ROSS®

BULLETIN 376D

SAE Standard Valves and Bases

ROSS ASIA • ROSS CONTROLS • ROSS EUROPA • ROSS UK

• Manufacturers of Premium Pneumatic Controls since 1921 •

ROSS Valves for SAE Bases

The SAE Standard Interface, though originally developed by U.S. auto companies in the early 1970s, has quickly gained wide acceptance throughout the industry. Due to the design's ruggedness and high-flow characteristics, the Society of Automotive Engineers (SAE) established it as a new standard. This ensures that valves designed to fit the SAE interface will be interchangeable, regardless of manufacturer. In practical terms, the user can change from one brand of valve to another without changing installed bases or manifolds.

ROSS valves are available in SAE sizes 125, 250 and 500. Both poppet and metal spool-and-sleeve construction are offered. The valves described in this bulletin are all solenoid-pilot controlled.

SOLENOID PILOTS

Internal or External Pilot Supply. Valves in this bulletin are made for *internal* pilot supply. However, they are easily converted for use with an external pilot supply by moving a single pipe plug in the bottom of the valve.

With solenoid pilot control, the main valve is shifted by applying air pressure to an actuating piston or spool end. There is no mechanical connection between the solenoid plunger in the pilot and the main valve mechanism as there is in a valve actuated by a direct-acting solenoid. If the valve mechanism were to stick, the plunger in a solenoid-pilot-controlled valve could complete its travel and avoid the high current flow which results when the travel is incomplete. Thus overheating and solenoid burnout are avoided. Furthermore, under average shop conditions, air pressure produces a valve-shifting force much greater than that from a direct-acting solenoid, so that the problem of valve sticking is minimized.

Indicator Lights. An indicator light is wired to each solenoid circuit so that the light is illuminated whenever the solenoid is energized.

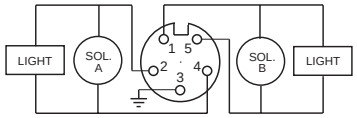
Hard Wiring. An electrical opening, threaded 1/2 NPSC, is available for use with conventional fittings.

ELECTRICAL CONNECTORS

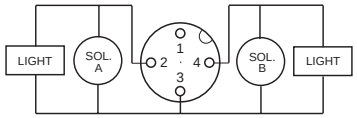
Electrical connections to the valves can be made with sealed 4 or 5-pin connectors (ANSI Standard B93.55) or by conventional hard wiring.

Sealed Connector. A 4 or 5-pin straight connector wired as required by either the Ford Motor Company or the Chrysler Corporation is available. Valves may be ordered with mini- or micro-change connectors. See the wiring diagrams below for the various options available.

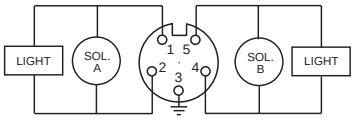
Ford Wired 5-pin mini-connector (all voltages)



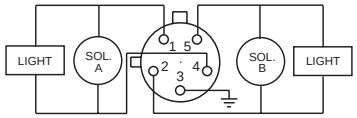
Ford Wired 4-pin micro-connector (24 vdc)



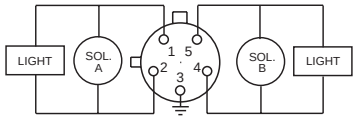
Chrysler Wired 5-pin mini-connector (all voltages)



Chrysler Wired 5-pin micro-connector (24 vdc)



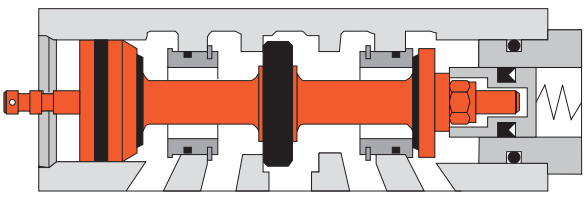
Chrysler Wired 5-pin micro-connector (120 volts / 60 Hz)



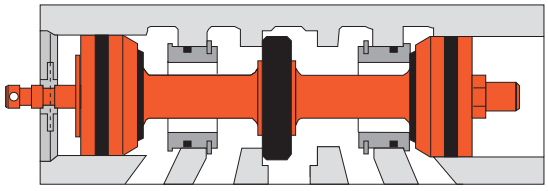
Series 84
Poppet Valve Construction

Poppets are face sealing valve elements which can open or close passageways without sliding friction or the close tolerances required of spool valves. Poppets don't build up breakaway resistance due to varnish, and are highly tolerant of dirty air.

ROSS poppet valves have rugged internals and self-adjusting exhaust poppet seats which equalize wear and promote long life. Designed for use with or without air line lubrication.



Single Control. 5-port, 2-position (5/2) valves that require a maintained signal to keep the valve in its shifted position. Internal air pressure provides the force to return the valve when the signal is removed.



Double Control. 5-port, 2-position (5/2) valves that require only a momentary signal to shift the valve in either direction. A mechanical detent and differential air pressure keep the valve in its shifted postion.

MANUAL OVERRIDES

Each solenoid pilot has a non-locking override button for manual actuation of the valve. For Size 500 valves, locking buttons and extended buttons are also available. See page 10.

VALVE RESPONSE TIME

Average response constants for each valve are listed in the charts on pages 4 thru 6. These constants, designated M and F, can be used to determine the amount of time required to fill or exhaust a volume of any size by using the following formula:

$$\text{Valve Response Time (msec)} = M + (F \bullet V)$$

In this formula, M represents the average time in milliseconds (msec) for the valve parts to move after the valve is energized. F is the average number of milliseconds required for a flow of one standard cubic inch through the valve. V is the number of cubic inches in the volume to be filled or exhausted.

The valve response time given by this formula is the average number of milliseconds required to fill the volume V to 90 per cent of supply pressure, or to exhaust the volume to 10 per cent of supply pressure. Response times will be valid for any pressure in the range specified for the valve under "Standard Specifications."

Note that F values are listed under two headings: "In-Out" and "Out-Exh." The In-Out values are used to calculate *fill* times, and the Out-Exh. values are used to calculate *exhaust* times.

SAMPLE PROBLEM. Using a ROSS double solenoid size 250 poppet valve, how long will it take to fill a 250-cubic-inch chamber to 90% of supply pressure?

