8
4	1	1-14	3/4-16	5/8-18	9-3/4	1-3/4	1	4-7/8	1-1/4	7-3/4	1/2	5-7/8	1	1-1/2	(4) 1/2	2	3-1/2	3/4
5	1	1-14	3/4-16	5/8-18	9-7/8	1-3/4	1	6-7/8	1-1/4	9	1/2	5-7/8	1	1-1/2	(6) 1/2	2	4-1/4	3/4
6	1-1/4	1-1/4-12	1-14	3/4-16	11-1/2	2-1/8	1	8-3/8	1-1/4	11	3/4	6-1/2	1	1-7/8	(6) 1/2	2-5/8	4-7/8	3/4
8	1-3/4	1-3/4-12	1-1/2-12	1-14	12-1/2	2-1/2	1-1/2	10-7/8	1-1/4	12-3/4	1	7-3/4	1-1/8	2-1/4	(6) 5/8	3-1/2	6-3/8	1
10	2	2-12	1-1/2-12	1-1/4-12	16	3-1/4	1-1/2	12-3/4	1-1/2	16-1/4	1-1/4	9-1/2	1-1/8	3	(8) 3/4	3-5/8	7-11/16	1-1/4
12	2-1/2	2-1/2-12	2-12	1-1/2-12	19-1/2	4	2	15-7/8	2	20-1/4	1-1/2	11-7/8	1-3/8	3-3/4	(8) 7/8	3-3/4	9-1/2	1-5/8
14	2-3/4	2-3/4-12	2-1/2-12	1-3/4-12	20-3/8	4	2-1/2	18-1/4	2-1/2	23-1/2	2	11-7/8	2	3-3/4	(8) 7/8	3-3/4	12-1/4	1-1/2

**Table 2** DIMENSION CHANGES FOR 1/4" OVERSIZE ROD DIAMETER & CLASS M

BORE	ROD DIA.	NO. 1 THREAD	NO. 3 THREAD	NO. 5 THREAD (FEMALE)	A NO. 1 THREAD	A NO. 3 & 5 THREAD	C NO. 1 THREAD	C NO. 3 & 5 THREAD	K NO. 1 THREAD	K NO. 3 THREAD	K NO. 5 THREAD (FEMALE)	I NO. 1 THREAD	I NO. 3 THREAD	I NO. 5 THREAD (FEMALE)
1-1/2	7/8	7/8-14	5/8-18	1/2-20	6-1/2	6-1/8	1-1/2	1-1/8	1-1/4	7/8	7/8	4-1/8	3-3/4	3-3/4
2	7/8	7/8-14	5/8-18	1/2-20	6-7/8	6-1/2	1-1/2	1-1/8	1-1/4	7/8	7/8	4-1/8	3-3/4	3-3/4
2-1/2	1	1-14	3/4-16	1/2-20	8-1/4	7-7/8	1-3/4	1-3/8	1-1/2	1-1/8	7/8	5-1/8	4-3/4	4-3/4
3	1	1-14	3/4-16	1/2-20	8-1/2	8-1/8	1-3/4	1-3/8	1-1/2	1-1/8	7/8	5-1/8	4-3/4	4-3/4
4	1-1/4	1-1/4-12	1-14	5/8-18	10-1/8	9-3/4	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	6-1/4	5-7/8	5-7/8
5	1-1/4	1-1/4-12	1-14	5/8-18	10-1/4	9-7/8	2-1/8	1-3/4	1-7/8	1-1/2	1-1/8	6-1/4	5-7/8	5-7/8
6	1-1/2	1-1/2-12	1-1/4-12	3/4-16	11-7/8	11-1/2	2-1/2	2-1/8	2-1/4	1-7/8	1-1/4	6-7/8	6-1/2	6-1/2
8	1-3/4	1-3/4-12	1-1/2-12	1-14	12-1/2	12-1/2	2-1/2	2-1/2	2-1/4	2-1/4	2-1/4	7-3/4	7-3/4	7-3/4
10	2-1/4	2-1/4-12	2-12	1-1/4-12	16-3/8	16	3-5/8	3-1/4	3-3/8	3	2	9-7/8	9-1/2	9-1/2
12	2-3/4	2-3/4-12	2-1/2-12	1-1/2-12	19-7/8	19-1/2	4-3/8	4	4-1/8	3-3/4	2-3/8	12-1/4	11-7/8	11-7/8
14	3	3-12	2-1/2-12	1-3/4-12	21-1/8	20-3/8	4-3/4	4	4-1/2	3-3/4	2-3/4	12-5/8	11-7/8	11-7/8

