AAA PRODUCTS INTERNATIONAL

- PREMIUM QUALITY
- UNSURPASSED SERVICE
- EXCEPTIONAL DELIVERY

VALVES

FOR COMPRESSED AIR OR GAS SERVICE

PUT AAA VALVES ON YOUR TOUGHEST JOBS

28th Edition

HISTORY OF AAA PRODUCTS INTERNATIONAL

AAA Products was envisioned during the early days of World War II. Bob Womack, Chairman of AAA, was in the special machine design and building business. Delivery on air valves and cylinders was very slow due to the large demand and to give a reasonable delivery on special machines, it was necessary to make air valves and cylinders to order.

After the war, with Bob's knowledge of fluid power (Air, hydraulic and vacuum), some of the fluid power equipment manufacturers around the world asked Bob to represent their products in the area. This was the beginning of Womack Machine Supply Company. While selling many different brands of air valves, Bob started AAA Products International and designed a line of air valves that have the best features of most air valves, while avoiding the undesirable features. The AAA air valve line has a minimum of parts, so anyone can understand its operation. There is no way the soft seal AAA valve packing can be sucked out, blown out or pinched, even when operated at four times the already high rated operating pressure of 250 PSI.

Bob Womack
Founder and Chairman
AAA Products International

AAA Products is an entirely different valve company. AAA Products is continually designing and building new and more efficient production machines to increase output, while maintaining the highest quality standards and very fast deliveries.

Ninety percent (90%) of the components that go into our valves are manufactured on machines designed and built in our plant.

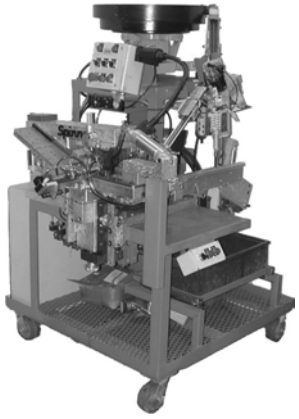
A well-known U.S. testing laboratory did blind hydrostatic tests on our standard AAA 1/4" die cast aluminum body air valves purchased at random from AAA valve distributors stock (Model RR2 used). This test was to simulate a catastrophic system failure where the valve may see a tremendous pressure increase. The standard AAA 1/4" air valves did not fracture or lose fluid containment until over 8800 PSI average. AAA rates these air valves for 250 PSI (Solenoid valves can have a maximum of 150 PSI on the solenoid operator). Just externally pilot the AAA solenoids with 150 PSI or less when using the valves for service over 150 PSI. If you need a stronger AAA valve, we have a high strength, aluminum bar stock body and for extreme pressures, we have a 316-cast stainless steel 1/4" and 3/8" NPT body. Contact us for your air valve needs for any kind of service. "**Put AAA valves on your toughest jobs, we really mean it**"!

P.S.: The reason why AAA Products is so well tooled is because the founder and chairman of AAA Products has over 60 years of machine design and building experience. AAA is a different kind of manufacturer. We build special tooling way ahead of product demand.

EXAMPLES OF CUSTOM PRODUCTION MACHINES IN OUR AAA PLANT

This is our new “O-ringer”, a machine designed and built in our facilities. This unique machine will insert the six O-ring packings deep into our 1/4" and 3/8" NPT air valve body. Each O-ring is placed into a specific groove, with all six O-rings inserted in just 3.8 seconds. It is powered by two high-speed electronic servo motors that quickly position and insert the O-ring within the groove, holding one thousandth of an inch accuracy. We also have an air operated O-ring inserter for the 1/4" and 3/8" air valve bodies that installs the six O-rings in 4 seconds (Many times we build a new machine to save a few seconds time on an operation or to give us backup production on critical operations).

We manufacture our most popular valve spool with a machine called the “Beaver”. A parts bowl feeder on top holds blank spools which are automatically fed to the cutting tools. The part is clamped and inspected for length. On proper length parts, the Beaver will cut 36 air groove passages around the circumference of the spool at 2 locations. The Beaver will produce 15 spools per minute and can run unattended for hours with occasional replenishment of blank spools.



This is our “Spinner” machine. This slick little machine, designed and built in our facilities, will feed valve spools and several clevis designs, and assemble them with a locking media. The spools are fed from a vibrating feeder and automatically oriented with the threaded end down. They are fed into three rotating rollers, torqued to a predetermined value and ejected. Rate of production is 20 spool clevis assemblies per minute.

The “Swinger”, with U.S. patent granted to AAA Products International, is a combination swing feed, valve end cap drilling and tapping machine. The 1/4" and 3/8" valve end caps are fed from a vibrating feeder bowl down into a parts pocket. The end cap is drilled from the bottom and tapped 1/8" NPT from the top. Rate of production is 60 end caps drilled and tapped per minute.

Note: The exceptional delivery and quality of AAA valves is due to the use of highly specialized machines like these and over fifty others in our plant. Our high production machines are always set up, ready to produce quality valve parts at unbelievable speeds.

FIND OUT FOR YOURSELF WHY AAA VALVES ARE THE BEST IN THE WORLD!

We, at AAA Products International, are committed to providing our customers with superior products of premium quality. Along with a full line of standard products, we supply over 400 special customer specific products to fit their unique applications. We promise unsurpassed customer service, exceptional delivery and competitive prices.

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National FLUID POWER Association MEMBER

American National Standards Institute MEMBER

UNDERSTANDING THE CATALOG LAYOUT

This catalog is organized first by the type of valve, then by the major valve shifting operator.

1 Choose Type Of Valve
1/4" through 2" NPTF Soft Seal, Inline or Subplate
1/4" or 3/8" NPTF Stacking
1/4" or 3/8" NPTF Namur Direct Mount

2 Choose Control Operator	Std	B-Series	Namur
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“Classic” Solenoid	pg. 30	pg. 129	
Manual Lever	pg. 46	pg. 134	
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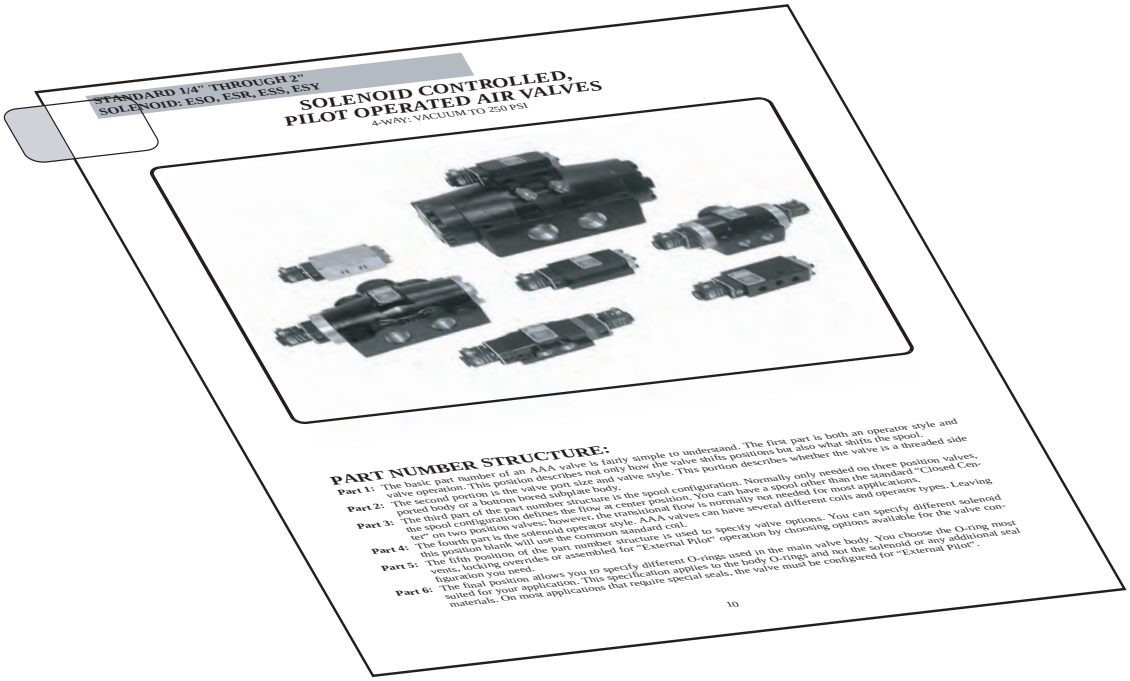
For convenience, on the major pages there are gray lines that can be used to align tabs for quick access. Most office stores carry self affixing colored tabs that are 1" wide by 1-1/2" long. Align the bottom of the tab to the gray line.


STANDARD 1/4" THROUGH 2"
SOLENOID: ESO, ESR, ESS, ESY

SOLENOID CONTROLLED,
PILOT OPERATED AIR VALVES

4-WAY; VACUUM TO 250 PSI

PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool. The second portion is the valve port size and valve style. This portion describes whether the valve is a threaded side ported body or a bottom ported subplate body.

Part 2: The second portion is the spool configuration. Normally only needed on three position valves, the third part of the part number structure is the spool configuration. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 3: The third part is the solenoid operator style. AAA valves can have several different coils and operator types. Leaving the spool configuration valves; however, the transitional flow is normally not needed for most applications. The fourth part is the solenoid operator style. AAA valves can have several different coils and operator types. Leaving this position blank will use the common standard coil.

Part 4: The fourth part is the solenoid operator style. AAA valves can have several different coils and operator types. Leaving this position blank will use the common standard coil. The fifth position of the part number structure is used to specify valve options. You can specify different solenoid vents, locking overrides or assembled for “External Pilot” operation by choosing options available for the valve configuration you need.

Part 5: The fifth position of the part number structure is used to specify valve options. You can specify different solenoid vents, locking overrides or assembled for “External Pilot” operation by choosing options available for the valve configuration you need. The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings and not the solenoid or any additional seal materials. On most applications that require special seals, the valve must be configured for “External Pilot”.

Part 6: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings and not the solenoid or any additional seal materials. On most applications that require special seals, the valve must be configured for “External Pilot”.

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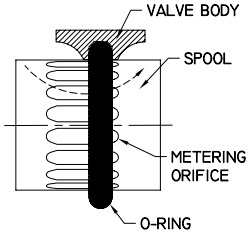
IMPORTANT FEATURES OF AAA VALVES

(ONE OF THE TOUGHEST VALVES IN THE WORLD)

A MINIMUM OF PARTS ★ SIMPLICITY OF OPERATION ★ UNDERSTOOD BY ANYONE
STANDARD LEAKTIGHT O-RING SEALS ARE AVAILABLE WORLD-WIDE

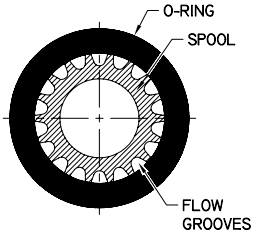


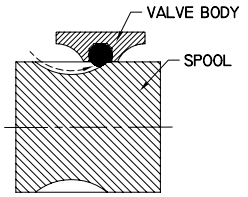
GOOD METERING NON-SHOCK REVERSAL

Whether you use manual, electric or pilot-operated valves, the tapered flow grooves give a smooth reversal of air flow, eliminating shock on lines and components.

LARGE DIAMETER SPOOL FOR HIGH FLOW

Competitive 1/2" valves have 5/8" or 3/4" diameter spool. AAA spools are 1-1/8", allowing room for seal retaining lands between the flow grooves without sacrificing flow.



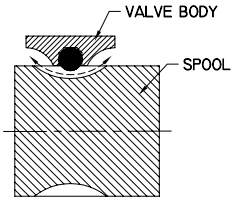


NO BITE! NO PINCH! NO WASHOUT OF O-RINGS! SIMPLE AND EFFICIENT!

A long angle on the flow grooves lifts the O-ring out of the groove as the spool shifts. No seal failure even at twice rated pressure.

AAA VALVES ARE SELF-CLEANING BY FLOW PRESSURE EITHER WAY!

AAA valves can be used with pressure or vacuum on any port because there are no cups, flanges or one direction seals.



OPERATIONAL ADVANTAGES OF AAA VALVES

1. Valves will not pinch, unseat or blow out the seals at high pressure or with any other operating condition.
2. Manually controlled valves can be throttled to a finer degree than most spool-type valves because of the double taper on each end of the grooves.
3. Vacuum to full pressure can be applied to any or all ports at the same time. Exhaust ports can be used as pressure ports for 5-way service.
4. Valves are 4-way, dual exhaust construction and work equally well as 2-way, 3-way or 5-way valves.
5. Every port is isolated from all other ports with O-rings, giving leak tight operation.
6. Cylinder speed can be controlled in both directions with needle valves screwed into exhaust ports.
7. AAA spool valve design permits operation under conditions of contamination that would lock up the spool on a metal-to-metal spool and body design.
8. Molded 11mm DIN solenoid coils are standard and are available in all popular A-C and D-C voltages. Other voltages and styles are available. Consult factory for voltages or styles not found in this catalog.
9. Coils of different voltages can be quickly and easily installed in the field.
10. Both coils of solenoid valves can be energized at the same time without damage to valve or solenoid coils.
11. O-ring seal life is extremely long because of unique flow characteristics. A 1/2" solenoid valve operated over 32 million cycles without O-ring replacements.
12. Solenoid valves are available with intrinsically safe, explosion proof, DIN connector, flying lead or Mold-Over operators.
13. Solenoid valves are available with CSA approval and solenoid operators are available with UL approval.
14. 3-position valves are normally supplied with closed center spools. Other spool types are available. Spool assembly can be changed in the field.

GENERAL INFORMATION ON AAA VALVES

AAA valves are spool-type with 4-way action and are intended primarily for control of air cylinders or air motors. Soft seal models, which include all listings, are for air, inert gas or low vacuum service up to 26" Hg. They are offered in a complete size range from 1/4" to 2". O-rings give tight sealing between all ports.

SIDE PORTED BODY SIZES

Soft seal valves are built in 4 side ported body sizes. The 1/4" and 3/8" valves are housed in the smallest body. Both are identical except for a slight difference in flow capacity. The 1/2" valves are in the next larger body. The 3/4" and 1" valves are in a still larger body. They have a flow area equal to a 3/4" diameter orifice. They are identical in appearance but have a slightly different flow capacity. The largest body with 1-3/8" diameter flow area is used for 1-1/2" and 2" valves. These two sizes are the same except for NPTF body ports on the 1-1/2" models and 2" subplate ports on the 2" models.

MODELS FOR SUBPLATE MOUNTING

Subplate mounting is offered in all body sizes except “NAMUR” and “B-Series” stack valves. 1/4" and 3/8" valves have flow area equal to 5/16" orifice and can mount on a subplate with 1/4" or 3/8" connections. 1/2" valves have a flow area of 1/2" orifice and can mount on subplates with 1/2" connections. 3/4" and 1" valves have a flow area of 3/4" orifice and can mount on subplates with 3/4" or 1" connections. 1-1/2" and 2" valves have a flow area of 1-3/8" orifice and can mount on subplates with 1-1/2" or 2" connections.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

THESE SAFETY PRECAUTIONS MUST BE OBSERVED

1. Do not operate solenoid valves above 150 PSI on the pilot section! Use “externally piloted” valves for pressures above 150 PSI (160 PSI on “Classic” solenoid styles).
2. Mount 2-position, no-spring models with spool horizontal to avoid accidental spool drift due to vibration.
3. Foot controlled valves should have OSHA approved safety guard.
4. Although AAA valves are virtually trouble-free through millions of normal cycles, they should be disassembled and inspected periodically, depending upon conditions.
5. Do not over lubricate! For further information contact factory.

FACTORY PRE-LUBRICATION

All valves are pre-lubricated at the factory using Magnalube®-G teflon based all purpose grease. Valves are suitable for and perform best in a low lube service.

For long life, use an air line filter/lubricator installed no further than 8 to 10 feet from the valve. The filter should be rated 25 pm or finer. Use a high grade of petroleum base non-detergent lubricating oil no heavier than SAE lOW. DO NOT OVER-LUBRICATE. This could cause the spool to stick. You should not see oil dripping or misting through the exhaust ports of the valve.

CAUTION! Do not use questionable fluids in air line lubricators. Do not use petroleum oil with detergent additives, volatile or aromatic fluids, vegetable oil, cup grease, or automobile chassis lubricant. The use of questionable fluids may swell rubber seals in valves and cylinders.

RECOMMENDED LUBRICATION

When cleaning AAA valves after extended service, lubricate the valve spool with AAA high film strength grease, or use O-ring grease which is usually available from supply houses which sell O-rings. Magnalube®-G is included in all valve repair kits for proper valve maintenance.

AAA Products International recommends the use of Magnalube®-G in all of its products. This teflon based lubricant is rated to operate under extreme load conditions and wide temperature ranges, mechanically and chemically stable, water resistant, and reduces the need for repetitive re-applications. We do not recommend any lubricants that include cleaners or solvents. These types of lubricants have a tendency to swell the O-rings and reduce the performance of the valve and O-rings must be replaced.

CONSTRUCTION FEATURES OF AAA VALVES — Soft Seal Types

One secret to the superior performance of AAA valves is the large spool diameter. The diameter is 25% to 50% larger than competitive valves, giving more positive shifting on pilot controlled and solenoid valves, less wear and longer life on the standard O-ring seals and larger flow area in a given size because so many more flow grooves can be cut around the larger diameter spools.

FULL RATED PRESSURE

The use of O-ring seals between ports permits the application of full rated pressure on any port. O-rings are standard commercial sizes and compounds available world wide from any supply house. The valve is constructed to confine the O-rings in a manner making it impossible to pinch, bite or pop them out under the most adverse operating conditions.

SYMMETRICAL CONSTRUCTION

The valve body and the spool are completely symmetrical end to end. This means that the spool and/or end caps may be reversed in the valve body. This is sometimes a great convenience in mounting or plumbing.

METERING

The double taper of the flow grooves gives AAA valves much better throttling characteristics on manual valves than is usual for spool valves and tends to reduce shifting shock on solenoid and pilot controlled models.

FULL FLOW

Flow area through the valve is generously designed, exceeding in most cases the size rating of the valve. Consequently, the flow losses though the valves are lower than might be expected.

HARD SPOOL

By a special process, the surface of the spool is treated to have a very hard and slick finish to give millions of trouble-free cycles. And yet, the spool is feather-light for fast response. For example, the 1/4" valve spool weighs only 1-1/4 ounce. On solenoid, pilot controlled and differential pilot models, the light spool gives extremely fast response with a minimum of shock on the end caps.

METERED EXHAUST

AAA valves have dual exhaust ports. A needle valve screwed into each exhaust port (Except “B-Series” stack valves), will permit adjustment of speed in both directions of a cylinder or air motor.

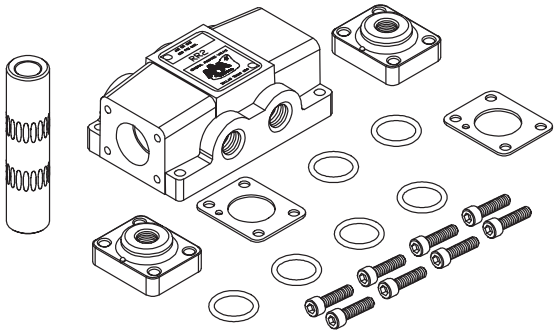
MINIMUM PRESSURE LOSS

AAA soft seal valves use a unique valving principle. Specially contoured grooves have a combined flow area equal to or greater than the size rating of the valve in most cases. Groove shape is responsible for smoother action of AAA valves as compared with ordinary spool valves.

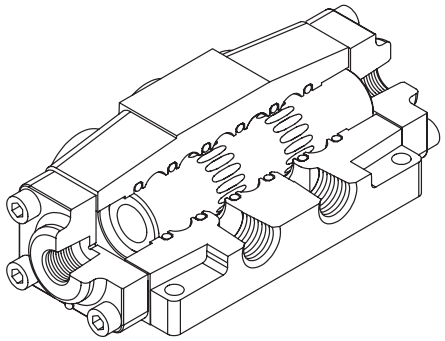
Since the O-ring seals are always confined, vacuum or pressure may be applied to any port and flow through the valve may be in either direction.

SIMPLICITY — MINIMUM OF PARTS

AAA Valves are designed for simplicity and minimum number of parts. Seals are standard O-rings and are available worldwide. If they should need replacing (After millions of cycles), the job can be quickly and easily done without service or parts drawings. There are no small loose parts to be damaged or lost and no hidden seals to leak.



Component Parts of 1/4" Double Piloted Valve



Cut-away View of 1/4" Double Piloted Valve

VALVE SEALS

AAA valves are virtually trouble-free through millions of cycles if these simple lubricating instructions are followed. Some oils may swell the rubber seals in valves and cylinders of any brand and may cause binding. To determine if seals are swelled in AAA valves, remove one O-ring from the body and slip it over the spool. If the clearance between O-ring and spool is 0.005" or more all around, the ring is swelled from its original shape. A small amount of swelling will not usually impair valve performance and sometimes the valve will still perform reliably with as much as 1/32" all around (See page 152 on how to replace O-rings).

Valve Size	O-ring Size	Std. Material
1/4" & 3/8"	3/4"x15/16"	Viton
1/2"	1-1/8"x1-3/8"	Buna-N
3/4" & 1"	1-3/8"x1-5/8"	Buna-N
1-1/2" & 2"	2-1/4"x2-5/8"	Buna-N

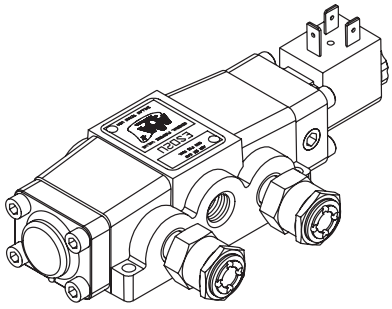
AAA spool valves use standard size O-rings available almost anywhere in the world. Specially built or non-standard valves may have been furnished with special O-rings to suit special operating conditions. When inquiring from the factory, give all model numbers and engineering numbers appearing on the valve nameplate.

Six O-rings, of 70 or 75 Shore hardness are used in the body of each valve.

EXHAUST FLOW CONTROLS WITH AAA VALVES

Standard AAA valves are built with dual exhaust ports. A needle valve may be screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel.

MFC muffler/flow controls, listed on page 146, are available for this purpose. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise. They are available up to 1/2" size.

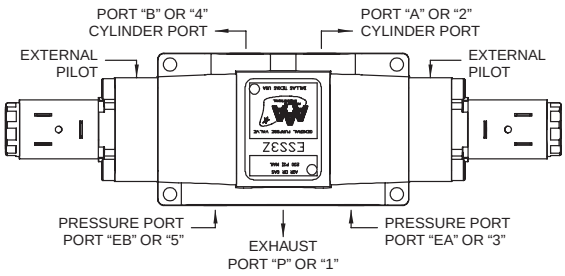


Model ESO2U Valve Showing MFC Flow Controls

USING AAA VALVES FOR 5-WAY SERVICE

A 5-way application is one using two inlet pressure levels or in which inlet pressure is derived from two different sources for use in the same circuit. Another type of 5-way application is for conserving air on the return stroke of double-acting cylinders.

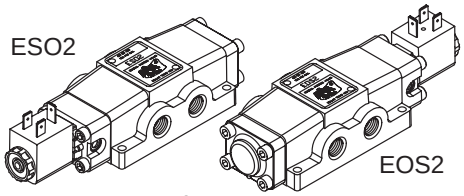
Standard AAA soft seal valves may be used for 5-way service with these exceptions: Solenoid valves must be re-connected to use an external source of 50 PSI to 150 PSI pilot pressure. Stack valve sections and differential pilot valves cannot be used for 5-way service.



Model ESS3Z Connected for 5-way Service

REVERSED OPERATORS

The end actuators on AAA Soft seal valves can be changed from one end to the other to put the inlet port and cylinder ports on the desired side for convenience in plumbing. On quantity orders, if actuators are desired on opposite ends of the valve from standard assembly as shown in this catalog, just reverse the valve operators in the valve model number when ordering (E.g. ESO2 represents standard assembly. In comparison, EOS2 has actuators reversed, end for end.



Example of Actuator Interchange

OPTIONAL O-RING MATERIALS

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. In the example, model RY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1" consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

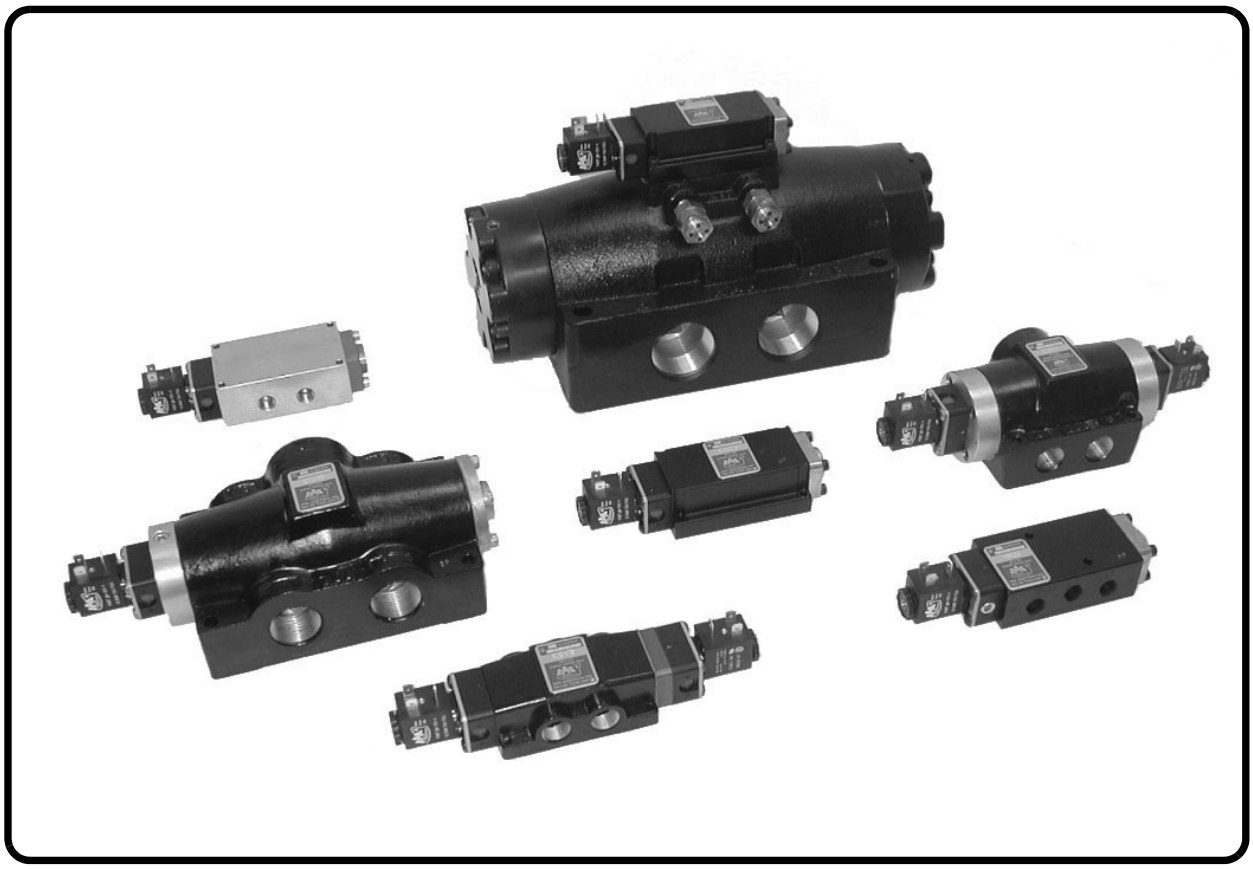
We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

Note: On standard solenoid model valves, the solenoid operator plunger seat is Viton. On "Classic" solenoid model valves, the solenoid operator plunger seat is Buna-N. Solenoid operators must be externally piloted when using gases not compatible with seal material. Consult factory for special plunger seat material.

STANDARD 1/4" THROUGH 2"
SOLENOID: ESO, ESR, ESS, ESY

SOLENOID CONTROLLED, PILOT OPERATED AIR VALVES

4-WAY: VACUUM TO 250 PSI



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Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

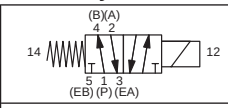
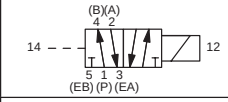
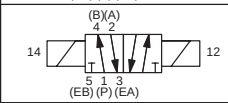
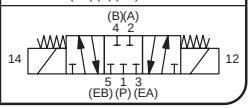
Part 4: The fourth part is the solenoid operator style. AAA valves can have several different coils and operator types. Leaving this position blank will use the common standard coil.

Part 5: The fifth position of the part number structure is used to specify valve options. You can specify different solenoid vents, locking overrides or assembled for “External Pilot” operation by choosing options available for the valve configuration you need.

Part 6: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings and not the solenoid or any additional seal materials. On most applications that require special seals, the valve must be configured for “External Pilot”.

ESS3PGMZ-5-120/60 (Voltage: e.g. 120/60, 24 vdc)

1 Operator Style

Code	Description	Symbol
ESO	Single solenoid, 2-position, spring return. Spool returns to position "C" when solenoid is de-energized.	
ESR	Single solenoid, 2-position, pilot returned spool. Spool returns to position "C" from auxiliary control valve furnished by the user.	
ESS	Double solenoid, 2-position, friction position. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized.	
ESY	Double solenoid, 3-position, spring centered. Spool returns to center, position "B", when both coils are de-energized.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF
12 = 1-1/2" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow
16P = 1-1/2" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed cross over, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Solenoid Operator Form

blank = Standard "DIN" style solenoid coil with 11mm/Industrial Form B pin pattern.
A = Intrinsically safe solenoid operator and coil with non-indicator, cord grip style DIN cap.
H = 30 mm DIN for high temperature applications.
J = Mold-Over coil, with 1/2"-14 NPT conduit connection.
M = Flying lead solenoid coil, with 18" leads.
X = Explosion proof solenoid coil.

5 Valve Options

blank = No options selected.
C = Side solenoid exhaust (can not be combined with option "L").
I = Non-threaded spool indicator pin (available only on models ESO2, ESO3, ESO3P).
K = Threaded spool indicator pin (available only on models ESO2, ESO3, ESO3P).
L = Sintered bronze dust excluder on solenoid exhaust (can not be combined with option "C").
O = Locking manual solenoid override.
OS = Manual main spool override (available only on models ESO2, ESO3, ESO3P).
Q = 2-postion spool detent (available only on models ESR & ESS with limited body styles).
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).
Z = Factory assembled for "External Pilot" operation.

6 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Standard solenoid models are assembled for “Internal Pilot” operation; that is, the valves derive shifting pressure for the spool from the valve inlet port. The required pressure to shift the spool is dependent upon the operator style. If the valve must operate at other pressures or vacuum, then the solenoid operator must use an “External Pilot” source at a pressure between 25 PSI to 150 PSI. Valves that require external pilot pressure can be ordered from the factory with the “Z” Option or be converted in the field for “External Pilot” operation.

When using an “External Pilot” source, the maximum pressure of any port is 250 PSI and the maximum vacuum of any port is 28" Hg. A combination of pressure and vacuum on multiple ports is permissible as long as the differential pressure does not exceed 250 PSI.

OPERATOR STYLE CODE:

ESO: Single solenoid, 2-position, spring return. Spool returns to original position when solenoid is de-energized. This operator style will operate reliably on line pressures from 150 PSI down to 50 PSI. If the line pressure is 150 PSI to 250 PSI or less than 50 PSI to 28" Hg, then the solenoid operator must be configured to use an “External Pilot” source.

ESR: Single solenoid, 2-position, pilot returned spool. Spool returns to position “C” from auxiliary control valve furnished by the user. This operator style will operate reliably on line pressures from 150 PSI down to 25 PSI. Return shift pressure should be 25 PSI or greater. If the line pressure is 150 PSI to 250 PSI or less than 25 PSI to 28" Hg, then the solenoid operator must be configured to use an “External Pilot” source.

ESS: Double solenoid, 2-position, no springs. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized. Standard models are assembled for “Internal Pilot” operation. This operator style will operate reliably on line pressures from 150 PSI down to 25 PSI. If the line pressure is 150 PSI to 250 PSI or less than 25 PSI to 28" Hg, then the solenoid operator must be configured to use an “External Pilot” source.

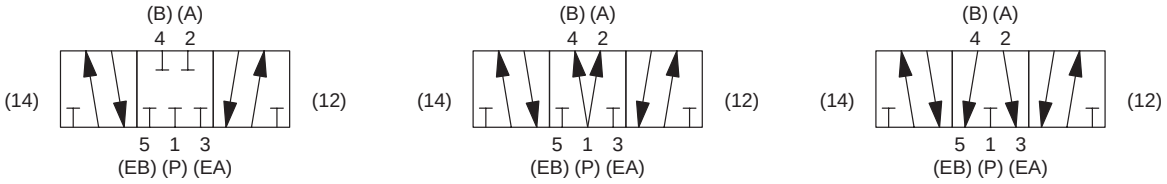
ESY: Double solenoid, 3-position, spring centered. Spool is centered when both solenoids are de-energized. Standard models are assembled for “Internal Pilot” operation. This operator style will operate reliably on line pressures from 150 PSI down to 50 PSI. If the line pressure is 150 PSI to 250 PSI or less than 50 PSI to 28" Hg, then the solenoid operator must be configured to use an “External Pilot” source.

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female “National Pipe Threads” to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4", 1" and 1-1/2" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All port connections, excluding “External Pilot” or “Pilot Return” ports, if used, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body. Consult factory on the possibility of routing external pilot or pilot return sources through the subplate on body styles 4P and 8P.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



STANDARD: Most valves are supplied with a “Closed Center” spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are “Closed Center”. Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option “D”. In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a “Regenerative” spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option “G”. In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a “Float Center” spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

SOLENOID OPERATOR FORMS:

STANDARD SOLENOID OPERATOR INFORMATION

The standard coils are a DIN 43650 style with a 11mm/Industrial Form B connector pin pattern. DIN caps are ordered as a separate line item. *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
24 volts, 60 Hz	7.1 VA	5.8 VA	31.6 ohms
48 volts, 60 Hz	7.7 VA	6.2 VA	121 ohms
120 volts, 60 Hz	7.8 VA	6.3 VA	840 ohms
240 volts, 60 Hz	7.8 VA	6.3 VA	3400 ohms
12 volts D-C		4.6 Watts	31.6 ohms
24 volts D-C		4.8 Watts	121 ohms
60 volts D-C		4.3 Watts	840 ohms

DIN Caps (11mm style): Various styles of DIN caps are available as lose items, see below for more information.

Environmental Ratings: (With mounted plug-in connector per IEC 529) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both a UL and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20@ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

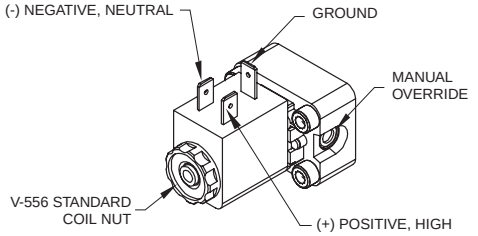
Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

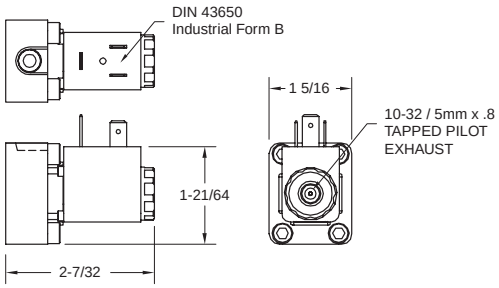
Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. For locking overrides, see valve option "O" on page 20.



Solenoid Terminal Definitions



Standard Solenoid Operator

OPTIONAL DIN CAPS FOR STANDARD COILS

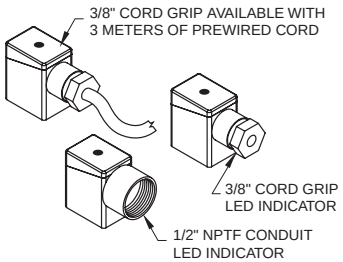
DIN caps are not supplied with standard solenoid valves. These caps must be ordered separately. Below are the DIN caps commonly used.

There are several styles of DIN caps. *When ordering LED Indicator types, you must specify voltage of solenoid coil* (E.g. DCL-120/60). All caps listed in table are for 11mm/Industrial Form B coils, consult factory for additional forms available. LED Indicator type caps are equipped with varistor surge protection (Diode surge protection available upon request).

Environmental Rating: IP 65

Model No.	Style	LED	Model No.	Style	LED
DCC	**1/2" Conduit**	**no**	**DCCL**	**1/2" Conduit**	**yes**
DCG	**3/8" Grip**	**no**	**DCGL**	**3/8" Grip**	**yes**
DC3M*	**3 Meter Cord**	**no**	**DC3ML***	**3 Meter Cord**	**yes**

*Consult factory for other lengths of cord.



DIN Cap Styles

OPERATOR STYLE A: INTRINSICALLY SAFE SOLENOID COIL

When related to solenoid valves, intrinsic safety means that the coil's current draw and resulting temperature is held to such a low level (When used with an approved safety barrier) that the valve no longer has the capability of igniting a mixture of flammable or combustible material, either during normal operation or under fault conditions.

Typically, they are used in situations where fire and explosive hazards exist due to the presence of flammable gases, vapors or liquids, combustible dusts or easily ignitable fibers.

These 24 VDC coils are approved according to EN 50 020 resp. DIN VDE 0170/0171 part 5. This coil is an ISO 4400 DIN style pin pattern. A non-indicator, cord grip style DIN cap provided.

To order solenoid valves with this coil type, use the suffix "A" (E.g. ESO2A). Intrinsically safe coils can not be placed on our standard solenoid assembly. This coil must be used with the proper operator and intrinsically safe barrier to function correctly. DIN caps are provided.

Electrical Characteristics: 21.6 - 28 VDC.

Max. Safe Valve: 28 VDC, 115 mA, 1.6W.

Electrical Characteristics: 37mA, 275 ohms ± 8%.

Environmental Ratings: (With mounted plug-in connector per IEC 529) IP 65 (NEMA 4 without structural rating).

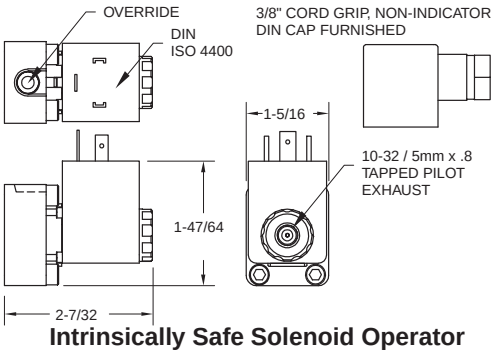
Certifications: This operator carries both FM and CSA approval rating. The rating only applies to the operator and not the entire valve.

Operating Temperatures: -4°F to 120°F.

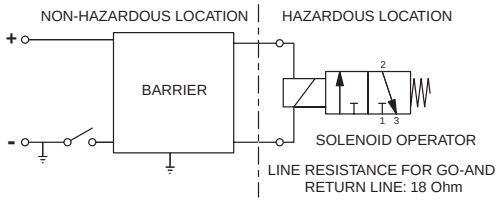
Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.



Intrinsically Safe Solenoid Operator



Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

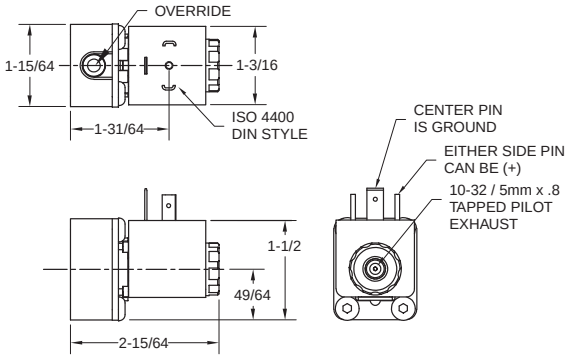
Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. For locking overrides, see valve option "O" on page 20.

OPERATOR STYLE H: 30MM COIL, HIGH TEMPERATURE COIL

30MM coils have same characteristics and performance as our standard coils, but have a ISO 4400 connector pin pattern. DIN caps are ordered as a separate line item. This coil is capable of higher temperatures than the other coils. To order solenoid valves with this coil type, use the suffix "H" (E.g. ESO2H 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
120 volts, 60 Hz	56 mA	34 mA	800 ohms
240 volts, 60 Hz	27 mA	17 mA	3205 ohms
12 volts D-C		218 mA	55 ohms
24 volts D-C		111 mA	216 ohms



High Temperature Solenoid Operator

DIN Caps (ISO 4400 style): Various styles of DIN caps are available as lose items, see below for more information.

Environmental Ratings: (With mounted plug-in connector) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both UL and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 190°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

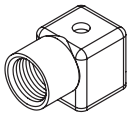
Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. For locking overrides, see valve option "O" on page 20.

OPTIONAL DIN CAPS FOR 30MM COILS

DIN caps are not supplied with standard solenoid valves. These caps must be ordered separately. Below are the DIN caps commonly used.

There are several styles of DIN caps. When ordering LED Indicator types, you must specify voltage of solenoid coil (E.g. EDCL-120/60). All caps listed in table are for "ISO 4400", consult factory for additional forms available. LED Indicator type caps are equipped with varistor surge protection (Diode surge protection available upon request).

Environmental Rating: IP 65


EDC Cap

Model No.	Style	LED	Model No.	Style	LED
EDC	1/2" Conduit	no	EDCL	1/2" Conduit	yes

OPERATOR STYLE J: MOLD-OVER COIL

"Mold-Over" coils have same characteristics and performance as our standard coils, but have a molded 1/2"-14 NPT connection with 18" leads that are wired through the 1/2"-14 NPT connection. To order solenoid valves with this coil type, use the suffix "J" (E.g. ESO2J 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
24 volts, 60 Hz	7.1 VA	5.8 VA	31.6 ohms
48 volts, 60 Hz	7.7 VA	6.2 VA	121 ohms
120 volts, 60 Hz	7.8 VA	6.3 VA	840 ohms
240 volts, 60 Hz	7.8 VA	6.3 VA	3400 ohms
12 volts D-C		4.6 Watts	31.6 ohms
24 volts D-C		4.8 Watts	121 ohms
60 volts D-C		4.3 Watts	840 ohms

Environmental Ratings: (With proper 1/2" NPT connection) IP 65 (NEMA 4 without structural rating).

Voltage Tolerance: ±10%.

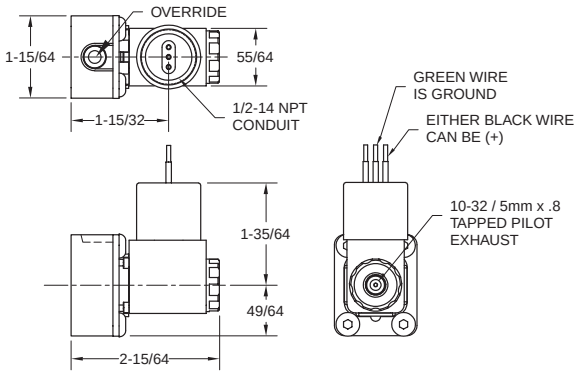
Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.



1/2" Conduit Solenoid Operator

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

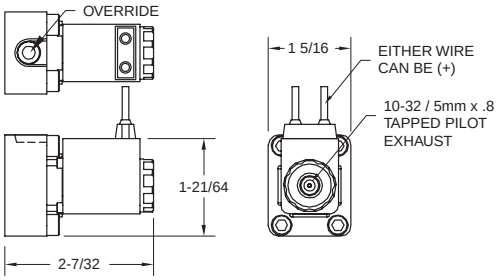
Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. For locking overrides, see valve option "O" on page 20.

OPERATOR STYE M: FLYING LEAD SOLENOID COIL

"Flying Lead" coils have same characteristics and performance as our standard coils, but have 18" lead wires molded with the coil. To order solenoid valves with this coil type, use the suffix "M" (E.g. ESO2M 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
24 volts, 60 Hz	7.1 VA	5.8 VA	31.6 ohms
48 volts, 60 Hz	7.7 VA	6.2 VA	121 ohms
120 volts, 60 Hz	7.8 VA	6.3 VA	840 ohms
240 volts, 60 Hz	7.8 VA	6.3 VA	3400 ohms
12 volts D-C		4.6 Watts	31.6 ohms
24 volts D-C		4.8 Watts	121 ohms
60 volts D-C		4.3 Watts	840 ohms



Flying Lead Solenoid Operator

Environmental Ratings: IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both UL and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR models. For locking overrides, see valve option "O" on page 20.

OPERATOR STYLE X: EXPLOSION PROOF SOLENOID COIL

All “Explosion Proof” solenoid operators carry the FM and CSA label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts). The connection is 1/2"-14 NPT conduit with 24" leads. **Note:** The FM and CSA label on an explosion proof solenoid operator covers only the electrical operator and does not cover the complete valve. To order solenoid valves with “Explosion Proof” operators, add suffix “X” to the basic part number (E.g. ESO2X 120/60). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
120 volts, 60 Hz	11.5 VA	6.5 VA	530 ohms
12 volts D-C		4.5 Watts	31.6 ohms
24 volts D-C		4.5 Watts	121 ohms

Environmental Ratings: (With proper 1/2" NPT connection) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both FM and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

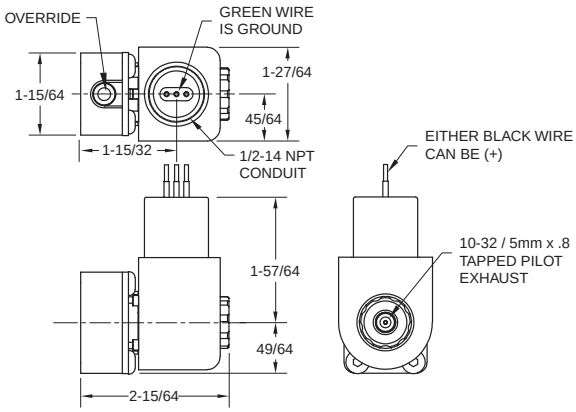
Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.



Explosion Proof Solenoid Operator

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. For locking overrides, see valve option “O” on page 20.

Unique Mounting Concern: On body styles 2 and 3 a 1/8" spacer or washers are required to mount the valve. **The explosion proof coil hangs below valve mounting surface by 3/32".**

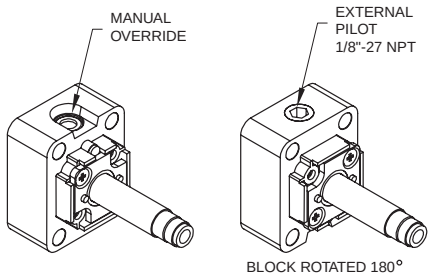
VALVE OPTIONS:

STANDARD: ALL SOLENOID FORMS PROVIDE

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust. If the valve is ordered with Option "L" or "C", the 10-32/5mm-0.8 exhaust will be covered by the nut and unusable.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ESO and ESY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. For locking overrides, see valve option "O" on page 20.

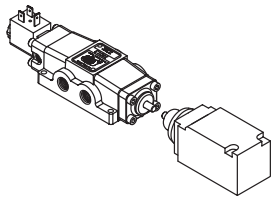
Field Modification: Able to convert between internal or external solenoid pilot source in the field.



Solenoid Adapter

OPTION I: NON-THREADED SPOOL INDICATOR PIN

Available only on single solenoid, spring return models with body styles of 2, 3 and 3P (ESO2, ESO3, ESO3P). This option allows a pin to protrude through the endcap to indicate the location of the internal spool. This is helpful for actuating a sensor to indicate the shift position of the valve. The pin will extend when the solenoid is energized. The travel of the pin is 18/32". The pin sticks out 3/8" from the face of the endcap when retracted.



OPTION K: THREADED SPOOL INDICATOR PIN

Same as Option "I", the non-threaded spool indicator pin, but the end of the indicator pin is 1/4"-20x3/4" threaded end.

OPTION L: SINTERED BRONZE DUST EXCLUDER NUT

This option allows the exhaust from the solenoid assembly to be filtered through a sintered bronze element. This causes a reduction in noise and filtering of exhaust. With this option, the 10-32/5mm-0.8 tapped exhaust is inaccessible


V-567

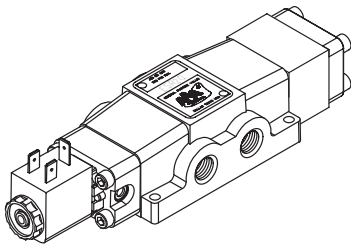
OPTION C: SIDE EXHAUST NUT

This option allows the exhaust from the solenoid assembly to be diffused. This causes a reduction in noise and diffusing of exhaust. With this option the 10-32/5mm-0.8 tapped exhaust is inaccessible.

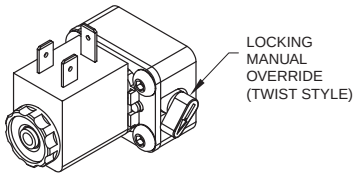

V-562

OPTION Q: 2-POSITION SPOOL DETENT

Available only on models ESR and ESS with body styles of 2, 3 and 3P. This option allows the spool to remain in position when shifting pressure is removed. This option is most often used in mobile applications where the vibrations may shift the spool when there is no holding pressure available. Overall length of the valve will increase by 1".



OPTION O: LOCKING MANUAL SOLENOID OVERRIDE

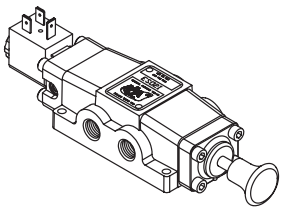


Locking Manual Solenoid Override

Solenoid structures with locking overrides are available on original factory orders. To activate manual override, the override knob must be twisted clockwise to the locked position. Spool will shift while the knob is in the override position, but will return to original position on spring models ESO and ESY when knob is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ESS and ESR. Converting to locking override from non-locking override in the field is not possible without replacing the entire solenoid assembly.

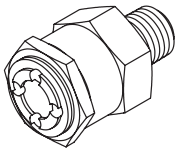
OPTION OS: MANUAL MAIN SPOOL OVERRIDE

Available only on single solenoid, spring return models with body styles of 2, 3 and 3P (ESO2, ESO3, ESO3P). The override knob is attached to the end of the main spool, allowing the knob to actuate the internal spool. The knob will have to be continuously held to overcome spring return. Minimum operating pressure of 70 PSI is required for reliable valve operation.



OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTION Z: "EXTERNAL" PILOT OPERATION

A valve may be ordered factory assembled for "External Pilot" operation by adding the suffix "Z" after the regular model number. 3/8" and 1-1/2" subplate valves are manufactured so the pilot source can **NOT** be provided through the mounting subplate base. On 1/2" and 1" subplate valves the pilot source can be routed through a pilot ported subplate. On all side ported valves, a pilot source must be provided to each solenoid operator.

OPTIONAL O-RING MATERIALS:

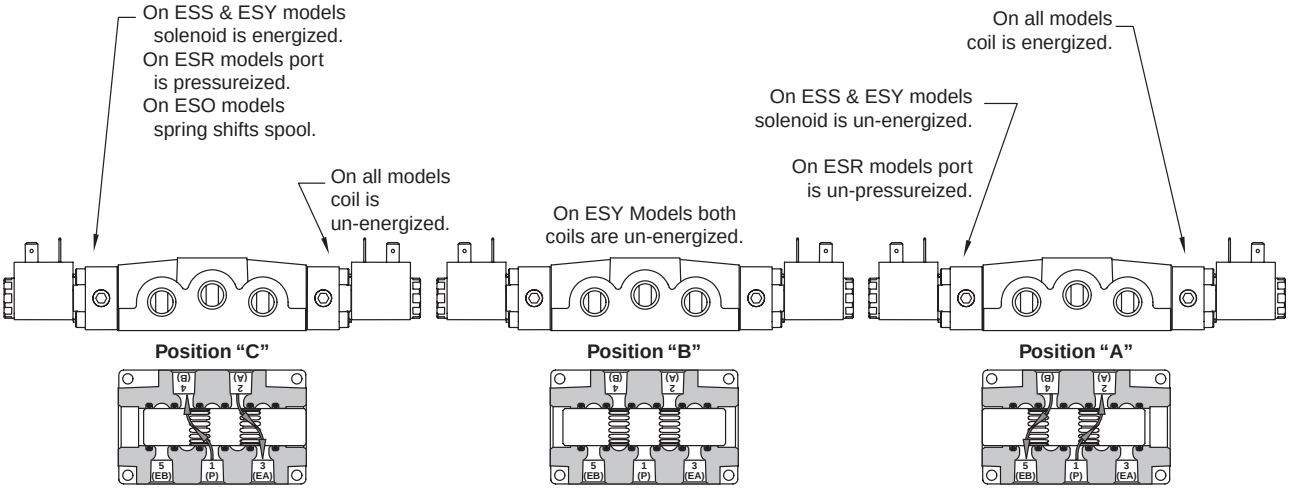
Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. In the example, model RY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1" consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

Note: On standard solenoid model valves, the solenoid operator plunger seat is Viton. Solenoid operators must be externally piloted when using gases not compatible with seal material. Consult factory for special plunger seat material.

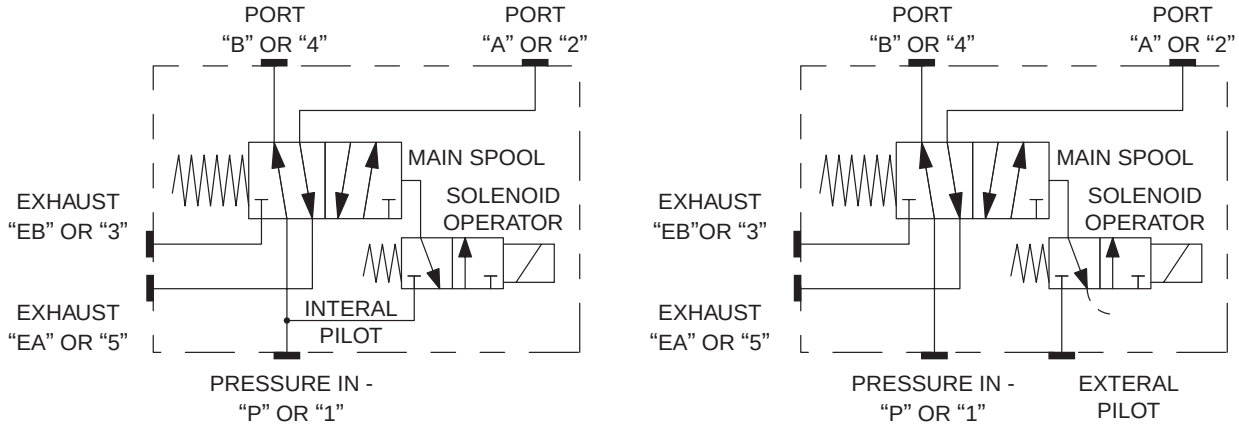
FLOW PATTERN:



1/4" through 1": When a solenoid is energized causing the internal spool to shift, port 1 will connect to the port closest to the energized coil. The furthest port will connect to the appropriate exhaust port.

1-1/2" and 2": These larger valves use a "Piggy-Back" valve mounted to the top of the larger valve. When a solenoid is energized causing the internal spool to shift, port 1 will connect to the port closest to the energized coil. The furthest port will connect to the appropriate exhaust port.

INTERNALLY AND EXTERNALLY PILOTED SOLENOID VALVES:



The diagram shows how AAA solenoid valves obtain their shifting power by tapping into the valve inlet inside the valve itself. If inlet pressure is above or below the limits stated by the operator style code, the valve must make use of an outside source of shifting power. It should be factory ordered with suffix "Z" following the regular model number and will be furnished with the electric operator connected to an external pilot pressure port as shown in the diagram above (E.g. ESO4Z 24 vdc).

CONVERTING TO EXTERNAL PILOT OPERATION

A valve may be ordered factory assembled for "External Pilot" operation by adding the suffix "Z" after the regular model number; or can be changed to "External Pilot" operation in the field as follows (This operation must be performed on each solenoid operator.)

Remove 4 screws holding the solenoid structure to the main body and remove the entire solenoid assembly. Rotate the entire solenoid assembly 180° and re-mount on the body. Remove the 1/8" plug and connect a source of external pilot pressure, 50 PSI to 150 PSI, to the external pilot port of each solenoid structure. Stamp the name tag with a "Z" to indicate "External Pilot" operation. External pilots can not be brought through the subplate on field conversions.

AIR FLOW RATINGS AND VALVE SHIFT TIME:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

Rated Flow

Body Style	2	3	4	6*	8*	12*
Port Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/2"
SCFM Flow	73.9	97.1	215.0	446.9	477.7	1627
Cv Factor	1.6	2.4	5.0	10.4	11.1	37.8

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

RESPONSE TIME. Shifting time of pneumatic directional control valves was measured in accordance with ISO 12238:2001, *Pneumatic fluid power - Directional control valves - Measurement of shifting time.*

With the valve initially shifted to communicate 150 PSI inlet pressure to a blocked cylinder port the total elapsed shifting time was measured between the instant of energization of the opposite solenoid and build up of 90% of full steady state flow in the other cylinder port, which was vented to atmosphere. The result is a measure of the "Blocked to Open Shift Time".

In another test, with the valve initially shifted to a port which was vented to atmosphere, the total elapsed time was measured between the instant of energization of the opposite solenoid and build-up of 90% of full steady state pressure in the other cylinder port which was blocked. The result is a measure of "Open to Blocked Shift Time":

Response Times in Milliseconds

Body Style	2	3	4	6	8	12
Blocked*	18.0	16.7	23.2	28.7	29.7	123.3
Open†	17.3	16.7	19.3	26.8	27.9	116.3

*Blocked to Open response time.

†Open to Blocked response time.

The shifting time is quite satisfactory for almost all applications, but for faster response a larger orifice can be supplied on special order.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

To use solenoid controlled models for vacuum service, they must be ordered with Option "Z" or field converted for "External Pilot" operation. An external source of air pressure, 50 PSI to 150 PSI, must be available for pilot pressure. Field conversion is explained with each model listing.

INTERNALLY PILOTED SOLENOID VALVE TESTING

Standard solenoid models are assembled for "Internal Pilot" operation; that is, they derive shifting pressure for the spool from the valve inlet port. When testing an internally piloted solenoid valve, do not let air free flow through the cylinder port. This flow is normally so great, that back pressure to shift the spool can not be adequately generated. To test an internally piloted valve, either plug the cylinder port, place a muffler in the cylinder port or attach the cylinder port to a short piece of hose to generate a slight back pressure to shift the valve.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-16: One kit required for each 1-1/2" or 2" valve. Includes six V-123 Buna-N body O-rings, two V-124 Buna-N end cap O-rings, two V-89 Buna-N end cap pilot O-rings, five V-125 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot O-rings (Seals used determined by valve model and style). To repair piggy back valve, use ERKV-3.

VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs or any other component that appears to be working less than optimum.

STANDARD SOLENOID ACCESSORIES:

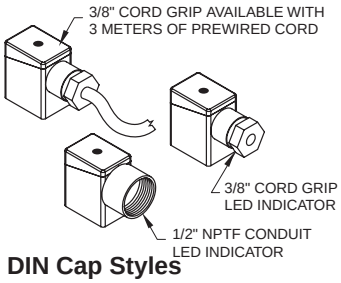
DIN CAPS

There are several styles of DIN caps. When ordering LED Indicator types, you must specify voltage of solenoid coil (E.g. DCL-120/60). All caps listed in table are for 11mm/Industrial Form B coils, consult factory for additional forms available. LED Indicator type caps are equipped with surge protection.

Environmental Rating: IP 65

Model No.	Style	LED
DCC	1/2" Conduit	no
DCCL	1/2" Conduit	yes
DCG	3/8" Grip	no
DCGL	3/8" Grip	yes
DC3M*	3 Meter Cord	no
DC3ML*	3 Meter Cord	yes

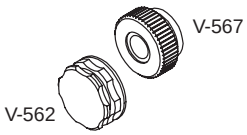
*Consult factory for other lengths of cord.

