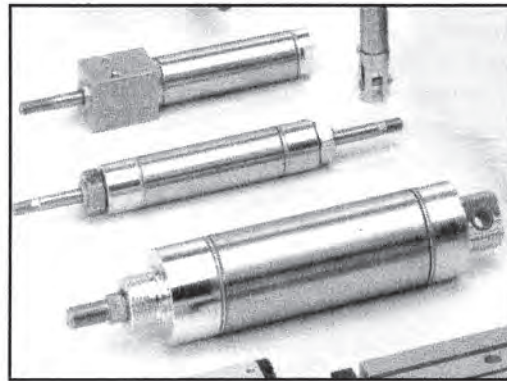
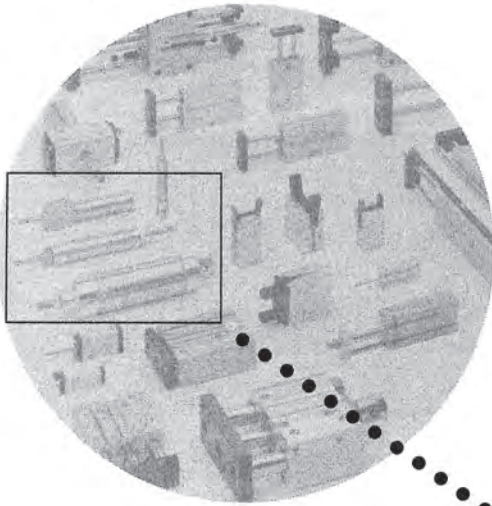