CLASS M



CLASS M Double Acting Cylinder

NOPAK Class M cylinders are strong and rugged in construction, especially designed for heavy duty applications in mines, quarries, steel mills, and in the heavy construction industries. Maximum system pressure is 650 PSI in all diameters to 4" – and 450 PSI in diameters of 5" and larger. The Class M construction is available in a full range of sizes and models (mountings) up through 14" in diameter for air, water or oil hydraulic service.

NO TIE RODS – Cylinder flanges are welded to steel cylinder tubing. High tensile alloy iron\* heads are bolted to those flanges.

Chrome plated or stainless steel piston rods and chrome plated or brass lined cylinder tubing can be furnished for water hydraulic applications.

\* Steel heads are available at extra cost.

**DIMENSIONS**

For mounting dimensions of Class M cylinders, use figures from tables of corresponding Class 1, shown on preceding pages, with exception of Piston Rod Diameter and Piston Rod Extension which are shown in tables below. Please note that dimension "I" varies from Class 1 or Class 2 dimension "I" as shown.

**Table 1** CLASS M PISTON ROD THREAD DIMENSIONS (Also Class 1 and 2 Standard Oversize)

See Clevis Information page 17

ROD END	CYLINDER DIAMETER										
	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14
Thread	7/8-14	7/8-14	1-14	1-14	1-1/4-12	1-1/4-12	1-1/2-12	1-3/4-12	2-1/4-12	2-3/4-12	3-12
I Dim.-C	1-1/2	1-1/2	1-3/4	1-3/4	2-1/8	2-1/8	2-1/2	2-1/2	3-5/8	4-3/8	4-3/4
Dim.-K	1-1/4	1-1/4	1-1/2	1-1/2	1-7/8	1-7/8	2-1/4	2-1/4	3-3/8	4-1/8	4-1/2
Thread	1/2-20	1/2-20	1/2-20	1/2-20	5/8-18	5/8-18	3/4-16	1-14	1-1/4-12	1-1/2-12	1-3/4-12
3 Dim.-C	1-1/8	1-1/8	1-3/8	1-3/8	1-3/4	1-3/4	2-1/8	2-1/2	3-1/4	4	4
Dim.-K	7/8	7/8	7/8	7/8	1-1/8	1-1/8	1-1/4	2-1/4	2	2-3/8	2-3/4
Thread	5/8-18	5/8-18	3/4-16	3/4-16	1-14	1-14	1-1/4-12	1-1/2-12	2-12	2-1/2-12	2-1/2-12
5 Dim.-C	1-1/8	1-1/8	1-3/8	1-3/8	1-3/4	1-3/4	2-1/8	2-1/2	3-1/4	4	4
Dim.-K	7/8	7/8	1-1/8	1-1/8	1-1/2	1-1/2	1-7/8	2-1/4	3	3-1/4	3-3/4

**Table 2** MINIMUM I DIMENSIONS CLASS M MODEL F CYLINDERS

BORE	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14
I Dimension	5	5	6	6	7-5/8	7-5/8	8-1/2	10-3/8	11-3/8	15-1/4	15-3/8