SOLUTION. The poppet valves are described on page 4 of this bulletin. From the chart at the bottom of the page, we find that the response constants for a size 250 valve are M = 20 and F = 0.54. Using these values in the response time formula we have:

$$\text{Valve Response Time (msec)} = 20 + (0.54)(250)$$
$$= 20 + 135$$
$$= 155 \text{ msec}$$

FLOW RATINGS

IMPORTANT NOTE. Widely different test standards are used by different manufacturers in the determination of Cv ratings of valves. For this reason, the Cv values given in the charts on pages 4, 5, and 6 should not be used in comparing ROSS valves with those of other makers. These Cv values are intended only for use with performance charts published by ROSS.

The Cv ratings in the charts on pages 4, 5, and 6 are averages for the various flow paths through the valve and are for steady flow conditions.

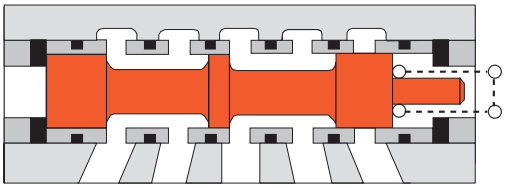
PORT IDENTIFICATION

Ports on bases and in diagrams are designated by the following letters:

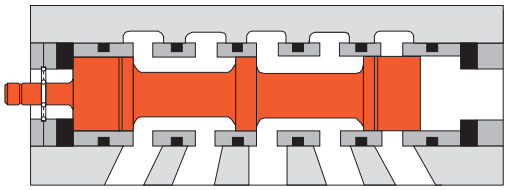
P:	Inlet port
A:	Outlet port
B:	Outlet port
EA:	Exhaust port (from port A)
EB:	Exhaust port (from port B)
X:	External pilot supply port

SERIES 80
Spool Valve Construction

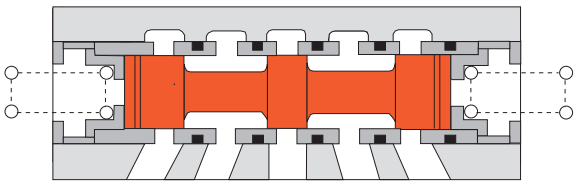
The matched spool and sleeve used in each of these valves is made of precision finished, hardened, stainless steel. The spool moves on a micro-inch film of air between spool and sleeve so that wear is minimized. For use in systems with or without air line lubrication.



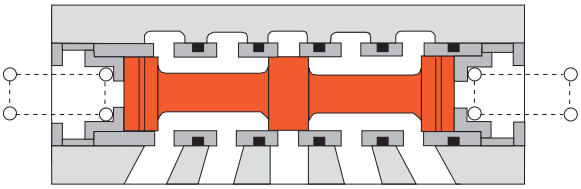
Single Control. 5-port, 2-position (5/2) valves require a maintained signal to keep the valve shifted. A spring provides the return force after the signal is removed.



Double Momentary Control. 5-port, 2-position (5/2) valves require only a momentary signal to shift the valve in either direction. A mechanical detent keeps the valve in its shifted position.

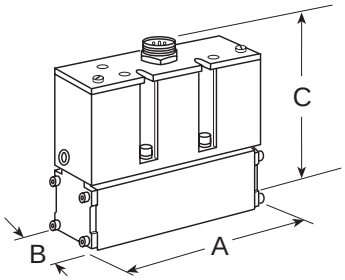


Closed Center, Double Control. 5-port, 3-position (5/3) valves require a maintained signal to shift the valve in either direction from center. In the center position all ports are closed.

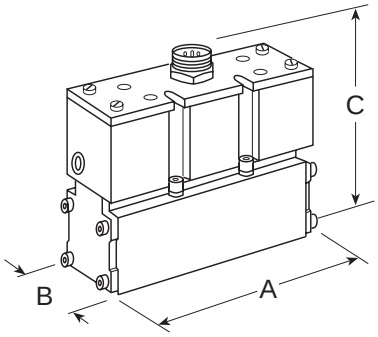


Open Center, Double Control. 5-port, 3-position (5/3) valves require a maintained signal to shift the valve in either direction from center. In the center position the outlet ports are connected to the exhaust ports and the inlet port is closed.

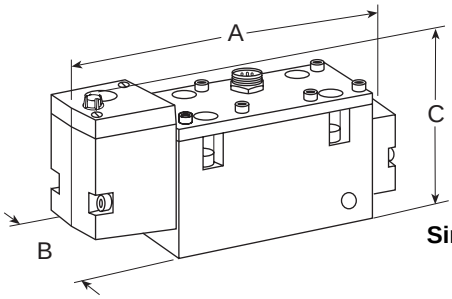
SERIES 84 5/2 POPPET VALVES



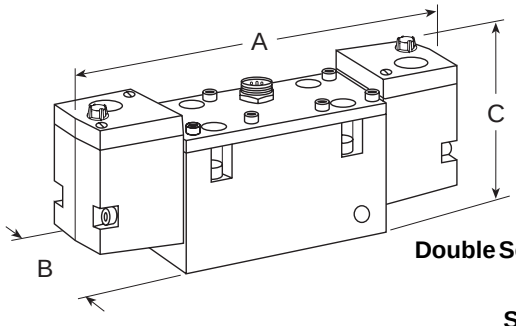
Size 125
Single or Double
Solenoid Pilot



Size 250
Single or Double
Solenoid Pilot

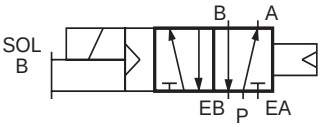


Size 500
Single Solenoid Pilot

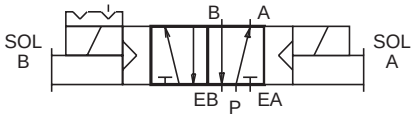


Size 500
Double Solenoid Pilot

SINGLE SOLENOID PILOT



DOUBLE SOLENOID PILOT



STANDARD SPECIFICATIONS

Solenoids: Rated for continuous duty.
100-110 volts 50 Hz; 100-120 volts 60 Hz;
24, 110 volts d.c.
Power Consumption: Each solenoid:
Size 125, 250: 8 VA inrush; 6 VA holding.
Size 500: 87 VA inrush; 30 VA holding.
Indicator Light: One for each solenoid.
Temperature Range:
Ambient: 40° to 120°F (4° to 50°C).
Media: 40° to 175°F (4° to 80°C).
Flow Media: Filtered air.
Inlet Pressure: 30 to 150 psig (2 to 10 bar).
Pilot Pressure: Must be equal to or greater than inlet pressure.

OPTIONS

Interposed Pressure Regulators

Interposed regulators and dimensions listed on page 11.

SUB-BASES and MANIFOLDS

Bases are not included with valves, and must be ordered separately. See pages 7 thru 10 for information about bases.

IMPORTANT NOTE
Please read carefully and thoroughly all of the **CAUTIONS** on page 11.

