

Pneumatic Actuators & Positioners / Mobile Type Air Cylinders



The Drive & Control Company



Section 1: SC-900 Pneumatic Actuators & Positioners

Single Direction Actuator Positioners

Two Direction Actuator Positioners

Section 2: SC-1000 Mobile Type Air Cylinders

Construction Grade (Cast Iron) Air Cylinders

Multi-Position Air Cylinders

Transmission Control Systems

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The products in this catalog are most often used in mobile, marine and oilfield applications. We manufacture many other standard products that are most often used in industrial applications. Visit the Pneumatics section of our web site at www.boschrexroth-us.com for details.

Section 1 (SC-900) Actuators and Positioners

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Single Directions Positioners

3 1/2 thru 36 lb. Thrust ratings - Fixed Strokes
Spring Controlled - Linear & Radial Motion Types
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Two Direction Positioners

1 3/4" & 3 1/4" bore sizes - Various Strokes
Spring Centered - Linear Motion
7 thru 25 lb. thrust ratings

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Actuators and Positioners

Overview



Rexroth Actuator Positioners are compact, pneumatically operated devices used for accurate positioning of engine governor control arms, butterfly valves, carburetors and other low-force mechanisms.

to act on a diaphragm or piston to compress a positioning spring. The actuator lever then assumes a specific position which corresponds to the applied pressure and to the control valve handle position.

Rexroth offers three types of positioners: diaphragm-with radial motion lever, diaphragm-linear, and cylinder-linear. All three models use the same basic principle of applying a predetermined air pressure (supplied by a Rexroth Type "H" Controlair® Valve or Type M PLUS™ proportional pressure control valve)

Our Actuator Positioners feature light-weight, strong, die-cast construction with a minimum of connections. Years of performance in heavy construction vehicles, drill rigs, marine applications, and other types of installations have proven them to be rugged and highly dependable.

STANDARD SPECIFICATIONS

MATERIALS

A-2-H—Die-cast aluminum utilizing close-fitting bearings with grease fittings.

AA TYPE—Cast aluminum utilizing close-fitting bearings with grease fittings.

"C" TYPE (small) Die-cast aluminum with chrome-plated piston rod.

"C" TYPE (large) Cast iron with chrome-plated piston rod.

"E" TYPE—Formed steel and cast aluminum with chrome-plated piston rod.

TWO DIRECTION POSITIONER—Die-cast aluminum with chrome-plated piston rod.

All positioners have long wearing synthetic rubber parts such as diaphragms and piston seals.

TEMPERATURE

All Models..... -40° F to 165° F

MEDIA

Air and inert gasses
(Consult factory for other uses)

PORTS

All models except Large 2D Positioner... 1/4 - 18 NPTF
(Large 2D Positioner 3/8 - 18 NPT)

Compact, versatile actuators where fast response, accurate positioning and durability are needed.

PRESSURES	
Maximum Supply Pressure 100 psig	
Model	†Operating Pressure (PSIG)
A-2-H	3-15 10-60 15-80 35-90
AA Type	10-60
"C" Type	10-60
"E" Type	10-60 10-90
2 Direction	10-60 10-90

† Control valve output pressure should match the positioner pressures.

FORCE RATING OUTPUT CHART

Strokes shown should be fully utilized.

A-2-H.....	§410 inch-lb. degrees or 3 1/2 lbs. through 2"
C-Linear (small).....	§650 inch-lb. degrees or 7 lbs. through 1 1/2"
C-Linear (long).....	§650 inch-lb. degrees or 7 lbs. through 3"
AA-AB-BA-1.....	§1125 inch-lb. degrees or 10 lbs. through 2"
C-Linear (large).....	§1400 inch-lbs. degrees or 15 lbs. through 1 1/2"
12E.....	§4500 inch-lb. degrees or 36 lbs. through 2"

SPRING CENTERED POSITIONER (based on total travel)

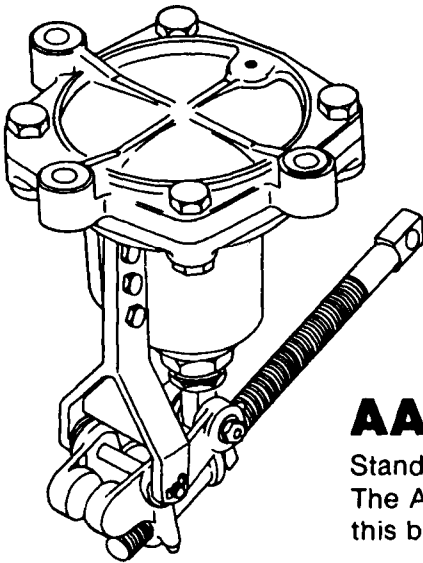
P-058822-00500.....	§410 inch-lb. degrees or 7 lbs. through 1"
P-059833-01000.....	§820 inch-lb. degrees or 7 lbs. through 2"
P-064076-01000.....	§820 inch-lb. degrees or 7 lbs. through 2"

§ The force rating of the controlled device is found by multiplying the force required in pounds to move the lever, times the length of the lever in inches, times the total number of degrees of travel of the lever. Compare your results to the above chart force ratings and select the nearest rating. If your rating is between two of the ratings above always go to the next highest rating.

Type AA Actuators

Diaphragm-lever type

Rexroth
Bosch Group



The AA Type are the most powerful of the diaphragm-lever type positioners, with a force rating of 1125 inch-lb-degrees. The AA Types are made in both Single (AA-1 and BA-1) and Two-Direction (AB-1) models. The AA Type are all easily mounted and take up a moderate amount of space.

Output Travel adjustable from 7/8" to 2 1/4"

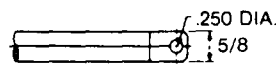
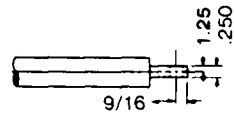
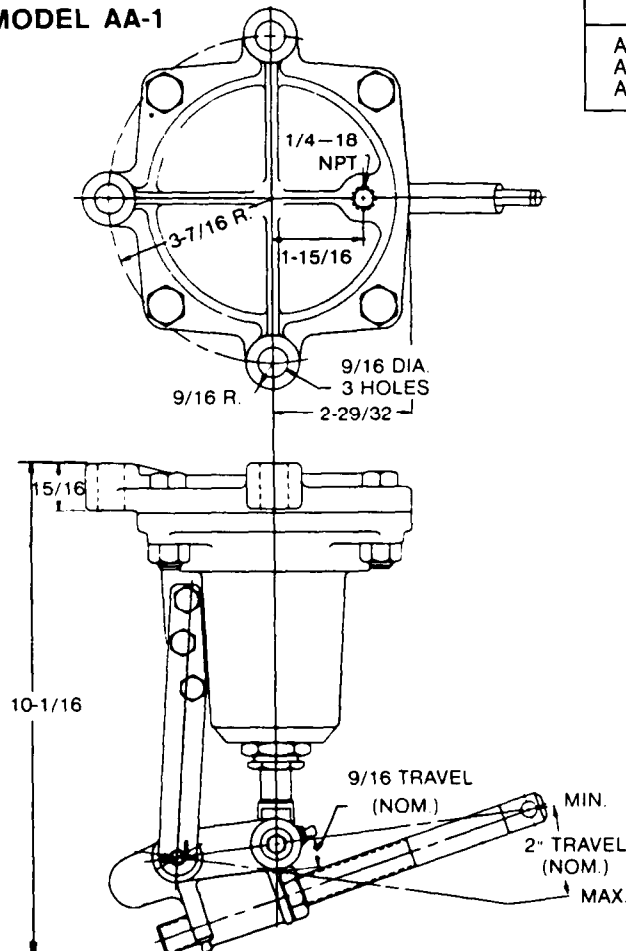
AA-1

Standard **Single Direction** Positioner.
The AB-1 and BA-1 are constructed from this basic model.

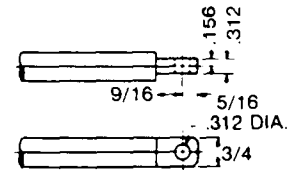
ORDERING INFORMATION

Designation	Piece No.	Pressure Range psi	Weight
AA-1 1/4" rod eye	P60263-0001	10-60	8.0
AA-1 5/8" rod eye	P60263-0002	10-60	8.5
AA-1 3/4" rod eye	P60263-0003	10-60	8.5

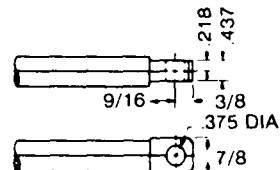
MODEL AA-1



ROD END "A"



ROD END "B"



ROD END "C"

Type AA Actuators

Diaphragm-lever type



AB-1

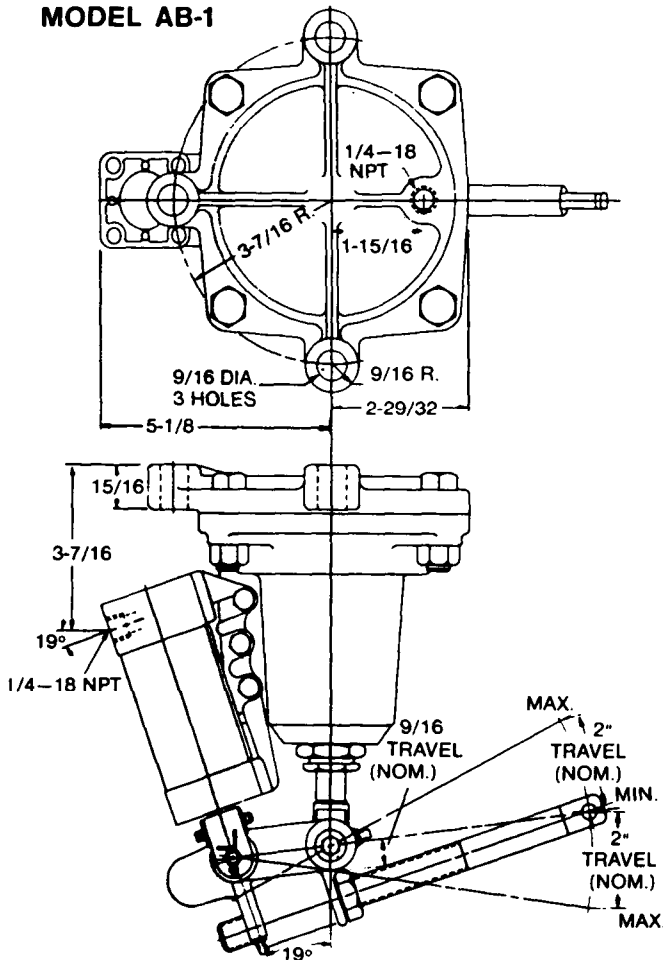
Basic AB Type Two-Direction Positioner is made from the basic AA Type and the addition of a separately controlled stop cylinder.

ORDERING INFORMATION			
Designation	Piece No.	Pressure Range psi	Weight
AB-1 1/4" rod eye	P60266-0001	10-60	11.5
AB-1 5/16" rod eye	P60266-0002	10-60	11.5
AB-1 3/8" rod eye	P60266-0003	10-60	11.5
BA-1 1/4" rod eye	P60269-0001	10-60	11.0
BA-1 5/16" rod eye	P60269-0002	10-60	11.0
BA-1 3/8" rod eye	P60269-0003	10-60	11.0

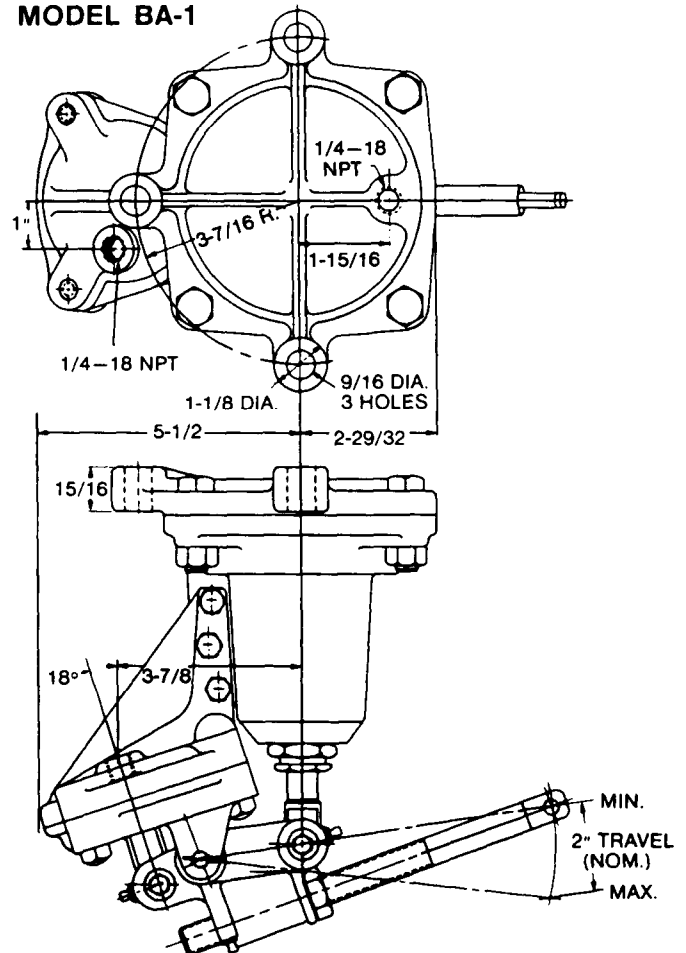
BA-1

Basic AA Type, **Single Direction** Positioner with a "vernier" feature added by the use of an additional diaphragm that is controlled separately. (An H-4 Controlair® Valve is a great combination.) This allows for exact positioning and very fine control.

MODEL AB-1



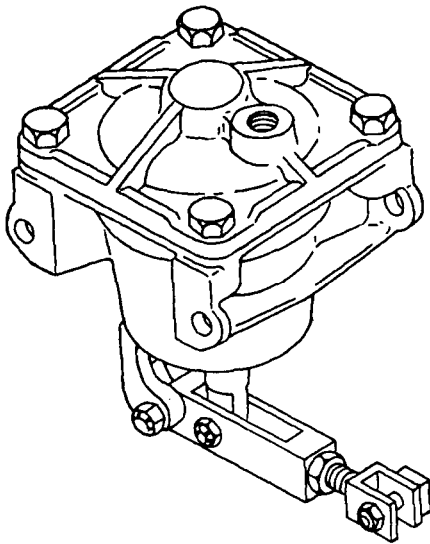
MODEL BA-1



A-2-H Actuators

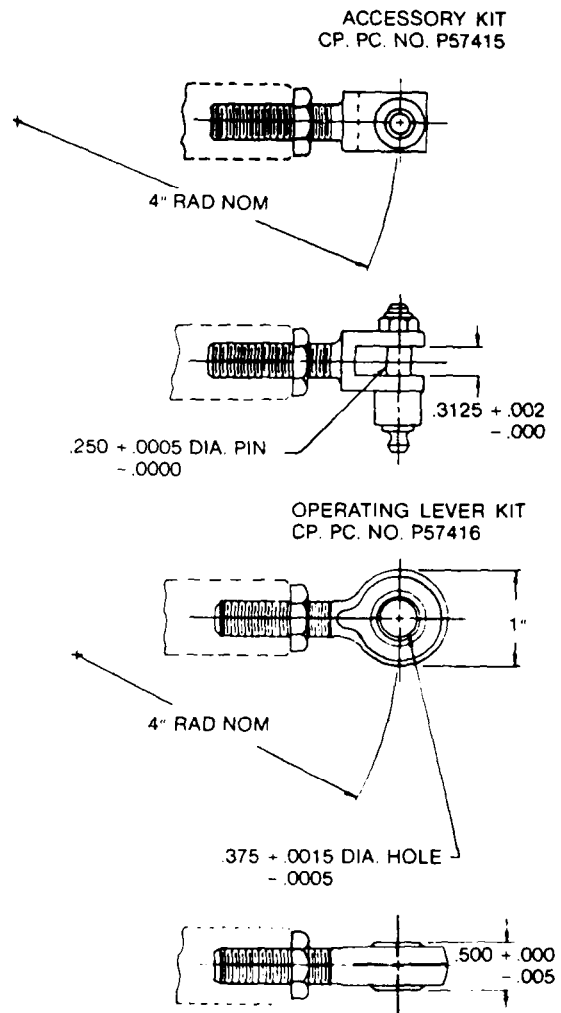
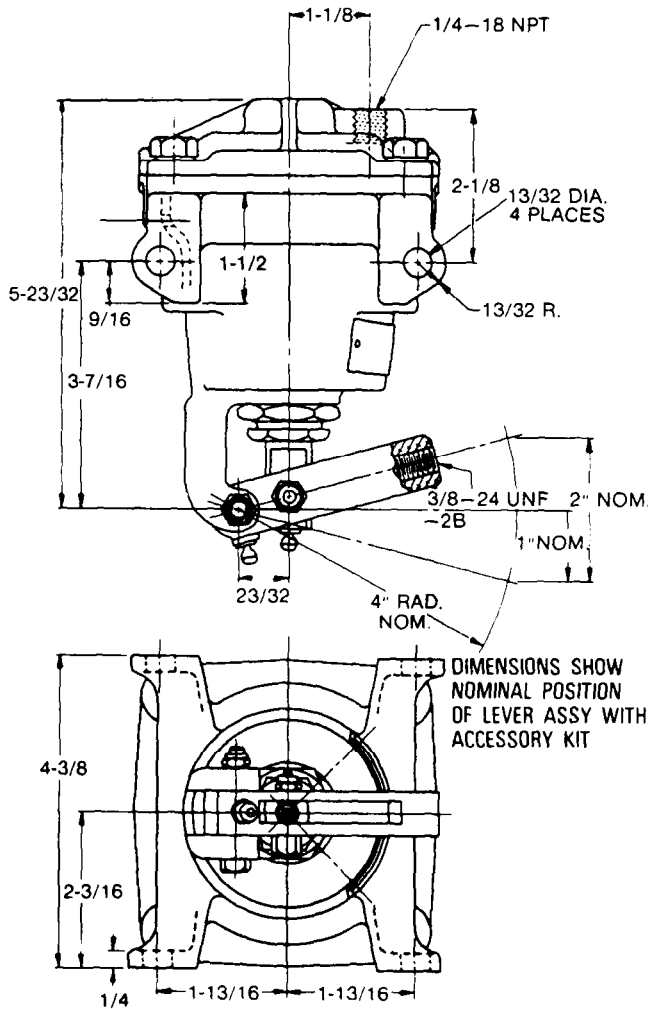
Diaphragm-lever type

Rexroth
Bosch Group



ORDERING INFORMATION				
Pressure Range (PSI)	Piece Number	Piece Number Less Accessories	Accessory Kit	Weight
3-15	P59718-0011	P59718-0010	P57415	3 lbs.
10-60	P57159-0011	P57159-0010	P57415	3 lbs.
10-60	P57159-0012	P57159-0010	P57416	3 lbs.
15-80	P58430-0011	P58430-0010	P57415	3 lbs.
35-90	P57086-0011	P57086-0010	P57415	3 lbs.

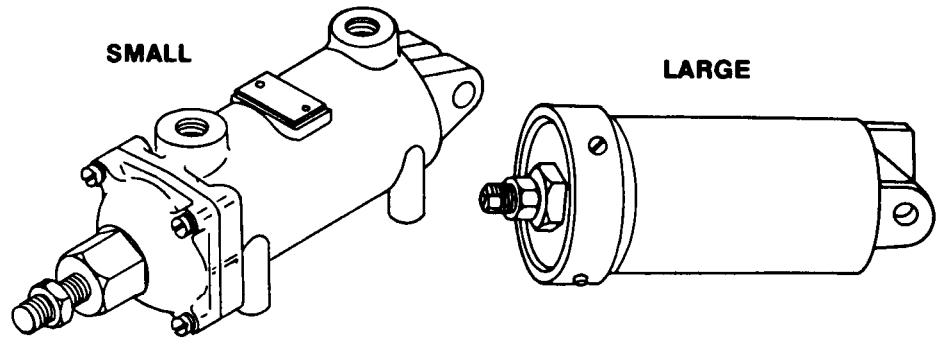
The A-2-H has the lowest power rating: 410 in-lb-degrees; this compares with the small "C" Type Linear Positioner of 650 in-lb-degrees, but has better accuracy due to the low-friction characteristics of its diaphragm operation. The A-2-H has a nominal stroke of 2" (adjustable from 1 7/8" to 2 1/4"). Integral mounting lugs make installation simple and clean.



