

MULTIPOSITION AIR CYLINDER CAST ALUMINUM THREE-POSITION - SPRING-CENTERED SERVICE INFORMATION



The three-position cylinder is a fixed position device when controlled by a four-way, three-position, exhaust-centered, 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 1” (25.4 mm) on each side of the center position, making a total piston rod travel of 2” (50.8 mm). External envelope dimensions of the cylinder do not change, but shorter strokes are available in increments of 1/16” (1.59 mm) for each position. The model number of the cylinder and the model number of the piston stop (13A) 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.



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 a system is under pressure. Always exhaust or drain the pressure from a 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 a manner that they cannot be accidentally operated.

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

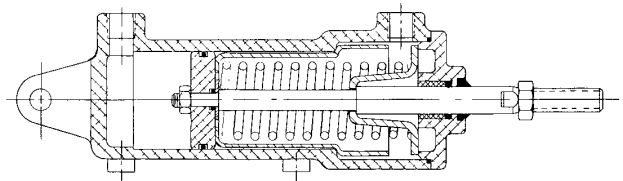
cylinder, all air lines in the system should be blown clean. It is recommended that the cylinder be mounted with the ports facing down. Gravity can then assist in preventing foreign material from accumulating in the cylinder by removing it through the control valve exhaust.

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. 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 (10.3 bar) at a temperature range of -40°F to 180°F (-40°C to 82°C). 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.