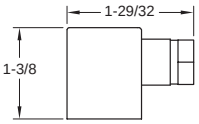


DIN Cap Styles

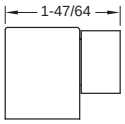
OPTIONAL COIL NUTS

V-567 Sintered Bronze Muffler
V-562 Side Exhaust





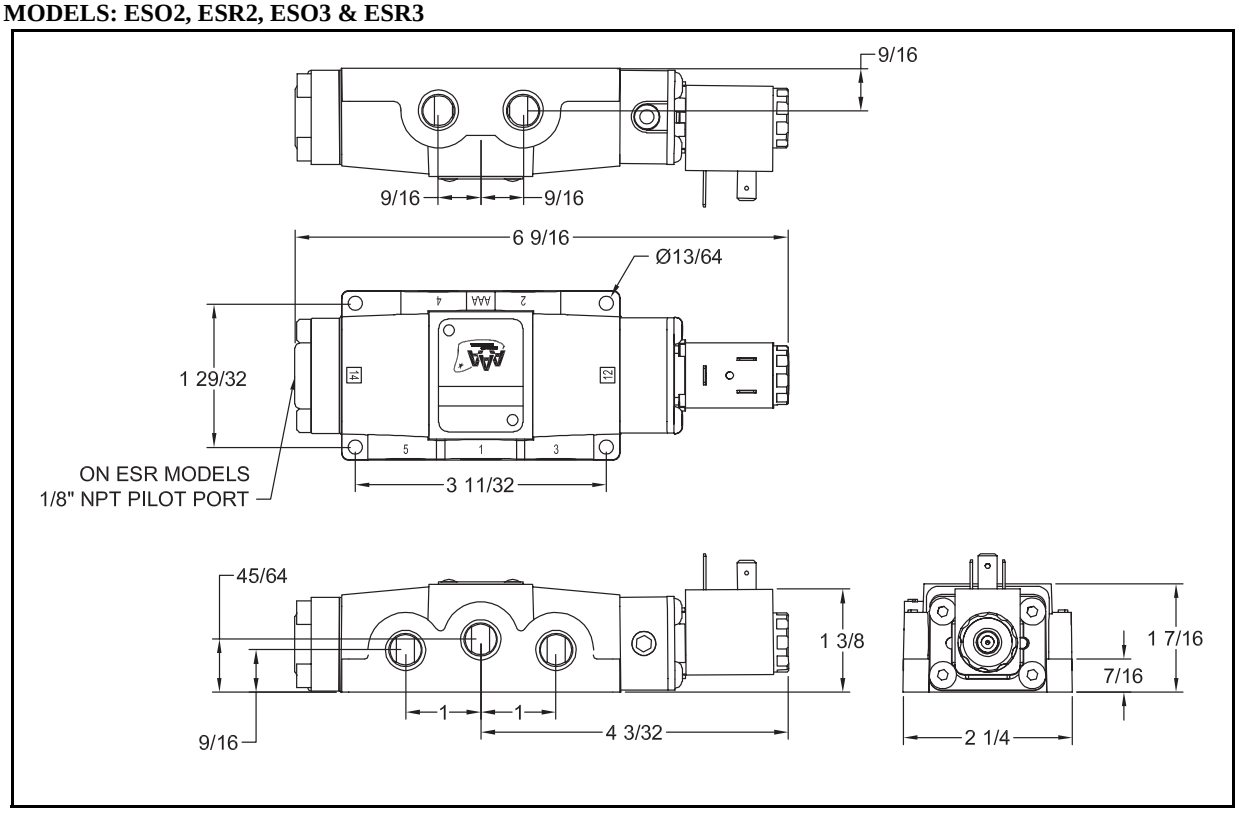
DCG
Cord Grip Style



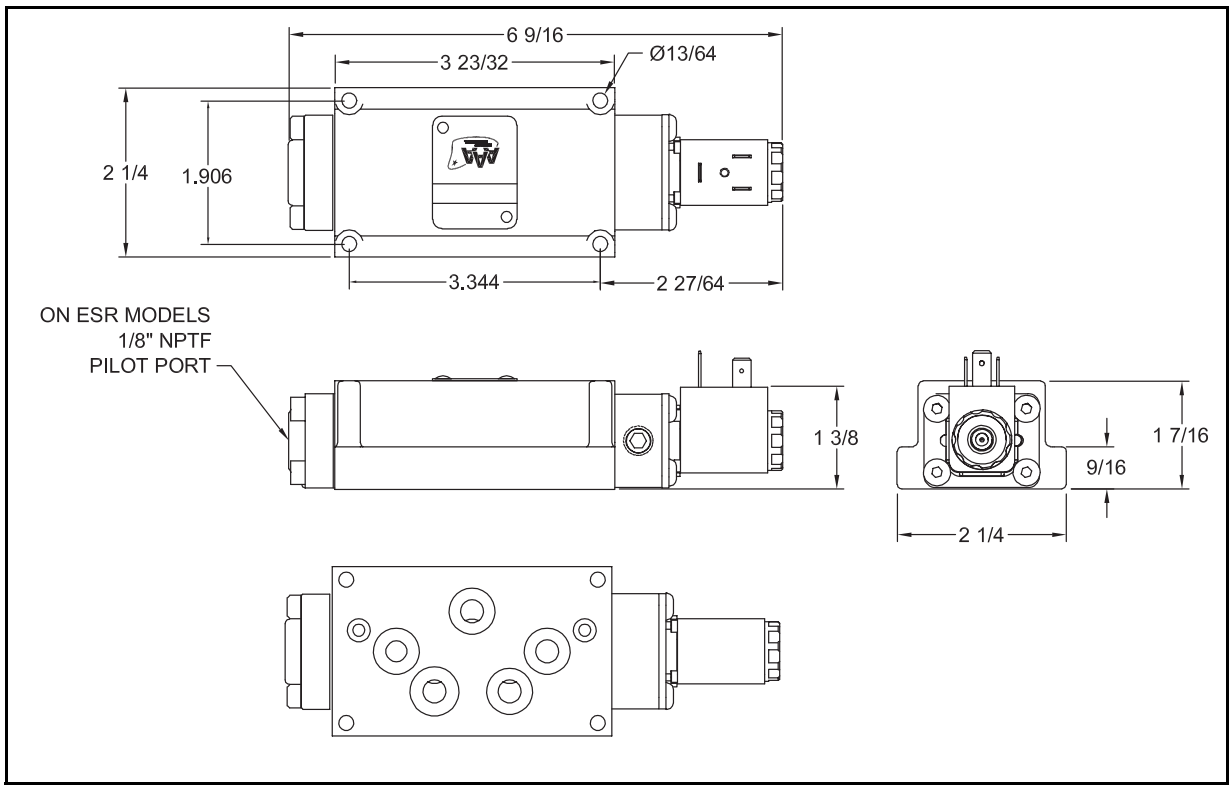
DCC
Conduit Style

SEMI-DIMENSIONAL DRAWINGS:

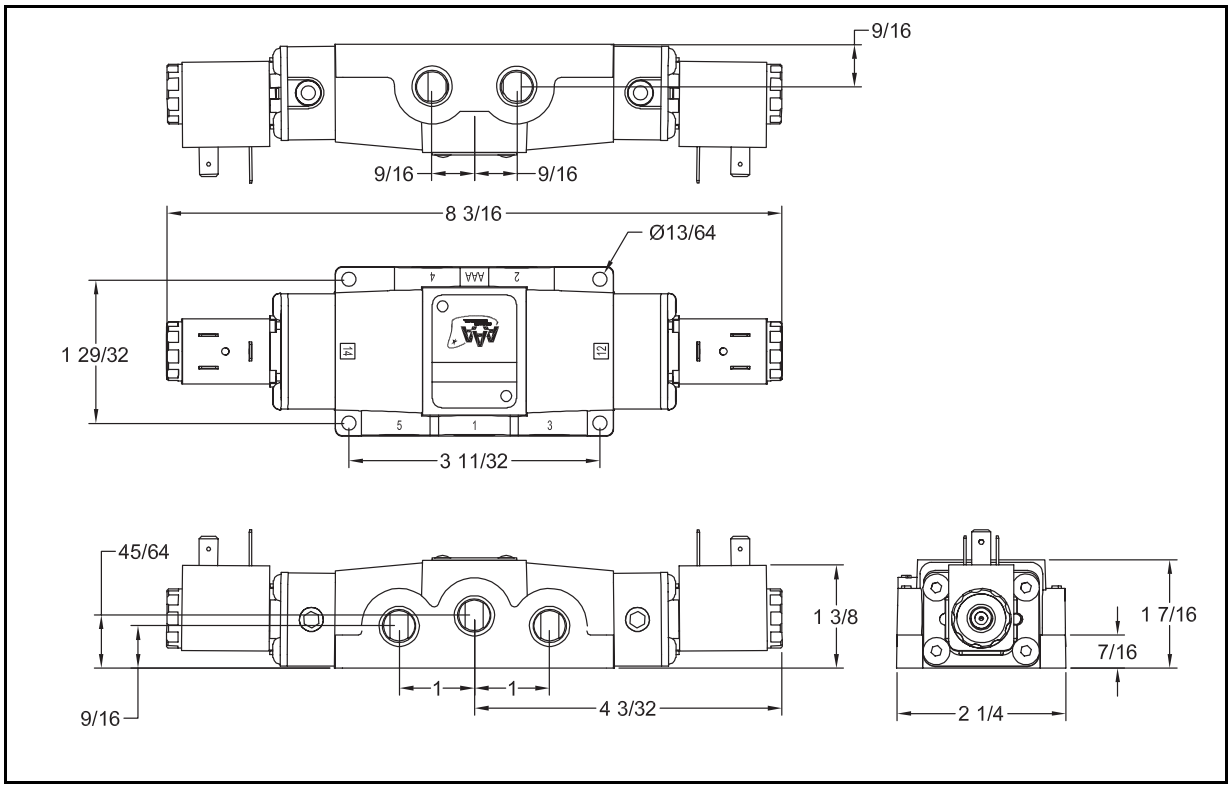
MODELS: ESO2, ESR2, ESO3 & ESR3



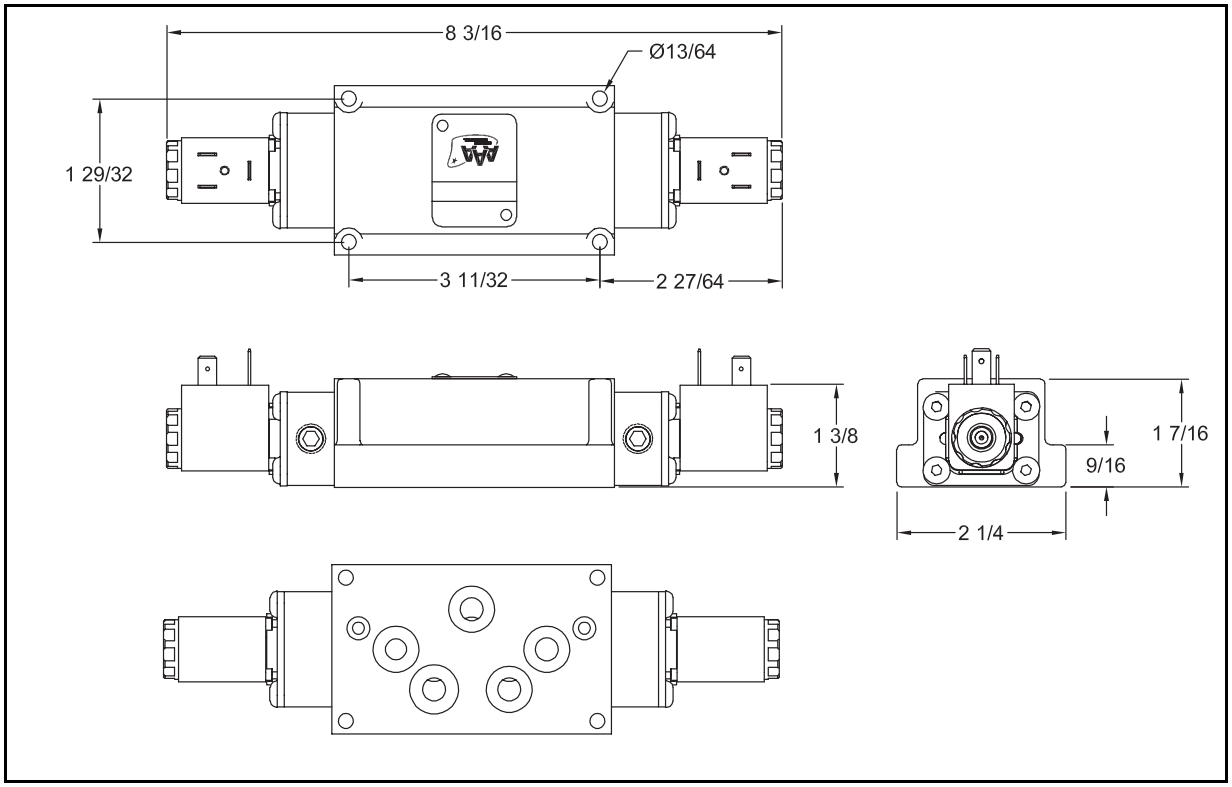
MODELS: ESO3P & ESR3P



MODELS: ESS2 & ESS3

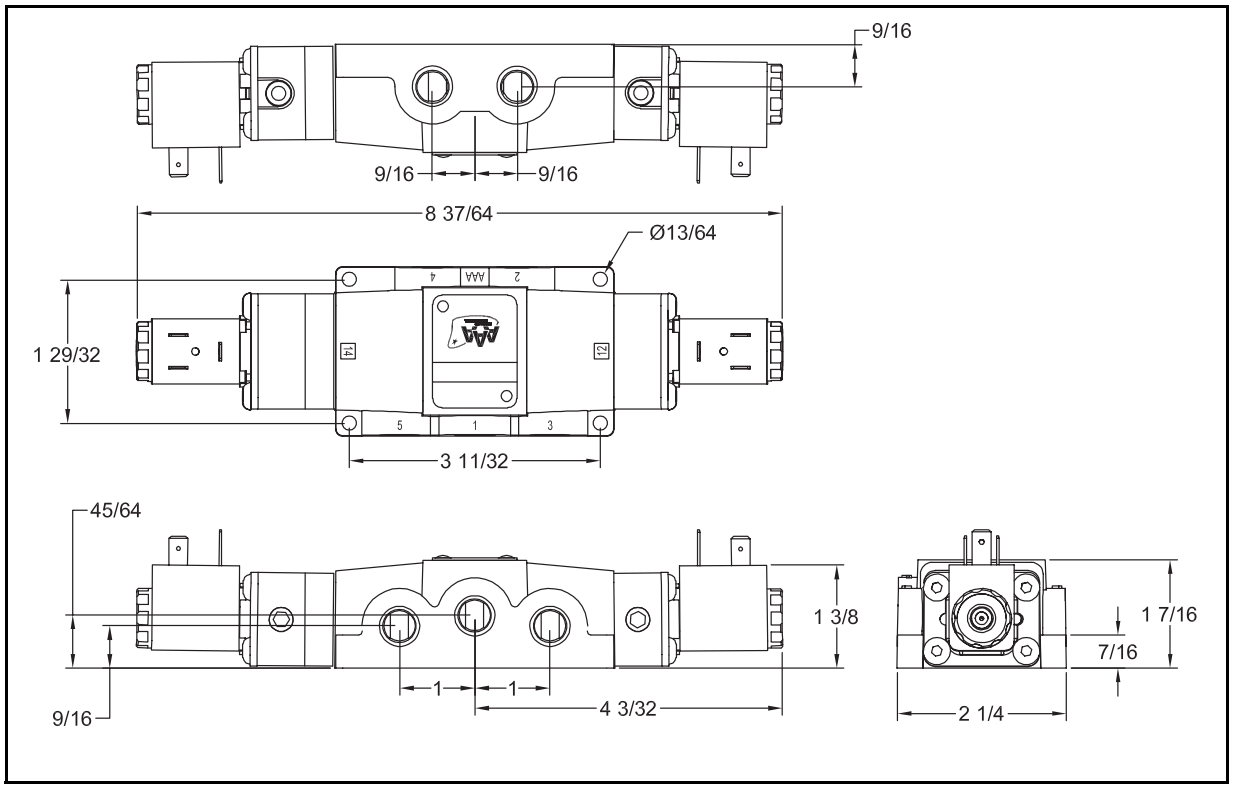


MODELS: ESS3P

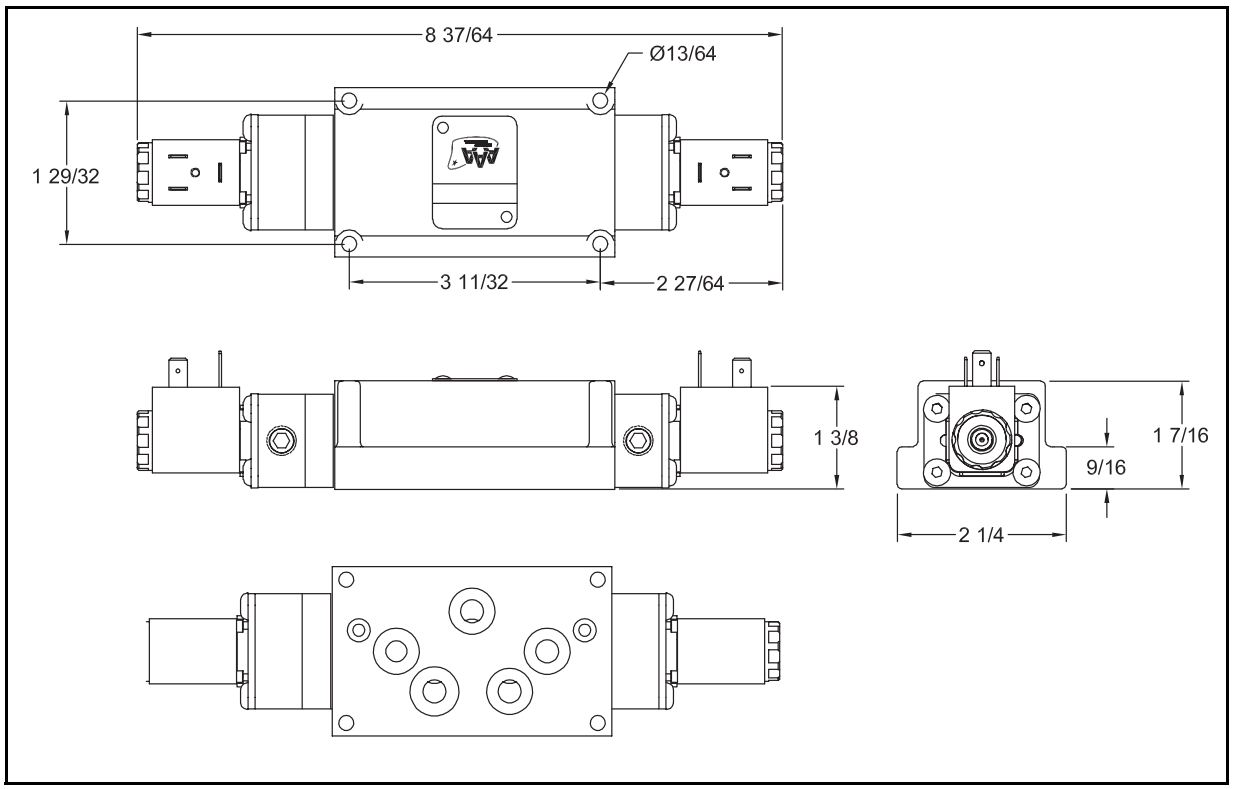


STANDARD 1/4" THROUGH 2"
SOLENOID: ESO, ESR, ESS, ESY

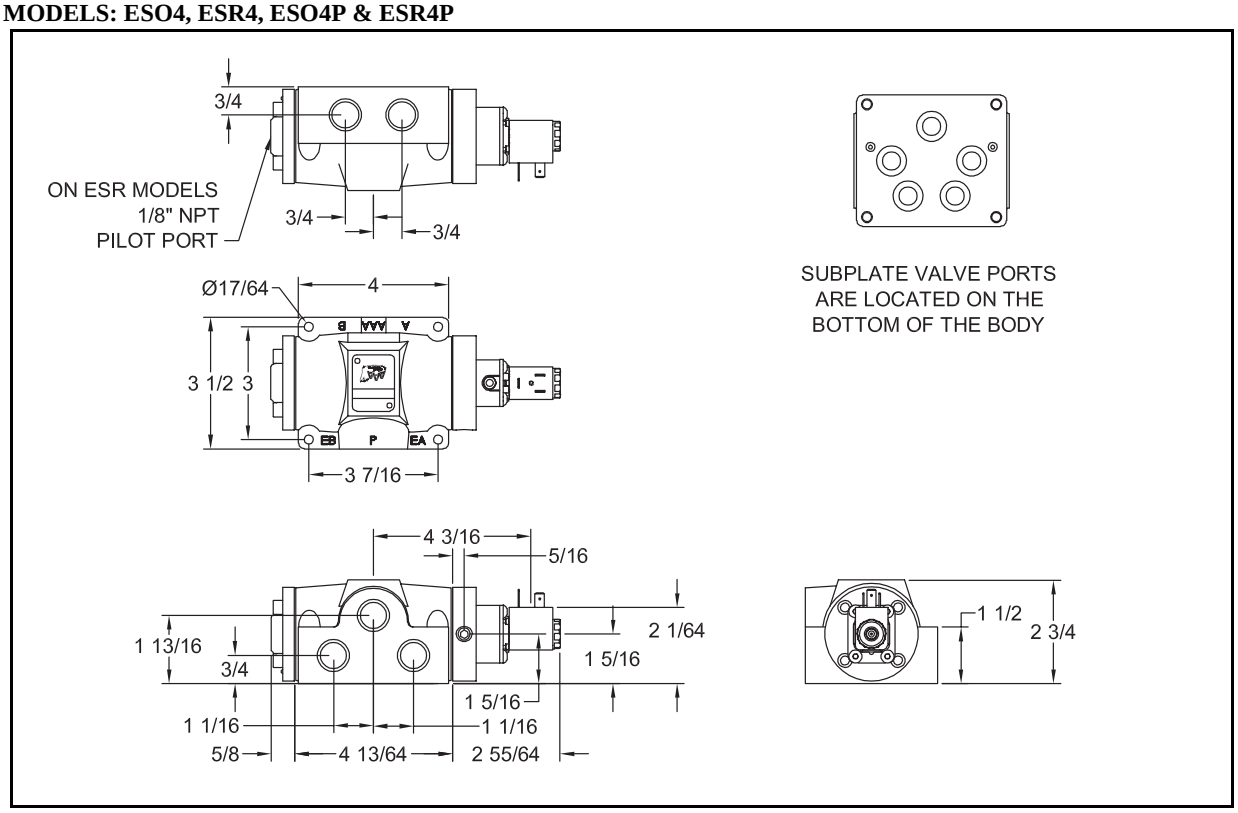
MODELS: ESY2 & ESY3



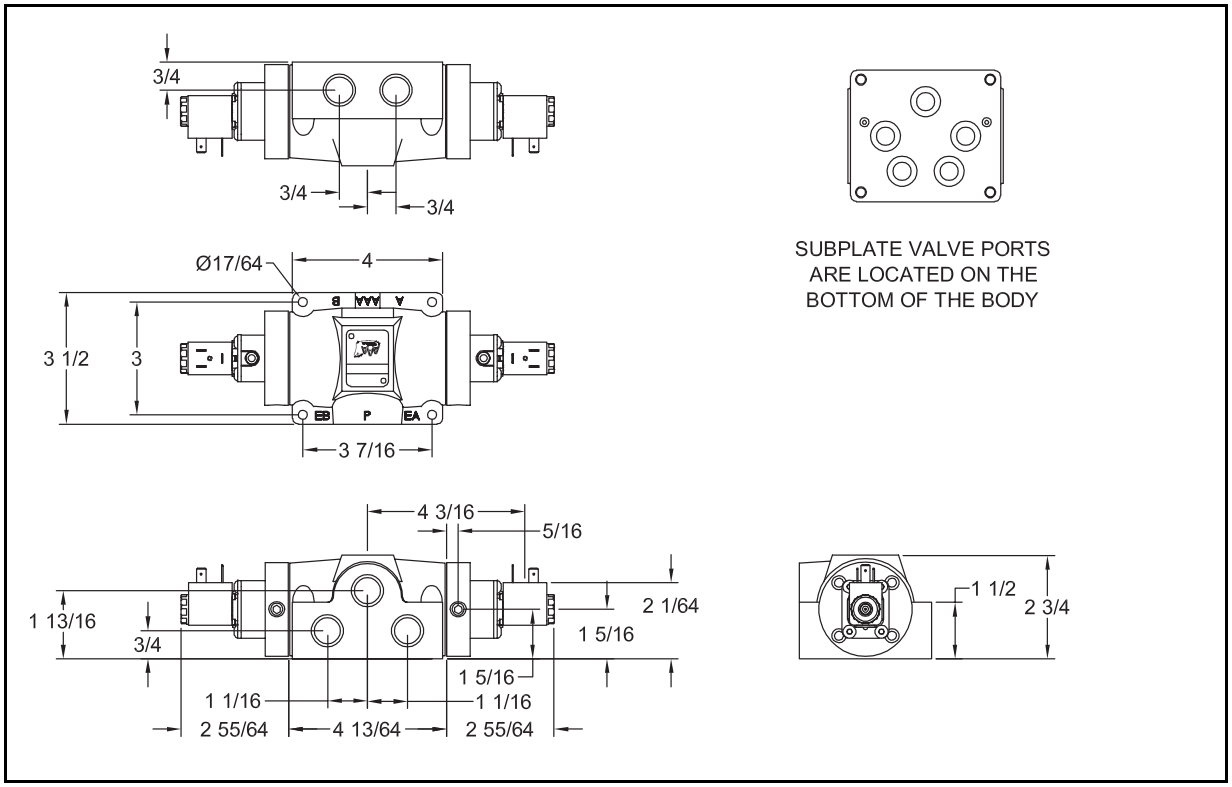
MODELS: ESY3P



MODELS: ESO4, ESR4, ESO4P & ESR4P

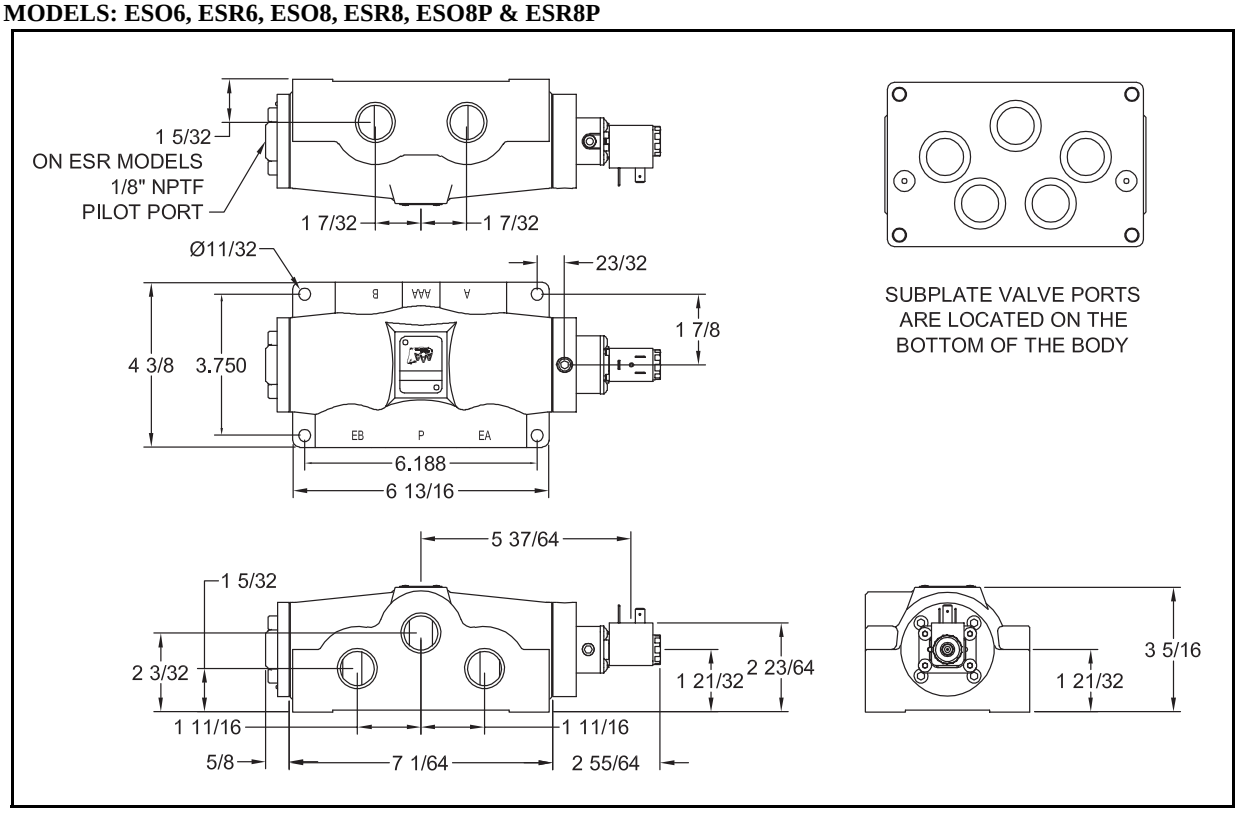


MODELS: ESS4, ESY4, ESS4P & ESY4P

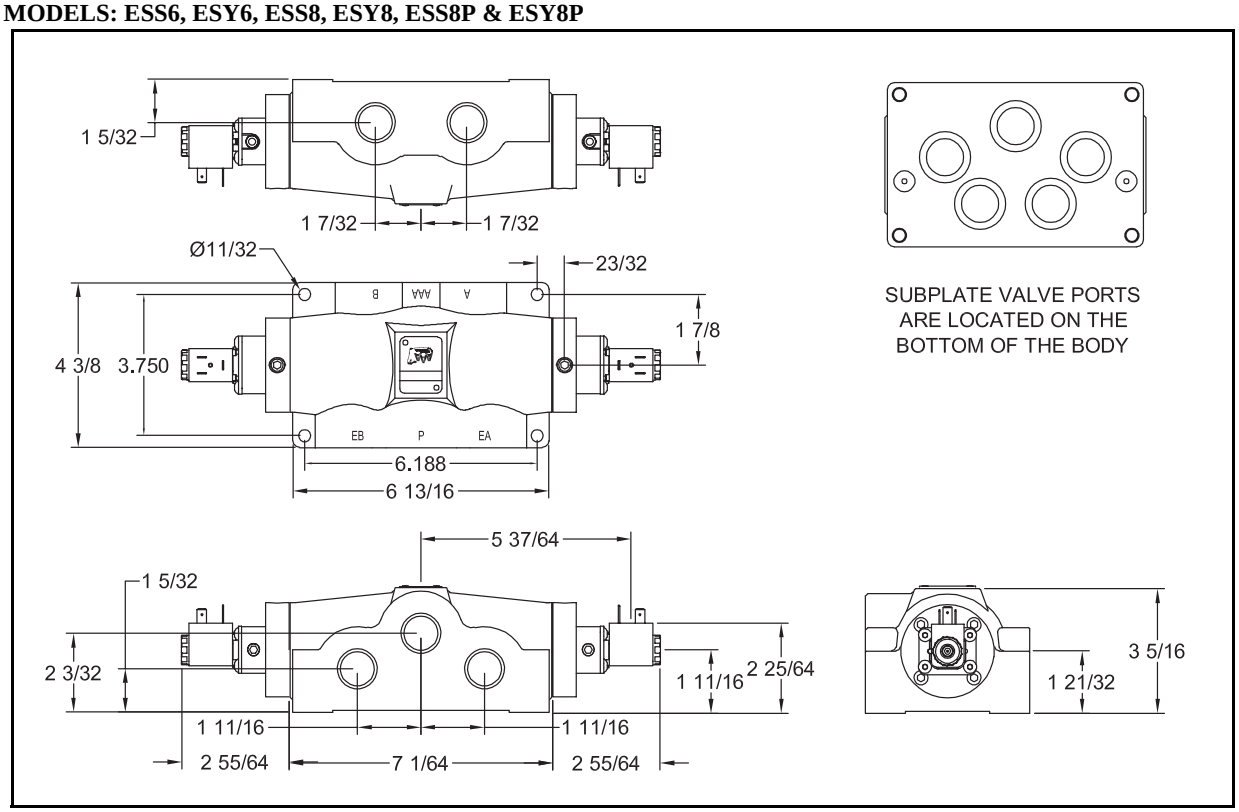


STANDARD 1/4" THROUGH 2"
SOLENOID: ESO, ESR, ESS, ESY

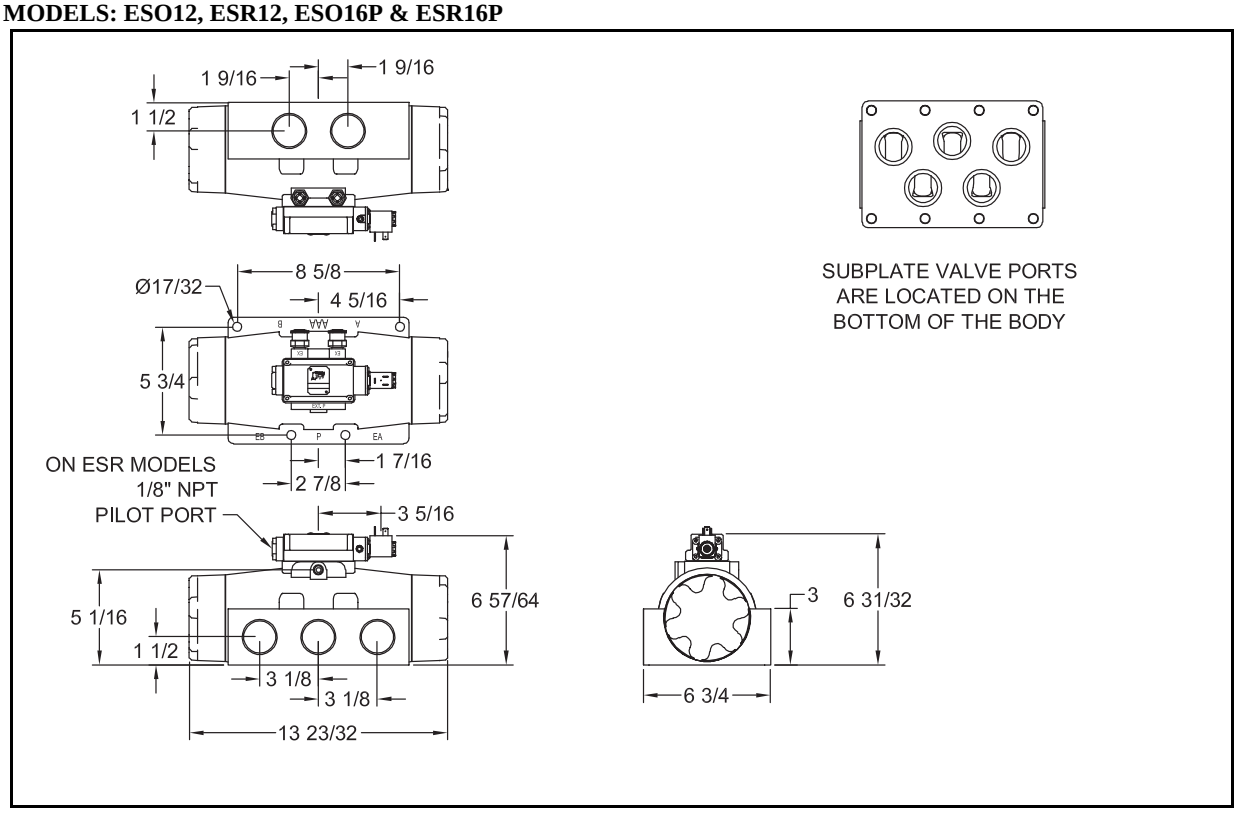
MODELS: ESO6, ESR6, ESO8, ESR8, ESO8P & ESR8P



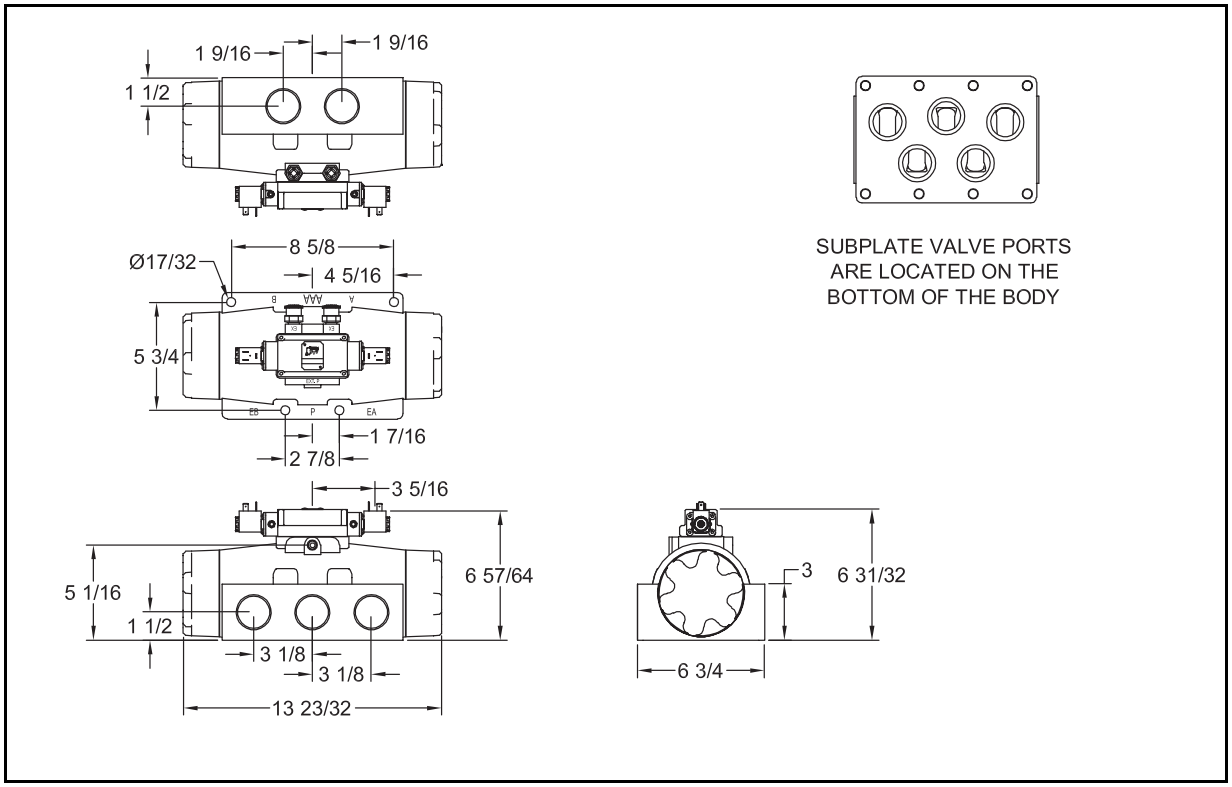
MODELS: ESS6, ESY6, ESS8, ESY8, ESS8P & ESY8P



MODELS: ESO12, ESR12, ESO16P & ESR16P

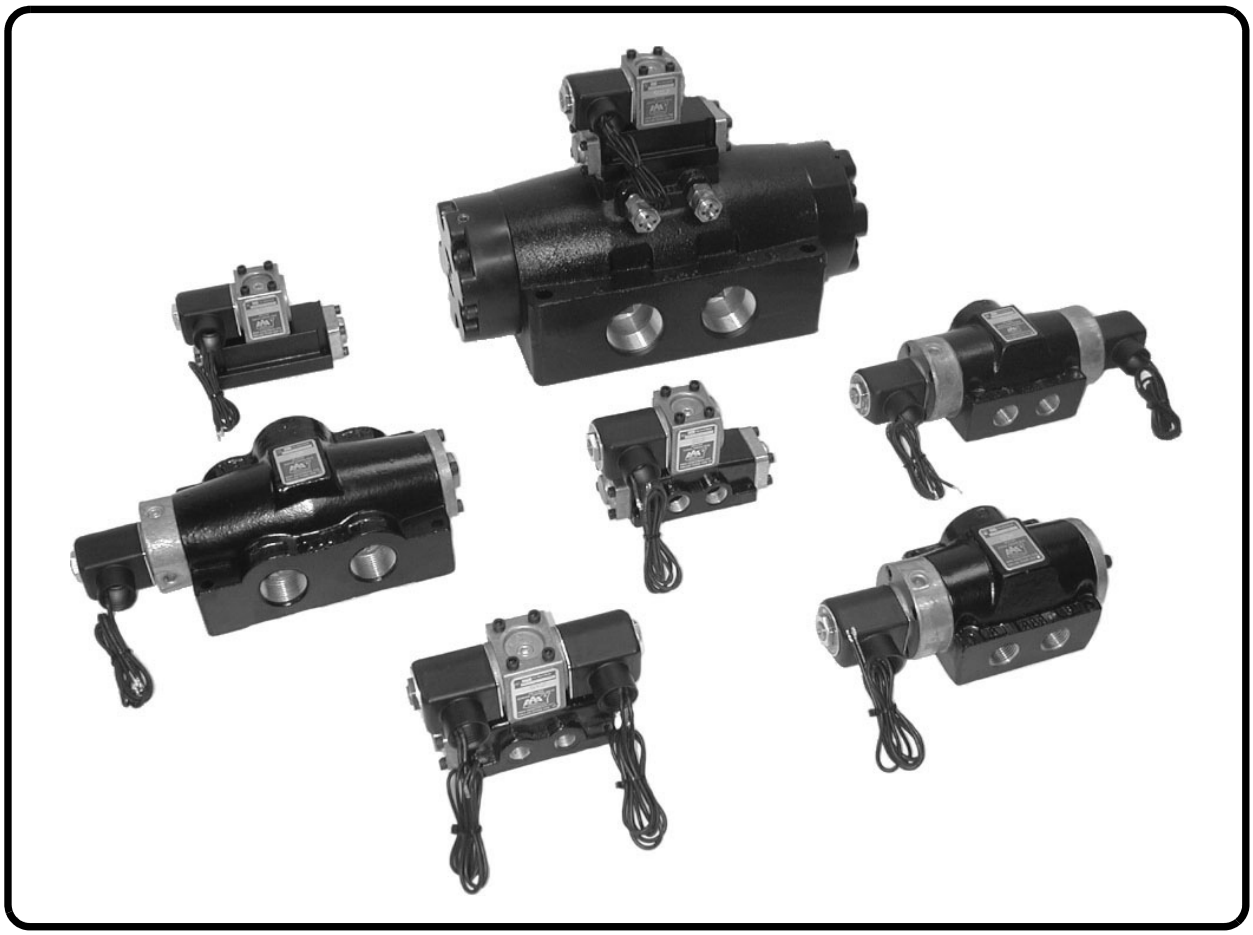


MODELS: ESS12, ESY12, ESS16P & ESY16P



"CLASSIC" SOLENOID CONTROLLED, PILOT OPERATED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard "Closed Center" on two position valves; however, the transitional flow is normally not needed for most applications.

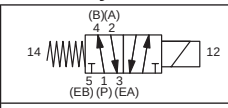
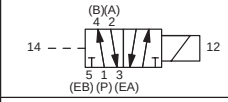
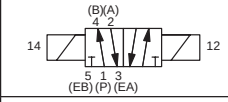
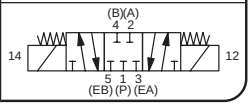
Part 4: The fourth part is the solenoid operator style. AAA valves can have several different coils and operator types. Leaving this position blank will use the common standard coil.

Part 5: The fifth position of the part number structure is used to specify valve options. You can specify different solenoid vents, locking overrides or assembled for "External Pilot" operation by choosing options available for the valve configuration you need.

Part 6: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings and not the solenoid or any additional seal materials. On most applications that require special seals, the valve must be configured for "External Pilot".

SS3PGMZ-5-120/60 (Voltage: e.g. 120/60, 24 vdc)

1 Operator Style

Code	Description	Symbol
SO	Single solenoid, 2-position, spring return. Spool returns to position "C" when solenoid is de-energized.	
SR	Single solenoid, 2-position, pilot returned spool. Spool returns to position "C" from auxiliary control valve furnished by the user.	
SS	Double solenoid, 2-position, friction position. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized.	
SY	Double solenoid, 3-position, spring centered. Spool returns to center, position "B", when both coils are de-energized.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF
12 = 1-1/2" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow
16P = 1-1/2" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed cross over, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Solenoid Operator Form

blank = "Classic" coil with 1/2"-14 NPT conduit connection, with 18" leads.
ED = DIN coil with ISO 4400 connection.
M = Mold-Over coil, with1/2"-14 NPT conduit connection, with 18" leads.
X = Explosion proof solenoid coil.

5 Valve Options

blank = No options selected.
I = Non-threaded spool indicator pin (available only on models with body styles 2, 3 & 3P).
K = Threaded spool indicator pin (available only on models with body styles 2, 3 & 3P).
L = Dust excluder cap.
O = Locking, twist style, manual solenoid override.
ON = Non-locking, twist style, manual solenoid override.
OP = Non-locking, push pin style, manual solenoid override.
OS = Alternate manual spool override (available only on models with body styles 2, 3 & 3P).
T = Tapped solenoid exhaust, 1/8" NPTF.
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).
V = High pressure solenoid, for "Internal Pilot" valves up to 300 psi.
Z = Factory assembled for "External Pilot" operation.

6 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

"Classic" style solenoid models are assembled for "Internal Pilot" operation; that is, the valves derive shifting pressure for the spool from the valve inlet port. The required pressure to shift the spool is dependent upon the operator style. If the valve must operate at other pressures or vacuum, then the solenoid operator must use an "External Pilot" source at a pressure between 25 PSI to 160 PSI. Valves that require "External Pilot" pressure can be ordered from the factory with the "Z" Option or be converted in the field for "External Pilot" operation.

When using an "External Pilot" source, the maximum pressure of any port is 250 PSI and the maximum vacuum of any port is 28" Hg. A combination of pressure and vacuum on multiple ports is permissible as long as the differential pressure does not exceed 250 PSI.

PREFIX L: LOW PRESSURE SOLENOID VALVES

This option is only available on valves with body styles 2, 3 and 3P. Standard 1/4" and 3/8" valves must use a minimum of 25 PSI on non-spring return models and a minimum of 50 PSI on spring return models. They can be ordered to operate at lower pressures, 15 PSI minimum on non-spring return models and 25 PSI minimum on spring return models. However, shifting response is slightly slower because of the larger volume required to shift the valve (E.g. LSO2 120/60).

OPERATOR STYLE CODE:

SO: Single solenoid, 2-position, spring return. Spool returns to original position when solenoid is de-energized. This operator style will operate reliably on line pressures from 160 PSI down to 50 PSI. If the line pressure is 160 PSI to 250 PSI or less than 50 PSI to 28" Hg, then the solenoid operator must be configured to use an "External Pilot" source.

SR: Single solenoid, 2-position, pilot returned spool. Spool returns to position "C" from auxiliary control valve furnished by the user. This operator style will operate reliably on line pressures from 160 PSI down to 25 PSI. Return shift pressure should be 25 PSI or greater. If the line pressure is 160 PSI to 250 PSI or less than 25 PSI to 28" Hg, then the solenoid operator must be configured to use an "External Pilot" source.

SS: Double solenoid, 2-position, no springs. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized. Standard models are assembled for "Internal Pilot" operation. This operator style will operate reliably on line pressures from 160 PSI down to 25 PSI. If the line pressure is 160 PSI to 250 PSI or less than 25 PSI to 28" Hg, then the solenoid operator must be configured to use an "External Pilot" source.

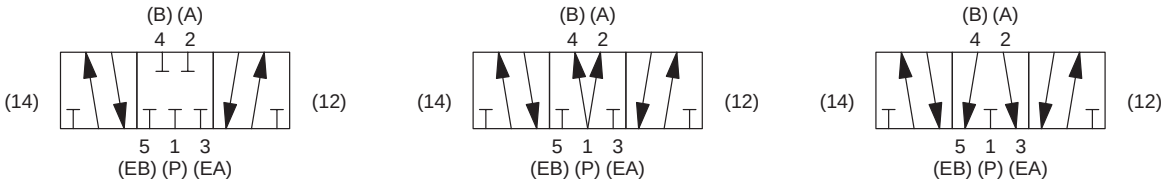
SY: Double solenoid, 3-position, spring centered. Spool is centered when both solenoids are de-energized. Standard models are assembled for "Internal Pilot" operation. This operator style will operate reliably on line pressures from 160 PSI down to 50 PSI. If the line pressure is 160 PSI to 250 PSI or less than 50 PSI to 28" Hg, then the solenoid operator must be configured to use an "External Pilot" source.

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female "National Pipe Threads" to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4", 1" and 1-1/2" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All port connections, excluding "External Pilot" or "Pilot Return" ports, if used, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body. Consult factory on the possibility of routing external pilot or pilot return sources through the subplate on body styles 4P and 8P.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



STANDARD: Most valves are supplied with a "Closed Center" spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are "Closed Center". Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option "D". In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a "Regenerative" spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option "G". In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a "Float Center" spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

"CLASSIC" SOLENOID OPERATOR FORMS:

"CLASSIC" SOLENOID INFORMATION

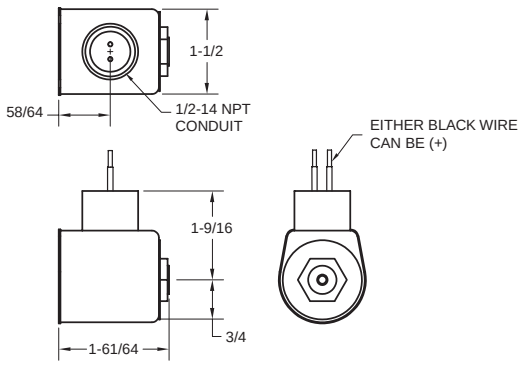
The "Classic" coils are a 1/2" Conduit, metal housing style with 1/2" NPT connection, with 18" leads. If no optional solenoid is specified, then the "Classic" coil is used. *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
24 volts, 60 Hz	1.72 amps	1.10 amps	5.39 ohms
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	546 ohms
6 volts D-C	2.30 amps	2.30 amps	2.4 ohms
12 volts D-C	1.20 amps	1.20 amps	12.8 ohms
24 volts D-C	0.58 amps	0.58 amps	61 ohms

Environmental Ratings: NEMA 1.
Voltage Tolerance: ±10%.
Resistance Tolerance: ±8% @ 20°C.
Operating Temperatures: -4°F to 120°F.
Casing: Molded steel canister.

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 160 PSIG).



"Classic" Solenoid Operator

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

Mounting Gasket: The gasket that mounts the solenoid stem to the adapter is Buna-N. Additional seals may connect the adapter to the valve body.

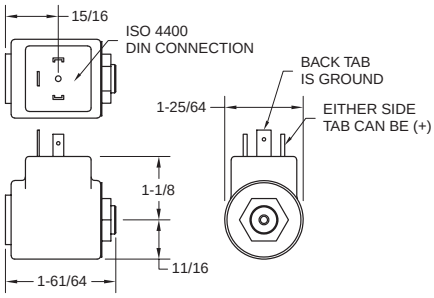
Manual Override: Manual overrides must be specified by using the valve options on page 36 and page 37.

OPTION ED: "DIN" SOLENOID COIL

"Classic DIN" coils have same characteristics and performance as the "Classic" coils, but have an ISO 4400 connection interface. To order solenoid valves with this coil type, use the suffix "ED" (E.g. SO2ED 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	539 ohms
12 volts D-C	1.20 amps	1.20 amps	9.6 ohms
24 volts D-C	0.58 amps	0.58 amps	38.4 ohms



Classic Style "DIN" Solenoid Operator

Environmental Ratings: (With proper ISO 4400 DIN connection) NEMA 4 and 4X.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 160 PSIG).

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

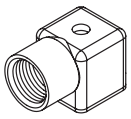
Mounting Gasket: The gasket that mounts the solenoid stem to the adapter is Buna-N. Additional seals may connect the adapter to the valve body.

Manual Override: Manual overrides must be specified by using the valve options on page 36 and page 37.

OPTIONAL DIN CAPS FOR "CLASSIC DIN" COILS

DIN caps are not supplied with "Classic" solenoid valves. These caps must be ordered separately. Below are the DIN caps commonly used.

There are several styles of DIN caps. When ordering LED Indicator type, you must specify voltage of solenoid coil (E.g. EDCL-120/60). All caps listed in table are for ISO 4400, consult factory for additional forms available. LED Indicator type caps are equipped with varistor surge protection (Diode surge protection available upon request).



EDC Cap

Environmental Rating: IP 65.

Model No.	Style	LED	Model No.	Style	LED
EDC	1/2" Conduit	no	EDCL	1/2" Conduit	yes

OPTION M: "CLASSIC MOLD-OVER" SOLENOID COIL

"Classic Mold-Over" coils have same characteristics and performance as the "Classic" coils, but have a molded 1/2"-14 NPT connection with 18" leads that are wired through the connection. To order solenoid valves with this coil type use the suffix "M" (E.g. SO2M 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	539 ohms
12 volts D-C	1.20 amps	1.20 amps	9.6 ohms
24 volts D-C	0.58 amps	0.58 amps	38.4 ohms

Environmental Ratings: (With proper 1/2" NPT connection) NEMA 4 and 4X.

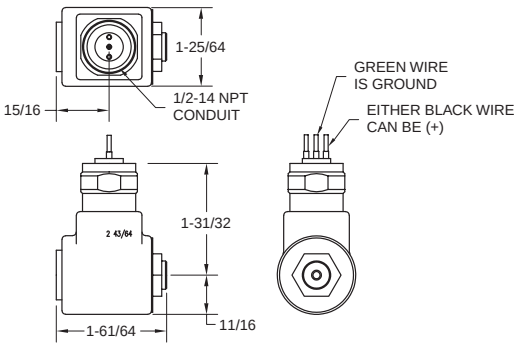
Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 160 PSIG).



Classic Style "Mold-Over" Solenoid Operator

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

Mounting Gasket: The gasket that mounts the solenoid stem to the adapter is Buna-N. Additional seals may connect the adapter to the valve body.

Manual Override: Manual overrides must be specified by using the valve options on page 36 and page 37.

OPTION X: "EXPLOSION PROOF" SOLENOID COIL

All "Classic Explosion Proof" solenoid operators carry the UL label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts). The metal housing uses a 1/2"-14 NPT conduit type connection with 18" leads. **Note:** The UL and CSA label on an explosion proof solenoid operator covers only the electrical operator and does not cover the complete valve. To order solenoid valves with "Classic Explosion Proof" operators, add suffix "X" to the basic part number (E.g. SO2X 120/60). *Specify voltage when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
24 volts, 60 Hz	1.72 amps	1.10 amps	5.5 ohms
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	539 ohms
6 volts D-C	2.30 amps	2.30 amps	2.4 ohms
12 volts D-C	1.20 amps	1.20 amps	9.6 ohms
24 volts D-C	0.58 amps	0.58 amps	38.4 ohms

Environmental Ratings: UL label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts).

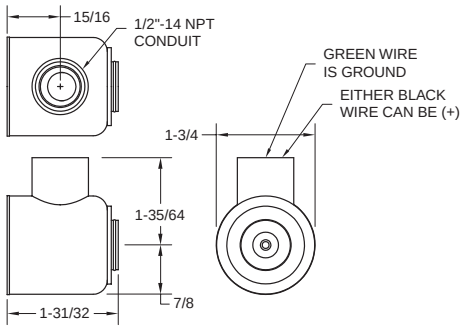
Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Casing: Steel.

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 160 PSIG).



Classic Style "Explosion Proof" Solenoid Operator

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

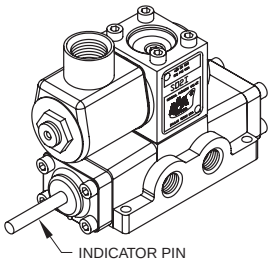
Mounting Gasket: The gasket that mounts the solenoid stem to the adapter is Buna-N. Additional seals may connect the adapter to the valve body.

Manual Override: Manual overrides must be specified by using the valve options on page 36 and page 37.

VALVE OPTIONS:

OPTION I: NON-THREADED SPOOL INDICATOR PIN

Available only on single solenoid, spring return models ("SO") with body styles 2, 3 and 3P. This option allows a pin to protrude through the endcap to indicate the location of the internal spool. This is helpful for actuating a sensor to indicate the shift position of the valve. The pin will retract when the solenoid is energized. The travel of the pin is 18/32". Minimum operating pressure of 70 PSI is required for reliable valve operation.

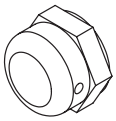


OPTION K: THREADED SPOOL INDICATOR PIN

Same as Option "I", the non-threaded spool indicator pin, but the end of the indicator pin is 1/4"-20x3/4 threaded end. Minimum operating pressure of 70 PSI is required for reliable valve operation.

OPTION L: DUST EXCLUDER NUT

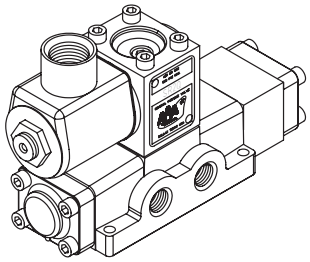
Replaces nut on end of "Classic 1/2" Conduit", "Classic DIN" and "Classic Mold-Over" solenoid coil to reduce entry of dust, water, etc. and reduce sound of exhaust air. Not available on "Classic Explosion Proof" solenoids.



FM-1 Nut

OPTION Q: 2-POSITION SPOOL DETENT

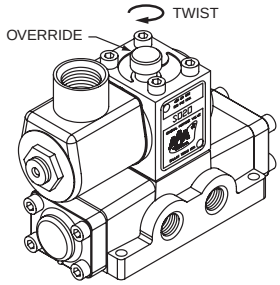
Available only on models SR and SS with body styles of 2, 3 and 3P. This option allows the spool to remain in position when shifting pressure is removed and is most often used in mobile applications where the vibrations may shift the spool when there is no holding pressure available. Overall length of the valve will increase by 1".



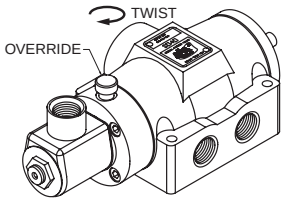
OPTION O: LOCKING MANUAL SOLENOID OVERRIDE TWIST STYLE

Manual override is available on any solenoid operator but is not included unless specified. In case of electrical failure in the control circuit, the valve can be shifted without electricity.

Option "O" designates the standard override as normally used. A knurled knob, operated by hand, physically lifts the poppet off its seat. The knob can be rotated over center and will remain either in the ON or OFF position.



Option "O" on 1/4" Valve



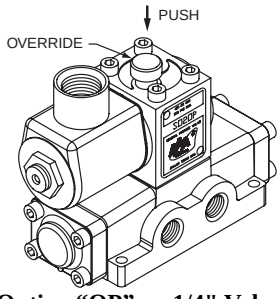
Option "O" on 1/2" Valve

OPTION ON: NON-LOCKING MANUAL SOLENOID OVERRIDE TWIST STYLE

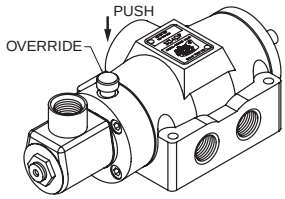
Option "ON" is the same override as "O" except the knob will spring back to the "OFF" position when released.

OPTION OP: NON-LOCKING MANUAL SOLENOID OVERRIDE PUSH STYLE

Option "OP" designates a push style non-locking override. When the knob is pushed in, the poppet is lifted off its seat. This shifts the internal spool and causes a change in air flow through the ports.



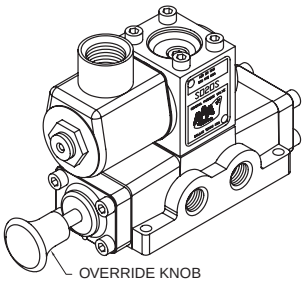
Option "OP" on 1/4" Valve



Option "OP" on 1/2" Valve

OPTION OS: MANUAL MAIN SPOOL OVERRIDE

This option is only available on valves with body styles 2, 3 and 3P. This option designates an alternate method for shifting 1/4" and 3/8" valves. The override knob is attached to the end of the main spool. This type override is most useful on 2-position, no spring models. On valves having springs on the spool, the knob would have to be continuously held. Minimum operating pressure of 70 PSI is required for reliable valve operation.

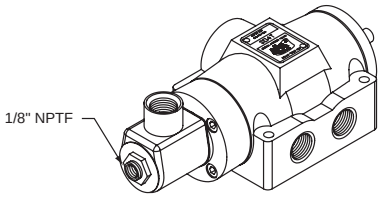


OPTION V: HIGH PRESSURE SOLENOID VALVES

Standard valves must be limited to 160 PSI maximum pressure. However, they can be reconnected for "External Pilot" operation and can operate up to 250 PSI on the main ports provided the external pilot pressure is below 160 PSI (See individual models for details). High pressure solenoids can be furnished for operation on 300 PSI without using external pilot pressure. To order, add Option "V" following standard valve model number. However, shifting response is slightly slower because of the smaller orifice in the operator (E.g. SO2V 120/60).

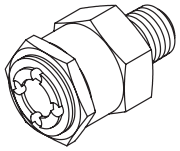
OPTION T: TAPPED SOLENOID EXHAUST

Standard solenoid operators vent pilot exhaust to atmosphere through a small un-threaded hole. A 1/8" NPTF threaded connection can be provided for those applications where the exhaust air or gas must be piped to another area. Sometimes it can be piped into the main exhaust port. To order, add Option "T" to regular valve model number (E.g. SO4T 120/60).



OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTION Z: "EXTERNAL" PILOT OPERATION

A valve may be ordered factory assembled for "External Pilot" operation by adding the Option "Z" after the regular model number. 3/8" and 1-1/2" subplate valves are manufactured so the pilot source can **NOT** be provided through the mounting subplate base. On 1/2" and 1" subplate valves the pilot source can be routed through a pilot ported subplate. On all side ported valves, a pilot source must be provided to each solenoid operator.

OPTIONAL O-RING MATERIALS:

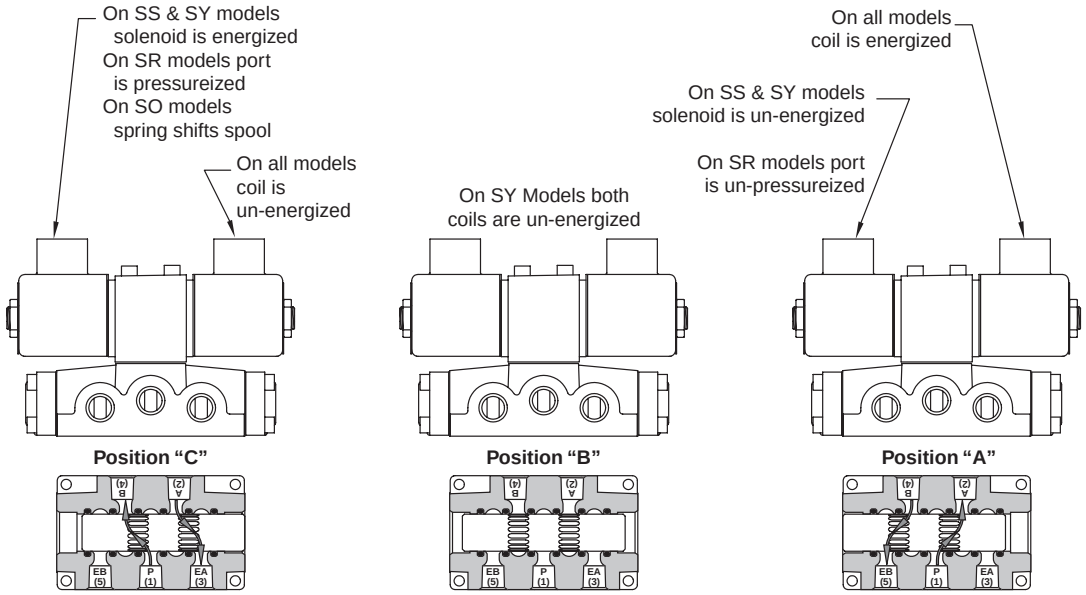
Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. In the example, model RY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

Note: On "Classic" solenoid model valves, the solenoid operator plunger seat is Buna-N. Solenoid operators must be externally piloted when using gases not compatible with seal material. Consult factory for special plunger seat material.

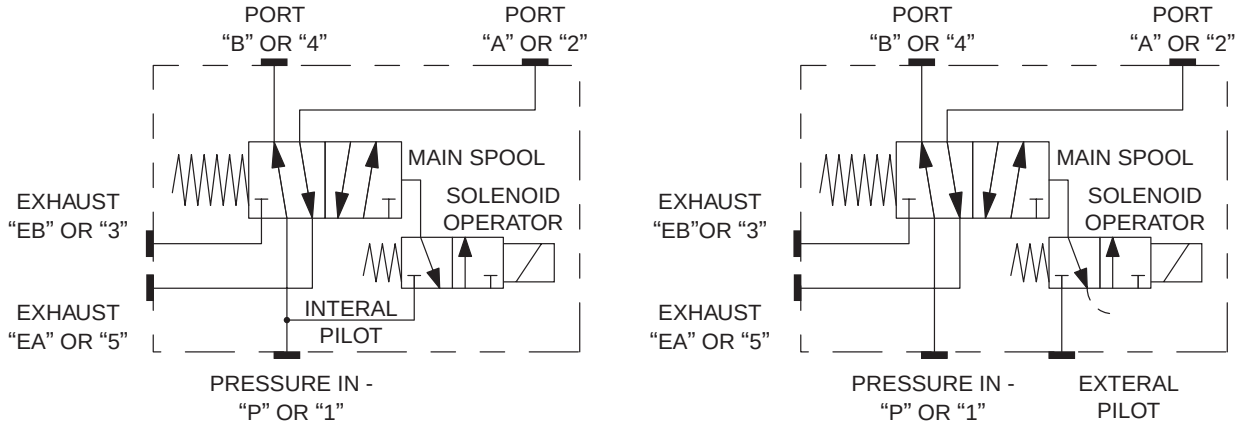
FLOW PATTERN:



1/4" through 1": When a solenoid is energized causing the internal spool to shift, port 1 will connect to the port closest to the energized coil. The furthest port will connect to the appropriate exhaust port.

1-1/2" and 2": These larger valves use a "Piggy-Back" valve mounted to the top of the larger valve. When a solenoid is energized causing the internal spool to shift, port 1 will connect to the port closest to the energized coil. The furthest port will connect to the appropriate exhaust port.

INTERNALLY AND EXTERNALLY PILOTED SOLENOID VALVES:



The diagram shows how AAA solenoid valves obtain their shifting power by tapping into the valve inlet inside the valve itself. If inlet pressure is above or below the limits stated by the operator style code, the valve must make use of an outside source of shifting power. It should be factory ordered with suffix "Z" following the regular model number and will be furnished with the electric operator connected to an external pilot pressure port as shown in the diagram above (E.g. ESO4Z 24 vdc).

CONVERTING TO EXTERNAL PILOT OPERATION:

A valve may be ordered factory assembled for "External Pilot" operation by adding the suffix "Z" after the regular model number; or can be changed to "External Pilot" operation in the field as follows (This operation must be performed on each solenoid operator.)

Remove 4 screws holding the solenoid structure to the main body and remove the entire solenoid assembly. Leave gasket as is and rotate the entire solenoid assembly 180° and re-mount on the body. Remove 1/8" plug and connect a source of external pilot pressure, 50 PSI to 160 PSI, to the external pilot port of each solenoid structure. Stamp the name tag with a "Z" to indicate "External Pilot" operation. External pilots can **NOT** be brought through the subplate on field conversions.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

To use solenoid controlled models for vacuum service, they must be ordered with Option "Z" or field converted for "External Pilot" operation. An external source of air pressure, 50 PSI to 160 PSI, must be available for pilot pressure. Field conversion is explained with each model listing.