Type "C" Linear Positioners

Linear piston type

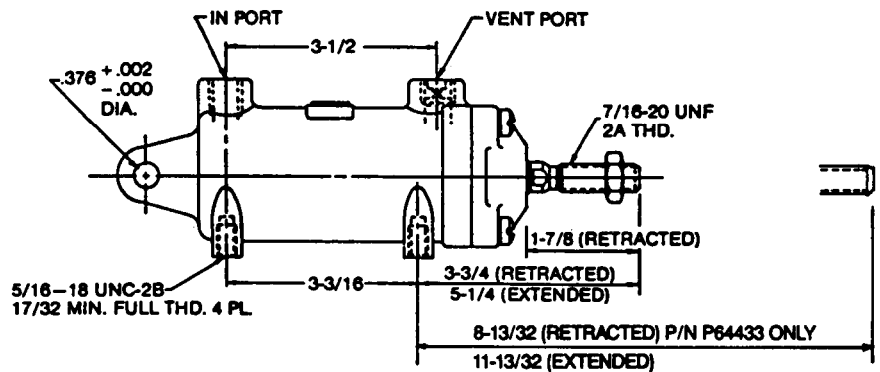
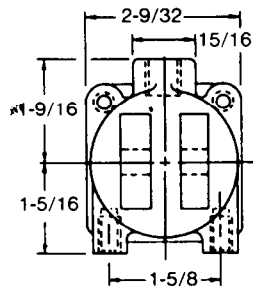
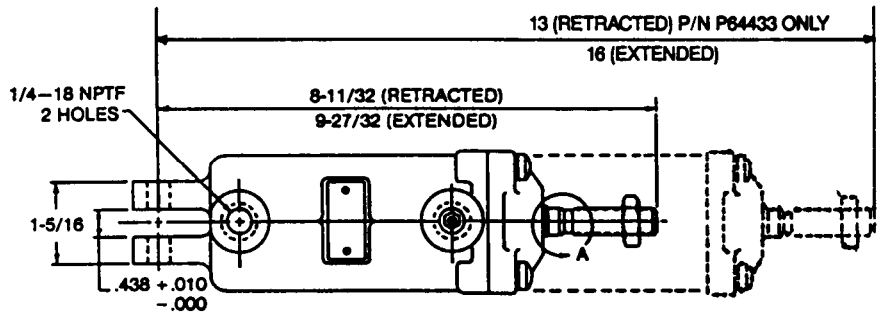
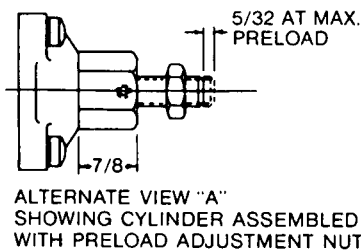
Rexroth
Bosch Group



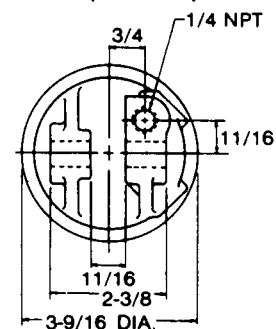
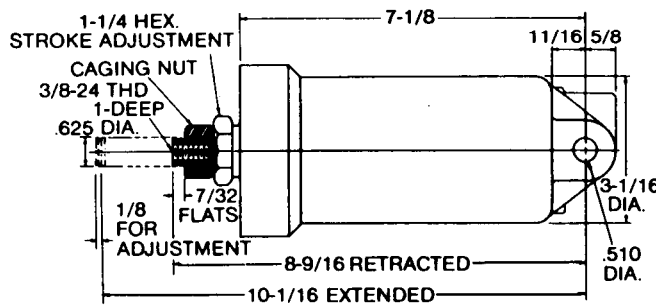
ORDERING INFORMATION				
Designation	Pressure Range (PSI)	Piece Number	Stroke	Weight
"C" Linear (small) with preload adj.	10-60	P59023-0001	1.5"	2.5 lbs.
"C" Linear (small)	10-60	P59023-0002	1.5"	2.5 lbs.
"C" Linear (large)	10-60	P55952	1.5"	9.0 lbs.
"C" Linear (long)	10-60	P64433	3"	3.0 lbs.

The "C" Type are the smallest and most economical of the positioners. They are linear piston type with force characteristics of 650 inch-lb-degrees and 1400 inch-lb-degrees. The "C" Type have integral female clevises for easy mounting.

"C" LINEAR (small) POSITIONER



"C" LINEAR (large) POSITIONER



Type "E" Linear Positioners

Linear diaphragm type

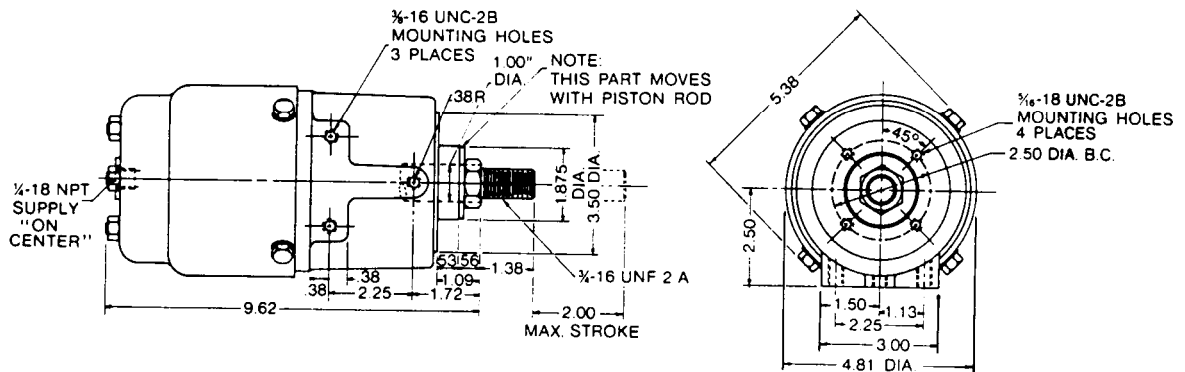


The "E" Type Diaphragm Linear Positioner is the most powerful of the diaphragm positioners. The diaphragms low friction and sensitive action, a relatively long stroke and the constant area of a cylinder enable the "E" Type to handle heavier force positioning applications with accuracy. They can be mounted using the 3-point mountings pad or integral rabbet style mounting holes in the head.

ORDERING INFORMATION			
DESIGNATION	OPERATING PRESSURE (psi)	PIECE NO.	WEIGHT
12E	10-60	P63910	14.4
12E	10-90	P63911	14.4

For service parts request
Bulletin B3-44.13

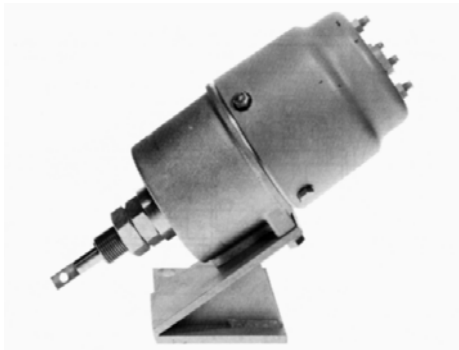
12E



12EC Governor Positioner

Linear diaphragm type

Rexroth
Bosch Group



(Part number P-067423-00000 shown)

APPLICATION—

For control of engine speed from Idle to Full by positioning governor control arm in response to pneumatic pressure signals from a remotely located control station. Suitable for use with most Diesel Engines, brackets and linkage adapted for Caterpillar Tractor D398 and D399.

FEATURES—

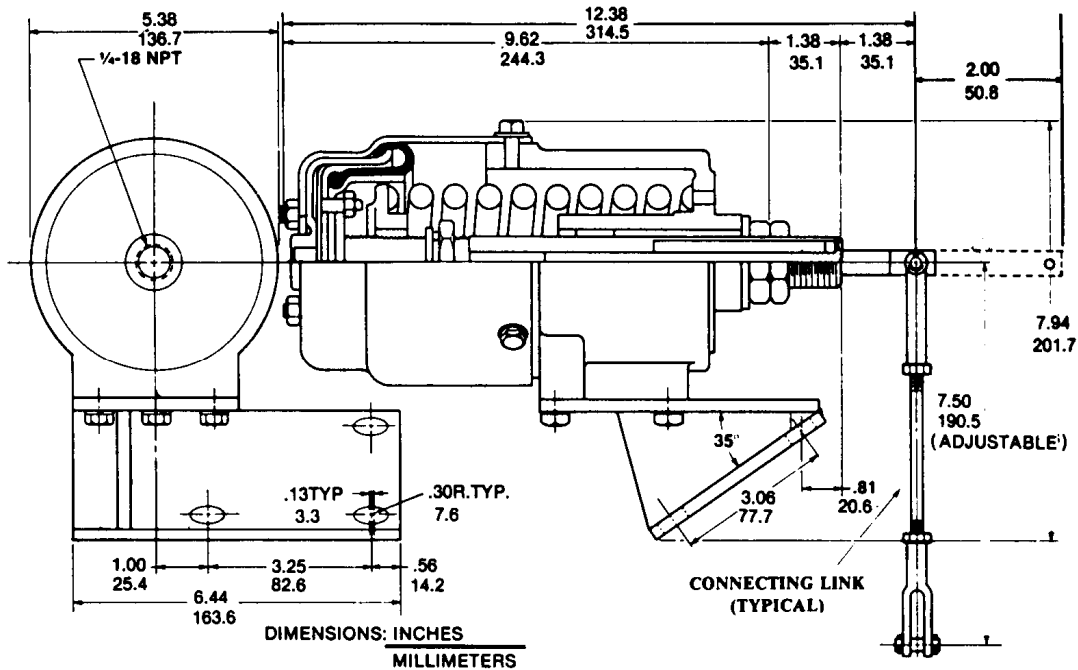
- Rugged construction, -40°F to 165°F operating temperature range.
- Rolling diaphragm actuation for: Accurate positioning
Sensitive low-hysteresis control.
- Control signal range 10 to 60 psi (idle to full)
- Output rod travel 2 inches.
- Built-in yield spring for overtravel protection of engine governor.

OPERATION—

Control signal pressure applied to the diaphragm is balanced against the calibrated positioning spring to produce a specific output rod position for each increment of pressure. Positioner travel is thus proportional to pressure delivered from a remotely located pressure graduating control valve. Engine speed is therefore controlled through its operating range in proportion to the movement and position of the control valve handle at the remote operating station.

12EC Governor Positioner

Linear diaphragm type



ORDERING INFORMATION	
PART NO.	DESCRIPTION
P67423	12EC Positioner with Bracket*
P67424	12EC Positioner
P67443	Adjustable Connecting Linkage Kit (purchase separately)*
P67482	12EC Mounting Bracket Kit*
P67686	Adapter**

* Adapted for Caterpillar D398 and D399 engines.

** Adapts 12EC Positioner to Caterpillar mounting brackets.

REPAIR KIT LIST — ACTUATORS/POSITIONERS

Service Bulletin	Description	Repair Kit P/N
SM-900.4407	A2H Actuator Repair Kit	P61278
B3-44.01	AA1 Actuator Repair Kit BA1 Actuator Repair Kit AB1 Actuator Repair Kit AA1 & AB1 Actuator Conversion Kit (from Needle brgs) BA1 Actuator Conversion Kit (to nylon bearings)	P63381 P63380 P63379 P63382 P63383
B3-44.09	C Linear (small) Repair Kit	P61051
B3-44.08	C Linear (large) Repair Kit	P58613
B3-44.04	Two Dir. Positioner (small) Repair Kit	P64454

With these repair kits the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletins listed above.

Two-Direction Positioners

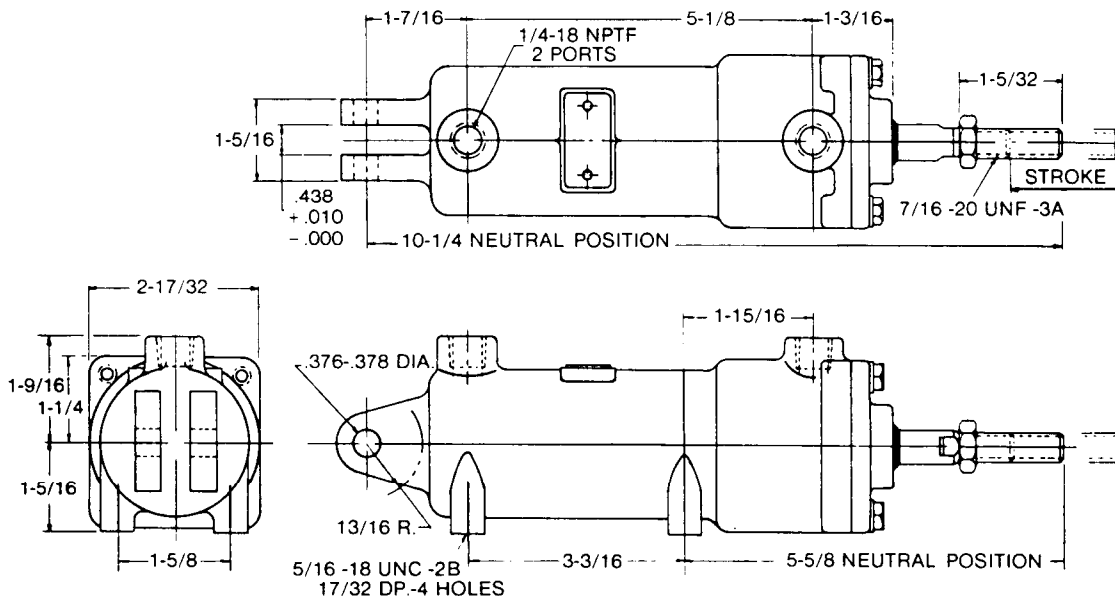
Linear piston type

Rexroth
Bosch Group



An extremely versatile type, the Two-Direction positioners move 1/2 their total stroke length in each direction from a center "zero" position. They are compact, economical, accurate linear piston type with three total stroke lengths, 1", 1-1/2" and 2". REXROTH HC-2 Controlair® Valves or MC-2 Type M PLUS™ Pressure Control Valves with center indexing are natural partners with the Two-Direction positioners.

ORDERING INFORMATION				
PIECE NO.	PRESSURE RANGE (PSI)	FORCE RATING (inch-lb.-degrees)	TOTAL STROKE LENGTH	WEIGHT
P58822-0500	5-80	410	1"	2.5 lbs.
P58822-0750	5-115	615	1½"	2.6 lbs.
P59833-1000	10-60	820	2"	2.7 lbs.
P64076-1000	10-90	820	2"	2.7 lbs.



The two-direction positioner is a low-sensitivity, infinite positioning device that is controlled by a graduating control valve, such as our Type "H" Controlair® Valve, Type M PLUS™ Pressure Control Valve or Flexair® Valve as shown in the Special Duty Valves section in catalog SC-700. The positioner has a wide range of applications including positioning of 4-way hydraulic valves, over center hydraulic pumps and other low-force mechanisms. It is corrosion-resistant and constructed of lightweight, die-cast, anodized aluminum with a chrome-plated piston rod and long-wearing synthetic rubber seals.

Maximum stroke of the piston rod is one inch on each side of the center position, making a total piston rod travel of two inches. External envelope dimensions of the positioner do not change.

NOTE: Control pressure should match the operating pressure of the positioner to eliminate any lost motion in the control valve.

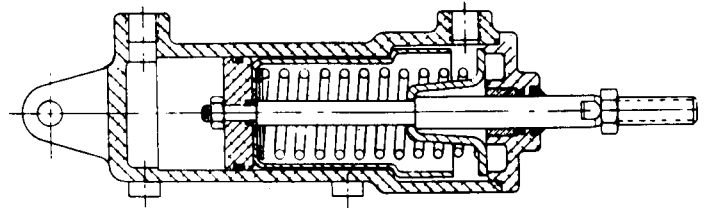
Two-Direction Positioners

Linear piston type

Rexroth
Bosch Group

OPERATION

Maximum pressure of the two-direction positioner is 150 psi at a temperature range of -40 F to 165 F. The positioner is held in its center position by a coil spring caged on the piston rod. When air pressure is supplied to the Cap-End Port, the piston rod moves to its extended position. When pressure is supplied to the Head-End Port, the piston rod moves to its retracted position.



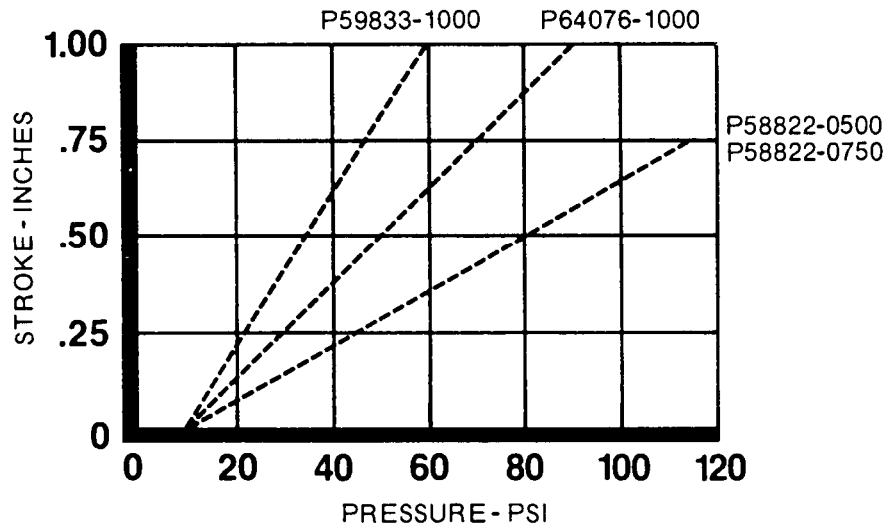
ASSEMBLY VIEW

AVAILABLE FORCES

The accompanying graph shows pressure in psi required to overcome the force of the spring as the piston rod is retracted or extended from its center position. From the graph, pounds of spring force can be determined by multiplying the pressure (psi) by the piston area. The following force ratings are based on 3 psi x 2.4 square inches (piston area).

P58822-0500	410 in.-lb.-degrees or 7lbs. through 1" total travel.
P58822-0750	615 in.-lb.-degrees or 7lbs. through 1½" total travel.
P59833-1000 & P64076-1000	820 in.-lb.-degrees or 7lbs. through 2" total travel.

To determine the control valve output pressure at any piston travel for either retracted or extended strokes, project across the graph from the appropriate stroke length point on the vertical line until the pressure line is intersected. Project down from this point to arrive at the pressure in psi. This is the no-load pressure required of the valve. Normally 3 psi above this is required to move a load of 7 lbs.



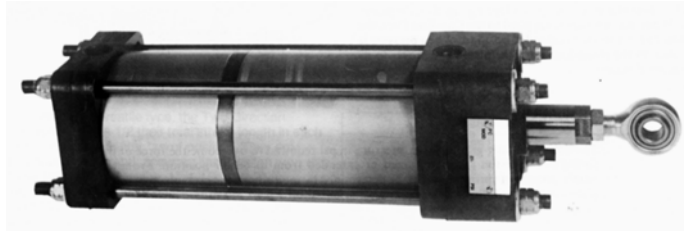
PISTON AREA: EXTENDED 2.4 sq. in.
RETRACTED 2.2 sq. in.

Mounting kits to mount this 2D Positioner on Sunstrand hydraulic pumps are available. Request brochure A9-150.07. Consult factory for recommendations for other hydraulic pump brands.

Two-Direction Positioners

Linear piston type

Rexroth
Bosch Group



(Part number P-067406-01000 shown)

APPLICATION

For infinite positioning control of: Large Hydraulic Over-Center Pumps and Motors, Large Hydraulic Spool Valves, Ball and Butterfly Valves or other devices from a remotely located control station.

FEATURES -

- Rugged, corrosion resistant construction
- Accurate, low-hysteresis positioning
- Selection of 1", 2" or 3" of stroke either side of center
- Spherical Bearing Rod Eye Standard
- Integral MS-4 blind tapped hole mounting (other 3/4" TASKMASTER Cylinder Mounting Kits adaptable)
- Control Signal range 10 to 90 psi (center to full extend or retract position)
- Fully caged positioning spring allows easy, safe disassembly for servicing or installation of Mounting Kits with extended Tie Rods.