SINGLE SOLENOID PILOT VALVES

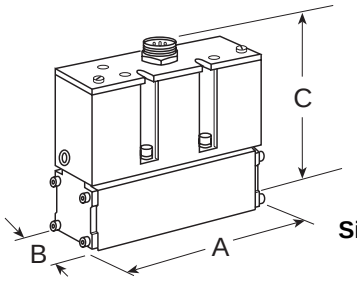
Avg. Cv	SAE Size	Valve Model Number			Avg. Response Constants*			Dimensions inches (mm)			Weight lb (kg)
		5 Pin Mini-Connectors		Hardwired	M	F		A	B	C	
		Ford[1] Wiring	Chrysler[2] Wiring			In-Out	Out-Exh.				
2.0	125	8476B3331	8476B3341	8476B3351	47	1.03	1.21	5.5 (140)	1.8 (45)	5.1 (129)	2.8 (1.3)
5.5	250	8476B4331	8476B4341	8476B4351	60	0.47	0.61	6.4 (160)	2.6 (65)	5.6 (142)	5.2 (2.4)
10.4	500	8476B6331	8476B6341	8476B6351	30	0.27	0.29	9.8 (248)	3.0 (76)	4.8 (121)	7.7 (3.5)

DOUBLE SOLENOID PILOT VALVES

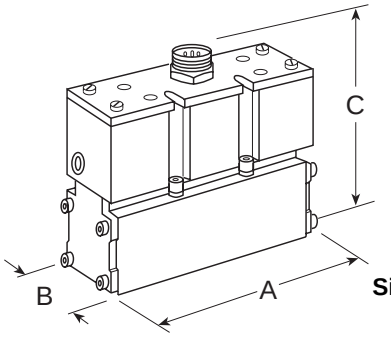
2.0	125	8476B3332	8476B3342	8476B3352	16	1.00	1.16	5.5 (140)	1.8 (45)	5.1 (129)	3.3 (1.5)
5.5	250	8476B4332	8476B4342	8476B4352	20	0.43	0.48	6.4 (160)	2.6 (65)	5.6 (142)	5.7 (2.6)
10.4	500	8476B6332	8476B6342	8476B6352	16	0.28	0.32	11.3 (286)	3.0 (76)	4.8 (121)	8.9 (4.1)

[1]For FORD wired models with 4 pin micro-connectors and 24 vdc, change 8th digit to "6," e.g., model 8476B3331 becomes 8476B3361.
[2]For CHRYSLER wired models with 5 pin micro-connectors and 120 Volts / 60 Hz, change 8th digit to "1," e.g., model 8476B3341 becomes 8476B3311.
[2]For CHRYSLER wired models with 5 pin micro-connectors and 24 vdc, change 8th digit to "2," e.g., model 8476B3341 becomes 8476B3321.
*Time (msec) = M + (F • V). See explanation on page 3.

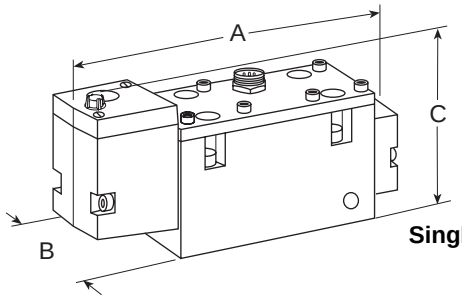
SERIES 80 5/2 SPOOL VALVES



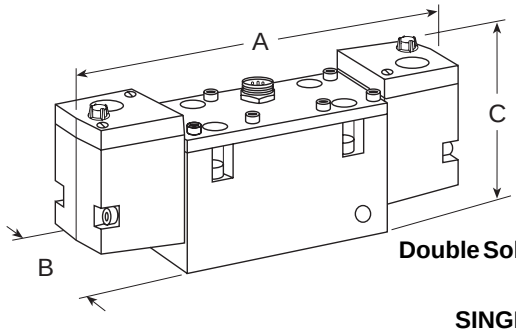
Size 125
Single or Double
Solenoid Pilot



Size 250
Single or Double
Solenoid Pilot

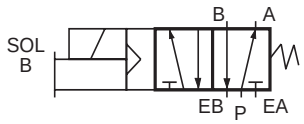


Size 500
Single Solenoid Pilot

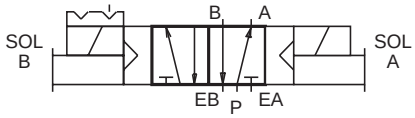


Size 500
Double Solenoid Pilot

SINGLE SOLENOID PILOT



DOUBLE SOLENOID PILOT



STANDARD SPECIFICATIONS

Solenoids: Rated for continuous duty.
100-110 volts 50 Hz; 100-120 volts 60 Hz;
24, 110 volts d.c.
Power Consumption: Each solenoid:
Size 125, 250: 8 VA inrush; 6 VA holding.
Size 500: 87 VA inrush; 30 VA holding.
Indicator Light: One for each solenoid.
Temperature Range:
Ambient: 40° to120°F (4° to 50°C).
Media: 40° to 175°F (4° to 80°C).
Flow Media: Filtered air.
Inlet Pressure: Vacuum to 150 psig (10 bar).
Pilot Pressure: At least 15 psig (1 bar).

OPTIONS

Interposed Pressure Regulators

Interposed regulators and dimensions listed on page 11.

SUB-BASES and MANIFOLDS

Bases are not included with valves, and must be ordered separately. See pages 7 thru 10 for information about bases.

IMPORTANT NOTE
Please read carefully and thoroughly all of the **CAUTIONS** on page 11.

SINGLE SOLENOID PILOT VALVES

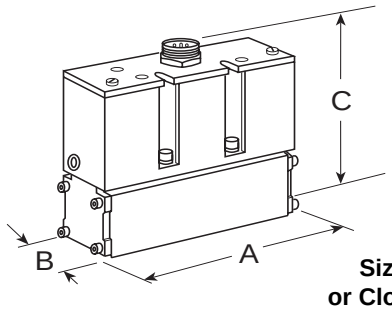
Avg. Cv	SAE Size	Valve Model Number: 5 Pin Mini-Connectors Ford[1] Wiring	Valve Model Number: 5 Pin Mini-Connectors Chrysler[2] Wiring	Valve Model Number: Hardwired	Avg. Response Constants* M	Avg. Response Constants* F In-Out	Avg. Response Constants* F Out-Exh.	Dimensions inches (mm) A	Dimensions inches (mm) B	Dimensions inches (mm) C	Weight lb (kg)
2.0	125	8076B3331	8076B3341	8076B3351	20	1.06	1.22	5.5 (140)	1.8 (45)	5.1 (129)	3.4 (1.6)
5.5	250	8076B4331	8076B4341	8076B4351	17	0.55	0.53	6.4 (160)	2.6 (65)	5.6 (142)	5.4 (2.5)
10.4	500	8076B6331	8076B6341	8076B6351	22	0.29	0.30	9.8 (248)	3.0 (76)	4.8 (121)	8.0 (3.6)