**CYLINDER FORCE AND AIR CONSUMPTION TABLE**

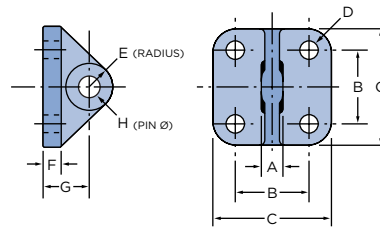
CYL. DIA.	ROD DIA.	THEORETICAL FORCE @ FLUID PRESSURE									CU. FT. FREE AIR* PER IN. PISTON TRAVEL AT 80 PSI
		40	60	80	100	125	200	250	450	650	
1-1/2	PUSH	70.8	106.0	141.4	176.7	220.9	353.4	441.8	795.2	1149	.00658
	PULL 5/8	58.4	87.6	116.8	146.0	182.6	292.1	365.1	657.1	949.2	.00658
	PULL 7/8	46.6	69.9	93.3	116.6	145.7	233.2	291.5	524.6	757.8	.00658
2	PUSH	125.7	188.5	251.3	314.2	392.7	628.3	785.4	1414	2042	.01175
	PULL 5/8	113.4	170.1	226.8	283.5	354.4	567.0	708.7	1276	1843	.01175
	PULL 7/8	101.6	152.4	203.2	254.0	317.5	508.1	635.1	1143	1651	.01175
2-1/2	PUSH	196.3	294.5	392.7	490.9	613.6	981.7	1227	2209	3191	.0183
	PULL 3/4	178.7	268.0	357.3	446.7	558.4	893.4	1117	2010	2903	.0183
	PULL 1	164.9	247.4	329.9	412.3	515.4	824.7	1031	1855	2680	.0183
3	PUSH	282.7	424.1	565.5	706.9	883.6	1414	1767	3181	4595	.0264
	PULL 3/4	265.1	397.7	530.1	662.7	828.4	1325	1657	2982	4307	.0264
	PULL 1	251.3	377.0	502.7	628.3	785.4	1257	1571	2827	4084	.0264
4	PUSH	502.7	754.0	1005	1257	1571	2513	3142	5655	8168	.0469
	PULL 1	471.2	706.9	942.5	1178	1473	2356	2945	5301	7658	.0469
	PULL 1-1/4	453.6	680.3	907.1	1134	1417	2268	2835	5103	7370	.0469
5	PUSH	785.4	1178	1571	1964	2454	3927	4909	8836	-	.0731
	PULL 1	754.0	1131	1508	1885	2356	3770	4712	8482	-	.0731
	PULL 1-1/4	736.3	1104	1473	1841	2301	3682	4602	8284	-	.0731
6	PUSH	1131	1696	2262	2827	3534	5655	7069	12723	-	.1055
	PULL 1-1/4	1082	1623	2164	2705	3381	5409	6762	12171	-	.1055
	PULL 1-1/2	1060	1590	2121	2651	3313	5301	6627	11928	-	.1055
8	PUSH	2011	3016	4021	5027	6283	10053	12566	22619	-	.188
	PULL 1-3/4	1914	2872	3829	4786	5982	9572	11965	21537	-	.188
10	PUSH	3142	4712	6283	7854	9818	15708	19635	35343	-	.294
	PULL 2	3016	4524	6032	7540	9425	15080	18850	33929	-	.294
	PULL 2-1/4	2983	4474	5965	7456	9320	14913	18641	33554	-	.294
12	PUSH	4524	6786	9048	11310	14138	22620	28275	50895	-	.423
	PULL 2-1/2	4328	6491	8655	10819	13524	21638	27048	48686	-	.423
	PULL 2-3/4	4286	6430	8573	10716	13395	21432	26790	48222	-	.423
14	PUSH	6158	9236	12315	15394	19243	30788	38485	69273	-	.575
	PULL 2-3/4	5920	8880	11840	14800	18500	29600	37000	66600	-	.575
	PULL 3	5875	8812	11750	14687	18359	29374	36718	66092	-	.575

\* = "Free Air" is normal atmospheric air (sea level) at compressor location. These figures are used in determining size of compressor required. Piston travel in double acting cylinders is twice the stroke. Free Air consumption at other line pressures will vary accordingly.