OPERATION -

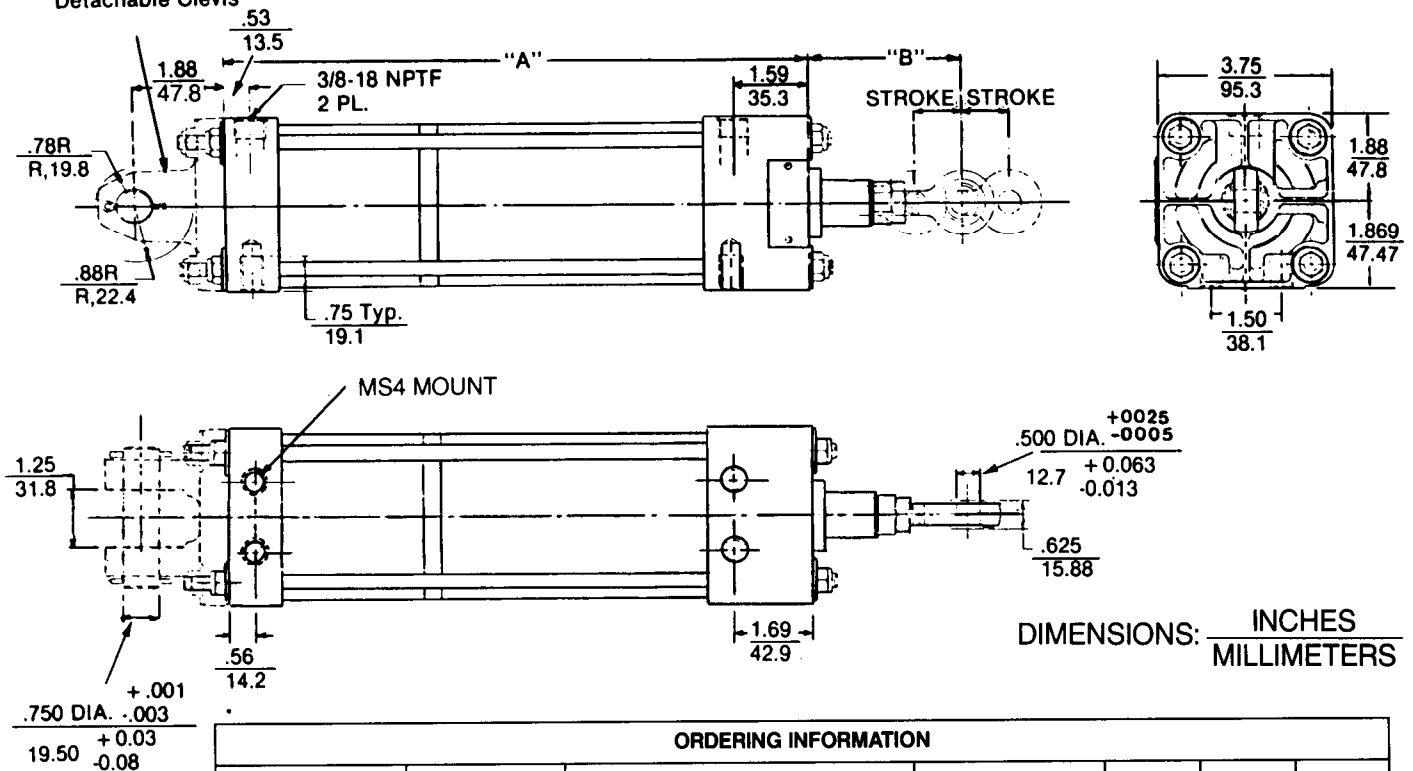
A graduated pressure control signal is applied to one side of the positioner piston and resulting force is balanced against the calibrated positioning spring to produce a specific output rod position for each increment of pressure. Piston rod travel in either direction is thus proportional to pressure delivered from a remote pressure graduating control valve. The controlled device therefore is positioned through its operating range in accordance with the position and direction selected for the remote control valve handle.

Two-Direction Positioners

Linear piston type



Taskmaster Cylinder Detachable Clevis



ORDERING INFORMATION						
Piece No.	Operating Pressure (psi)	Optimum* Force Rating (Based on Total Travel)	Stroke (Each Side of Center)	"A" Dim.	"B" Dim.	Weight
P67406-1000	10-90	25 lbs. thru 2"/5.08 (or 1620 IN-LB-Degrees)	<u>1.00</u> 25.4	<u>11.25</u> 285.8	<u>3.25</u> 82.6	6.8
P67406-2000	10-90	25 lbs. thru 4"/10.16 (or 3240 IN-LB-Degrees)	<u>2.00</u> 50.8	<u>16.12</u> 409.4	<u>4.25</u> 108.0	7.8
P67406-3000	10-90	25 lbs. thru 6"/15.24 (or 4860 IN-LB-Degrees)	<u>3.00</u> 76.2	<u>21.00</u> 533.4	<u>5.25</u> 133.4	8.8

HOW TO ORDER

1. Determine positioning requirements [force and length of travel (or degrees of rotation and level arm radius)].
2. Select Two-Direction Positioner from above chart that equals, or exceeds, required stroke and provides adequate force/hysteresis trade-off.
3. Select appropriate TASKMASTER® Cylinder Mounting Kit, if desired. TASKMASTER® Mounts MP2, MP4, MF2, MT2, MS2 and integral MS4 suitable. See catalog SC-200.
4. Select appropriate pressure graduating control valve such as REXROTH HC-2 CONTROLAIR®, MC-2 Type M PLUS™ Pressure Control Valve or FLEXAIR® Valve to suit application.
5. Adjust linkage to use the full stroke of the positioner, and adjust valve output (under rated load) to use full handle travel to match full positioner stroke for maximum sensitivity and "feel".

Section 2 (SC-1000) Mobile Type Air Cylinders

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CONSTRUCTION GRADE (CAST IRON) AIR CYLINDERS

Air to 120 psi Cast Iron Body Construction
2 1/2" thru 4 1/2" bore Double Acting
Spring Returned Models
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MULTI-POSITION AIR CYLINDERS

Air to 150 psi
2, 3, 4, 5, 6, 7, & 8 Position Models
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Cast Body Construction

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Construction Grade Pneumatic Cylinders

(Cast Iron Cylinders)

Rexroth
Bosch Group



A LOW-COST LINE OF HEAVY-DUTY CYLINDERS SPECIALLY DESIGNED TO MEET YOUR MOST SEVERE APPLICATIONS.

Constructed of unyielding semisteel, these durable cylinders are unequalled for clutch, brake and other medium-duty-cycle applications. With their many dependability-plus features, you can be sure of long, reliable service. And, low cost is achieved by their compact, efficient design.

ECONOMICAL... Efficient design keeps the cost low. Simple, easy maintenance means added economy. Most importantly, down-time is kept to an absolute minimum.

RESISTS EXTERNAL DAMAGE... Protection against dents is assured by the semisteel body. Further rigidity is provided by the one-piece design of the body, cap and swivel mount. Damaging dirt is filtered by a metal strainer in the non-pressure port.

EASILY MAINTAINED... Grease-lubricated at the factory before it comes to you. Maintenance-free service is prolonged because of the grease-retaining qualities of the semisteel body.

All parts of the cylinder are accessible by disconnecting the rod end and removing only four screws. The entire internal assembly easily slides out as one unit. It is seldom necessary to remove the cylinder from its mounting.

External replacement of the rod bearing, seal and wiper is fast and simple (model with integral rod and rod eye requires routine disassembly).

BUILT TO LAST... Resistance to wear and corrosion is engineered into all parts of the cylinder, and its life and appearance are enhanced by the noncorrosive qualities of the semisteel body. Long-wearing rod bearings are either brass or sintered bronze. The piston rod is hard-chrome-plated steel. Other corrosive-resistant parts include an anodized aluminum head, piston and follower. To assure positive seal with minimal friction, only genuine REXROTH Packing Cups are used.

SPECIFICATIONS...

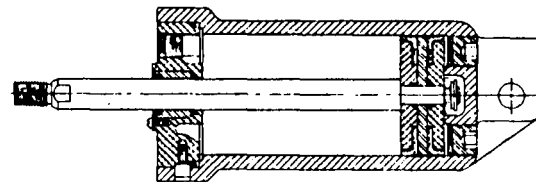
Up to 120 psi operating pressure

Wide temperature range: -20° F to 160° F

(200° F intermittently)

Ports: 1/4" or 3/8" (see illustrations)

Mounting: integral female clevis



ASSEMBLY VIEW

Construction Grade Pneumatic Cylinders

(Cast Iron Cylinders)



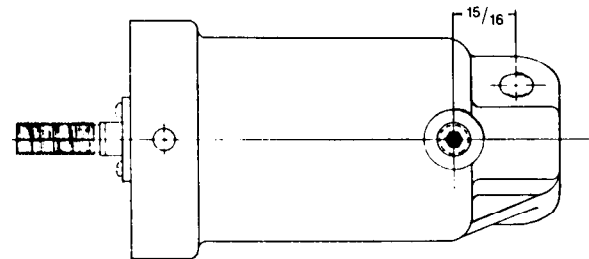
ORDERING INFORMATION

Part Number	Bore	Stroke	Model	Description	Spring Force (lbs)		Approx. Weight (lbs.)	Ref. No.
					At "O" Stroke	Increase per Inch of Stroke		
P53341	2-1/2"	4"	Double Acting	—	—	—	9	1
P54198	2-1/2"	3"	Single Acting	Push Type - Spring Returned	15.9	4.3	9	2
P53342	2-3/4"	2-3/4"	Single Acting	Push Type - Spring Returned	10.0	8.0	9	3
P53343	2-3/4"	2-3/4"	Single Acting	Push Type - Spring Returned	10.0	8.0	9	3
P53344	2-3/4"	3"	Double Acting	—	—	—	9	3
P54640	2-3/4"	2-3/4"	Single Acting	Push Type - Spring Returned	23.0	9.18	9	4
P54640-1	2-3/4"	2-3/4"	Single Acting	Pull Type - Spring Extended	23.0	9.18	9	4
P55521-1	2-3/4"	3"	Double Acting	—	—	—	9	5
P54176-2	3-1/2"	2-7/8"	Single Acting	Push Type - Spring Returned	40.0	20.0	12	6
P55701-1	3-1/2"	2-7/8"	Single Acting	Push Type - Spring Returned	40.0	20.0	12	7
P53373-1	3-1/2"	3-3/8"	Double Acting	—	—	—	10	8
P55433	4-1/2"	3-3/16"	Double Acting	—	—	—	15	9
P55433-1	4-1/2"	3-3/16"	Double Acting	—	—	—	15	9
P53345	4-1/2"	3-1/4"	Single Acting	Push Type - Spring Returned	40.0	16.0	15	9
P53345-2	4-1/2"	2-3/4"	Single Acting	Push Type - Spring Returned	21.5	17.2	15	9

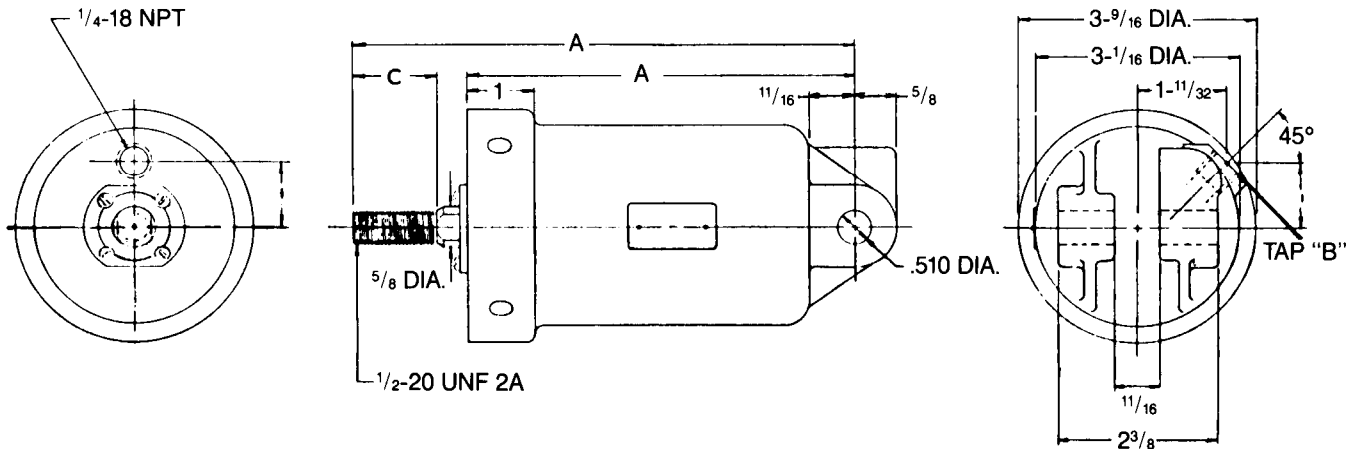
OUTLINE DIMENSIONS

REFERENCE 1 - Part Number P53341

Part No.	A	B	C
P53341	10	7-1/8	3/4



VIEW IN DIRECTION OF ARROW "A" (45° ROTATION)



Construction Grade Pneumatic Cylinders

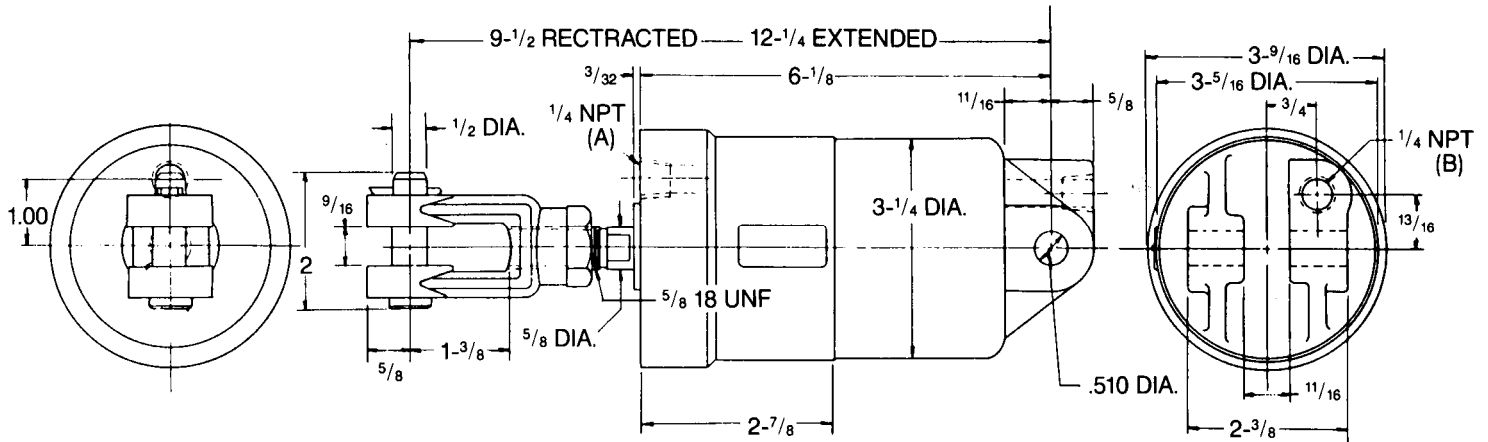
(Cast Iron Cylinders)



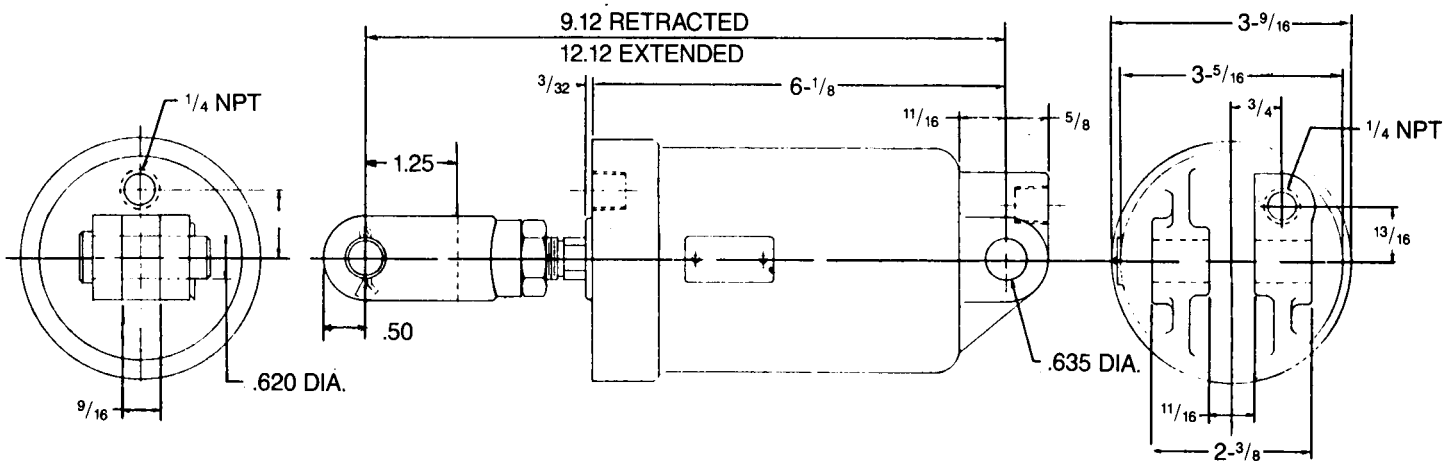
OUTLINE DIMENSIONS

REFERENCE 4 - Part Numbers P54640 & P54640-0001

Part No.	Type	Remarks
P54640	Spring Retracted	Filter Plug Tap "A"
P54640-0001	Spring Extended	Filter Plug Tap "B"



REFERENCE 5 - Part Number P55521-1



Construction Grade Pneumatic Cylinders

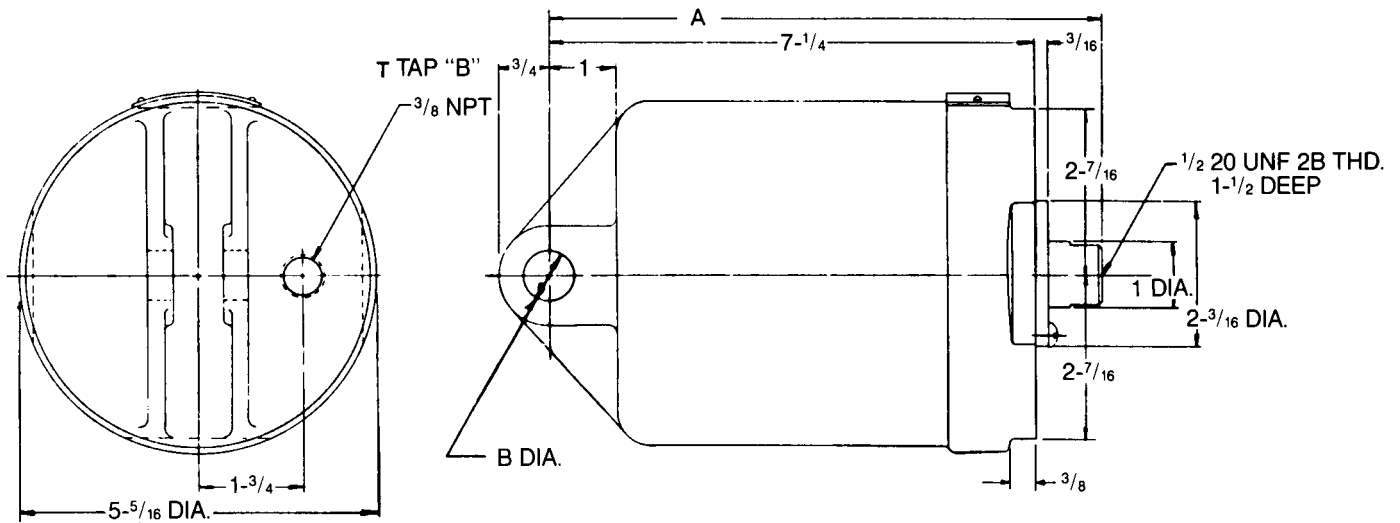
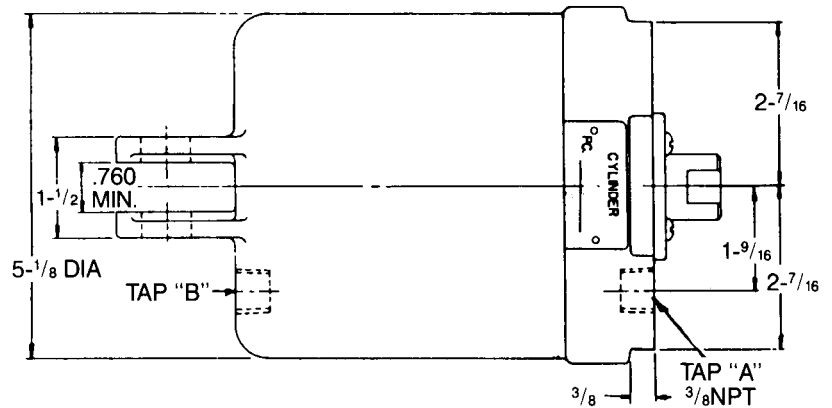
(Cast Iron Cylinders)



OUTLINE DIMENSIONS

REFERENCE 9 - Part Numbers P55433, P55433-0001,
P53345, P53345-0002

Part No.	A	B	Remarks
P55433	8-1/4	.500	—
P55433-1	8-1/4	.750	—
P53345	8-1/4	.750	Filter Plug Tap "A"
P53345-2	8-1/4	.750	Filter Plug Tap "A" Spring 60s



Construction Grade Pneumatic Cylinders

(Cast Iron Cylinders)

REPAIR KIT LIST

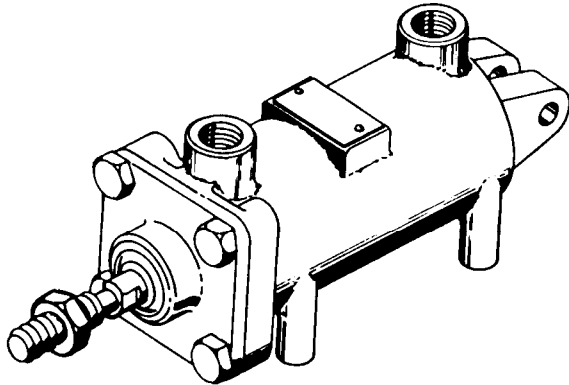
Cylinder Part Number	Repair Kits	Cylinder Part Number	Repair Kits
P53341	P59161	P54190-1	P59169
P53342	P59163	P54190-2	P59169
P53343	P59163	P54198	P59162
P53344	P59164	P54640	P59163
P53345	P59167	P54640-1	P59164
P53346	P59168	P55433	P59168
P53373-1	P59166	P55521-1	P59164
P54172	P59161	P55701-1	P59165
P54176-2	P59165	P57530	P59161

With these repair kits, the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletin B3-42.00

Multiposition Air Cylinders

Two Position, Single & Double Acting

Rexroth
Bosch Group



The two-position cylinder is a positioning device controlled by a three-way (single-acting model) or a four-way (double-acting model), two-position, control valve such as the "A" or "D" PILOTAIR® Valve. The cylinder has a wide range of applications, being particularly suited for shifting transmissions and positioning hydraulic valves. It is corrosion-resistant and constructed of lightweight, die-cast, anodized aluminum heads, pistons and body.