DOUBLE SOLENOID PILOT VALVES

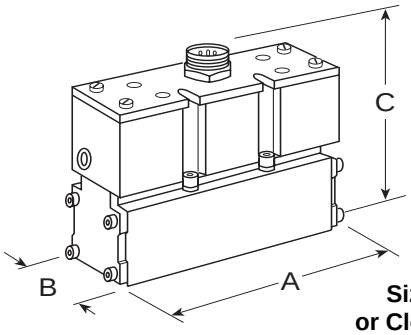
2.0	125	8076B3332	8076B3342	8076B3352	15	1.04	1.15	5.5 (140)	1.8 (45)	5.1 (129)	3.4 (1.6)
5.5	250	8076B4332	8076B4342	8076B4352	17	0.49	0.46	6.4 (160)	2.6 (65)	5.6 (142)	5.9 (2.7)
10.4	500	8076B6332	8076B6342	8076B6352	10	0.29	0.29	11.3 (286)	3.0 (76)	4.8 (121)	9.2 (4.2)

[1]For FORD wired models with 4 pin micro-connectors and 24 vdc, change 8th digit to "6," e.g., model 8076B3331 becomes 8076B3361.
[2]For CHRYSLER wired models with 5 pin micro-connectors and 120 Volts / 60 Hz, change 8th digit to "1," e.g., model 8076B3341 becomes 8076B3311.
[2]For CHRYSLER wired models with 5 pin micro-connectors and 24 vdc, change 8th digit to "2," e.g., model 8076B3341 becomes 8076B3321.
*Time (msec) = M + (F • V). See explanation on page 3.

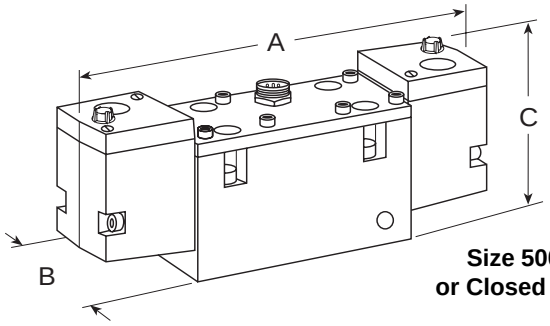
SERIES 80 5/3 SPOOL VALVES



Size 125 Open or Closed Center

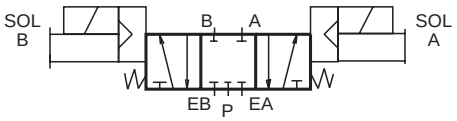


Size 250 Open or Closed Center

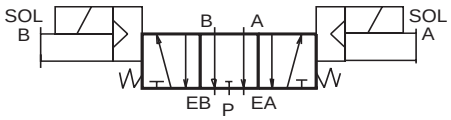


Size 500 Open or Closed Center

CLOSED CENTER



OPEN CENTER



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Flow Media: Filtered air.
Inlet Pressure: Vacuum to 150 psig (10 bar).
Pilot Pressure: At least 15 psig (1 bar).

OPTIONS

Interposed Pressure Regulators

Interposed regulators and dimensions listed on page 11.

SUB-BASES and MANIFOLDS

Bases are not included with valves, and must be ordered separately. See pages 7 thru 10 for information about bases.

IMPORTANT NOTE
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CLOSED CENTER SOLENOID PILOT VALVES

Avg. Cv	SAE Size	Valve Model Number: 5 Pin Mini-Connectors Ford[1] Wiring	Valve Model Number: 5 Pin Mini-Connectors Chrysler[2] Wiring	Valve Model Number: Hardwired	Avg. Response Constants* M	Avg. Response Constants* F In-Out	Avg. Response Constants* F Out-Exh.	Dimensions inches (mm) A	Dimensions inches (mm) B	Dimensions inches (mm) C	Weight lb (kg)
2.0	125	8077B3331	8077B3341	8077B3351	20	1.08	1.25	5.5 (140)	1.8 (45)	5.1 (129)	3.4 (1.6)
4.5	250	8077B4331	8077B4341	8077B4351	10	0.58	0.61	6.4 (160)	2.6 (65)	5.6 (142)	5.4 (2.5)
9.4	500	8077B6331	8077B6341	8077B6351	12	0.30	0.31	11.3 (286)	3.0 (76)	4.8 (121)	8.0 (3.6)

OPEN CENTER SOLENOID PILOT VALVES

2.0	125	8077B3332	8077B3342	8077B3352	20	1.12	1.21	5.5 (140)	1.8 (45)	5.1 (129)	3.4 (1.6)
4.5	250	8077B4332	8077B4342	8077B4352	10	0.65	0.58	6.4 (160)	2.6 (65)	5.6 (142)	5.9 (2.7)
9.4	500	8077B6332	8077B6342	8077B6352	12	0.32	0.30	11.3 (286)	3.0 (76)	4.8 (121)	9.2 (4.2)

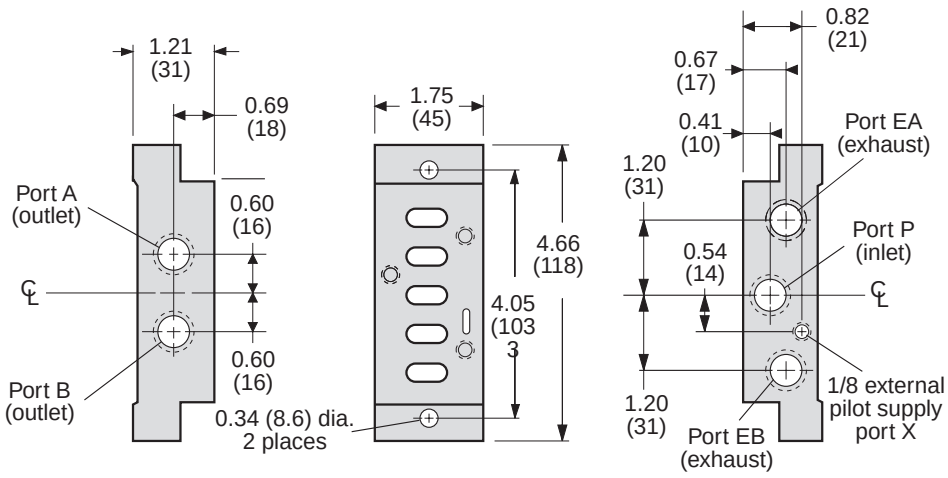
[1]For FORD wired models with 4 pin micro-connectors and 24 vdc, change 8th digit to "6," e.g., model 8077B3331 becomes 8077B3361.
[2]For CHRYSLER wired models with 5 pin micro-connectors and 120 Volts / 60 Hz, change 8th digit to "1," e.g., model 8077B3341 becomes 8077B3311.
[2]For CHRYSLER wired models with 5 pin micro-connectors and 24 vdc, change 8th digit to "2," e.g., model 8077B3341 becomes 8077B3321.
*Time (msec) = M + (F • V). See explanation on page 3.