**TIE ROD (OR SOCKET HEAD CAP SCREWS ON CLASS M) TORQUE VALUES**

CYLINDER DIAMETER	TIE ROD		CLASS 1-2	CLASS M
	DIA. THD.	QTY.	TORQUE (FT. LB.)	TORQUE (FT. LB.)
1.50"	5/16-24 NF	4	7	14
2.00"	5/16-24 NF	4	7	14
2.50"	5/16-24 NF	4	7	14
3.00"	3/8-24 NF	4	14	20
4.00"	3/8-24 NF	4	14	20
5.00"	3/8-24 NF	6	14	20
6.00"	3/8-24 NF	6	14	20
8.00"	1/2-20 NF	6	40	70
10.00"	3/4-16 NF	8	100	200
12.00"	3/4-16 NF	8	100	200
14.00"	7/8-14 NF	8	170	300

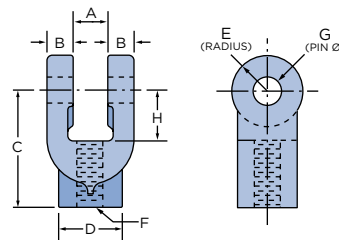
## STANDARD MOUNTING BRACKET AND PIN



**Mounting Brackets** of high grade malleable iron or steel plate stock are designed to fit the blank end of Model E cylinders or into the slot of the clevises described below. Order by size and part number.

CYL. DIA.	A	B	C	D	E	F	G	BRACKET		MTG. PIN "H"	PIN	
								FORMER P/N	CURRENT P/N		FORMER P/N	CURRENT P/N
1-1/2	7/16	1-3/4	2-3/4	13/32	1/2	3/8	1-3/16	1430CY	1801L00	3/8	3253CY-1	3221L46-1
2	7/16	2	3-1/4	17/32	5/8	1/2	1-3/8	1630CY	1802L46	1/2	3253CY-3	3221L46-3
2-1/2	7/16	2	3-1/4	17/32	5/8	1/2	1-3/8	1630CY	1802L46	1/2	3253CY-3	3221L46-3
3	7/16	2	3-1/4	17/32	5/8	1/2	1-3/8	1630CY	1802L46	1/2	3253CY-3	3221L46-3
4	5/8	3-1/4	4-1/2	17/32	7/8	1/2	1-3/4	1796CY	1803L46	3/4	3253CY-4	3221L46-4
5	5/8	3-1/4	4-1/2	17/32	7/8	1/2	1-3/4	1796CY	1803L46	3/4	3253CY-4	3221L46-4
6	7/8	4-1/4	5-1/2	17/32	1-1/8	5/8	2	1797CY	1804L06	7/8	3253CY-5	3221L46-5
8	1	5	6-1/2	21/32	1-1/4	3/4	2-1/2	1798CY	1805L07	1	3253CY-6	3221L46-6
10	1-1/4	6	8	25/32	1-1/2	1	3	1799CY	1806L08	1-1/4	3253CY-7	3221L46-7
12	1-3/4	6-3/4	10	1-1/16	2	1-1/4	3-1/2	1800CY	1807L09	1-1/2	3253CY-8	3221L46-8
14	2-1/4	8	10-1/2	1-5/16	2-1/8	1-1/2	3-3/4	2958CY	1767L46	1-3/4	3253CY-9	3221L46-9

## STANDARD FEMALE CLEVIS AND PIN



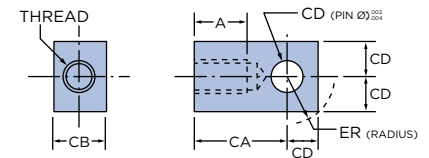
**Clevises** of high grade malleable iron are available for all standard model and size Class 1 and 2 cylinders. Clevises for any diameter cylinder are threaded for that particular standard 1 rod end. Class 1 and 2 cylinders with oversize rod and Class M cylinders will therefore require a larger clevis unless the rod end is turned down. Be sure to specify when ordering. Special clevises available made to order.

