

# H-3 CONTROLAIR® VALVE

## Service Information

### DESCRIPTION OF MODEL

The H-3 TYPE CONTROLAIR Valves are 3-way pneumatic pressure graduating valves. The operator portion is equipped with a cam roller which can be operated by another cam or similar mechanical operator. The roller actuates the pressure graduating portion to increase, decrease, or maintain graduated air pressure to a separate delivery line.

In "release" position the delivery line is connected to exhaust, except preload type. From "release" position, force down on the roller actuates the graduating portion to deliver graduated pressure to a delivery line according to the value of control spring being used. The roller is spring returned from all positions.



### **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.

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# Installation and General Maintenance Recommendations

## Installation

Before installing the CONTROLAIR® Valve, all air lines in the system should be blown clean to remove any moisture, dirt, or harmful contamination. Strainers are furnished in the INLET and OUTLET ports to protect the valve from large particles of foreign matter in the line. To further ensure long, trouble-free service, a 10 MICRON or better filter should be installed in the supply line to the valve.

The H-3 Type CONTROLAIR is designed for side mounting. Refer to page 3 for mounting dimensions. Allow suitable clearance for removal of the pipe bracket screws which are 1 3/4" long.

Travel of the cam roller and the position of the actuating device must be considered in mounting. Refer to the outline dimensions on page 3.

## General Maintenance and Repair

Maintenance periods should be scheduled in accordance with frequency of use and working environment of the CONTROLAIR Valve.

All valves must be visually inspected for wear and given an "in system" operating performance and leakage test at least once a year. If these visual observations indicate valve repair is required, the valve must be removed, repaired and tested.

A major overhaul is recommended at one million cycles, or every two years, whichever comes first.

When it is determined that the CONTROLAIR Valve requires a major repair as a result of the one million cycles, one year routine inspection, or the two year service period having elapsed, the device must be disassembled, cleaned, inspected, parts replaced as required, rebuilt and tested for leakage, and proper operation prior to installation. Refer to MAJOR REPAIR AND MAINTENANCE INSTRUCTION, pg. 11, and TEST PROCEDURES, pg. 12.

One complete CONTROLAIR Valve should be kept for each four valves in service. During the maintenance period, replace the complete valve with the "stand-by" unit. This will reduce downtime and afford inspection and replacement of worn parts at a more appropriate or opportune time and favorable location.

Notice that the operating portion of a valve can be removed without disturbing the pipe connections. Remove the valve from the pipe bracket by loosening (2) screws and lifting the unit free.

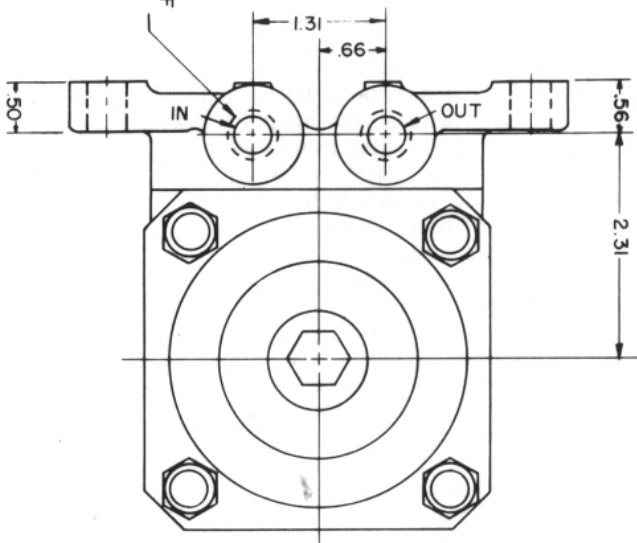
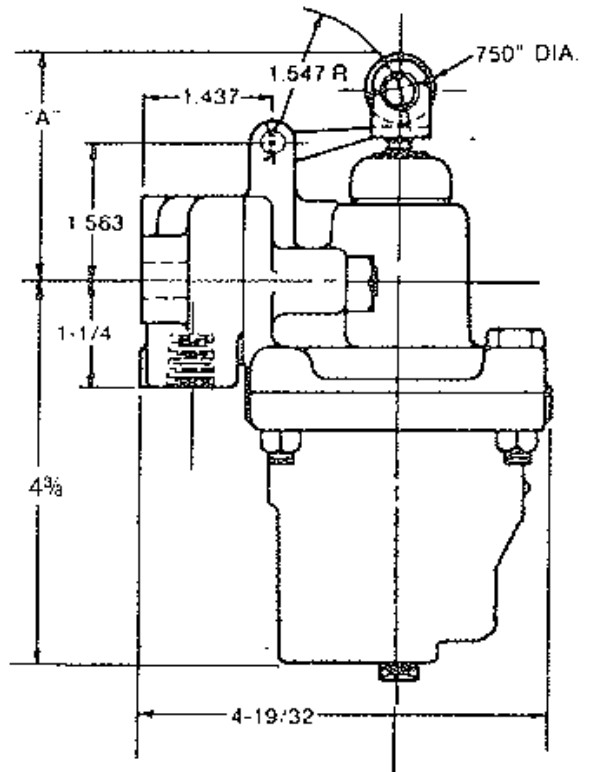
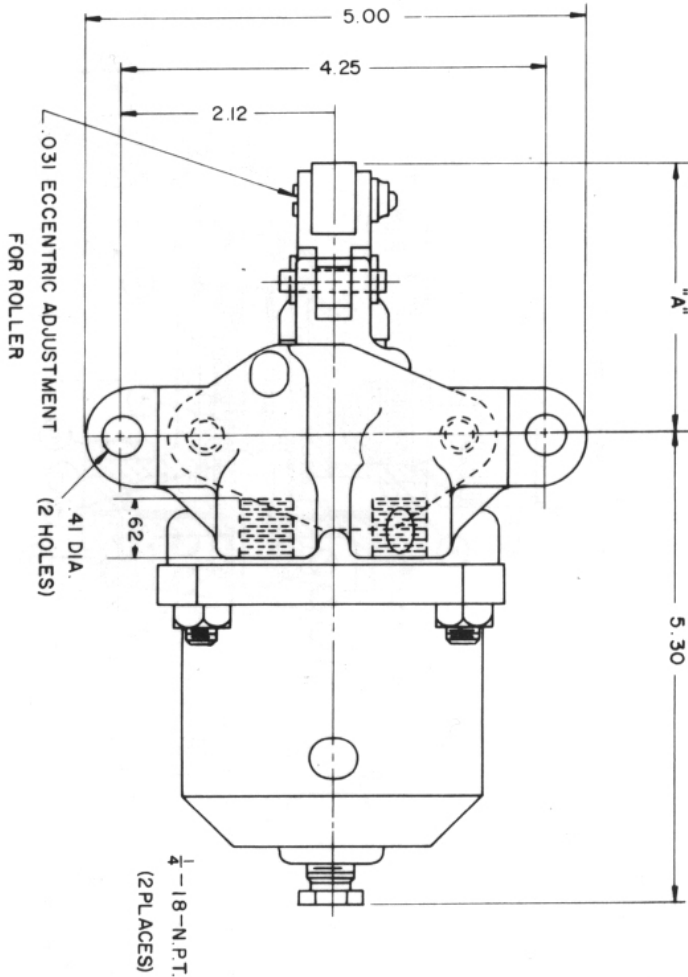
No special tools are required to maintain the CONTROLAIR Valve.