Cylinders with return springs can be used for infinite positioning, similar to an actuator, by selecting the proper graduating pressure control valve (see SC-800 catalog, CONTROLAIR® Valve; or FLEXAIR® Valve). To select the required pressure range of the control valve, see the graph shown under "Available Forces" on the following page.

Maximum stroke of the piston rod for each cylinder is shown, with shorter strokes available in 1/16-inch increments only. External envelope dimensions do not change. The complete piece number and the piece number of the piston stop for each cylinder will have an identical four-digit suffix. The first digit is always zero; the last three digits show the stroke in thousandths of an inch.

INSTALLATION & ADJUSTMENT

Because cylinders are installed at the end of an air system, they are vulnerable to dirt and moisture carried through the air lines. Therefore, before installing the two-position cylinder, all air lines in the system should be blown clean. It is recommended that the cylinder be

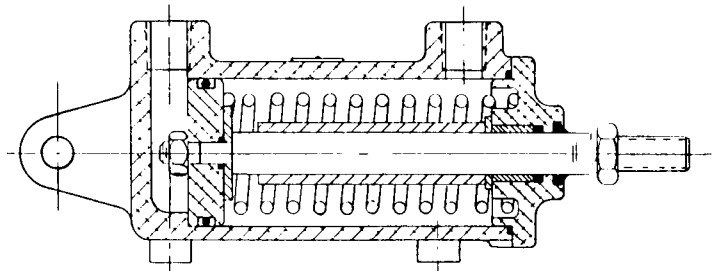
mounted with the ports facing down. Gravity can then assist in preventing foreign material from accumulating in the cylinder by removing it through the control valve exhaust.

In providing a mounting for the cylinder, an adjustable link must be included between the piston rod and the lever to which the rod is connected.

OPERATION

Maximum operating pressure of the two-position cylinder is 150 psi at a temperature range of -40° F to 180° F. On the single-acting model, supply pressure from a three-way control valve is piped through the cap-end port to move the piston rod to its extended position. When air pressure is exhausted, a spring returns the piston rod to its retracted position.

On the double-acting model, the return spring is omitted, and a four-way control valve is used. Pressure supplied to either the cap-end or head-end port will force the piston rod to its extended or retracted position, respectively.



ASSEMBLY VIEW
(Single-Acting Model)
(Double-Acting Model contains no spring)

MAINTENANCE

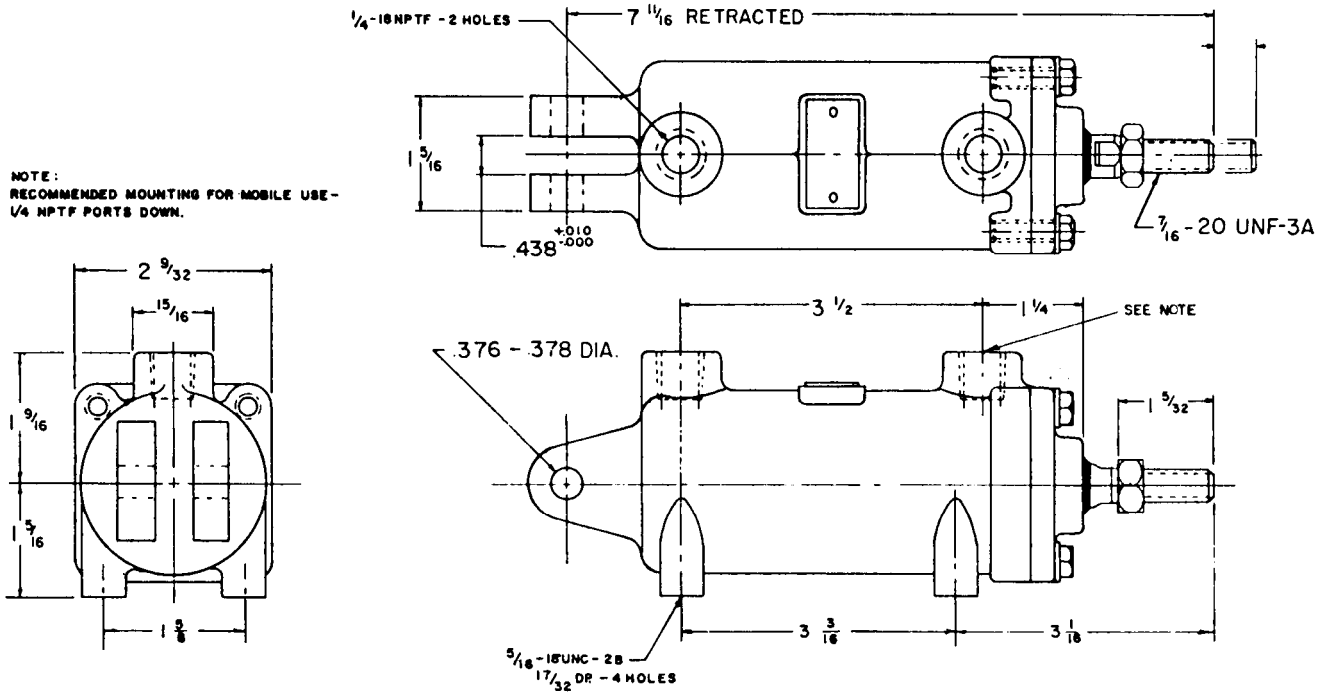
Periodically disassemble the cylinder for cleaning, inspection and lubrication. Clean all metal parts with a nonflammable solvent, and wash all rubber parts with soap and water. Rinse thoroughly and blow dry with a low-pressure air jet. Replace those parts which are damaged or worn.

Reassemble the cylinder, using the exploded and assembly views as reference. No special tools are required. To avoid cutting or nicking the piston O-ring, carefully insert the piston rod assembly into the cylinder bore with the piston tilted at a slight angle. As the assembly proceeds, lubricate all O-rings with Dow Corning 55M grease.

Multiposition Air Cylinders

Two Position, Single & Double Acting

Rexroth
Bosch Group



REFER TO AVAILABLE FORCE RATING ON NEXT PAGE

Piece Number	Type of Operation	Maximum Stroke★	Repair Kit P/N
P57368-0000	Spring Returned	1-1/8"	P59818 (see note)
P58994-0000	Spring Returned	1-7/8"	
P62303-0000	Spring Returned	2-1/4"	
P57401-0000	Double Acting	2-9/16"	

★ Shorter strokes available in 1/16" increments only.
The four digit suffix denotes effective stroke in thousandths of an inch.

Examples: P57368-1000 has a 1" effective stroke.
P57401-1500 has a 1 1/2" effective stroke.

With these repair kits the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletin B3-49.06.

Multiposition Air Cylinders

Two Position, Single & Double Acting

Rexroth
Bosch Group

AVAILABLE FORCES

Force developed by the double-acting cylinder is determined by multiplying the applied air pressure by the exposed piston area.

Pounds of force (retracted stroke) = applied pressure (psi) x 2.2 square inches

Pounds of force (extended stroke) = applied pressure (psi) x 2.4 square inches

On either of the two single-acting, spring-returned models, spring force must be considered in determining force developed by the cylinder at different points in the stroke. On extended stroke:

Pounds of force = applied pressure (psi) x 2.4 square inches
minus pounds of spring force

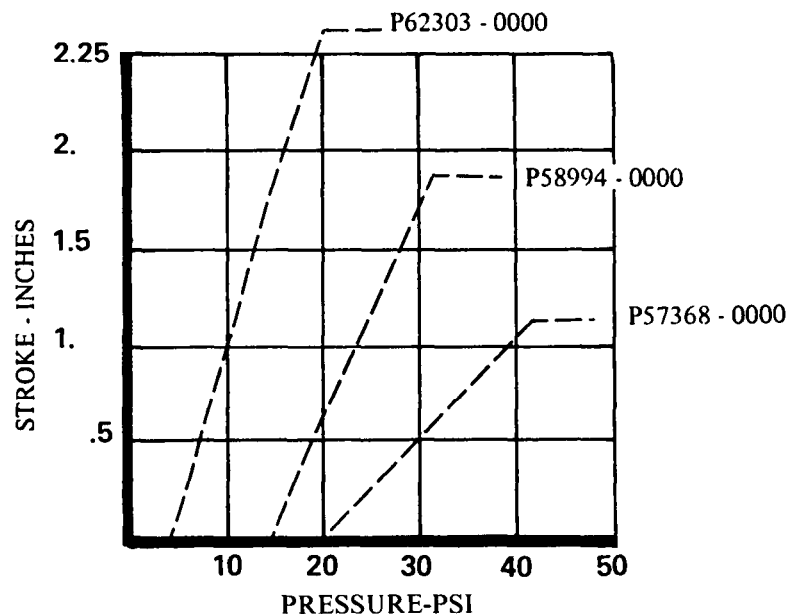
The accompanying graph shows pressure in psi required to overcome the force of the spring as the piston rod is extended. Opposing spring force increases as the stroke length of the piston rod increases and the spring is further compressed. From the graph, pounds of spring force can be determined by multiplying the pressure (psi) by the piston area. Thus, the initial force of the cylinder at zero stroke is:

Pounds of force (Pc. No. P57368-0000) = applied pressure (psi) x 2.4 square inches
minus (20 psi x 2.4 square inches)

Pounds of force (Pc. No. P58994-0000) = applied pressure (psi) x 2.4 square inches
minus (16 psi x 2.4 square inches)

For spring force at subsequent piston rod positions on extended stroke, project across the graph from the appropriate stroke length point on the vertical line until the pressure line is intersected. Project down from this point to arrive at pressure in psi. Multiply this figure by the 2.4 square inches of piston area.

On retracted stroke, only spring force is available.

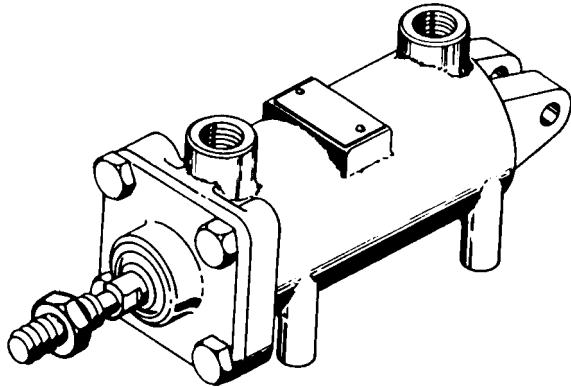


PISTON AREA: EXTENDING = 2.4 square inches
RETRACTING = 2.2 square inches

Multiposition Air Cylinders

Three Position, Spring Centered

Rexroth
Bosch Group



The three-position cylinder is a fixed position device when controlled by a four-way, three-position, exhaust-center, control valve such as the "A" or "D" PILOTAIR® Valve. The cylinder has a wide range of applications, being particularly suited for shifting transmissions and positioning hydraulic valves. It is corrosion-resistant and constructed of lightweight, die-cast, anodized aluminum heads, pistons and body.

Maximum stroke of the piston rod is one inch on each side of the center position, making a total piston rod travel of two inches. External envelope dimensions of the cylinder do not change, but shorter strokes are available in increments of 1/16-inch for each position. The complete piece number of the cylinder and the piece number of the piston stop will have an identical four-digit suffix. The first digit denotes the stroke in inches; the last three digits show the stroke in thousandths of an inch.

INSTALLATION & ADJUSTMENT

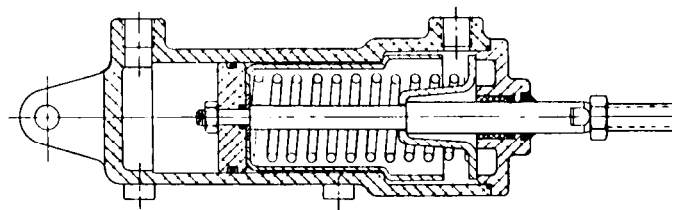
Because cylinders are installed at the end of an air system, they are vulnerable to dirt and moisture carried through the air lines. Therefore, before installing the three-position cylinder, all air lines in the system should be blown clean. It is recommended that the cylinder mounted with the ports facing down. Gravity can then assist in preventing foreign material from accumulating in the cylinder by removing it through the control valve exhaust.

In providing a mounting for the cylinder, an adjustable link must be included between the piston rod and the lever to which the rod is connected. The cylinder stroke should be checked in its center position when aligned with the lever to be operated. Check for exact register, making sure the clevis pin is free from load in the center position.

This procedure will allow any inaccuracies in leverage ratio or manufacturing tolerance to be absorbed at the extremes of the stroke where exact registration is of least importance. Also, any inaccuracies will be divided between the extreme positions. When alignment is done at one of the extreme positions, inaccuracies are all in the same direction.

OPERATION

Maximum operating pressure of the three-position cylinder is 150 psi at a temperature range of -40° F to 180° F. The cylinder is held in its center position by a coil spring caged on the piston rod. When air pressure is supplied to the cap-end port, the piston rod moves to its extended position. When pressure is supplied to the head-end port, the piston rod moves to its retracted position.



ASSEMBLY VIEW

MAINTENANCE

Periodically disassemble the cylinder for cleaning, inspection and lubrication. Clean all metal parts with a nonflammable solvent, and wash all rubber parts with soap and water. Rinse thoroughly and blow dry with a low-pressure air jet. Replace those parts which are damaged or worn.

Reassemble the cylinder, using the exploded and assembly views as reference. No special tools are required. To avoid cutting or nicking the piston O-ring, carefully insert the piston rod assembly into the cylinder bore with the piston tilted at a slight angle. As the assembly proceeds, lubricate all O-rings with Dow Corning 55M grease.

Multiposition Air Cylinders

Three Position, Spring Centered

Rexroth
Bosch Group

AVAILABLE FORCES

Forces developed by the cylinders are determined by multiplying the applied air pressure by the exposed piston area, less the spring force.

$$\text{Pounds of force} = \text{applied pressure (psi)} \times \text{piston area} \\ \text{minus pounds of spring force}$$

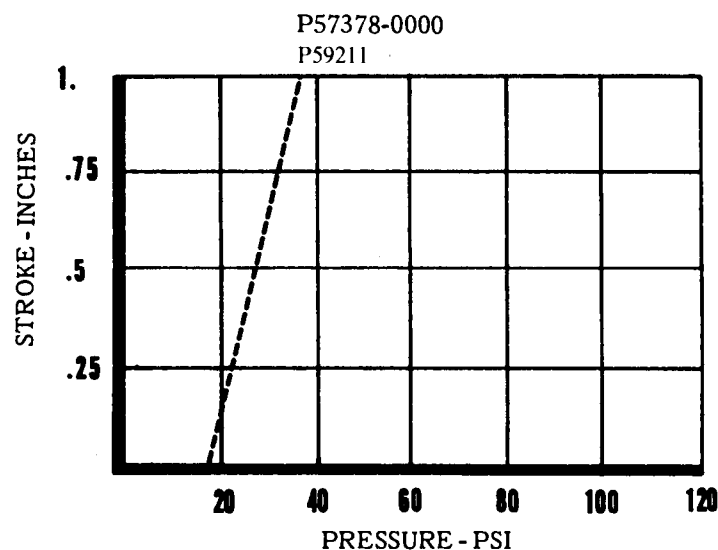
The accompanying graph shows pressure in psi required to overcome the force of the spring as the piston rod is retracted or extended from its center position. Opposing spring force increases as the stroke length of the piston rod increases and the spring is further compressed. From the graph, pounds of spring force can be determined by multiplying the pressure (psi) by the piston area. Thus, the initial force of the cylinder at zero stroke in the center position is:

Pc. No. P57378-0000 & P59211

$$\text{Pounds of force (retracted stroke)} = \text{applied pressure (psi)} \times 2.2 \text{ square inches} \\ \text{minus } (18 \text{ psi} \times 2.4 \text{ square inches})$$

$$\text{Pounds of force (extended stroke)} = \text{applied pressure (psi)} \times 2.4 \text{ square inches} \\ \text{minus } (18 \text{ psi} \times 2.4 \text{ square inches})$$

For spring force at subsequent piston rod positions on either retracted or extended stroke, project across the graph from the appropriate stroke length point on the vertical line until the pressure line is intersected. Project down from this point to arrive at pressure in psi. Multiply this figure by the 2.4 square inches of piston area.



PISTON AREA: EXTENDING = 2.4 square inches
RETRACTING = 2.2 square inches

Multiposition Air Cylinders

Three Position, Air Centered

Rexroth
Bosch Group



The three-position cylinder is a positioning device controlled by a four-way, three-position, open-center, control valve such as the "A" or "D" PILOTAIR[®] VALVE. The cylinder has a wide range of applications, being particularly suited for shifting transmissions and positioning hydraulic valves. It is corrosion-resistant and constructed of lightweight, die-cast, anodized aluminum heads, pistons and body.

Maximum stroke of the piston rod for each cylinder is 13/16 inch on each side of the center position, making a total piston rod travel of 1-5/8 inches. External envelope dimensions of the cylinder do not change, but shorter strokes are available in increments of 1/16 inch for each position. The complete piece number and the piece number of the piston stop for cylinders with equal-stroke increments will have an identical four-digit suffix. The first digit is always zero; the last three digits show the stroke in thousandths of an inch. Complete piece numbers will be assigned for cylinders with unequal-stroke increments as required.

INSTALLATION & ADJUSTMENT

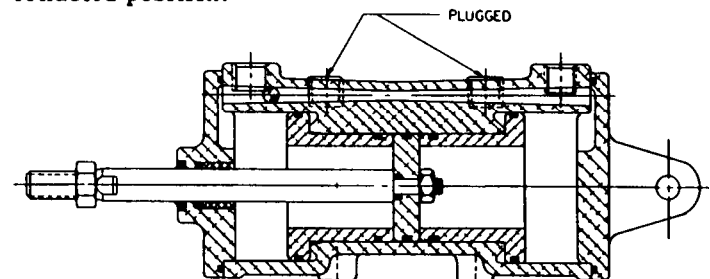
Because cylinders are installed at the end of an air system, they are vulnerable to dirt and moisture carried through the air lines. Therefore, before installing the three-position cylinder, all air lines in the system should be blown clean. It is recommended that the cylinder be mounted with the ports facing down. Gravity can then assist in preventing foreign material from accumulating in the cylinder by removing it through the control valve exhaust.

In providing a mounting for the cylinder, an adjustable link must be included between the piston rod and the lever to which the rod is connected. The cylinder stroke should be checked in its center position when aligned with the lever to be operated. Supply air through Port One and Port Four, and check for exact register. In the center position, the clevis pin should be free from load.

This procedure will allow any inaccuracies in leverage ratio or manufacturing tolerance to be absorbed at the extremes of the stroke where exact registration is of least importance. Also, any inaccuracies will be divided between the extreme positions. When alignment is done at one of the extreme positions, inaccuracies are all in the same direction.

OPERATION

Maximum operating pressure of the three-position cylinder is 150 psi at a temperature range of -40 F to 180 F. The cylinder is held in its center position by equal pressure being applied to both sides of the piston through Port One and Port Four. Port Two and Port Three are open to atmosphere through breather plugs. When pressure is supplied through Port Four only, the piston rod moves to its extended position. When pressure is supplied through Port One only, the piston rod moves to its retracted position.



ASSEMBLY VIEW

The forces developed by the cylinder are functions of exposed piston areas and amount of air pressure applied, and are tabulated in the following table according to rod position.