CYL. DIA.*	THREAD "F"■	A	B	C	D	E	G	H	CLEVIS		MTG. PIN "G"	PIN	
									FORMER P/N	CURRENT P/N		FORMER P/N	CURRENT P/N
1-1/2	5/8-18	17/32	3/8	1-5/8	1	1/2	1/2	3/4	4330CY	1787L46	1/2	3253CY-3	3221L46-3
2	5/8-18	17/32	3/8	1-5/8	1	1/2	1/2	3/4	4330CY	1787L46	1/2	3253CY-3	3221L46-3
2-1/2	3/4-16	17/32	1/2	2	1-1/4	5/8	1/2	7/8	4331CY	1788L46	1/2	3253CY-3	3221L46-3
3	3/4-16	17/32	1/2	2	1-1/4	5/8	1/2	7/8	4331CY	1788L46	1/2	3253CY-3	3221L46-3
4	1-14	25/32	3/4	2-5/8	1-1/2	3/4	3/4	1-1/8	4332CY	1789L46	3/4	3253CY-4	3221L46-4
5	1-14	25/32	3/4	2-5/8	1-1/2	3/4	3/4	1-1/8	4332CY	1789L46	3/4	3253CY-4	3221L46-4
6	1-1/4-12	1-1/32	15/16	3-1/4	1-3/4	1-1/8	7/8	1-3/8	4333CY	1790L06	7/8	3253CY-5	3221L46-5
8	1-3/4-12	1-9/32	1	3-3/4	2-1/2	1-1/4	1	1-1/2	16989CY	1791L07	1	3253CY-6	3221L46-6
10	2-12	1-17/32	1-1/4	4-3/4	3	1-1/2	1-1/4	1-3/4	1373CY	1792L08	1-1/4	3253CY-7	3221L46-7
12	2-1/2-12	2-1/32	1-1/2	5-7/8	3-1/2	1-3/4	1-1/2	2-1/8	1374CY	1793L46	1-1/2	3253CY-8	3221L46-8
14▲	2-1/2-12	2-1/32	1-1/2	5-7/8	3-1/2	1-3/4	1-1/2	2-1/8	1374CY	1793L46	1-1/2	3253CY-8	3221L46-8

- \* = Indicates Class 1 and 2 cylinder diameter with Standard 1 NF rod end which clevis will fit.
- = 1-1/2-12 thread clevis 7286L07 (4334CY) available. Dimensions on 1791L07 (18510CY) apply.
- ▲ = For 5 Rod only on 14" diameter.

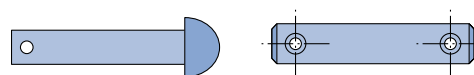
## STANDARD ROD EYE AND PIN

THREAD	A	CA	CB	CD	ER	ROD EYE		PIN	
						FORMER P/N	CURRENT P/N	FORMER P/N	CURRENT P/N
5/8-18	7/8	1-5/8	1	1/2	3/4	21789CY	1811L59	3253CY-3	3221L46-3
3/4-16	1-1/8	2-1/16	1-1/4	3/4	1-1/16	7061CY	1812L59	3253CY-4	3221L46-4
1-14	1-5/8	2-13/16	1-1/2	1	1-7/16	7062CY	1813L59	3253CY-6	3221L46-6
1-1/4-12	2	3-7/16	2	1-3/8	2	7063CY	1814L59	3253CY-4	3221L46-4
1-3/4-12	2-1/4	4	2-1/2	1-3/4	2-1/16	21790CY	1816L59	3253CY-9	3221L46-9
2-12	3	5	2-1/2	2	2-1/4	23464CY	1819L59	3253CY-11	3221L46-11
2-1/2-12	3-1/2	6-1/8	3	3	3-1/4	23465CY	1823L59	3253CY-7	3221L46-7