### Technical Data

Maximum Operating Pressure .....	200 psi (13.8 Bar)
Admissible Medium .....	Air, clean and dry
Operating Temperature .....	-40° F to +160° F (-40°C to +71°C)
Hysteresis.....	1 1/2 psi (0.1 Bar)
Control Pressure Range .....	(Reference Identity Chart, Pg 7)
Pressure Change.....	1/2 psi Increment (0.03 bar)
Mounting.....	Flange Plate
Port Size.....	1/4 - 18 NPTF
Materials	
Controlair Valve Housing and Body .....	Die Cast Aluminum
Internal Parts.....	Brass, Rubber (buna-N), Aluminum, and Steel
Weight .....	14.5 lbs (6.6. kg) approximately

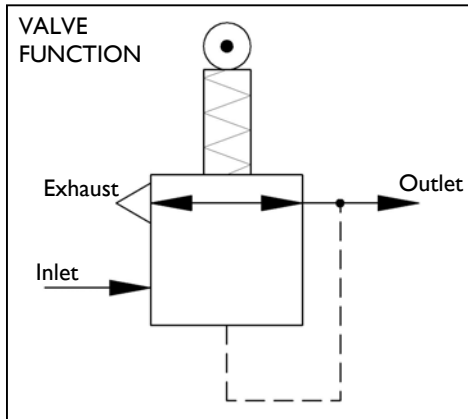
# H-3 CONTROLAIR® VALVES OUTLINE DIMENSIONS

Adjustable CAM Roller  
.031 Eccentric for total  
Roller adjustment of .062"  
to obtain 2.531 "A" Dim.