INTERNALLY PILOTED SOLENOID VALVE TESTING

Standard solenoid models are assembled for "Internal Pilot" operation; that is, they derive shifting pressure for the spool from the valve inlet port. When testing an internally piloted solenoid valve, do not let air free flow through the cylinder port. This flow is normally so great, that back pressure to shift the spool can not be adequately generated. To test an internally piloted valve, either plug the cylinder port, place a muffler in the cylinder port or attach the cylinder port to a short piece of hose to generate a slight back pressure to shift the valve.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

AIR FLOW RATINGS AND VALVE SHIFT TIME:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

Rated Flow

Body Style	2	3	4	6*	8*	12*
Port Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/2"
SCFM Flow	73.9	97.1	215.0	446.9	477.7	1627
Cv Factor	1.6	2.4	5.0	10.4	11.1	37.8

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

RESPONSE TIME. With the valve initially shifted to communicate 150 psi inlet pressure to a blocked cylinder port the total elapsed shifting time was measured between the instant of energization of the opposite solenoid and build up of 90% of full steady state flow in the other cylinder port, which was vented to atmosphere. The result is a measure of the "Blocked to Open Shift Time".

In another test, with the valve initially shifted to a port which was vented to atmosphere, the total elapsed time was measured between the instant of energization of the opposite solenoid and build-up of 90% of full steady state pressure in the other cylinder port which was blocked. The result is a measure of "Open to Blocked Shift Time":

Response Times in Milliseconds

Body Style	2	3	4	6	8	12
Blocked*	91.0	95.0	74.2	147	147	147
Open†	80.0	67.5	67.5	152	170	105

*Blocked to Open response time.

†Open to Blocked response time.

These test were made over a range of 50 to 150 psi.

The shifting time is quite satisfactory for almost all applications, but for faster response a larger orifice can be supplied on special order.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-16: One kit required for each 1-1/2" or 2" valve. Includes six V-123 Buna-N body O-rings, two V-124 Buna-N end cap O-rings, two V-89 Buna-N end cap pilot O-rings, five V-125 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot O-rings (Seals used determined by valve model and style). To repair piggy back valve, use ERKV-3.

RKPSV-1: Pilot solenoid repair kit for "Classic" solenoids. Includes one V-49 plunger, one V-50 spring, one V-61 O-ring. Use one kit for each solenoid on all sizes soft seal and stack sections with "Classic", explosion proof, "DIN" or "Moldover". To repair both main body and solenoid operator(s) order one kit for each solenoid on the valve, plus appropriate body kit from listings above

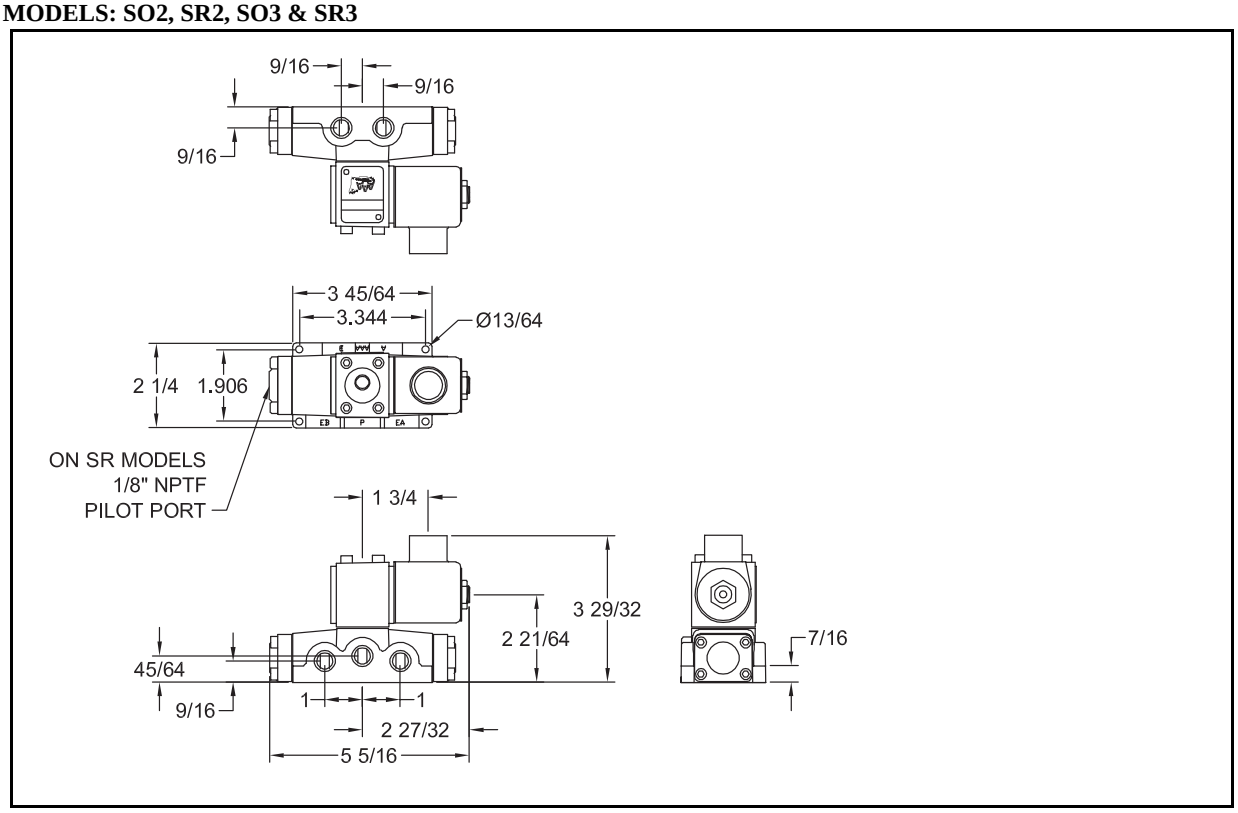
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

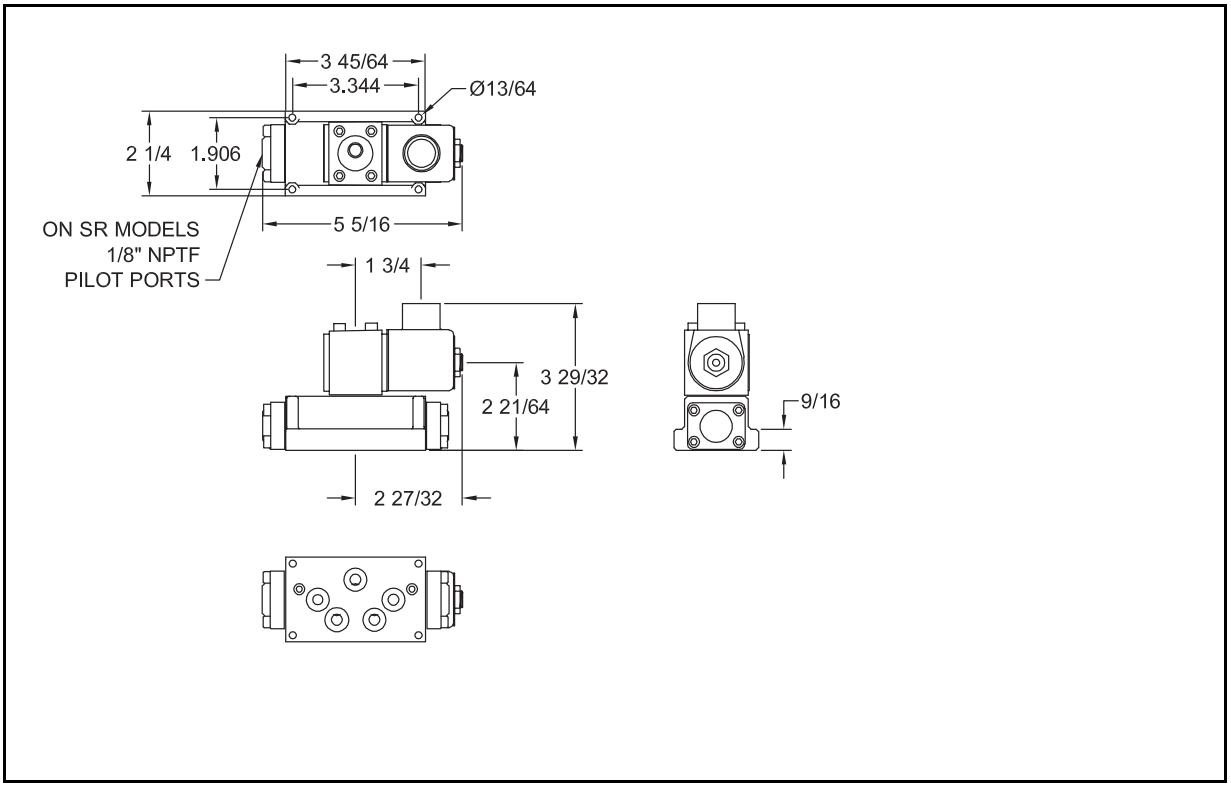
Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken items, tired springs or any other component that appears to be working less than optimum.

SEMI-DIMENSIONAL DRAWINGS:

MODELS: SO2, SR2, SO3 & SR3

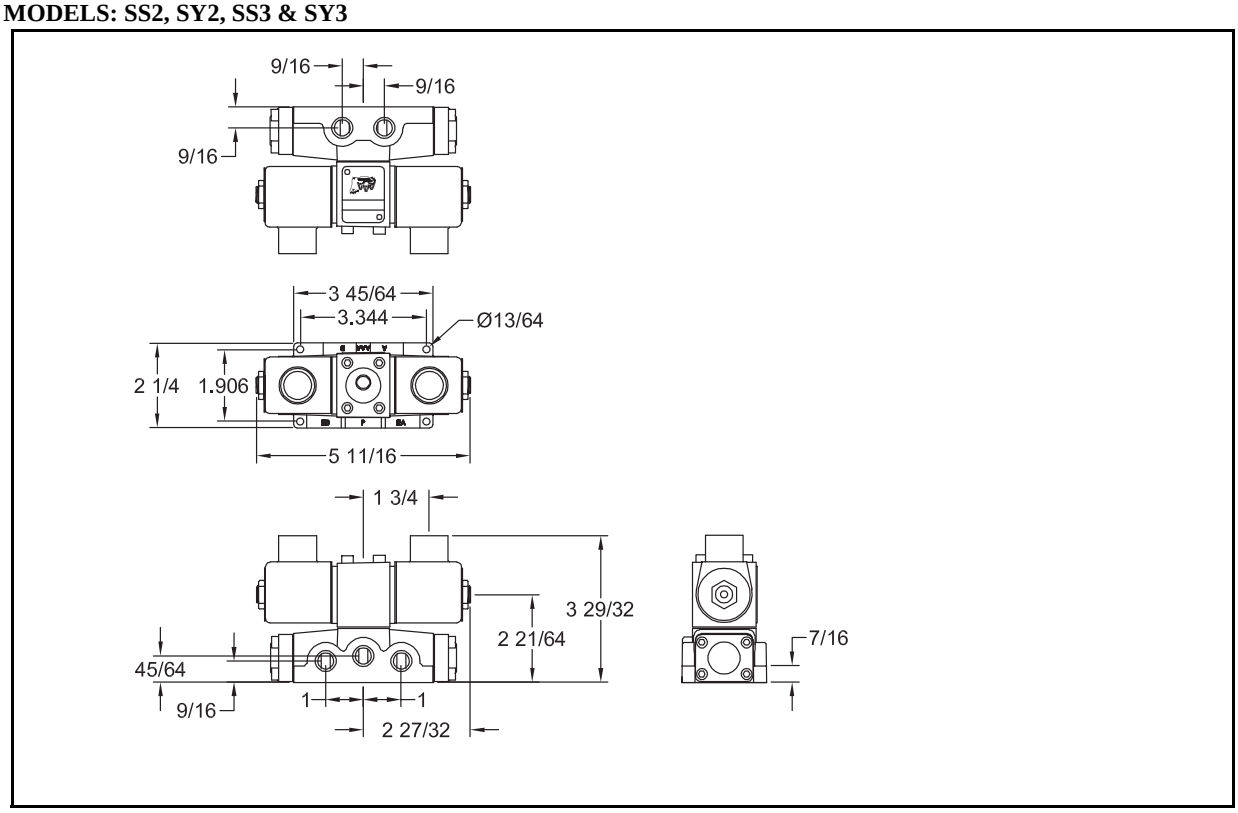


MODELS: SO3P & SR3P

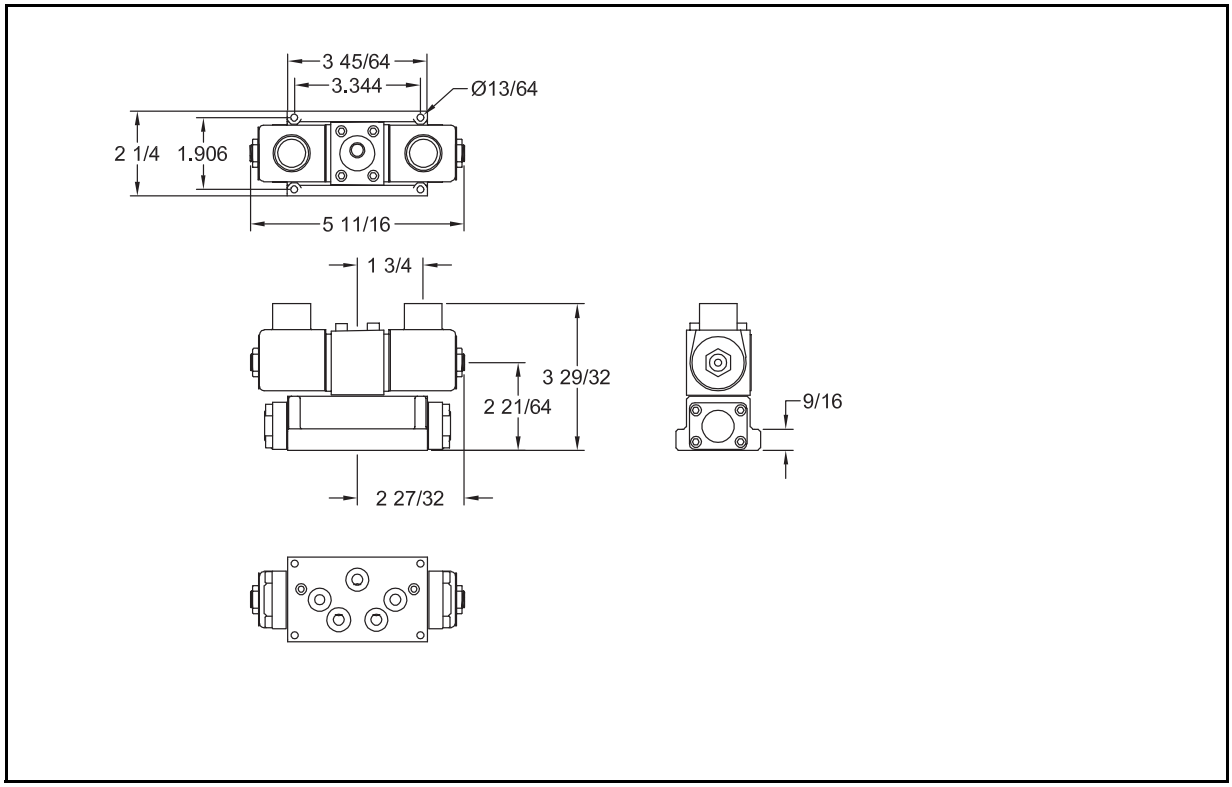


STANDARD 1/4" THROUGH 2"
"CLASSIC" SOLENOID: SO, SR, SS, SY

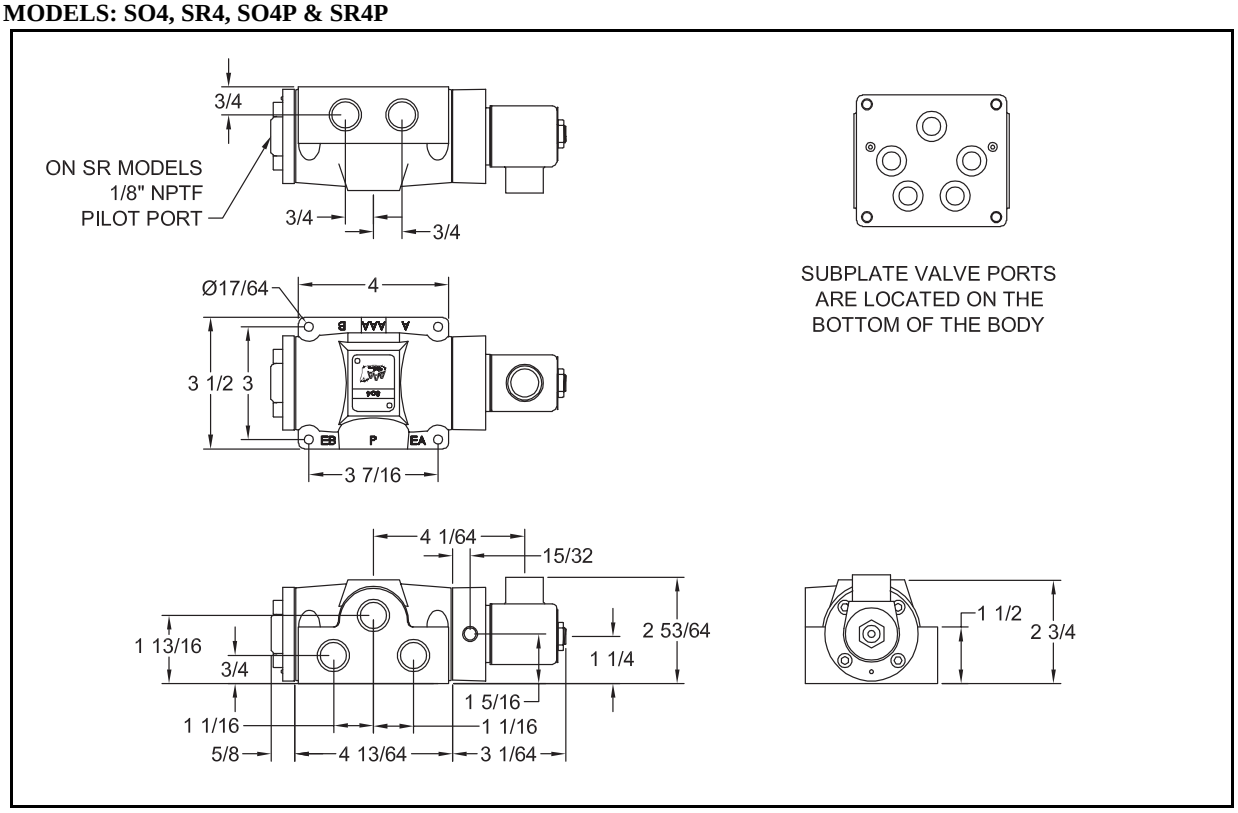
MODELS: SS2, SY2, SS3 & SY3



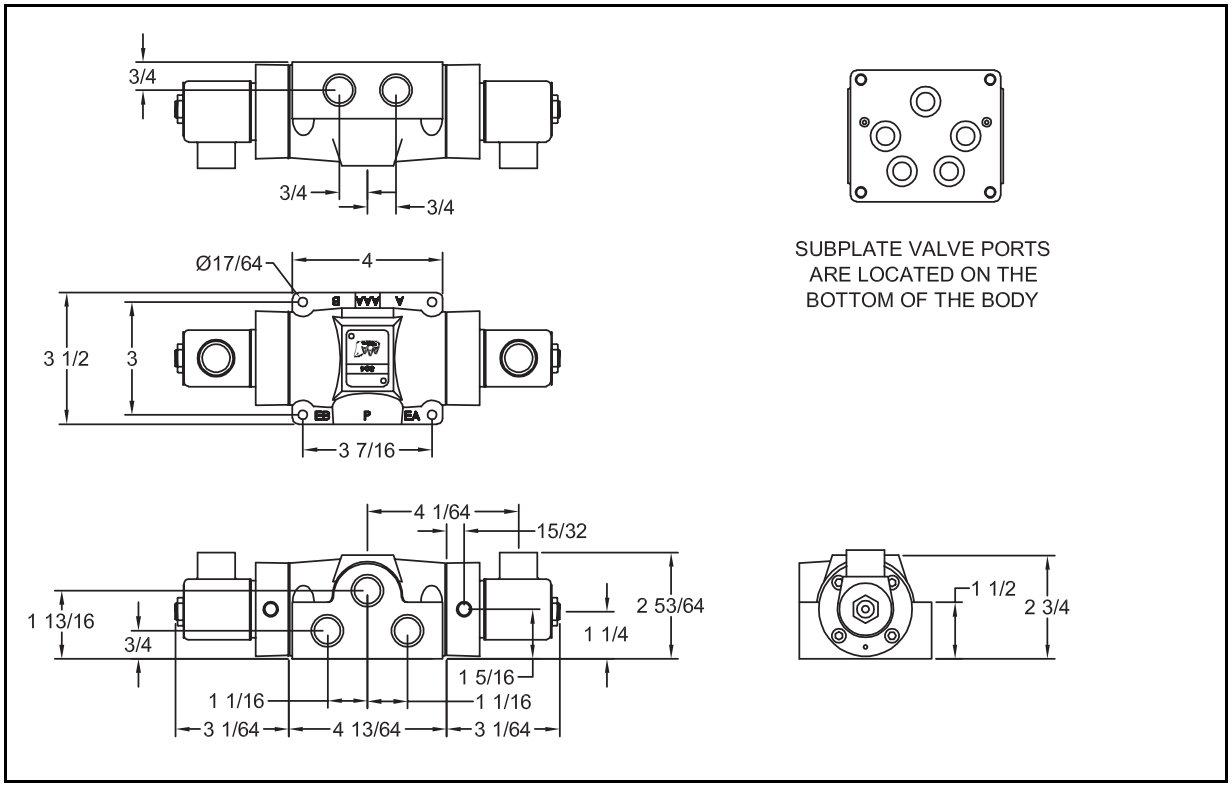
MODELS: SS3P & SY3P



MODELS: SO4, SR4, SO4P & SR4P

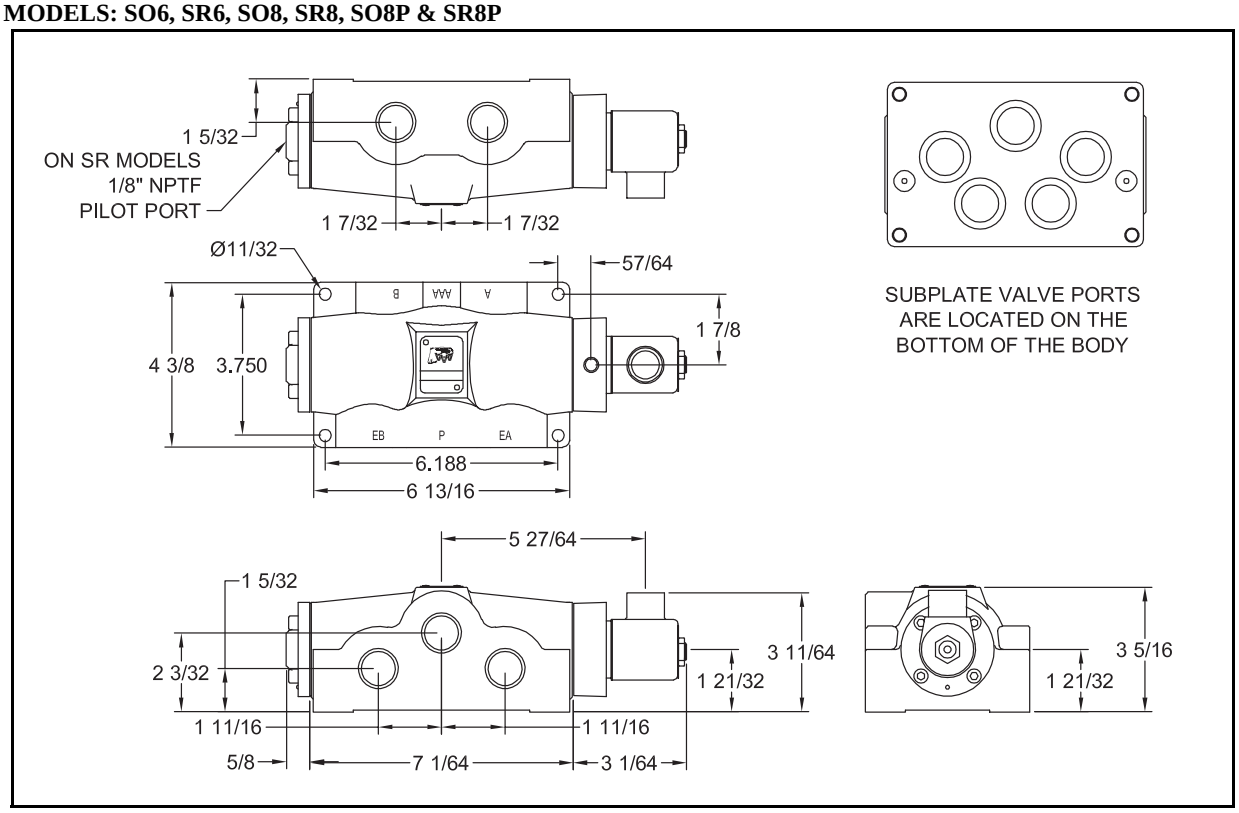


MODELS: SS4, SY4, SS4P & SY4P

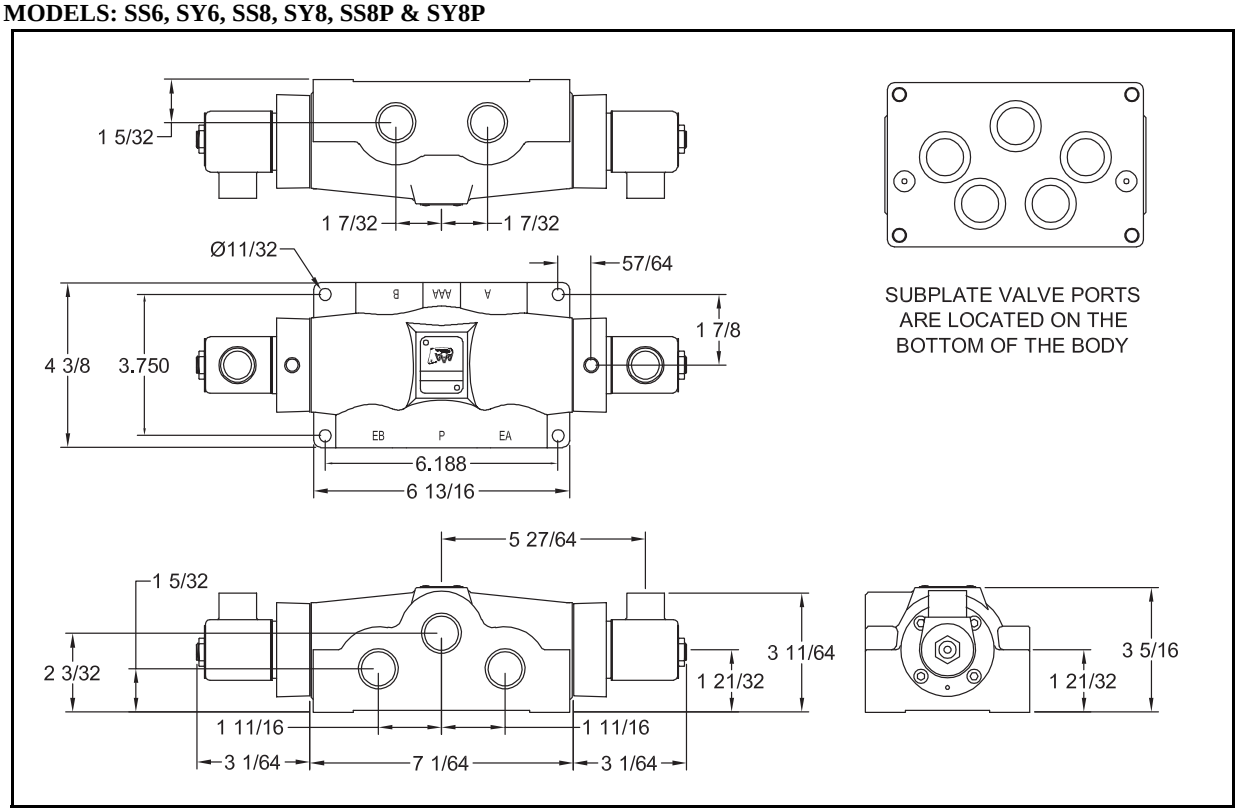


STANDARD 1/4" THROUGH 2"
"CLASSIC" SOLENOID: SO, SR, SS, SY

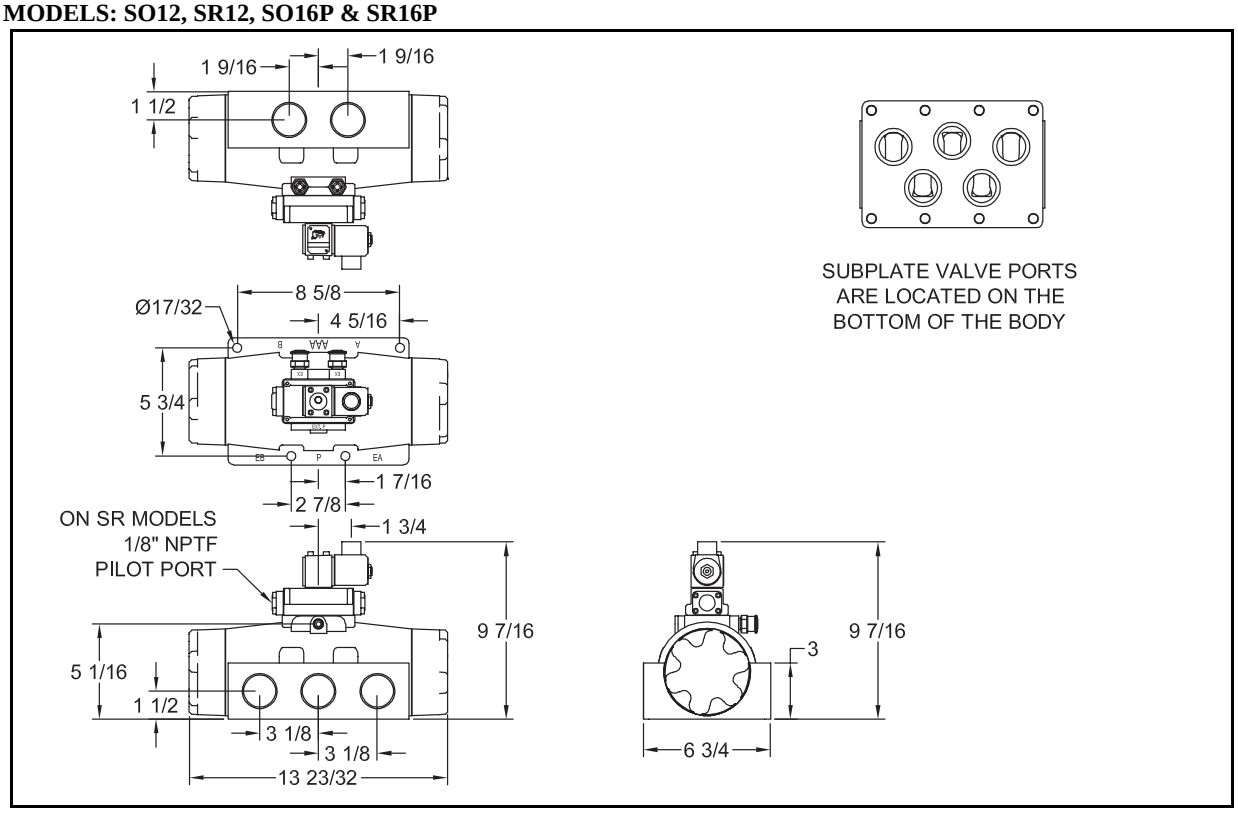
MODELS: SO6, SR6, SO8, SR8, SO8P & SR8P



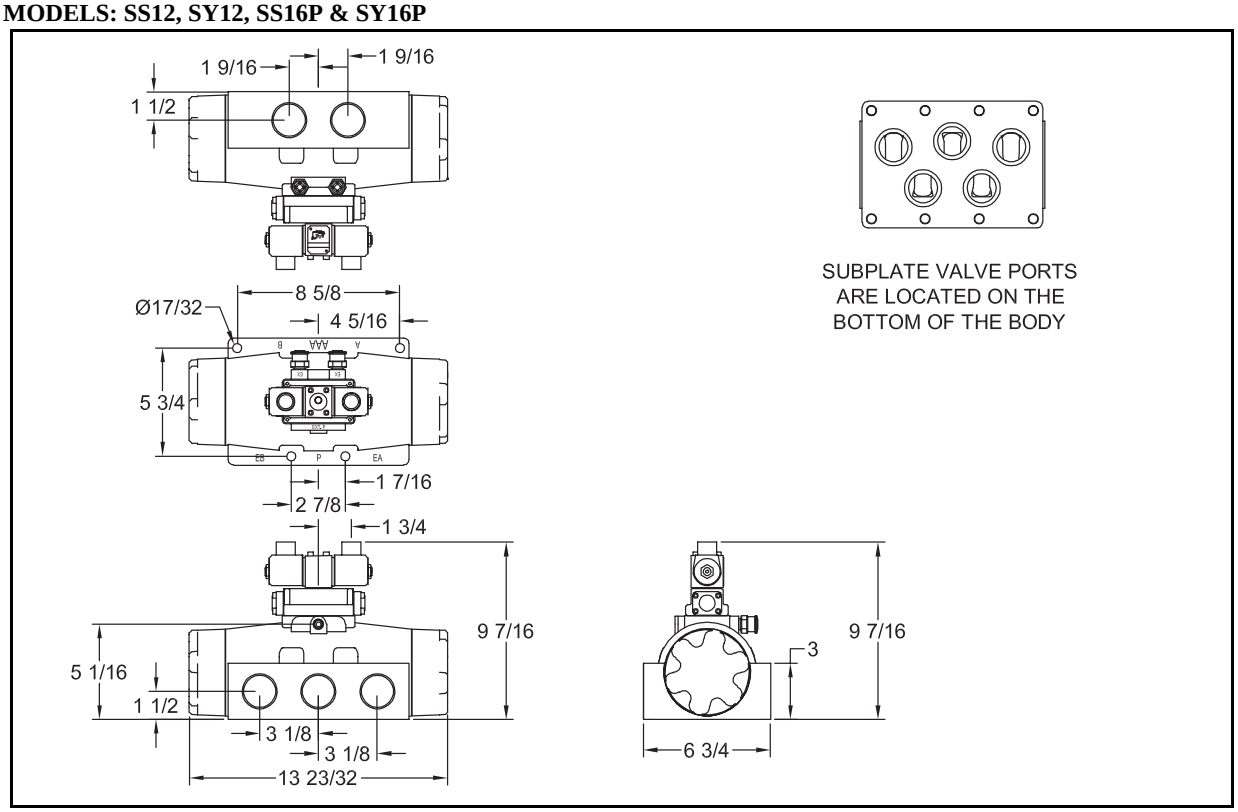
MODELS: SS6, SY6, SS8, SY8, SS8P & SY8P



MODELS: SO12, SR12, SO16P & SR16P

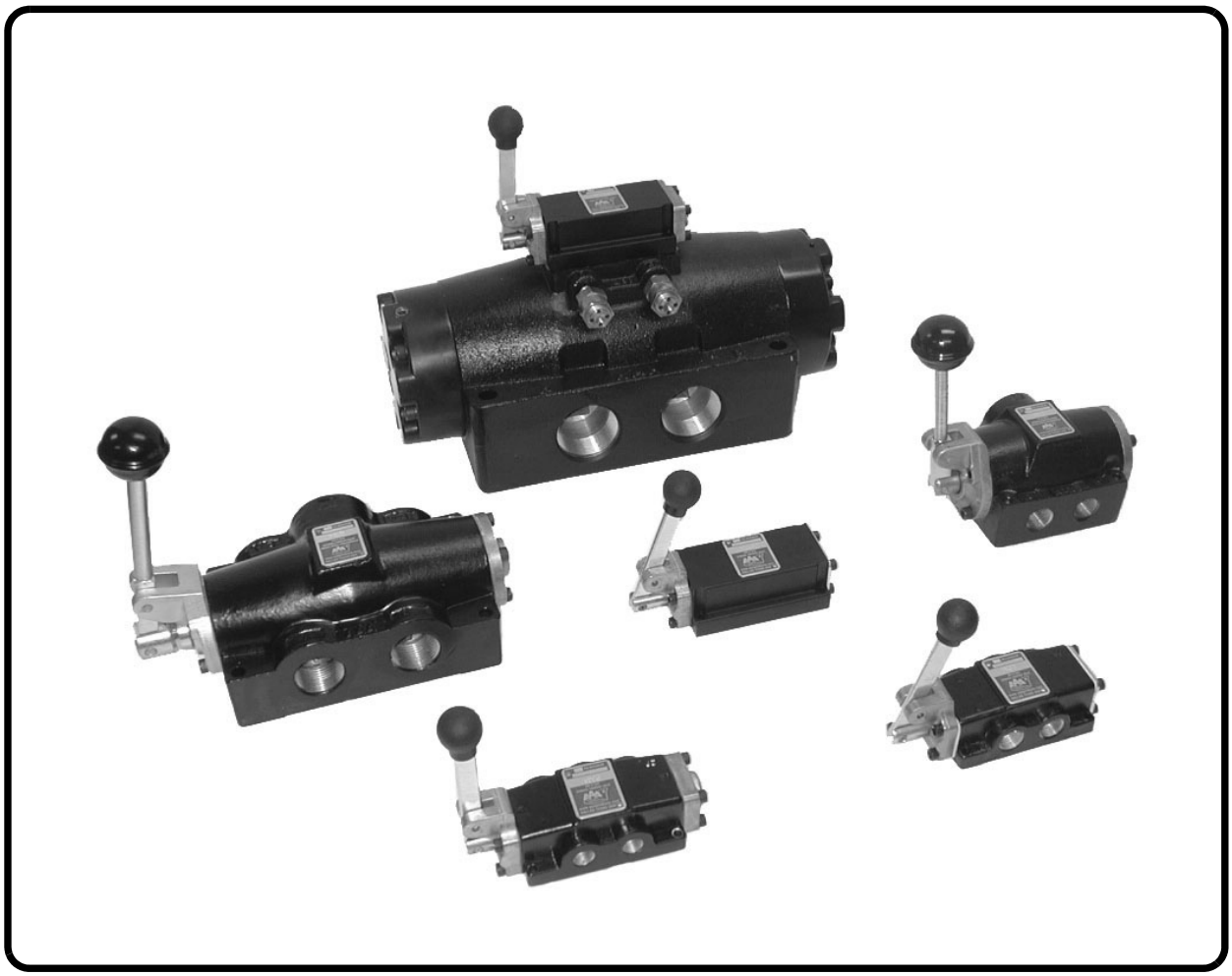


MODELS: SS12, SY12, SS16P & SY16P



MANUAL LEVER CONTROLLED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

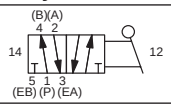
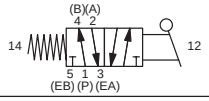
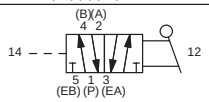
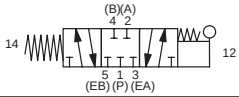
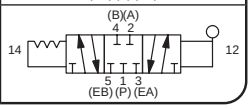
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options. You can specify different handle orientations, lockout or detents by choosing options available for the valve configuration you need.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

HE3PGR-5

1 Operator Style

Code	Description	Symbol
HE	2-position, friction positioned. Spool stays in any position when handle is released.	
HO	2-position, spring returned spool. Spool returns to position “C” when the handle is released.	
HR	2-position, pilot returned spool. Spool returns to position “C” from auxilary control valve furnished by the user (or by handle).	
HY	3-position, spring centered. Spool returns to position “B” when handle is released.	
HD	3-position, friction position, positive detent in all positions. Spool stays in position when lever is released.	

2 Port Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF
12 = 1-1/2" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow
16P = 1-1/2" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
C = Curved handle.
E = Pin lock (available only on port styles 2, 3 & 3P).
LO = Lockout (available only on port styles 2, 3 & 3P).
Q = 2-postion spool detent (available only on model HD).
R = Handle orientation rotated 90° toward 2-hole side.
U = Factory installed muffler/flow controls in ports 3 and 5 (port styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for port styles 2, 3 & 3P, Buna-N for port styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Manual lever models are operated with a handle that shifts the spool. The standard handle position of the knob for a 3-position valve is the center of the valve (Position “B”). To fully shift the valve, the handle is pulled towards the operator (Position “A”) or away from the operator (Position “C”). On 2-position valves, there is no positive detent for centering the spool (Position “B”).

OPERATOR STYLE CODE:

HE: 2-position, friction position, manual return. Spool stays in any position when handle is released (See the detented version for mobile or vertical valve mounting).

HO: 2-position, spring returned spool. Spool returns to position “C” when lever is released.

HR: 2-position, pilot returned spool. Spool returns to position “C” from auxiliary control valve furnished by the user or by pushing the lever to position “C”. Return shift pressure should be 25 PSI or greater.

HY: 3-position, spring centered. Spool returns to position “B” when lever is released.

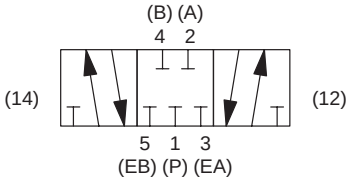
HD: 3-position, friction position, positive detent in all positions. Spool stays in position when lever is released. Additional shifting force is required to initiate spool shifting.

BODY STYLE:

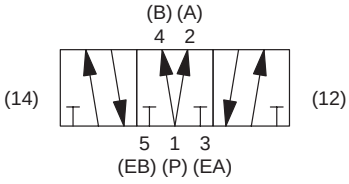
SIDE PORTED: Side ported valves can be installed inline. These valves have standard female “National Pipe Threads” to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4", 1" and 1-1/2" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All connections, including “Pilot Return” ports, if used, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body.

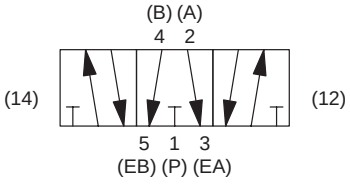
SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



“Standard”
Closed Center Spool



“D”
Regenerative Spool



“G”
Float Center Spool

STANDARD: Most valves are supplied with a “Closed Center” spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are “Closed Center”. Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

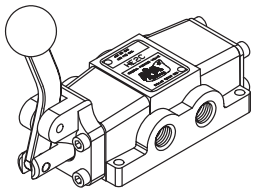
REGENERATIVE: Spool Option “D”. In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a “Regenerative” spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option “G”. In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a “Float Center” spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

VALVE OPTIONS:

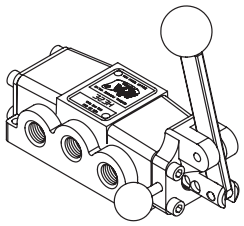
OPTION C: CURVED HANDLE

This option has a slightly curved handle to ease operator use when the valve is mounted in awkward locations. Contact the factory for custom handle curves and also unique lever mechanisms. We even have created a valve with a 3-foot long rod that is used in cattle loading and unloading.



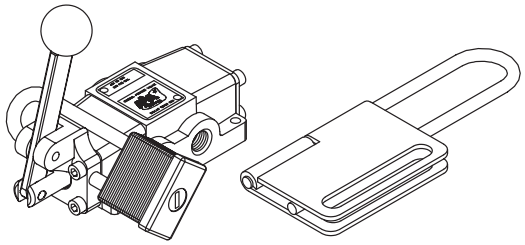
OPTION E: PIN LOCK

This option converts a single hand operated valve into a two hand operated valve required for some safety applications. To operate, user pulls the pin lock out, while simultaneously shifting the valve. The user releases the pin. The pin lock is spring loaded and snaps into the next available detent when the valve is shifted. On two position valves (HE, HO & HR), the pin will only snap in positions "A" and "C". On three position valves (HY), the pin will also snap in the "B" position. Contact the factory if you want valves that only snap in different spool positions. Available only on valve with body style 2, 3 and 3P. Not available on HD models.



OPTION LO: LOCK-OUT

This option allows the valve to be locked into position. On two position valves (HE, HO & HR), the lock-out position is position "C". On three position valves (HY), the lock-out position is position "B". Contact the factory if you want valves that lock-out in different spool positions. Available only on valve with body style 2, 3 and 3P. Valve shown with optional lock and optional multi-lockout hasp.

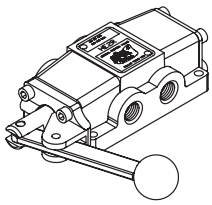


OPTION Q: TWO POSITION DETENT

This option is available on HD models only. Spool stays in position "A" or "C" when lever is released. This is a 2-position version of the model HD, where there is no center position detent. Additional shifting force is required to initiate spool shifting.

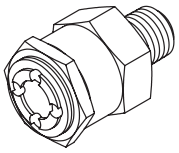
OPTION R: ROTATED HANDLE

On all lever operated valves, the handle can be rotated up or down. On body styles 4, 4P, 6, 8 and 8P, the handle can also be rotated to the left or right position. On body styles, 2, 3, 3P, 12 and 16P, the valve requires a different end cap to change the standard "Up" orientation to a "Left or Right". Once the valve has been converted to the "Left or Right" orientation, you would need the original endcap to return it to the standard "Up or Down" orientation. The picture shows the standard Option "R" orientation. To order the Option "R" so the orientation is "Left", consult factory. This option only applies to valves with body style 2, 3, 3P, 12 and 16P.



OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

STANDARD TEMPERATURE RANGE:

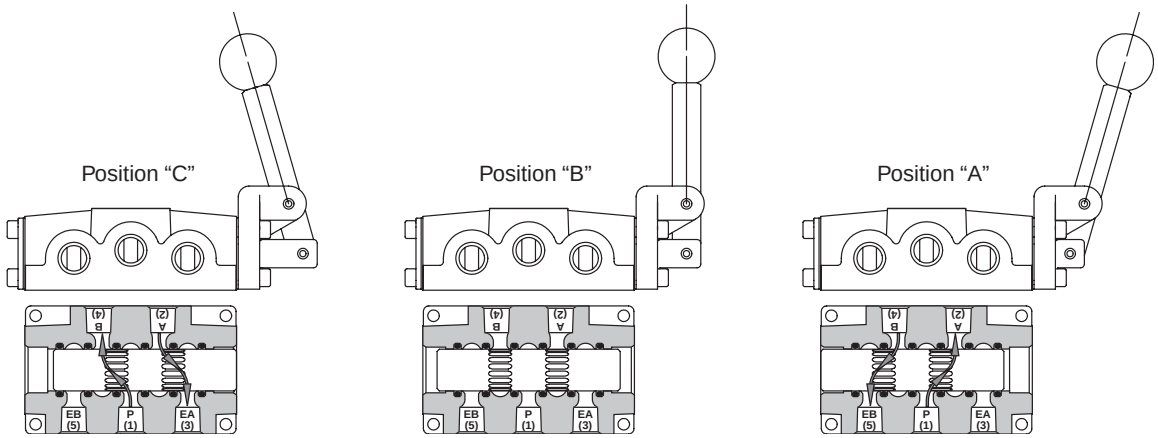
Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

1/2", 3/4", 1", 1-1/2" and 2" valves use Buna-N O-rings: -40°F to 250°F.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

FLOW PATTERN:



1/4" through 1": When the handle is shifted, causing the internal spool to shift, various ports will be connected. If the handle is in position “A”, port 1 will connect to port 2. When the handle is in position “C”, port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position “B”, the connection of the ports depend on the style of spool used.

1-1/2" and 2": These larger valves use a “Piggy-Back” valve mounted to the top of the larger valve. The flow through the larger valve is the same as above.

AIR FLOW RATINGS:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics.* These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

	Rated Flow					
Body Style	**2**	**3**	**4**	**6***	**8***	**12***
Port Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/2"
SCFM Flow	73.9	97.1	215.0	446.9	477.7	1627
Cv Factor	1.6	2.4	5.0	10.4	11.1	37.8

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-16: One kit required for each 1-1/2" or 2" valve. Includes six V-123 Buna-N body O-rings, two V-124 Buna-N end cap O-rings, two V-89 Buna-N end cap pilot O-rings, five V-125 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot O-rings (Seals used determined by valve model and style). To repair piggy back valve, use ERKV-3.

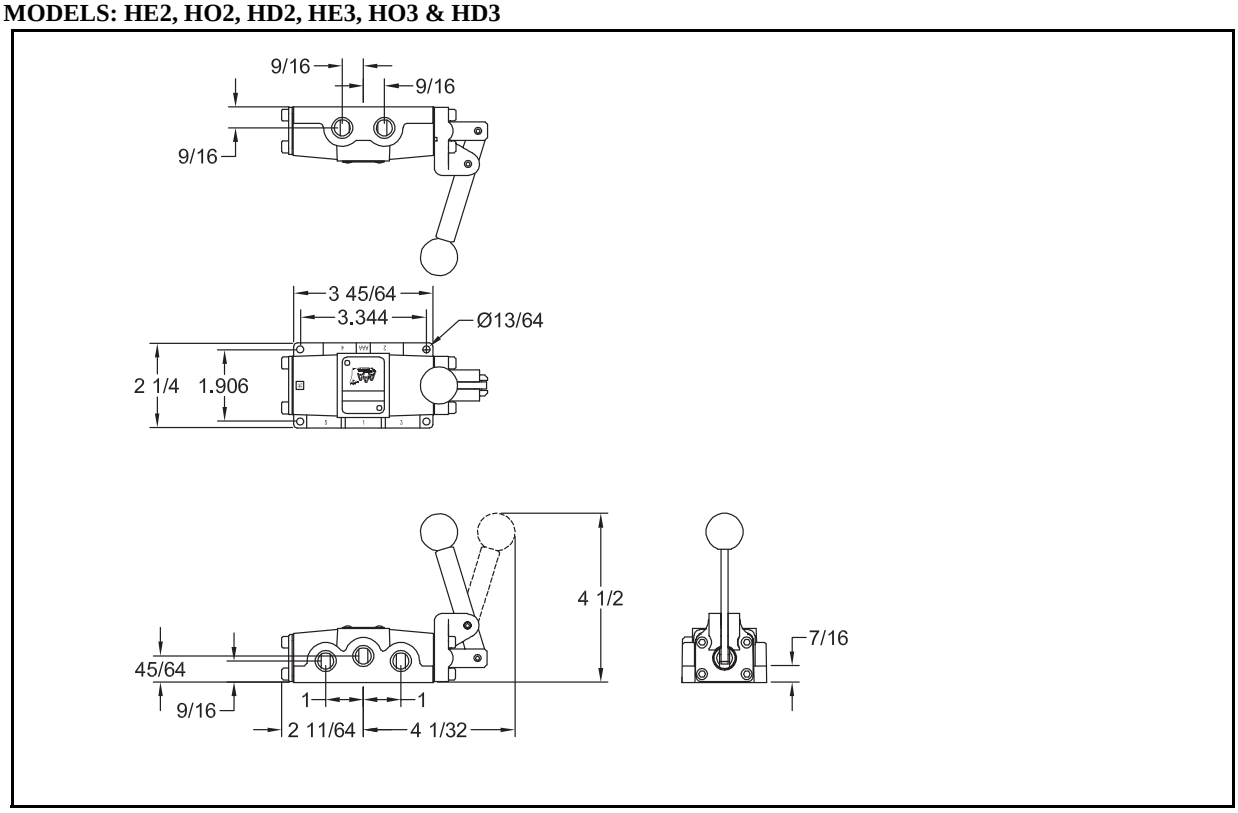
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

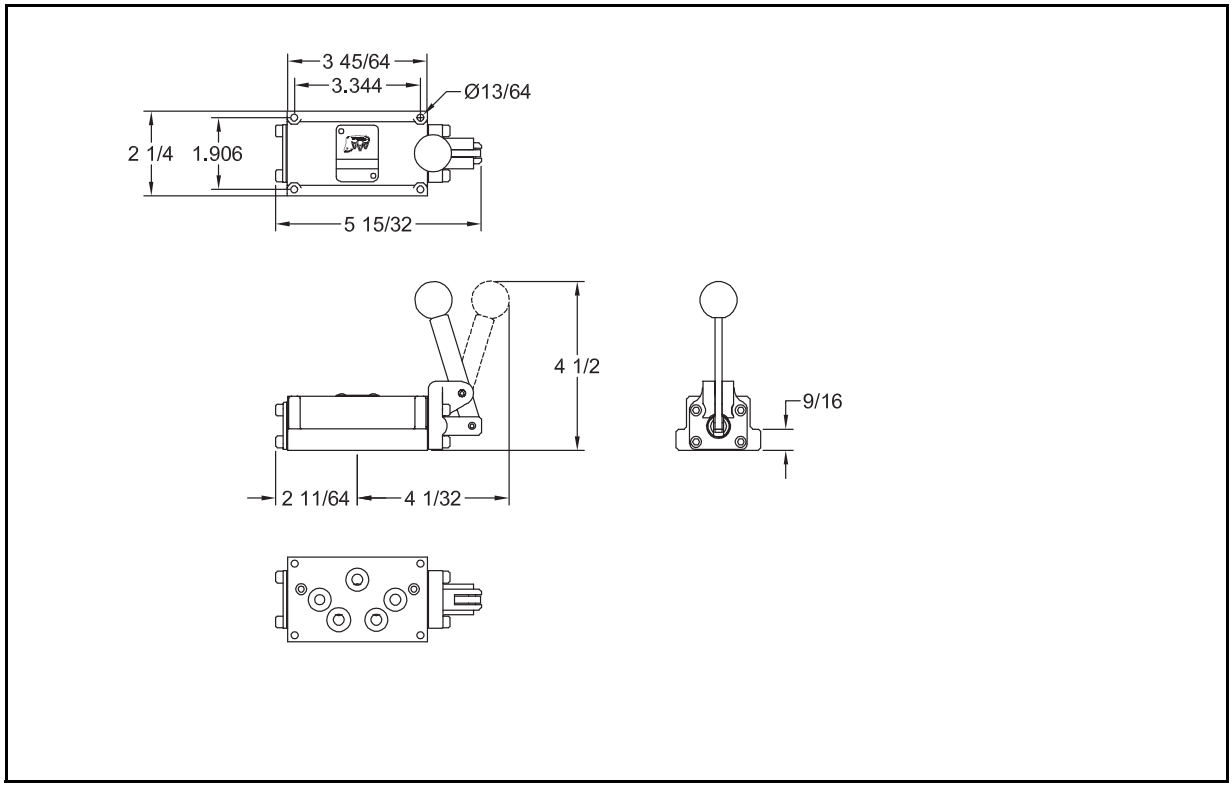
Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs or any other component that appears to be working less than optimum.

SEMI-DIMENSIONAL DRAWINGS:

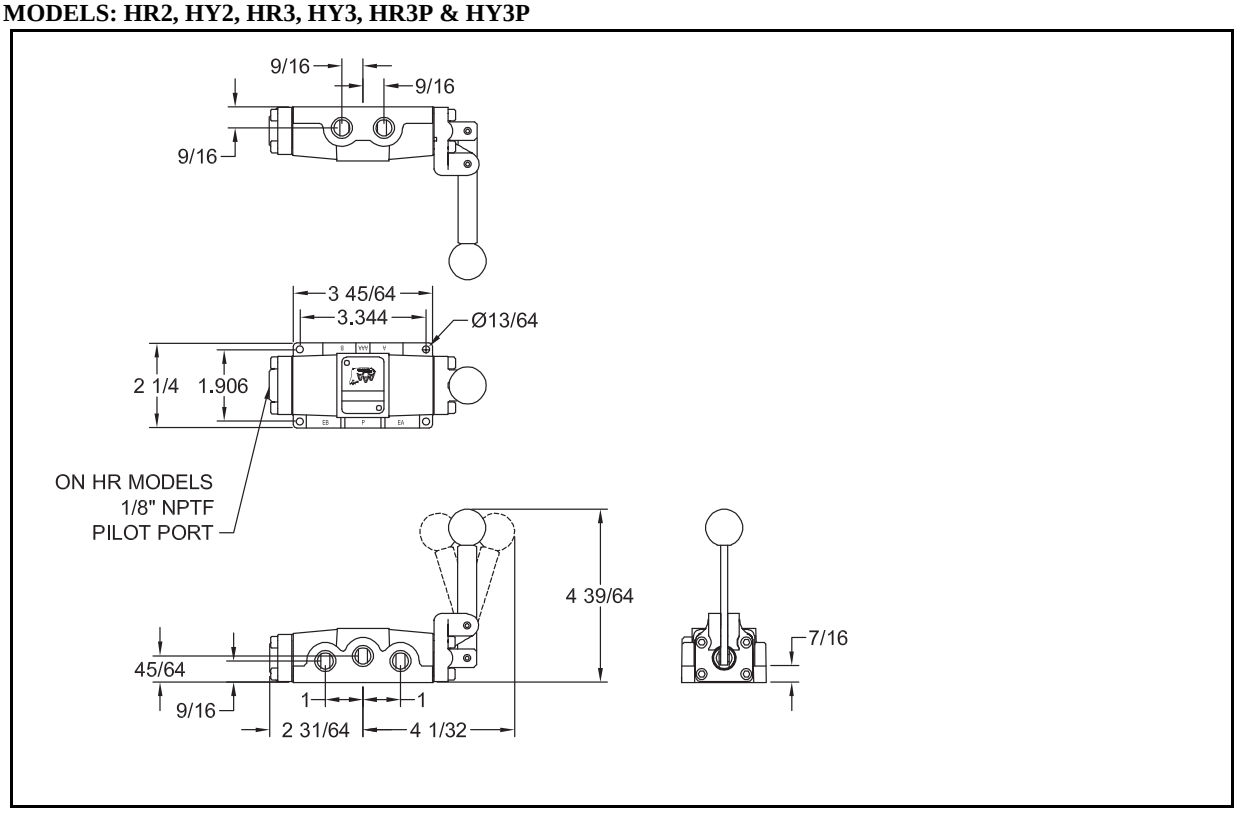
MODELS: HE2, HO2, HD2, HE3, HO3 & HD3



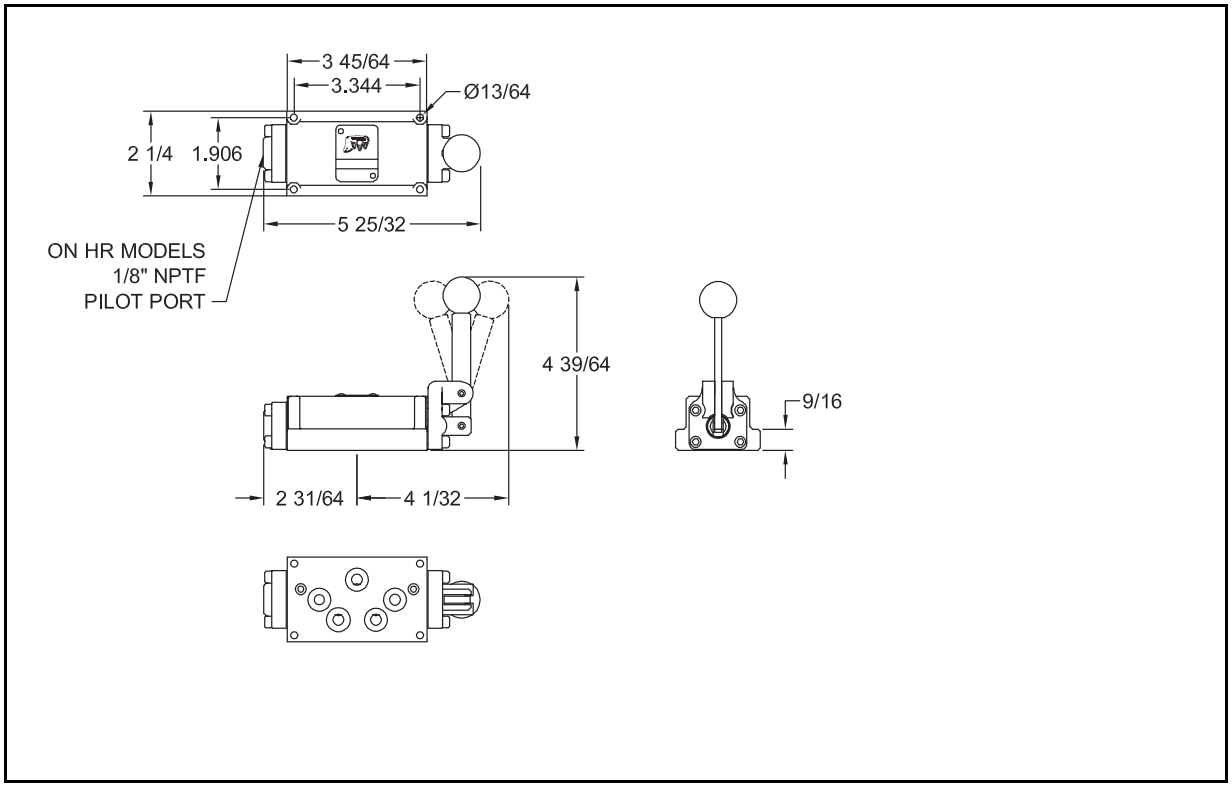
MODELS: HE3P, HO3P & HD3P



MODELS: HR2, HY2, HR3, HY3, HR3P & HY3P

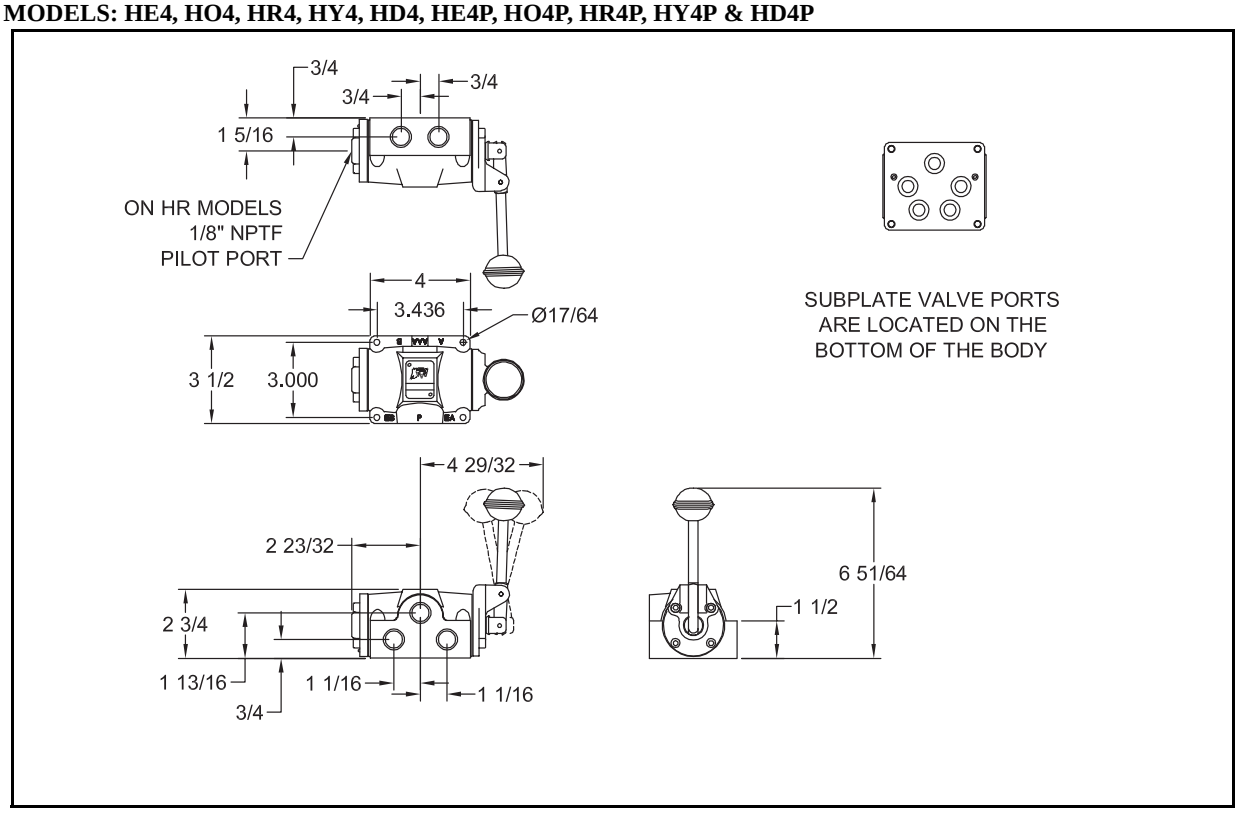


MODELS: HR3P & HY3P

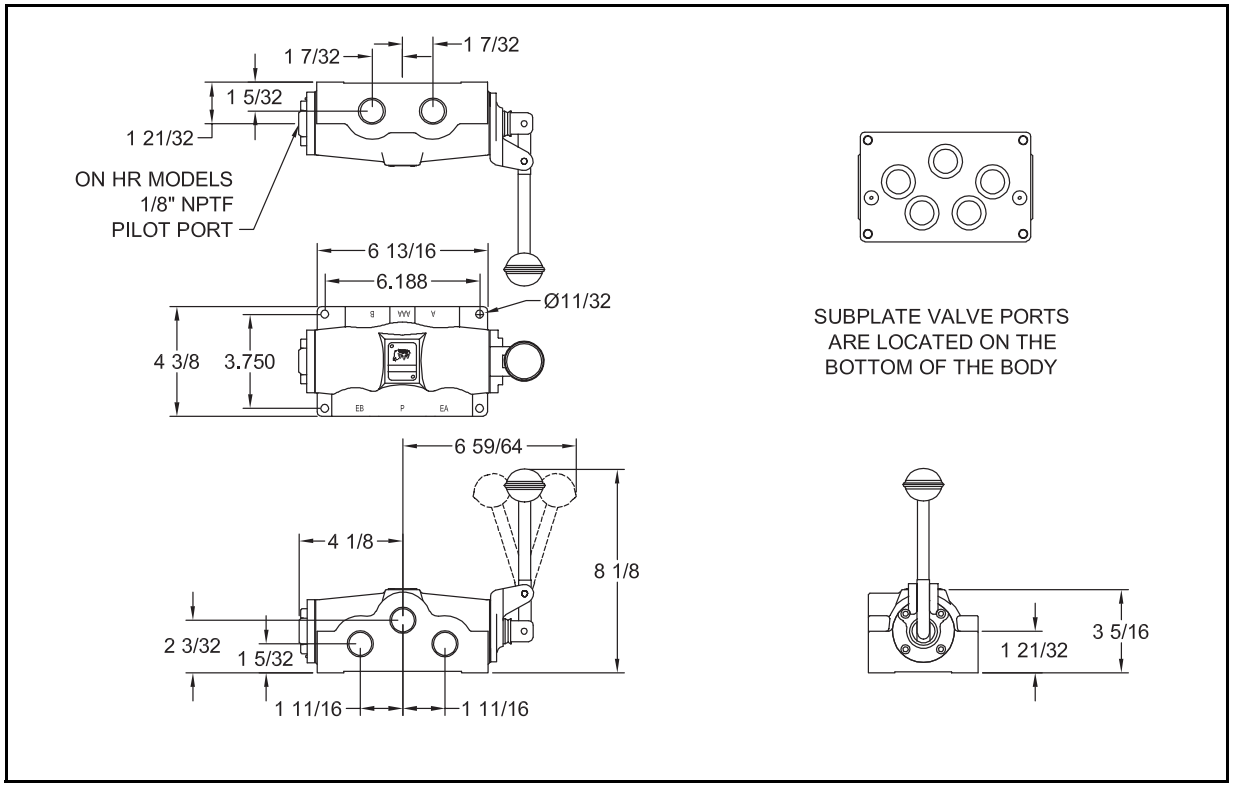


STANDARD 1/4" THROUGH 2"
MANUAL LEVER: HE, HO, HR, HY, HD

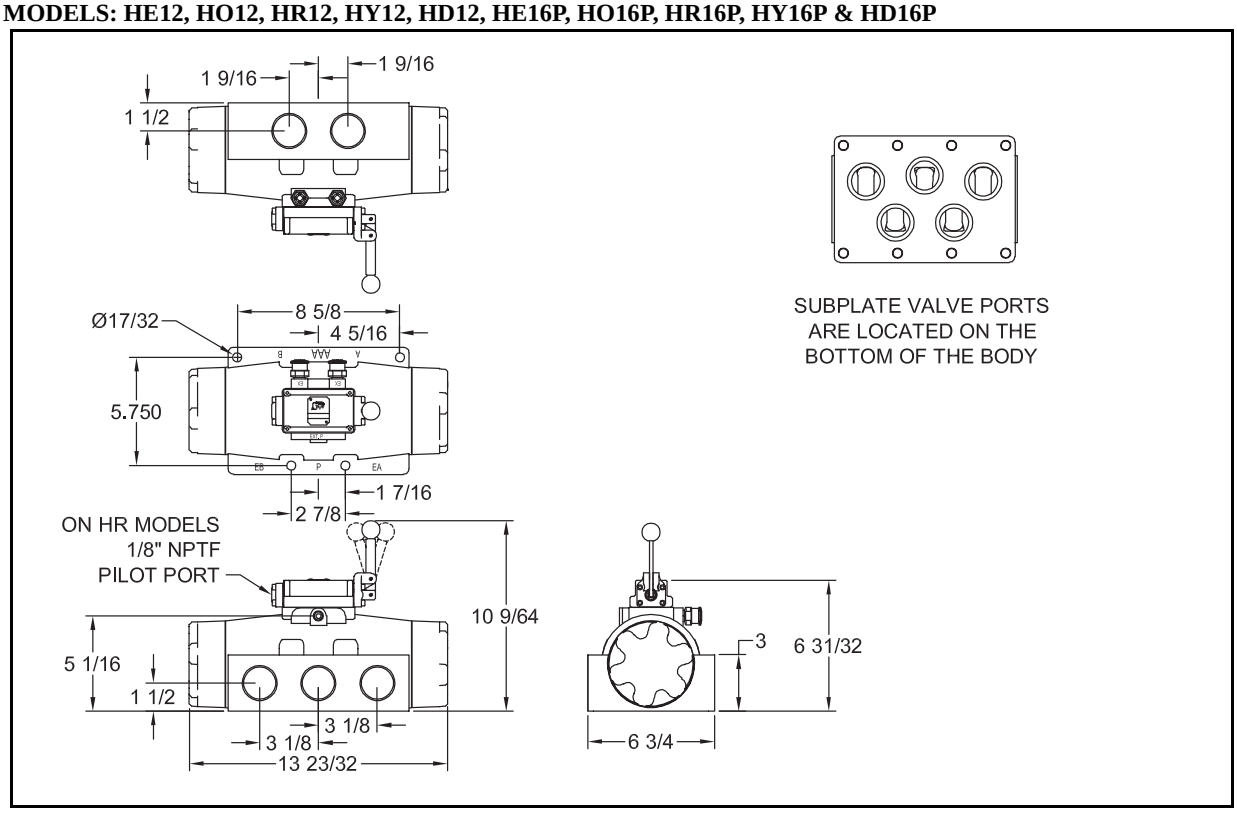
MODELS: HE4, HO4, HR4, HY4, HD4, HE4P, HO4P, HR4P, HY4P & HD4P