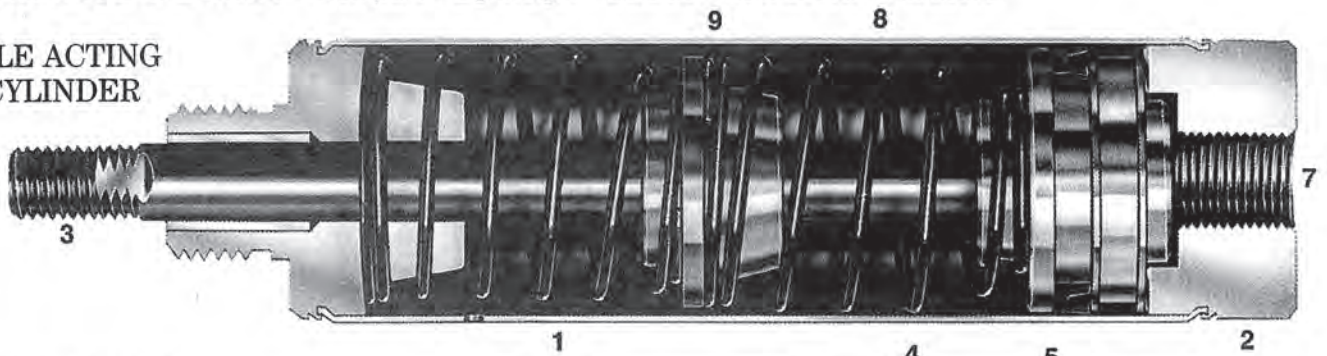
Stainless Steel Cylinders



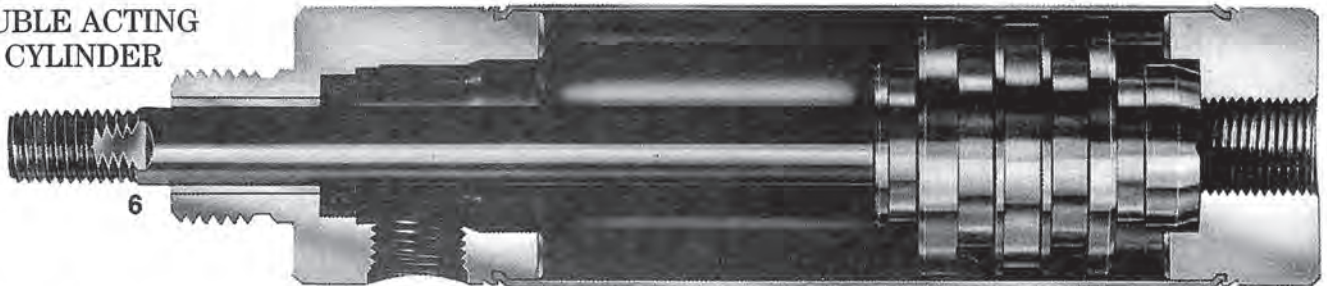
HUMPHREY AIR CYLINDERS

CONSTRUCTION • Compact • Lightweight • Durable • Economical • Attractive

SINGLE ACTING AIR CYLINDER



DOUBLE ACTING AIR CYLINDER



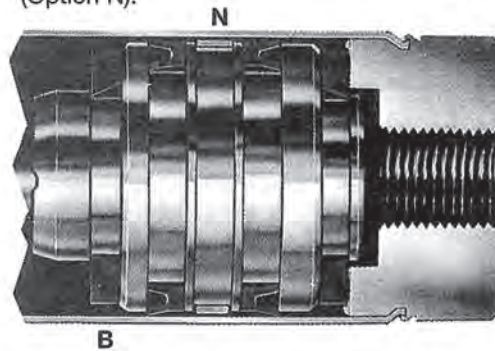
1. **BARREL** Stainless steel (Type 304). Drawn and polished I.D. provides ideal lube-holding, low friction surface. Matte finish on O.D. Barrel attached to heads by Humphrey roll-forming process.
2. **HEADS** Aluminum. Internal face grooved for positive air flow to piston seals.
3. **PISTON ROD** Accuracy stock, centerless ground and polished Type 303 Stainless Steel, standard all models.
Wrench Flats, standard most models, chamfered for easy wrench contact without rod damage.
Threads are Roll Formed for strength and durability.
4. **PISTON** Unique Humphrey Piston may be factory assembled in two different ways – same overall dimensions with or without Bumpers. Piston threads are Roll Formed for greater strength and durability.
5. **SEALS** Buna N standard on all models. Fluorocarbon (fluoroelastomer...Option F) available for high ambient temperatures; for extremely high cycling conditions with limited lubrication; or mild chemical resistance (air supply contaminants and/or lubricants). Seal design insures constant contact with cylinder barrel...eliminates seal collapse and blow-by.
6. **ROD BUSHING** Oil permeated bronze, ball-sized to close tolerance...provides rod support and smooth, low friction rod movement for longer cylinder life.
7. **PRESSURE PORTS** Full, unrestricted porting for maximum air flow...combines with groove in Heads to provide fast cylinder response and smooth rod movement.
8. **RETURN SPRINGS** High tensile strength music wire. *Shotpeened*...to relieve stresses for longer life.
9. **SPACERS** Spacers insure a uniform spring rate and prohibit collapse of springs, providing maximum life.

ACCESSORIES Steel mounting nuts, mounting brackets, rod clevises, etc., are burnished and bright zinc plated.

Exclusive Humphrey Reversible Piston

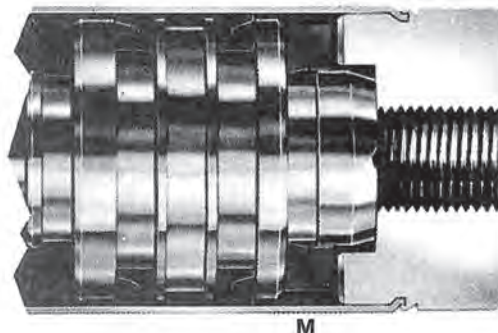
(Patented) shown with Bumpers (Option B) for shock absorption and quiet operation; and Wearstrip (Option N).

Reversible Piston permits addition of Bumpers without changing overall external cylinder dimensions.



Humphrey Reversible Piston

Shown with Option M (Internal Magnet) for use with sensors.



SPECIFICATIONS

HUMPHREY AIR CYLINDERS

- For Compressed Air to 200 PSIG, Hydraulic to 100 PSI (expect rod weep)
- Ambient temperature -40°F to 160°F as standard
 -20°F to 400°F with Viton seals
 -10°F to 250°F with ELF seals

Force (F) is determined by square inches of piston area (A), and pressure (P) in PSIG, $F = A \times P$

Volume (V) in *cubic inches* is determined by square inches of piston area (A), and length of stroke (L), $V = A \times L$

Speed is affected by many variables (including force to move load, cylinder volume, control valve flow capacity, length of supply lines, etc.)
 Piston area X inches of stroke – Cubic inches of volume making precise calculations difficult.