# DESCRIPTION OF OPERATION

## DIAGRAMMATIC VIEW

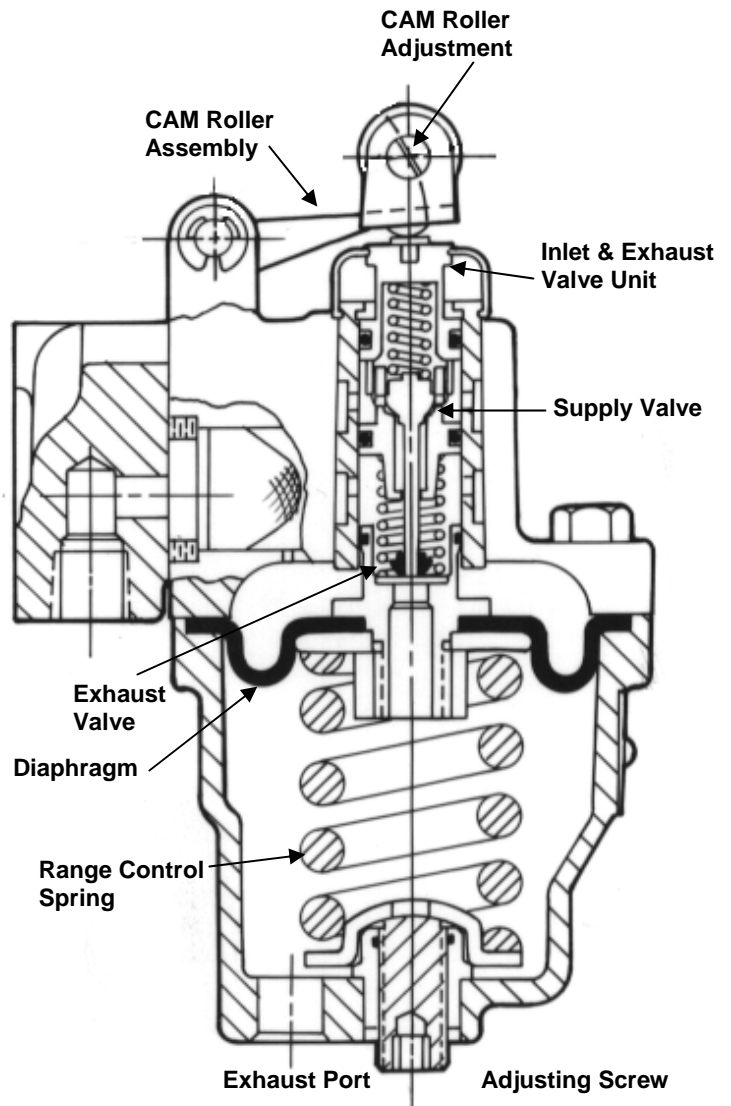


In released position, the supply valve is closed to supply pressure and "out" port is open to exhaust. Note in the diagram, when the roller is forced down to increase pressure, it pushes down the pressure control plunger, closing the lower exhaust valve and opening the upper supply valve which permits air to flow to out port delivery and the upper diaphragm chamber. As the pressure builds up in the delivery line it acts through the sensing port orifice and deflects the control diaphragm downward, compressing the control spring. When sufficient diaphragm deflection is reached to allow the upper supply valve in pressure control portion to close, the pressure in the delivery line is held to that value.

The value of the pressure delivered to the outlet port is proportional to the pressure control plunger movement. This movement in turn is controlled by the roller and is therefore proportional to the roller travel.

The CONTROLAIR Valve will automatically compensate for downstream air pressure changes in the graduated pressure delivery line. These air pressure changes can be caused by line leakage, temperature change or load feedback. If air pressure at the outlet port increases over that called for by roller position, the diaphragm in the control portion will deflect downward opening the lower exhaust valve and exhausting air until the original setting is obtained. If the pressure drops below that called for by the handle position, the decreased force on the diaphragm will allow the control spring to force the diaphragm upward, opening the upper supply valve to restore the set pressure.

The range of pressure is controlled by the strength of the diaphragm spring. Various values are available as shown on Identity Schedule, page 5.



## ASSEMBLY VIEW

# IDENTITY SCHEDULE

H-3 COMPLETE PART NUMBER	DELIVERY PRESSURE RANGE	VALVE CONTROL* PORTION COMPLETE	CONTROL SPRING & COLOR CODE		"A" DIMENSION			MAXIMUM OUT PRES-SURE +5/-0 PSI	NOTES
					NORMAL POSITION (1)	LAPPED POSITION (2)	MAXIMUM PRESSURE POSITION (3)		
P -050382-00001	0-65 psi	P -051085-00001	P -055442	Brown	2.531"	2.469"	2.203"	65 psi	
P -050382-00002	0-100 psi	P -051085-00002	526749	Yellow	2.531"	2.469"	2.213"	100 psi	
P -050382-00003	0-125 psi	P -051085-00003	540577	Light Blue	2.531"	2.469"	2.205"	125 psi	
P -050382-00004	0-150 psi	P -051085-00004	P -055441	Red	2.531"	2.469"	2.205"	150 psi	
P -050382-00006	0-15 psi	P -051085-00006	P -060293	White	2.531"	2.469"	2.201"	15 psi	
P -050382-00008	0-25 psi	P -051085-00008	P -060295	Dark Blue	2.531"	2.469"	2.160"	25 psi	
P -050382-00009	0-75 psi	P -051085-00010	531418	Dark Green	2.531"	2.469"	2.234"	75 psi	
P -050382-00013	15-50 psi	P -051085-00013	P -060291	Orange	2.531"	2.469"	2.189"	50 psi	
P -050382-00015	0-65 psi	P -051085-00001	P -055442	Brown	2.531"	2.469"	2.203"	65 psi	See note 1
P -050382-00016	0-175 psi	P -051085-00015	P -054159	Silver	2.531"	2.469"	2.220"	175 psi	
P -055184-00002	0-100 psi	P -055209-00002	526749	Yellow	2.531"	2.469"	2.213"	100 psi	See note 2
P -057531-00001	0-65 psi	P -058419-00000	P -055442	Brown	2.531"	2.469"	2.203"	65 psi	See note 3
P -063107-00000	0-70 w/FP	P -063107-00001	531418	Dark Green	--	--	--	Supply psi	See note 4
P -063234-00000	0-72 w/FP	P -063235-00000	531418	Dark Green	--	--	--	Supply psi	See note 4

\*Control portion less pipe bracket and mounting screws.

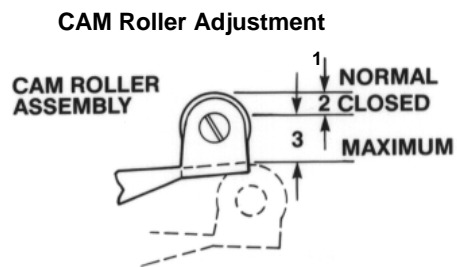
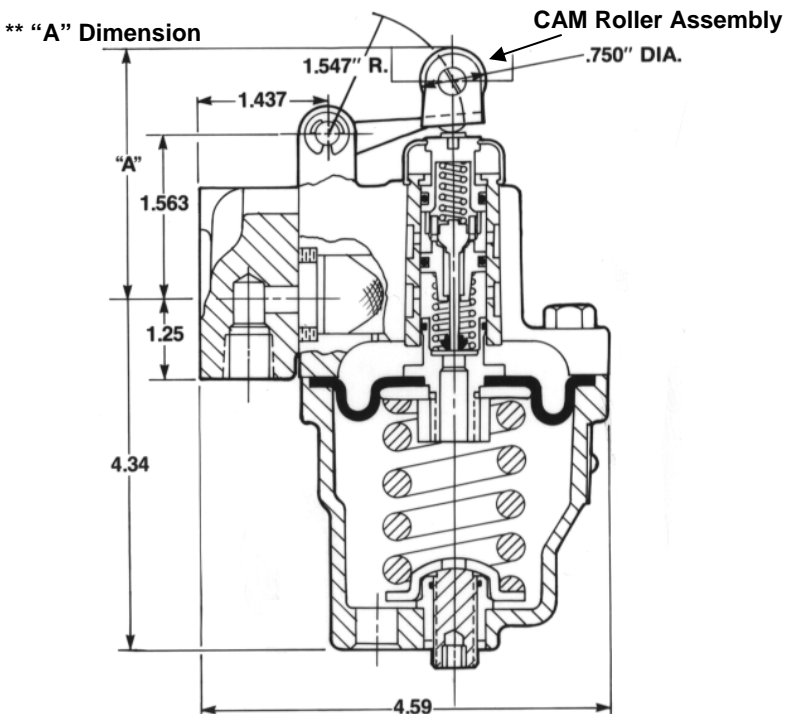
\*\*Locations of "A" dimensions (1), (2) and (3) shown on Assembly Views.