MODELS: HE6, HO6, HR6, HY6, HD6, HE8, HO8, HR8, HY8, HD8, HE8P, HO8P, HR8P, HY8P & HD8P



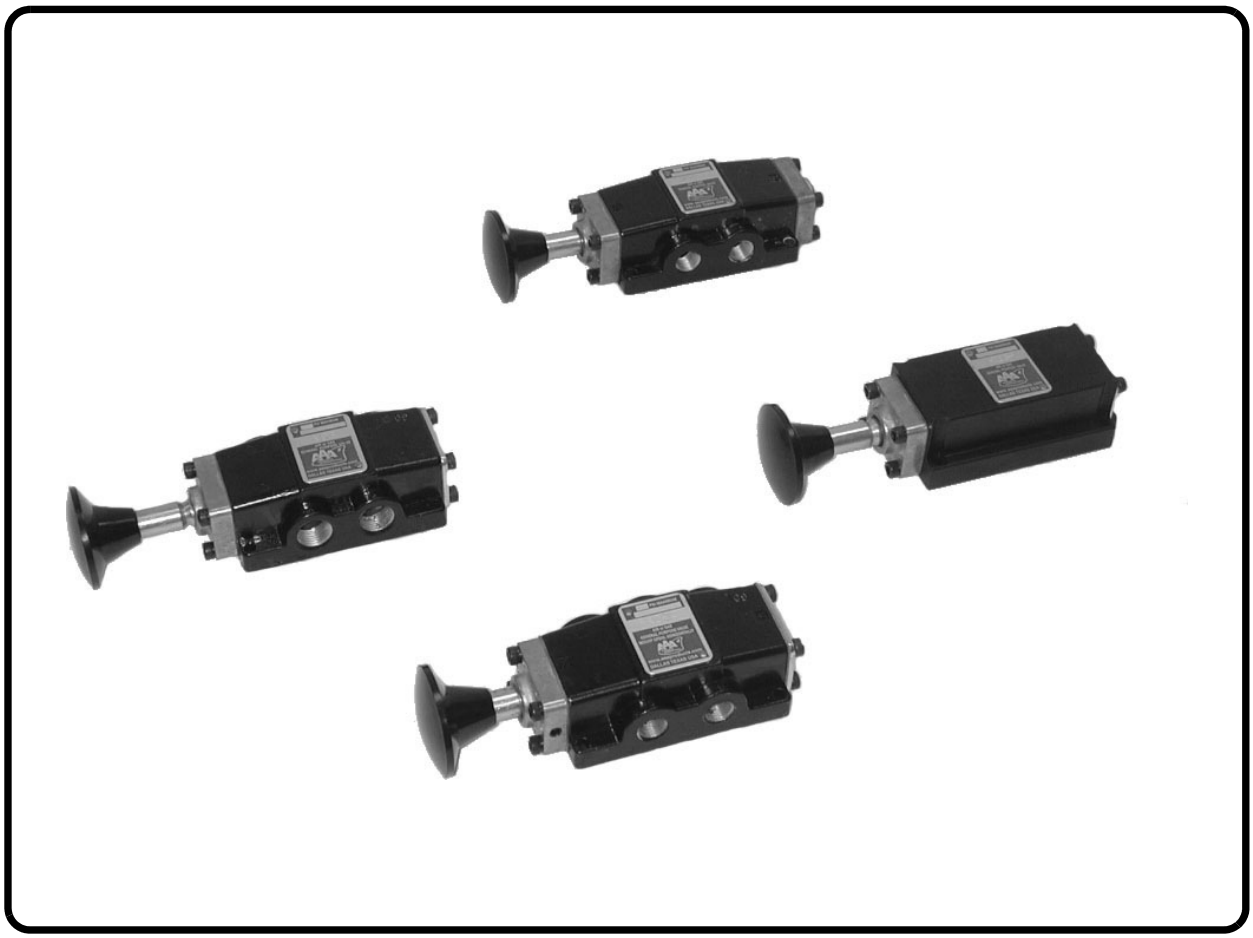
MODELS: HE12, HO12, HR12, HY12, HD12, HE16P, HO16P, HR16P, HY16P & HD16P



STANDARD 1/4" THROUGH 2"
PALM BUTTON: KE, KO, KR, KY, KD

PALM BUTTON CONTROLLED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

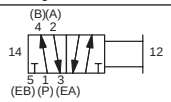
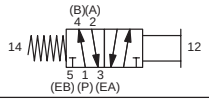
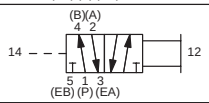
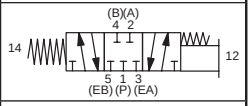
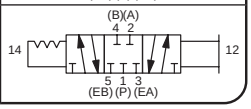
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options. You can specify pin lock, lockout or panel mount by choosing options available for the valve configuration you need.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

KE3PGR-5

1 Operator Style

Code	Description	Symbol
KE	2-position, friction positioned. Spool stays in any position when knob is released.	
KO	2-position, spring returned spool. Spool returns to position “C” when the knob is released.	
KR	2-position, pilot returned spool. Spool returns to position “C” from auxiliary control valve furnished by the user (or by knob).	
KY	3-position, spring centered. When knob is released, spool shifts to center (position “B”).	
KD	3-position, friction position, positive detent in all positions. Spool stays in position when knob is released.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF

Subplate Mounted

3P = 3/8" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
E = Pin lock.
LO = Lockout.
Q = 2-postion spool detent (available only on model KD).
R = Panel mount (available only on body styles 2 & 3).
SS = All stainless steel construction (KE2, KE3, KO2 & KO3 Only).
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Palm button models are operated with a palm button that directly connects to the spool. The standard position of the palm button for a 3-position valve is the center of the valve (Position “B”). To fully shift the valve, the palm button is pushed away from the operator (Position “A”) or pulled towards the operator (Position “C”). On 2-position valves, there is no positive lock for centering the spool (Position “B”).

OPERATOR STYLE CODE:

KE: 2-position, friction position, manual return. Spool stays in any position when knob is released (See the detented version for mobile or vertical valve mounting).

KO: 2-position, spring returned spool. Spool returns to position “C” when knob is released.

KR: 2-position, pilot returned spool. Spool returns to position “C” from auxiliary control valve furnished by the user or by pulling the knob to position “C”. Return shift pressure should be 25 PSI or greater.

KY: 3-position, spring center. Spool returns to center, position “B”, when knob is released.

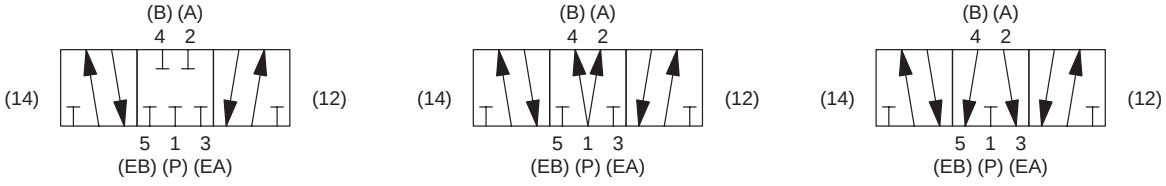
KD: 3-position, friction position, positive detent in all positions. Spool stays in position when knob is released. Additional shifting force is required to initiate spool shifting.

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female “National Pipe Threads” to connect directly to installed air lines. The standard pipe sizes are 1/4" and 3/8" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All connections, including “Pilot Return” port, if used, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



STANDARD: Most valves are supplied with a “Closed Center” spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are “Closed Center”. Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

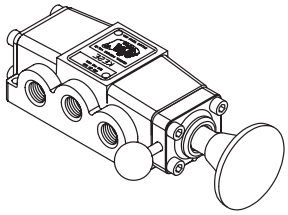
REGENERATIVE: Spool Option “D”. In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a “Regenerative” spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option “G”. In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a “Float Center” spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

VALVE OPTIONS:

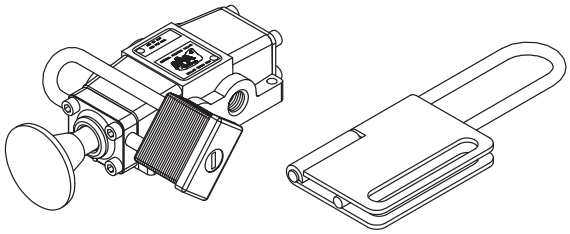
OPTION E: PIN LOCK

This option converts a single hand operated valve into a two hand operated valve required for some safety applications. To operate, user pulls the pin lock out while simultaneously shifting the valve. The user then releases the pin. The pin lock is spring loaded and snaps into the next available detent when the valve is shifted. On two position valves (KE, KO & KR), the pin will only snap in positions “A” and “C”. On three position valves (KY, the pin will also snap in the “B” position. Contact the factory if you want valves that only snap in different spool positions. Not available on KD models.



OPTION LO: LOCK OUT

This option allows the valve to lock into position. On two position valves (KE, KO and KR), the lock-out position is position “C”. On three position valves (KY), the lock-out position is position “B”. Contact the factory if you want valves that lock-out in different spool positions. Not available on KD models. Valve shown with optional lock and optional multi-lockout hasp.

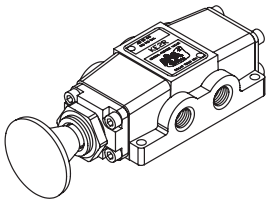


OPTION Q: TWO POSTION DETENT

This option is available on KD models only. Spool stays in position “A” or “C” when palm button is released. This is a 2-position version of the model KD where there is no center position detent. Additional shifting force is required to initiate spool shifting.

OPTION R: PANEL MOUNT

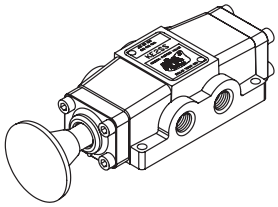
This option is only available on body styles 2 and 3. This option allows the valve to be mounted on a panel up to 1/4" thick through a 7/8" diameter hole.



OPTION SS: STAINLESS STEEL

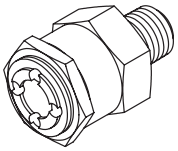
This option is only available on models KE and KO with body styles 2 and 3. This option allows the valve to be used in harsh, wash down environments. Entire construction is stainless steel, even the nameplate and screws. Soft seal construction with Viton O-ring seals in body grooves. Can be used on compressed air or gases compatible with 316 stainless steel and Viton seals.

Physical dimensions, flow diagrams and other specifications are the same as standard valves.



OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

STANDARD TEMPERATURE RANGE:

Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

1/2", 3/4", 1", 1-1/2" and 2" valves use Buna-N O-rings: -40°F to 250°F.

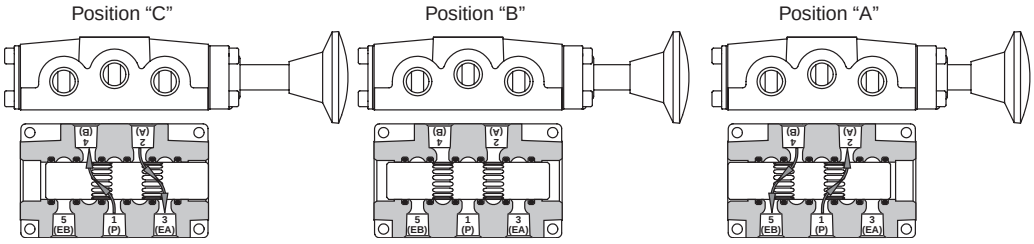
Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

SHIFTING CHARACTERISTICS:

1/4" and 3/8": On KO models, a minimum force of 12 lbs is required to shift the spool against the spring with a functional spool travel of 17/32" and with an over-travel of 1/32". On KY models, a minimum force of 12 lbs is required to shift the spool against the spring in either direction from center. Functional spool travel of 1/4" in either direction from center with an over-travel of 1/32" on each end. On KR models a sufficient force is required to opposing force created by the pilot return. Functional spool travel is 17/32" with an over-travel of 1/32". On KE and KD models, sufficient force to overcome friction and/or detents. Functional spool travel is similar to models described above.

Operating pressure of the valve may affect the shifting force required.

FLOW PATTERN:



1/4" through 3/8": When the palm button is shifted, causing the internal spool to shift, various ports will be connected. If the palm button is in position “A”, port 1 will connect to port 2. When the palm button is in position “C”, port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position “B”, the connection of the ports depend on the style of spool used.

AIR FLOW RATINGS:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics.* These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

	Rated Flow	
Body Style	**2**	**3**
Port Size	1/4"	3/8"
SCFM Flow	73.9	97.1
Cv Factor	1.6	2.4

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

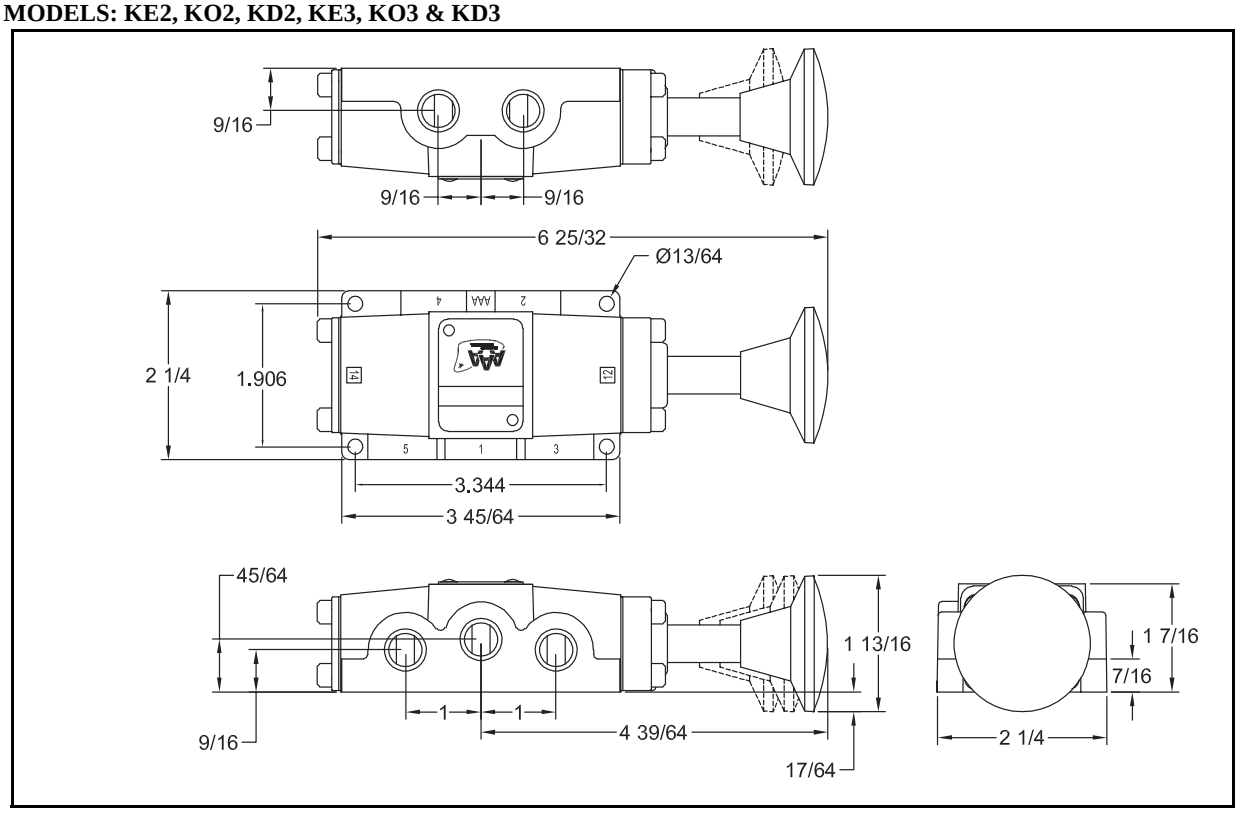
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

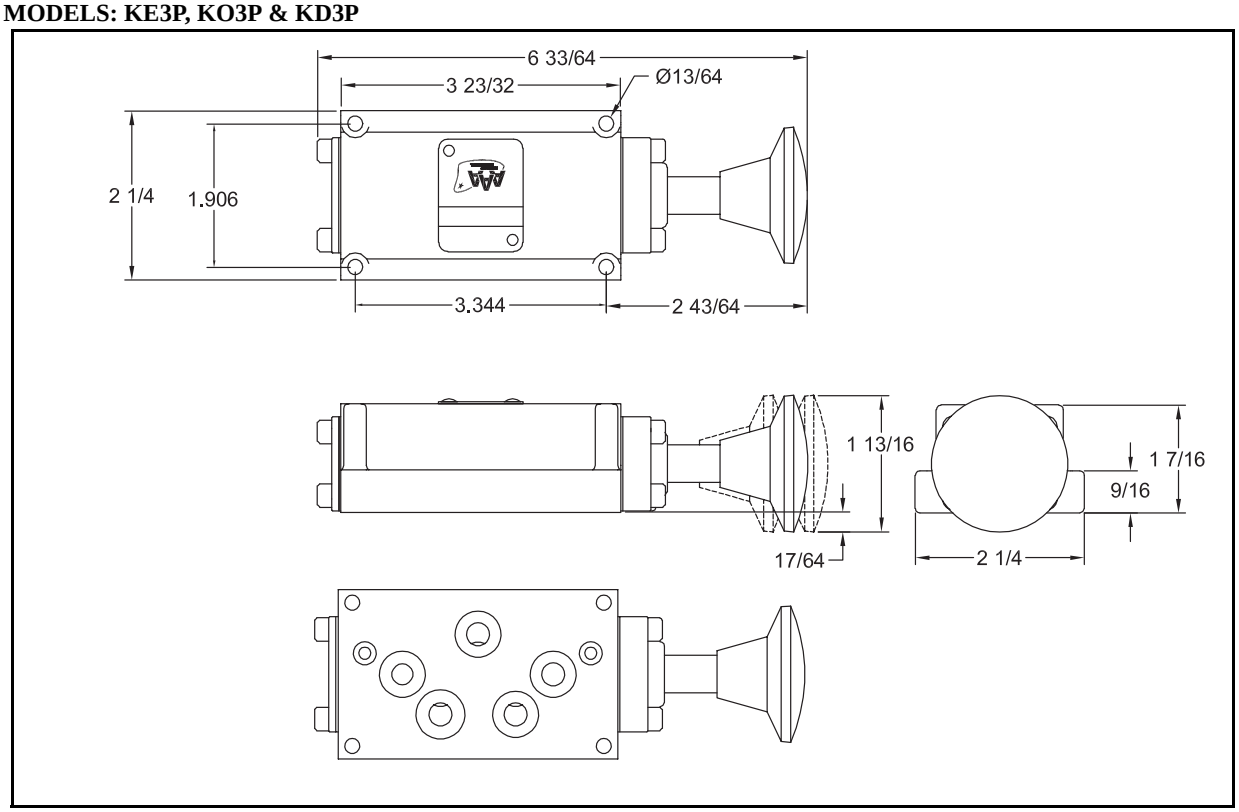
Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs or any other component that appears to be working less than optimum.

SEMI-DIMENSIONAL DRAWINGS:

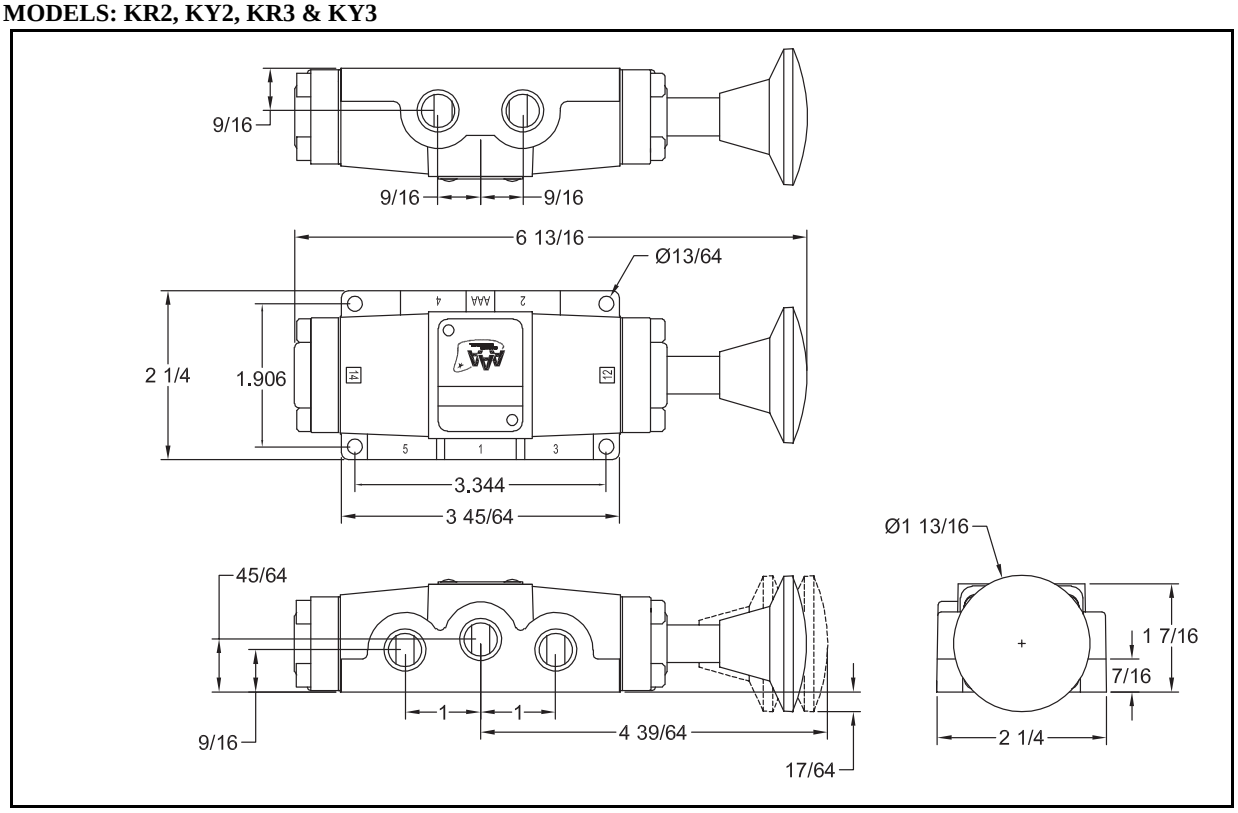
MODELS: KE2, KO2, KD2, KE3, KO3 & KD3



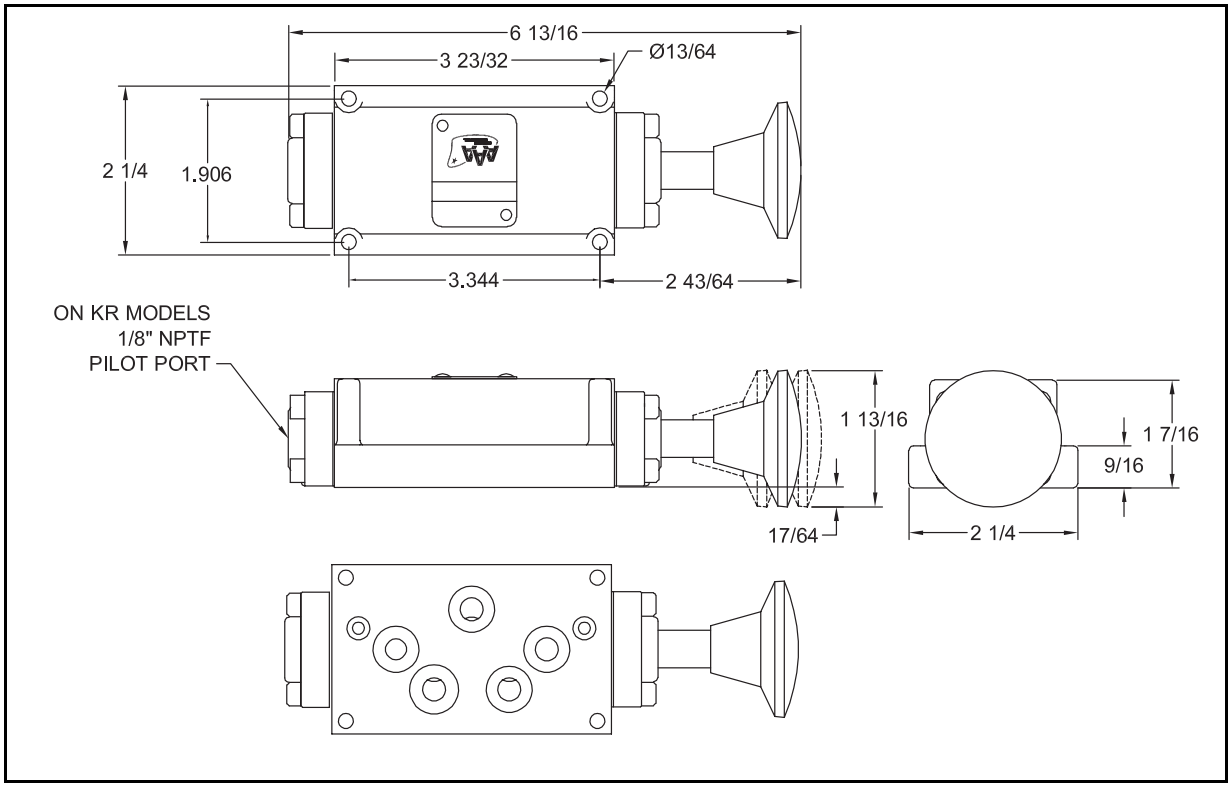
MODELS: KE3P, KO3P & KD3P



MODELS: KR2, KY2, KR3 & KY3

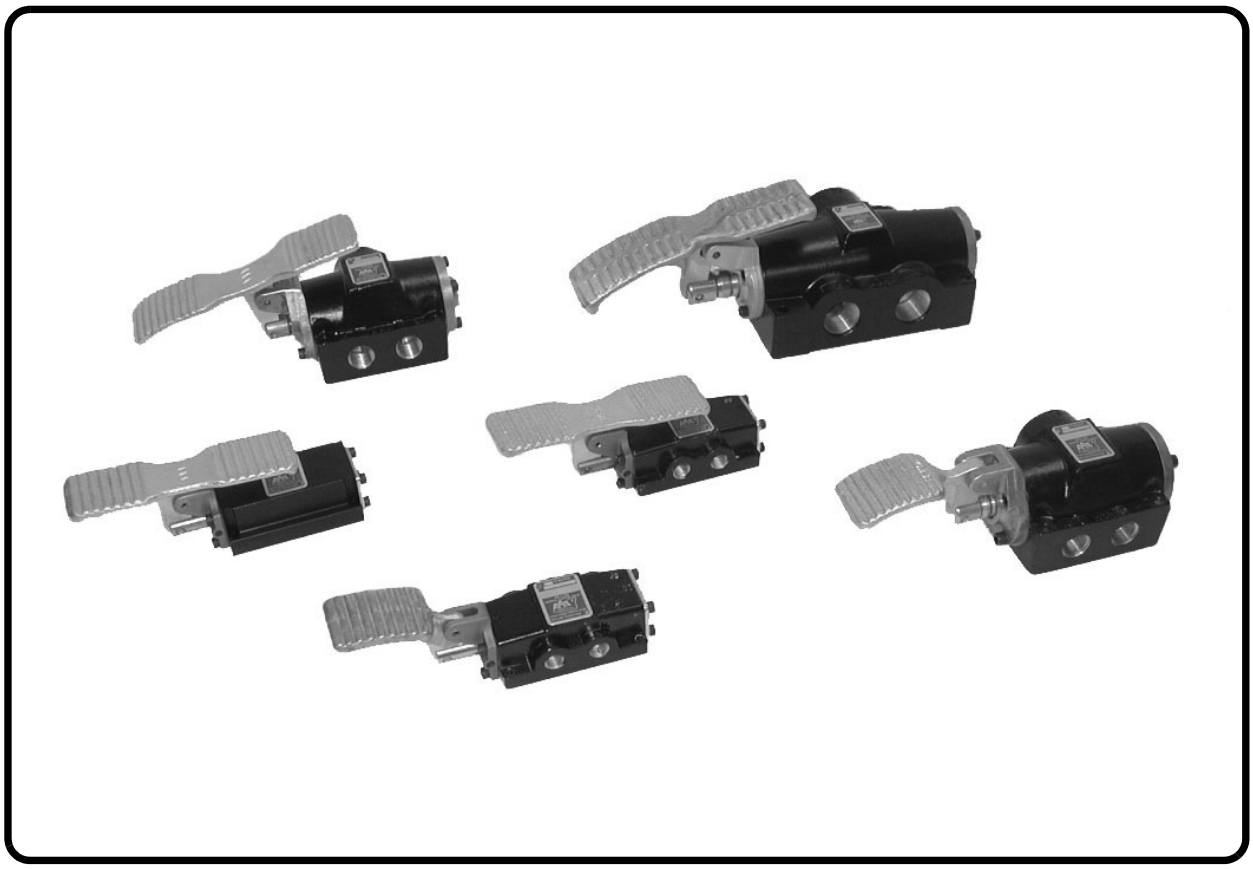


MODELS: KR3P & KY3P



FOOT PEDAL/TREADLE CONTROLLED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

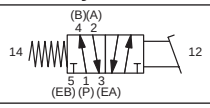
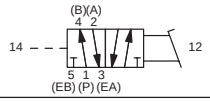
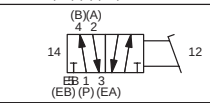
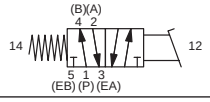
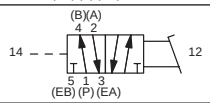
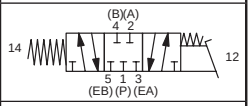
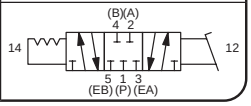
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options. You can specify lockout or detents by choosing options available for the valve configuration you need.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

TE3PGR-5

1 Operator Style

Code	*Description*	*Symbol*
FO	2-position, spring returned spool. Spool returns to position “C” when the pedal is released.	
FR	2-position, pilot returned spool. Spool returns to position “C” from auxilary control valve furnished by the user.	
TE	2-position, friction positioned. Spool stays in any position when treadle is released.	
TO	2-position, spring returned spool. Spool returns to position “C” when the treadle is released.	
TR	2-position, pilot returned spool. Spool returns to position “C” from auxilary control valve furnished by the user.	
TY	3-position, spring centered. Spool returns to position “B” when treadle is released.	
TD	3-position, friction position, positive detent in all positions. Spool stays in position when lever is released.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
LO = Lockout (available only on certain models).
Q = 2-postion spool detent (available only on model TD).
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Foot pedal/treadle models are operated with a foot pedal/treadle that shifts the spool. The standard treadle position for a 3-position valve is the center of the valve (Position "B"). To fully shift the valve, the pedal/treadle is stepped on towards the operator (Position "A") or the treadle may be stepped on away from the operator (Position "C"). On 2-position valves, there is no positive detent for centering the spool (Position "B").

User must assume full safety responsibility for the use of foot valves. Guards are recommended and may be ordered as optional extras for certain models (See page 69 for further details).

OPERATOR STYLE CODE:

FO: 2-position, spring returned spool. Spool returns to position "C" when pedal is released.

FR: 2-position, pilot returned spool. Spool returns to position "C" from auxiliary control valve furnished by the user. Force pushing on pedal must be less than the pilot return pressure to shift valve. Return shift pressure should be 25 PSI or greater.

TE: 2-position, friction position, manual return. Spool stays in any position when treadle is released.

TO: 2-position, spring returned spool. Spool returns to position "C" when treadle is released.

TR: 2-position, pilot returned spool. Spool returns to position "C" from auxiliary control valve furnished by the user. Force pushing on treadle must be less than the pilot return pressure to shift valve. Return shift pressure should be 25 PSI or greater.

TY: 3-position, spring centered. Spool returns to position "B" when treadle is released.

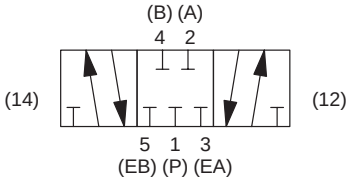
TD: 3-position, friction position, positive detent in all positions. Spool stays in position when treadle is released. Additional shifting force is required to initiate spool shifting.

BODY STYLE:

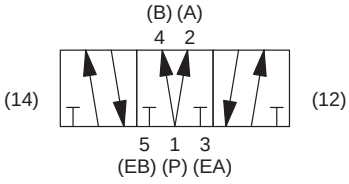
SIDE PORTED: Side ported valves can be installed inline. These valves have standard female "National Pipe Threads" to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4" and 1" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All connections, including "Pilot Return" port, if used, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body.

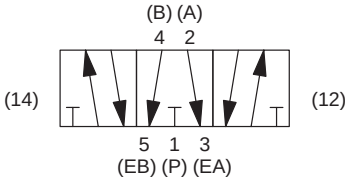
SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



"Standard"
Closed Center Spool



"D"
Regenerative Spool



"G"
Float Center Spool

STANDARD: Most valves are supplied with a "Closed Center" spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are "Closed Center". Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option "D". In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a "Regenerative" spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option "G". In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a "Float Center" spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

VALVE OPTIONS:

OPTION LO: LOCK OUT

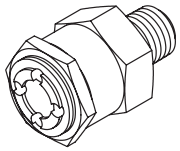
This option allows the valve to lock into position. On two position valves (FO, FR, TE, TR and TO), the lock-out position is position “C”. On three position valves (TY), the lock-out position is position “B”. Contact the factory if you want valves that lock-out in different spool positions. Not available on TD models.

OPTION Q: TWO POSTION DETENT

This option is available on TD models only. Spool stays in position “A” or “C” when treadle is released. This is a 2-position version of the model TD where there is no center position detent. Additional shifting force is required to initiate spool shifting.

OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

STANDARD TEMPERATURE RANGE:

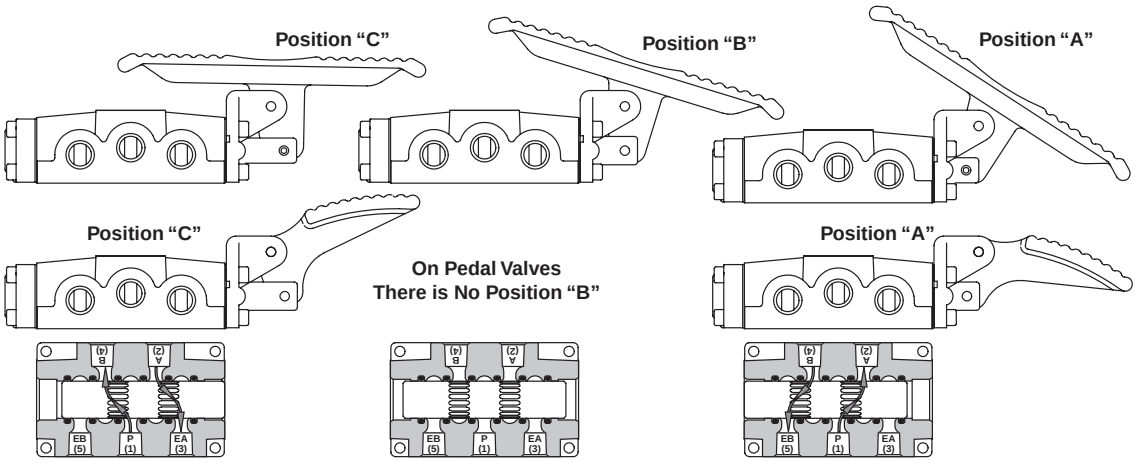
Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

1/2", 3/4", 1", 1-1/2" and 2" valves use Buna-N O-rings: -40°F to 250°F.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

FLOW PATTERN:



1/4" through 1": When the pedal/treadle is shifted, causing the internal spool to shift, various ports will be connected. If the treadle/pedal is in position "A", port 1 will connect to port 2. When the pedal/treadle is in position "C", port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position "B", the connection of the ports depend on the style of spool used.

AIR FLOW RATINGS:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

	Rated Flow				
Body Style	**2**	**3**	**4**	**6***	**8***
Port Size	1/4"	3/8"	1/2"	3/4"	1"
SCFM Flow	73.9	97.1	215.0	446.9	477.7
Cv Factor	1.6	2.4	5.0	10.4	11.1

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

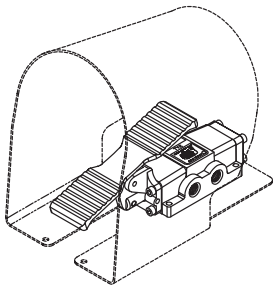
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

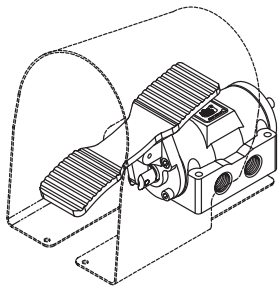
Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs or any other component that appears to be working less than optimum.

PEDAL/TREADLE PILOT VALVE ACCESSORIES:

GUARD, Part No. FTG-3: Constructed of 16-gauge steel and finished with a blue-gray primer. Inside dimensions are 5-1/2" wide x 8" high (At front) x 6-1/2" deep. For body styles 2, 3, 3P and 4 only. For all other models, the customer should provide adequate protection.



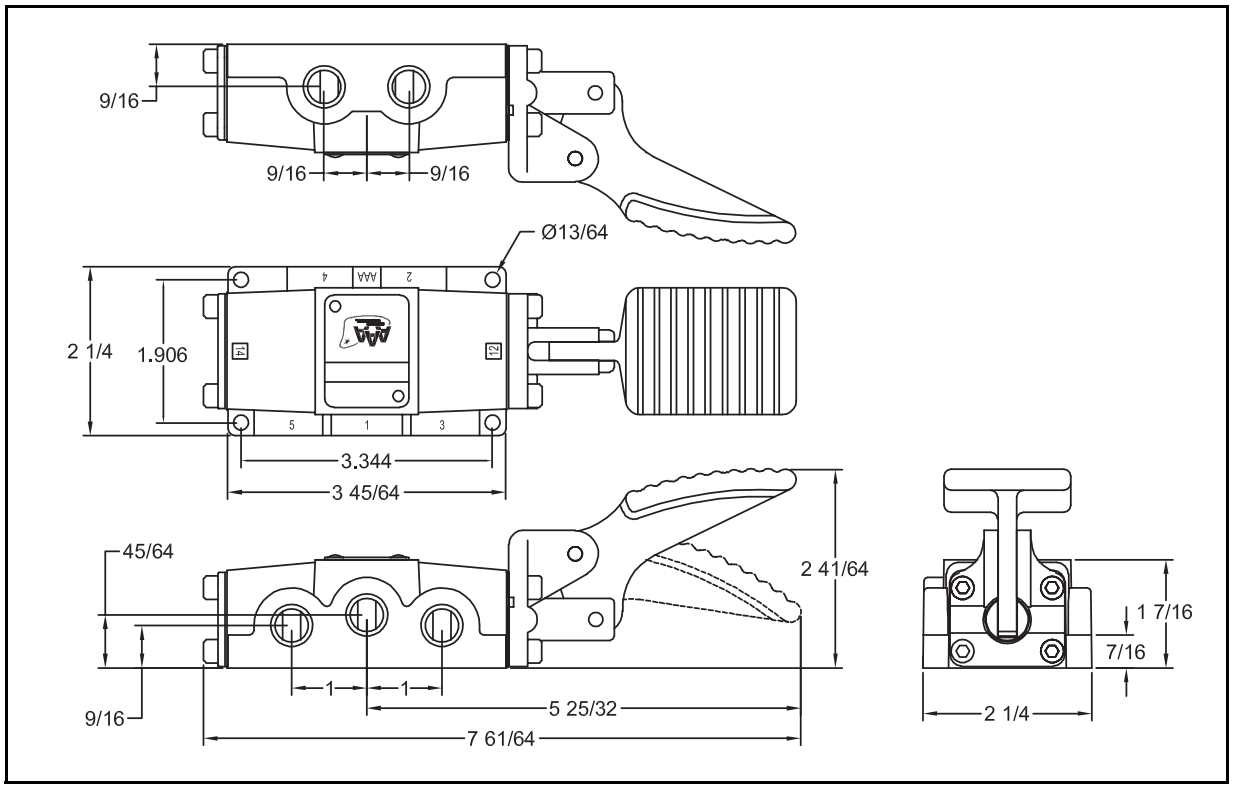
Shown With Body Style 2



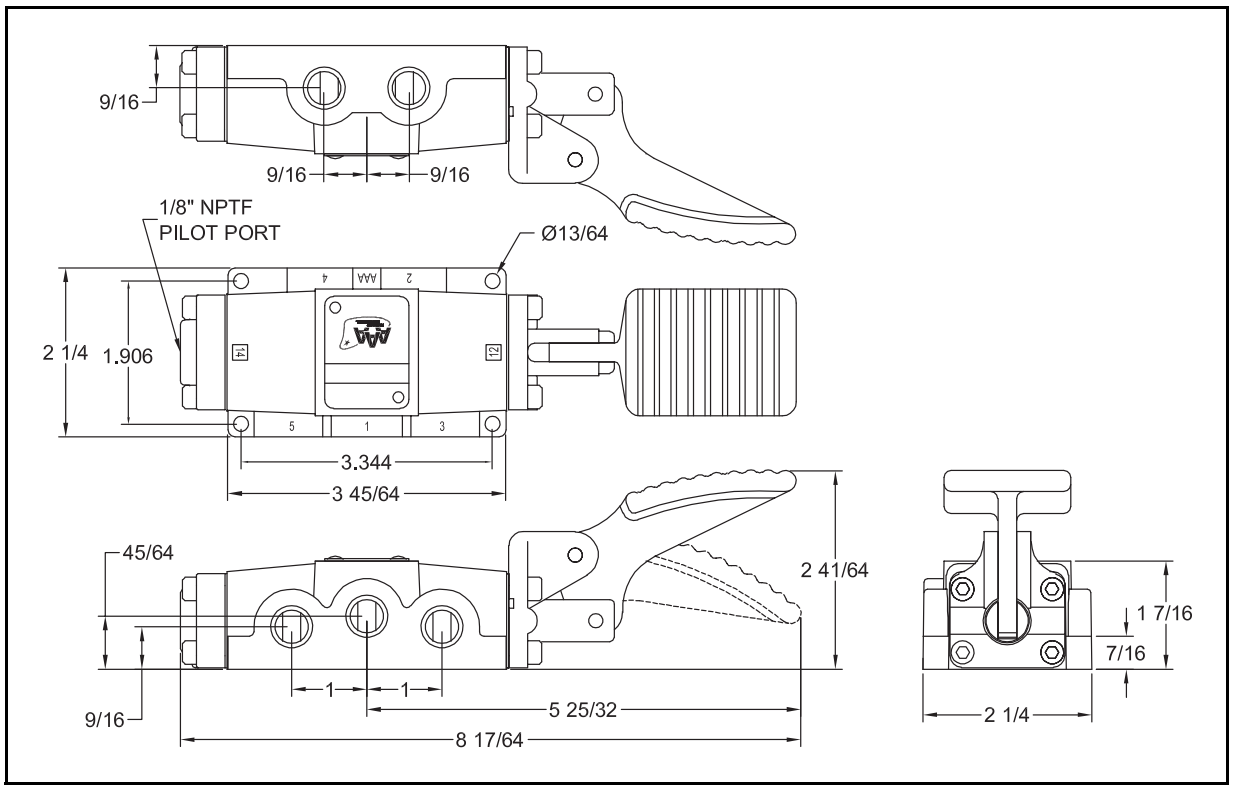
Shown With Body Style 4

SEMI-DIMENSIONAL DRAWINGS:

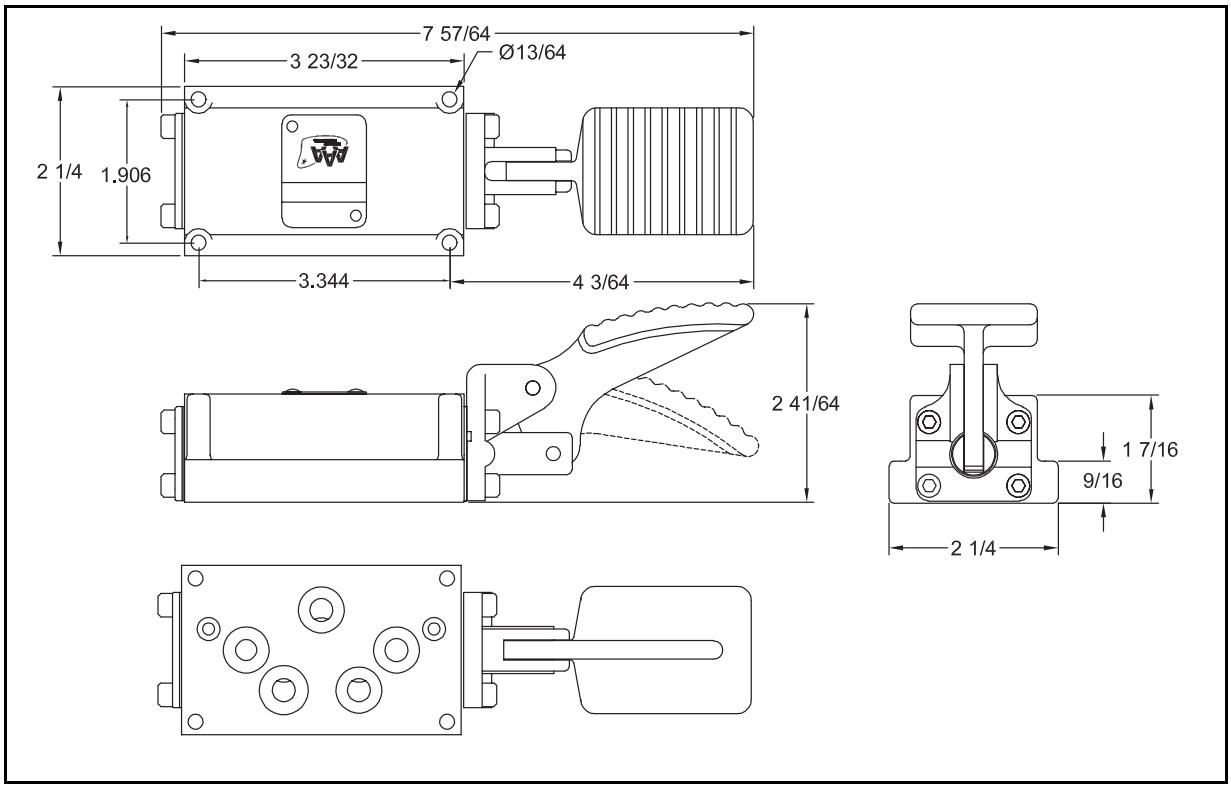
MODELS: FO2 & FO3



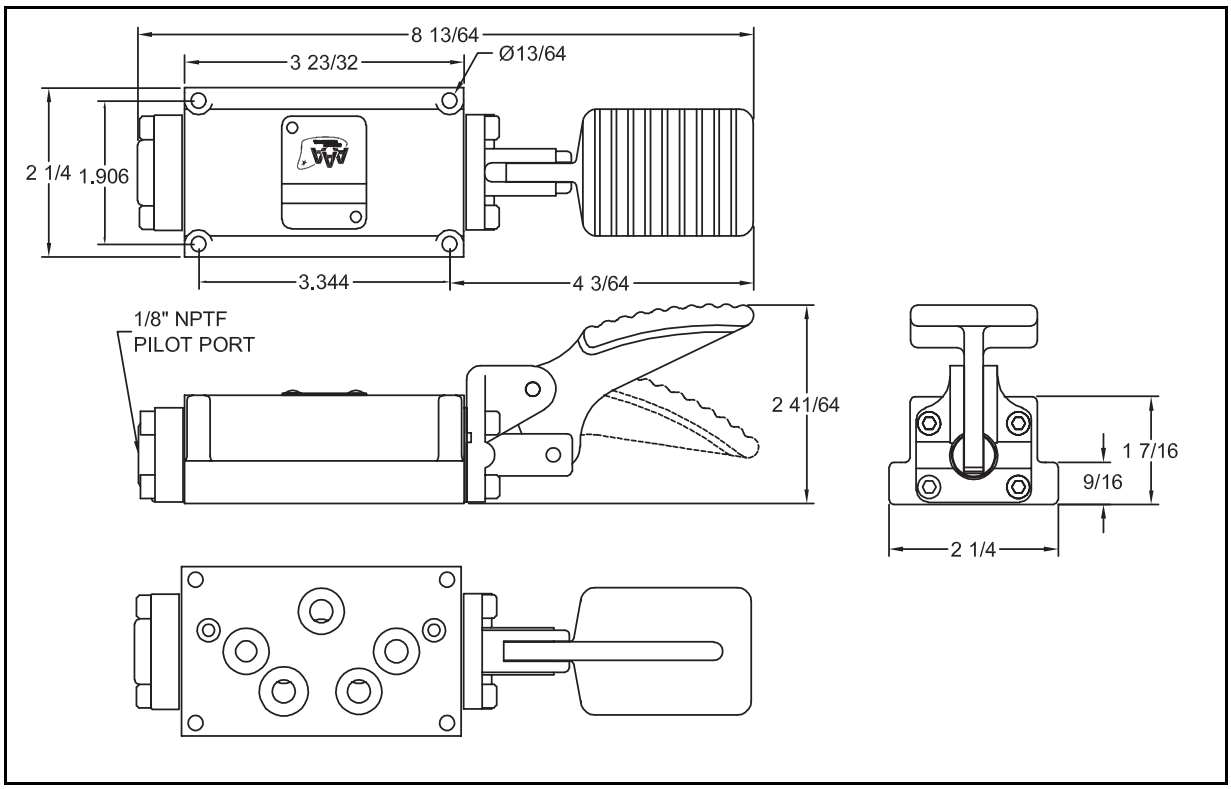
MODELS: FR2 & FR3



MODELS: FO3P

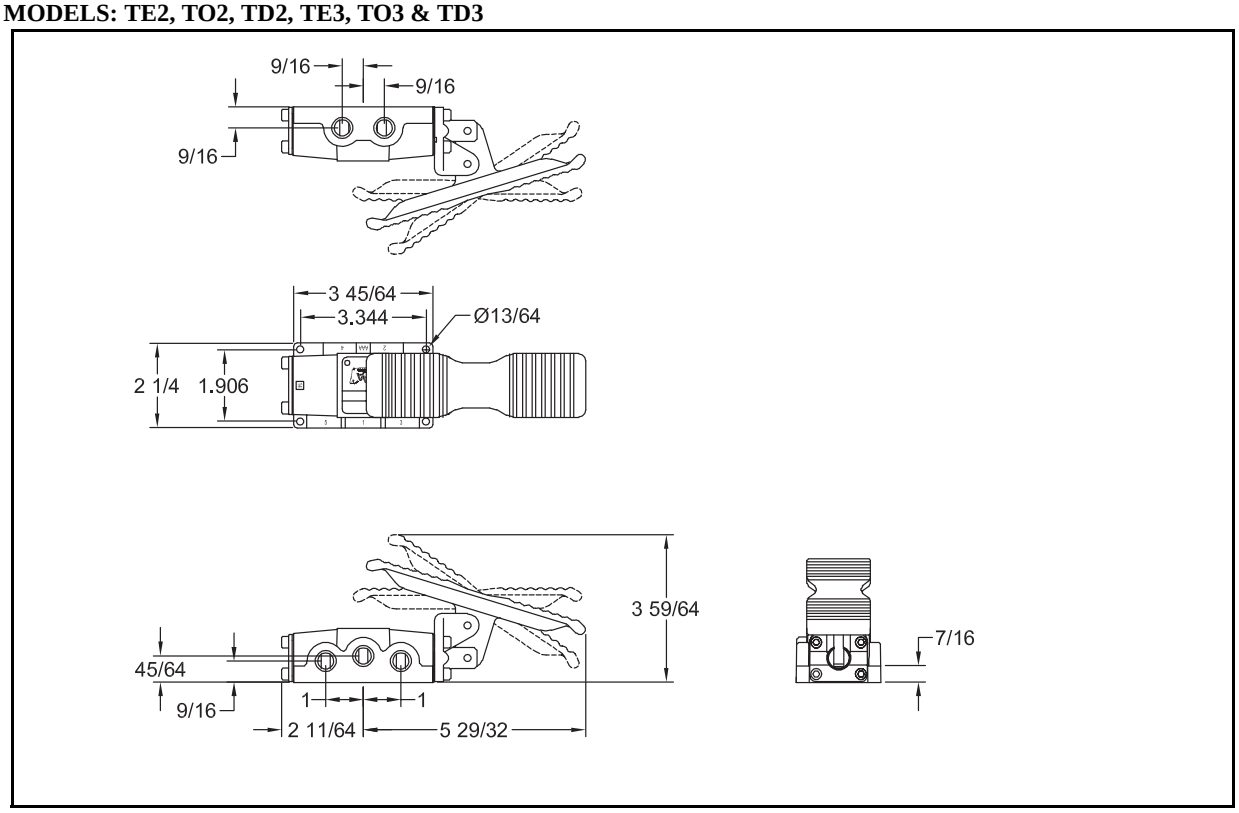


MODELS: FR3P

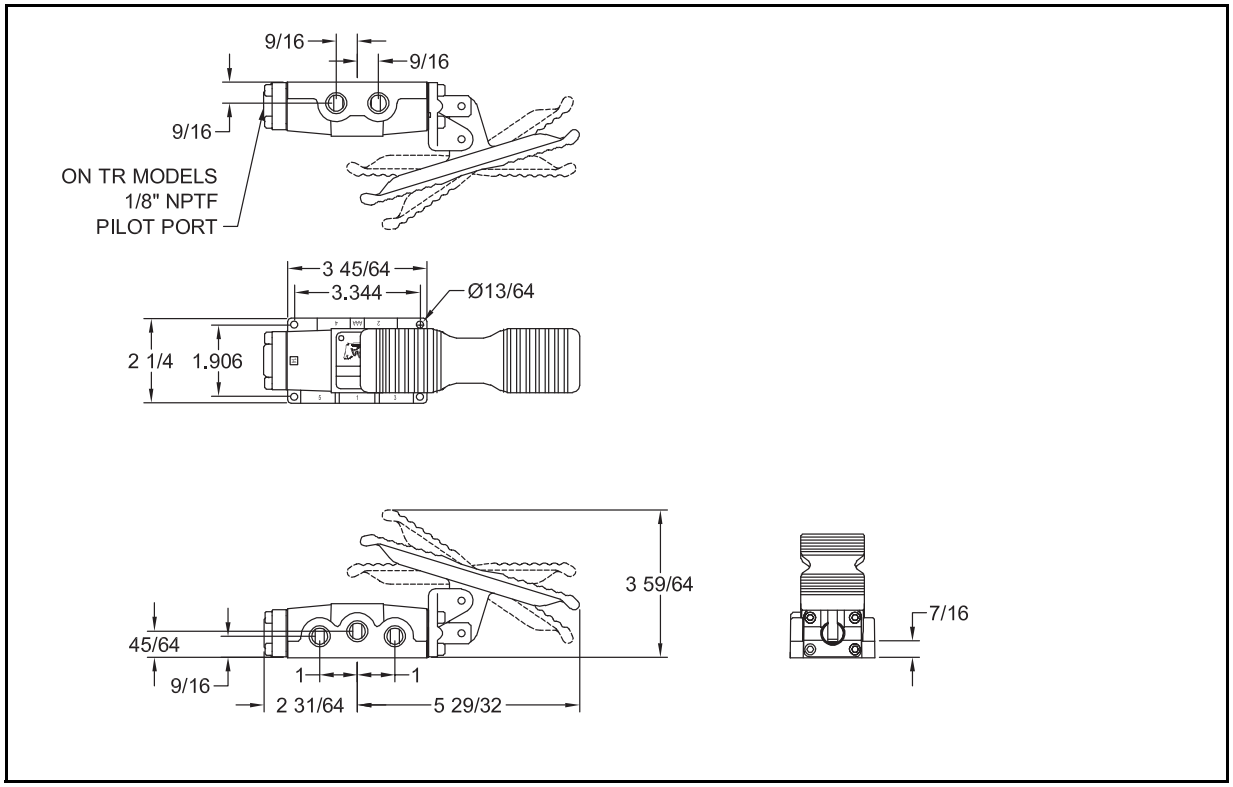


STANDARD 1/4" THROUGH 2"
FOOT PEDAL/TREADLE: FO, FR, TE, TO, TY, TD

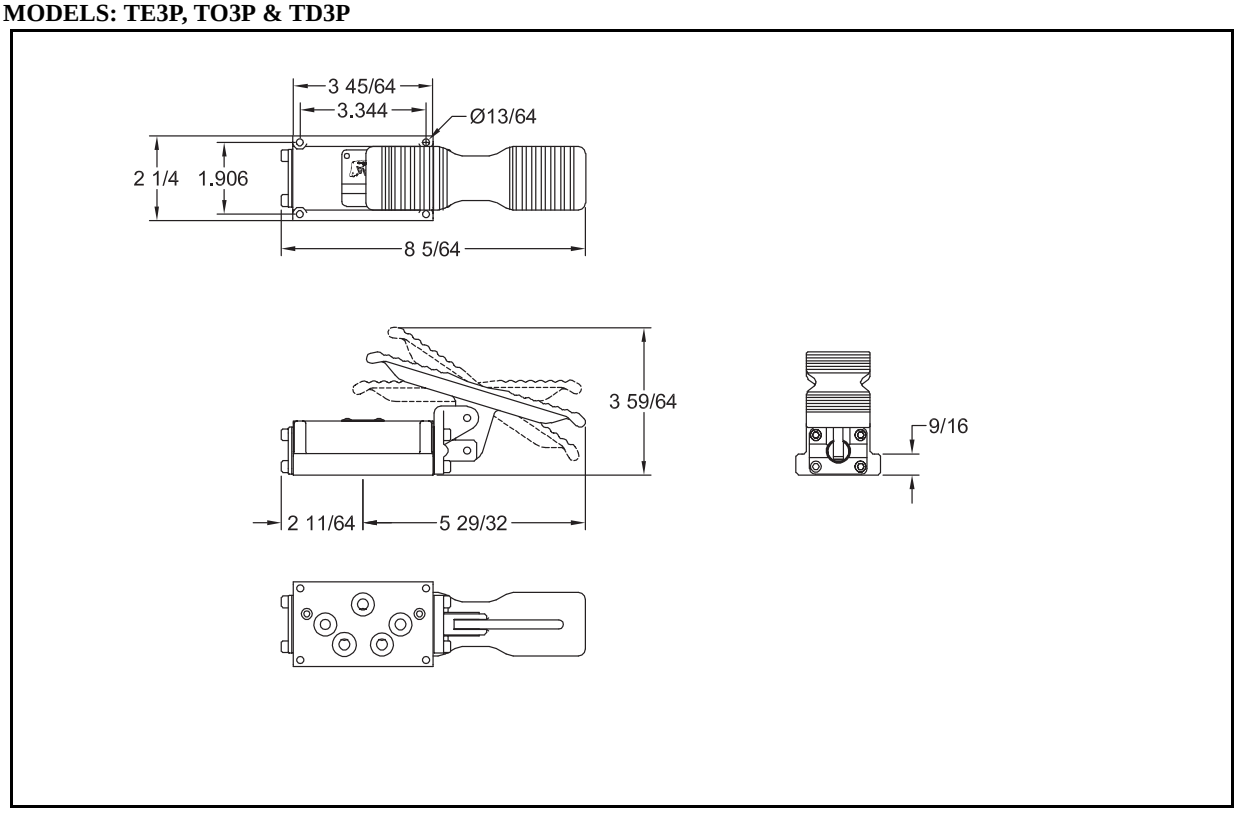
MODELS: TE2, TO2, TD2, TE3, TO3 & TD3



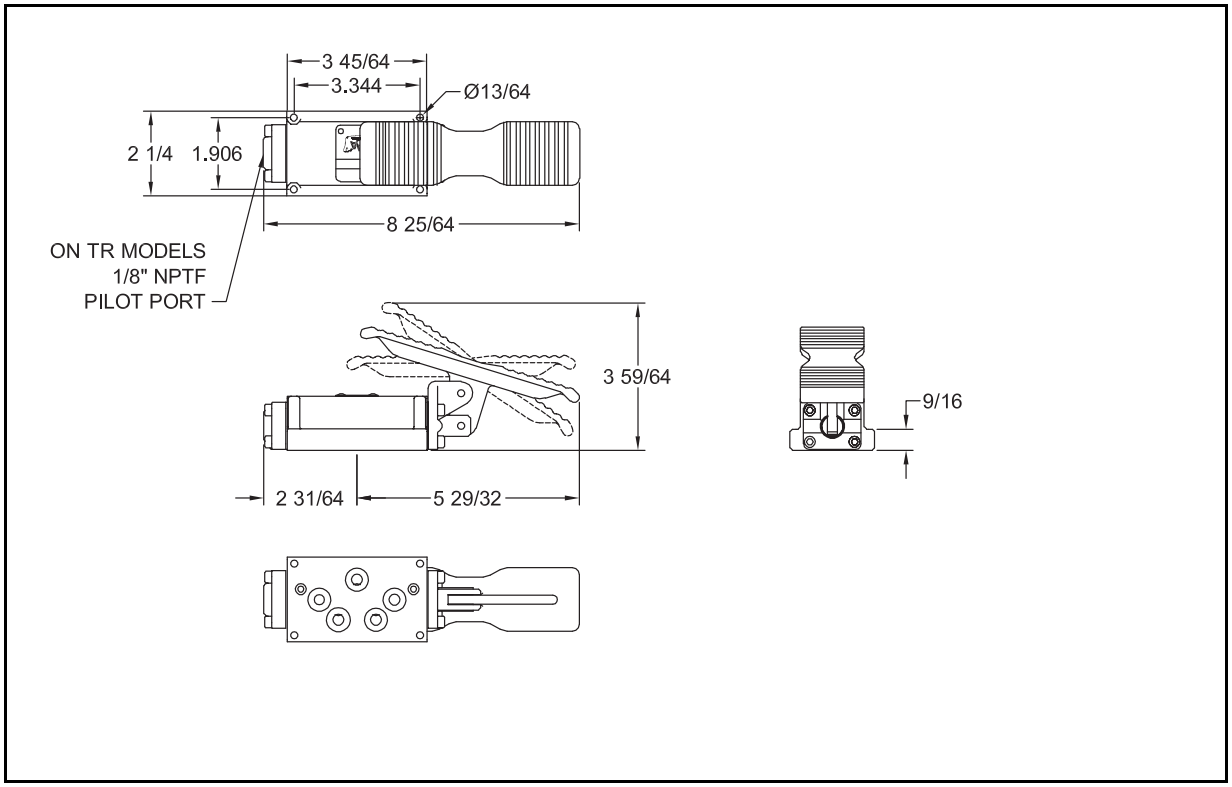
MODELS: TY2 & TY3



MODELS: TE3P, TO3P & TD3P

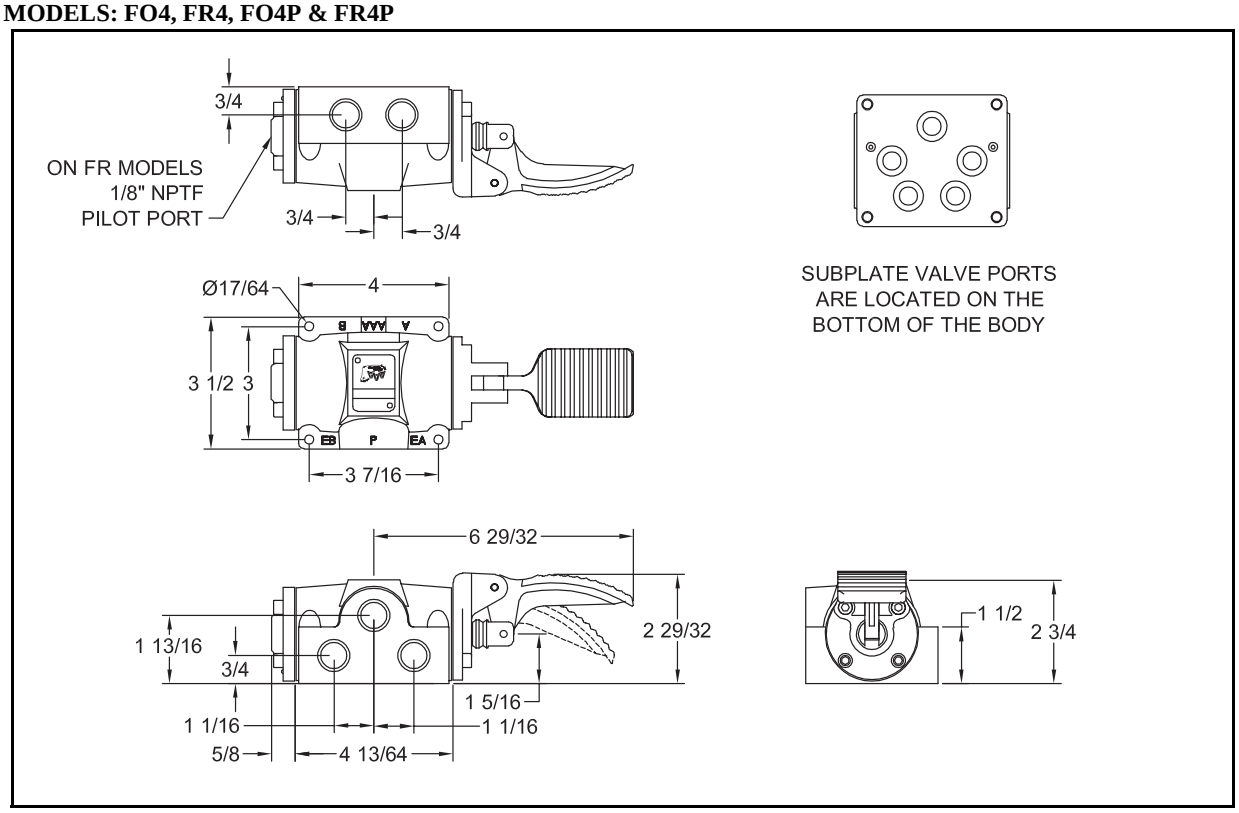


MODELS: TY3P

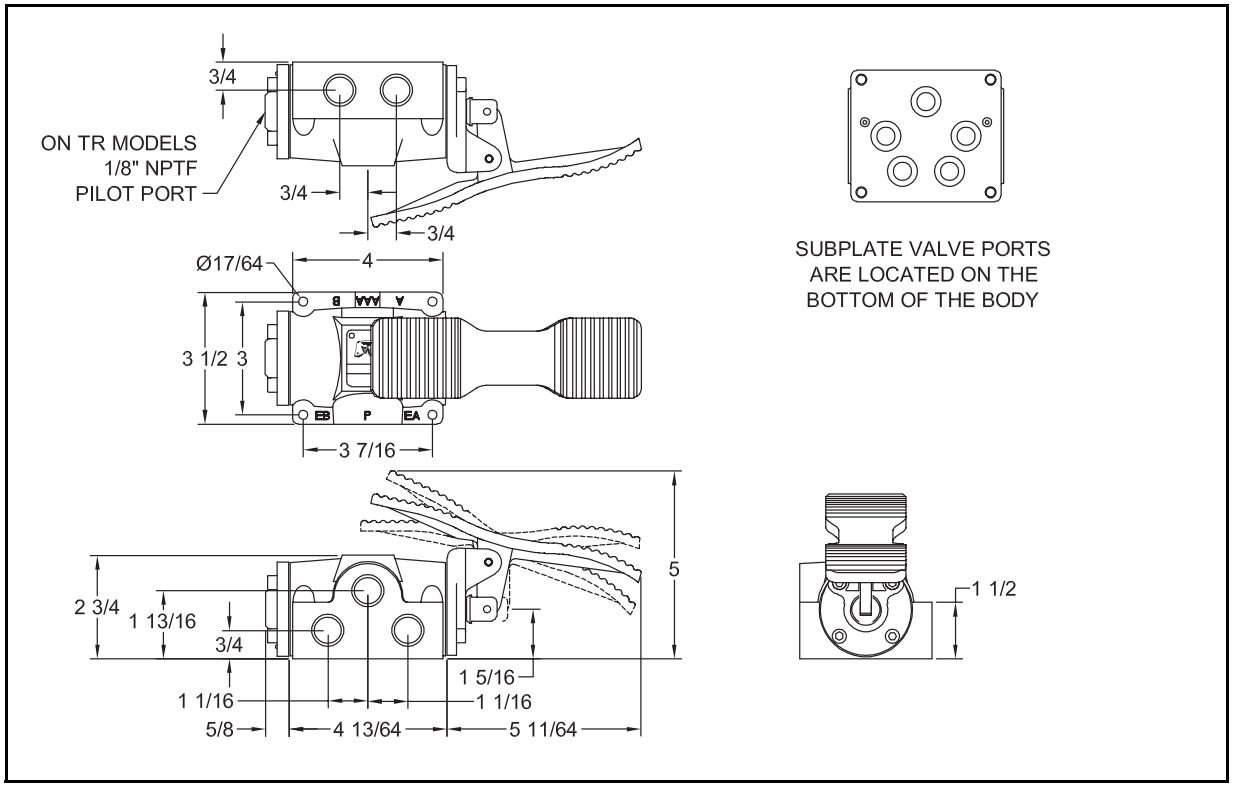


STANDARD 1/4" THROUGH 2"
FOOT PEDAL/TREADLE: FO, FR, TE, TO, TY, TD

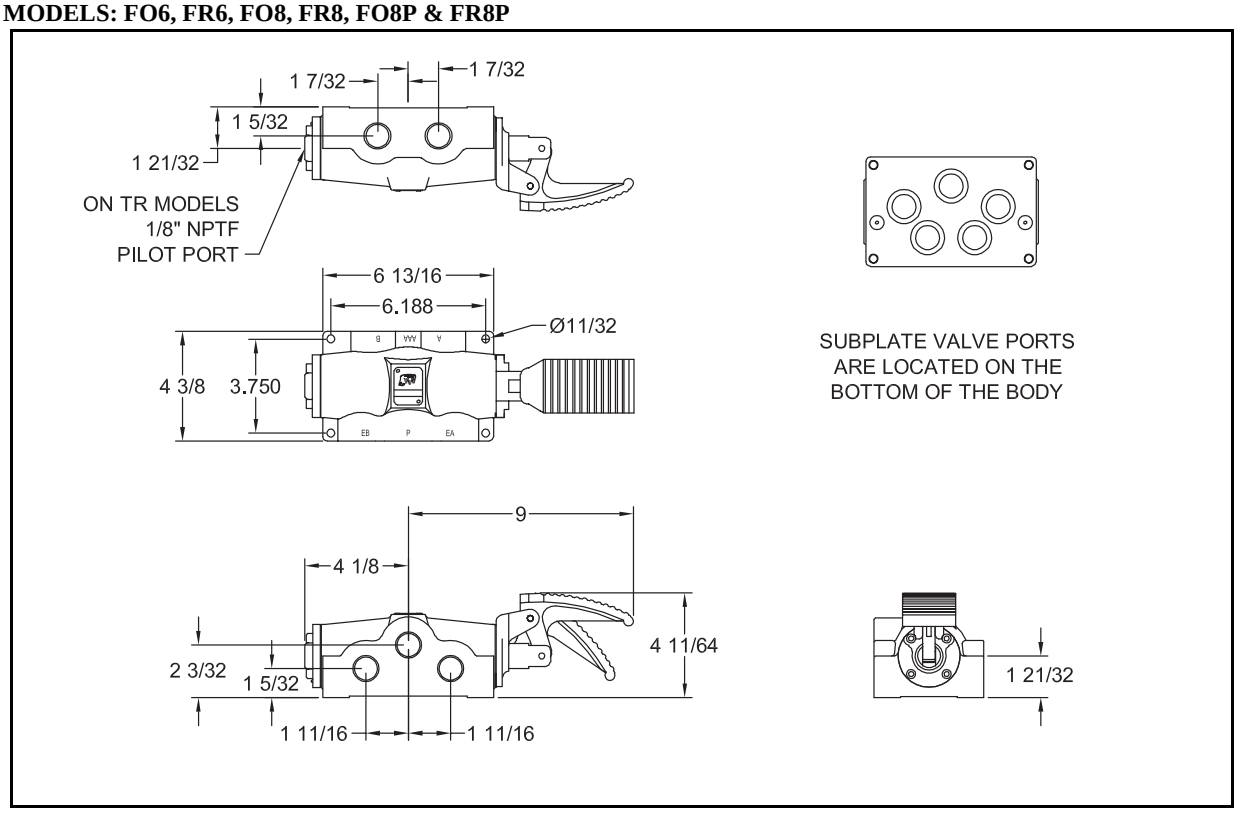
MODELS: FO4, FR4, FO4P & FR4P



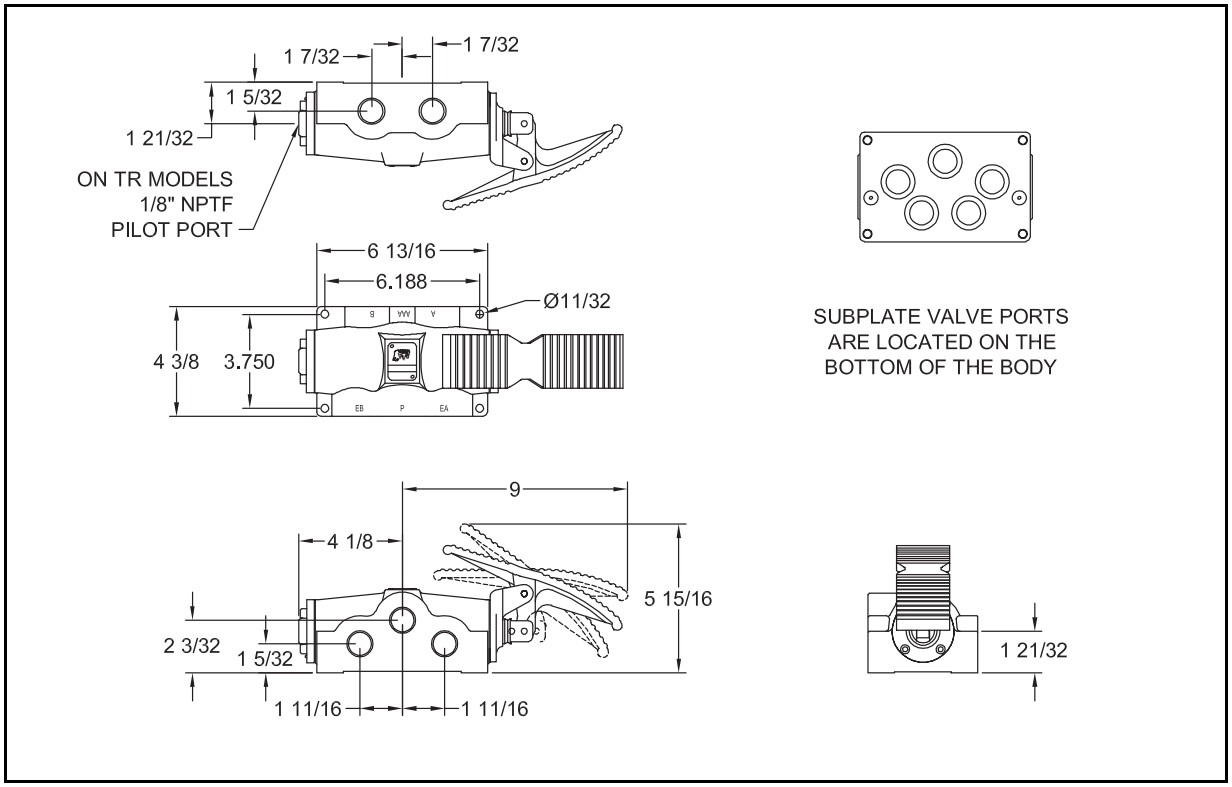
MODELS: TE4, TO4, TY4, TD4, TE4P, TO4P, TY4P & TD4P



MODELS: FO6, FR6, FO8, FR8, FO8P & FR8P

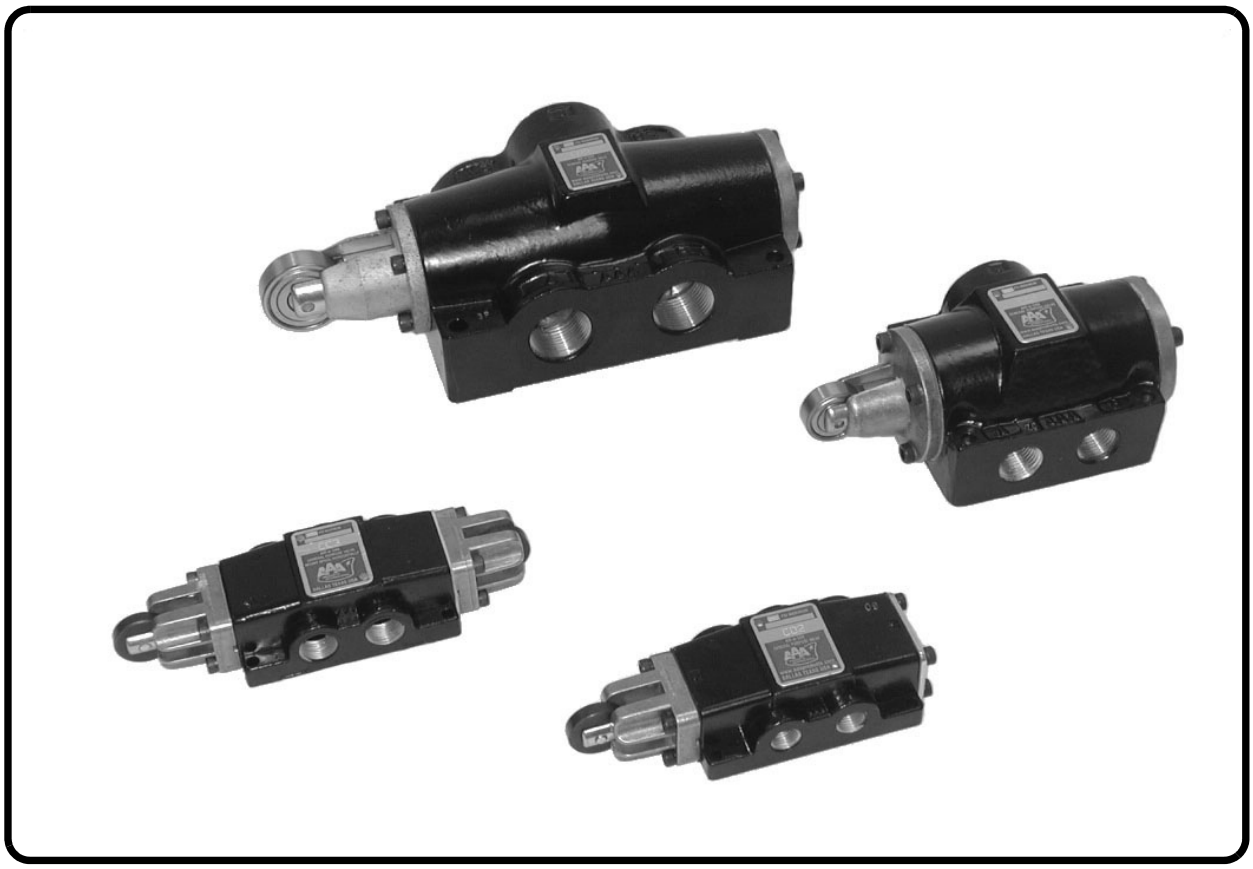


MODELS: TE6, TO6, TY6, TD6, TE8, TO8, TY8, TD8,TE8P, TO8P, TY8P & TD8P



CAM ROLLER CONTROLLED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

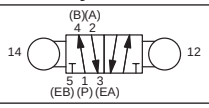
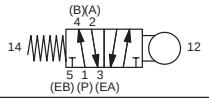
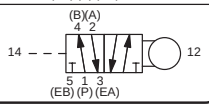
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options. You can specify cam orientation by choosing options available for the valve configuration you need.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

CC3PGR-5

1 Operator Style

Code	Description	Symbol
CC	2-position, friction positioned. Cam roller mounted on both ends of valve.	
CO	2-position, spring returned spool. Spool returns to position “C” when the cam is released.	
CR	2-position, pilot returned spool. Spool returns to position “C” from auxilary control valve furnished by the user.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
R = Cam rotated 90˚ to horizontal position.
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Cam roller models are operated with a cam that shifts the spool. To fully shift the valve, the cam is pushed toward the valve. Normally the cam is contacted by a mechanical ramp to cause the shifting of the valve. On all cam valves, there is no positive detent for centering the spool (Position "B").

OPERATOR STYLE CODE:

CC: 2-position, cam returned spool. Spool returns to position "C" from secondary cam, primary cam must be released.

CO: 2-position, spring returned spool. Spool returns to position "C" when cam is released.

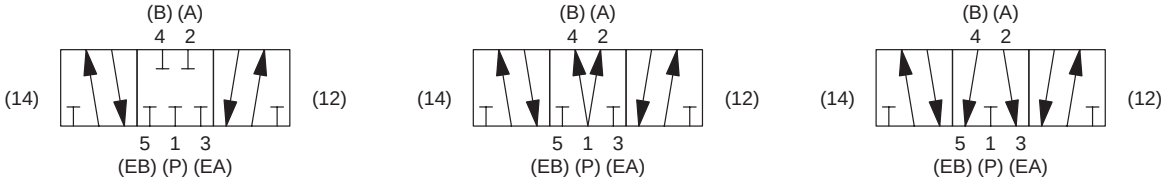
CR: 2-position, pilot returned spool. Spool returns to position "C" from auxiliary control valve furnished by the user, cam must be released. Return shift pressure should be 25 PSI or greater.

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female "National Pipe Threads" to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4" and 1" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All connections, including external pilot, if used, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



STANDARD: Most valves are supplied with a "Closed Center" spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are "Closed Center". Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option "D". In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a "Regenerative" spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option "G". In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a "Float Center" spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

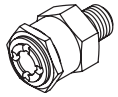
VALVE OPTIONS:

OPTION R: ROTATED CAM

The standard orientation of the cam on all models is in the vertical direction. On body styles 4, 4P, 6, 8 and 8P, the cam can easily be rotated in any 90° position. On body styles, 2, 3 and 3P, the cam pin must be removed to rotate the cam stud, then replaced to attach the cam in the alternate orientation. On original factory orders specifying this option, the cams will be assembled in the horizontal position. On dual cam models this option would apply to both cams. Consult factory if different orientations are required on dual cam models.

OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

STANDARD TEMPERATURE RANGE:

Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

1/2", 3/4", 1", 1-1/2" and 2" valves use Buna-N O-rings: -40°F to 250°F.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

SHIFTING CHARACTERISTICS:

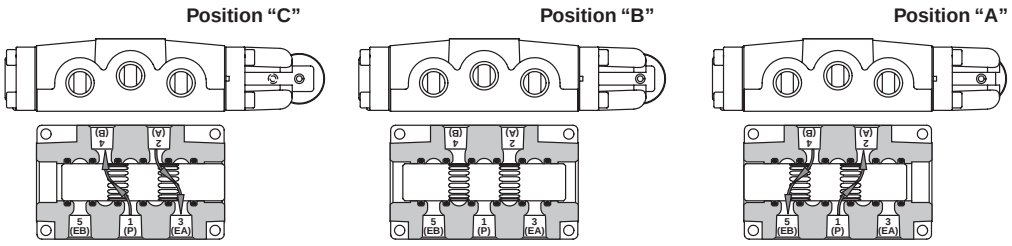
1/4" and 3/8": On CO models, a minimum force of 20 lbs is required to shift the spool against the spring. On models CR and CC, sufficient force is required to opposing force created by the pilot return or secondary cam. Functional spool travel is 17/32" with an over-travel of 1/32" to prevent accidental damage to the valve.

1/2": On CO models, a minimum force of 20 lbs is required to shift the spool against the spring. On models CR and CC, sufficient force is required to opposing force created by the pilot return or secondary cam. Functional spool travel is 9/16" with an over-travel of 1/32" to prevent accidental damage to the valve.

3/4" and 1": On CO models, a minimum force of 50 lbs is required to shift the spool against the spring. On models CR and CC, sufficient force is required to opposing force created by the pilot return or secondary cam. Functional spool travel is 7/8" with an over-travel of 1/32" to prevent accidental damage to the valve.

Operating pressure of the valve may affect the shifting force required.

FLOW PATTERN:



1/4" through 1": When the cam is shifted, causing the internal spool to shift, various ports will be connected. If the cam is in position “A”, port 1 will connect to port 2. When the cam is in position “C”, port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position “B”, the connection of the ports depend on the style of spool used.

AIR FLOW RATINGS:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

	Rated Flow				
Body Style	**2**	**3**	**4**	**6***	**8***
Port Size	1/4"	3/8"	1/2"	3/4"	1"
SCFM Flow	73.9	97.1	215.0	446.9	477.7
Cv Factor	1.6	2.4	5.0	10.4	11.1

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

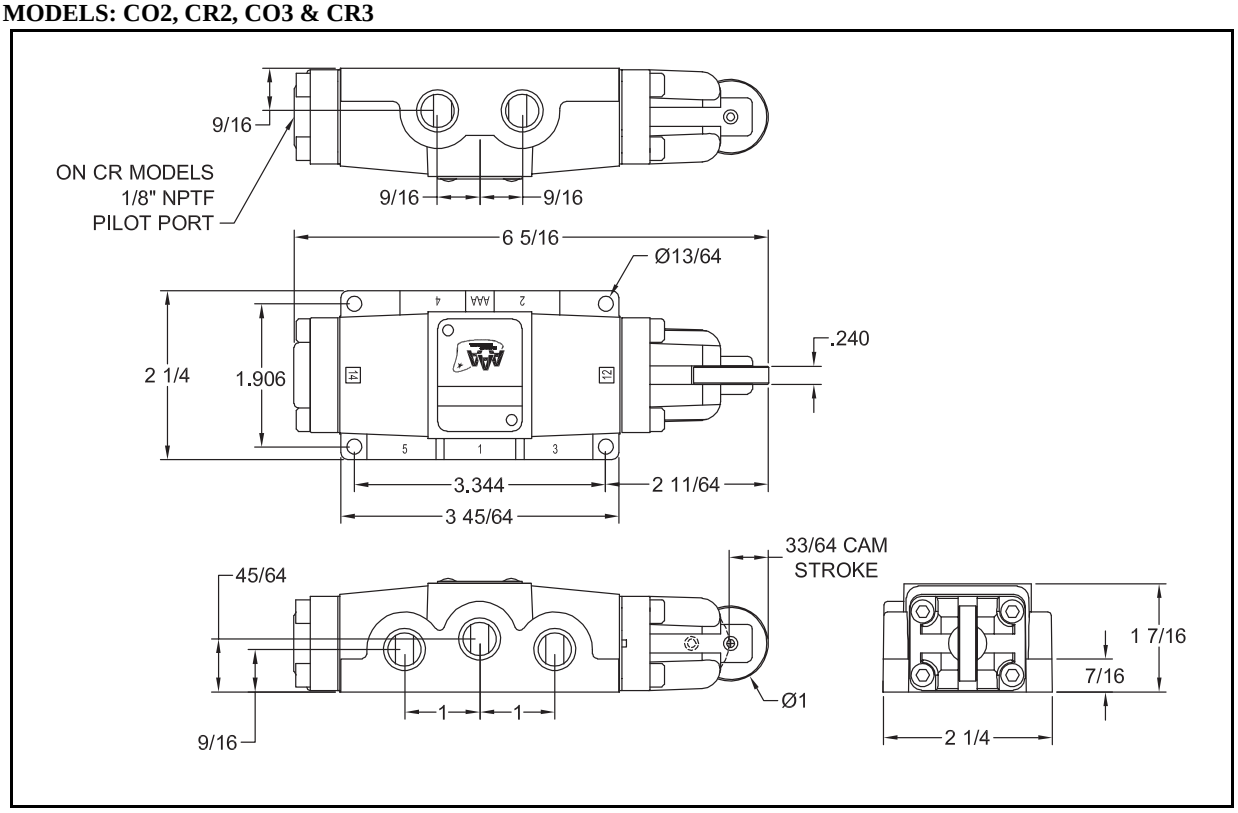
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

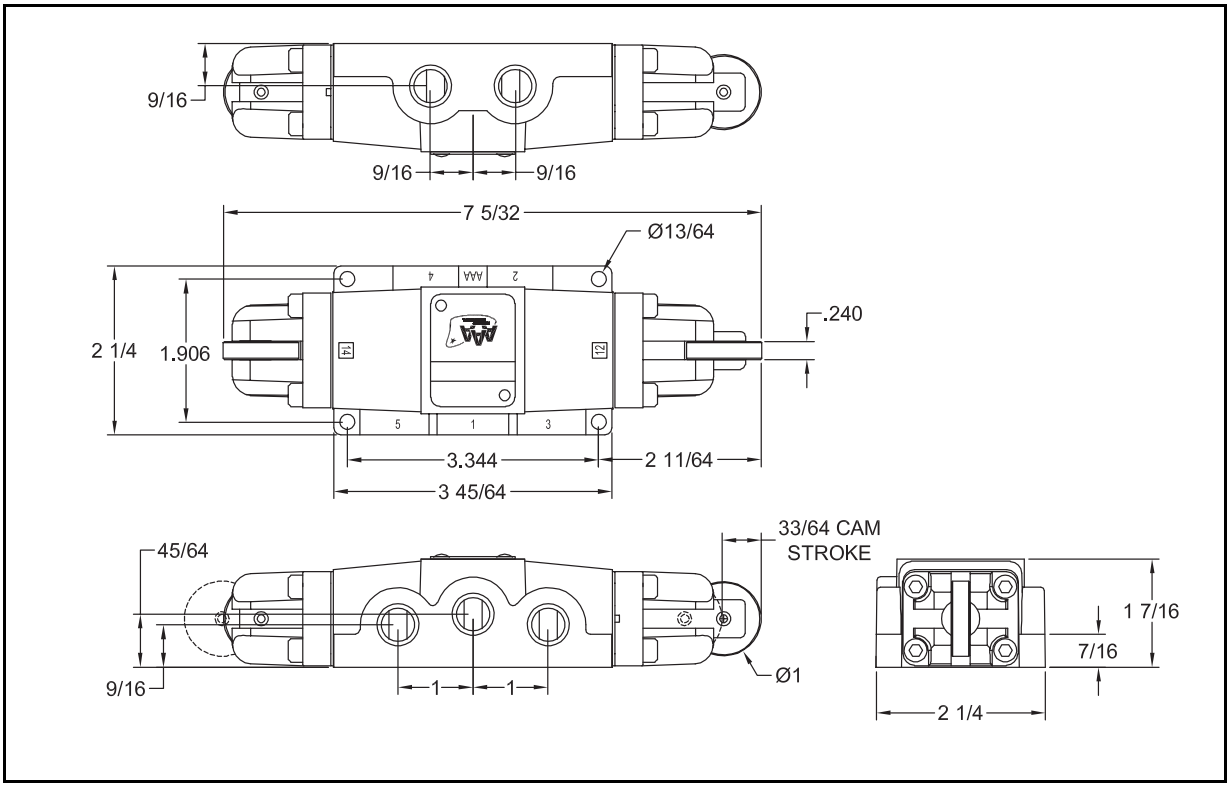
Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs, flattened cams or any other component that appears to be working less than optimum.

SEMI-DIMENSIONAL DRAWINGS:

MODELS: CO2, CR2, CO3 & CR3

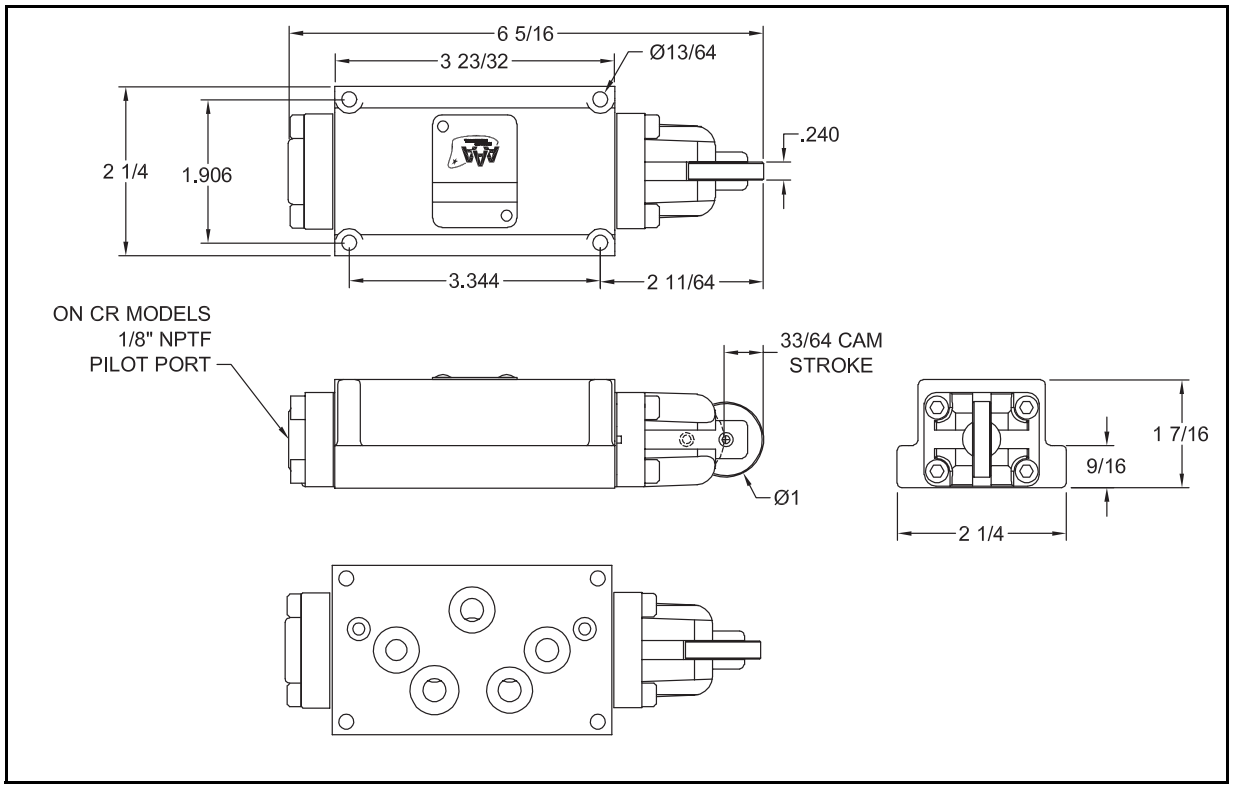


MODELS: CC2 & CC3

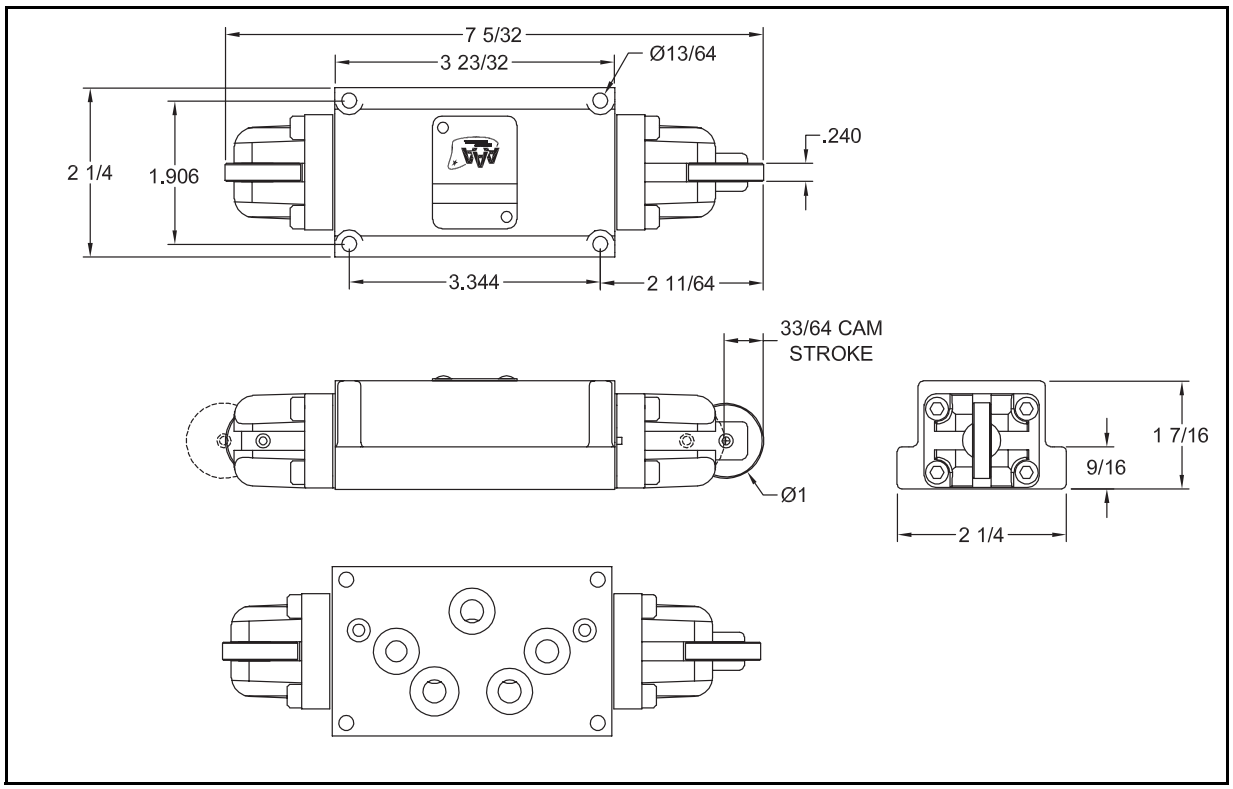


STANDARD 1/4" THROUGH 2"
CAM ROLLER: CO, CR, CC

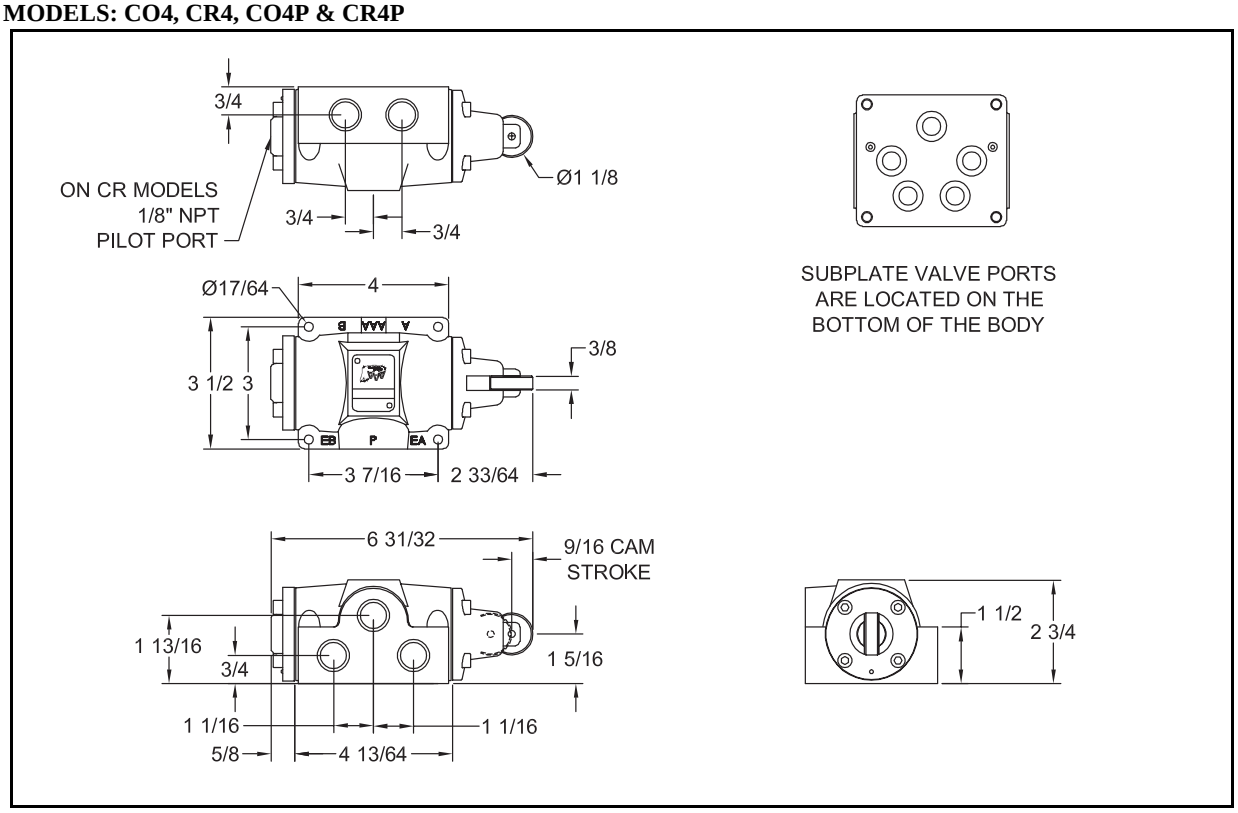
MODELS: CO3P



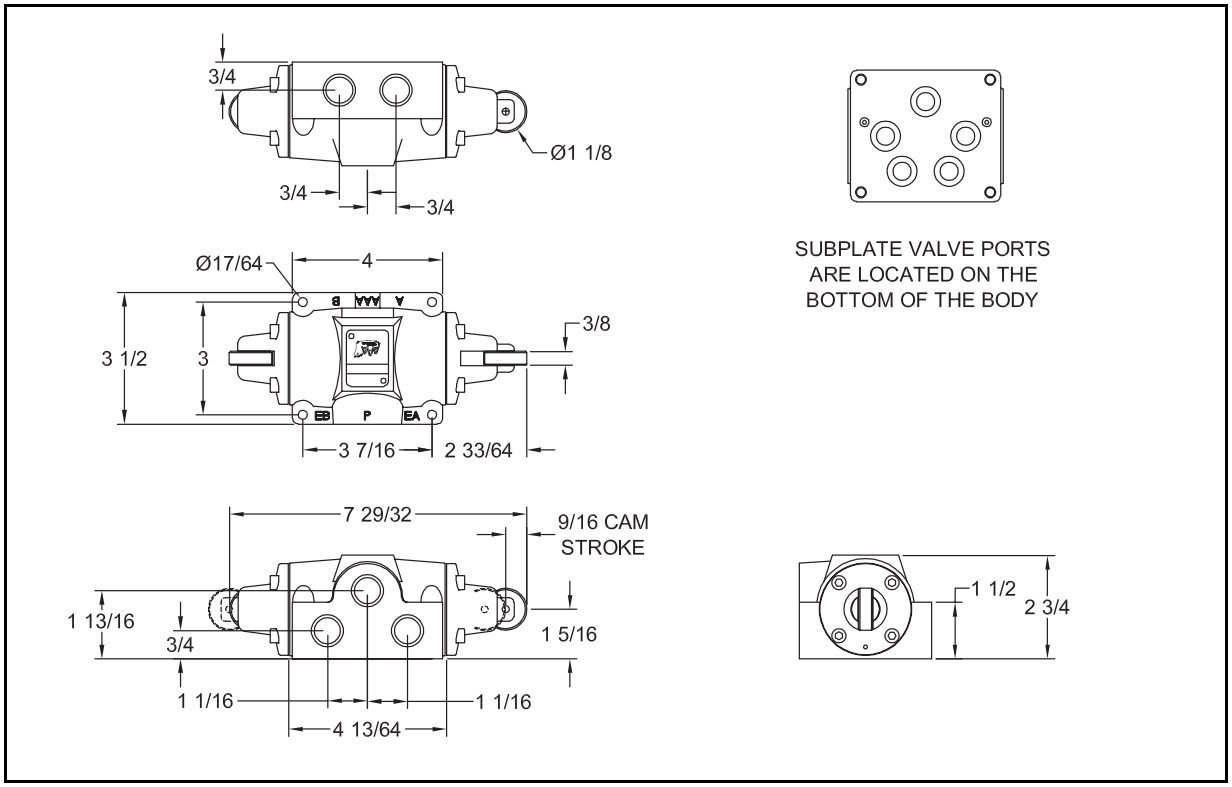
MODELS: CC3P



MODELS: CO4, CR4, CO4P & CR4P

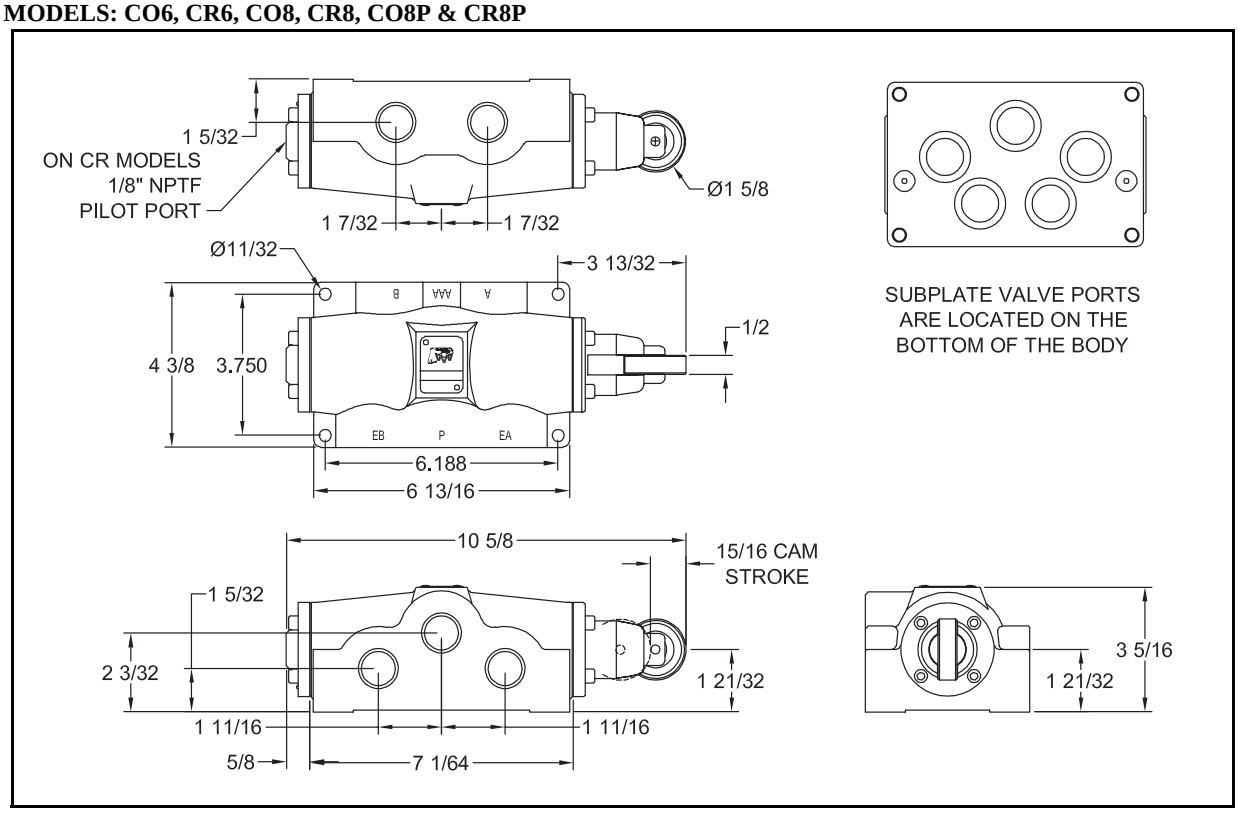


MODELS: CC4 & CC4P

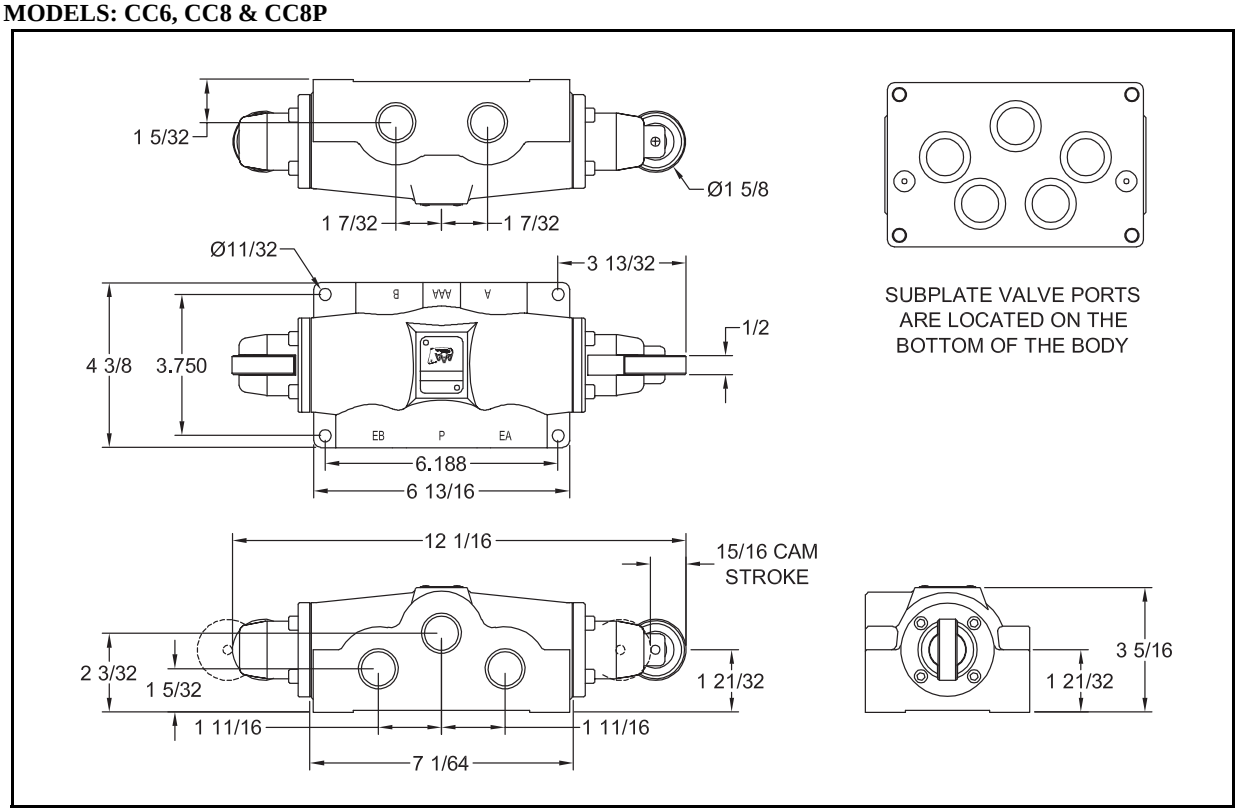


STANDARD 1/4" THROUGH 2"
CAM ROLLER: CO, CR, CC

MODELS: CO6, CR6, CO8, CR8, CO8P & CR8P



MODELS: CC6, CC8 & CC8P



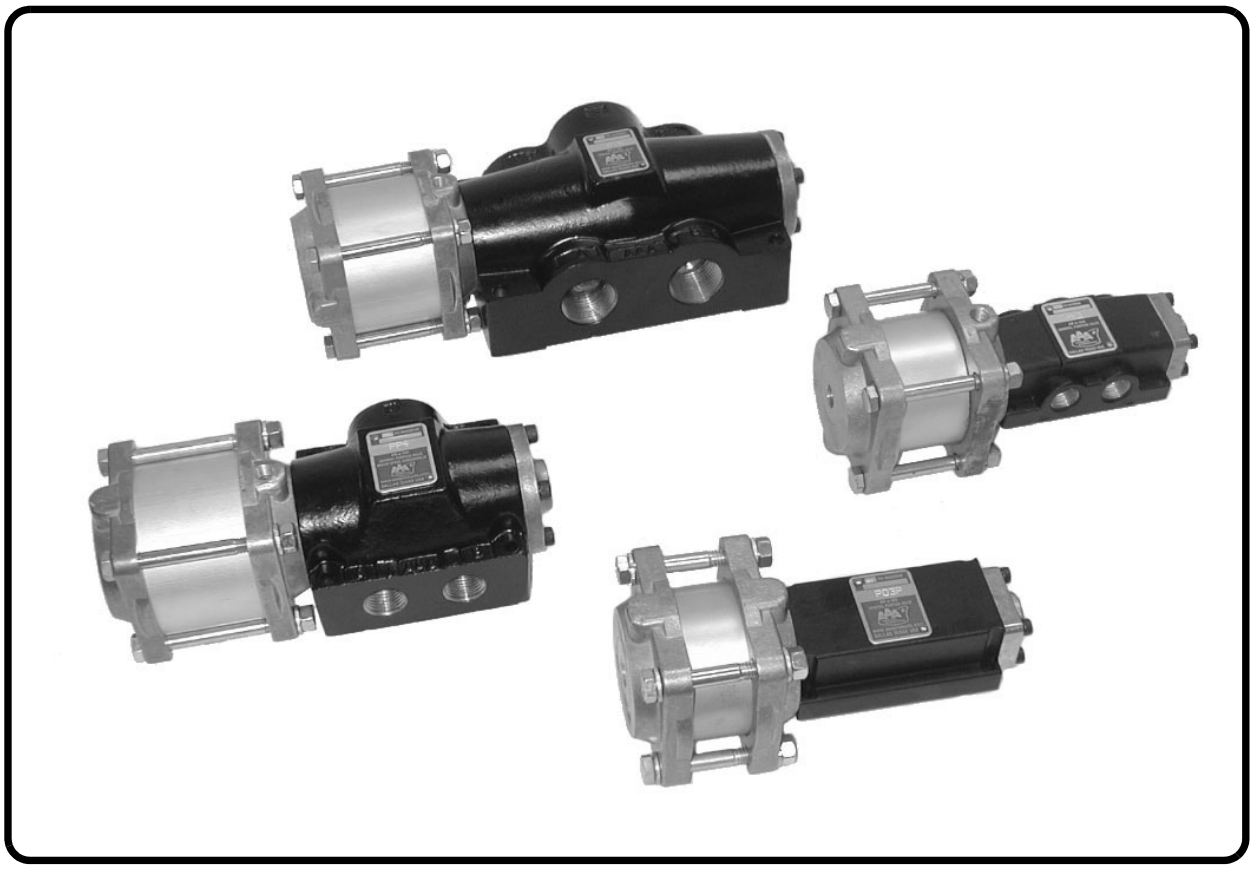
Notes:

PUT AAA VALVES ON YOUR TOUGHEST JOBS

STANDARD 1/4" THROUGH 2"
PISTON: PP, PO, PY

PISTON CONTROLLED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

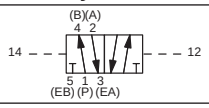
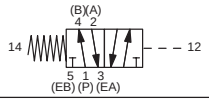
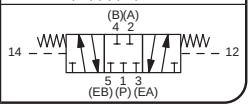
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

PP3PG _ -5

1 Operator Style

Code	*Description*	*Symbol*
PP	2-position, friction positioned. Double acting piston actuator on one end. Spool stays in shifted position when pilot pressure is removed.	
PO	2-position, spring returned spool. Spool returns to position “C” when pilot pressure is removed.	
PY	3-position, spring centered. Double acting piston actuator on one end. Spool returns to center position when pilot pressure is removed.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF

Subplate Mounted

*3P = 3/8" flow
*4P = 1/2" flow
8P = 1" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

*Requires custom subplate and recommended only for replacement in existing applications.

GENERAL INFORMATION

Piston models are operated with a larger piston that shifts the spool. This allows you to use lower pilot pressures to shift the valve. Because of the large piston area on the actuator, pilot pressure must be limited to 150 PSI on all models. On body styles 3P and 4P, the piston is larger than the valve, therefore these models require custom subplates and recommended only for replacement in existing applications.

OPERATOR STYLE CODE:

PO: 2-position, spring returned spool. Spool returns to position "C" when piston port is exhausted. Shifting pressure should be 12 PSI or greater.

PP: 2-position, no springs. Spool shifts and remains shifted when one piston port or the other is momentarily or continuously pressurized. Shifting pressure should be 7 PSI or greater.

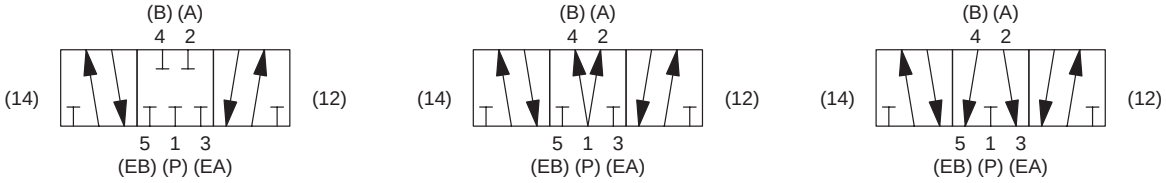
PY: 3-position, spring centered. Spool returns to position "B" when both piston ports are exhausted or pressurized. Shifting pressure should be 12 PSI or greater.

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female "National Pipe Threads" to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4" and 1" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All port connections, excluding piston pilot ports, are made through O-ring sealed holes in the base of the valve through a subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body. Piston control ports can **NOT** be routed through the subplate. On body styles 3P and 4P, the piston is larger than the valve, therefore these models require custom subplates and recommended only for replacement in existing applications.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



STANDARD: Most valves are supplied with a "Closed Center" spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are "Closed Center". Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

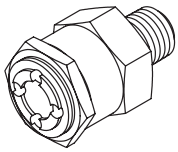
REGENERATIVE: Spool Option "D". In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a "Regenerative" spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option "G". In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a "Float Center" spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

VALVE OPTIONS:

OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

Note: The piston U-cup material is Buna-N. Piston operators must be piloted with compatible air.

STANDARD TEMPERATURE RANGE:

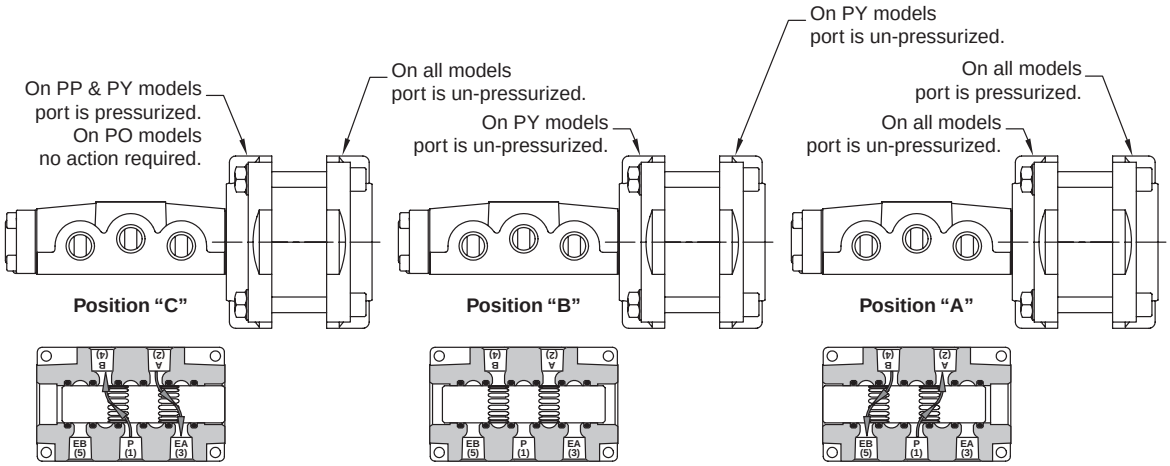
Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

1/2", 3/4" and 1" valves use Buna-N O-rings: -40°F to 250°F.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

FLOW PATTERN:



1/4" through 1": When the piston is shifted, causing the internal spool to shift, various ports will be connected. If the piston is in position "A", port 1 will connect to port 2. When the piston is in position "C", port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position "B", the connection of the ports depend on the style of spool used.