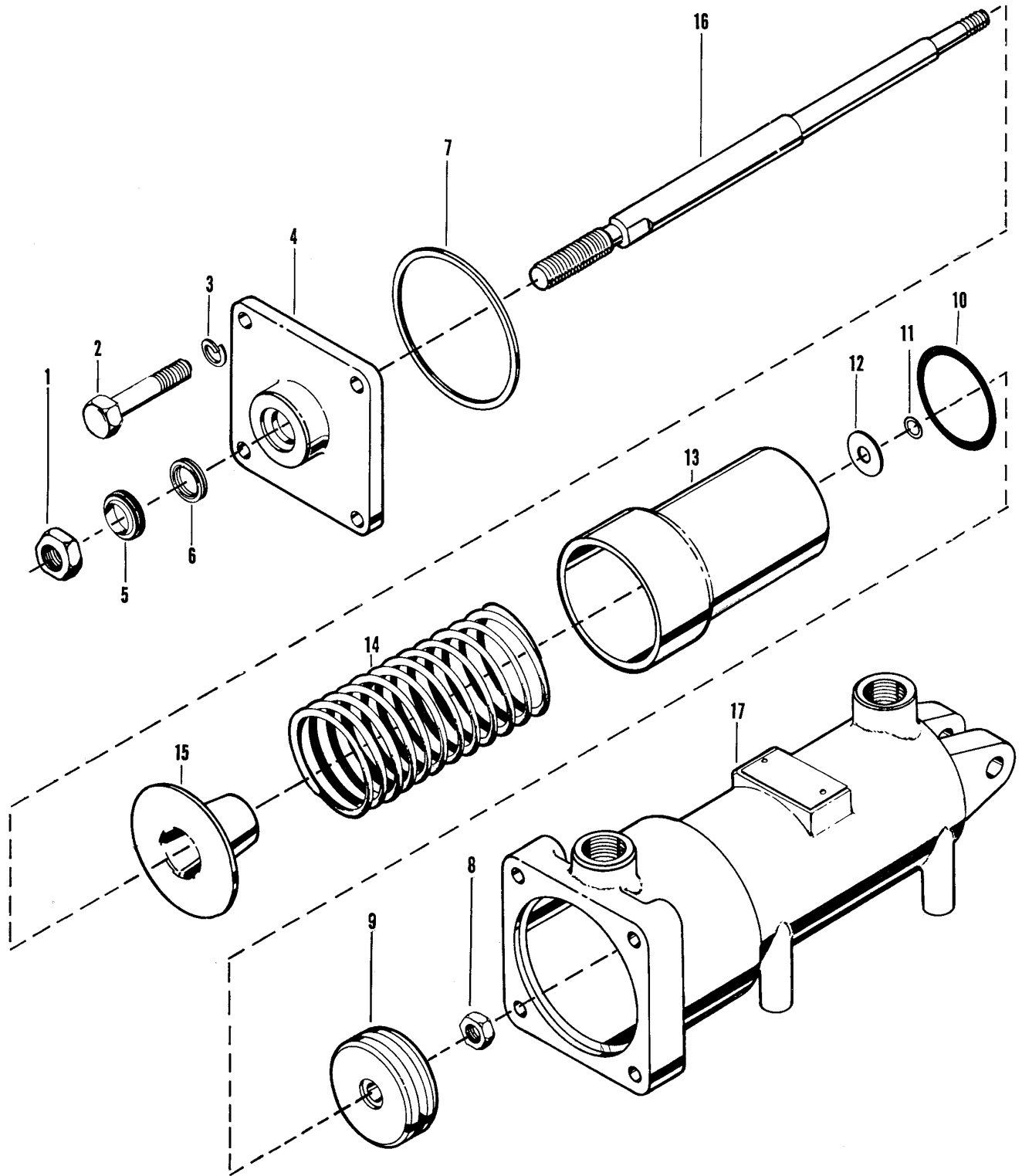


ASSEMBLY VIEW

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.



EXPLODED VIEW

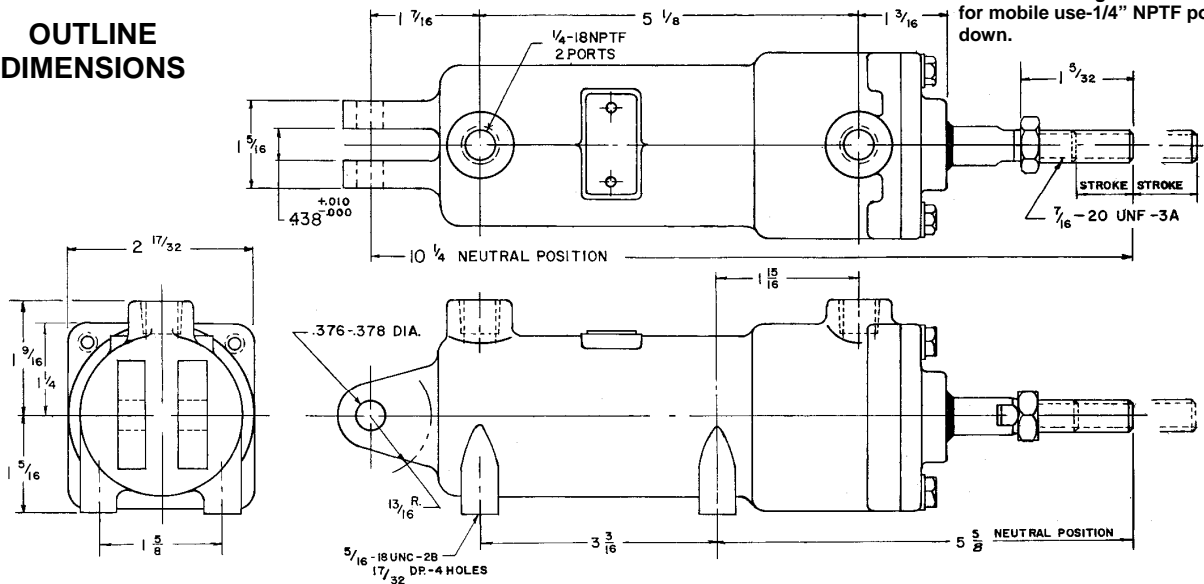
PARTS LIST (In Order of Disassembly)