Note 1: Same as P -050382-00001 except ports in pipe bracket are 9/16-18 UNF thread, and Item 26 is part number P -059584-00000.

Note 2: Same as P -050382-00002 except tapped exhaust, and Item 2 is part number P -066488-00003.

Note 3: Same as P -050382-00001 except has special adjustable cam roller assembly with special parts.

Note 4: Same as P -050382-00009 except with full pressure feature and body less cam dog lugs (special valve portion, and item part numbers required, consult factory).

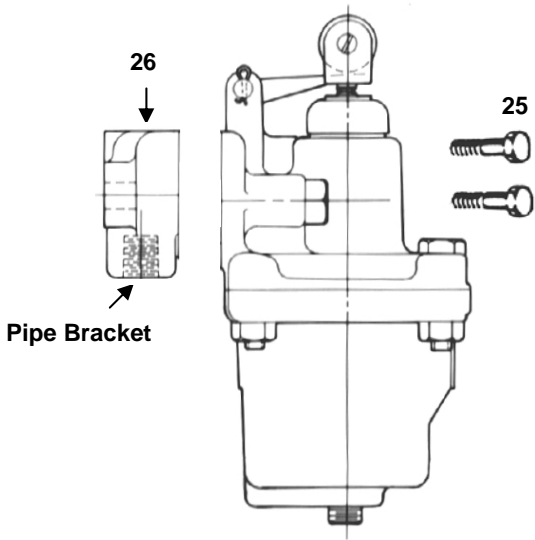


- (1) Release Position
- (2) Lapped Position
- (3) Maximum Pressure Position

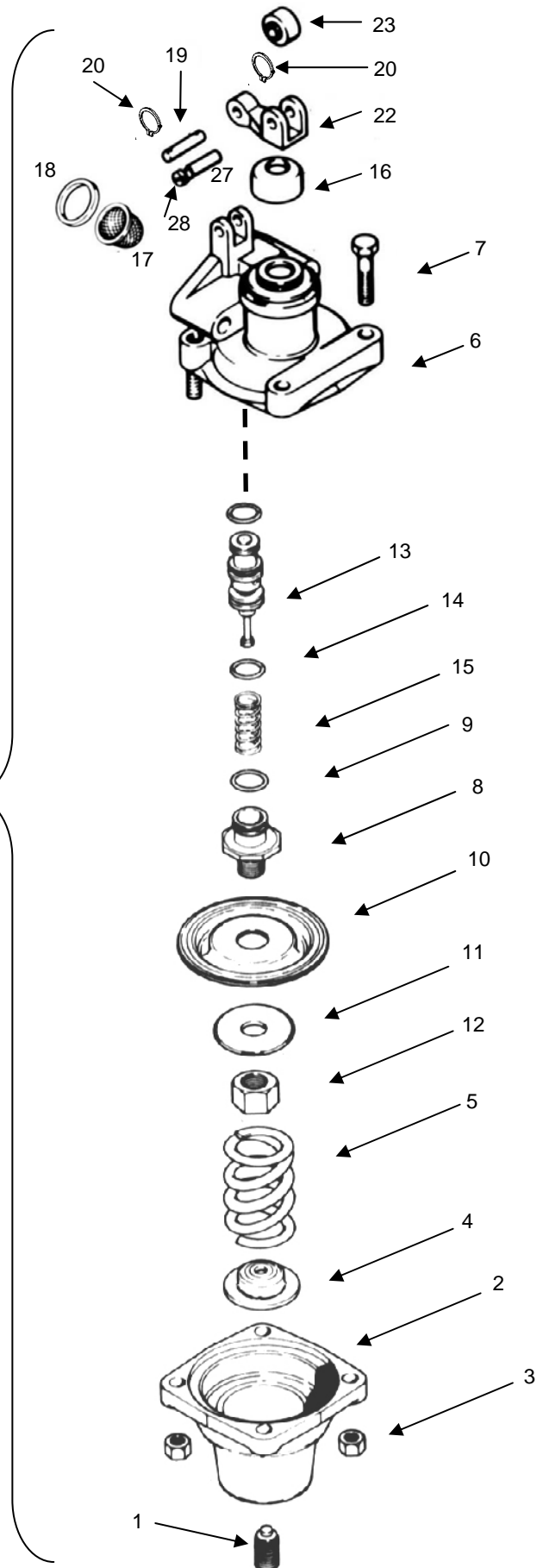
# EXPLODED VIEW

**Notes:**

1. See page 7 for part numbers.
2. See page 8 for repair kits.
3. Matched/lapped set of items 13 and 14, and 8 - 12 are in kit, part number P -055687-00000, page 8.