AIR FLOW RATINGS:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

	Rated Flow				
Body Style	**2**	**3**	**4**	**6***	**8***
Port Size	1/4"	3/8"	1/2"	3/4"	1"
SCFM Flow	73.9	97.1	215.0	446.9	477.7
Cv Factor	1.6	2.4	5.0	10.4	11.1

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused 2 (A) or 4 (B) port.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

UNIQUE MOUNTING CONCERN

On body styles 2 and 3, the piston actuator is larger in diameter than the valve body, a 1-1/4" spacer should be used when mounting on a flat surface. On body styles 3P and 4P, the piston is larger than the valve, therefore these models require custom subplates and recommended only for replacement in existing applications.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

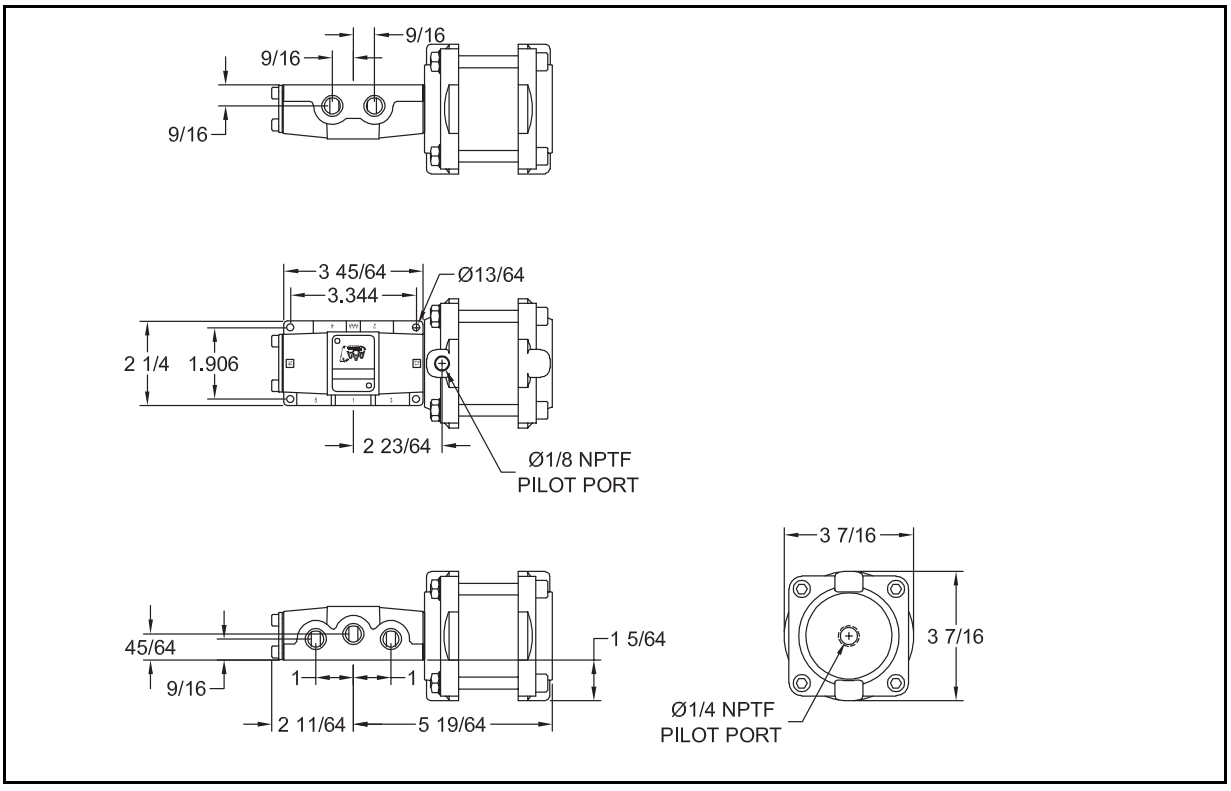
RKPV-3A: One kit required for each 1/4" or 3/8" valve to replace all the seals in the piston. Each kit includes one V-89 Buna-N O-ring, two V-115 Buna-N U-cups (Only one used on PO models) and two V-165 composition barrel gaskets (Does not include any valve body seals).

RKPV-48A: One kit required for each 1/2", 3/4" or 1" valve to replace all the seals in the piston. Each kit includes one V-89 Buna-N O-ring, two V-102 Buna-N U-cups (Only one used on PO models) and two V-166 composition barrel gaskets (Does not include any valve body seals).

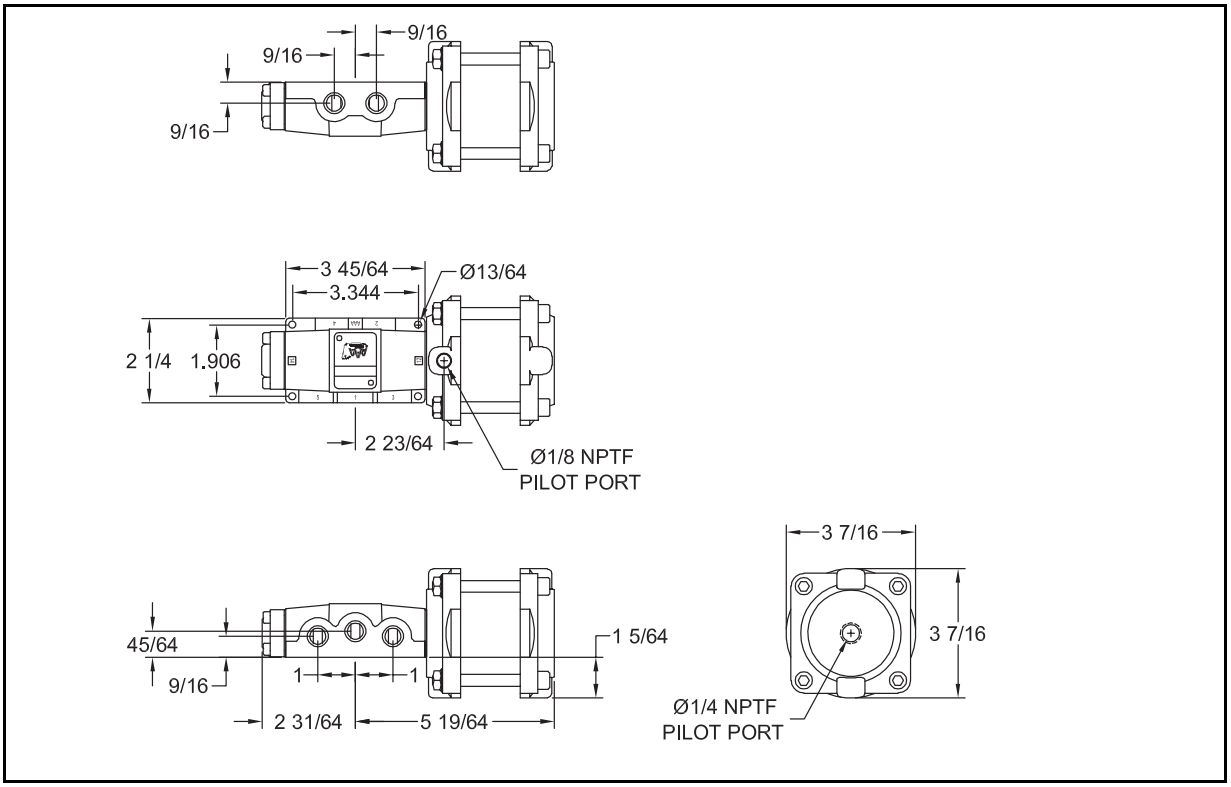
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

SEMI-DIMENSIONAL DRAWINGS:

MODELS: PP2 & PP3

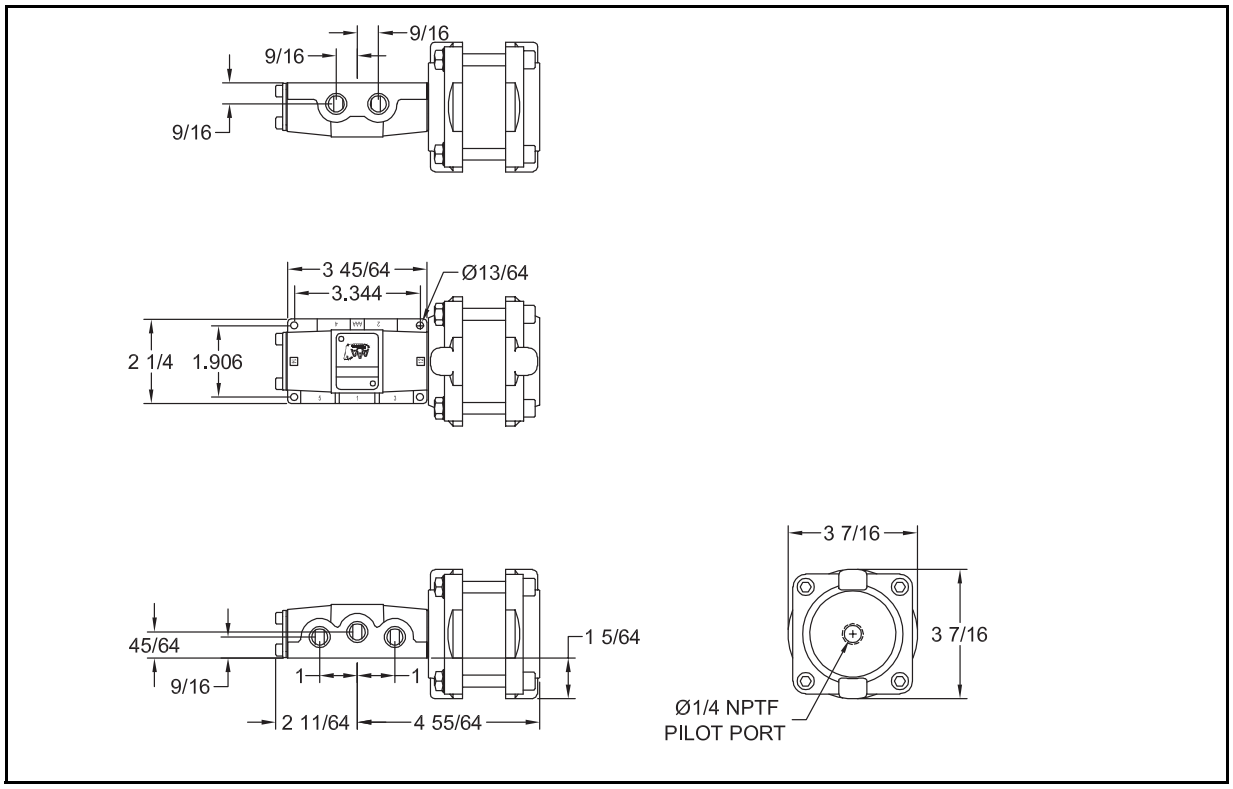


MODELS: PY2 & PY3

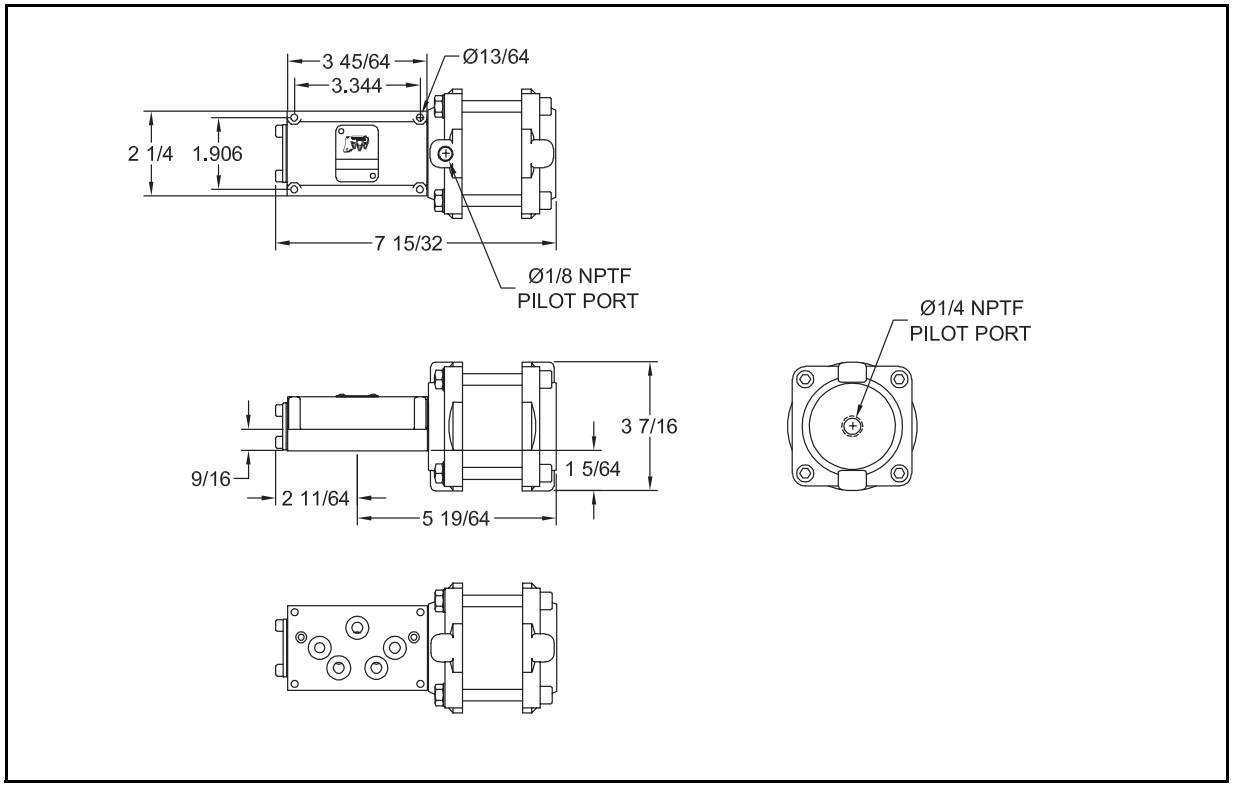


STANDARD 1/4" THROUGH 2"
PISTON: PP, PO, PY

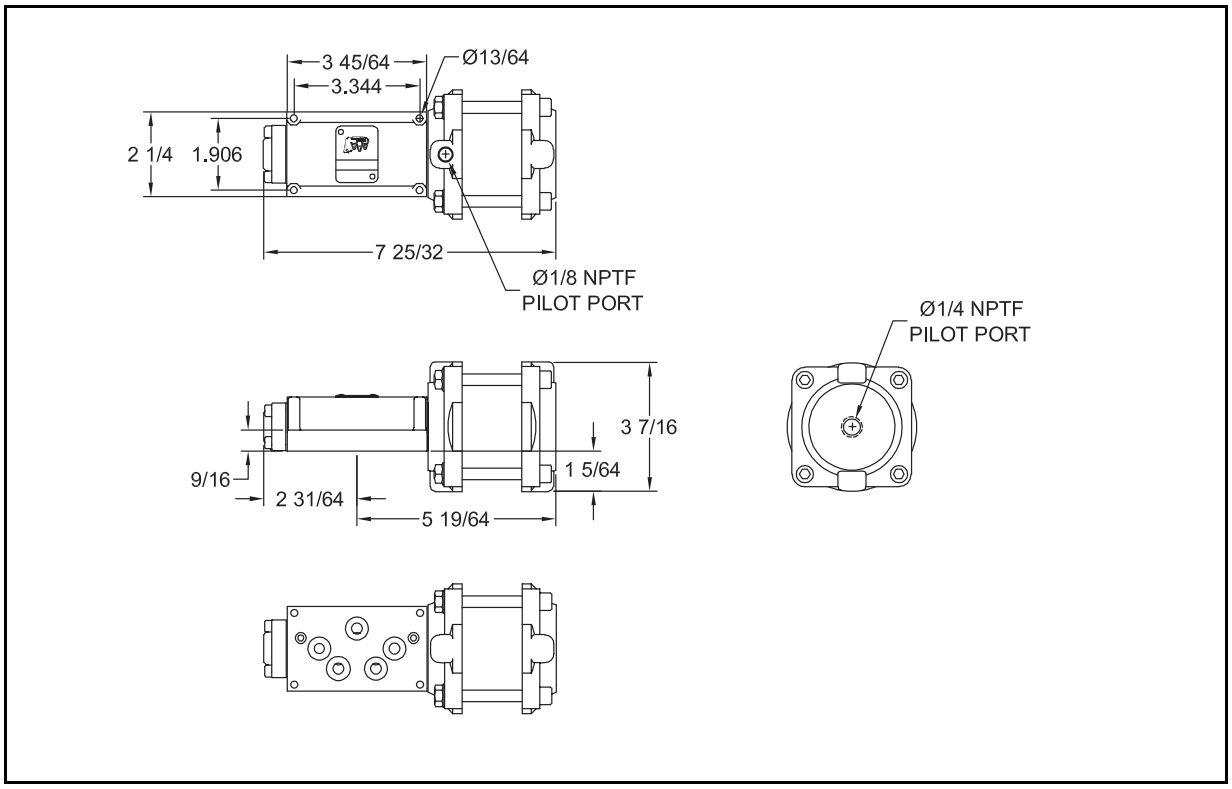
MODELS: PO2 & PO3



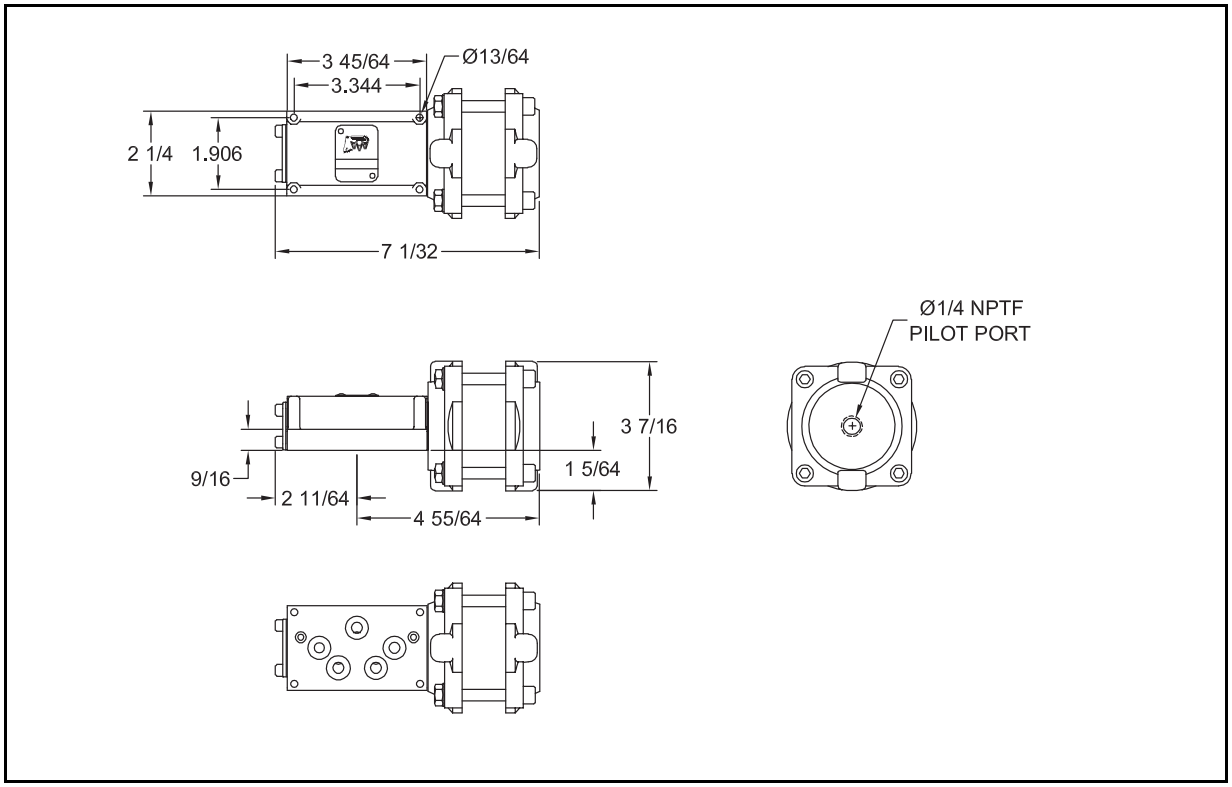
MODELS: PP3P



MODELS: PY3P

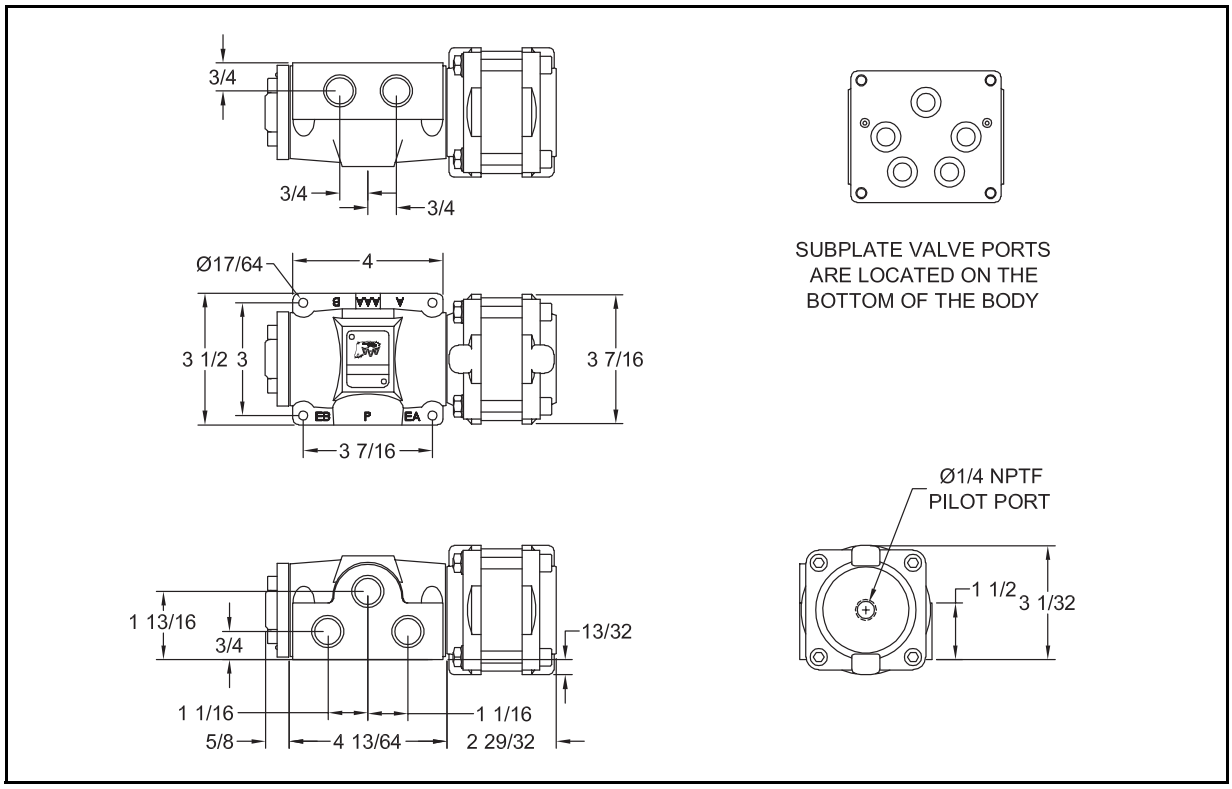


MODELS: PO3P

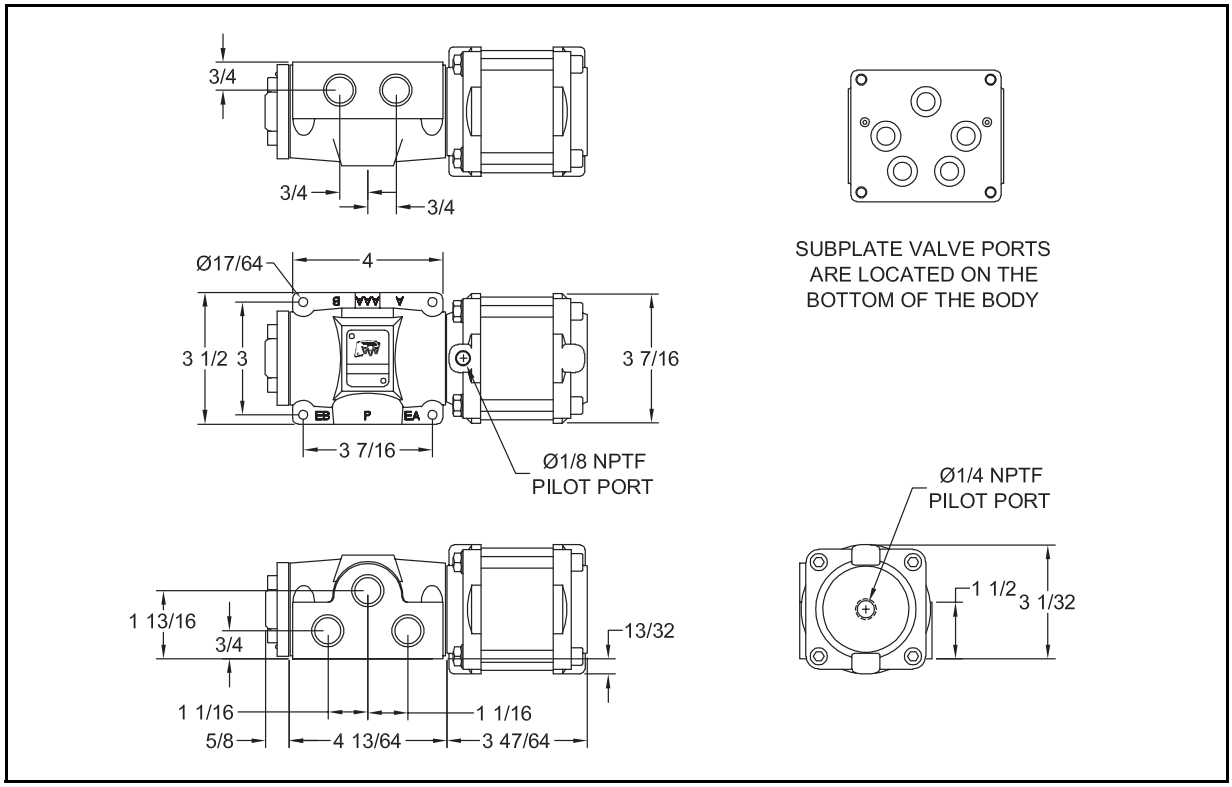


STANDARD 1/4" THROUGH 2"
PISTON: PP, PO, PY

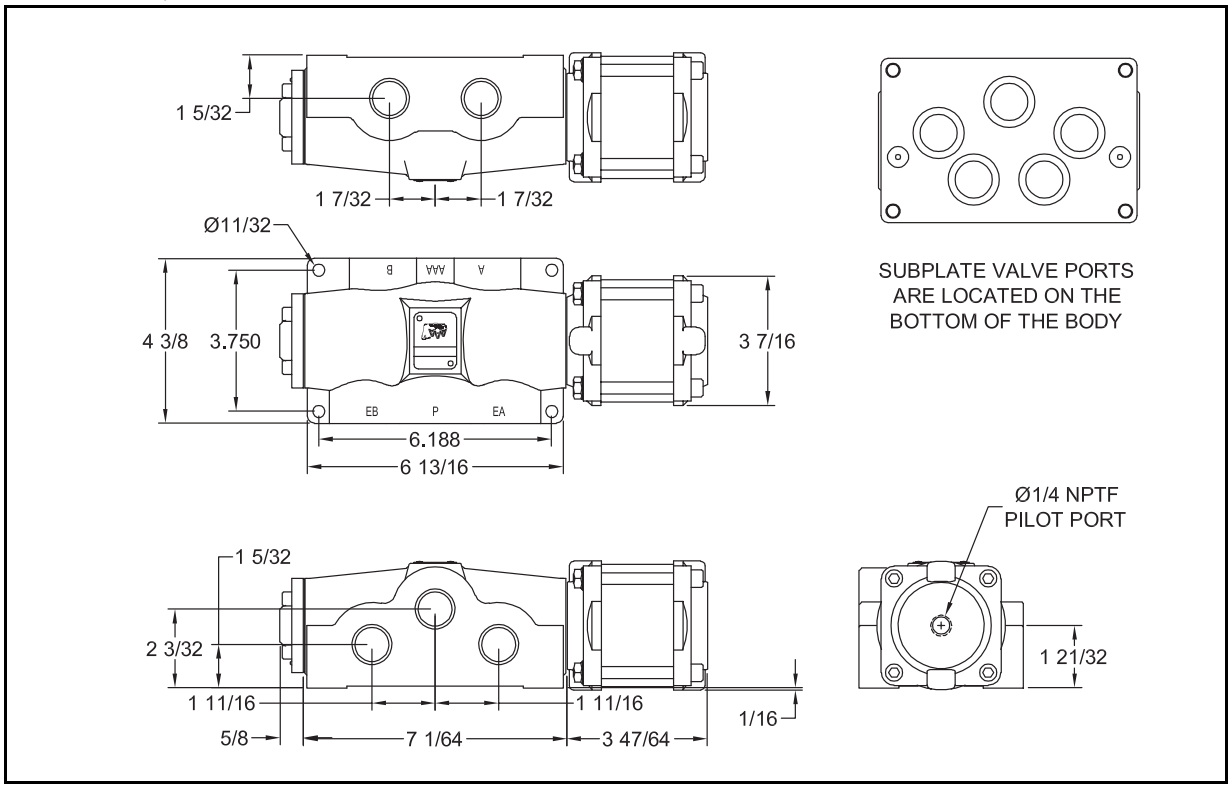
MODELS: PO4 & PO4P



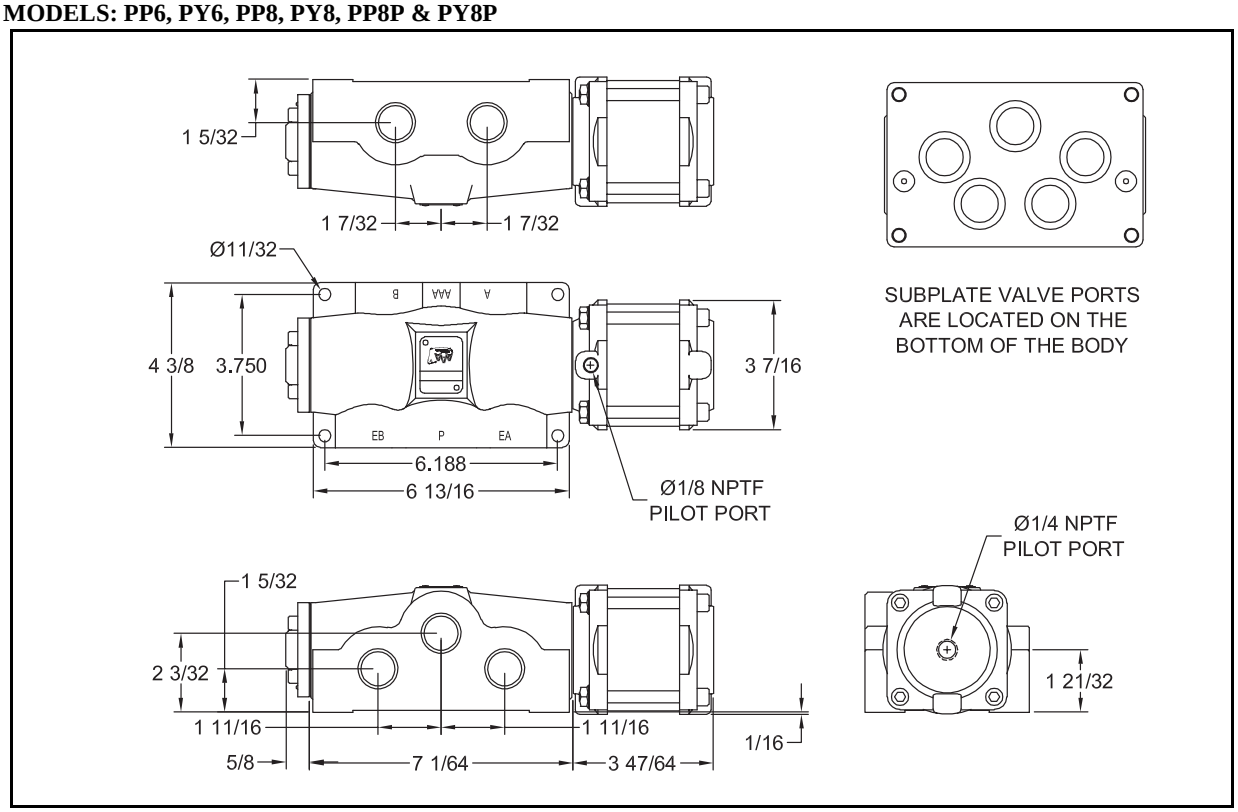
MODELS: PP4, PY4, PP4P & PY4P



MODELS: PO6, PO8 & PO8P

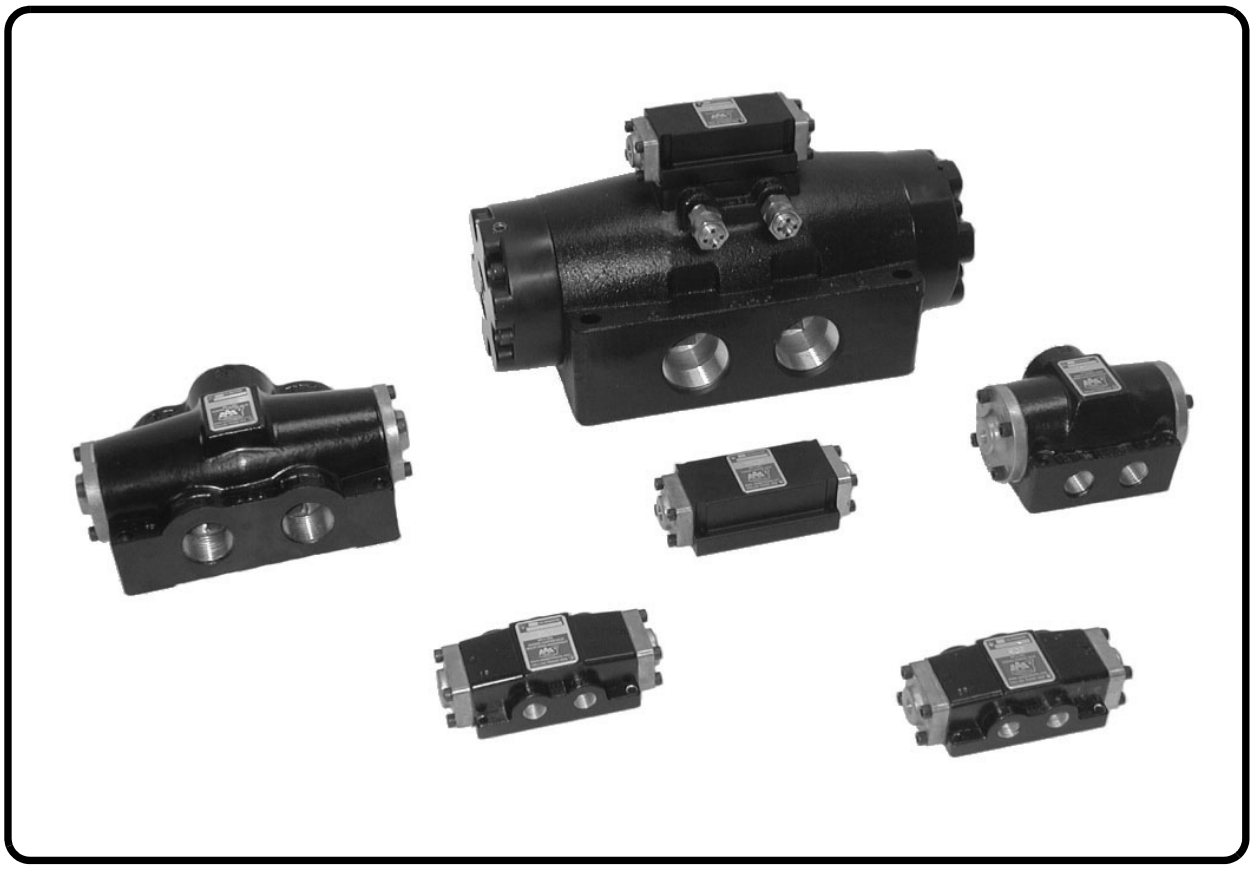


MODELS: PP6, PY6, PP8, PY8, PP8P & PY8P



REMOTE PILOT CONTROLLED AIR VALVES

4-WAY: VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

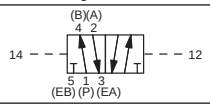
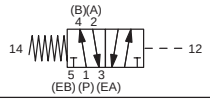
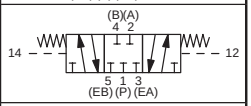
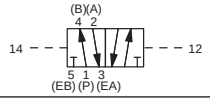
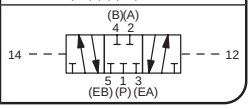
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

RO3PG_-5

1 Operator Style

Code	Description	Symbol
RR	2-position, double pilot, friction positioned. Spool stays in shifted position when pilot pressure is removed.	
RO	2-position, spring returned spool. Spool returns to position “C” when the pilot pressure is removed.	
RY	3-position, spring centered. Spool returns to center position when pilot pressure is removed.	
GR	2-position, double pilot. Main spool is shifted by pilot pressure from remote valve. Spool is shifted by pilot pressure (12 and 16P).	
GY	3-position. Main spool is shifted by pilot pressure from remote valve. Spool is shifted by pilot pressure. Spool is centered by dual pressure on pilots (12 and 16P).	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF
12 = 1-1/2" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow
16P = 1-1/2" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
SS = All stainless steel construction (RR2, RR3, RO2 & RO3 only).
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Pilot models are operated with a remote pressure source that shifts the spool. To shift the valve, remote pressure source is sent to the valve. Refer to the section on flow control to understand more on spool position and port flow.

OPERATOR STYLE CODE:

RO: 2-position, spring returned spool. Spool returns to position “C” when remote port is exhausted. Minimum shift pressure should be 50 PSI or greater.

RR: 2-position, no springs. Spool shifts and remains shifted when one remote port or the other is momentarily or continuously pressurized. Minimum shift pressure should be 25 PSI or greater.

RY: 3-position, spring centered. Spool returns to position “B” when both remote ports are exhausted or pressurized. Minimum shift pressure should be 50 PSI or greater.

GR: 2-position, double pilot. Spool is shifted by remote pilot pressure supplied to end cap ports. Minimum shift pressure should be 25 PSI or greater. Only available on body styles 12 and 16P (For other styles use RR operator style).

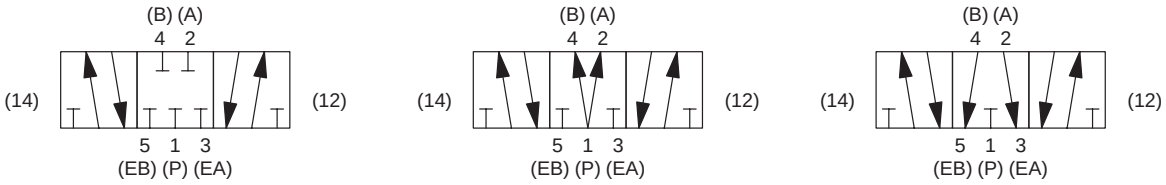
GY: 3-position, double pilot. Spool is shifted by remote pilot pressure supplied to end cap ports. The control valve must use a “D” spool or a “Regenerative” spool; when the control valve is in the center position, pressure is supplied to both pilot ports of the valve (For other styles use RY operator style).

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female “National Pipe Threads” to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4", 1" and 1-1/2" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All port connections, including remote pilot ports are made through O-ring sealed holes in the base of the valve through a subplate. If a subplate with pilot ports is used, either the remote pilot connections to the valve or the subplate must be plugged. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



“Standard”
Closed Center Spool

“D”
Regenerative Spool

“G”
Float Center Spool

STANDARD: Most valves are supplied with a “Closed Center” spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are “Closed Center”. Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option “D”. In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a “Regenerative” spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

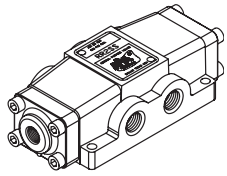
FLOAT CENTER: Spool Option “G”. In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a “Float Center” spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

VALVE OPTIONS:

OPTION SS: STAINLESS STEEL

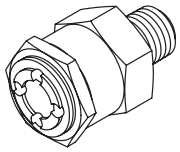
This option is only available on models RR and RO with body styles 2 and 3. This option allows the valve to be used in harsh, wash down environments. Entire construction is stainless steel, even the nameplate and screws. Soft seal construction with Viton O-ring seals in body grooves. Can be used on compressed air or gases compatible with 316 stainless steel and Viton seals.

Physical dimensions, flow diagrams and other specifications are the same as standard valves.



OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

STANDARD TEMPERATURE RANGE:

Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

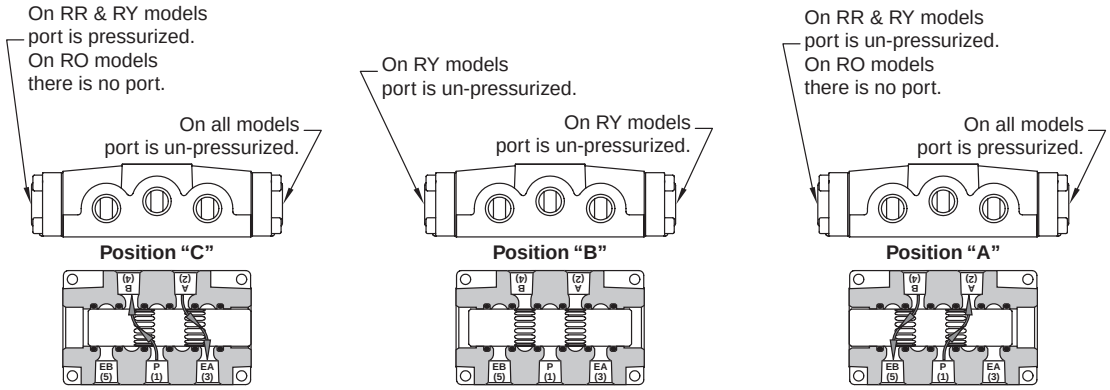
1/2", 3/4", 1", 1-1/2" and 2" valves use Buna-N O-rings: -40°F to 250°F.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

REPLACEMENT COMPONENTS:

Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs, flattened cams or any other component that appears to be working less than optimum.

FLOW PATTERN:



1/4" through 1": When the pilot pressure is created, causing the internal spool to shift, various ports will be connected. If the pilot source causes the spool to be in position "A", port 1 will connect to port 2. When the pilot source causes the spool to be in position "C", port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position "B", the connection of the ports depend on the style of spool used.

1-1/2" and 2": These larger valves use a "Piggy-Back" valve mounted to the top of the larger valve. The flow through the larger valve is the same as above.

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

AIR FLOW RATINGS:

Test for the determination of flow-rate characteristics conforms to ISO 6358, *Pneumatic fluid power - Components using compressible fluids - Determinations of flow-rate characteristics*. These tests were conducted on AAA valves at the Fluid Power Institute Testing Laboratories of the Milwaukee School of Engineering.

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Cv values were calculated by graphing the flow (scfm) versus the square root of change in pressure across the valve. A line was fitted to this graph and the resulting slope is the Cv value. Cv uses the theoretical flow (scfm) through the valve when the differential pressure between the inlet and outlet is equal to 1 psi. **We have never lost an application based on either flow or durability**.

	Rated Flow					
Body Style	**2**	**3**	**4**	**6***	**8***	**12***
Port Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/2"
SCFM Flow	73.9	97.1	215.0	446.9	477.7	1627
Cv Factor	1.6	2.4	5.0	10.4	11.1	37.8

*Tested before the published ISO standards. Cv's were calculated using previous data.

SCFM flow in the above table was calculated for 70 PSIG then converted to 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 3P at 80 PSIG (94.7 PSIA) inlet pressure.

Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826

Flow at 80 PSIG = 0.826 x 97.1 = 80.2 SCFM.

LIMITATIONS ON VACUUM OPERATION

The five main ports on AAA valves can be operated on industrial vacuum to 28" Hg, based on a 30" barometer. O-rings between all ports give tight sealing. While AAA valves are basically 4-way, they can be used for 3-way service by plugging the unused port 2 or 4.

MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

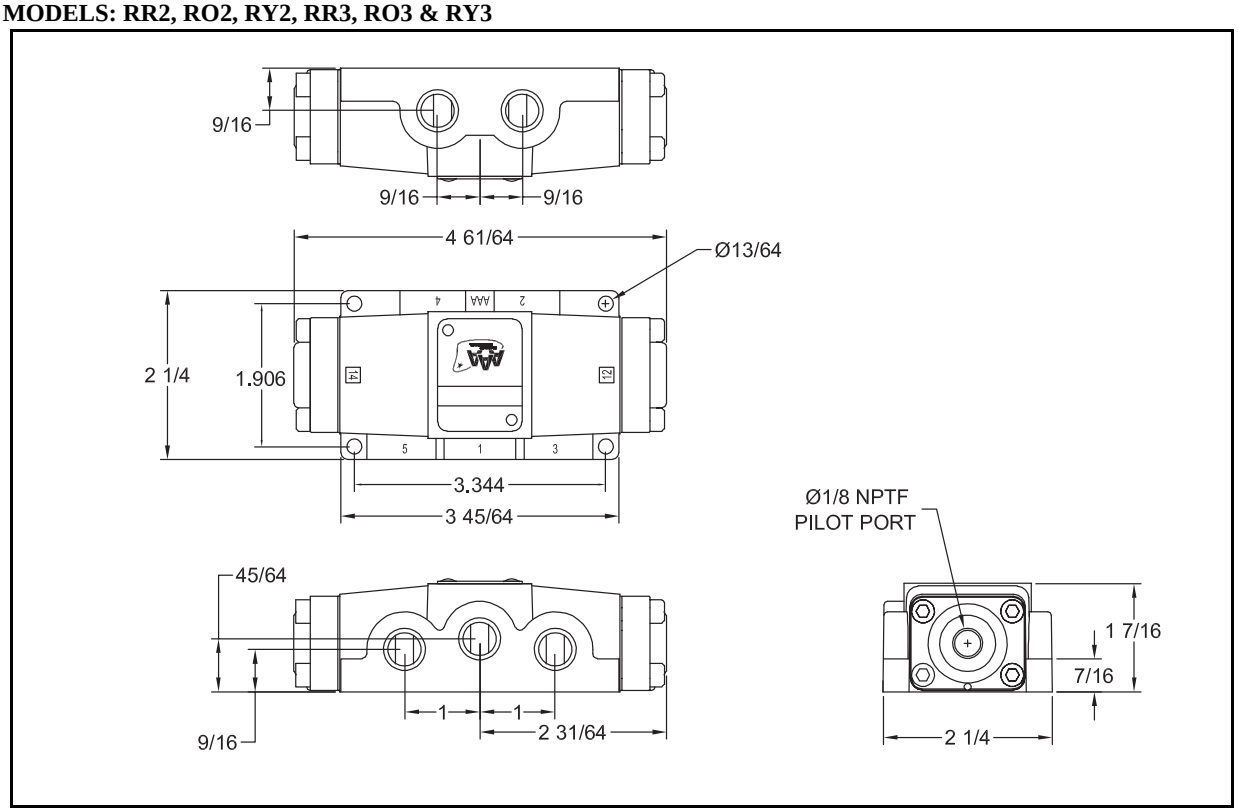
ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-16: One kit required for each 1-1/2" or 2" valve. Includes six V-123 Buna-N body O-rings, two V-124 Buna-N end cap O-rings, two V-89 Buna-N end cap pilot O-rings, five V-125 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot O-rings (Seals used determined by valve model and style). To repair piggy back valve, use ERKV-3.

VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

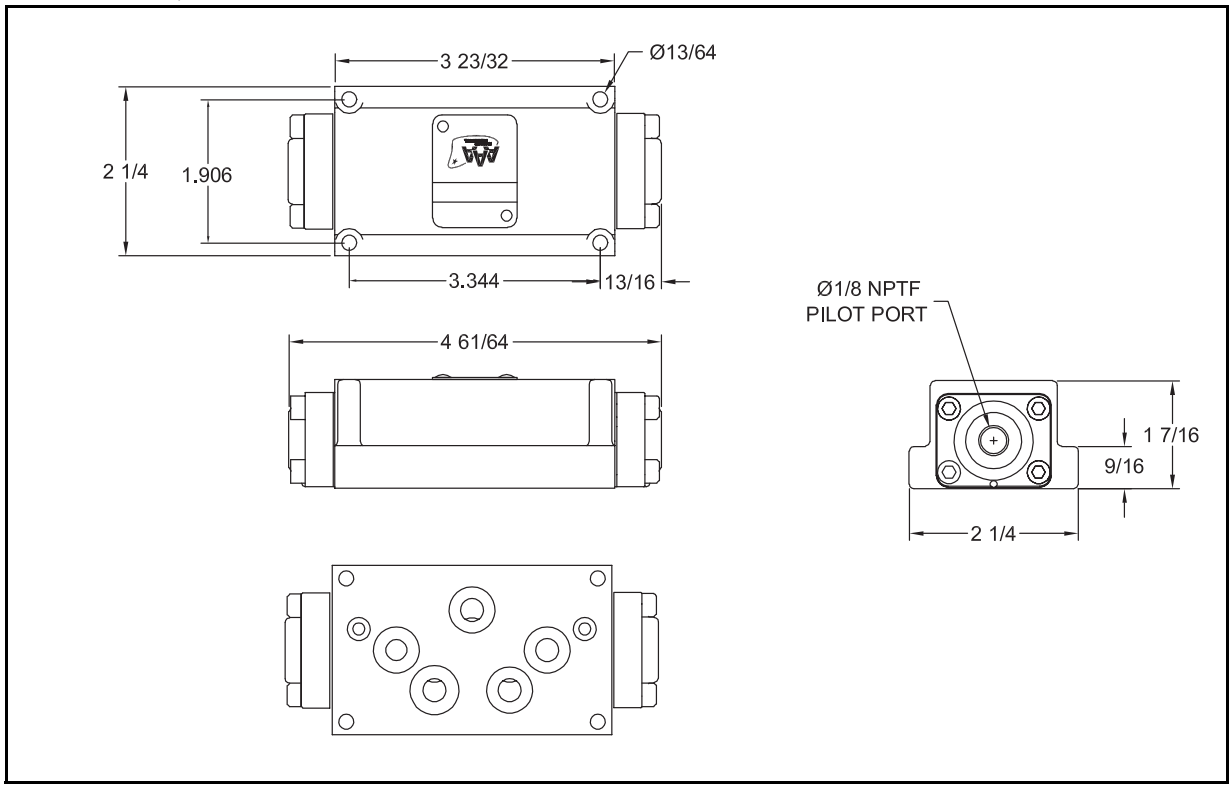
SEMI-DIMENSIONAL DRAWINGS:

MODELS: RR2, RO2, RY2, RR3, RO3 & RY3

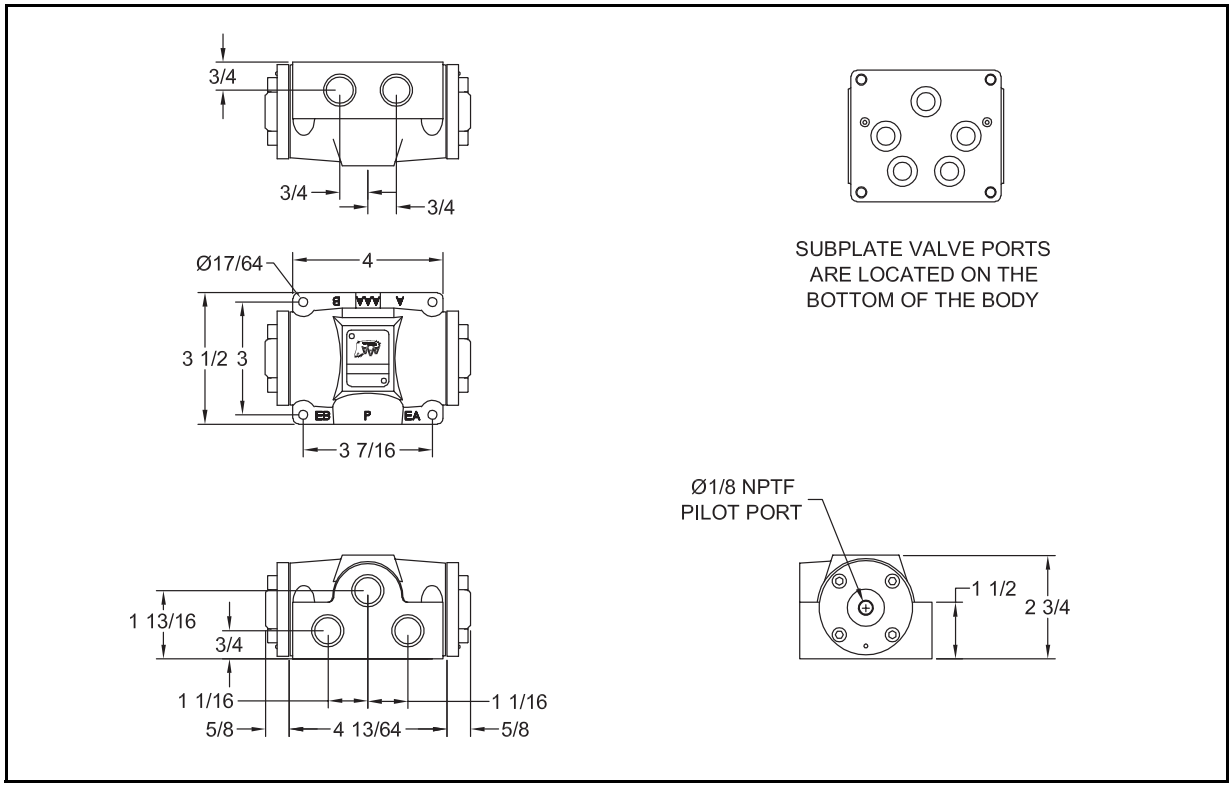


STANDARD 1/4" THROUGH 2"
REMOTE PILOT: RR, RO, RY

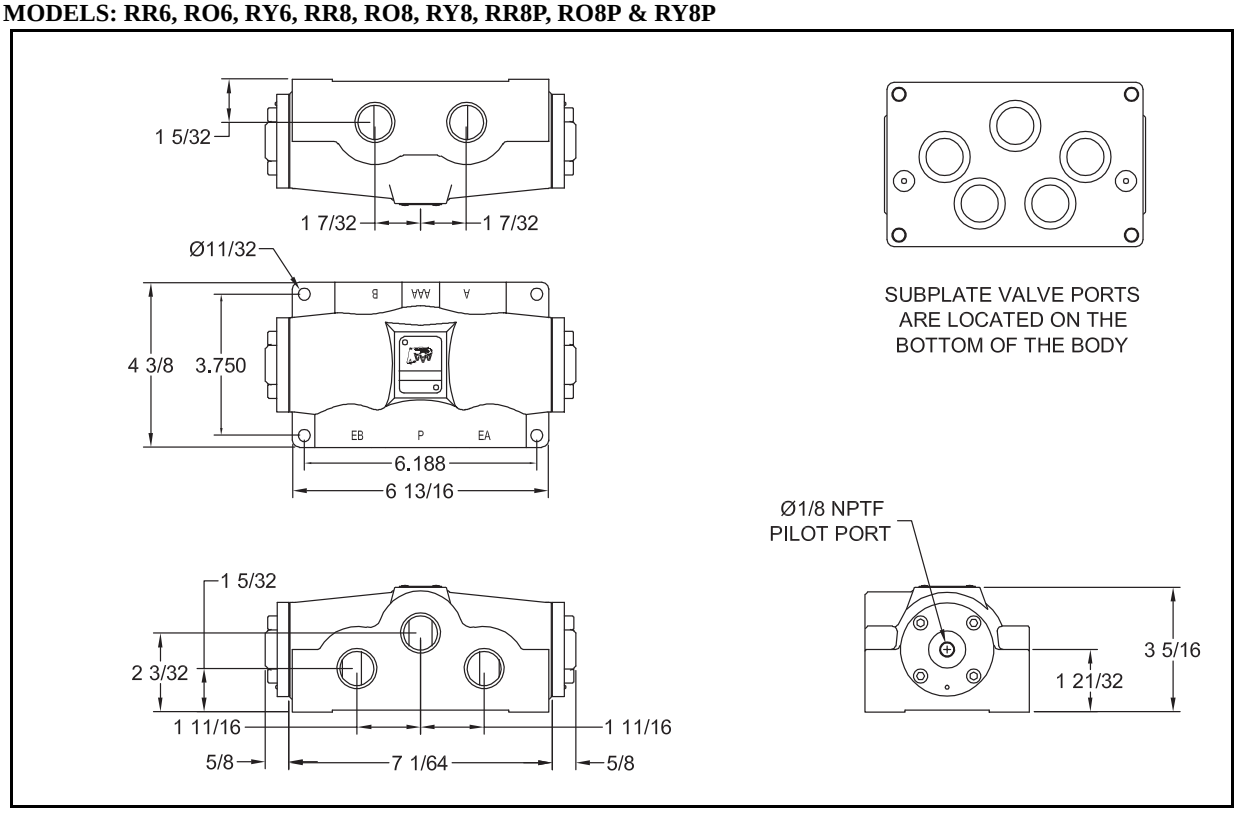
MODELS: RR3P, RO3P & RY3P



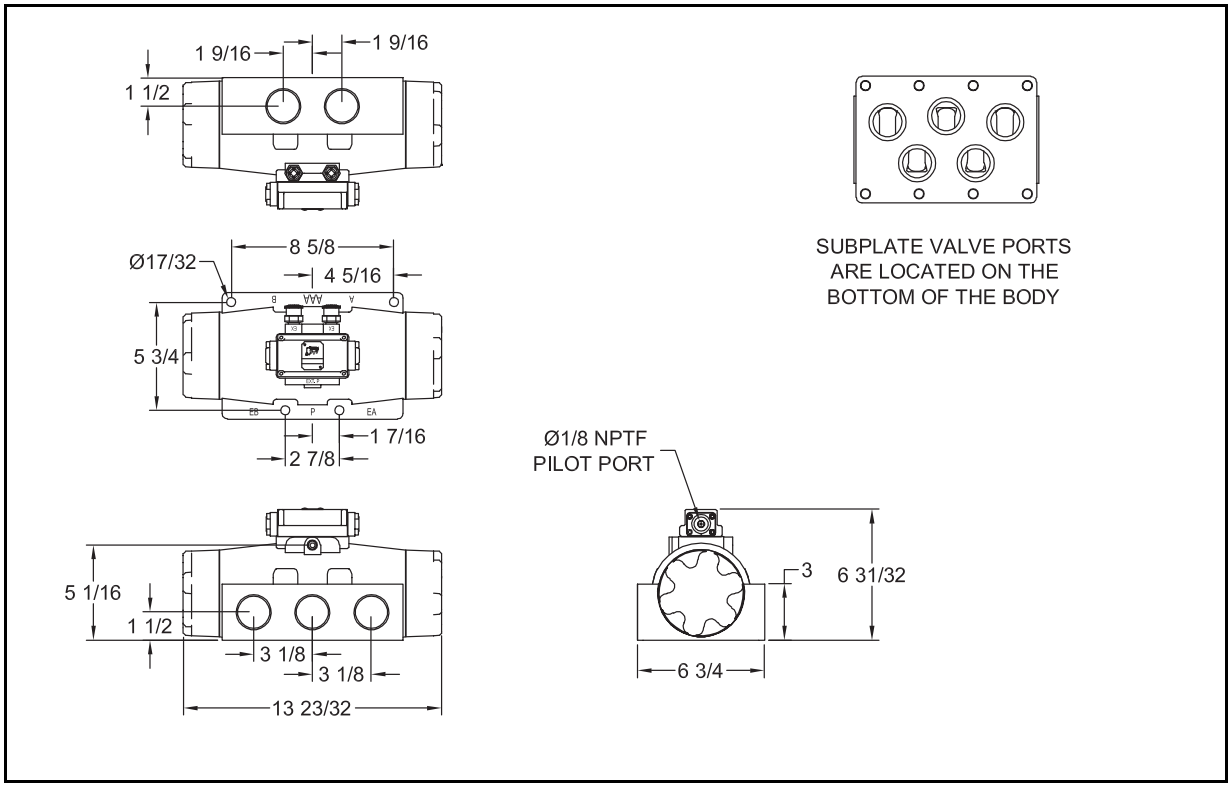
MODELS: RR4, RO4, RY4, RR4P, RO4P & RY4P



MODELS: RR6, RO6, RY6, RR8, RO8, RY8, RR8P, RO8P & RY8P

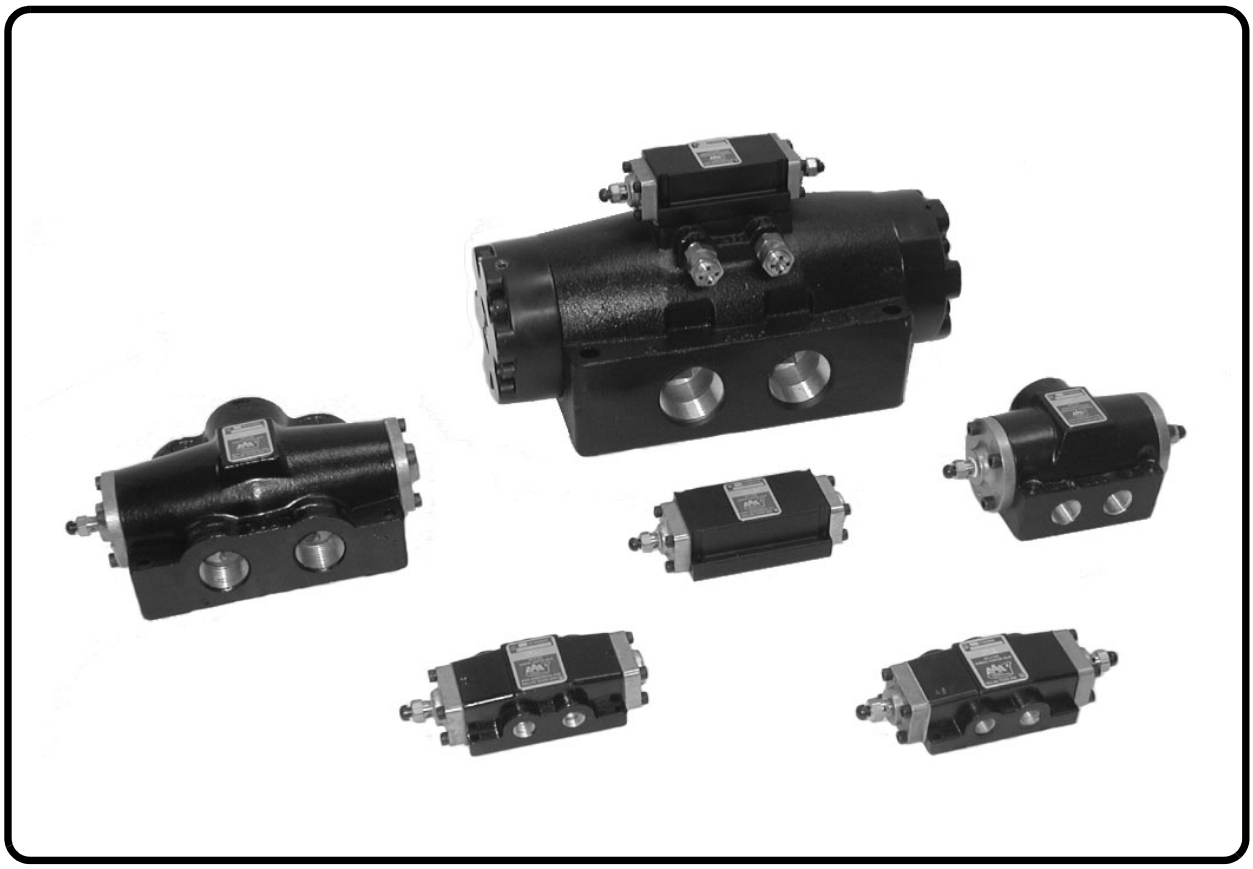


MODELS: RR12, RO12, RY12, RR16P, RO16P & RY16P



DIFFERENTIAL PILOT CONTROLLED AIR VALVES

4-WAY: 25 PSI TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA valve is fairly simple to understand. The first part is both an operator style and valve operation. This position describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size and body style. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

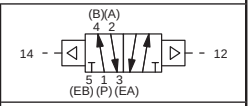
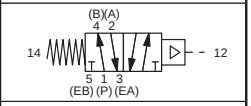
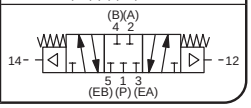
Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth position of the part number structure is used to specify valve options.

Part 5: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings only.

DO3PG -5

1 Operator Style

Code	Description	Symbol
D	2-position, double differential pilot, friction positioned. Spool stays in shifted position when buttons are released.	
DO	2-position, single differential pilot, spring returned spool. Spool returns to position “C” when the button is pressed.	
DY	3-position, spring centered. Spool returns to center position when both buttons are closed or open.	

2 Body Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF
4 = 1/2" NPTF
6 = 3/4" NPTF
8 = 1" NPTF
12 = 1-1/2" NPTF

Subplate Mounted

3P = 3/8" flow
4P = 1/2" flow
8P = 1" flow
16P = 1-1/2" flow

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Valve Options

blank = No options selected.
U = Factory installed muffler/flow controls in ports 3 and 5 (body styles 2, 3 & 4 only).

5 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for body styles 2, 3 & 3P, Buna-N for body styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

Differential Pilot models are operated with a button bleeder that shifts the spool.

OPERATOR STYLE CODE:

DO: 2-position, spring returned spool. Spool returns to position "A" when button bleeder is depressed. Minimum operating pressure should be 50 PSI or greater.

D: 2-position, no springs. Spool shifts and remains shifted when one button bleeder or the other is momentarily or continuously depressed. Minimum operating pressure should be 25 PSI or greater.