NET FORCE WITH 100 PSI AIR PRESSURE	POUNDS	PORTS SUPPLIED
Extended to Neutral	171	1 & 4
Neutral to Extended	207	4
Neutral to Retracted	188	1
Retracted to Neutral	210	1 & 4

Multiposition Air Cylinders

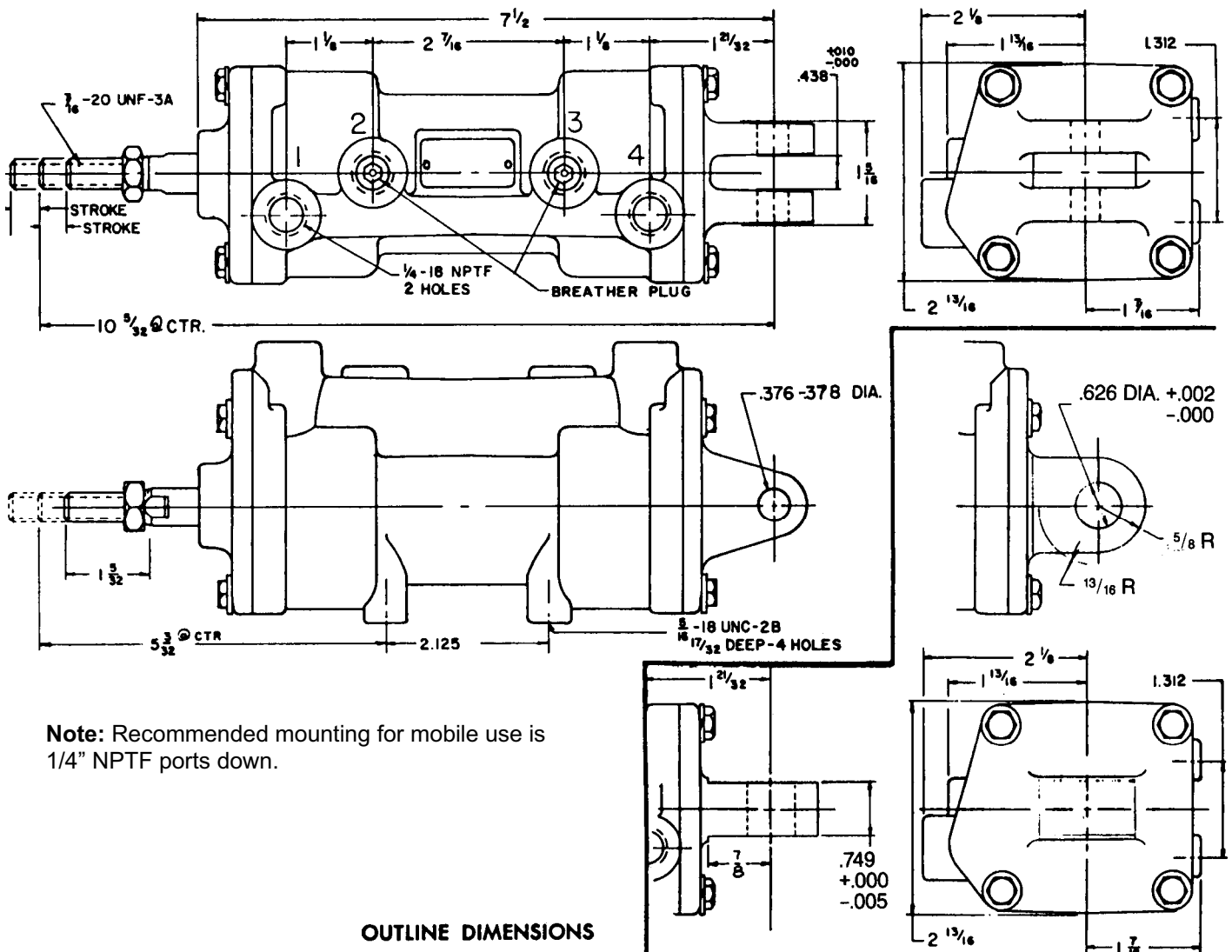
Three Position, Air Centered



With these repair kits the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletin B3-49.11.

DESCRIPTION	MAXIMUM STROKE★ EACH SIDE OF CENTER	PC. NO.	REPAIR KIT NO.
CYLINDER, Three-Position (With Female Clevis) CYLINDER, Three-Position (With Male Clevis)	13/16"	P57400-0000 P58572-0000	P59385

★ Shorter strokes are available in 1/16" increments only.
Stroke on each side of center is equal.
The four digit suffix denotes the stroke on each side of center in thousandths of an inch.
Example: P57400-0750 has a 3/4" effective stroke each side of center.



Note: Recommended mounting for mobile use is 1/4" NPTF ports down.

OUTLINE DIMENSIONS

Multiposition Air Cylinders

Four Position, All Air

Rexroth
Bosch Group



The four-position cylinder is a positioning device controlled by a four-position control valve such as the 2-HA-3 PILOTAIR® VALVE. The cylinder has a wide range of applications, being particularly suited for shifting transmissions and positioning hydraulic valves. It is corrosion-resistant and constructed of lightweight, die-cast, anodized aluminum heads, pistons and body.

Maximum stroke of the piston rod is 3/4 inch between each of the four positions, making a total piston rod travel of 2-1/4 inches. External envelope dimensions of the cylinder do not change, but shorter strokes are available in increments of 1/16 inch for each position. The complete piece number and the piece number of the piston stop for cylinders with equal-stroke increments will have an identical four-digit suffix. The first digit is always zero; the last three digits show the stroke in thousandths of an inch. Complete piece numbers will be assigned for cylinders with unequal-stroke increments as required.

Consult factory for unequal stroke specifications.

INSTALLATION & ADJUSTMENT

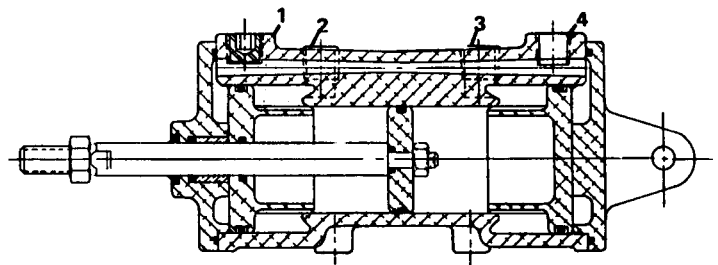
Because cylinders are installed at the end of an air system, they are vulnerable to dirt and moisture carried through the air lines. Therefore, before installing the four-position cylinder, all air lines in the system should be blown clean. It is recommended that the cylinder be mounted with the ports facing down. Gravity can then assist in preventing foreign material from accumulating in the cylinder by removing it through the control valve exhaust.

In providing a mounting for the cylinder, an adjustable link must be included between the piston rod and the lever to which the rod is connected. The cylinder stroke should be checked in one of its intermediate positions when aligned with the lever to be operated. Supply air as indicated in the "Rod Position-Ports Supplied" table (see "Operation"), and check for exact register. In this position, the clevis pin should be free from load.

This procedure will allow any inaccuracies in leverage ratio or manufacturing tolerance to be absorbed at the extremes of the stroke where exact registration is of least importance. Also, any inaccuracies will be divided between the extreme positions. When alignment is done at one of the extreme positions, inaccuracies are all in the same direction.

OPERATION

Maximum operating pressure of the four-position cylinder is 150 psi at a temperature range of -40 F to 180 F. The cylinder assumes any one of its four positions when air pressure from the control valve is supplied in accordance with the table below.



ASSEMBLY VIEW

The forces developed by the cylinder are functions of exposed piston areas and amount of air pressure applied, and are tabulated in the following table according to rod position.

NET FORCE WITH 100 PSI AIR PRESSURE	POUNDS	*PORTS SUPPLIED
Pos. 1 (Extended) to Pos. 2	171	3 & 4
Pos. 2 to Pos. 1	207	3
Pos. 2 to Pos. 3	188	2 & 4
Pos. 3 to Pos. 2	207	3 & 4
Pos. 3 to Pos. 4	188	2
Pos. 4 (Retracted) to Pos. 3	210	2 & 4

*Ports 1 & 4 are internally connected.

Multiposition Air Cylinders

Four Position, All Air

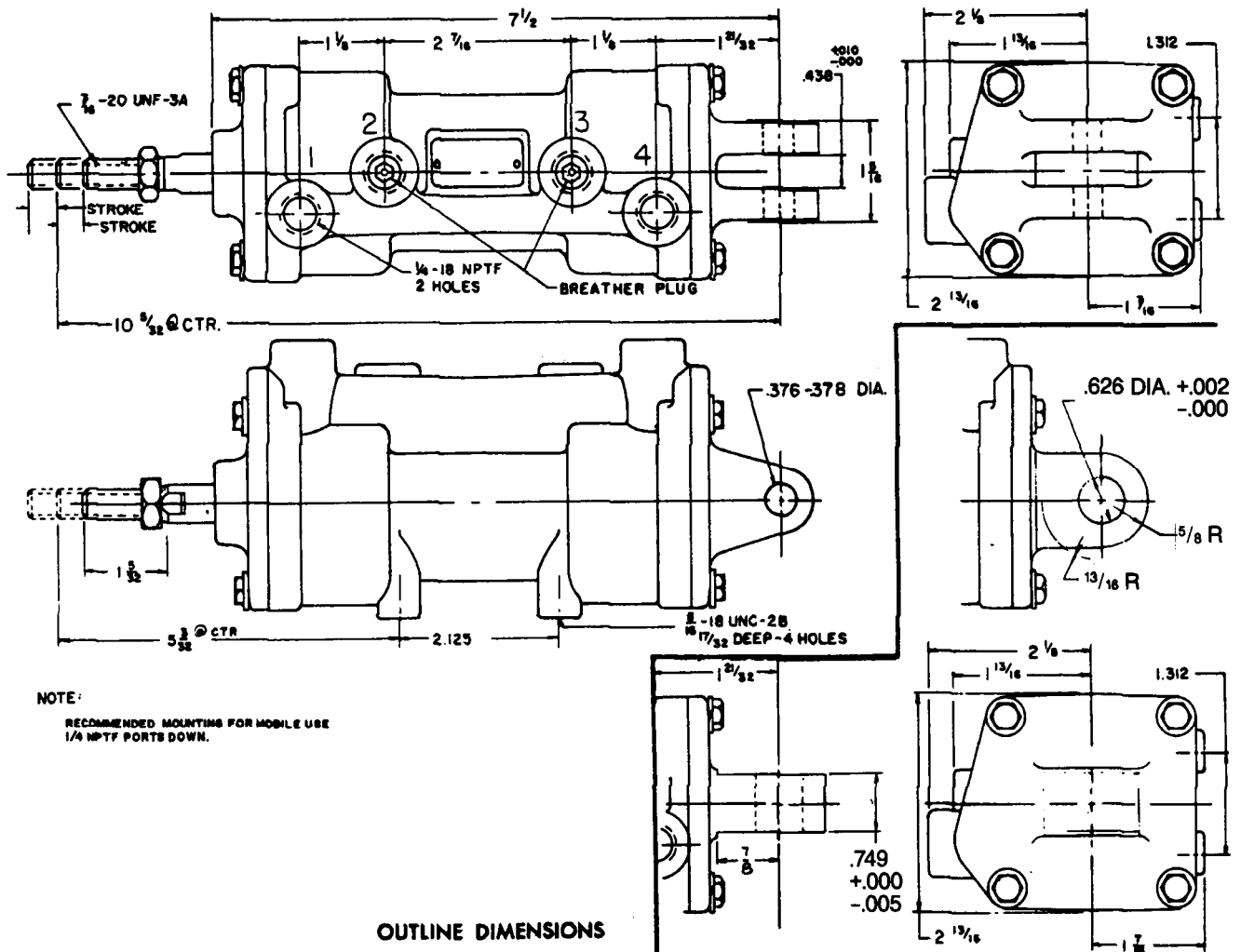


With these repair kits the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletin B3-49.21.

DESCRIPTION	MAXIMUM STROKE INCREMENT ★	PC. NO.	REPAIR KIT NO.
CYLINDER, Four-Position (With Female Clevis) CYLINDER, Four-Position (With Male Clevis)	$\frac{3}{8}$ "	P57386-0000 P59817-0000	P59820
† CYLINDER, Four-Position	Fixed $\frac{17}{32}$ " - $\frac{1}{2}$ " - $\frac{17}{32}$ "	P59694	

† Cylinder with fixed stroke — stroke-length code in piece number suffix does not apply.
★ Shorter equal stroke increments are available in $\frac{1}{16}$ " increments only.

Example: P57386-0500 has $\frac{1}{2}$ " stroke increments.
Consult factory for unequal stroke requirements.
See Catalog Section SC-700 for Type "A" PILOTAIR Valve which can be used to operate these cylinders.



Multiposition Air Cylinders

Six and Seven Position

Rexroth
Bosch Group



The six and seven position cylinders are medium duty pneumatic positioning devices that operate through six or seven predetermined positions of 1/2" increments with total strokes of 2-1/2" or 3" respectively. They were primarily designed for powershift transmissions but may also be utilized for indexing and any other application where fixed stroke increments are required. The ideal companion valve for these cylinders is REXROTH's Type "P" six or seven position ROTAIR® Valve. An alternative control is an electro-pneumatic switching circuit using 3-way solenoid valves. These cylinders are extremely rugged having anodized, corrosion-resistant, lightweight aluminum body, pistons and piston stops. Seals are Teflon coated nitrile compound.

INSTALLATION

Mount the cylinders in any desirable plane to a sturdy, flat surface (preferably with the ports facing down) with three 3/8" bolts. Mounting lugs are cast in the body of the cylinders. Avoid misalignment with the load to be positioned since side thrust and binding will affect the service life of the rod bearing and piston stop seals.

All ports are 1/4"-18 NPT. The following ports should be piped together with "T" connections: 3 with 3A on the six position cylinder, 3 with 3A and 6 with 6A on the seven position cylinder. Connections should be made as close to the cylinder as possible to reduce the number of lines from the control valve.

OPERATION

Maximum operating pressure is 150 psi within a temperature range of -40° F to 160° F. The cylinder piston rod reaches its various positions in response to pressure being supplied to the cylinder ports as shown in the porting diagrams, V means air must be vented to atmosphere, S means air must be supplied and S/V means port can be supplied or vented, whichever is most convenient in the control valve. Each cylinder has reverse at full extended position of the rod and is spring returned to neutral (next position in from reverse) from any position. The transmissions which these cylinders usually control have the full automotive or drive position adjacent to neutral. The corresponding position is 5 on the seven position and 4 on the six position cylinder. The sequential order of cylinder position is a function of the "P" ROTAIR Valve.

NOTE: "P" ROTAIR Valve P63984 was designed to control six position cylinder P63982-1 and valve P63985 was designed to control seven position cylinder P63981-2. Both of these ROTAIR Valves have first gear position adjacent to neutral and progress toward full automatic at the extreme position of valve handle travel (see catalog SC-700). Six position ROTAIR P63984 should be connected as follows: Ports No. 1 & No. 5 plugged, Exhaust port is 1/8" NPT, pressure is supplied to unnumbered port in the side of the pipe bracket, valve port No.2 to cylinder port No. 2, valve No. 4 to cylinder No. 5, valve No. 3 to cylinder No. 3 & 3A, and valve port No. 6 to cylinder port No. 6A in six position cylinder P63982-1.

Seven position ROTAIR P63985 should be connected as follows: Port No. 1 plugged, exhaust port No. 4, pressure is supplied to unnumbered port in the side of the pipe bracket, valve port No. 2 to cylinder port No. 2, valve No. 5 to cylinder No. 5, valve No. 3 to cylinder no. 3 & No. 3A and valve port No. 6 to cylinder No. 6 & 6A in seven position cylinder P63981-2.

The forces developed by the cylinder are functions of the air pressure applied to the exposed piston areas and are tabulated for rod movement at the various stroke positions as shown on the charts on pages 6 and 7. The internal spring returns the piston rod to its "Neutral" position when air pressure is intentionally or unintentionally exhausted from all control lines. This safety feature returns the transmission to neutral if the air supply is lost.

Repair Kit List

Seal Kit	P64997-0001
Spring	P64191

With these repair kits, the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletin B3-49.05.

Multiposition Air Cylinders

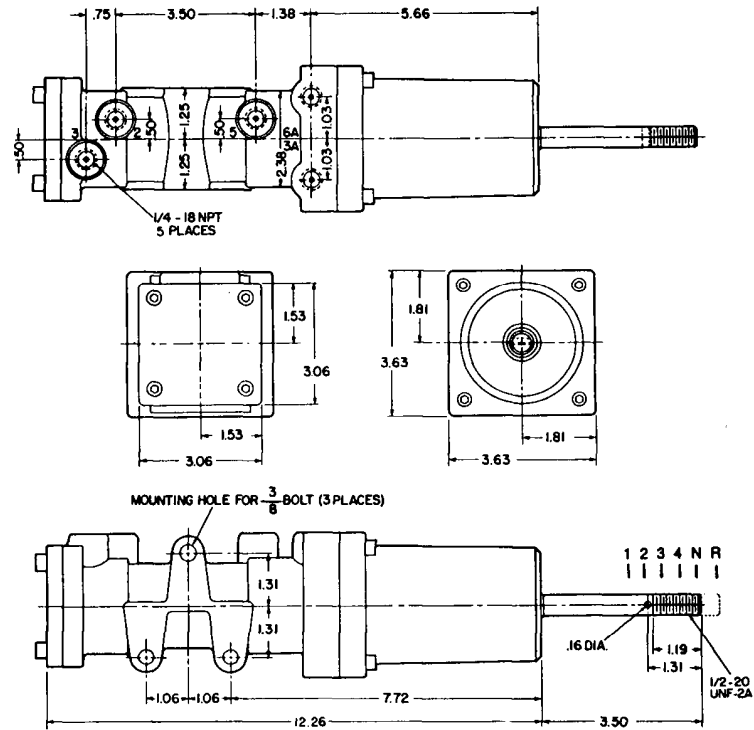
Six and Seven Position



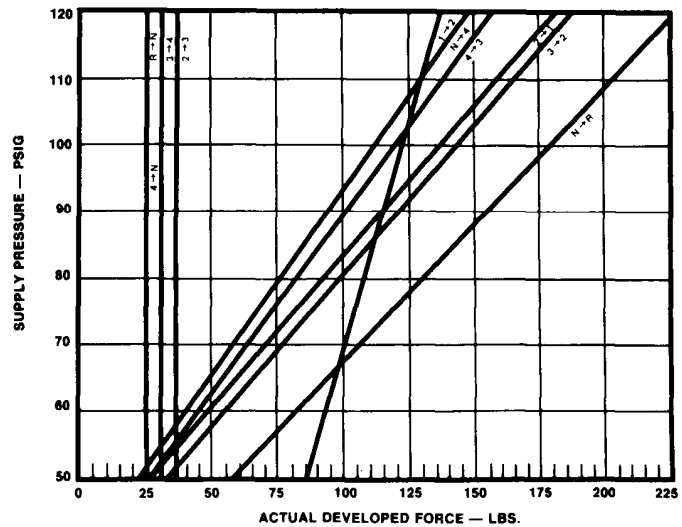
SIX POSITION CYLINDER

M4-N-1B CYLINDER

Cast Aluminum Body

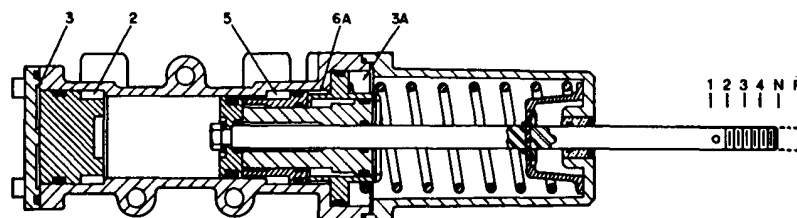


CONDITION OF PORTS					
CYLINDER POSITION	CAVITY				
	3	2	5	3A	6A
R	S/V	S	V	V	V
N	S/V	V	V	V	V
4	SV	V	V	V	S
3	SV	V	V	S	V
2	S	V	S	SV	SV
1	V	V	S	SV	SV
S SUPPLIED			V VENTED		



ASSEMBLY VIEW

PORT & CAVITY NUMBERS



PC. NO. P63982-0001

Multiposition Air Cylinders

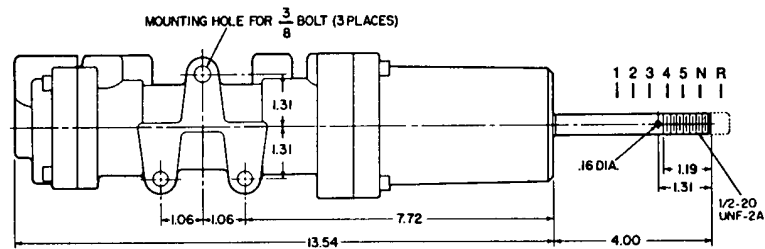
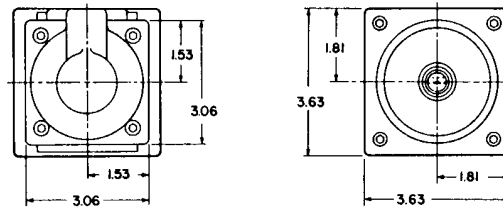
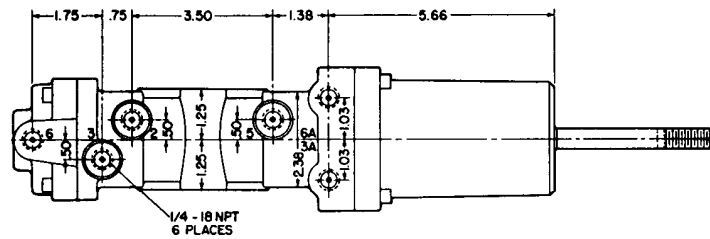
Six and Seven Position



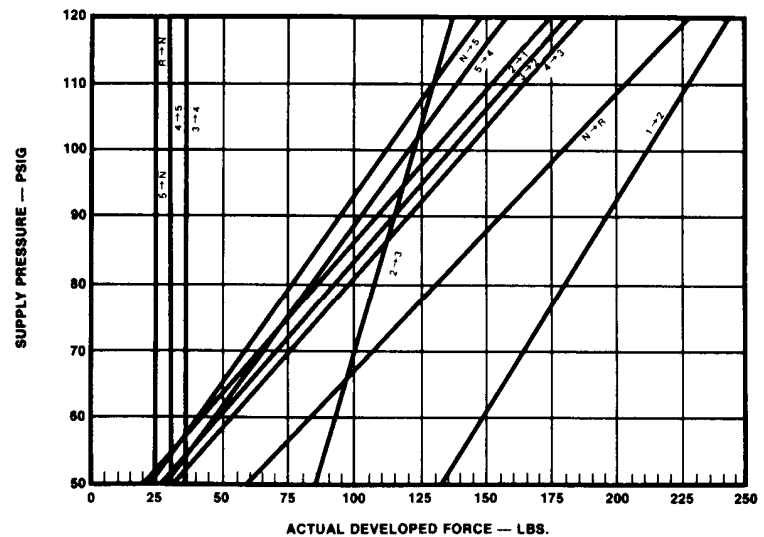
SEVEN POSITION CYLINDER

M5-N-1B CYLINDER

Cast Aluminum Body

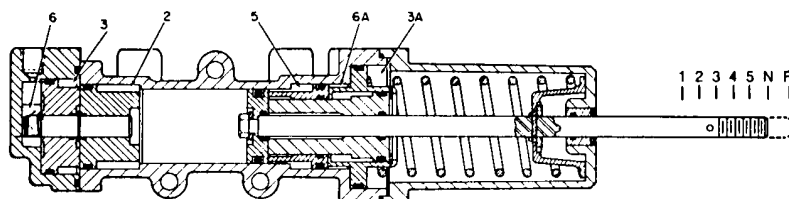


CONDITION OF PORTS						
CYLINDER POSITION	CAVITY					
	6	3	2	5	3A	6A
R	SV	SV	S	V	V	V
N	SV	SV	V	V	V	V
5	SV	SV	V	V	V	S
4	SV	SV	V	V	S	V
3	SV	S	V	S	SV	SV
2	S	V	V	S	SV	SV
1	V	V	V	S	SV	SV
S SUPPLIED			V VENTED			



ASSEMBLY VIEW

PORT & CAVITY NUMBERS



PC. NO. P63981-0002

Multiposition Air Cylinders

Eight Position

Rexroth
Bosch Group



The Eight-Position Cylinder is a medium duty pneumatic positioning device that operates through eight predetermined positions of 3/8" increments with a total stroke length of 2-5/8". Although it was primarily designed for power-shift transmissions it may also be utilized for indexing and any other application where a fixed stroke can be used. The ideal companion valve for the cylinder is REXROTH's Type "P" eight-position ROTAIR® Valve, but a suitable substitute is an electro-pneumatic switching set-up using 3-way solenoids. The cylinder is extremely rugged, having an anodized, corrosion-resistant, lightweight aluminum body, pistons and piston stops. Seals are Teflon coated nitrile compound.