**Valve Control Portion Complete  
(See Identity Schedule)**



# PARTS LIST

REF.	QTY	DESCRIPTION	PART NUMBER
1	1	Adjusting screw	P -066209-00000
2	1	Spring housing w/nut	P -066488-00002
3	4	Nuts, 5/16"-18	P -049901-00020
4	1	Spring seat	-526347-00000
5	1	Control spring	(See Identity Schedule, page 5)
6	1	Body, w/2 studs	-526874-00000
7	2	5/16"-18 x 1 3/8" Cap screws	-850557-00000
	1	Diaph. Unit incl. 8, 9, 10, 11, 12	* See Kit
8	1	Exhaust valve seat	* See Kit
9	1	11/16" O.D. "O" ring	* See Kit
10	1	Diaphragm	* See Kit
11	1	Diaphragm follower	* See Kit
12	1	5/16"-18 Hex nut	* See Kit
13	1	Inlet & Exhaust valve (incl. Item 14)	* See Kit
14	2	3/4" O.D. "O" ring	* See Kit
15	1	Exhaust valve spring	* See Kit
16	1	Boot, dirt protector	* See Kit
17	2	Strainers	* See Kit
18	2	Gaskets	* See Kit
19	1	Pin, pivot	* See Kit
20	2	Retaining ring, 1/4	* See Kit
21	1	Cam roller assembly (incl. 22, 23, 24)	* See Kit
22	1	Lever with Tip and nut	* See Kit
23	1	Roller	* See Kit
24	1	Pin, Fulcrum (eccentric)	P -051856-00000
25	2	3/8"-16 x 1 3/4 Cap screw	-850563-00000
26	1	Pipe bracket	P -057558-00000
27	1	Fulcrum Pin	* See Kit
28	1	Nut	* See Kit

\* See repair kits on page 8.

NOTE: Parts list items (1) through (24) - Control Portion  
 Parts list items (1) through (26) - H-3 CONTROLAIR Valve Complete

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## REPAIR KITS

PART NUMBER	QTY PER VALVE	DESCRIPTION
P -055687-00000*	1	MINOR GRADUATING VALVE PORTION Repair Kit (Includes Items 8, 9, 10, 11, 12, 13, 14) See note 1
P -059028-00000	1	MAJOR GRADUATING VALVE PORTION Repair Kit (Includes Items 15, 16, 17, 18, and Kit P- 055687-00000)
P -051127-00001	1	LEVER Repair Kit (Includes Items 19, 20, 21, 22, 23)
P -065636-00000	1	Lever Kit with Fulcrum Pin & Nut (Includes Items 19, 20, 22, 23, 27 & 28)

**Notes:**

1. \*The Inlet and Exhaust valve unit item (13) and Exhaust valve seat item (8) must be lapped together to form a matched set. Kit contains these items factory matched.
2. Select replacement range control spring from identity schedule page 5.
3. All repair kits above include small tubes of recommended lubricant.
4. Valve portion kits listed above contain seals and other parts that are recommended for repair of valve portion only.
5. On severely worn or damaged components, additional parts may be required especially in the mechanical operating portions of the valve. Select these as required from parts list on page 7.



# SH-3 CONTROLAIR® VALVE

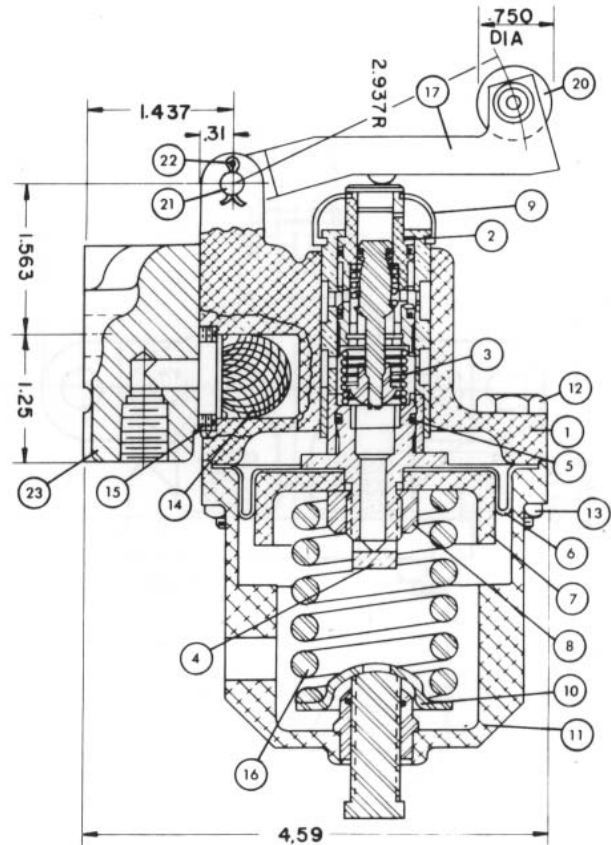
The SH-3 has a larger diaphragm for minimum hysteresis, better graduation and increased sensitivity.

See page 10 for additional dimensional information.