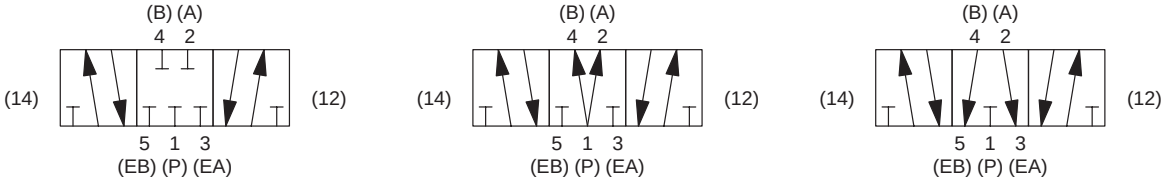
DY: 3-position, spring centered. Spool returns to position "B" when **both** button bleeders are released. Minimum operating pressure should be 50 PSI or greater.

BODY STYLE:

SIDE PORTED: Side ported valves can be installed inline. These valves have standard female "National Pipe Threads" to connect directly to installed air lines. The standard pipe sizes are 1/4", 3/8", 1/2", 3/4", 1" and 1-1/2" NPTF.

SUBPLATE MOUNTED: Subplated valves require a mounting base. This mounting base is pre-plumbed to existing control lines. Due to the nature of all the plumbing lines fixed to a mounting base, replacing subplate mounted valves is rapid and quick. All port connections, excluding differential pilot ports are made through O-ring sealed holes in the base of the valve through a subplate. The differential pilot connections can not be made through the subplate. O-ring seals and mounting screws are furnished with each subplate valve. Because the connections to a base mount can be of any size and configuration, subplate mounted valves are assigned a designation derived from a basic valve body size. A 3P size subplate valve will have the same flow characteristics as a 3/8" NPTF side ported valve body.

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



STANDARD: Most valves are supplied with a "Closed Center" spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are "Closed Center". Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option "D". In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a "Regenerative" spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option "G". In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a "Float Center" spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

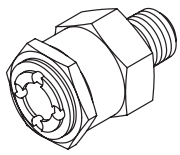
MOUNTING OF VALVES

AAA valves may generally be mounted in any position. But for safety, any valve which does not have springs or detents to hold the spool in position should be mounted with the spool horizontal unless pressure is continually applied to hold the spool in position.

VALVE OPTIONS:

OPTION U: EXHAUST FLOW CONTROLS

Available only on body styles 2, 3 and 4. A Model MFC flow control, listed on page 146, is screwed into each exhaust port, giving meter-out speed control of an associated air cylinder or air motor in both directions of travel. MFC flow controls not only give adjustable speed control but have a built-in muffler to reduce exhaust noise.



MFC Flow Control

OPTIONAL O-RING MATERIALS:

Unless otherwise specified, all 1/4" and 3/8" soft seal valves come standard with Viton O-rings and all 1/2", 3/4", 1", 1-1/2" and 2" soft seal valves come standard with Buna-N O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. As an example, model SY3G-2 will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

STANDARD TEMPERATURE RANGE

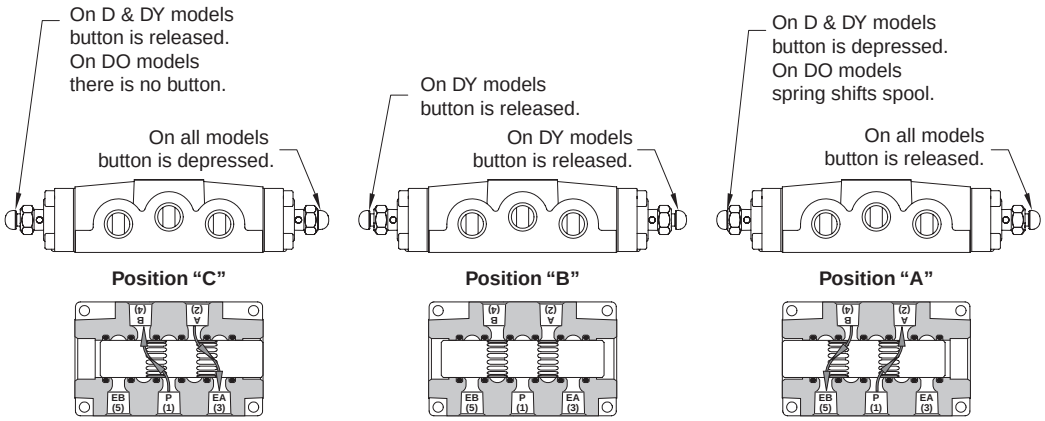
Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20 to 400 °F, 600 °F for short time.

1/2", 3/4", 1", 1-1/2" and 2" valves use Buna-N O-rings: -40 to 250 °F.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

FLOW PATTERN:



1/4" through 1": If the button depressed causes the spool to be in position "A", port 1 will connect to port 2. When the button depressed causes the spool to be in position "C", port 1 will connect to port 4. The appropriate exhaust will connect to the un-pressurized port. In position "B", the connection of the ports depend on the style of spool used.

1-1/2" and 2": These larger valves use a "Piggy-Back" valve mounted to the top of the larger valve. The flow through the larger valve is the same as above.

AIR FLOW RATINGS:

Reference page 100 for SCFM and Cv ratings.

PRESSURE LIMITATION ON DIFFERENTIAL PILOT VALVES

Differential Pilot models are special types in which full line pressure is maintained on both ends of the main spool. To shift the spool, one or the other bleed buttons on the end caps must be momentarily pressed. This vents pressure from one end, permitting pressure on the other end to shift the spool. This diagram shows the working principle.

A minimum of 25 PSI is required for reliable shifting of non-spring models. Minimum pressure for spring offset and 3 position models is 50 PSI. They will not operate correctly on compressed air lines of less than 25 PSI. They are not suitable for liquids. By careful design they can be built in a 3-position, spring centered configuration.

The bleed buttons can be removed from the valve body and mounted on 1/4" hose or tube extensions for shifting the valve from a few feet away. Any other 2-way normally closed (N.C.) valve, manual, cam or solenoid can be substituted for either or both bleed buttons.

Differential Pilot valves can **NOT** be used on vacuum service.

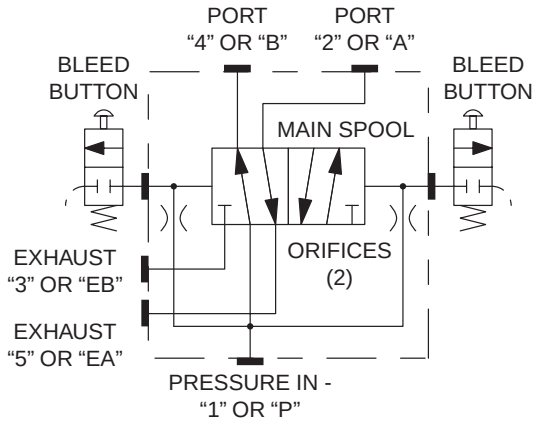


Diagram of Differential Pilot Valve

SEAL KITS:

ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

ERKV-4: One kit required for each 1/2" valve. Includes six V-6 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-110 Buna-N subplate O-rings, two V-29 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-8: One kit required for each 3/4" or 1" valve. Includes six V-30 Buna-N body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG48 composition end cap gaskets, five V-90 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot hole O-rings (Seals used determined by valve model and style).

ERKV-16: One kit required for each 1-1/2" or 2" valve. Includes six V-123 Buna-N body O-rings, two V-124 Buna-N end cap O-rings, two V-89 Buna-N end cap pilot O-rings, five V-125 Buna-N subplate O-rings, two V-89 Buna-N subplate pilot O-rings (Seals used determined by valve model and style). To repair piggy back valve, use ERKV-3.

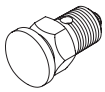
VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

REPLACEMENT COMPONENTS:

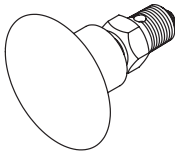
Consult Factory. All AAA valves are designed for rugged applications. But sometimes unforeseen damage does occur. Please contact us for broken clevis', handles, tired springs, flattened cams or any other component that appears to be working less than optimum.

DIFFERENTIAL PILOT VALVE ACCESSORIES:

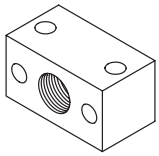
BB-1S Bleed Button



BB-1SSL Bleed Button



BB-1P Bleed Button



TB-1/8 Mounting Block

MODEL BB-1S: STEEL BLEED BUTTON. Replacement button same as original equipment on all AAA differential pilot valves. Threaded 1/8" NPT. Extends approximately 3/4" when installed. Requires 6 lbs operating force on 100 PSI line.

MODEL BB-1SSL: Same as BB-1S except with larger stainless steel head and spring for heavy duty applications.

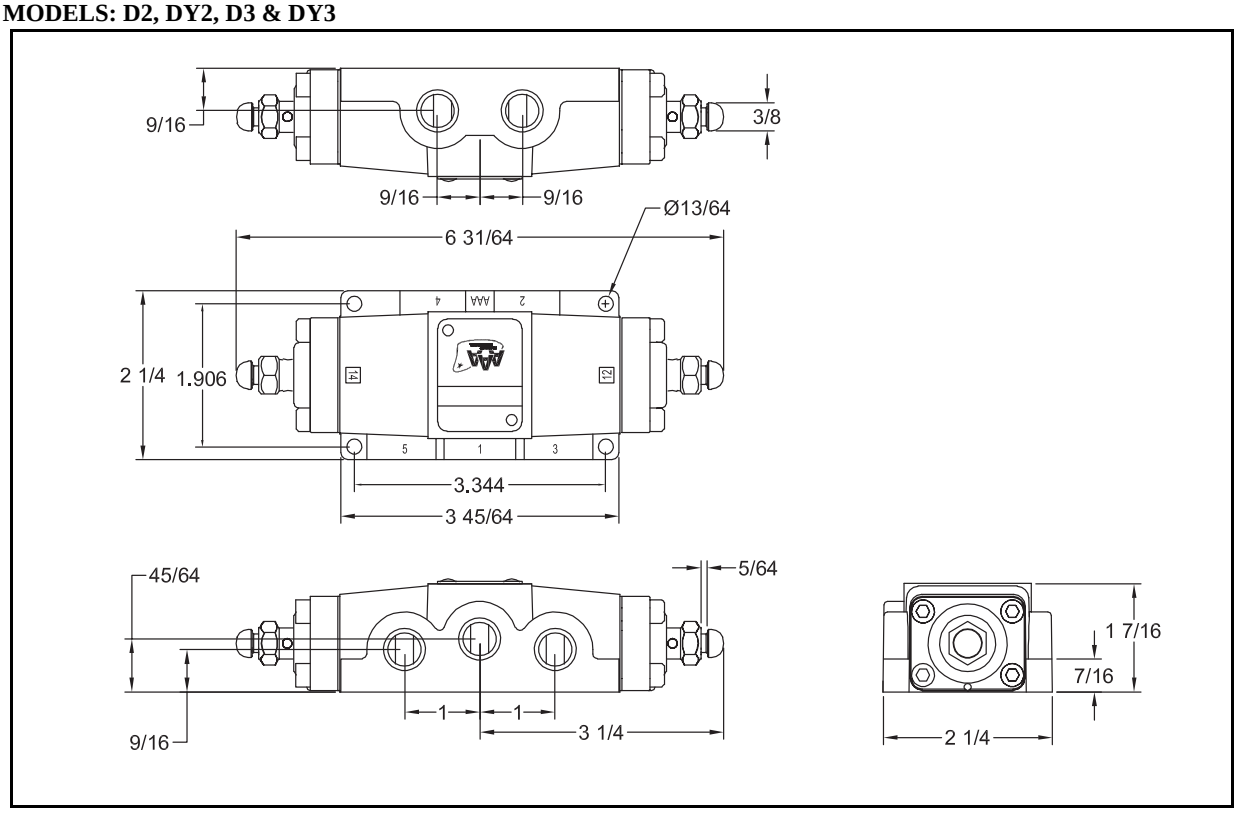
MODEL BB-1P: PALM DIFFERENTIAL PILOT. Same as BB-1S, with hard black plastic palm button 1-3/8" diameter. For use as manual control or panic button.

MODEL TB-1/8: MOUNTING BLOCK. A convenient means of mounting a bleed button remotely. Body is 3/4" square x 1-1/8" long. Universal mounting with 1/8" NPTF ports on two sides. Mounts with two No. 10 or 3/16" screws.

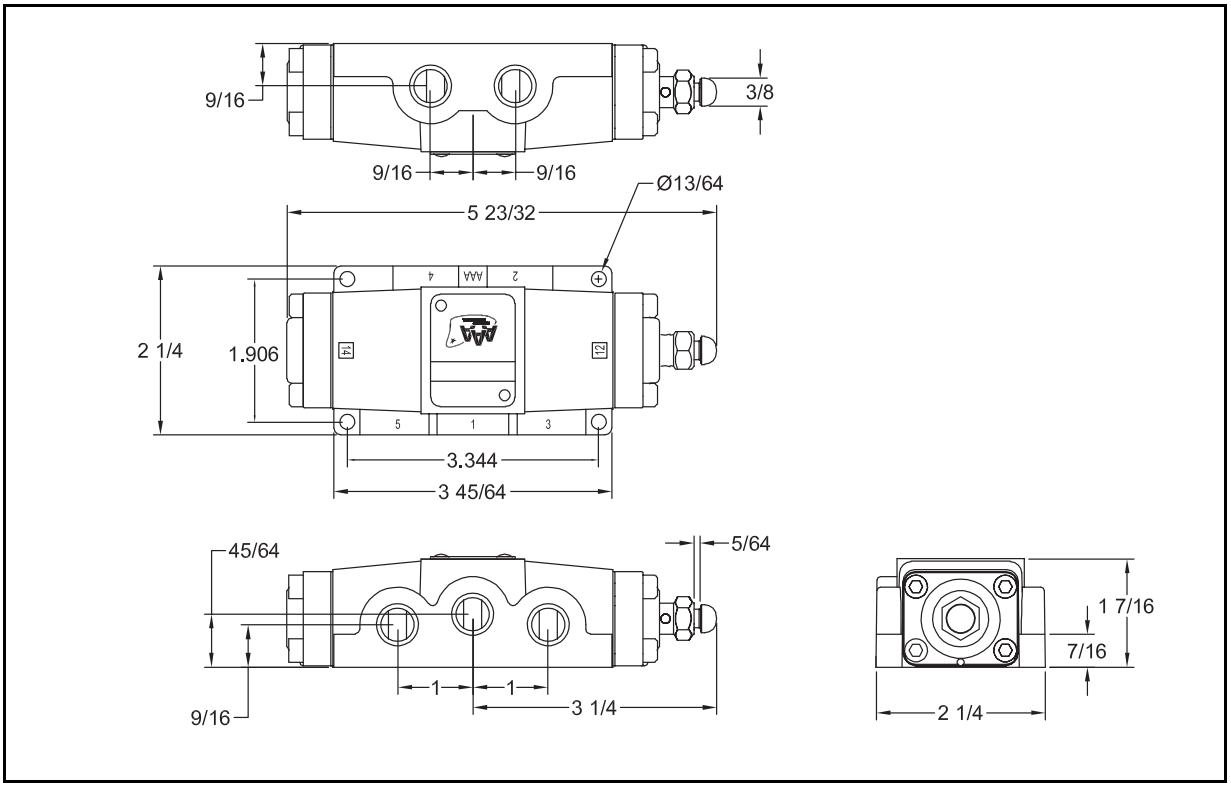
Unless otherwise noted all button bleed bodies are brass, with bronze internal spring and steel plunger button.

SEMI-DIMENSIONAL DRAWINGS:

MODELS: D2, DY2, D3 & DY3

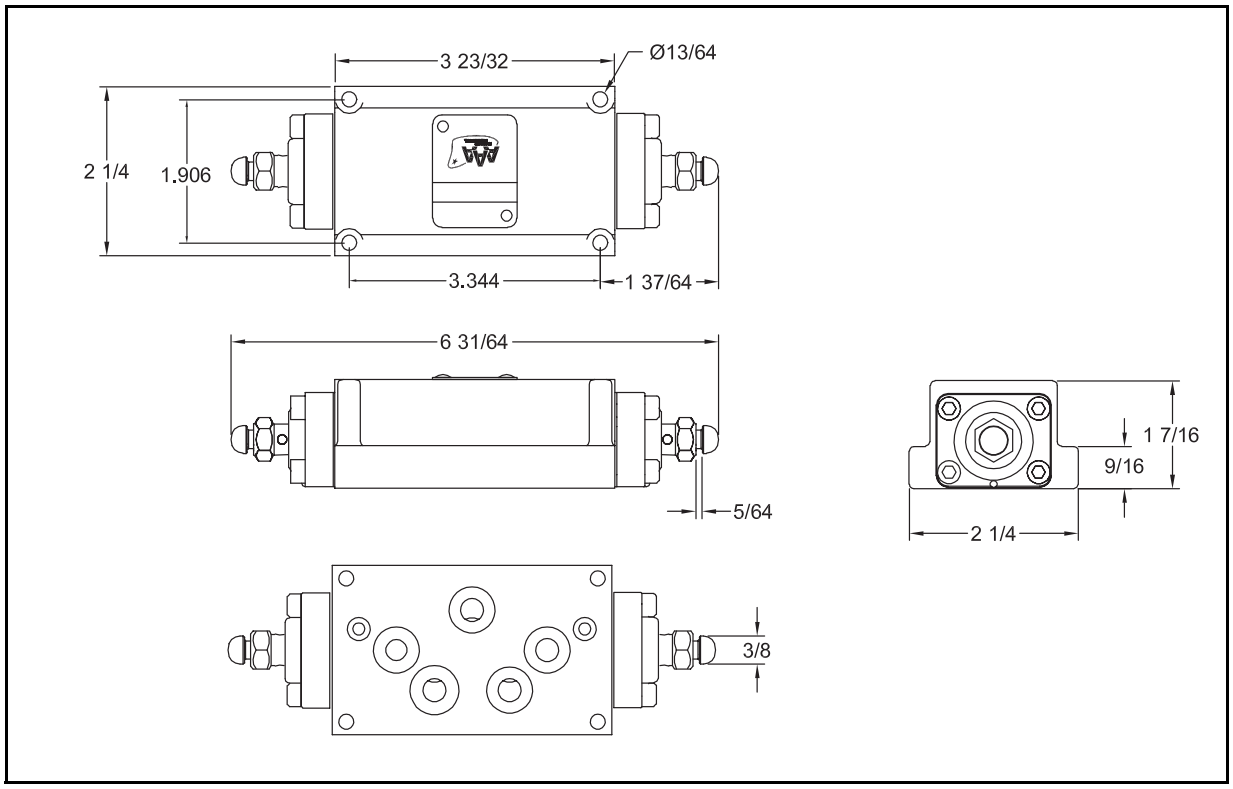


MODELS: DO2 & DO3

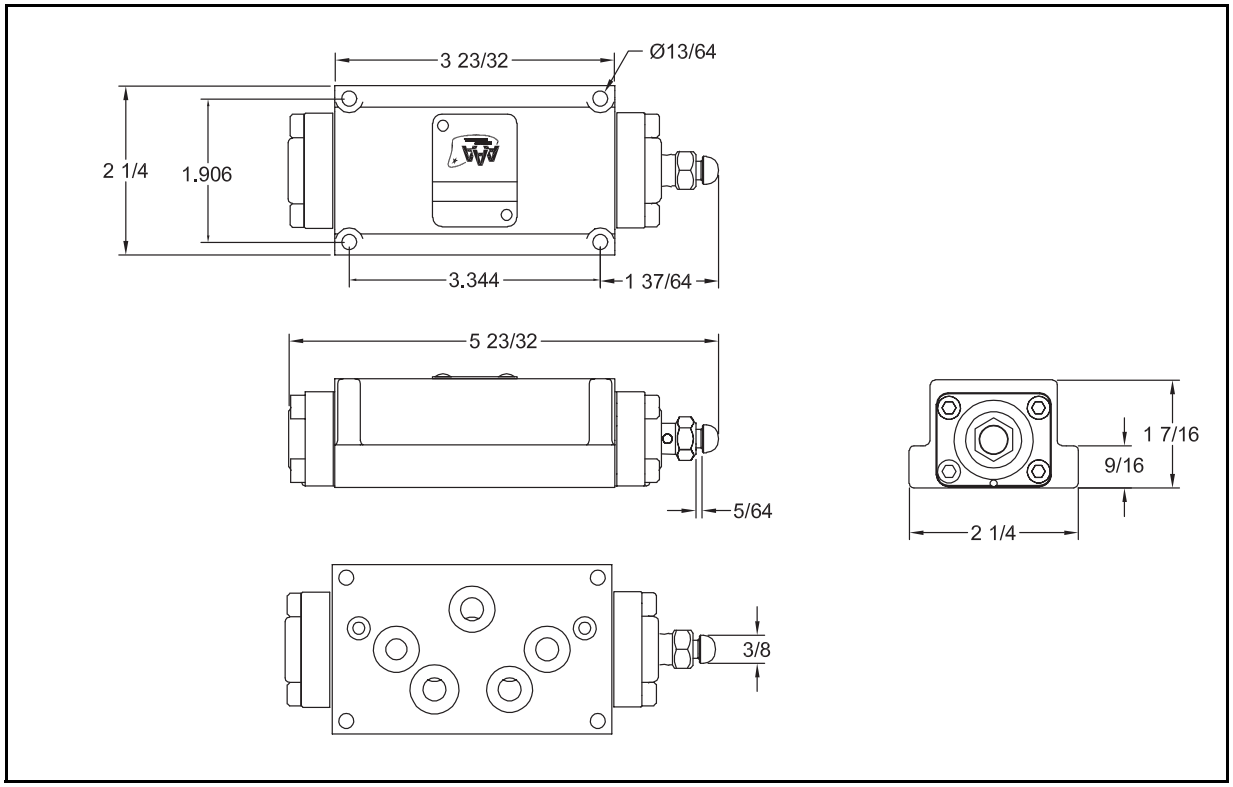


STANDARD 1/4" THROUGH 2"
DIFFERENTIAL PILOT: D, DO, DY

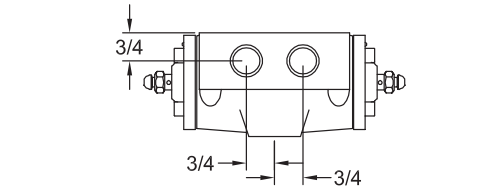
MODELS: D3P & DY3P

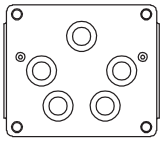


MODELS: DO3P

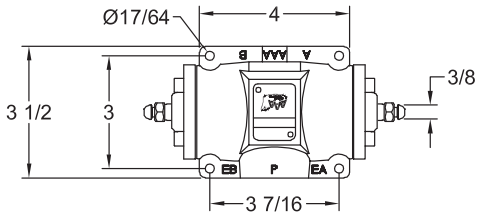


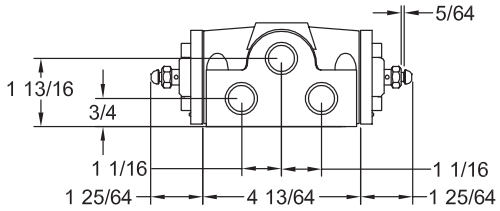
MODELS: D4, DY4, D4P & DY4P

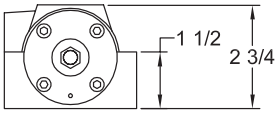




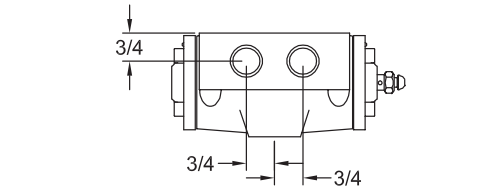
SUBPLATE VALVE PORTS
ARE LOCATED ON THE
BOTTOM OF THE BODY

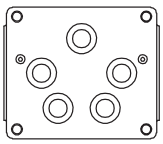




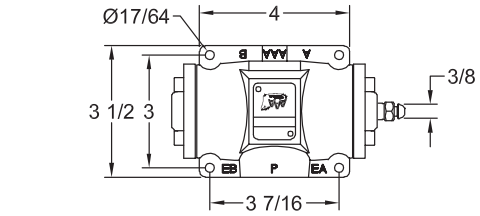


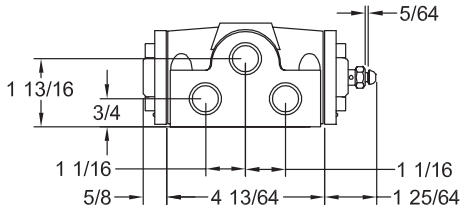
MODELS: DO4 & DO4P

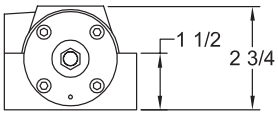




SUBPLATE VALVE PORTS
ARE LOCATED ON THE
BOTTOM OF THE BODY

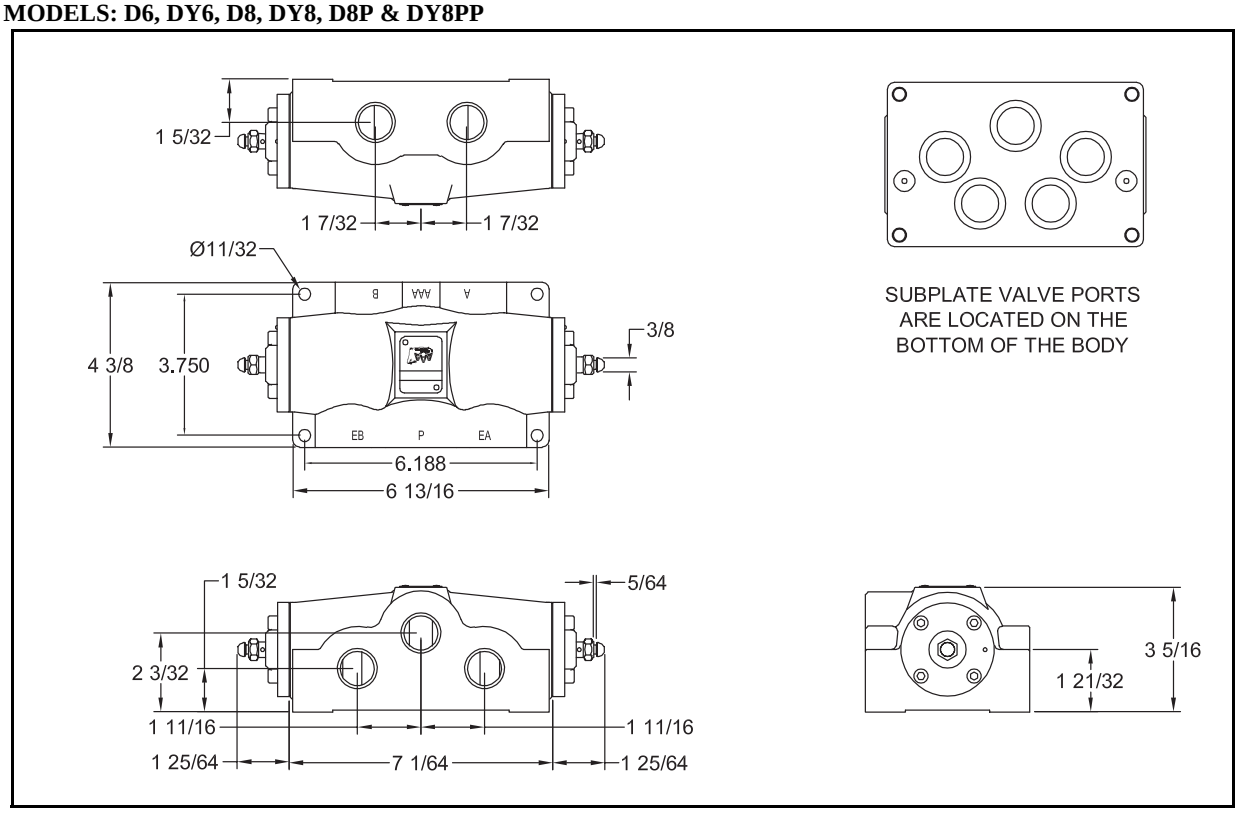




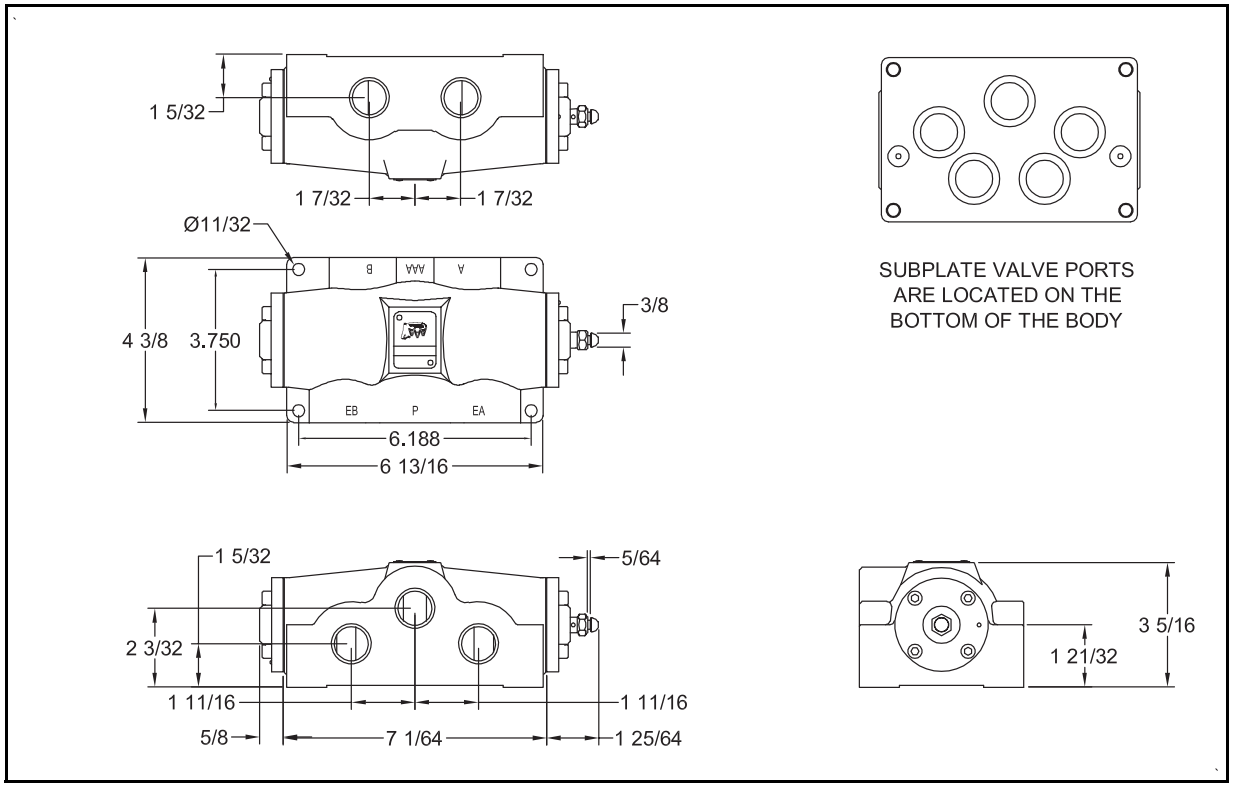


STANDARD 1/4" THROUGH 2"
DIFFERENTIAL PILOT: D, DO, DY

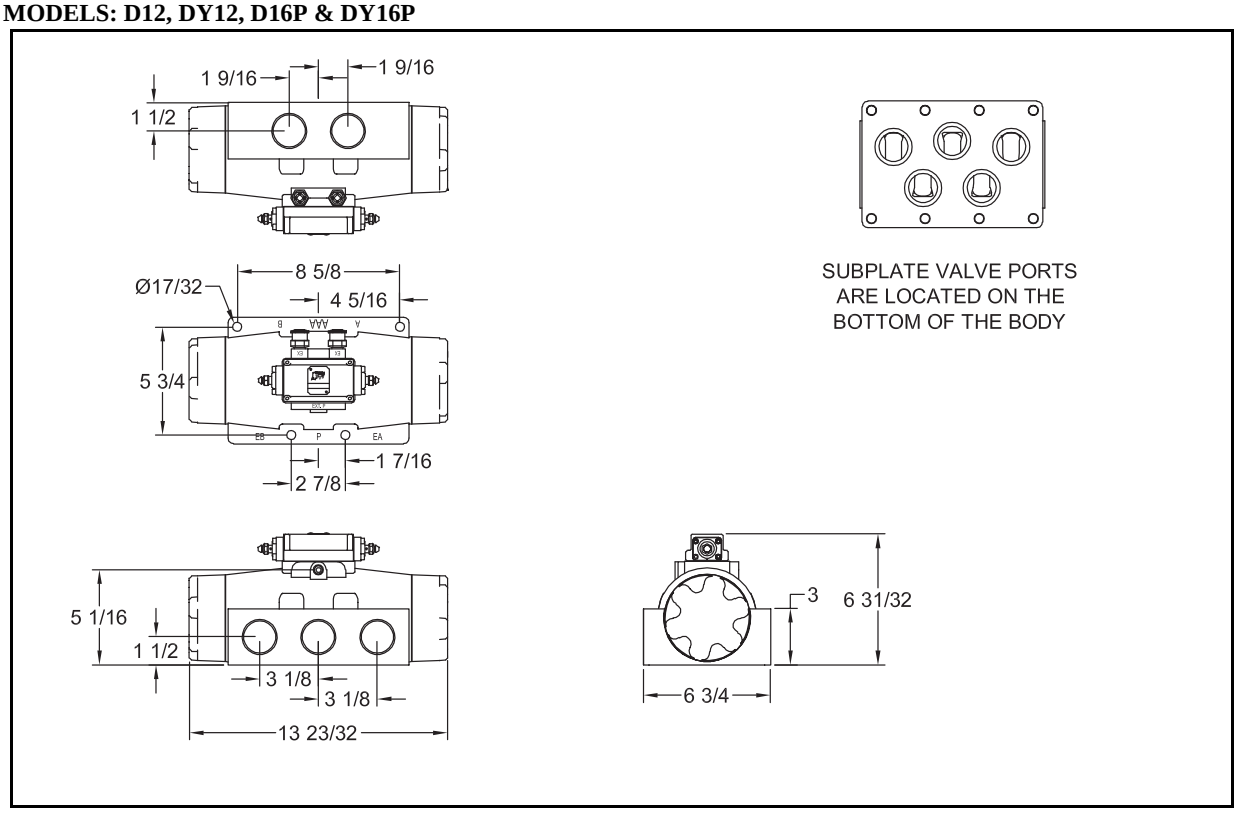
MODELS: D6, DY6, D8, DY8, D8P & DY8PP



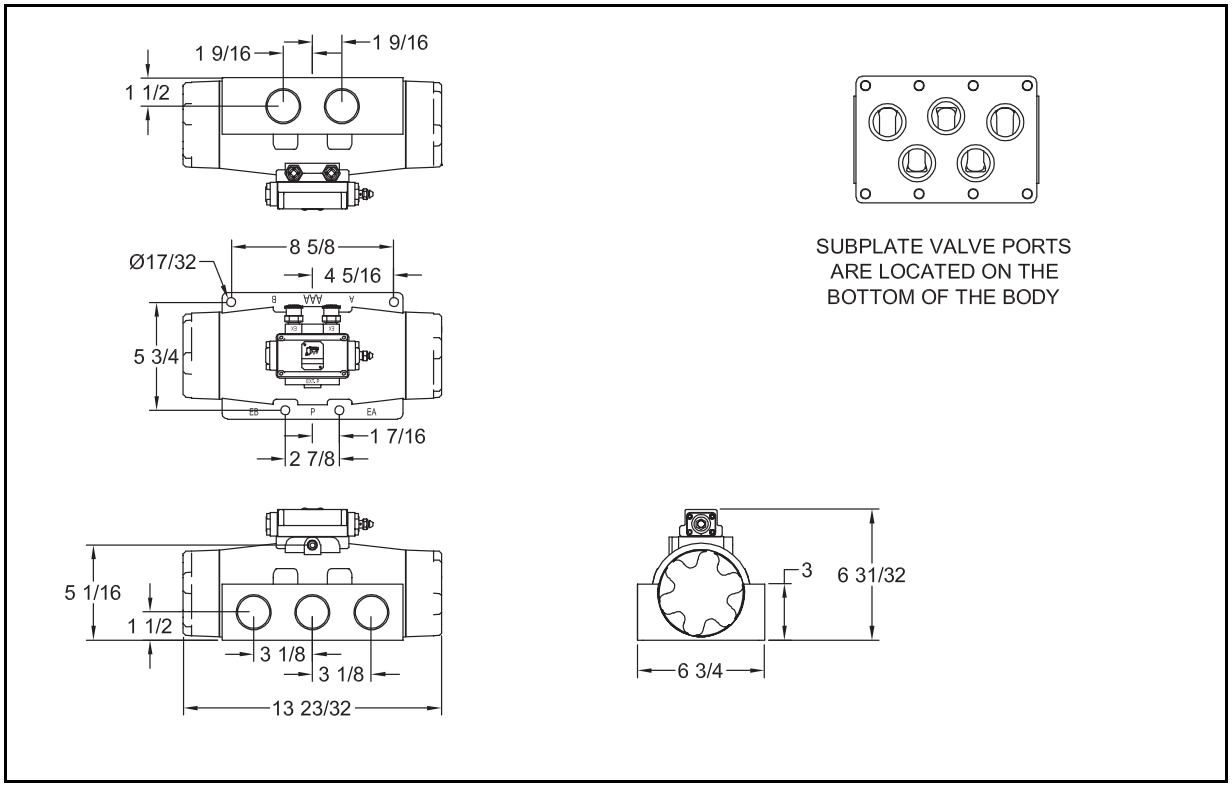
MODELS: DO6, DO8 & DO8P



MODELS: D12, DY12, D16P & DY16P

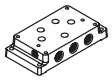
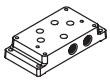


MODELS: DO12 & DO16P



SUBPLATE MODEL SELECTION

Subplates are connection bases for the mounting of and connection to, subplate-type valves. They are of die-cast, sand-cast or solid aluminum construction. Connection ports, located in the sides or bottom, are standard NPTF dry seal pipe threads. No mounting hardware or seals are furnished with subplates. O-rings and mounting screws are furnished with each subplate mounted valve.

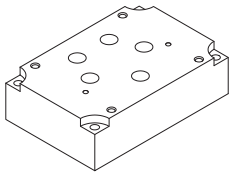
SUBPLATE DESCRIPTION (3/8" Subplate Shown)	1/4" NPTF Port Size	3/8" NPTF Port Size	1/2" NPTF Port Size	3/4" NPTF Port Size	1" NPTF Port Size	1-1/2" NPTF Port Size	2" NPTF Port Size
SIDE PORTED, DUAL EXHAUST  Inlet and two exhausts on one side, two cylinder ports on opposite side.	Models with no pilot ports in the subplate:						
	SP2-3N	**SP3-3N**	**SP4-3N**	**SP6-3N**	**SP8-3N**	**SP12-3N**	**N/A**
	Models with 1/8" NPTF pilot ports on both ends of subplate:						
	SP2-3	**SP3-3**	**SP4-3**	**SP6-3**	**SP8-3**	**SP12-3**	**N/A**
SIDE PORTED, SINGLE EXHAUST  Inlet and common exhaust on one side, two cylinder ports on opposite side.	Models with no pilot ports in the subplate:						
	SP2-4N	**SP3-4N**	**SP4-4N**	**SP6-4N**	**N/A**	**N/A**	**N/A**
	Models with 1/8" NPTF pilot ports on both ends of subplate:						
	SP2-4	**SP3-4**	**SP4-4**	**SP6-4**	**N/A**	**N/A**	**N/A**
BOTTOM PORTED, DUAL EXHAUST  Inlet, two exhausts and two cylinder ports tapped into bottom side of subplate.	Models with no pilot ports in the subplate:						
	SP2-1N	**SP3-1N**	**SP4-1N**	**SP6-1N**	**SP8-1N**	**SP12-1N**	**SP16-1N**
	Models with 1/8" NPTF pilot ports on bottom of subplate:						
	SP2-1	**SP3-1**	**SP4-1**	**SP6-1**	**SP8-1**	**SP12-1**	**SP16-1**
BOTTOM PORTED, SINGLE EXHAUST  Inlet, one common exhaust and two cylinder ports tapped into bottom of subplate.	Models with no pilot ports in the subplate:						
	SP2-2N	**SP3-2N**	**SP4-2N**	**SP6-2N**	**N/A**	**N/A**	**N/A**
	Models with 1/8" NPTF pilot ports on bottom of subplate:						
	SP2-2	**SP3-2**	**SP4-2**	**N/A**	**N/A**	**N/A**	**N/A**

MOUNTING STANDARD SUBPLATES TO FLAT SURFACES

The table below gives diameter and spacing of the mounting holes in the subplates. If more dimensions are required, please request factory drawings through your distributor.

Subplate No.	Subplate Mounting Pattern	Hole Dia.	Mounting Screw	Subplate Height	Blank Subplate No.
SP2 & SP3	1-29/32" x 4-3/16"	13/64"	10-24x7/8"	29/32"	*
SP4	3" x 4-3/4"	17/64"	1/4"-20x2"	1-1/2"	SP4
SP6 & SP8	3-3/4" x 7-7/16"	11/32"	5/16"-18x2-1/4"	2-5/16"	SP8
SP12 & SP16	5-3/4" x 10-3/4"	35/64"	1/2"-13x3-3/4"	3-7/16"	SP12

***The SP2 and SP3 subplates are die cast and cannot be furnished without port holes. They can be used as 29/32" high mounting spacers for threaded body 1/4" and 3/8" valves.**



BLANK SUBPLATES

Blank bases are provided with four tapped holes for valve mounting but without port holes. Some top detail is provided.

MOUNTING VALVES ON STANDARD SUBPLATES

SUBPLATE-TO-VALVE SEALS: O-ring seals are furnished with each subplate valve for sealing between valve body and subplate. Replacement O-rings, if needed, can be purchased locally. Sizes are shown in this chart. Any material, such as Buna-N, which is compatible with air line lubrication can be used. Seal kits obtained from the AAA factory include these seals. For only the mounting seals and no internal valve seals, use the mounting seal kits listed below

PILOT PORTS: Read the valve description to see whether external pilot or bleed connections can be brought to the valve through the subplate. Then, select a subplate either with or without external pilot ports as required.

MOUNTING HARDWARE: Socket head cap screws are required for proper clearance of valve body.

MOUNTING SEAL KITS: Each kit includes 5 subplate-to-valve O-rings and 2 pilot hole O-rings.

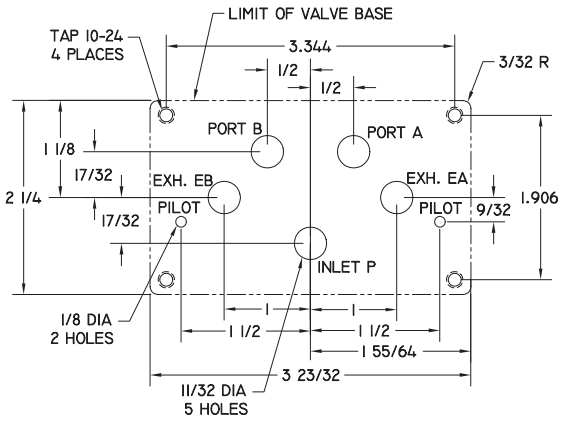
Subplate No.	Port O-rings	Pilot 0-rings	Socket Head Cap Screw	Mounting Seal Kit
SP2 & SP3	1/2" I.D. x 5/8" O.D.	3/16" I.D. x 5/16" O.D.	10-24 x 7/8"	SPK-3
SP4	5/8" I.D. x 13/16" O.D.	1/8" I.D. x 1/4" O.D.	1/4"-20 x 2"	SPK-4
SP6 & SP8	1-1/8"I.D. x 1-3/8"O.D.	3/8" I.D. x 9/16" O.D.	5/16"-18 x 2-1/4"	SPK-8
SP12 & SP16	1-3/4" I.D. x 2" O.D.	3/8" I.D. x 9/16" O.D.	1/2"-13 x 3-3/4"	SPK-16

CUSTOM SUBPLATE DIMENSIONS

1/4" & 3/8"SUBPLATE MOUNTED VALVES

USERS SPECIAL MANIFOLDS

When laying out valves on a manifold or on a machine, be sure to allow sufficient clearance between valves for pilot connections, if any and space for removing solenoid covers for wiring.



MOUNTING PATTERN — 1/4" & 3/8" VALVES

SUBPLATE-TO-VALVE PORT SEALS

O-ring seals are furnished with each subplate valve for sealing between valve body and subplate. Replacement O-rings, if needed, can be purchased locally. Any material, such as Buna-N, which is compatible with air line lubrication can be used. Seal kits obtained from the AAA factory include these seals.

Subplate No.	O-ring for Replacement	Qnty
SP2 & SP3	1/2" I.D. x 5/8" O.D.	5

PILOT PORT SEALS

Pilot O-ring seals are furnished with each subplate valve for sealing between valve body and subplate.

Subplate No.	O-ring for Replacement	Qnty
SP2 & SP3	3/16" I.D. x 5/16" O.D.	2

SCREWS TO MOUNT VALVES ON SUBPLATES

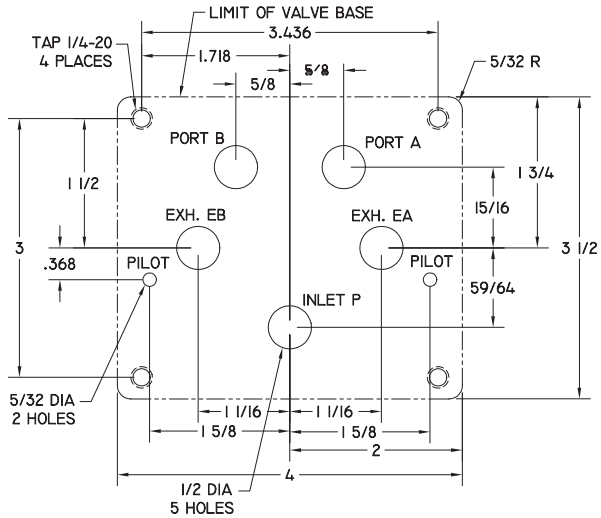
Mounting screws for attaching valves to subplate are normally furnished with each valve. If replacements are necessary, these can be obtained from the local industrial distributor in the following sizes.

Subplate No.	Thread	Length	Qnty
SP2 & SP3	10-24	7/8"	4

1/2" SUBPLATE MOUNTED VALVE

USERS SPECIAL MANIFOLDS

When laying out valves on a manifold or on a machine, be sure to allow sufficient clearance between valves for pilot connections, if any and space for removing solenoid covers for wiring.



MOUNTING PATTERN — 1/2" VALVES

SUBPLATE-TO-VALVE PORT SEALS

O-ring seals are furnished with each subplate valve for sealing between valve body and subplate. Replacement O-rings, if needed, can be purchased locally. Any material, such as Buna-N, which is compatible with air line lubrication can be used. Seal kits obtained from the AAA factory include these seals.

Subplate No.	O-ring for Replacement	Qnty
SP4	5/8" I.D. x 13/16" O.D.	5

PILOT PORT SEALS

Pilot O-ring seals are furnished with each subplate valve for sealing between valve body and subplate.

Subplate No.	O-ring for Replacement	Qnty
SP4	1/8" I.D. x 1/4" O.D.	2

SCREWS TO MOUNT VALVES ON SUBPLATES

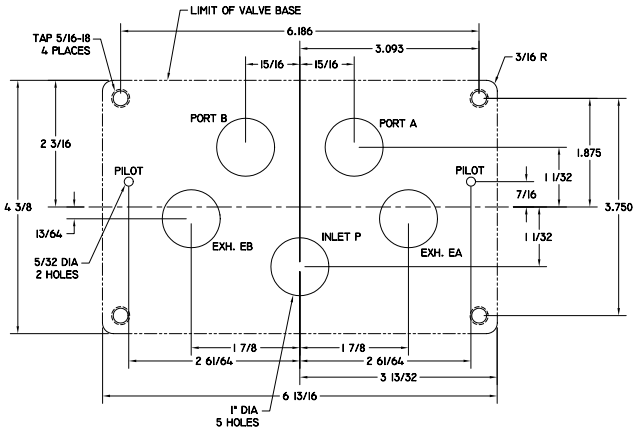
Mounting screws for attaching valves to subplate are normally furnished with each valve. If replacements are necessary, these can be obtained from the local industrial distributor in the following sizes.

Subplate No.	Thread	Length	Qnty
SP4	1/4"-20	2"	4

3/4" & 1" SUBPLATE MOUNTED VALVES

USERS SPECIAL MANIFOLDS

When laying out valves on a manifold or on a machine, be sure to allow sufficient clearance between valves for pilot connections, if any and space for removing solenoid covers for wiring.



MOUNTING PATTERN — 3/4" & 1" VALVES

SUBPLATE-TO-VALVE PORT SEALS

O-ring seals are furnished with each subplate valve for sealing between valve body and subplate. Replacement O-rings, if needed, can be purchased locally. Any material, such as Buna-N, which is compatible with air line lubrication can be used. Seal kits obtained from the AAA factory include these seals.

Subplate No.	O-ring for Replacement	Qnty
SP6 & SP8	1-1/8" I.D. x 1-3/8" O.D.	5

PILOT PORT SEALS

Pilot O-ring seals are furnished with each subplate valve for sealing between valve body and subplate.

Subplate No.	O-ring for Replacement	Qnty
SP6 & SP8	3/8" I.D. x 9/16" O.D.	2

SCREWS TO MOUNT VALVES ON SUBPLATES

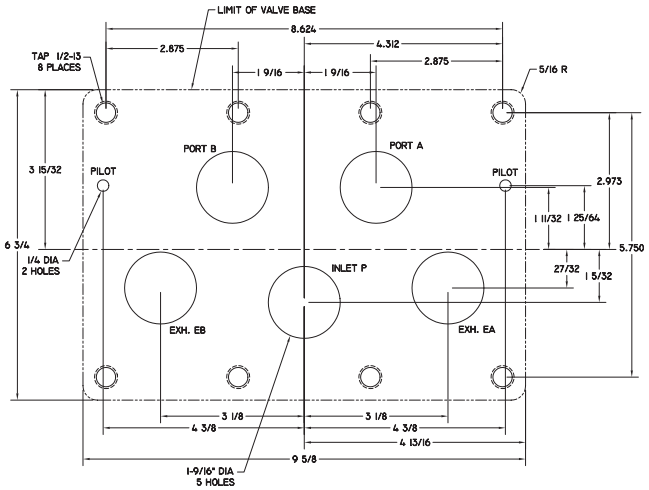
Mounting screws for attaching valves to subplate are normally furnished with each valve. If replacements are necessary, these can be obtained from the local industrial distributor in the following sizes.

Subplate No.	Thread	Length	Qnty
SP6 & SP8	5/16"-18	2-1/4"	4

1-1/2" & 2" SUBPLATE MOUNTED VALVES

USERS SPECIAL MANIFOLDS

When laying out valves on a manifold or on a machine, be sure to allow sufficient clearance between valves for pilot connections, if any and space for removing solenoid covers for wiring.



MOUNTING PATTERN — 1-1/2" & 2" VALVES

SUBPLATE-TO-VALVE PORT SEALS

O-ring seals are furnished with each subplate valve for sealing between valve body and subplate. Replacement O-rings, if needed, can be purchased locally. Any material, such as Buna-N, which is compatible with air line lubrication can be used. Seal kits obtained from the AAA factory include these seals.

Subplate No.	O-ring for Replacement	Qnty
SP12 & SP16	1-3/4" I.D. x 2" O.D.	5

PILOT PORT SEALS

Pilot O-ring seals are furnished with each subplate valve for sealing between valve body and subplate.

Subplate No.	O-ring for Replacement	Qnty
SP12 & SP16	3/8" I.D. x 9/16" O.D.	2

SCREWS TO MOUNT VALVES ON SUBPLATES

Mounting screws for attaching valves to subplate are normally furnished with each valve. If replacements are necessary, these can be obtained from the local industrial distributor in the following sizes.

Subplate No.	Thread	Length	Qnty
SP12 & SP16	1/2"-13	3-3/4"	8

TYPE SM - STACKING MANIFOLD

BOLT-TOGETHER SUBPLATES

For 3/8" Subplate-Type Valves - Body style 3P

These are individual subplates which can be bolted together to make a mounting surface (Or manifold) for any number of 3/8" individual subplate mounting valves. Inlet pressure and exhaust connections are made to port holes on the side or bottom of end plates and manifolded through to all subplates. Cylinder and pilot ports come out the bottom of each subplate.

Note: On long stacks, inlet and exhaust lines can be connected to both ends of stack to reduce internal flow resistance.

SM2. Subplate for valve mounting, with 1/4" NPTF bottom cylinder ports and 1/8" NPTF pilot ports. Includes screws and section O-ring seals.

SM3. Same as SM2 except with 3/8" NPTF bottom cylinder ports.

SMSC-4. End plate with 1/2" NPTF pressure and exhaust port holes coming out the side.

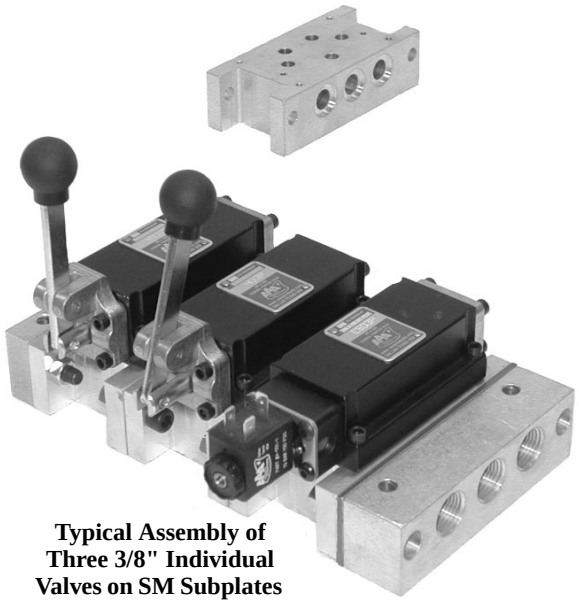
SMBC-4. End plate with 1/2" NPTF pressure and exhaust port holes coming out the bottom.

SMBE-3. Blind end plate. To cover either end of subplate assembly or can be used between subplates to separate pressure or media.

SMOS. Spacer. One must be used per assembly to support O-ring seals between first subplate and end plate.

BP3-C. Blanking plate with hardware. To cover a section when a valve is removed from the assembly and maintain the use of the assembly. Comes with mounting screws and O-rings to seal the section.

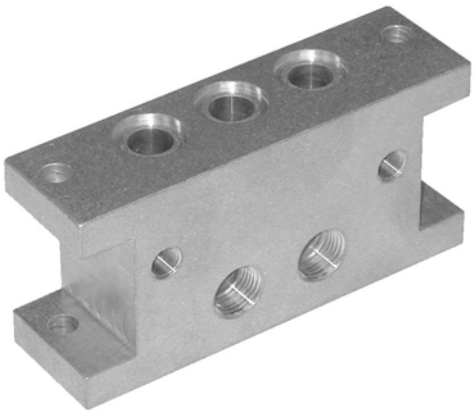
SM Subplate



Typical Assembly of Three 3/8" Individual Valves on SM Subplates with End Plates.

ASSEMBLY - The subplates are assembled using standard 5/16"-18 x 1-1/4" socket head cap screws, lock washers and nuts. Each SM2 or SM3 manifold includes hardware and seals for mounting manifolds together. Mounting hardware for assembling each subplate valve to the manifold is included with each subplate valve. You can use standard 5/8" I.D. x 13/16" O.D. Buna-N, 70 Durometer, O-rings between subplates, spacer plates or end plates. These O-rings can be ordered from AAA Products as part number V-110.

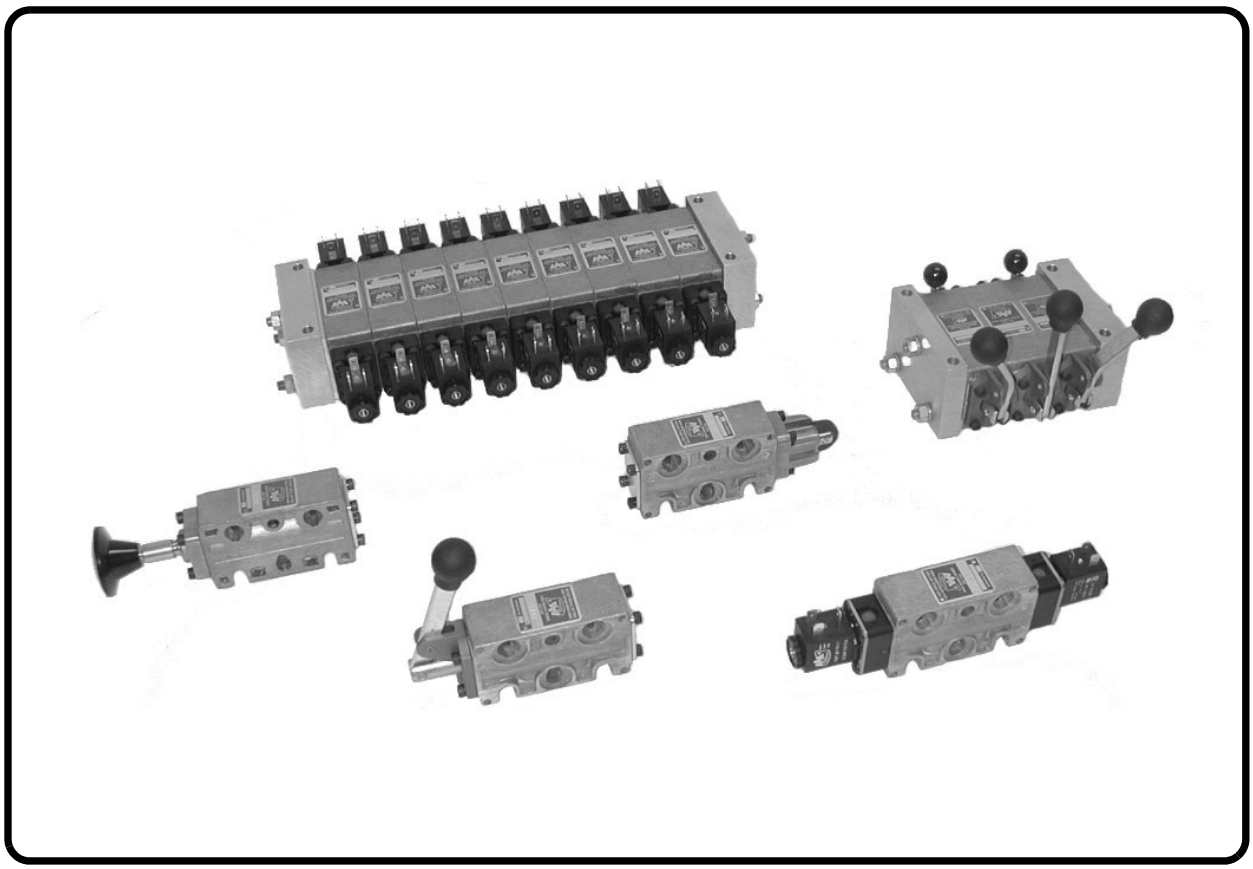
In the above right picture, the assembly would be as follows: starting at the rear of the stack, you use a SMBE-3 blind end plate, 3 V-110 O-rings seals (included with SMBE-3), SM2 or SM3 bottom ported subplate, 3 V-110 O-ring seals (included with SM2 or SM3), Bolt to SMBE-3 with included hardware. Continue assembling the desired number of subplates with O-rings between subplates, bolting each new subplate to the previous subplate. Finally, place a SMOS spacer with 3 V-110 O-rings between the spacer and the last subplate. Use included hardware to attach SMSC-4 side ported end plate with 3 V-110 O-rings between the end plate and the spacer. Choose the desired 3/8" subplate valves. (See pages 10 through 76 and pages 96 through 113; use body style 3P. Piston valves on pages 86 through 95 can not be used with stacking manifolds.) and mount them on the desired station using the hardware and O-rings included with each subplate valve.



SM3 subplate showing 3/8" NPTF cylinder ports and 1/8" NPTF pilot ports located on the bottom of the subplate.

“B-SERIES” STACK VALVES

1/4" AND 3/8" SIZES — 4-WAY ACTION — VACUUM TO 250 PSI



PART NUMBER STRUCTURE:

Part 1: The basic part number of an AAA stack valve is fairly simple to understand. The first part (a) is an operator style and part (b) is valve operation. This combination of these parts describes not only how the valve shifts positions but also what shifts the spool.

Part 2: The second portion is the valve port size. This portion describes whether the valve is a threaded side ported body or a bottom bored subplate body.

Part 3: The third part of the part number structure is the spool configuration. Normally only needed on three position valves, the spool configuration defines the flow at center position. You can have a spool other than the standard “Closed Center” on two position valves; however, the transitional flow is normally not needed for most applications.

Part 4: The fourth part is the solenoid operator style. AAA valves can have several different coils and operator types. Leaving this position blank will use the common standard coil.

Part 5: The fifth position of the part number structure is used to specify valve options. You can specify different solenoid vents, locking overrides or assembled for “External Pilot” operation by choosing options available for the valve configuration you need.

Part 6: The final position allows you to specify different O-rings used in the main valve body. You choose the O-ring most suited for your application. This specification applies to the body O-rings and not the solenoid or any additional seal materials. On most applications that require special seals, the valve must be configured for “External Pilot”.

BDO3G -5-120/60 (Voltage: e.g. 120/60, 24 vdc)

1a Operator Style

Code	Description
EBS	Solenoid
BS	"Classic" solenoid
BH	Manual lever
BK	Manual palm button
BC	Cam roller
BR	Remote pilot
BD	Differential pilot

1b Valve Operation

Code	Description
O	2-Position, spring return
R	2-Position, remote pilot return
S	2-Position, solenoid return
Y	3-Position, spring centered
E	2-Position, friction positioned*
D	3-Position, detent positioned*

*Only on BH and BK models

2 Port Style

Side Ported

2 = 1/4" NPTF
3 = 3/8" NPTF

3 Spool Configuration (Normally on 3-position valves, 2-position valves use a closed center spool)

blank = Closed center, all ports are blocked in the center position.
D = Regenerative center, ports 2 & 4 are connectect to port 1, ports 3 & 5 are blocked.
G = Float center, port 2 is connected to port 3, port 4 is connected to port 5, port 1 is blocked.

4 Solenoid Operator Form (If applicable)

blank = Available solenoids depends on operator style.
Refer to standard solenoids or "Classic" solenoids.

5 Valve Options

blank = No options selected.
Refer to each valve section for common options.
Most options that are available on our standard 1/4" and 3/8" soft seal valves are available on "B-Series" stack valves.

6 Valve O-Ring Option (Only applies to valve body O-Rings)

blank = Viton for port styles 2, 3 & 3P, Buna-N for port styles 4, 6, 8, 12, 4P, 8P &16P.
-1 = Neoprene for freon (-40°F to 225°F).
-2 = Silicon (-80°F to 400°F).
-3 = Viton for most aromatic gases (-20°F to 400°F, 600°F for short time).
-4 = Butyl Rubber (-60°F to 200°F).
-5 = Teflon (-250°F to 450°F).
-7 = Urethane, 70 Durometer (-65°F to 200°F).
-9 = Buna-N (-40°F to 250°F).

GENERAL INFORMATION

1/4" AND 3/8" SIZES — 4-WAY ACTION — VACUUM TO 250 PSI

Note: Most actuators can be mounted on either end of valve section. Sections can be arranged in any order. Inlet and exhaust ports can be on either end of the stack (See page 9 on how to order reversed operators).

The "B-Series" stack valve consists of individual sections sandwiched between two end plates, the stack being held together with three tie bolts. Sections, listed on page 122 through page 139, are available with a variety of actuators.

Pressure and exhaust connections are 1/2" NPTF on both the 1/4" and 3/8" sizes. They come in through threaded port holes on one end plate and are manifolded through to all sections. Cylinder connections come out threaded port holes, 1/4" or 3/8" NPTF, in the side of each section. On special orders the stack can be turned with all cylinder port holes facing up.