Side-Ported Sub-Bases

Size 125

Sub-Base Number	Port Sizes		
	A, B	P	EA, EB
577K91	1/8 NPT	1/4 NPT	1/4 NPT
578K91	1/4 NPT	3/8 NPT	3/8 NPT
579K91	3/8 NPT	3/8 NPT	3/8 NPT
672K91	SAE-04	SAE-06	3/8 NPT
786K91	SAE-06	SAE-06	3/8 NPT

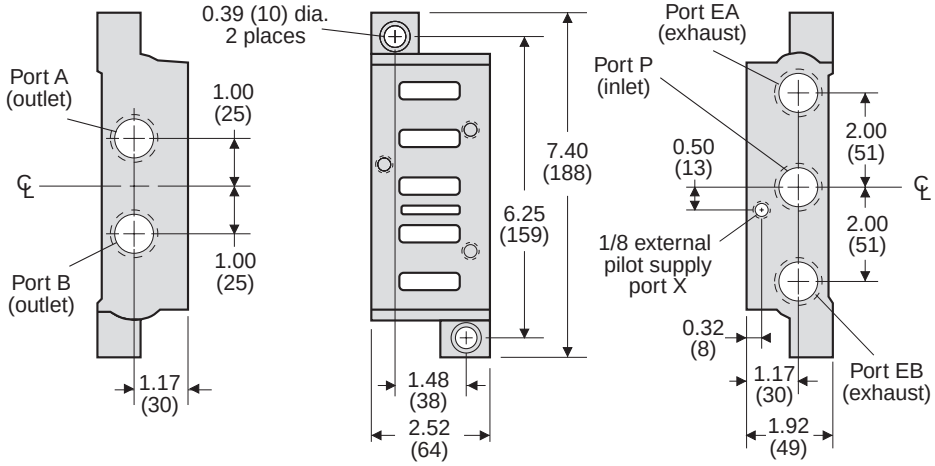
Dimensions: inches (mm)



Size 250

Sub-Base Number	Port Sizes		
	A, B	P	EA, EB
539K91	1/4 NPT	3/8 NPT	3/8 NPT
540K91	3/8 NPT	1/2 NPT	1/2 NPT
541K91	1/2 NPT	1/2 NPT	1/2 NPT
542K91	3/4 NPT	3/4 NPT	3/4 NPT
832K91	SAE-08	SAE-08	1/2 NPT
673K91	SAE-12	SAE-12	3/4 NPT

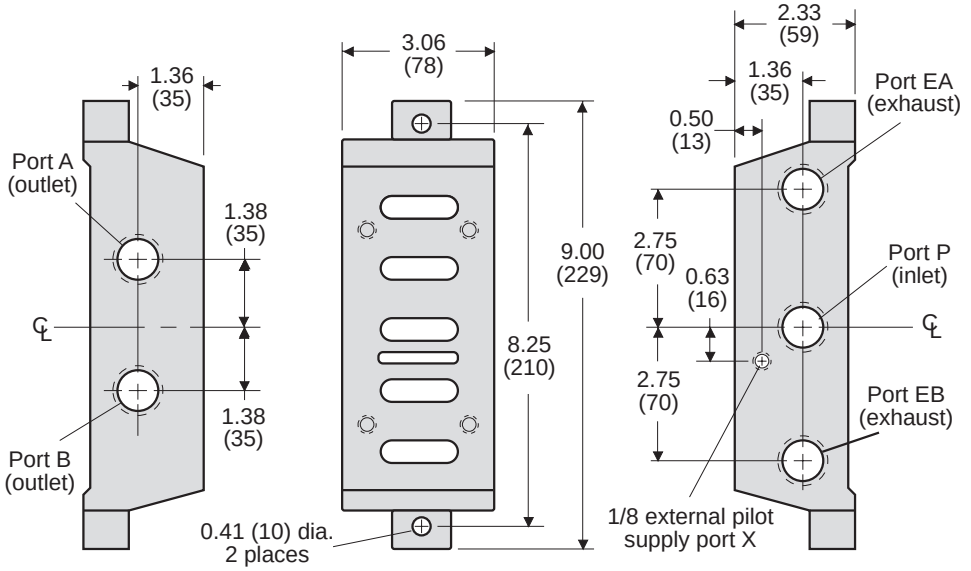
Dimensions: inches (mm)



Size 500

Sub-Base Number	Port Sizes		
	A, B	P	EA, EB
582K91	1/2 NPT	3/4 NPT	3/4 NPT
728K91	3/4 NPT	3/4 NPT	3/4 NPT
583K91	3/4 NPT	1 NPT	1 NPT
584K91	1 NPT	1 NPT	1 NPT
706K91	SAE-12	SAE-12	1 NPT
674K91	SAE-16	SAE-16	1 NPT

Dimensions: inches (mm)