BASIC MODEL NO.	BORE SIZE I.D.	PORT SIZE IN.	ROD DIAMETER OR (HEX)	PISTON AREA SQ. IN. Cylinder Volume CU. IN. per 1 in. of stroke		SPRING FORCE IN POUNDS IF CYL. IS:	
				A	B LESS ROD	C NORMAL	C ACTUATED
8	1/2	10-32 UNF	.187 (.187)	.20	.17	1	2
7	3/4	1/8 NPSF	.250 (.250)	.44	.39	1 1/2	5
6	1 1/16	1/8 NPSF	.312 (.375)	.89	.81	4	8
25	1 1/4	1/8 NPSF	.437 (N.A.)	1.23	1.08	7	14
5	1 1/2	1/8 NPSF	.437 (.437)	1.77	1.62	6	12
75	1 3/4	1/4 NPSF	.500 (N.A.)	2.41	2.21	12	24
4	2	1/4 NPSF	.625 (N.A.)	3.14	2.84	15	30
3	2 1/2	1/4 NPSF	.625 (N.A.)	4.91	4.60	NA	NA

NOTE: For **Volume Chambers** please refer to page 162.
 For **Special Rod Ends** please refer to pages 163–185.

HOW TO ORDER

BORE SIZES AVAILABLE BY MODEL

TYPE	DESCRIPTION	BORE SIZES AVAILABLE								RECOMMENDED MAXIMUM STROKE IN.	COMMENTS
		8 1/2 in.	7 3/4 in.	6 1 1/16 in.	25 1 1/4 in.	5 1 1/2 in.	75 1 3/4 in.	4 2 in.	3 2 1/2 in.		
S	Single Acting Nose Mount	•	•	•	•	•	•	•	•	6	All models Specify stroke in 1/8 inch increments as standard. Stroke tolerance ±1/32 in. Longer than standard stroke lengths are avail- able, consult factory. When specifying longer than standard strokes consider possible rod deflection, adequate lubrication, high speed friction, etc. No war- ranty applies.
SP	Single Acting Pivot Mount	•	•	•	•	•	•	•	•	6	
SH	Single Acting Nose Mount/Hex Rod	•	•	•		•				6	
SHP	Single Acting Pivot Mount/Hex Rod	•	•	•		•				6	
SR	Single Acting Reverse/Nose Mount	•	•	•	•	•	•	•		4	
SRP	Single Acting Reverse/Pivot Mount	•	•	•	•	•	•	•		4	
D	Double Acting Nose Mount	•	•	•	•	•	•	•	•	12	
DP	Double Acting Pivot/Double-End Mount	•	•	•	•	•	•	•	•	12	
D2EY	Double Acting Double End Rod	•	•	•	•	•	•	•	•	12	
BFS	Single Acting Block Front Mount	•	•	•		•				6	
BFSR	Single Acting Reverse/Block Front Mount	•	•	•		•				4	
BFD	Double Acting Block Front Mount	•	•	•		•				12	

OPTIONS AVAILABLE BY MODEL

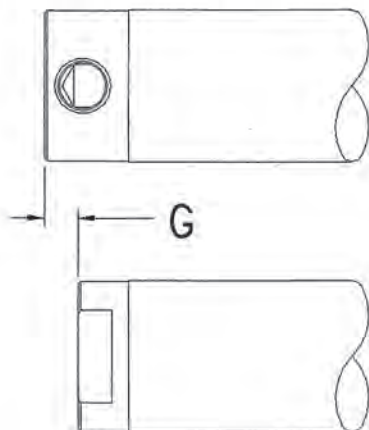
TYPE	DESCRIPTION	OPTIONS AVAILABLE													
		A	B	E	F	J	K	L	M	N	P	R	T	W	U
S	Single Acting Nose Mount	•	•	•	•						•				
SP	Single Acting Pivot Mount		•	•	•						•		•		•
SH	Single Acting Nose Mount/Hex Rod	•	•	•	•						•				
SHP	Single Acting Pivot Mount/Hex Rod		•	•	•						•		•		•
SR	Single Acting Reverse/Nose Mount	•	•	•	•	•	•	•	•	•	•			•	
SRP	Single Acting Reverse/Pivot Mount		•	•	•	•	•	•	•	•	•	•	•	•	•
D	Double Acting Nose Mount	•	•	•	•	•	•	•	•	•	•			•	
DP	Double Acting Pivot/Double-End Mount		•	•	•	•	•	•	•	•	•	•	•	•	•
D2EY	Double Acting Double End Rod			•	•	•	•	•	•	•	•			•	
BFS	Single Acting Block Front Mount	•	•	•	•	•	•	•	•		•				
BFSR	Single Acting Reverse/Block Front Mount	•	•	•	•	•	•	•	•		•	•			
BFD	Double Acting Block Front Mount	•	•	•	•	•	•	•	•	•	•				