INSTALLATION

Mount the eight-position cylinder in any desirable plane to a sturdy, flat surface (preferably with the ports facing down) with three 3/8" bolts. Mounting lugs are cast in the body of the cylinders. Avoid misalignment with the load to be positioned since side thrust and binding will affect the service life of the rod bearing and piston stop seals.

All ports are 1/4"-18 NPT pipe size. The following ports should be piped together with "T" connections; 1 with 1A, 3 with 3A and 6 with 6A. Connections should be made as close to the cylinder as possible to reduce the number of lines from the control valve.

NOTE: When the REXROTH Type "P" ROTAIR® Control Valve P55556-0003 or P55556-0004 is used, the ports on cylinder P55557-0003 correspond directly to the port numbers stenciled on the valve. When cylinder P56426-0004 is utilizing port number 2 on the valve, it should be connected to port number 5 on the cylinder; and port number 5 on the valve should be connected to port number 2 on the cylinder to provide the reversal of the neutral position in that cylinder.

OPERATION

Maximum operating pressure of the eight-position cylinder is 150 psi at a temperature range of -40° F to 160° F. The cylinder assumes any one of its eight positions when air pressure from the control valve is supplied in accordance with the tables on the following pages.

The forces developed by the cylinder are functions of exposed piston area and amount of air pressure applied, and are tabulated according to rod positions in graphs on the following pages.

Internal springs return the piston rod to its "neutral" position when air pressure is intentionally or unintentionally exhausted from the control lines. This is a safety feature that insures against operation in case of a loss of air supply.

In the event that an application may not need the above feature, cylinder P61185-0002 with no return springs is available.

These cylinders should be mounted with the pipe ports pointed down to avoid accumulation of condensate in the cylinder pressure spaces. Drain holes are also provided on the port side in the front spring housing for the same reason on P55557-0003 and P56426-0004, and are functionally interchangeable with P55557-0001, P55557-0002 and P56426-0001, P56426-0002 and P56426-0003.

Cylinder Part Number	Repair Kit No.	Weight
P55557-0003 & 2	P56556-0005	11.5
P56426-0004 & 3	P56556-0004	11.5
P61185-0002	P64556-0001	11.5

With these repair kits, the elastomer seals and some common wear parts on the component are renewed. On severely worn or damaged components, additional parts may be required. For additional parts, information and service instructions, refer to Service Bulletin SM-1000.4904.

Multiposition Air Cylinders

Eight Position

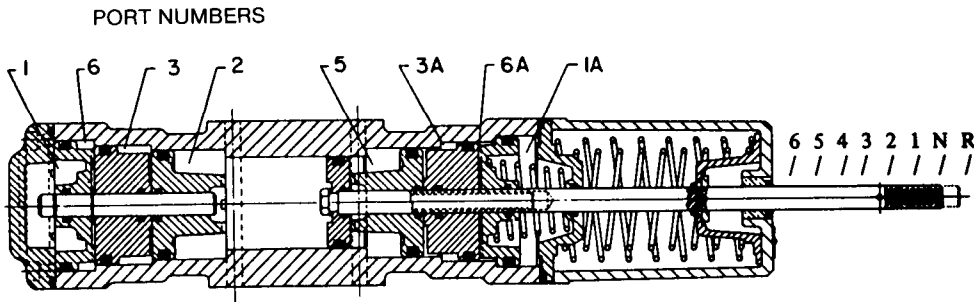


ORDERING REFERENCE

M6-N-1B EIGHT POSITION CYLINDER Complete

P55557-0003

ASSEMBLY VIEW

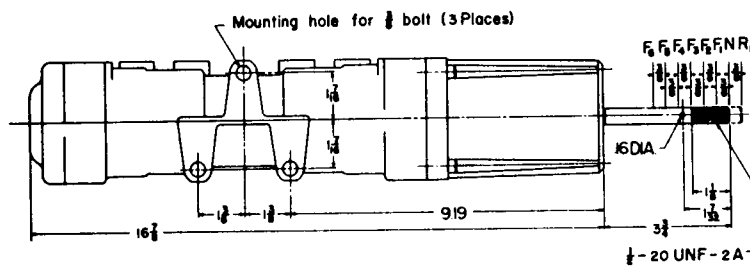
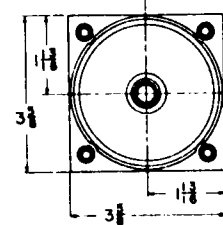
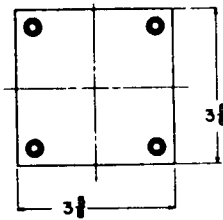
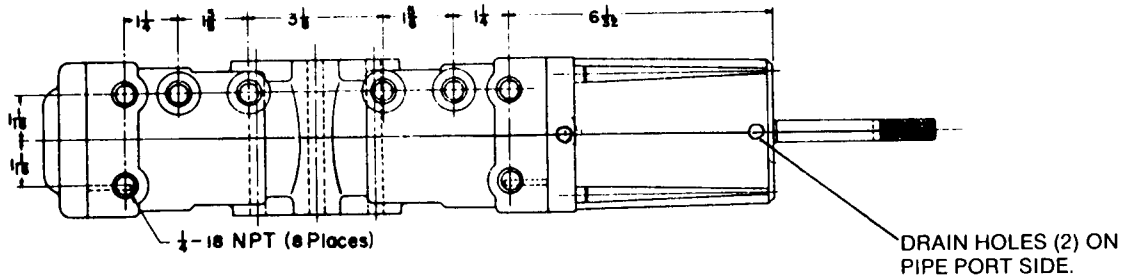


PORTING DIAGRAM P55557-0003

Cylinder Position	CAVITY							
	1	6	3	2	5	3A	6A	1A
R	S/V	S/V	S/V	S	V	V	V	V
N	S/V	S/V	S/V	S	V	V	V	S
F1	S/V	S/V	S/V	V	V	V	S	S/V
F2	S/V	S/V	S/V	V	V	S	S/V	S/V
F3	S/V	S/V	S	V	S	S/V	S/V	S/V
F4	S/V	S	V	V	S	S/V	S/V	S/V
F5	S	V	V	V	S	S/V	S/V	S/V
F6	V	V	V	V	S	S/V	S/V	S/V

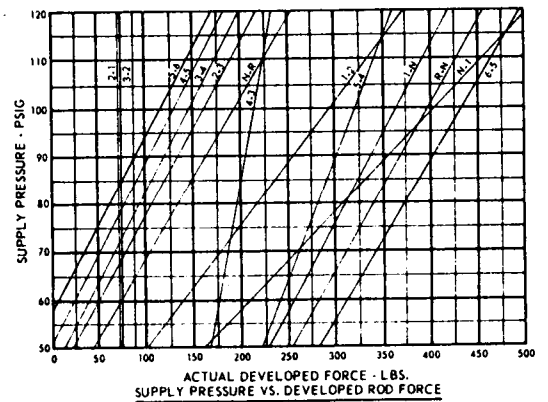
S - Supplied, V = Vented S/V = Supplied or Vented

OUTLINE DIMENSIONS



REVERSE IN EXTENDED POSITION

AVAILABLE FORCES



Denotes rod travel from position 5 to position 6 (typical)

Note: Actual force in lbs. available in position N (zero air pressure) 70 lbs.

Figure 5

Multiposition Air Cylinders

Eight Position

Rexroth
Bosch Group

ORDERING REFERENCE

M1-N-6B EIGHT POSITION CYLINDER Complete

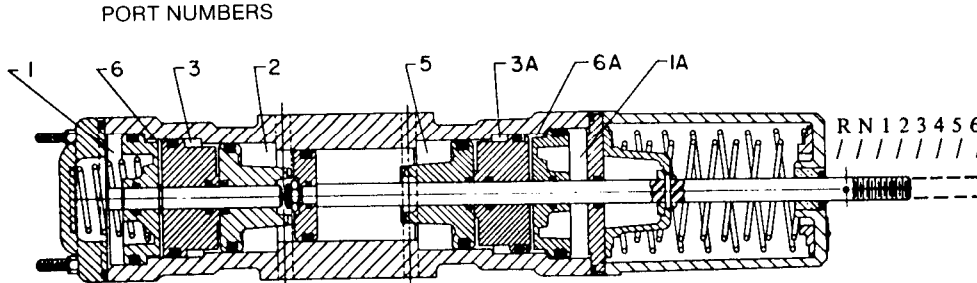
P56426-0004

PORTING DIAGRAM P56426-0004

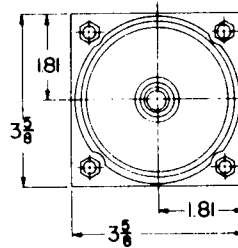
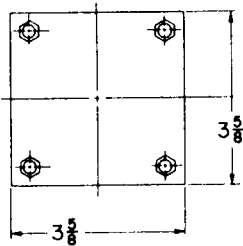
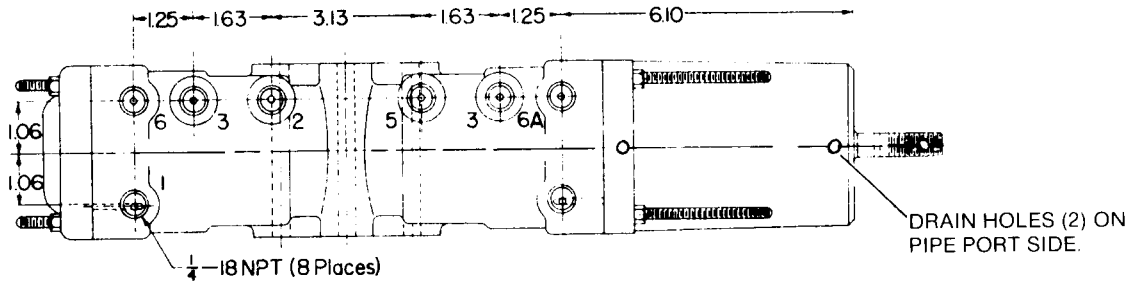
Cylinder	CAVITY							
	1A	6A	3A	2	5	3	6	1
R	S/V	S/V	S/V	V	S	V	V	V
N	S/V	S/V	S/V	V	S	V	V	S
F1	S/V	S/V	S/V	V	V	V	S	S/V
F2	S/V	S/V	S/V	V	V	S	S/V	S/V
F3	S/V	S/V	S	S	V	S/V	S/V	S/V
F4	S/V	S	V	S	V	S/V	S/V	S/V
F5	S	V	V	S	V	S/V	S/V	S/V
F6	V	V	V	S	V	S/V	S/V	S/V

S = Supplied, V = Vented S/V = Supplied or Vented

ASSEMBLY VIEWS

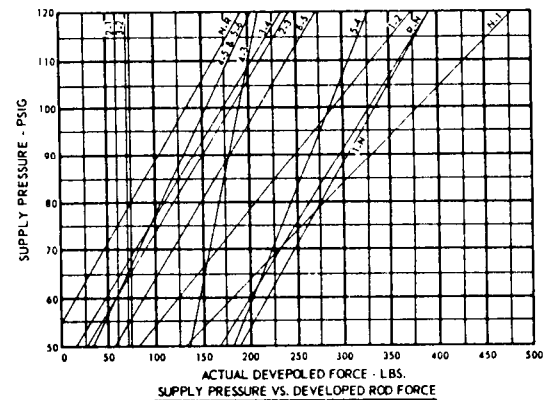
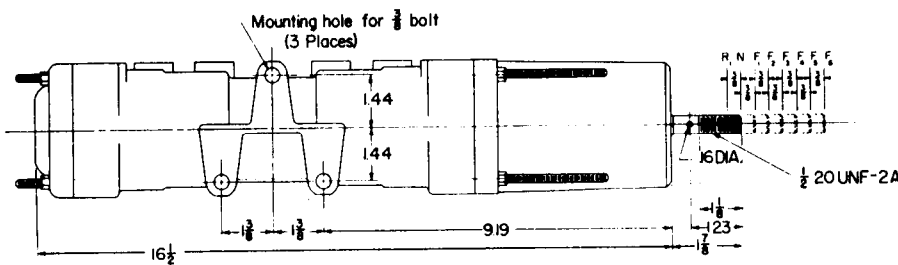


OUTLINE DIMENSIONS



REVERSE IN RETRACTED POSITION

AVAILABLE FORCES



Denotes rod travel from position N to position R (typical)

Note: Actual force in lbs. available in position N (zero air pressure) 70 lbs.

Figure 6

Multiposition Air Cylinders

Eight Position



ORDERING REFERENCE

M-8 EIGHT POSITION CYLINDER

P61185-0002

PORTING DIAGRAM P61185-0002

Cylinder Position	CAVITY							
	1	6	3	2	5	3A	6A	1A
1	S/V	S/V	S/V	S	V	V	V	V
2	S/V	S/V	S/V	S	V	V	V	S
3	S/V	S/V	S/V	S	V	V	S	S/V
4	S/V	S/V	S/V	S	V	S	S/V	S/V
5	S/V	S/V	S	V	S	S/V	S/V	S/V
6	S/V	S	V	V	S	S/V	S/V	S/V
7	S	V	V	V	S	S/V	S/V	S/V
8	V	V	V	V	S	S/V	S/V	S/V

S = Supplied, V = Vented S/V = Supplied or Vented

PORT NUMBERS

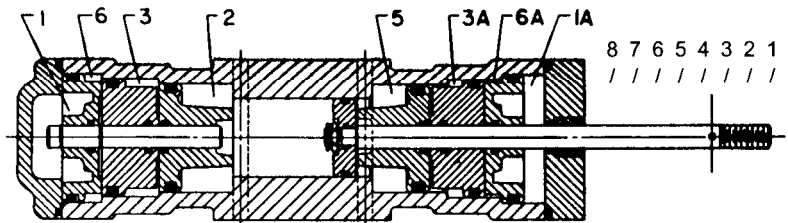
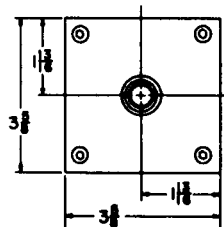
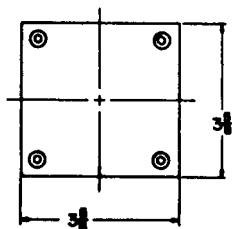
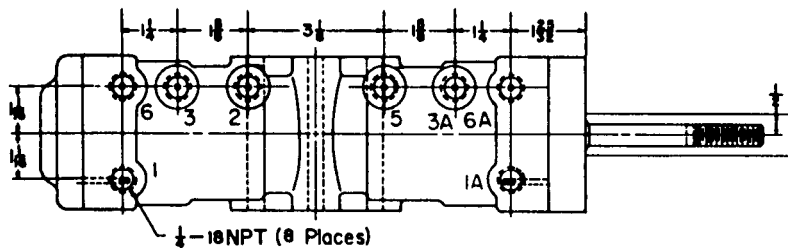


Figure 4

OUTLINE DIMENSIONS



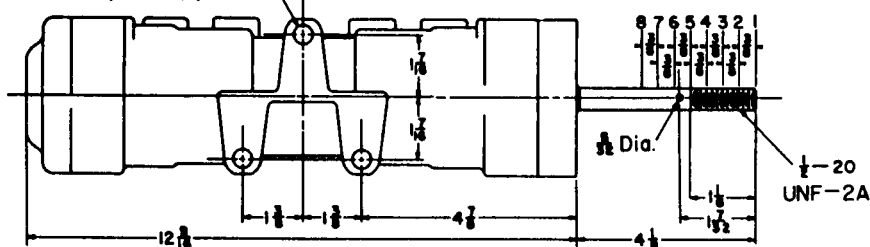
AVAILABLE FORCES

MOVEMENT	NET AREA P61185-0001	FI
2 ← 1	3.12	28.1
2 → 1	3.14	19.9
3 ← 2	2.06	2.4
3 → 2	3.14	19.9
4 ← 3	1.06	10.1
4 → 3	3.14	16.6
5 ← 4	2.95	8.4
5 → 4	3.14	10.0
6 ← 5	2.95	16.9
6 → 5	1.25	16.4
7 ← 6	2.95	16.9
7 → 6	2.25	11.6
8 ← 7	2.95	18.1
8 → 7	3.31	15.6

P = Pressure, A = Net Area in ²
FI = Approximate Friction in lbs.

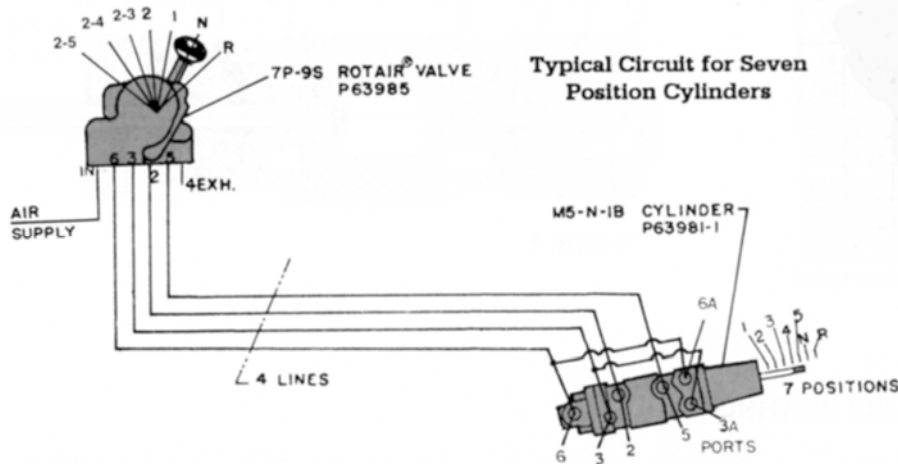
$$\text{Force} = (P \times A) - FI$$

Mounting hole for 3/8" bolt
(3 Places)



Transmission Control Systems

The basic REXROTH pneumatic multi-position control system consists of a multi-position power cylinder and a rotary type selector valve connected by only air lines. An air supply pressure in the range of 90-150 psig is connected to the rotary valve. For each handle position of the rotary valve, a different combination of the air lines is pressurized... causing the cylinder to move to corresponding positive positions and hold in these positions. A typical single circuit for seven-position cylinders is diagrammed below. (see pages 30-34 for other circuits.)