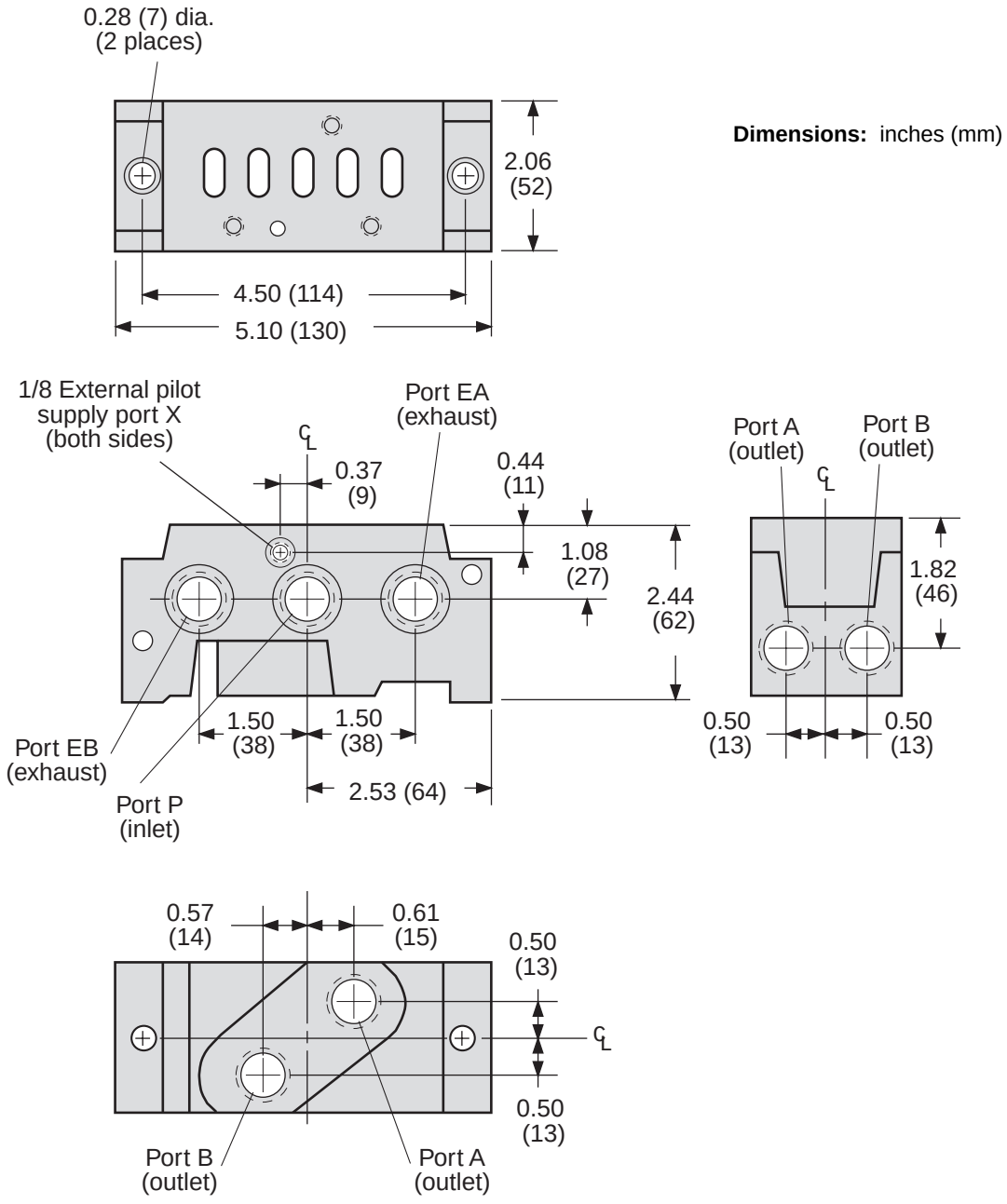
Size 125 Manifold Stations

Station Number	Port Sizes		
	A, B	P	EA, EB
580K91	1/4 NPT	3/8 NPT	3/8 NPT
581K91	3/8 NPT	3/8 NPT	3/8 NPT
787K91	SAE-06	SAE-06	3/8 NPT

Each manifold station is supplied with all necessary seals and hardware for assembly. End plates are *not* required with these manifolds. Each station has all ports threaded to accept piping.

BLANKING PLATE. For manifold stations not occupied by a valve, blanking plates are available. These plates block the unused air passages. Order by part number **820K77**.

Dimensions: inches (mm)