## Repairs for complete devices

P-066183-0000\*  
P-066184-0000\*  
P-066186-0000\*

\* Valve rating



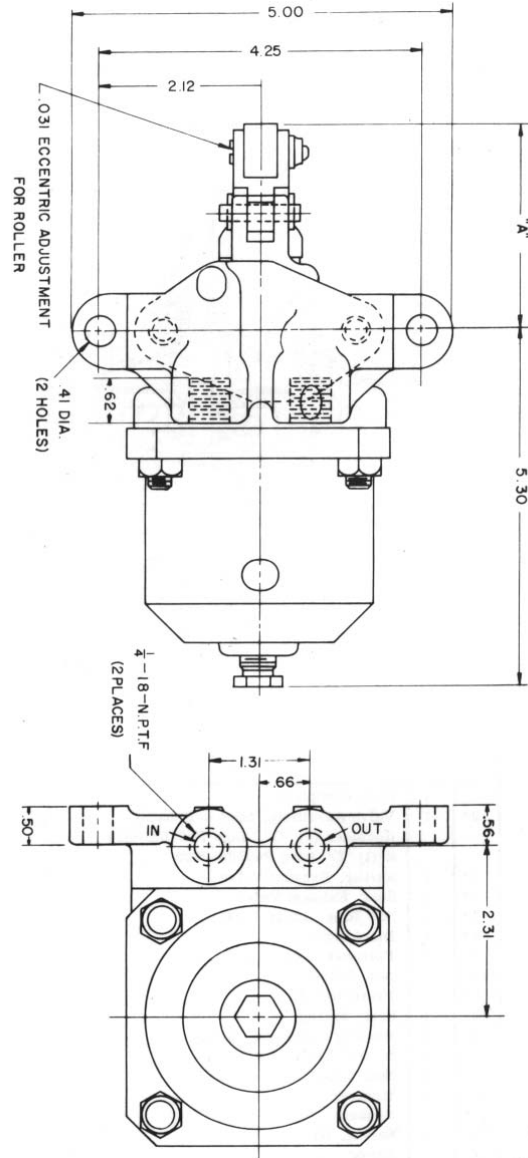
## Repair Kits for SH-3

PART NUMBERS	DESCRIPTION
P-064993-K0000 (Minor Kit)	Includes items 2, 3, 4, 5, 6 and 7
P-065018-00000 (Major Kit)	Includes kit P-064993-K0000 plus items 9, 10, 14 and 15
P-063154-K0000 (Lever Kit)	Includes items 17, 20, 21 and 22

Item	Qty.	Description	Part Number
1	1	Body Complete	P-063148-00000
* 2	1	Valve Assembly, Inlet & Exhaust (Includes (2) "O" Ring P	See Repair Kit
* 3	1	Spring, Exhaust Valve	See Repair Kit
* 4	1	Seat, Exhaust Valve	See Repair Kit
* 5	1	"O" Ring, 15/16 O.D.	See Repair Kit
* 6	1	Diaphragm	See Repair Kit
* 7	1	Follower, Diaphragm	See Repair Kit
8	1	Nut, 9/16-18	P-049901-00031
* 9	1	Protector, Dirt	See Repair Kit
* 10	1	Seat, Spring	See Repair Kit
11	1	Housing Complete, Spring	P-063137-00000
12	2	Screw, 5/16 x 1 3/8	-850577-00000
13	4	Nut, 5/16	P-049901-00020
* 14	2	Strainer	See Repair Kit
* 15	2	Gasket	See Repair Kit
16	1	Spring, 60 for P-063150-00001	-531418-00000
16a	1	Spring, 60 psi for P-064920-00001	P-065000-00000
16b	1	Spring, 15 psi for P-064920-00005	P-060295-00000
16c	1	Spring, 25 psi for P-064920-00007	P-060292-00000
* 17	1	Lever	See Repair Kit
18	1	Pin, Fulcrum (not shown)	P-051856-00000
19	1	Bearing (not shown)	P-049585-00007
* 20	1	Roller, Cam	See Repair Kit
* 21	1	Pin, Double Cotter	See Repair Kit
* 22	2	Pin, 1/16 x 1/2	See Repair Kit
23	1	Bracket, Pipe	P-057558-00000
24	2	Screw, 3/8 Cap (not shown)	-850563-00000

\* See Repair Kits on this page.

# SH-3 CONTROLAIR® VALVE



Valve Part Number	'A' (Factory Setting)		
	Full Exhaust	Ex. Valve Closed 0 psi Delivery	Max. Delivery
P-063150-00001	2.750	2.625 Approx.	+5 60 psi @2.125 -0
Valve Part Number	Lever Travel 'A' (Factory Setting)		
	2.2718	2.531	*2.114
P-064920-00001	Full Exhaust	10 psi	+5 60 psi -1
P-064920-00005	Full Exhaust	3 psi	+2 15 psi -1/2
P-064920-00007	4 psi max.	10 psi	+2 25 psi -1

\* Note: Travel further than the 2.114 dimension will damage the valving seals.

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# MAJOR REPAIR AND MAINTENANCE, ADJUSTMENTS

## Major Repair and Maintenance Instruction

When it is determined that the CONTROLAIR® Valve requires shop repairs (see page 2 for GENERAL MAINTENANCE AND REPAIR RECOMMENDATIONS), the following general instructions are recommended:

### Disassembly, Cleaning and Lubrication

Completely disassemble the CONTROLAIR Valve. Wash all metal parts in a non-flammable solvent. Rinse each part thoroughly and blow dry with a low pressure air jet. Arrange the parts on a clean surface.

Inspect and clear strainers (17). Be sure all body and bracket passages are clear and unrestricted. Be sure sensing port orifice in top of diaphragm chamber is clear.

Examine each part carefully. Replace all rubber parts and all other worn or damaged parts. The use of REPAIR KITS is strongly recommended; see page 8.

### Reassembly

Refer to EXPLODED VIEW (page 6) and ASSEMBLY VIEW (page 4).

Valve should be reassembled using new rubber parts and parts indicated by inspection. As reassembly proceeds, lubricate all metal-to-metal wear surfaces with 107 Lubriplate Grease. Lubricate all rubber parts, except diaphragm, with No. 55 Dow Corning Pneumatic Grease (included in repair kits). **Do not lubricate diaphragm.** The exhaust valve and seat may have to be slightly polished for minimum leakage. If necessary, use BW valve lapping compound (600+ grit).

### Adjustments and Test Set Up

The valve is factory set to provide the appropriate graduated pressure and mechanical operation per part number (see IDENTITY SCHEDULE, page 5). However, after the CONTROLAIR Valve has been disassembled, repaired and reassembled, it must be adjusted and tested for proper operation prior to returning to service. It is recommended that the valve should be connected in a test set up as shown on page 13.