HOW TO ORDER OPTIONS

OPTIONS	DESCRIPTION
A	SIDE PORTED REAR HEAD Locates rear port on side of body on double or single acting models. (See below.)
B	BUMPER Reduce mechanical noise. Absorb Shock. Negligible stroke change due to compression set. Buna N standard (Fluoroelastomer Bumpers standard when Option B is ordered with Option F). Single Acting Models—one bumper opposite spring side of piston. Double Acting Models—one bumper on both sides of piston. Standard on type D2EY. Option B & M ordered together—one bumper on rod end, magnet on head end of piston, also add 1/8 inch to desired stroke.
E	LOW FRICTION SEALS For low breakaway or low pressure applications.
F	FLUOROCARBON SEALS (Fluoroelastomer) For ambient temperatures of -20°F to 400°F (also consider heat generated by friction in high speed applications). For mild resistance to air line and ambient contaminants, fumes, compressor varnish, fire resistant lubricants, etc.
J	ROTATE FRONT HEAD 90 Front head is rotated 90 degrees clockwise from rear port, viewed from rod end.
K	ROTATE FRONT HEAD 180 Front head is rotated 180 degrees clockwise from rear port, viewed from rod end.
L	ROTATE FRONT HEAD 270 Front head is rotated 270 degrees clockwise from rear port, viewed from rod end.
M	INTERNAL MAGNET For use with Humphrey Sensors. Available for Type D, DP, and BFD. (D2EY only models 7, 6, 25, 5). Option B (Bumpers) with Option M cylinders add 1/8 inch to desired stroke.
N	WEARSTRIP Protects piston and barrel from wear due to minor rod deflection. Standard on: Type D, DP, and BFD with 5 inches or more of stroke; Type SR and SRP with 3 inches or more of stroke. Not available on Model 8.
P	POLYPAK ROD SEALS provides excellent rod sealing capabilities at low pressures.
R	ROTATED REAR PIVOT TANG Rotation of rear pivot tang 90 degrees. Port remains in original position.
T	PIVOT PIN IN REAR TANG Pivot pin pressed into rear tang. No bracket available. Not available in Model 4 and 3.
W	ROD WIPER Provides a wiping action to remove most foreign material from exposed rod while maintaining adequate lubricating film. Protect rod and primary rod seal. Available on all Type D, DP, SR and D2EY models. Not available on Model 8.
U	REAR PIVOT BUSHING Bushing in rear pivot hole. Hole diameter remains the same. Available on SR, SHP, SRP, DP Models 7, 65, 25 STD on Model 3 + 4. Note: Model 5 cylinders have no threads on tang and tang diameter is 1.0.

OPTION "A" DIMENSIONS

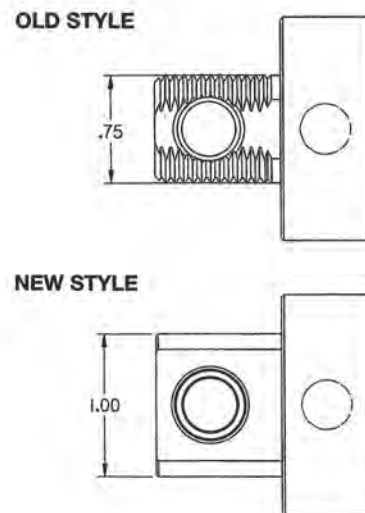
When ordering option "A," add dimension "G" to dimension "M" for overall length. ("M" dimension found on desired cylinder specification page).



MODEL	G
8	.19
7	.44
6	.25
25	.31
5	.19
75	.56
4	.37
3	.37

OPTION "U" ON MODEL 5 CHANGED

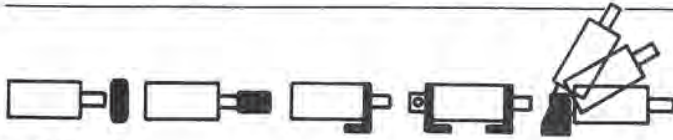
There are 2 differences between the old and new model 5 U-option: 1) Old style had threads on pivot tang, while the new style does not; 2) The tang diameter was 3/4", now the tang diameter is 1.0"



GENERAL INFORMATION

Air cylinders have an excellent ability to provide fast response and rapid movement from the energy of compressed air. Rapid indexing, stamping, punching, part

location, etc., are ideally suited to air cylinders. Applications requiring slow or precise movement are more difficult to satisfy due to the compressibility of air.