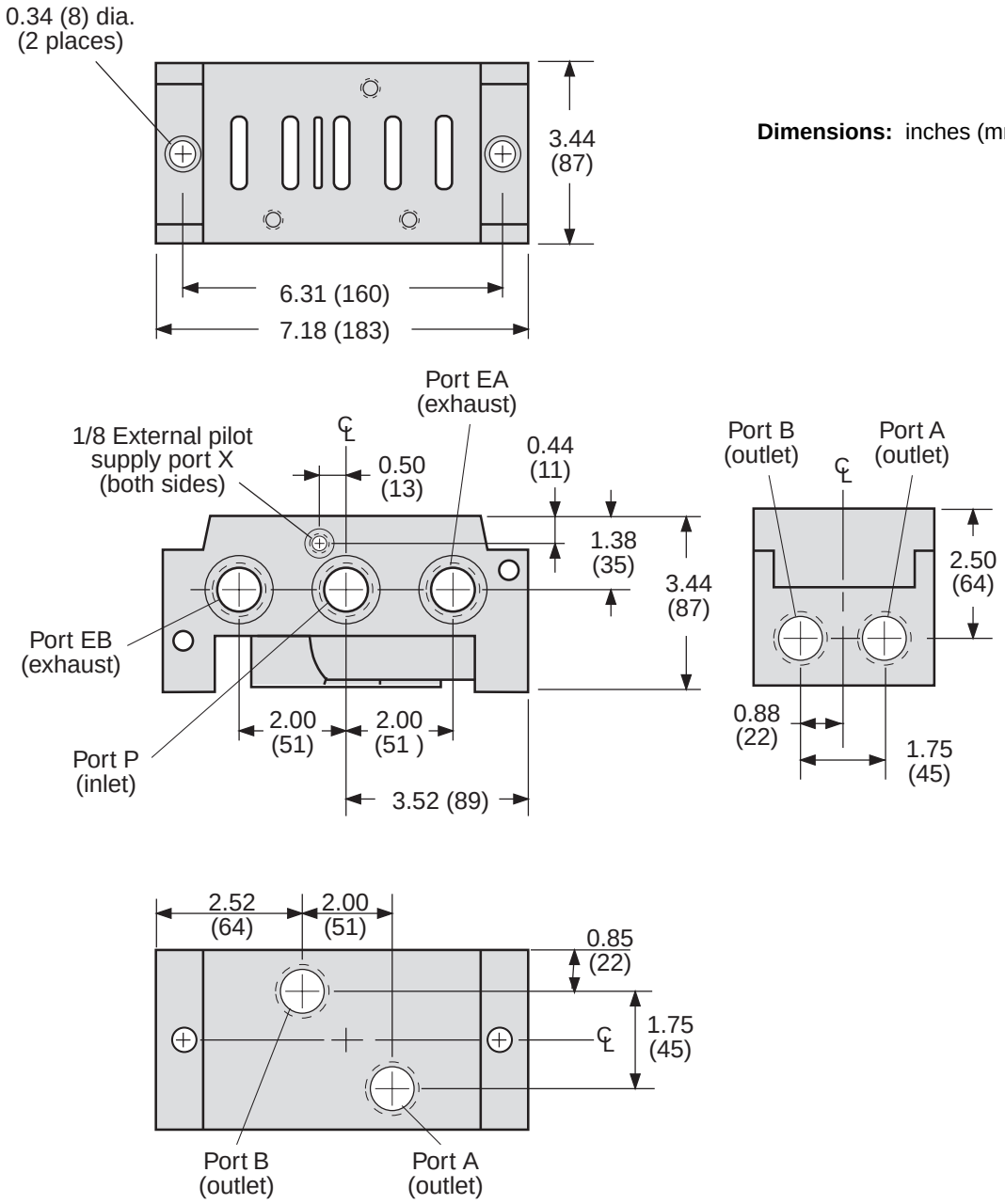
Size 250 Manifold Stations

Station Number	Port Sizes		
	A, B	P	EA, EB
553K91	3/8 NPT	1/2 NPT	1/2 NPT
554K91	1/2 NPT	3/4 NPT	3/4 NPT
555K91	3/4 NPT	3/4 NPT	3/4 NPT
675K91	SAE-12	SAE-12	3/4 NPT

Each manifold station is supplied with all necessary seals and hardware for assembly. End plates are *not* required with these manifolds. Each station has all ports threaded to accept piping.

BLANKING PLATE. For manifold stations not occupied by a valve, blanking plates are available. These plates block the unused air passages. Order by part number **821K77.**

Dimensions: inches (mm)



Size 500 Manifold Stations

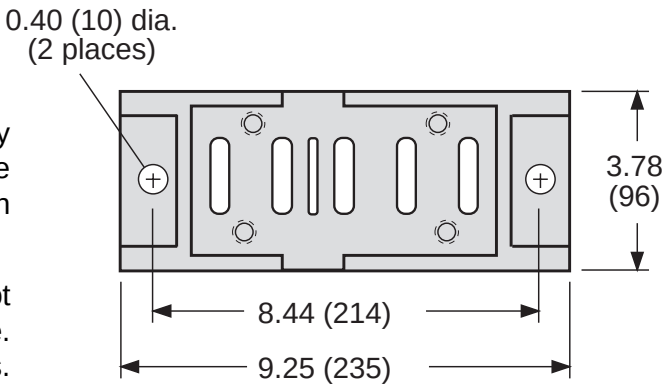
Station Number	Port Sizes	
	A, B	P, EA, EB
585K91	1/2 NPT	3/4 NPT
586K91	3/4 NPT	1 NPT
587K91	1 NPT	1 NPT

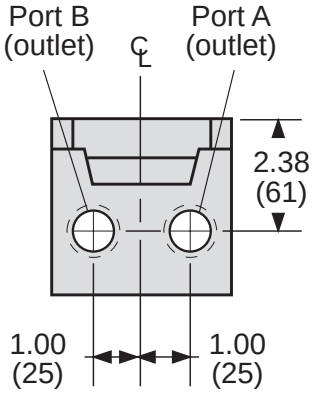
*Consult ROSS for SAE threads.

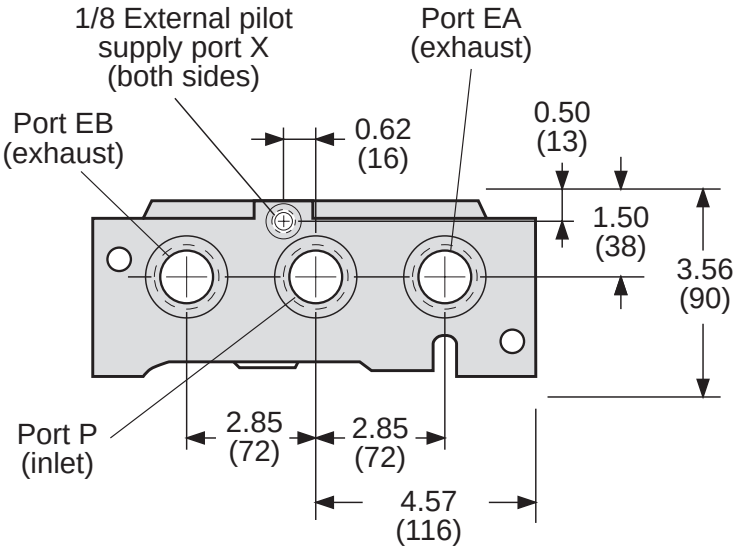
Each manifold station is supplied with all necessary seals and hardware for assembly. End plates are *not* required with these manifolds. Each station has all ports threaded to accept piping.

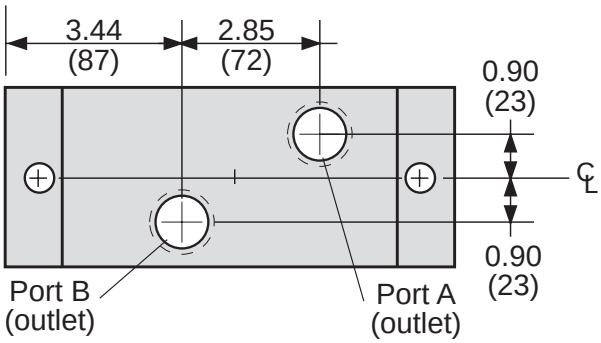
BLANKING PLATE. For manifold stations not occupied by a valve, blanking plates are available. These plates block the unused air passages. Order by part number **822K77**.

Dimensions: inches (mm)

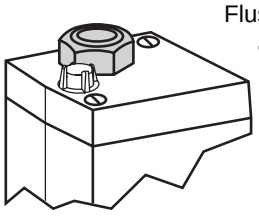








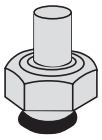
MANUAL OVERRIDE KITS for SIZE 500 VALVES



Flush metal buttons (shown at left as installed) are of either the locking or non-locking type. The extended button (see below) is the non-locking type. Order by the kit numbers below:

Flush Button

Non-locking	790K87
Locking	792K87



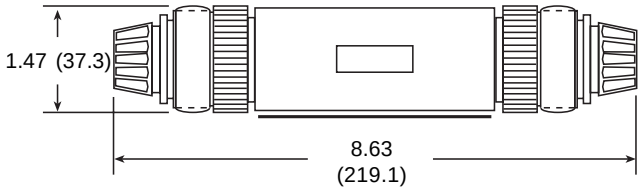
Extended Button

Non-locking	791K87

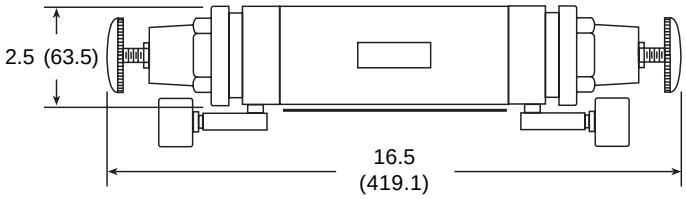
Interposed Regulators

Both single and dual interposed regulators are available for sizes 125 and 250. A regulator is sandwiched between the valve and sub-base or manifold station and the valve is then bolted through the regulator to the sub-base or manifold station with the longer bolts provided. Single pressure regulators supply the same regulated pressure at both outlet ports. Dual pressure regulators allow the pressure at each outlet port to be set independently. *Use dual pressure regulators with 80 Series valves only. When using dual pressure regulators, the valve must be externally piloted.* Regulated pressure range: 10 – 130 psig (regulator-to-base gasket included).

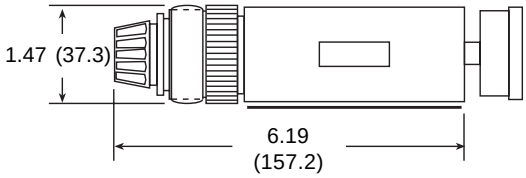
Size 125 – Dual: 873H91



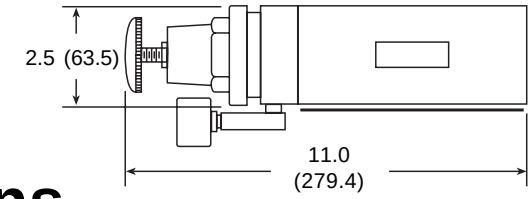
Size 250 – Dual: 816H91



Size 125 – Single: 593K91



Size 250 – Single: 595K91



Cautions

PRE-INSTALLATION or SERVICE

1. Before servicing a valve or other pneumatic component, be sure that the electrical supply is turned off and that the entire pneumatic system is shut off and exhausted.
2. All ROSS products, including service kits and parts, should be installed and/or serviced only by persons having training and experience with pneumatic equipment. Because any installation can be tampered with or need servicing after installation, persons responsible for the safety of others or the care of equipment must check every installation on a regular basis and perform all necessary maintenance.
3. All applicable instructions should be read and complied with before using any fluid power system in order to prevent harm to persons or equipment. In addition, overhauled or serviced valves must be functionally tested prior to installation and use.
4. Each ROSS product should be used within its specification limits. In addition, use only ROSS parts to repair ROSS products. Failure to follow these directions can adversely affect the performance of the product or result in the potential for human injury.

FILTRATION and LUBRICATION

5. Dirt, scale, moisture, etc. are present in virtually every air system. Although some valves are more tolerant of these contaminants than others, best performance will be realized if a filter is installed to clean the air supply, thus preventing contaminants from interfering with the proper performance of the equipment. ROSS recommends a filter with a 5-micron rating for normal applications.
6. All standard ROSS filters and lubricators with polycarbonate plastic bowls are designed for compressed air applications only. Do *not* fail to use the metal bowl guard, where provided, to minimize danger from high pressure fragmentation in the event of bowl failure. Do not expose these products to certain fluids, such as alcohol or liquefied petroleum gas, as they can cause bowls to rupture, creating a combustible condition, hazardous leakage, and the potential for human injury. Immediately replace a crazed, cracked, or deteriorated bowl. When bowl gets dirty, replace it or wipe it with a clean dry cloth.
7. Only use lubricants which are compatible with materials used in the valves and other components in the system. Normally, compatible lubricants are petroleum base oils with oxidation inhibitors, an aniline point between 82 degrees Celsius (180 degrees Fahrenheit) and 104 degrees Celsius (220 degrees Fahrenheit), and an ISO 32, or lighter, viscosity. Avoid oils with phosphate type additives which can harm polyurethane components, potentially leading to valve failure and/or human injury.

AVOID INTAKE/EXHAUST RESTRICTION

8. Do not restrict the air flow in the supply line. To do so could reduce the pressure of the supply air below the minimum requirements for the valve and thereby cause erratic action.
9. Do not restrict a poppet valve's exhaust port as this can adversely affect its operation. Exhaust silencers must be resistent to clogging and have flow capacities at least as great as the exhaust capacities of the valves. Contamination of the silencer can result in reduced flow and increased back pressure.

ROSS expressly disclaims all warranties and responsibility for any unsatisfactory performance or injuries caused by the use of the wrong type, wrong size, or inadequately maintained silencer installed with a ROSS product.

POWER PRESSES

10. Mechanical power presses and other potentially hazardous machinery using a pneumatically controlled clutch and brake mechanism must use a press control double valve with a monitoring device. A double valve without a self-contained monitoring device should be used only in conjunction with a control system which assures monitoring of the valve. All double valve installations involving hazardous applications should incorporate a monitoring system which inhibits further operation of the valve and machine in the event of a failure within the valve.

ENERGY ISOLATION/EMERGENCY STOP

11. Per specifications and regulations, ROSS L-O-X® and L-O-X®/EEZ-ON® products are defined as energy isolation devices, NOT AS EMERGENCY STOP DEVICES.

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WARRANTY

Products manufactured by ROSS are warranted to be free of defects in material and workmanship for a period of one year from the date of purchase. ROSS' obligation under this warranty is limited to repair or replacement of the product or refund of the purchase price paid solely at the discretion of ROSS and provided such product is returned to ROSS freight prepaid and upon examination by ROSS is found to be defective. This warranty shall be void in the event that product has been subject to misuse, misapplication, improper maintenance, modification or tampering. THE WARRANTY EXPRESSED ABOVE IS IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES AND ROSS EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED WITH RESPECT TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ROSS MAKES NO WARRANTY WITH RESPECT TO ITS PRODUCTS MEETING THE PROVISIONS OF ANY GOVERNMENTAL OCCUPATIONAL SAFETY AND/OR HEALTH LAWS OR REGULATIONS. IN NO EVENT SHALL ROSS BE LIABLE TO PURCHASER, USER, THEIR EMPLOYEES OR OTHERS FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM A BREACH OF THE WARRANTY DESCRIBED ABOVE OR THE USE OR MISUSE OF THE PRODUCTS. NO STATEMENT OF ANY REPRESENTATIVE OR EMPLOYEE OF ROSS SHALL EXTEND THE LIABILITY OF ROSS AS SET FORTH HEREIN.

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