#### Adjustments

Screw (1) varies the graduated output pressure setting. Turn the adjusting screw clockwise to raise the pressure; turn counterclockwise to lower the pressure. The eccentric cam roller adjustment is for fine tuning as outlined below.

#### Graduated Output Pressure Setting Adjustment

Refer to IDENTITY SCHEDULE, page 5.

With no preload setting on the valve and the cam roller in the "release pressure" position, the IN port is closed and the OUT port is open to EXHAUST.

The "A" dimension in the (1) "release" pressure position of the cam roller is adjusted by the eccentric in the cam roller to 2.531 inches for all H-3 CONTROLAIR Valves. Force the roller down until the "A" dimension (2) lapped position becomes 2.469 inches. With the roller in this position, the valve should be in "lapped" position. The IN port and EXHAUST port are both closed. If the delivery air gauge registers any pressure, turn the adjusting screw counterclockwise until the gauge reads zero. If gauge registers zero, turn screw clockwise until a reading is obtained, then back off to obtain zero.

Move the roller down farther until the "A" dimension for (3) maximum pressure position OUT pressure is the dimension indicated in the Identity Schedule (page 5). This dimension varies according to the pressure range of the control spring used in the valve. With the roller in this position, the air gauge should be the maximum delivery pressure (+5/-0 psi). If the pressure reading is too high or too low, change the adjusting screw accordingly. The lapped position should be rechecked if any adjustment is required at the maximum pressure dimension.

### Special Preload Setting Adjustment

This setting calls for a predetermined pressure when the cam roller is in the "release" pressure position dimension "A" (1). The "A" dimension in the "release" position of the cam roller is 2.531 inches for all valves. With the roller in its release position, turn the adjusting screw until the gauge reads the desired preload pressure.

Force the roller down until the "A" dimension for maximum OUT pressure is the dimension indicated in the IDENTITY SCHEDULE, page 5. The delivery gauge should read preload setting pressure plus or minus 3 psi.

**WARNING:** Do not move the cam roller down farther than necessary. The H-3 CONTROLAIR Valve delivers approximately the pressures indicated within the "A" dimensions specified for each valve. Further movement of the cam roller only creates unnecessary stresses on the internal parts of the valve.

### Full Pressure Feature Adjustment

Part numbers P -063107-00000 and P -063234-00000 have a full pressure feature, and are adjusted as follows:

Depress inlet and exhaust valve unit plunger to "full pressure position." Adjust regulating screw at bottom of spring housing until the maximum specified graduated pressure is shown on delivery gauge. Release inlet and exhaust valve unit plunger to "full release position" and note that all pressure vents to "0" pressure on the delivery gauge. Repeat operation of plunger to assure proper pressure setting.

Depress inlet and exhaust valve plunger until maximum specified graduated pressure is shown on delivery gauge. Hold plunger in this position and turn the full pressure screw inside the adjusting screw at bottom of spring housing "in" until the delivery gauge pressure charges to supply pressure.

Release plunger to "full releases position" and note delivery gauge reads zero. Depress plunger to "full applied position" and note that delivery gauge changes to supply pressure at maximum specified graduated pressure +/- 05 psi.

Release plunger to release position and note delivery pressure falls to zero.

# TESTING AND TEST SET-UP

After repair or adjustment, the H-3 CONTROLAIR® Valve should be tested using procedures and test arrangements as described in this section.

Pressure control valves of this nature should be tested for the following:

1. Function
2. Pressure range
3. Leakage
4. Flow capacity
5. Response

The adjustments affecting these points have been described in the previous section. General instructions for accomplishing the five tests above are as follows:

1. **FUNCTION:** The H-3 CONTROLAIR Valves are cam roller actuated 3-way pressure graduating valves. A roller actuates the valve to increase, decrease or maintain graduated air pressure to a separate delivery line. The roller is spring returned from all positions. This function should be checked using the test arrangement shown.
2. **PRESSURE RANGE:** Supply pressure at “IN” port will be delivered as graduated pressure to “OUT” port delivery line depending on the strength of control spring being used and roller position. In release pressure position the out delivery line is at minimum pressure setting. Forcing the roller down actuates the graduating control portion to deliver graduated pressure to the out delivery line. See ADJUSTMENTS, TESTING AND TEST SETUP on page 9 to adjust valve. After valve is adjusted, check that minimum and maximum pressure ranges are generated in delivery line per IDENTITY SCHEDULE on page 5.
3. **LEAKAGE:** Set supply pressure to 20 psi above maximum delivery pressure of valve being tested.

Using soap solution, coat the valve at pipe bracket and spring housing parting lines. No leakage is permitted in any handle position.

- A. On all valves with spring ranges less than 100 psi, set supply line pressure to 100 psi. Move cam roller to full travel position and hold. Close valve in supply line to “IN” port, and valve in delivery line from “OUT” port to trap the supply pressure at the valve. Observe the “OUT” delivery line pressure gauge. A pressure drop of no more than 2 psi in 30 seconds is permitted. Release cam rollers.
- B. On all valves with spring ranges 100 psi and above, set supply line pressure to 100 psi. Move cam roller to deliver 95 psi to delivery line from “OUT” port. Close valve in supply line to “IN” port, and valve in delivery line from “OUT” port to trap the supply pressure at the valve. Observe the “OUT” delivery line pressure gauge. A pressure drop of no more than 2 psi in 30 seconds is permitted.
4. **FLOW CAPACITY:** Set supply line pressure to 100 psi regardless of control spring rating of valve. Move cam roller to full travel position. The delivery volume or volumes from “OUT” port should be inflated to specified pressure within time limits shown on Table 1, Flow Capacity. Release cam roller quickly from full travel position to release position. The delivery volume or volumes connected to “OUT” port should be “exhausted” within time limits shown in Table 1.
5. **RESPONSE:** Move cam roller to full travel position. Fully open the valve at delivery volume so that air exhausts through the choke plug. Observe the delivery pressure gauge. A pressure drop of no more than 3 psi is permitted. Release cam roller.