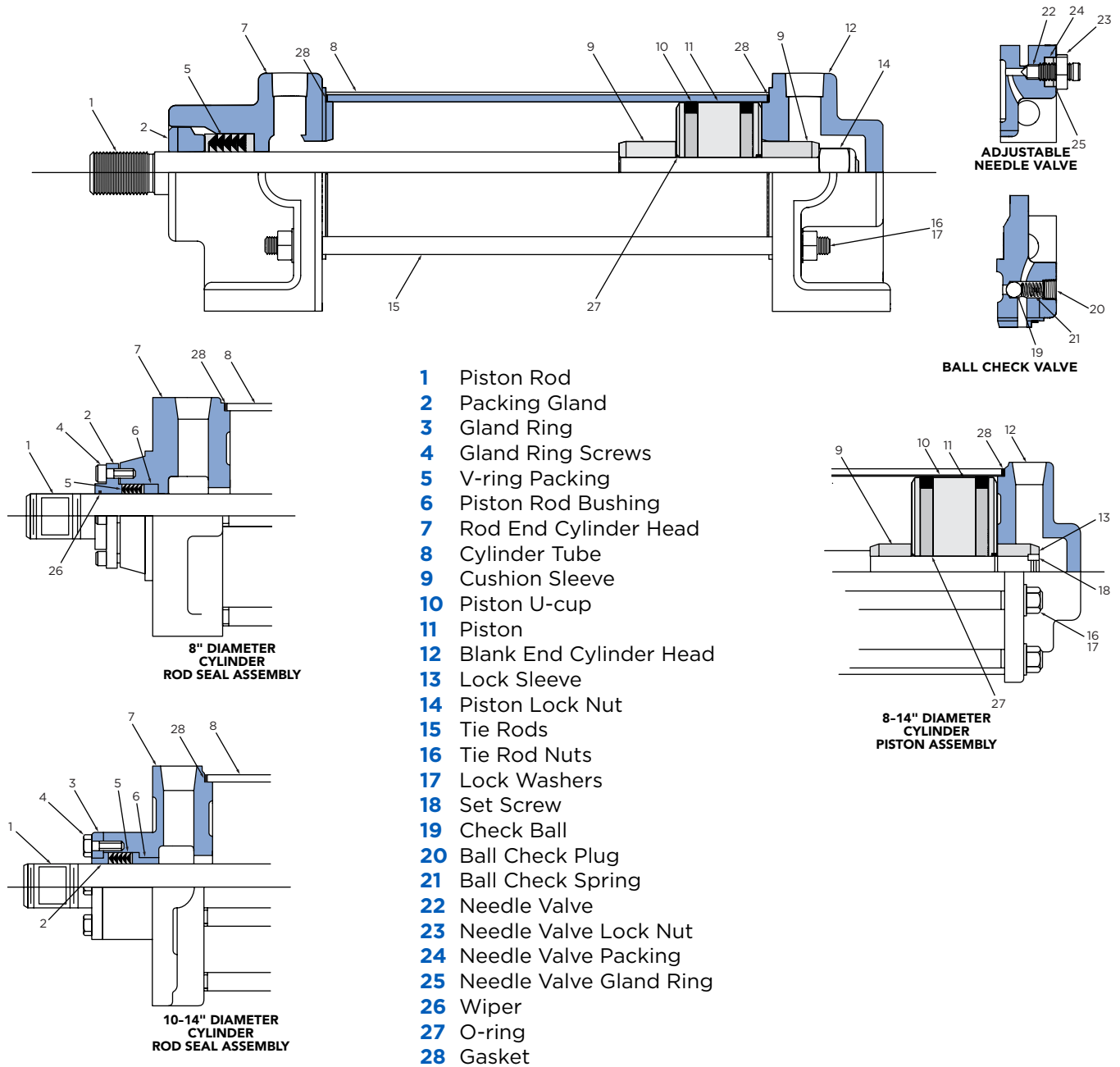


**Rod eyes** of mild steel are available for all standard model and size Class 1 and Class 2 cylinders with 1 rod ends. Other sizes of rod eyes are also available. Pins for rod eye, are not furnished unless requested.