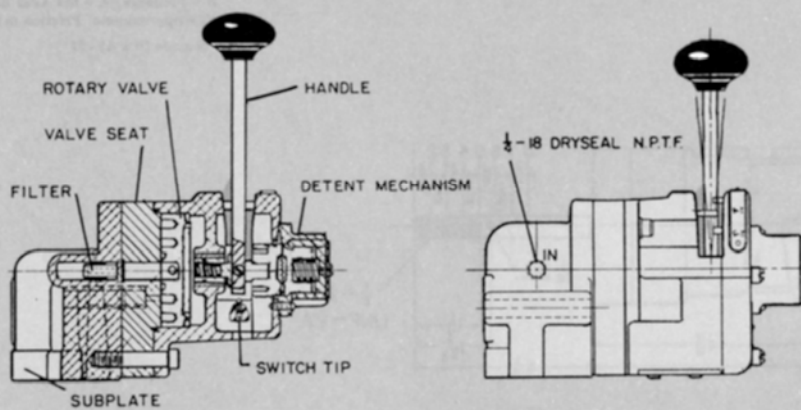
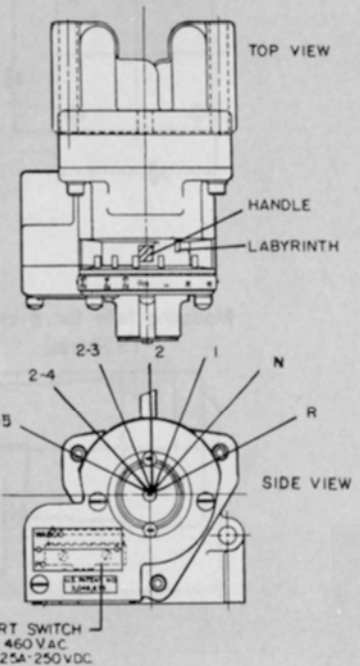
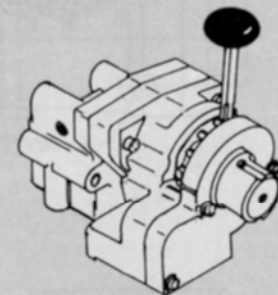


7P-9S ROTAIR® Pneumatic Directional Valve — P63985

Consists of a subplate portion containing air strainers in each port connection, a seat and rotary disc valve section, a handle operating section containing the handle labyrinth and position detents, and an interlock switch section with a SPDT switch depressed only when the handle is in N position. Note the open labyrinth design which permits the handle to be moved quickly between desired positions and to N Position. Detents for each position permit the operator to feel the handle location for each selection. When the handle is released, it spring offsets between two pins to help prevent inadvertent operation. A complete description, dimensions, parts and service information is contained in service bulletin B4-76.00.

PORTING DIAGRAM				
PC. NO. P63985, 7P-9S				
ROTAIR VALVE				
HDL. POS.	PRESSURE SUPPLIED TO PORTS			
	6	3	2	5
R			X	
N				
1				X
2	X			X
2-3	X	X		X
2-4		X		
2-5	X			

Port in side of the pipe bracket is "IN" port. Port #4 is exhaust. #1 is plugged.



Features of REXROTH Pneumatic Control Systems

LINEAR POSITIONING CYLINDER

- Positive linear positioning
- Each position held with rated forces
- Six or seven positions
- Cylinder forces can position both automatic selection lever and manual step control valve
- Spring return to neutral on loss of air pressure
- Minimum number of parts
- Easy service

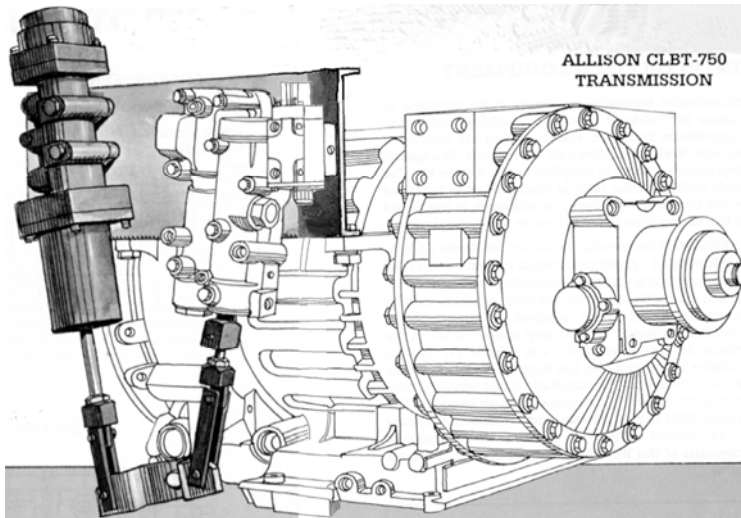
ROTARY CONTROL VALVE

- Multi-position valve handle permits quick selection of any speed
- Valve position sequence: R-N-F1-F2-F3-F4-F5 (manual mode); R, N, 1, 2, 2-3, 2-4, 2-5 (automatic mode)
- Quick shift to N with open labyrinth & detents on valve handle
- Neutral position interlock switch
- SPDT switch built in valve for starting interlock
- Compact, subplate mounting for easy servicing
- Integral line filters in valve assembly

NO ELECTRICAL CONNECTIONS OR CABLE REQUIRED FOR OPERATION

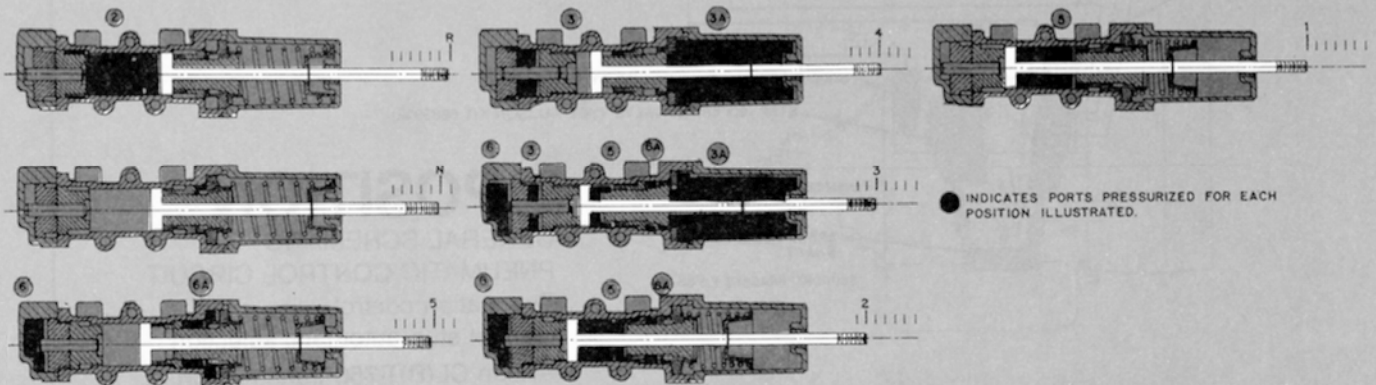
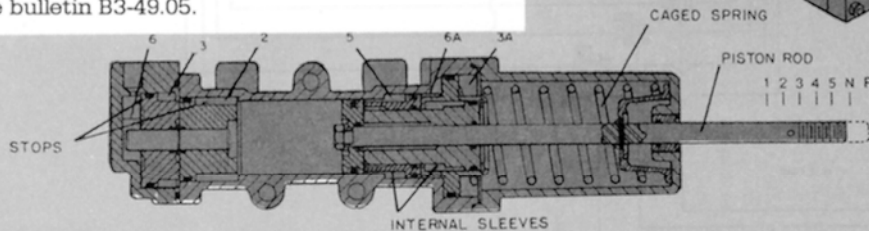
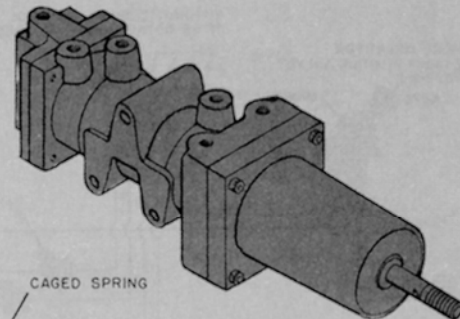
- Only four (4) air line connections from cylinder to valve
- Wiring is required for neutral start switch (interlock)

MULTIPLE STATION CONTROL • EASY MOUNTING



M5-N-1B Seven Position Cylinder — P63981-2

Consists of a main body section containing piston and piston stops, and a nose section containing a caged spring assembly for control of the cylinder to neutral position. The cylinder has six ports which are interconnected to the four lines from the control valve. Each positive position is determined by the internal stops and sleeves as shown. A complete description, dimensions, parts and service information is contained in service bulletin B3-49.05.



ALLISON 750 SERIES TRANSMISSIONS FOR MANUAL/AUTOMATIC OPERATION ON OILFIELD EQUIPMENT

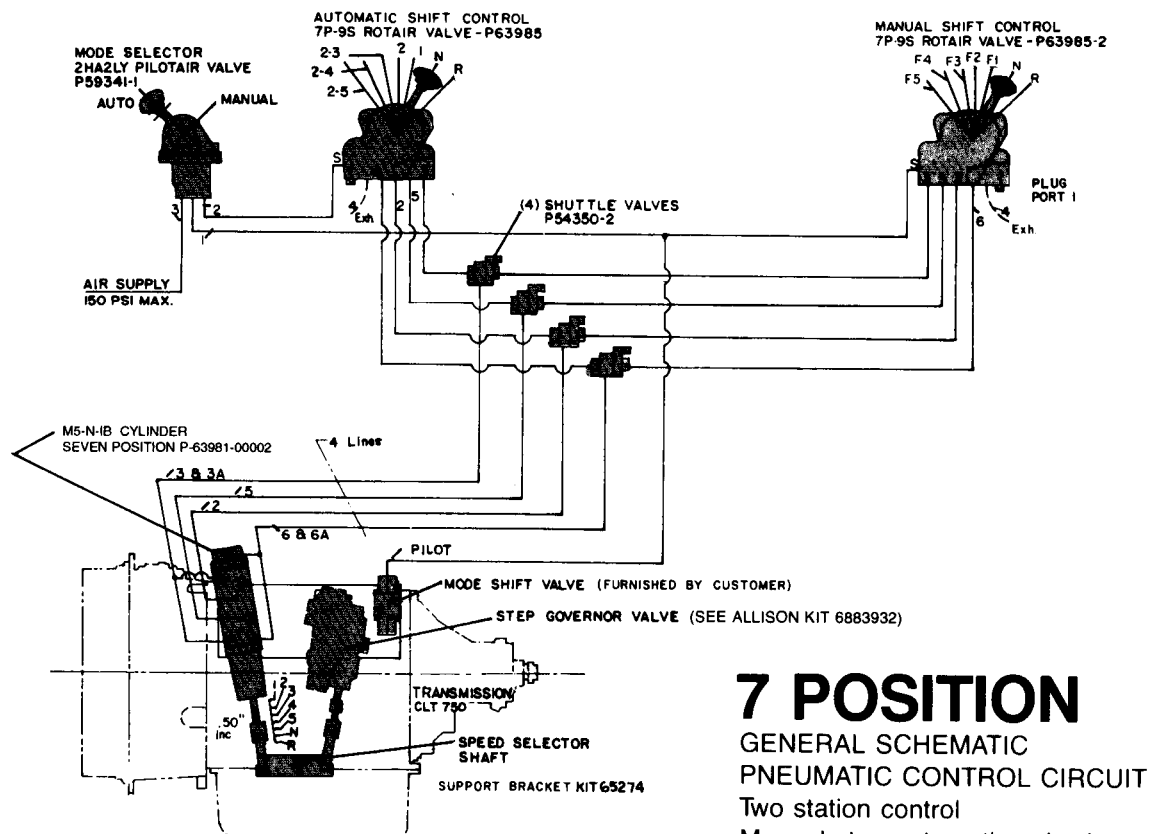
Detroit Diesel Allison has obsoleted the model CLT 4460 transmission used widely on mobile oilwell drilling and servicing equipment. A new 750 series transmission was substituted for current and future orders.

The CLT 4460 transmission was a manual powershift model and the new CL(B)T-750 is basically an automatic shift model. In response to oilfield requirements, Allison has developed a manual/automatic kit for the new CL(B)T-750 transmission which permits the selection of either full automatic or manual step operation. This permits a mobile rig to be "roaded" in full automatic and "worked" with manual step control for speed selection.

This dual mode kit is Allison part 6883932 and is fully described in Allison instruction sheet 109 and drawing AS45-052. For manual/automatic control 6883940 and two additional components must be installed and operated in conjunction with the normal speed selector shaft. The separate step governor valve must be operated in synchronization with the speed selector shaft, and a mode shift valve connected in the

transmission hydraulic system must be operated to change the mode of operation. Modifications to the transmission hydraulic system piping are necessary and specified in the Allison kit instructions. The special step governor valve is supplied in the Allison kit. The mode shift hydraulic valve is specified but is furnished by the customer. The dealer, or customer, is instructed to mount and pipe these valves on the transmission.

REXROTH, in cooperation with Detroit Diesel Allison, has developed a pneumatic control system for this dual mode operation of the transmission, CL(B)T-750. Allison instructions permit "roading" a vehicle only in automatic mode. They suggest an interlock be provided to prevent manual step operation when the vehicle is being "roaded". The REXROTH system provides this feature in the form of a station select system which shifts to automatic mode whenever the driving control valve is supplied with air pressure. The system shifts to manual step mode whenever the draw works control valve is pressurized. A general schematic of the REXROTH control system is shown below.



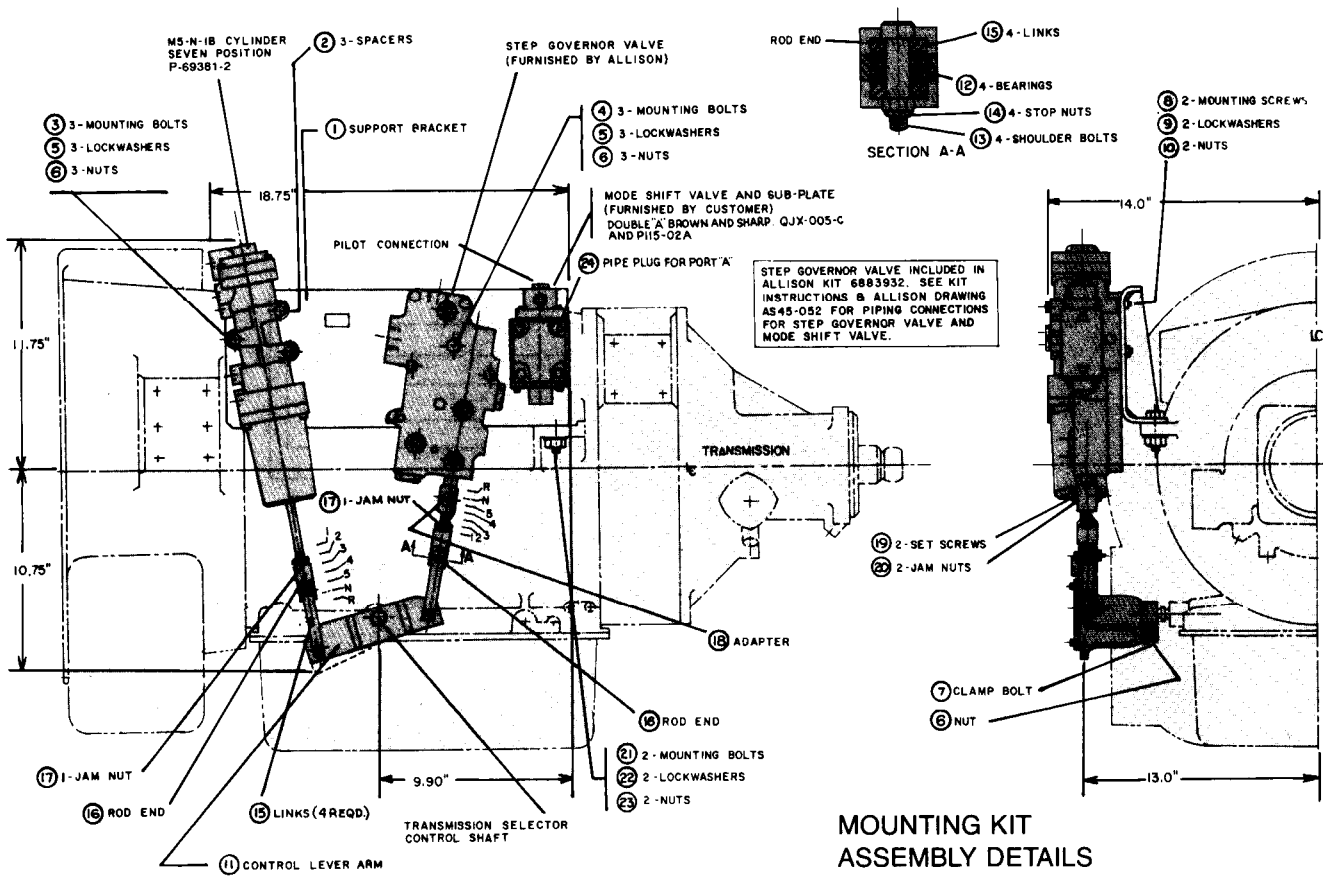
7 POSITION
GENERAL SCHEMATIC
PNEUMATIC CONTROL CIRCUIT
Two station control
Manual step-automatic selection
Allison CL(B)T-750 transmission

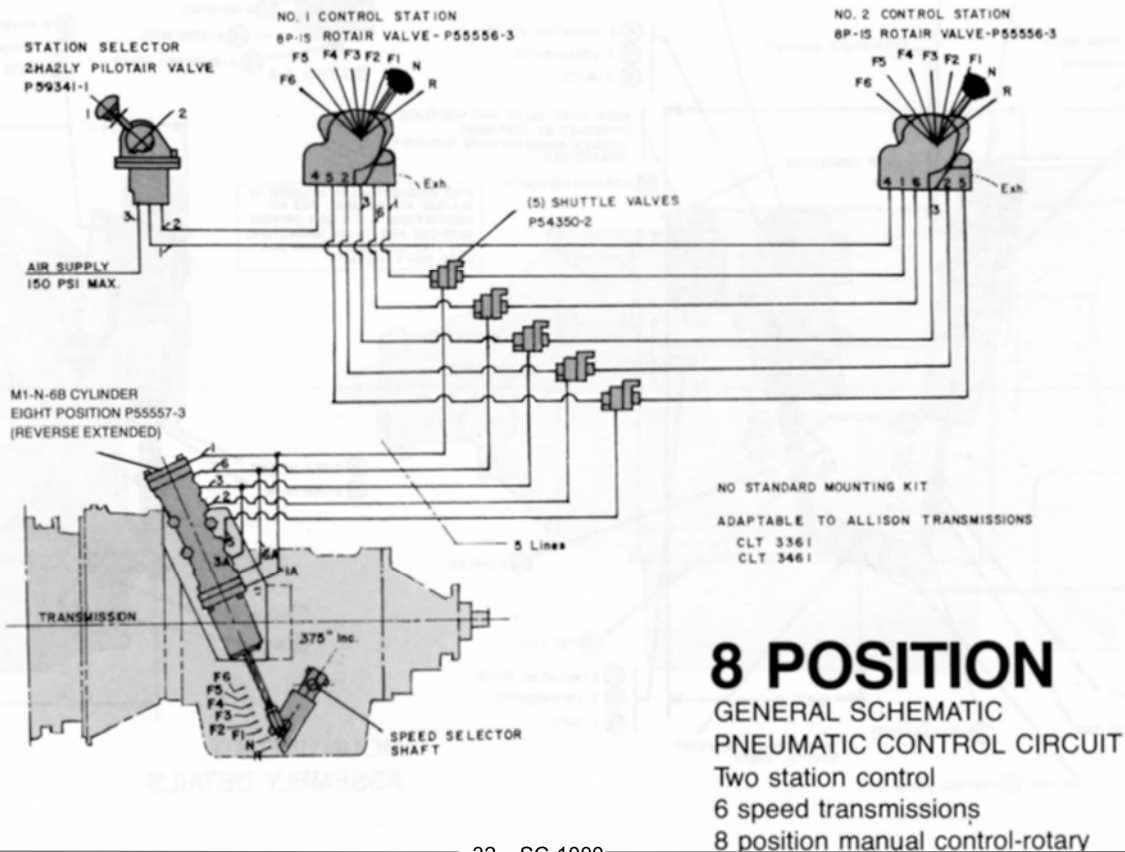
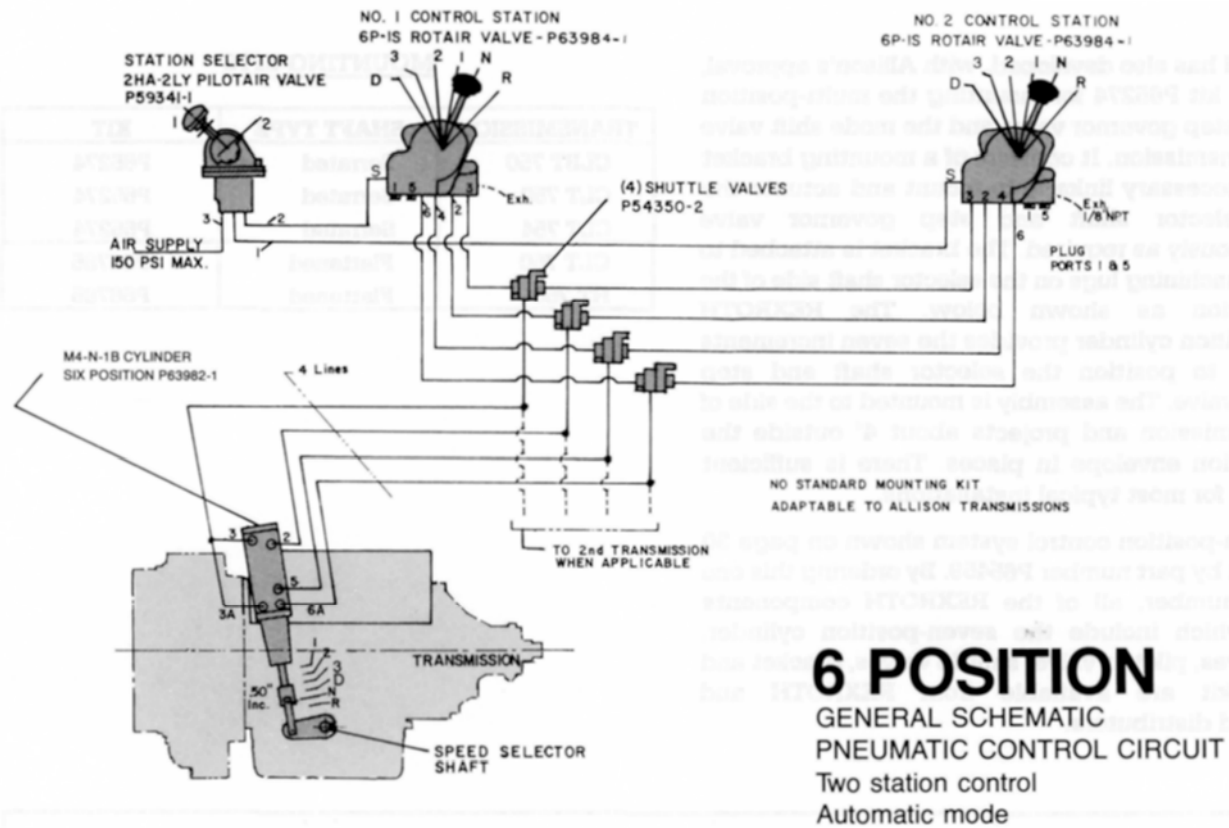
REXROTH has also developed, with Allison's approval, a bracket kit P65274 for mounting the multi-position cylinder, step governor valve and the mode shift valve to the transmission. It consists of a mounting bracket and the necessary linkage to mount and actuate the speed selector shaft and step governor valve simultaneously as required. The bracket is attached to the two machining lugs on the selector shaft side of the transmission as shown below. The REXROTH multi-position cylinder provides the seven increments of stroke to position the selector shaft and step governor valve. The assembly is mounted to the side of the transmission and projects about 4" outside the transmission envelope in places. There is sufficient clearance for most typical installations.