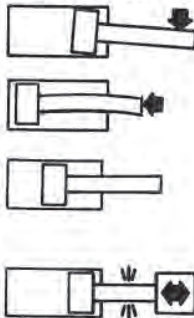
MOUNTING

Mount to centerline of work to avoid side load on rod. Mount securely, without over-torquing mounting nuts. Check frequently for loose mountings. A secure mount, accurately placed, promotes cylinder performance and endurance.

Side load on rod should be eliminated. Severe side load or stress can cause rod breakage, excessive bushing wear, and scoring of piston/barrel. Consider Option N (Wearstrip).

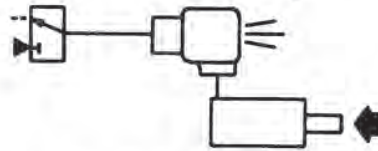
Reduce adverse effect of side load by attaching a universal rod eye to the piston rod. Also, consider utilizing only part of total stroke ... keep piston "back" in barrel for greater column strength.

Avoid "bottoming-out" piston on cylinder heads at high pressures. Consider Option B (Bumper).



LUBRICATION

All models are factory prelubricated for optimum life and performance. Periodically lubricate internally with a non-detergent mineral-base oil. Automatic air line lubricators are most commonly used. To solve lubrication problems due to lubricant backflow during control valve exhaust cycle... install a quick exhaust valve directly to the cylinder port. This stops backflow and allows progressive flow of oil to cylinder.



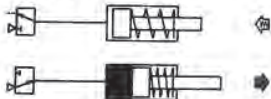
Avoid using higher pressure than is actually required. Nominal air pressure provides optimum cylinder life, reduces use and cost of compressed air, and saves energy.

AIR CYLINDER APPLICATION FACTORS

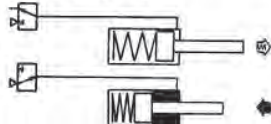
Symbols of typical control valves are shown left of cylinders.

Single acting types

Spring returned



Spring extended



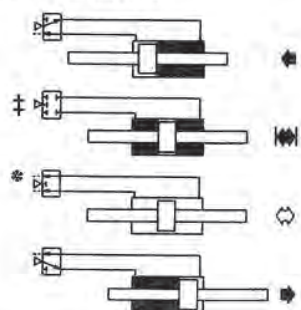
- Spring returned: Air pressure produces force in one "pushing" direction only, causing rod to extend.
- Spring extended: Air pressure produces force in one "pulling" direction only, causing rod to retract.
- Spring returns rod to "normal" position in one quick motion, determined by control valve's flow capability and cylinder volume. Flow control (metering) of exhausting air during return stroke does not provide optimum smoothness of movement (consider Double Acting models for smoothest movement).
- Only one 3-way valve is required...less expensive than valving for double acting cylinders.
- Consider when compressed air supply is limited or must be conserved.
- Mount to insure that Vent in side of barrel can "breathe" freely.

Double acting types

Double acting



Double-end rod



- Air pressure produces force in either "pushing" or "pulling" direction. *Pushing* force is greater than *pulling* force due to smaller effective piston area on rod side of piston.
- Flow control (metering) of exhausting air can be performed in either direction. Air *exhausts* from the cylinder port opposite the port being pressurized. For smoothest movement, meter the *exhausting* air. Metering of the incoming pressure may produce erratic, "jumpy" cylinder action.
- "Closed" system...no Vent (breather hole) to consider; see above. Consider, when cylinder must operate in dirty ambient conditions.

- Air pressure produces equal force in both "pushing" and "pulling" directions due to equal piston area. Pressurizing both sides "locks" cylinder position at any given point. ‡
- Fixed mounting of both rod ends allows movement of barrel only ... barrel moves back and forth; rods are stationary. Caution: Do not side load rod (barrel weight, alignment, etc.).
- One rod can be used to perform a work function, second rod...
 - Permits operation of limit switches away from work function.
 - Permits attachment of guiding methods to eliminate rod rotation (alternate to hex rod).
 - Provides additional support to guard against rod deflection.

* Allows cylinder to be manually positioned or ‡ locked in position.