## TYPICAL PIN STYLES



**REPLACEMENT PARTS**



- 1** Piston Rod
- 2** Packing Gland
- 3** Gland Ring
- 4** Gland Ring Screws
- 5** V-ring Packing
- 6** Piston Rod Bushing
- 7** Rod End Cylinder Head
- 8** Cylinder Tube
- 9** Cushion Sleeve
- 10** Piston U-cup
- 11** Piston
- 12** Blank End Cylinder Head
- 13** Lock Sleeve
- 14** Piston Lock Nut
- 15** Tie Rods
- 16** Tie Rod Nuts
- 17** Lock Washers
- 18** Set Screw
- 19** Check Ball
- 20** Ball Check Plug
- 21** Ball Check Spring
- 22** Needle Valve
- 23** Needle Valve Lock Nut
- 24** Needle Valve Packing
- 25** Needle Valve Gland Ring
- 26** Wiper
- 27** O-ring
- 28** Gasket

**HOW TO ORDER**

**When using this parts list for replacements, be sure to identify:**

- 1. Part by name and item number.
- 2. Diameter of cylinder.
- 3. Model of cylinder.
- 4. Serial number on NOPAK cylinder label.



# REED PROXIMITY SWITCH

## AIR CYLINDER APPLICATIONS



cause the reeds to flex and contact each other. When the magnetic field is removed, they will again spring apart to their normal positions.

The cylinder/Reed Switch combination operates by using a magnetic band on the cylinder piston, which closes the externally mounted reed switch, as it approaches. When the piston moves away again the switch opens.

Proper application of this versatile Reed Switch can offer millions of cycles of trouble-free operation.

### 3 AMP REED SWITCH SPECIFICATIONS

Circuit - Normally open - SPST (Form A)

VA (Max) - 360

Switching voltage - 65-120 VAC (50/60 Hz)

Current (Break) - 3.0 Amp

Leakage - 1.7 mA

Response Time - 15 ms On, 0.83 ms Off

Switch Burden Current - 5 mA

**Note:** All incandescent loads derate switch capacity to 10% due to inrush current.

Moisture and dust proof (no NEMA rating)

### SHOCK RATING

The basic switch can withstand up to 60 G maximum in the direction of contact closure without misfire or malfunction.

### VIBRATION SENSITIVITY

Switch will withstand amplitude of 30 G at frequencies up to 6000 Hz without misfire. False operation can occur at vibration frequency levels higher than 6000 Hz.

### OPERATING TEMPERATURE

-40°F to +170°F for standard cable.

### CABLE SPECIFICATION

The conductors are tinned copper with polyethylene insulation, conductors are cabled with a rayon braid, a tinned copper braided shield and a chrome vinyl jacket that is resistant to hydraulic fluids.

## LONG LIFE/HIGH PERFORMANCE

### FEATURES AND ADVANTAGES

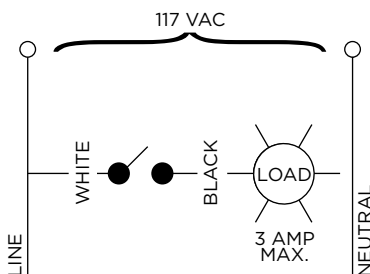
- Adjustable mounting allows switches to be located anywhere within range of piston travel.
- Several switches may be mounted to control or initiate any sequence function.
- No externally moving parts to wear or maintain.
- Suited for use in plant environments where dirt and contamination create difficulties for electromechanical and other types of controls.
- Neon Indicator Light provides convenient means for positioning and troubleshooting switch and circuits.
- Suitable for AC service only.

### WORKING PRINCIPLE

Basically the Reed Switch consists of two overlapping ferro magnetic blades (reeds). The reeds are hermetically sealed inside a glass tube leaving a small air gap between them.

Since the reeds are magnetic, they will assume opposite polarity and be attracted to each other when influenced by a magnetic field. Sufficient magnetic flux density will

### SWITCH WIRING SCHEMATIC



### CAUTION

**Do not connect switch without a load. Permanent damage to switch will result.**

**NOTE:** Switch is internally protected against failure due to normal electrical transient levels. However, it may be necessary to use additional transient protection if high levels exist.

### ORDER NUMBERS

For switch and bracket assembly complete or separate units.

**10990E00** For switch and bracket assembly

**10988E00** Part No. - Switch Unit

**3985E00** Part No. - Adjustable Bracket Unit