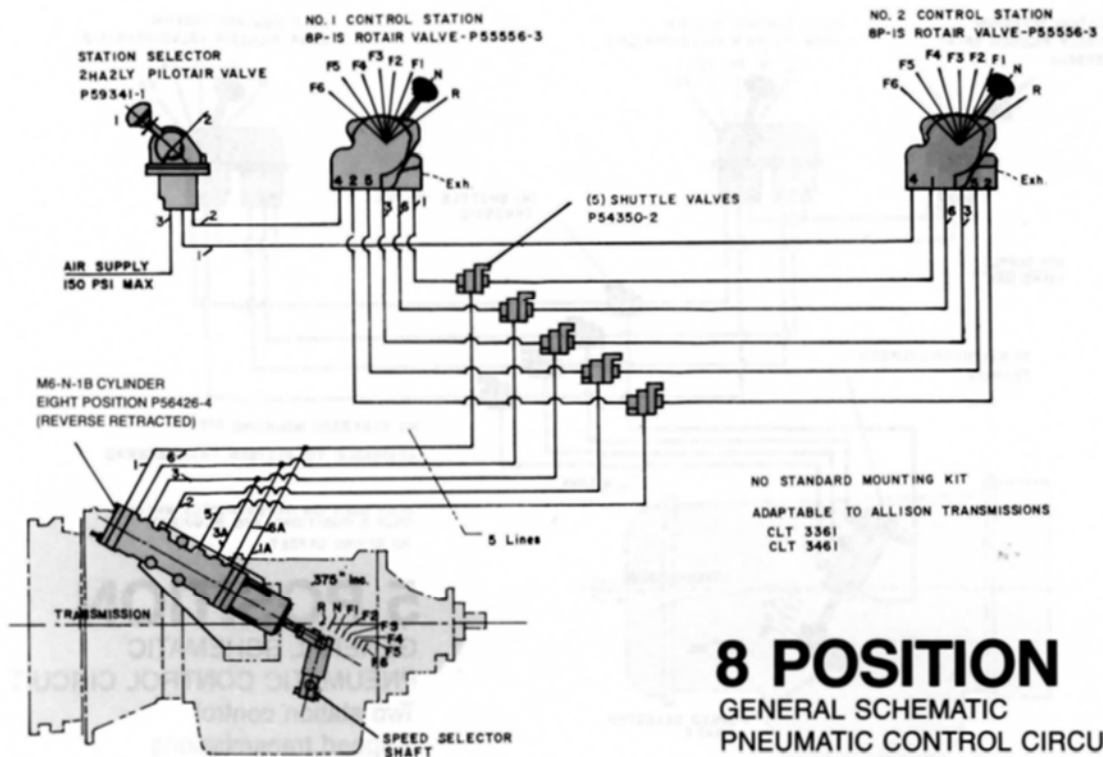
The seven-position control system shown on page 30 is covered by part number P65459. By ordering this one kit part number, all of the REXROTH components shown which include the seven-position cylinder, rotair valves, pilotair valve, shuttle valves, bracket and linkage kit are available from REXROTH and authorized distributors.

MOUNTING KITS

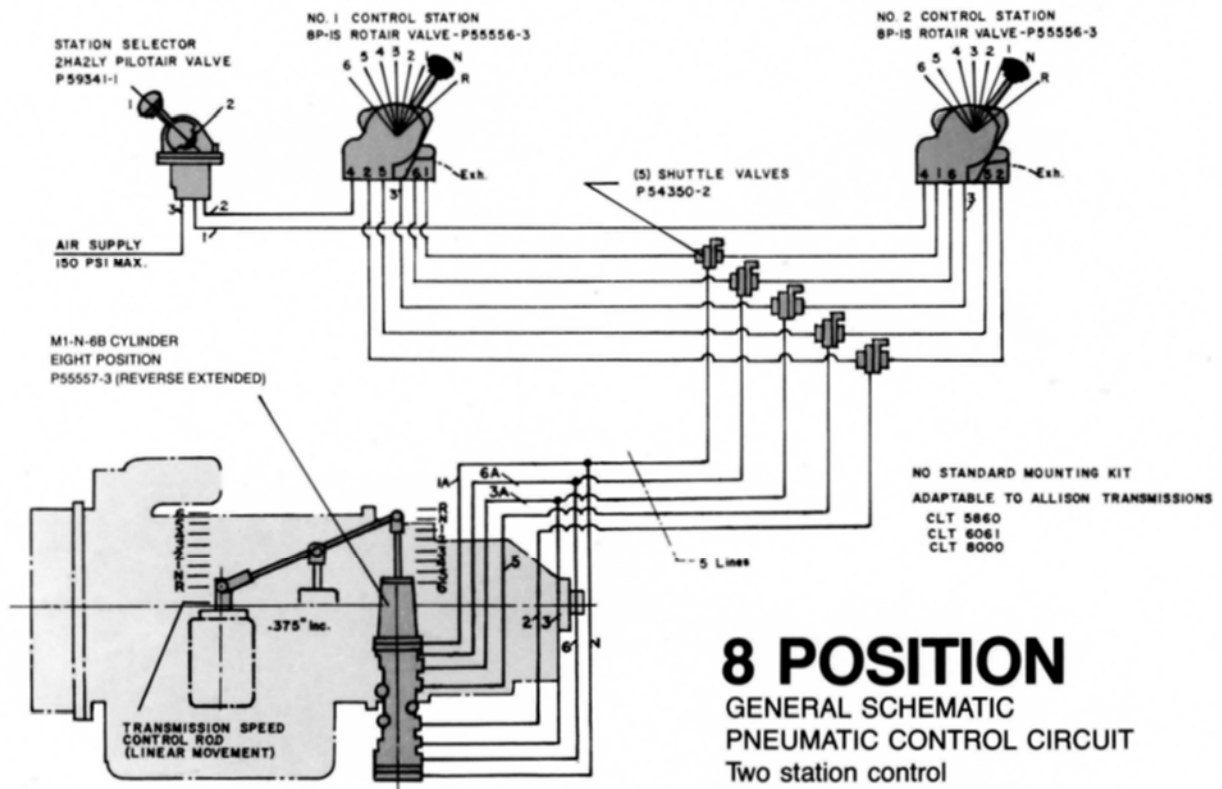
TRANSMISSION	SHAFT TYPE	KIT
CLBT 750	Serrated	P65274
CLT 750	Serrated	P65274
CLT 754	Serrated	P65274
CLT 750	Flattened	P66785
HT 750	Flattened	P66785





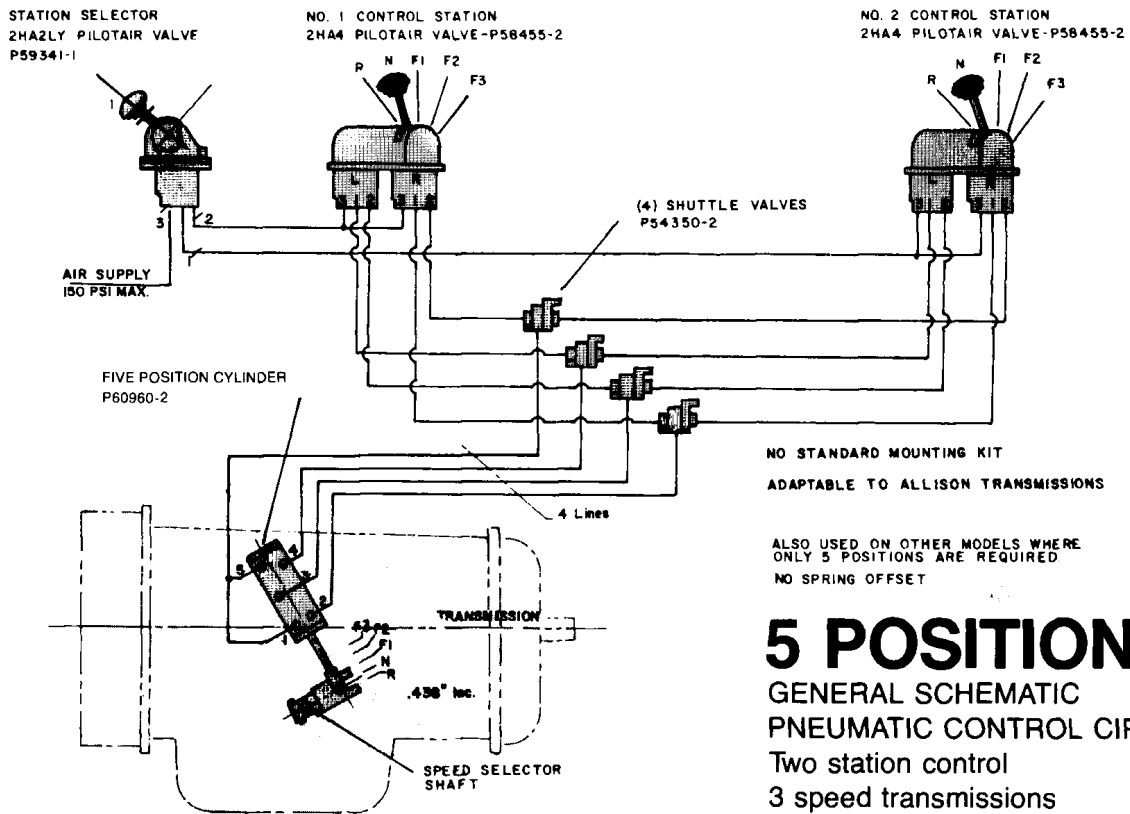


8 POSITION
GENERAL SCHEMATIC
PNEUMATIC CONTROL CIRCUIT
Two station control
6 speed transmissions
8 position manual control-rotary



8 POSITION
GENERAL SCHEMATIC
PNEUMATIC CONTROL CIRCUIT
Two station control
6 speed transmissions
8 position manual control-linear

Transmission Control Systems



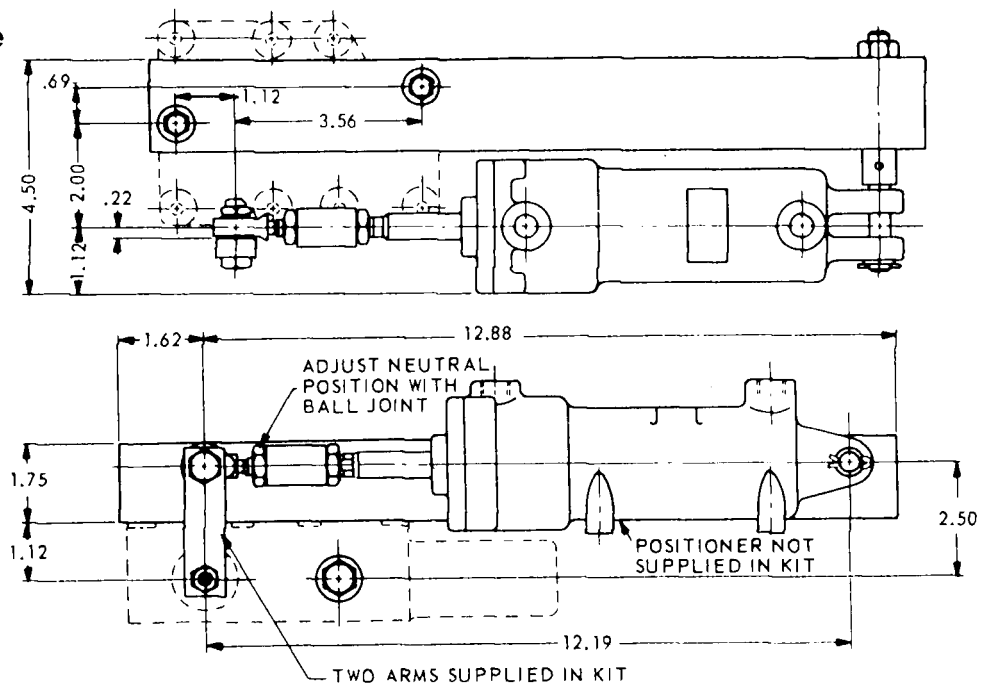
Mounting Bracket Kit for Sundstrand Pumps

Part Number P-064424-00000

Bracket and hardware for mounting Rexroth positioner part number P-059833-01000 to Sundstrand pump models 20 through 28.

Dimension Reference

Mounting Bracket
Kit P64424



NOTICES TO PRODUCT USERS

1. WARNING: FLUID MEDIA

Bosch Rexroth pneumatic devices are designed and tested for use with filtered, clean, dry, chemical free air at pressures and temperatures within the specified limits of the device. For use with media other than air or for human life support systems, Bosch Rexroth must be consulted. Hydraulic cylinders are designed for operation with filtered, clean, petroleum based hydraulic fluid; operation using fire-resistant or other special types of fluids may require special packing and seals. Consult the factory.

2. WARNING: MATERIAL COMPATIBILITY

Damage to product seals or other parts caused by the use of non-compatible lubricants, oil additives or synthetic lubricants in the air system compressor or line lubrication devices voids Bosch Rexroth's warranty and can result in product failure or other malfunction. See lubrication recommendations below.

AIR LINE LUBRICANTS! In service higher than 18 cycles per minute or with continuous flow of air through the device, an air line lubricator is recommended. * (Do not use line lubrication with vacuum products.) However, the lubricator must be maintained since the oil will wash out the grease, and lack of lubrication will greatly shorten the life expectancy. The oils used in the lubricator must be compatible with the elastomers in the device. The elastomers are normally BUNA-N, NEOPRENE, VITON, SILICONE and HYTREL. Bosch Rexroth recommends the use of only petroleum-based oils without synthetic additives, and with an aniline point between 180° and 210° F.

COMPRESSOR LUBRICANTS! All compressors (with the exception of special "oil free" units) pass oil mist or vapor from the internal crankcase lubricating system through to the compressed air. Since even small amounts of non-compatible lubricants can cause severe seal deterioration (which could result in component and system failure) special care should be taken in selecting compatible compressor lubricants. It is recommended that users review the National Fluid Power Association "Recommended Guide Lines For Use Of Synthetic Lubricants In Pneumatic Fluid Power Systems" (NFPA T1-1978).

3. WARNING: INSTALLATION AND MOUNTING

The user of these devices must conform to all applicable electrical, mechanical, piping and other codes in the installation, operation or repair of these devices.

INSTALLATION! Do not attempt to install, operate or repair these devices without proper training in the technique of working on pneumatic or hydraulic systems and devices, unless under trained supervision. Compressed air and hydraulic systems contain high levels of stored energy. Do not attempt to connect, disconnect or repair these products when system is under pressure. Always exhaust or drain the pressure from system before performing any service work. Failure to do so can result in serious personal injury.

MOUNTING! Devices should be mounted and positioned in such manner that they cannot be accidentally operated.

4. WARNING: APPLICATION AND USE OF PRODUCTS

The possibility does exist for any device or accessory to fail to operate properly through misuse, wear or malfunction. The user must consider these possibilities and should provide appropriate safe guards in the application or system design to prevent personal injury or property damage in the event of malfunction.

5. WARNING: CONVERSION, MAINTENANCE AND REPAIR

When a device is disassembled for conversion to a different configuration, maintenance or repair, the device must be tested for leakage and proper operation after being reassembled and prior to installation.

MAINTENANCE AND REPAIR! Maintenance periods should be scheduled in accordance with frequency of use and working conditions. All Bosch Rexroth products should provide minimum of 1,000,000 cycles of maintenance free service when used and lubricated as recommended. However, these products should be visually inspected for defects and given an "in system" operating performance and leakage test once a year. Where devices require major repair as result of the one million cycles, one year, or routine inspection, the device must be disassembled, cleaned, inspected, parts replaced as required, rebuilt and tested for leakage and proper operation prior to installation. See individual catalogs for specific cycle life estimates.

6. PRODUCT CHANGES

Product changes including specifications, features, designs and availability are subject to change at any time without notice. For critical dimensions or specifications, contact factory.

*Many Bosch Rexroth pneumatic components can operate with or without air line lubrication; see individual sales catalogs for details.

--Refer to the appropriate service catalog for parts and service information.

LIMITATIONS OF WARRANTIES & REMEDIES

Bosch Rexroth warrants its products sold by it to be free from defects in material and workmanship to the following:

For twelve months after shipment Bosch Rexroth will repair or replace (F.O.B. our works), at its option, any equipment which under normal conditions of use and service proves to be defective in material or workmanship at no charge to the purchaser. No charge will be made for labor with respect to defects covered by this Warranty, provided that the work is done by Bosch Rexroth or any of its authorized service facilities. However, this Warranty does not cover expenses incurred in the removal and reinstallation of any product, nor any downtime incurred, whether or not proved defective.

All repairs and replacement parts provided under this Warranty policy will assume the identity, for warranty purposes, of the part replaced, and the warranty on such replacement parts will expire when the warranty on the original part would have expired. Claims must be submitted within thirty days of the failure or be subject to rejection.

This Warranty is not transferable beyond the first using purchaser. Specifically, excluded from this Warranty are failures caused by misuse, neglect, abuse, improper operation or filtration, extreme temperatures, or unauthorized service or parts. This Warranty also excludes the use of lubricants, fluids or air line additives that are not compatible with seals or diaphragms used in the products. This Warranty sets out the purchaser's exclusive remedies with respect to products covered by it, whether for negligence or otherwise. Neither, Bosch Rexroth nor any of its affiliates will be liable for consequential or incidental damages or other losses or expenses incurred by reason of the use or sale of such products. Our liability (except as to title) arising out of the sale, use or operation of any product or parts, whether on warranty, contract or negligence (including claims for consequential or incidental damage) shall not in any event exceed the cost of replacing the defective products and, upon expiration of the warranted period as herein provided, all such liability is terminated. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER FOR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE. No attempt to alter, amend or extend this Warranty shall be effective unless authorized in writing by an officer of Bosch Rexroth Corporation.

Bosch Rexroth reserves the right to discontinue manufacture of any product, or change product materials, design or specifications without notice.

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The data specified herein only serves to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The given information does not release the user from obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

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