REF.	QTY.	DESCRIPTION	NEW PART NO.	MODEL NO. / OLD PART NO.
		CYLINDER, Three-Position	R431004052 R431004053 R431004054 R431004055 R431004056 R431004057 R431004058 R431004059 R431004060 R431006294 —	P -057378-00312 P -057378-00375 P -057378-00438 P -057378-00500 P -057378-00625 P -057378-00688 P -057378-00750 P -057378-00875 P -057378-01000 P -063522-01000 P -066824-01000
		† CYLINDER, Three-Position (1.062" Stroke)	R431004943	P -059211-00000
1	1	NUT, 7/16"-20 Jam	R431002447	P -049903-00020
2	4	SCREW, 1/4"-20 x 7/8 Hex.-Head Cap	R431002219	P -049832-00019
3	4	WASHER, 1/4" Lock	R431002345	P -049866-00009
4	1	HEAD, Bushed	R431004068	P -057381-00003
5*	1	WIPER, 3/4" O.D. Rod	See Kit	See Kit
6*	1	O-RING, 11/16" O.D.	See Kit	See Kit
7*	1	TETRASEAL, 2-3/8" O.D.	See Kit	See Kit
8	1	NUT, 1/4"-28 Lock	R431001871	P -049589-00000
9	1	PISTON	R431004033	P -057374-00000
10*	1	O-RING, 1-3/4" O.D.	See Kit	See Kit
11*	1	O-RING, 3/8" O.D.	See Kit	See Kit
12	1	WASHER, 3/4" O.D. Piston	R431002166	P -049804-00045
13A	1	STOP, Piston (For models: P -066824-00000, P -063522-00000, & P -057378-00000)	R431004071 R431004072 R431004073 R431004074 R431004076 R431004077 R431004078 R431004079 R431004081	P -057384-00312 P -057384-00375 P -057384-00438 P -057384-00500 P -057384-00625 P -057384-00688 P -057384-00750 P -057384-00875 P -057384-01000
13B	1	STOP, Piston (for R432004943) (Old P/N P -059211-00000 only)	R431004942	P -059210-00000
14	1	SPRING, Centering	R431004050	P -057376-00000
15	1	CAGE, Spring	R431004878	P -059000-00000
16	1	ROD, Piston	R431004069	P -057383-00000
17	1	BODY	R431004061	P -057379-00000

* Recommended spare parts to be retained in stock at all times. These parts are available in kit form by ordering Repair Kit Part No. R431005249 (Old Part No. P -059819-00000)

† Cylinder with fixed stroke longer than standard - stroke-length code in part number suffix does not apply.

OUTLINE DIMENSIONS



AVAILABLE FORCES

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

Pounds of force = applied pressure (psi) x piston area 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:

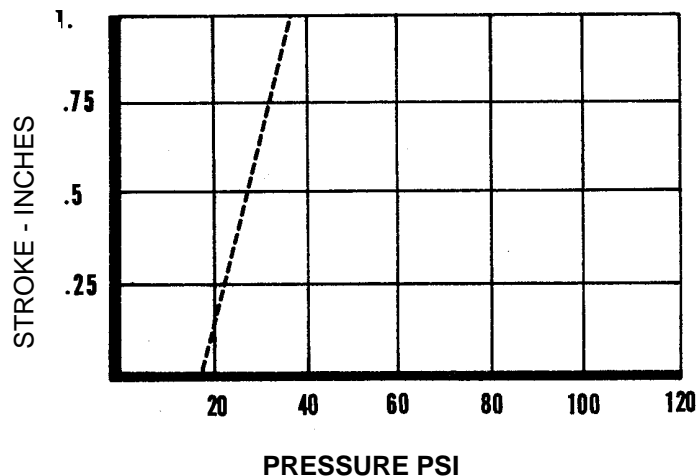
Part Number R431004052 (P -057378-00312), R431006294 (P -063522-01000),
P -066824-01000 & R431004943 (P -059211-00000)

Pounds of force (retracted stroke) = applied pressure (psi) x 2.2 inches (56 mm)
minus 18 psi x 2.4 inches (1.2 bar x 61 mm)

Pounds of force (extended stroke) = applied pressure (psi) x 2.4 inches (61 mm)
minus 18 psi x 2.4 inches (1.2 bar x 61 mm)

For spring force at subsequent piston rod positions on either retracted or extended stroke, project across the graph from the appropriate stroke length 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 inches (61 mm) of piston area.

R431004052 (P -057378-000312), R431006294 (P -063522-01000),
P -066824-01000, R431004943 (P -0589211-00000)



PISTON AREA: EXTENDED 2.4
RETRACTED 2.2

NOTICE 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 noncompatible 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° F 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 T1.9.2-1978).

3. WARNING: INSTALLATION AND MOUNTING

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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 a system is under pressure. Always exhaust or drain the pressure from a 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 a 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 a 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 a 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 a major repair as a 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 valves and cylinders can operate with or without air line lubrication; see individual sales catalogs for details.

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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