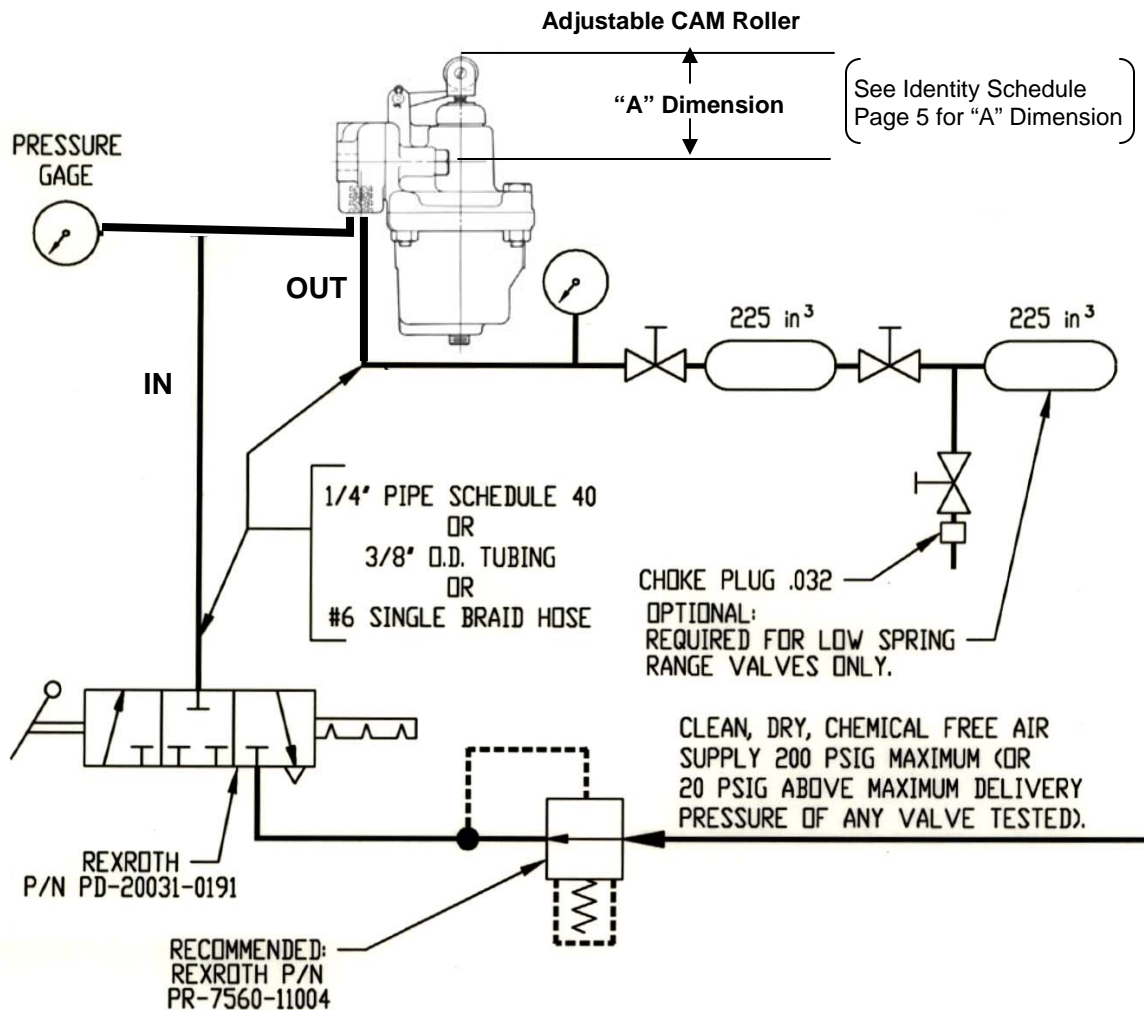
**Table 1  
Flow Capacity Tests—Port “OUT”**

VALVE SETTING	TEST RANGES & TIME				TEST VOLUME [CU. IN.]
	FILL [PSI]	MAX TIME [SEC]	EXHAUST [PSI]	MAX TIME [SEC]	
0-15 psi	0 incr. to 15	1	15 decr. to 5	2	450
0-25 psi	0 incr. to 15	1	15 decr. to 5	2	450
0-65 psi	0 incr. to 50	2	50 decr. to 10	2	225
0-70 w/FP	0 incr. to 50	2	50 decr. to 10	2	225
0-72 w/FP	0 incr. to 50	2	50 decr. to 10	2	225
0-75 psi	0 incr. to 50	2	50 decr. to 10	2	225
0-100 psi	0 incr. to 50	2	50 decr. to 10	2	225
0-125 psi	0 incr. to 50	2	50 decr. to 10	2	225
0-150 psi	0 incr. to 50	2	50 decr. to 10	2	225
0-175 psi	0 incr. to 50	2	50 decr. to 10	2	225
15-50 psi	15 incr. to 40	2	50 decr. to 20	2	225

# TEST ARRANGEMENT DIAGRAM

## Notes:

1. Rexroth TASKMASTER® timing volume, part number P -058887-00225, can be used for the volumes indicated.
2. The supply air lines to the valves and delivery lines must be full size as shown. Line length must not exceed 3 ft. between the supply valve and "IN" port, and between the "OUT" port and delivery test volume(s). The piping connections must have zero leakage, and must not restrict the flow. If quick couplers are used, be sure they are full flow or oversize.
3. It is recommended that as large of a gauge as practical be used on the delivery lines. A 6" gauge is recommended.



# 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

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.

## 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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