RATINGS

Valve bodies are rated for vacuum or compressed air up to 250 PSI. Not recommended for liquids. Solenoid sections are rated 50 PSI to 150 PSI for spring centered and spring return models, 25 PSI to 150 PSI for others. Higher or lower pressures can be handled by supplying external pilot pressure to each solenoid actuator.

Flow capacity is the same for 1/4" or 3/8" sizes. Only the cylinder port size is different. Capacity is sufficient to operate air cylinders up to 3" bore at normal speeds and larger cylinders at reduced speeds. Cylinder speeds can be controlled with flow control valves installed in cylinder lines.

HOW TO ORDER STACK VALVES

Individual parts can be ordered for user assembly or stacks can be assembled at the factory at no extra charge. When facing actuator side of stack, specify each section starting at the left side, BHO2, EBSO2, etc. One ported end plate PEP-4, one blank end plate BEP-4 and one BOS-4 spacer required for every stack. Ported end plate can be assembled on either end of stack. Specify left or right end. Tie rod kits and additional spacer plates will be added as necessary.

ASSEMBLING IN YOUR PLANT

Place all sections side by side in any desired order. On adjacent solenoid sections a spacer plate may be required (See spacer and end plate section). Place a threaded end plate PEP-4 on one end (Either end) and a blank end plate BEP-4 on the other end. Place a BOS-4 spacer on one end of the stack (Depending on which way the sections are turned), to support O-rings (See page 139 for typical configuration). You may also use two PEP-4 threaded end plates and one BOS-4 spacer plate to supply pilot pressure to both ends of the stack. This is usually used on stacks of 10 or more valves or in high flow applications.

Cut 3 tie rods to length from 5/16"-18 all-thread steel rod. Allow 1-5/16" for each valve section, 1" for PEP-4 threaded end plate, 5/8" for BEP-4 blank end plate, 1/8" for BOS-4 spacer and 3/4" for 2 washers and nuts.

Threaded tie rods can be purchased locally or is available in 18" and 36" length tie rod kits from the factory.

CYLINDER PORTS

Normal assembly is with cylinder ports down and nameplate up, with cylinder connections through a cut-out in the mounting surface. However, on special order, the stack can be assembled with all cylinder ports up (On solenoid valves, the manual override will remain on the name tag side.)

If override access is required from cylinder port side, valves must be ordered with OOK (Override Orientation Kit). One kit per solenoid is required except on EBSY models which requires only one kit. This kit will add 3/8" to overall length of valve per solenoid. These kits can be ordered separately and installed in the field or pre-assembled on original factory orders. Models EBSY can not be converted in the field to reorient the solenoid assembly and still be internally piloted.

Actuators are normally assembled as shown in the illustrations on page 122 through page 139. However, most actuators can be mounted on opposite end of valve body. Take off actuator and end cap and reverse their positions. **Note:** On manual lever, spring centered models, the lever must be removed before the end cap with attached spool can be pulled out. Remove lever by pressing out hinge pin. Check gasket orientation before disassembling valve and verify proper orientation during reassembly.

The handle of any section can be pointed up or down by removing 4 mounting screws, rotating the handle 180° and re-mounting.

SPACER AND END PLATES

PEP-4: End plate, 1" thick, with 1/2" NPTF threaded inlet and exhaust ports. Includes 3 O-ring seals.

BEP-4: Blank end plate 5/8" thick with 3 O-ring seals.

BOS-4: 1/8" spacer with 3 holes. Used between an end plate and adjacent section to support O-rings. One required on each stack.

PS-4: 5/16" spacer plate with 3 holes. Used between two adjacent solenoid valves when using explosion proof solenoids shown on page 127 or "Classic" solenoids shown on page 130 (Except "Classic" explosion proof - see XPS-4).

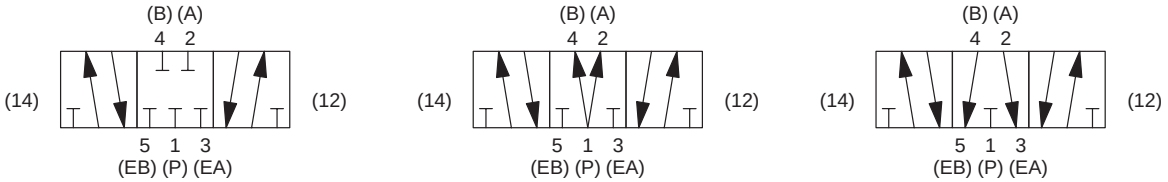
XPS-4: 1/2" spacer plate with 3 holes. Used between two adjacent solenoid valves when using "Classic" explosion proof solenoids shown on page 132 (On BSO3X not EBSO3X).

REPLACEMENT SEAL KIT

BRKV-3MP: One kit required for each valve section. Includes six V-39 Viton body O-rings, three V-110 Buna-N section O-ring seals, two EMG3 Buna-N solenoid gaskets and two ECG3 composition end cap gaskets.

VGK-3: AAA valve grease to lubricate body O-rings during valve overhaul (Each seal repair kit does supply enough grease for complete seal replacement).

SPOOL CONFIGURATION (FOR 3-POSITION VALVES):



"Standard" Closed Center Spool | "D" Regenerative Spool | "G" Float Center Spool

STANDARD: Most valves are supplied with a "Closed Center" spool. In the center position, all ports are blocked. If a valve is only a 2-position valve, the actual function of the center position is not critical. So most 2-position valves are "Closed Center". Some designs do require softer transitions, so we offer alternate spool configurations on 2-position valves.

REGENERATIVE: Spool Option "D". In the center position or during transition, ports 2 and 4 are connected to port 1. We call this a "Regenerative" spool since both cylinder ports 2 and 4 are supplied with pressure and flow from port 1.

FLOAT CENTER: Spool Option "G". In the center position or during transition, port 2 is connected to port 3 and port 4 is connected to port 5. We call this a "Float Center" spool since both standard cylinder ports 2 and 4 are vented to an exhaust port and no pressure or flow from port 1 is supplied.

OPTIONAL O-RING MATERIALS:

Unless otherwise specified stack valves come standard with Viton O-rings. If a different material is required, use the dash numbers following the basic valve numbering code. In the example, model EBSY3G-2, will have Silicon O-rings installed for a low temperature application. On valves larger than 1", consult factory on availability of O-ring materials.

Dash No.	O-ring Description	Temperature Rating
-1	Neoprene for freon	-40°F to 225°F
-2	Silicon	-80°F to 400°F
-3	Viton for most aromatic gases	-20°F to 400°F, 600°F for short time
-4	Butyl Rubber	-60°F to 200°F
-5	Teflon	-250°F to 450°F
-7	Urethane, 70 Durometer	-65°F to 200°F
-9	Buna-N	-40°F to 250°F

We are constantly researching O-ring materials to evaluate performance and durability in the AAA valve product line. Above is a compilation of the most commonly requested O-ring materials and the associated dash number. If you have a particular application that requires an O-ring material that is not listed, please contact us. Since we utilize standard O-ring dimensions in our valves, we can respond to the most obscure O-ring material request.

Note: On standard solenoid model valves, the solenoid operator plunger seat is Viton. On "Classic" solenoid model valves, the solenoid operator plunger seat is Buna-N. Solenoid operators must be externally piloted when using gases not compatible with seal material. Consult factory for special plunger seat material.

STANDARD TEMPERATURE RANGE:

Unless otherwise stated in the valve description, solenoids operators normally require lower ambient temperatures.

Operating temperature is dependent upon the seal materials used. The following are temperatures for standard valves:

1/4" and 3/8"valves use Viton O-rings: -20°F to 400°F, 600°F for short time.

Caution: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

AIR FLOW RATINGS:

RATED FLOW. Flow factor tests were made with the valve outlet vented to atmosphere and flow in the sonic region. The average flow factor was calculated from tests over a range of inlet pressures. The factor was then used to calculate expected flow at 100 PSIG. Reference page 100 for additional information on air flow ratings.

Rated Flow

Body Style	2	3
Port Size	1/4"	3/8"
SCFM Flow	73.9	97.1
Cv Factor	1.6	2.4

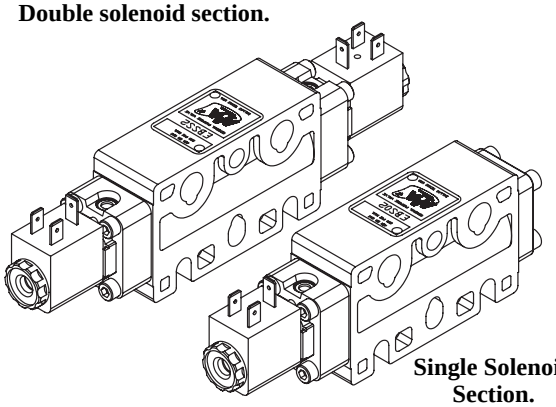
SCFM flow in the table was calculated for 100 PSIG (114.7 PSIA) inlet pressure. At other inlet pressures, SCFM flow will be in proportion to PSIA inlet pressure.

Example: Size 2 at 80 PSIG (94.7 PSIA) inlet pressure.
Ratio of 94.7 to 114.7 is 94.7 ÷ 114.7 = 0.826
Flow at 80 PSIG = 0.826 x 73.9 = 61.0 SCFM.

SOLENOID CONTROLLED, PILOT OPERATED AIR VALVES

SECTIONS FOR “B-SERIES” STACK VALVE ASSEMBLIES — 4-WAY 1/4" AND 3/8" SIZES — VACUUM TO 250 PSI

Double solenoid section.



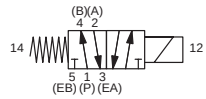
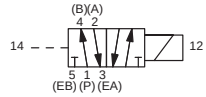
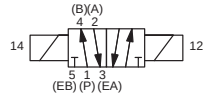
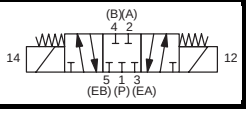
Single Solenoid Section.

PRESSURE RATING: Standard solenoid sections are assembled for “Internal Pilot” operation using end mount solenoids. Shifting pressure is obtained from the main body through holes drilled from the body into the solenoid base. **Caution**! Inlet pressure on standard solenoid operators must not exceed 150 PSI.

Models EBSR and EBSS (No internal springs) will shift reliably on a minimum line pressure of 25 PSI. Spring return (EBSO) and spring centered (EBSY) should not be operated on a line pressure less than 50 PSI.

Solenoid sections may be used on vacuum or on pressure below the above limits or up to 250 PSI, by ordering them with Option “Z” or converting them in the field to “External Pilot” operation, provided the pilot pressure is in the range of 50 PSI to 150 PSI. The external pilot pressure must be connected to the external pilot port on each solenoid base.

Select basic model (See page 121 for optional spools).

MODEL NUMBER Threaded body 1/4" NPTF	MODEL NUMBER Threaded body 3/8" NPTF	DESCRIPTION	SYMBOL
EBSO2	**EBSO3**	Single solenoid, 2-position, spring return. Spool returns to original position when solenoid is de-energized.	
EBSR2	**EBSR3**	Single solenoid, 2-position, pilot pressure returned spool. Pilot pressure from an external 3-way valve returns spool to its original position.	
EBSS2	**EBSS3**	Double solenoid, 2-position, no springs. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized.	
EBSY2	**EBSY3**	Double solenoid, 3-position, spring centered, closed center spool. All ports are blocked when both solenoids are de-energized (See page 121 for other spools).	

FLOW PATTERN:

When a solenoid is energized, this will cause air to flow from the pressure inlet out the cylinder port which is closest to the solenoid which is energized. The opposite solenoid, if applicable, must be un-energized.

“EXTERNAL PILOT” OPERATION:

To order a standard solenoid section factory assembled for “External Pilot” operation, add suffix “Z” following the regular model number (E.g. EBSO2Z 120/60 **manual override is facing down**).

CONVERSION TO “EXTERNAL PILOT” OPERATION:

This valve can be converted to “External Pilot” operation in the field by rotating the entire solenoid assembly 180°. **Manual override will be facing opposite the nameplate.**

To orient the override on the same side as the nameplate and still be externally piloted, you must use kit EPOOK (External Pilot Override Orientation Kit). It takes one kit per solenoid. On models EBSY, only one kit is required (Spring centered assembly is rotated instead of the solenoid assembly). This kit will add 1/8" to overall length of valve per solenoid. This kit can be ordered separately and installed in the field or pre-assembled on original factory orders.

SOLENOID OPERATOR FORMS:

STANDARD SOLENOID OPERATOR INFORMATION

The standard coils are a DIN 43650 style with 11mm/Industrial Form B connector pin pattern. DIN caps are ordered as a separate line item.*Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
24 volts, 60 Hz	7.1 VA	5.8 VA	31.6 ohms
48 volts, 60 Hz	7.7 VA	6.2 VA	121 ohms
120 volts, 60 Hz	7.8 VA	6.3 VA	840 ohms
240 volts, 60 Hz	7.8 VA	6.3 VA	3400 ohms
12 volts D-C		4.6 Watts	31.6 ohms
24 volts D-C		4.8 Watts	121 ohms
60 volts D-C		4.3 Watts	840 ohms

DIN Caps (11mm style): Various styles of DIN caps are available as lose items, see below for more information.

Environmental Ratings: (With mounted plug-in connector per IEC 529) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both a UL and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

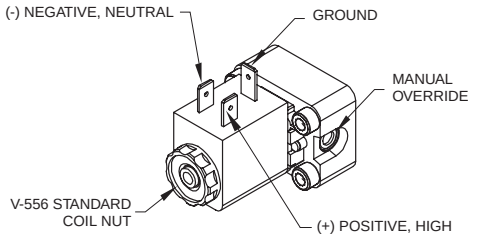
Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

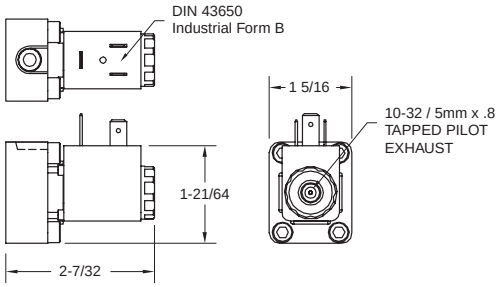
Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR. For locking overrides, see valve option "O" on page 128.



Solenoid Terminal Definitions



Standard Solenoid Operator

OPTIONAL DIN CAPS FOR STANDARD COILS

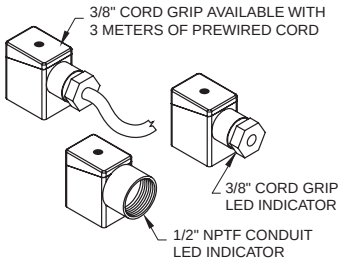
DIN caps are not supplied with standard solenoid valves. These caps must be ordered separately. Below are the DIN caps commonly used.

There are several styles of DIN caps. When ordering LED Indicator types, you must specify voltage of solenoid coil (E.g. DCL-120/60). All caps listed in table are for 11mm/Industrial Form B coils, consult factory for additional forms available. LED Indicator type caps are equipped with varistor surge protection (Diode surge protection available upon request).

Environmental Rating: IP 65

Model No.	Style	LED	Model No.	Style	LED
DCC	**1/2" Conduit**	**no**	**DCCL**	**1/2" Conduit**	**yes**
DCG	**3/8" Grip**	**no**	**DCGL**	**3/8" Grip**	**yes**
DC3M*	**3 Meter Cord**	**no**	**DC3ML***	**3 Meter Cord**	**yes**

*Consult factory for other lengths of cord.



DIN Cap Styles

OPERATOR STYLE A: INTRINSICALLY SAFE SOLENOID COIL

When related to solenoid valves, intrinsic safety means that the coil's current draw and resulting temperature is held to such a low level (When used with an approved safety barrier) that the valve no longer has the capability of igniting a mixture of flammable or combustible material, either during normal operation or under fault conditions.

Typically, they are used in situations where fire and explosive hazards exist due to the presence of flammable gases, vapors or liquids, combustible dusts or easily ignitable fibers.

These 24 VDC coils are approved according to EN 50 020 resp. DIN VDE 0170/0171 part 5. This coil is an ISO 4400 DIN style pin pattern. A non-indicator, cord grip style DIN cap provided.

To order solenoid valves with this coil type, use the suffix “A” (E.g. ESO2A). Intrinsically safe coils can not be placed on our standard solenoid assembly. This coil must be used with the proper operator and intrinsically safe barrier to function correctly. DIN caps are provided.

Electrical Characteristics: 21.6 - 28 VDC.

Max. Safe Valve: 28 VDC, 115 mA, 1.6W.

Electrical Characteristics: 37mA, 275 ohms ± 8%.

Environmental Ratings: (With mounted plug-in connector per IEC 529) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both FM and CSA approval rating. The rating only applies to the operator and not the entire valve.

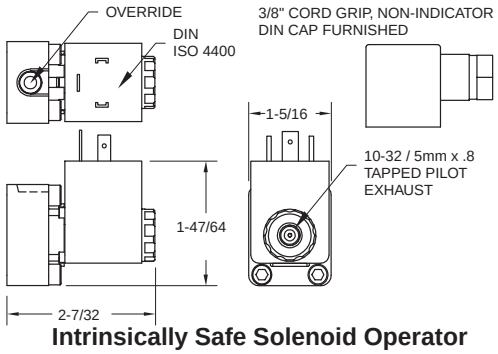
Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

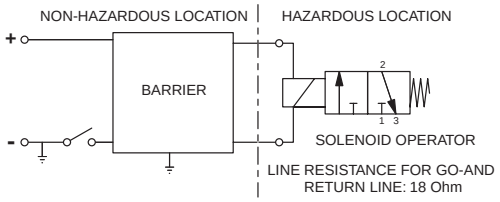
Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.



Intrinsically Safe Solenoid Operator



Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

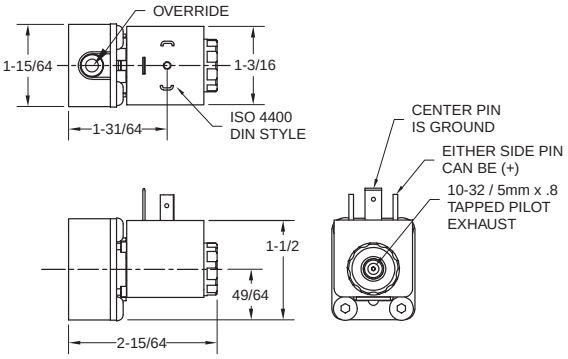
Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR. For locking overrides, see valve option “O” on page 128.

OPERATOR STYLE H: 30MM COIL, HIGH TEMPERATURE COIL

30MM coils have same characteristics and performance as our standard coils, but have a ISO 4400 connector pin pattern. DIN caps are ordered as a separate line item. This coil is capable of higher temperatures than the other coils. To order solenoid valves with this coil type, use the suffix "H" (E.g. ESO2H 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
120 volts, 60 Hz	56 mA	34 mA	800 ohms
240 volts, 60 Hz	27 mA	17 mA	3205 ohms
12 volts D-C		218 mA	55 ohms
24 volts D-C		111 mA	216 ohms



High Temperature Solenoid Operator

DIN Caps (ISO 4400 style): Various styles of DIN caps are available as lose items, see below for more information.

Environmental Ratings: (With mounted plug-in connector) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both UL and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 190°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

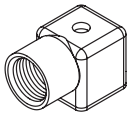
Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR. For locking overrides, see valve option "O" on page 128.

OPTIONAL DIN CAPS FOR 30MM COILS

DIN caps are not supplied with standard solenoid valves. These caps must be ordered separately. Below are the DIN caps commonly used.

There are several styles of DIN caps. When ordering LED Indicator types, you must specify voltage of solenoid coil (E.g. EDCL-120/60). All caps listed in table are for "ISO 4400", consult factory for additional forms available. LED Indicator type caps are equipped with varistor surge protection (Diode surge protection available upon request).

Environmental Rating: IP 65


EDC Cap

Model No.	Style	LED	Model No.	Style	LED
EDC	1/2" Conduit	no	EDCL	1/2" Conduit	yes

OPERATOR STYLE J: MOLD-OVER COIL

“Mold-Over” coils have same characteristics and performance as our standard coils, but have a molded 1/2"-14 NPT connection with 18" leads that are wired through the 1/2"-14 NPT connection. To order solenoid valves with this coil type, use the suffix “J” (E.g. ESO2J 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
24 volts, 60 Hz	7.1 VA	5.8 VA	31.6 ohms
48 volts, 60 Hz	7.7 VA	6.2 VA	121 ohms
120 volts, 60 Hz	7.8 VA	6.3 VA	840 ohms
240 volts, 60 Hz	7.8 VA	6.3 VA	3400 ohms
12 volts D-C		4.6 Watts	31.6 ohms
24 volts D-C		4.8 Watts	121 ohms
60 volts D-C		4.3 Watts	840 ohms

Environmental Ratings: (With proper 1/2" NPT connection) IP 65 (NEMA 4 without structural rating).

Voltage Tolerance: ±10%.

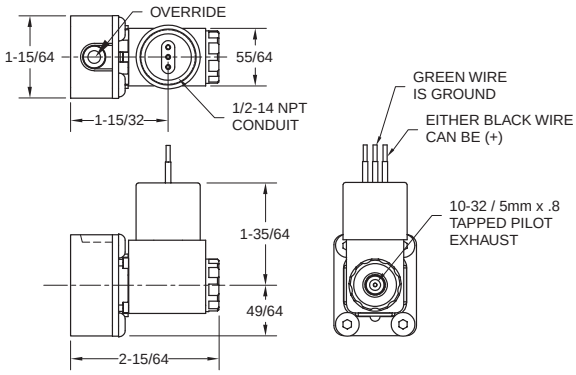
Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.



1/2" Conduit Solenoid Operator

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR. For locking overrides, see valve option “O” on page 128.

OPERATOR STYE M: FLYING LEAD SOLENOID COIL

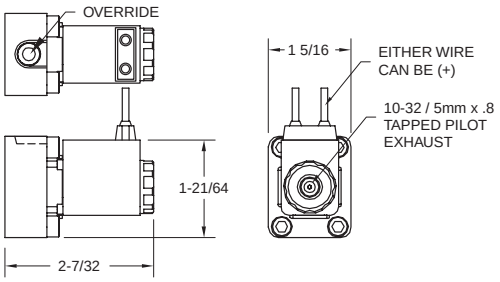
“Flying Lead” coils have same characteristics and performance as our standard coils, but have 18" lead wires molded with the coil. To order solenoid valves with this coil type, use the suffix “M” (E.g. EBSO2M 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
24 volts, 60 Hz	7.1 VA	5.8 VA	31.6 ohms
48 volts, 60 Hz	7.7 VA	6.2 VA	121 ohms
120 volts, 60 Hz	7.8 VA	6.3 VA	840 ohms
240 volts, 60 Hz	7.8 VA	6.3 VA	3400 ohms
12 volts D-C		4.6 Watts	31.6 ohms
24 volts D-C		4.8 Watts	121 ohms
60 volts D-C		4.3 Watts	840 ohms

Environmental Ratings: IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both UL and CSA approval rating. The rating only applies to the operator and not the entire valve.



Flying Lead Solenoid Operator

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Stan-

dard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR models. For locking overrides, see valve option “O” on page 128.

OPERATOR STYLE X: EXPLOSION PROOF SOLENOID COIL

All “Explosion Proof” solenoid operators carry the FM and CSA label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts). The connection is 1/2"-14 NPT conduit with 24" leads. **Note:** The FM and CSA label on an explosion proof solenoid operator covers only the electrical operator and does not cover the complete valve. To order solenoid valves with “Explosion Proof” operators, add suffix “X” to the basic part number (E.g. ESO2X 120/60). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
120 volts, 60 Hz	11.5 VA	6.5 VA	530 ohms
12 volts D-C		4.5 Watts	31.6 ohms
24 volts D-C		4.5 Watts	121 ohms

Environmental Ratings: (With proper 1/2" NPT connection) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both FM and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

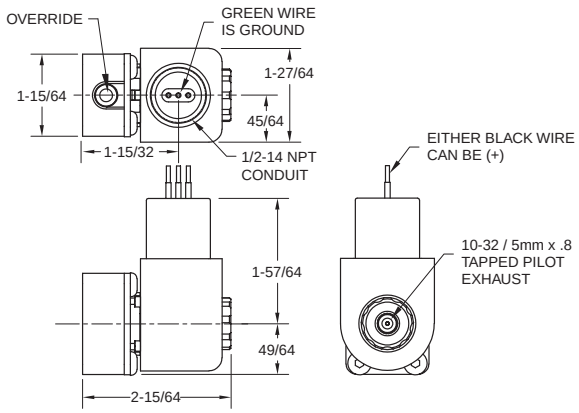
Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.



Explosion Proof Solenoid Operator

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR. For locking overrides, see valve option “O” on page 128.

Adjacent Mounting Concern: When using this coil on adjacent solenoid valves in a stack arrangement, you must use PS-4 plate between the valves for clearance (See page 120 for information on spacer plates).

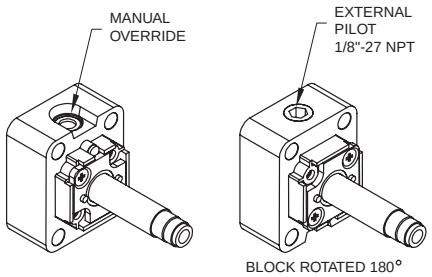
VALVE OPTIONS:

STANDARD: ALL SOLENOID FORMS PROVIDE

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust. If the valve is ordered with Option “L” or “C”, the 10-32/5mm-0.8 exhaust will be covered by the nut and unusable.

Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models EBSO and EBSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR.

Field Modification: Able to convert between internal or external solenoid pilot source in the field.



Solenoid Adapter

OPTION L: SINTERED BRONZE DUST EXCLUDER NUT

This option allows the exhaust from the solenoid assembly to be filtered through a sintered bronze element. This causes a reduction in noise and filtering of exhaust. With this option, the 10-32/5mm-0.8 tapped exhaust is inaccessible


V-567

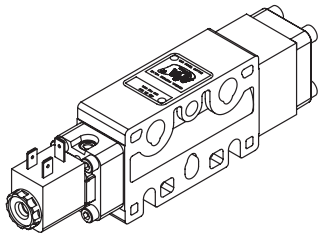
OPTION C: SIDE EXHAUST NUT

This option allows the exhaust from the solenoid assembly to be diffused. This causes a reduction in noise and diffusing of exhaust. With this option the 10-32/5mm-0.8 tapped exhaust is inaccessible.

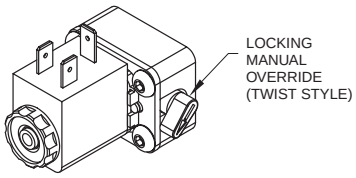

V-562

OPTION Q: 2-POSITION SPOOL DETENT

Available only on models EBSR and EBSS with body styles of 2, 3 and 3P. This option allows the spool to remain in position when shifting pressure is removed. This option is most often used in mobile applications where the vibrations may shift the spool when there is no holding pressure available. Overall length of the valve will increase by 1".



OPTION O: LOCKING MANUAL SOLENOID OVERRIDE



Locking Manual Solenoid Override

Locking Override: Solenoid structures with locking overrides are available on original factory orders. To activate manual override, the override knob must be twisted clockwise to the locked position. Spool will shift while the knob is in the override position, but will return to original position on spring models EBSO and EBSY when knob is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models EBSS and EBSR models. Converting to locking override from non-locking override in the field is not possible without replacing the entire solenoid assembly, Contact factory for details.

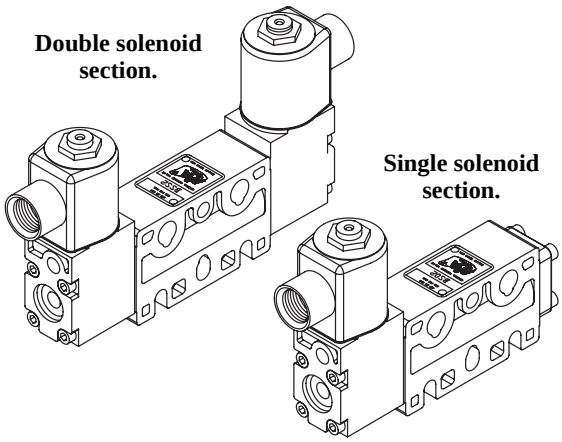
OPTION Z: “EXTERNAL PILOT” OPERATION

A valve may be ordered factory assembled for “External Pilot” operation by adding the suffix “Z” after the regular model number or converted in the field by rotating the entire solenoid assembly 180°. **Manual override will be facing opposite the nameplate.**

To orient the override on the same side as the nameplate and still be externally piloted, you must use kit EPOOK (External Pilot Override Orientation Kit). It takes one kit per solenoid. Models EBSY only one kit is required (Spring centered assembly is rotated instead of the solenoid assembly). This kit will add 1/8" to overall length of valve per solenoid. This kit can be ordered separately and installed in the field or pre-assembled on original factory orders.

“CLASSIC” SOLENOID

SECTIONS FOR “B-SERIES” STACK VALVE ASSEMBLIES — 4-WAY 1/4" AND 3/8" SIZES — VACUUM TO 250 PSI

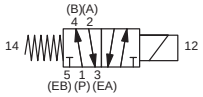
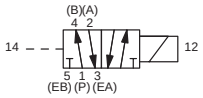
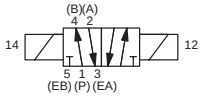
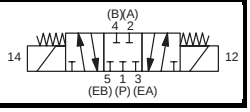


PRESSURE RATING. Standard solenoid sections are assembled for “Internal Pilot” operation using end mount solenoids. Shifting pressure is obtained from the main body through holes drilled from the body into the solenoid base. **Caution!** Inlet pressure on standard solenoid operators must not exceed 160 PSI.

Models EBSR and EBSS (No internal springs) will shift reliably on a minimum line pressure of 25 PSI. Spring return (EBSO) and spring centered (EBSY) should not be operated on a line pressure less than 50 PSI.

Solenoid sections may be used on vacuum or on pressure below the above limits or up to 250 PSI, by ordering them with Option “Z” or converting them in the field to “External Pilot” operation, provided the pilot pressure is in the range of 50 PSI to 160 PSI. The external pilot pressure must be connected to the external pilot port on each solenoid base.

Select basic model (See page 121 for optional spools).

MODEL NUMBER Threaded body		DESCRIPTION	SYMBOL
1/4" NPTF	3/8" NPTF		
BSO2	**BSO3**	Single solenoid, 2-position, spring return. Spool returns to original position when solenoid is de-energized.	
BSR2	**BSR3**	Single solenoid, 2-position, pilot pressure returned spool. Pilot pressure from an external 3-way valve returns spool to its original position.	
BSS2	**BSS3**	Double solenoid, 2-position, no springs. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized.	
BSY2	**BSY3**	Double solenoid, 3-position, spring centered, closed center spool. All ports are blocked when both solenoids are de-energized.	

FLOW PATTERN:

When a solenoid is energized, this will cause air to flow from the pressure inlet out the cylinder port which is closest to the solenoid which is energized. The opposite solenoid, if applicable, must be un-energized.

“EXTERNAL PILOT” OPERATION:

To order a standard solenoid section factory assembled for “External Pilot” operation, add suffix “Z” following the regular model number (E.g. BSO2Z 24 vdc).

CONVERSION TO “EXTERNAL PILOT OPERATION:

This valve can be converted to “External Pilot” operation in the field. This operation must be performed on each solenoid operator. Remove the 4 screws holding the solenoid base to the body. Remove the solenoid structure and rotate the gasket 180°, then remount the solenoid structure in the same position as before. This will block the internal pressure passages. Connect the source of pilot pressure to the 1/8" NPTF connection on each solenoid base.

“CLASSIC” SOLENOID OPERATOR FORMS:

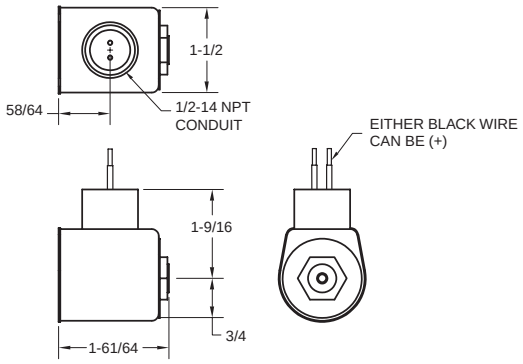
“CLASSIC” SOLENOID INFORMATION

The “Classic” coils are a 1/2" Conduit, metal housing style with 1/2" NPT connection, with 18" leads. If no optional solenoid is specified, then the “Classic” coil is used. *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
24 volts, 60 Hz	1.72 amps	1.10 amps	5.39 ohms
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	546 ohms
6 volts D-C	2.30 amps	2.30 amps	2.4 ohms
12 volts D-C	1.20 amps	1.20 amps	12.8 ohms
24 volts D-C	0.58 amps	0.58 amps	61 ohms

Environmental Ratings: NEMA 1.
Voltage Tolerance: ±10%.
Resistance Tolerance: ±8% @ 20°C.
Operating Temperatures: -4°F to 120°F.
Casing: Molded steel canister.
Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 160 PSIG).



“Classic” Solenoid Operator

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

Mounting Gasket: The gasket that mounts the solenoid stem to the adapter is Buna-N. Additional seals may connect the adapter to the valve body.

Manual Override: Manual overrides must be specified by using the valve options.

Adjacent Mounting Concern: When using this coil on adjacent solenoid valves in a stack arrangement, you must use PS-4 plate between the valves for clearance (See page 120 for information on spacer plates).

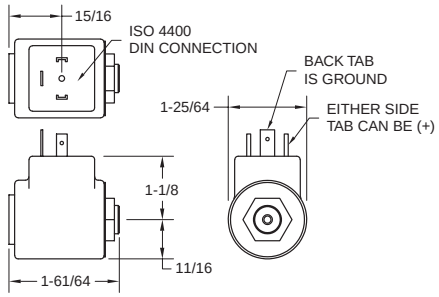
OPTION ED: “CLASSIC DIN” SOLENOID COIL

“Classic DIN” coils have same characteristics and performance as the “Classic” coils, but have an ISO 4400 connection interface. To order solenoid valves with this coil type, use the suffix “ED” (E.g. BSO2ED 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	539 ohms
12 volts D-C	1.20 amps	1.20 amps	9.6 ohms
24 volts D-C	0.58 amps	0.58 amps	38.4 ohms

Environmental Ratings: (With proper ISO 4400 DIN connection) NEMA 4 and 4X.
Voltage Tolerance: ±10%.
Resistance Tolerance: ±8% @ 20°C.
Operating Temperatures: -4°F to 120°F.
Moulding Material: Duroplast/thermoset resin (Duro).
Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 160 PSIG).



Classic Style “DIN” Solenoid Operator

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Manual Override: Manual overrides must be specified by using the valve options.

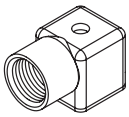
Adjacent Mounting Concern: When using this coil on adjacent solenoid valves in a stack arrangement, you must use PS-4 plate between the valves for clearance (See page 120 for information on spacer plates).

OPTIONAL DIN CAPS FOR "CLASSIC DIN" COILS

DIN caps are not supplied with "Classic DIN" solenoid valves. These caps must be ordered separately. Below are the DIN caps commonly used.

There are several styles of DIN caps. When ordering LED Indicator type, you must specify voltage of solenoid coil (E.g. EDCL-120/60). All caps listed in table are for ISO 4400, consult factory for additional forms available. LED Indicator type caps are equipped with varistor surge protection (Diode surge protection available upon request).

Environmental Rating: IP 65.



EDC Cap

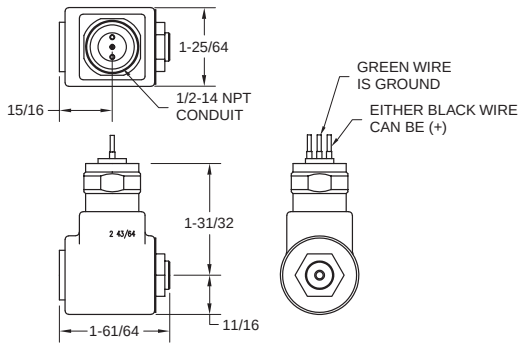
Model No.	Style	LED	Model No.	Style	LED
EDC	1/2" Conduit	no	EDCL	1/2" Conduit	yes

OPTION M: "CLASSIC MOLD-OVER" SOLENOID COIL

"Classic Mold-Over" coils have same characteristics and performance as the "Classic" coils, but have a molded 1/2"-14 NPT connection with 18" leads that are wired through the 1/2"-14 NPT connection. To order solenoid valves with this coil type, use the suffix "M" (E.g. BSO2M 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	539 ohms
12 volts D-C	1.20 amps	1.20 amps	9.6 ohms
24 volts D-C	0.58 amps	0.58 amps	38.4 ohms



Classic Style "Mold-Over" Solenoid Operator

Environmental Ratings: (With proper 1/2" NPT connection) NEMA 4 and 4X.

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 160 PSIG).

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Manual Override: Manual overrides must be specified by using the valve options.

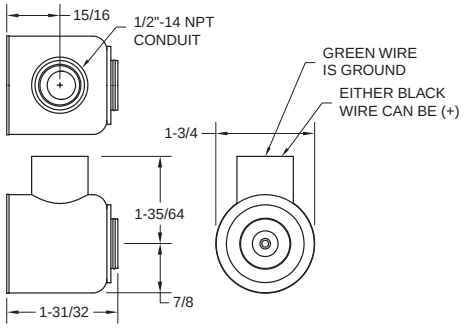
Adjacent Mounting Concern: When using this coil on adjacent solenoid valves in a stack arrangement, you must use PS-4 plate between the valves for clearance (See page 120 for information on spacer plates).

OPTION X: “CLASSIC EXPLOSION PROOF” SOLENOID COIL

All “Classic Explosion Proof” solenoid operators carry the UL label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts). The metal housing uses a 1/2"-14 NPT conduit type connection with 18" leads. **Note:** The UL and CSA label on an explosion proof solenoid operator covers only the electrical operator and does not cover the complete valve. To order solenoid valves with “Classic Explosion Proof” operators, add suffix “X” to the basic part number (E.g. BSO2X). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Inrush Current	Holding Current	Resistance
24 volts, 60 Hz	1.72 amps	1.10 amps	5.5 ohms
120 volts, 60 Hz	0.36 amps	0.23 amps	135 ohms
240 volts, 60 Hz	0.18 amps	0.12 amps	539 ohms
6 volts D-C	2.30 amps	2.30 amps	2.4 ohms
12 volts D-C	1.20 amps	1.20 amps	9.6 ohms
24 volts D-C	0.58 amps	0.58 amps	38.4 ohms



Classic Style “Explosion Proof” Solenoid Operator

Environmental Ratings: UL label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts).

Voltage Tolerance: ±10%.

Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Casing: Steel.

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 160 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 160 PSIG, below minimum pressure and for vacuum service, the valve must be configured for “External Pilot” (Between 50 PSIG and 160 PSIG).

Solenoid Seal Material: The internal gasket material is Buna-N, for both the plunger seat and override seal. Consult the factory for seals of other materials.

Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

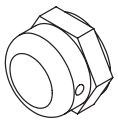
Manual Override: Manual overrides must be specified by using the valve options.

Adjacent Mounting Concern: When using this coil on adjacent “Explosion Proof” solenoid valves in a stack arrangement, you must use XPS-4 plate between the valves for clearance (See page 120 for information on spacer plates).

VALVE OPTIONS:

OPTION L: DUST EXCLUDER NUT

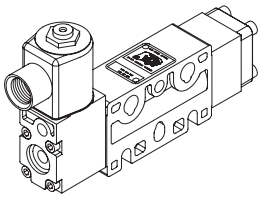
Replaces nut on end of “Classic 1/2 Conduit”, “Classic Din” and “Classic Mold-Over” solenoid coil to reduce entry of dust, water, etc. and reduce sound of exhaust air. Not available on “Classic Explosion Proof” solenoids.



FM-1 Nut

OPTION Q: 2-POSITION SPOOL DETENT

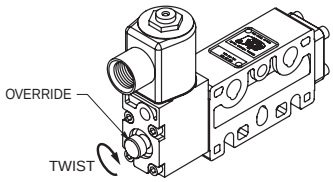
Available only on models BSR and BSS with body styles of 2, 3 and 3P. This option allows the spool to remain in position when shifting pressure is removed. This option is most often used in mobile applications where the vibrations may shift the spool when there is no holding pressure available. Overall length of the valve will increase by 1".



OPTION O: LOCKING MANUAL SOLENOID OVERRIDE TWIST STYLE

Manual override is available on any solenoid operator but is not included unless specified. In case of electrical failure in the control circuit, the valve can be shifted without electricity.

Option “O” designates the standard override as normally used on “Classic” solenoid air valves. A knurled knob, operated by hand, physically lifts the poppet off its seat. The knob can be rotated over center and will remain either in the ON or OFF position.

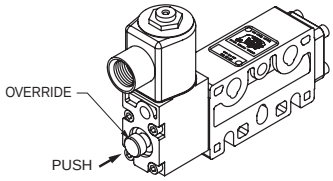


OPTION ON: NON-LOCKING MANUAL SOLENOID OVERRIDE TWIST STYLE

Option “ON” is the same override as “O” except the knob will spring back to the “OFF” position when released.

OPTION OP: NON-LOCKING MANUAL SOLENOID OVERRIDE PUSH STYLE

Option “OP” designates a push style non-locking override. When the knob is pushed in, the poppet is lifted off its seat. This shifts the internal spool and causes a change in air flow through the ports.



OPTION R: SOLENOID ROTATED 180°

The standard assembly of the solenoid block is in the up position so when the cylinder ports are facing down, the solenoid assembly is pointing up. To reverse the solenoid assembly, the valve must be ordered with Option “R”. With this option the solenoid block is assembled in the down position or assembled so the cylinder ports are facing up. Only available on original factory orders and can not be retrofitted in the field.

OPTION T: SOLENOID PIPED EXHAUST

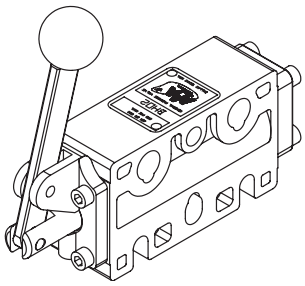
Standard solenoid operators vent pilot exhaust to atmosphere through a small un-threaded hole. A 1/8" NPTF threaded connection can be provided for those applications where the exhaust air or gas must be piped to another area. Sometimes it can be piped into the main exhaust port. To order, add suffix “T” to regular valve model number (E.g. BSO3T 24 vdc).

OPTION Z: “EXTERNAL PILOT” OPERATION

A valve may be ordered factory assembled for “External Pilot” operation by adding the suffix “Z” after the regular model number or converted in the field. To convert in the field, this operation must be performed on each solenoid operator. Remove the 4 screws holding the solenoid base to the body. Remove the solenoid structure and rotate the gasket 180°, then remount the solenoid structure in the same position as before. This will block the internal pressure passages. Connect the source of pilot pressure to the 1/8" NPTF connection on each solenoid base.

MANUAL LEVER CONTROLLED

SECTIONS FOR "B-SERIES" STACK VALVE ASSEMBLIES — 4-WAY 1/4" AND 3/8" SIZES — VACUUM TO 250 PSI



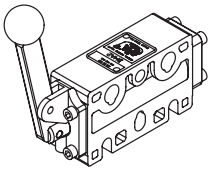
Normal position of handle on spring return model. Manual lever can he installed on opposite end (See page 120 "Cylinder Ports"). Entire stack can be turned with cylinder ports up.

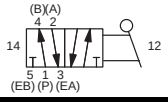
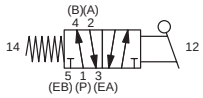
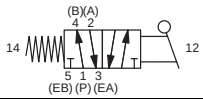
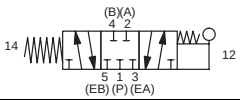
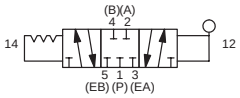
HANDLE POSITION. On 3-position models, handle is vertical in neutral position. On spring return models the handle is normally in position shown at left. On friction positioned models there is no normal position; handle moves 1-1/2" from side to side or 3/4" from center to a side position.

PRESSURE RATING. A manual lever section can be used on any pressure from vacuum to 250 PSI. Can be used as a 3-way valve by plugging the unused cylinder port.

FLOW PATTERN. When lever is pulled outward. Air flows out the cylinder port nearest the handle.

On factory order, 2-position, spring return, model can be furnished with normal handle in position "A", (Order as BHA2 or BHA3).



MODEL NUMBER Threaded body		DESCRIPTION	SYMBOL
1/4" NPTF	3/8" NPTF		
BHE2	**BHE3**	2-position, friction positioned. Spool stays in any position when handle is released.	
BHO2	**BHO3**	2-position, spring return. Handle returns to original position (See left illustration above) when handle is released.	
BHR2	**BHR3**	2-position, pilot return. Handle is returned to original position (See left illustration above) by external 3-way control valve furnished by user (25 PSI minimum).	
BHY2	**BHY3**	3-position, spring centered, closed center spool. All ports blocked when handle is released (See other spools on page 121).	
BHD2†	**BHD3†**	3-position, click detent, closed center spool. Handle stays in any one of three positions (See other spools on page 121).	

†Also available, 3-position manual valve detented in position "C", spring return to center from "A" position.

VALVE OPTIONS:

OPTION C: CURVED HANDLE

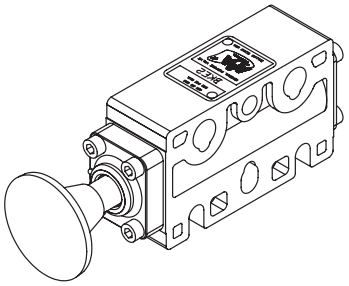
This option has a slightly curved handle to ease operator use when the valve is mounted in awkward locations. Contact the factory for custom handle curves and also unique lever mechanisms. We also have created a valve with a 3-foot long rod that is used in cattle loading and unloading.

OPTION Q: TWO POSITION DETENT

This option is available on BHD models only. Spool stays in position "A" or "C" when lever is released. This is a 2-position version of the model BHD, where there is no center position detent. Additional shifting force is required to initiate spool shifting.

PALM BUTTON CONTROLLED

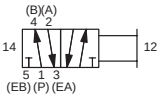
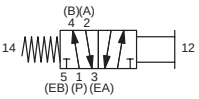
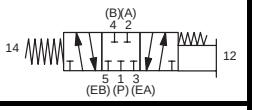
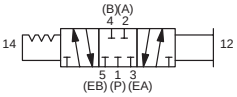
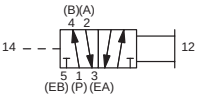
SECTIONS FOR “B-SERIES” STACK VALVE ASSEMBLIES — 4-WAY
1/4" AND 3/8" SIZES — VACUUM TO 250 PSI



PALM BUTTON SECTION. Valve is operated with a push-pull motion by a knob attached to the spool. The knob is moved 17/32" to fully shift a 2-position model or 1/4" each side of center on a 3-position model. The actuating force is about 12 lbs on spring loaded models and 5 lbs on no-spring models. Consult factory for mounting palm button valves side by side.

FLOW PATTERN. When the knob is pushed in, air flows out the cylinder port which is nearest the knob.

MOUNTING CONCERN. The knob is larger in diameter than the valve body width. Consult factory when needing to stack palm valves next to each other.

MODEL NUMBER Threaded body		DESCRIPTION	SYMBOL
1/4" NPTF	3/8" NPTF		
BKE2	**BKE3**	Palm button, 2-position, friction positioned. Spool stays in any position when knob is released.	
BKO2	**BKO3**	Palm button, 2-position, spring return. Knob returns to “Out” position (See drawing on page 139) when knob is released.	
BKY2	**BKY3**	Palm button, 3-position, spring centered, closed center spool. All ports blocked when knob is released (See other spools on page 121).	
BKD2	**BKD3**	Palm button, 3-position, click detent, closed center spool. Knob stays in any one of three positions (See other spools on page 121).	
BKR2	**BKR3**	Palm button, 2-position, pilot return. Spool is returned by external 3-way control valve furnished by user (25 PSI minimum).	

VALVE OPTIONS:

OPTION Q: TWO POSTION DETENT

This option is available on BKD models only. Spool stays in position “A” or “C” when palm button is released. This is a 2-position version of the model BKD, where there is no center position detent. Additional shifting force is required to initiate spool shifting.

OPTION R: PANEL MOUNT

Palm button models are available for panel mounting up to 1/4" thick. Use a 7/8" diameter hole in panel for mounting valve. To order, add suffix “R” to regular valve model number for this option (E.g. BKO2R).

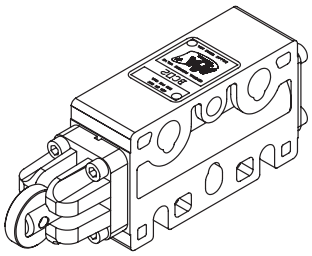
SHIFTING CHARACTERISTICS:

1/4" and 3/8": On BKO models, a minimum force of 12 lbs is required to shift the spool against the spring, with a functional spool travel of 17/32" and with an over-travel of 1/32". On BKY models, a minimum force of 12 lbs is required to shift the spool against the spring in either direction from center. Functional spool travel of 1/4" in either direction from center, with an over-travel of 1/32" on each end. On BKR models a sufficient force is required to opposing force created by the pilot return. Functional spool travel is 17/32" with an over-travel of 1/32". On BKE and BKD models, sufficient force to overcome friction and/or detents is required. Functional spool travel is similar to models described above.

Operating pressure of the valve may affect the shifting force required.

CAM ROLLER CONTROLLED

SECTIONS FOR “B-SERIES” STACK VALVE ASSEMBLIES — 4-WAY
1/4" AND 3/8" SIZES — VACUUM TO 250 PSI

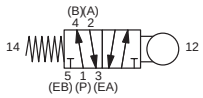
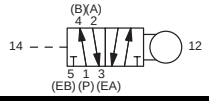


CAM OPERATED SECTION. The hardened steel roller can be actuated either by cross-moving or head-on action of a suitable cam mounted on a machine. Functional spool travel is 17/32" with an over-travel of 1/32" to prevent accidental damage to the valve body in case of incorrect adjustment of the cam. A force of 20 lbs is needed to fully shift the spool on spring return models.

Normal assembly is with the cam roller in a vertical plane as shown in the illustration. Valve may be ordered with roller horizontal or it can be re-positioned in the field.

FLOW PATTERN. When roller is pushed in, air comes out of the cylinder port which is nearest the roller.

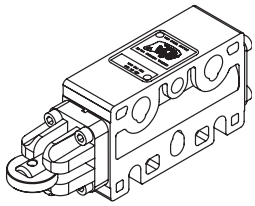
PILOT RETURN MODEL. Model BCR has its spool returned by application of pilot pressure from another valve furnished by the user. This may be a miniature 3-way valve of any type (25 PSI minimum).

MODEL NUMBER Threaded body 1/4" NPTF	MODEL NUMBER Threaded body 3/8" NPTF	DESCRIPTION	SYMBOL
BCO2	**BCO3**	Cam actuated, 2-position, spring return. Roller returns to position “Out” when released.	
BCR2	**BCR3**	Cam actuated, 2-position, pilot pressure return. Spool is returned by external 3-way control valve furnished by user (25 PSI minimum).	

VALVE OPTIONS:

OPTION R: ROTATED CAM

The standard orientation of the cam on all models is in the vertical direction. To rotate the cam, the cam pin must be removed. With the cam and pin removed, rotate the cam stud and replace the cam and pin to secure the cam in the alternate orientation. On original factory orders specifying this option, the cams will be assembled in the horizontal position.



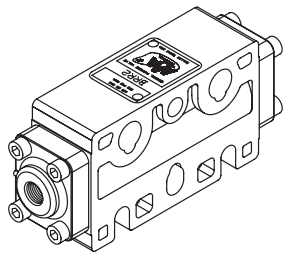
SHIFTING CHARACTERISTICS:

1/4" and 3/8": On BCO models, a minimum force of 20 lbs is required to shift the spool against the spring. On models BCR and BC”, sufficient force is required to opposing force created by the pilot return or secondary cam. Functional spool travel is 17/32" with an over-travel of 1/32" to prevent accidental damage to the valve.

Operating pressure of the valve may affect the shifting force required.

REMOTE PILOT CONTROLLED

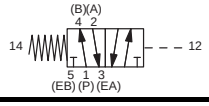
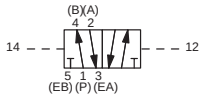
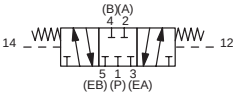
SECTIONS FOR “B-SERIES” STACK VALVE ASSEMBLIES — 4-WAY 1/4" AND 3/8" SIZES — VACUUM TO 250 PSI



PILOT OPERATED SECTIONS require a minimum of 25 PSI is required for reliable shifting of no-spring model BRR and 50 PSI for spring loaded models BRO and BRY. Pilot pressure up to 250 PSI is permissible. Pilot ports on one or both end caps are 1/8" NPTF.

FLOW PATTERN. When pilot pressure is applied, flow comes out cylinder port which is nearest the end being piloted.

REMOTE CONTROL. Pilot operated sections must be controlled with an auxiliary remote 3-way valve on each pilot. A remote solenoid or manual valve, with 3-position float center spool, is sometimes used to control both pilots.

MODEL NUMBER Threaded body		DESCRIPTION	SYMBOL
1/4" NPTF	3/8" NPTF	PILOT OPERATED SECTION	
BRO2	**BRO3**	2-position, single pilot, spring return. Spool returns to original position when pilot pressure is released.	
BRR2	**BRR3**	2-position, double pilot, no springs. Spool stays in position to which shifted when pressure on pilot(s) is vented.	
BRY2	**BRY3**	3-position, double pilot, spring centered, closed center spool. All ports are blocked when pressure is released from both pilots (See other spools on page 121).	

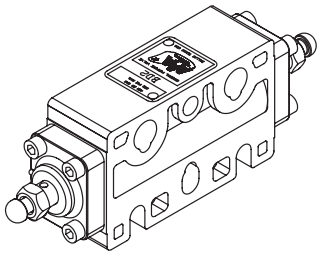
SHIFTING CHARACTERISTICS:

1/4" and 3/8": On BRO and BRY models, a minimum pressure of 50 PSI is required to shift the spool against the spring. On BRR models a minimum pressure of 25 PSI is required to shift the spool. If the return pilot is pressurized then additional pressure will be required overcome the opposing force created by the pilot return.

Operating pressure of the valve may affect the shifting force required.

DIFFERENTIAL PILOT

SECTIONS FOR “B-SERIES” STACK VALVE ASSEMBLIES — 4-WAY
1/4" AND 3/8" SIZES — VACUUM TO 250 PSI

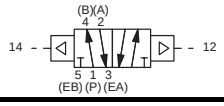
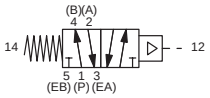
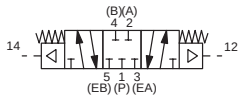


DIFFERENTIAL PILOT SECTIONS will not operate on liquids, vacuum, nor on inlet pressure less than 25 PSI. Two bleed buttons are furnished, screwed into body end caps. In a stack valve, these two buttons are usually removed and connected to body end caps with short lengths of hose for remote operation from a few feet away.

Bleed buttons supplied do not have threaded exhaust ports. For this reason, other types of 2-way N.C. miniature valves must sometimes be substituted for the bleed buttons for remote control (See more information on differential pilot operation on page 104).

FLOW PATTERN. On differential pilot sections, when a bleed button is actuated, air comes out the cylinder port farthest from the button which was actuated.

REMOTE CONTROL. Remote operation by means of bleed buttons should be limited to a distance of less than 10 feet from the valve. At greater distances, spool shifting may be slow or unreliable.

MODEL NUMBER Threaded body		DESCRIPTION	SYMBOL
1/4" NPTF	3/8" NPTF	DIFFERENTIAL PILOT SECTION	
BD2	**BD3**	2-position, differential pilot. Furnished with a button valve on both ends.	
BDO2	**BDO3**	2-position, single differential pilot, spring return. Spool returns to original position when button is pressed.	
BDY2	**BDY3**	3-position, differential pilot, spring centered, closed center spool. Spool returns to center when buttons are released (See other spools on page 121).	

SHIFTING CHARACTERISTICS:

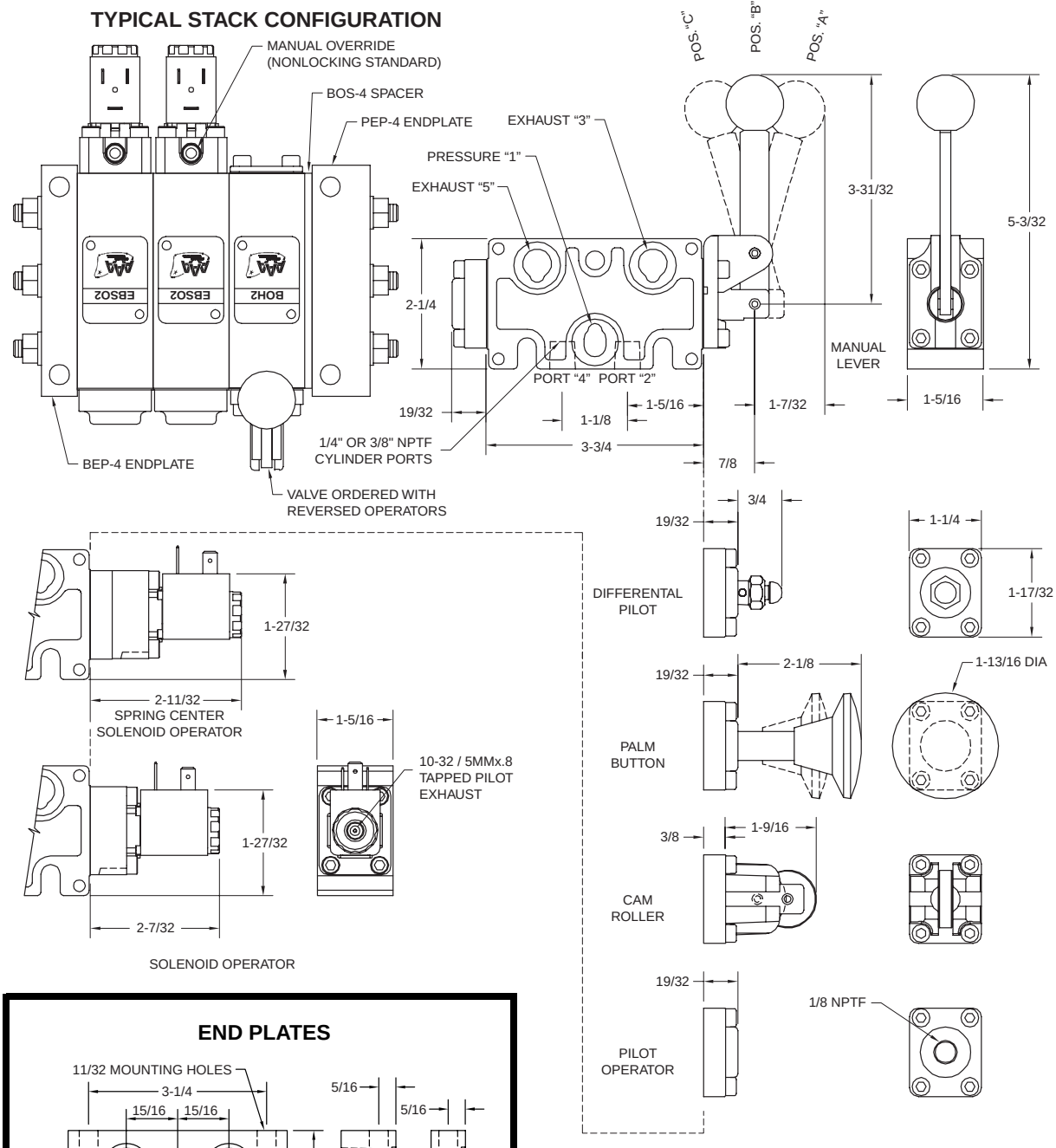
1/4" and 3/8": On BDO and BDY models a minimum pressure of 50 PSI is required to shift the spool against the spring. On BD models a minimum operating pressure is 25 PSI.

Operating pressure of the valve may affect the shifting force required.

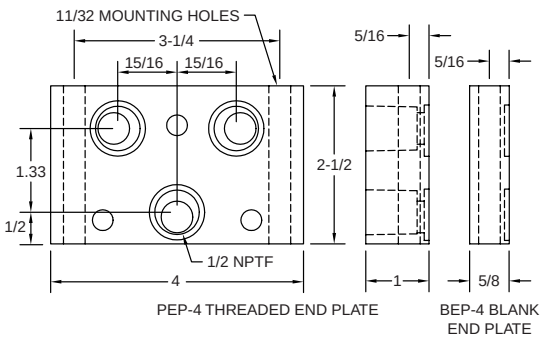
BODY DIMENSIONS - STACK VALVES

Overall dimensions are shown. If additional dimensions or a certified print is required, your distributor will obtain it for you.

TYPICAL STACK CONFIGURATION



END PLATES

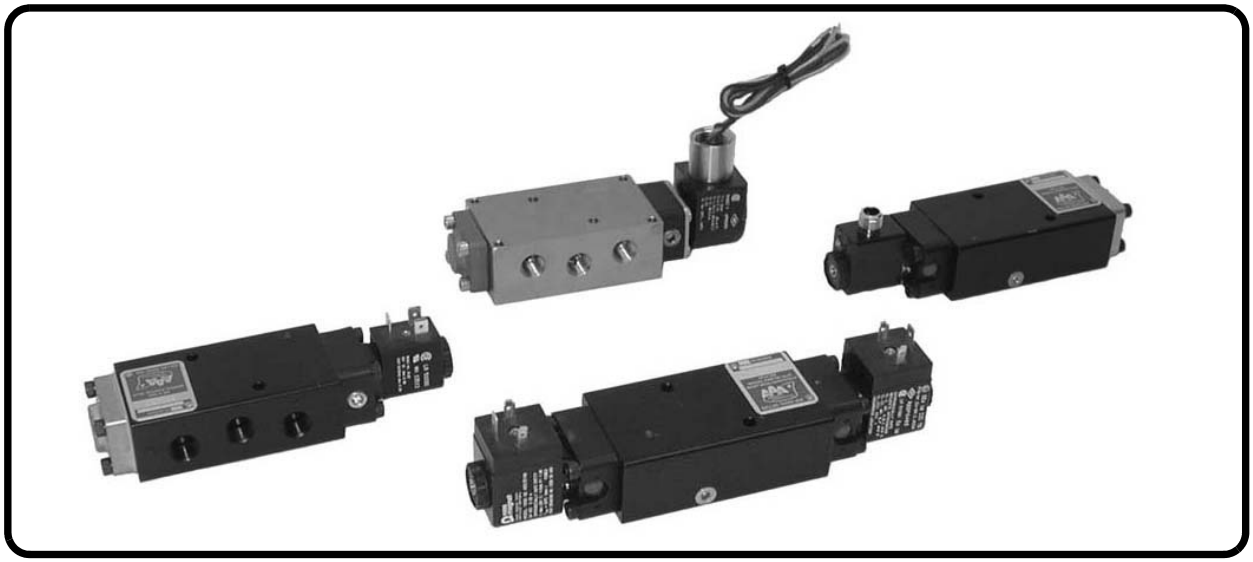


MOUNTING DIMENSIONS

Stack assemblies mount with two 5/16" bolts through each end plate to the mounting surface. Mounting bolt pattern is 3-1/4" wide x length of stack. This includes 1-5/16" for each section, plus 5/16" for each end plate, plus 1/8" for BOS-4 spacer (See page 120 for more information).

“NAMUR” DIRECT MOUNT

1/4" SIZE AIR VALVE, SOLENOID CONTROLLED, PILOT OPERATED TYPE 4-WAY
VACUUM TO 250 PSI AIR



The “Namur” mount is a semi-subplate mounting style that allows rapid valve replacement with reduced plumbing assembly.

Standard models are assembled for “Internal Pilot” operation. They will operate reliably on line pressures from 150 PSI down to 25 PSI minimum for no spring models NSS and NSR and down to 50 PSI on spring return and spring centered models NSO and NSY. External pilot operation (Option “Z”) must be used in vacuum, low pressure (Below minimum PSI), high pressure (Above 150 PSI and less than 250 PSI) or 5-Way service applications (See page 9).

SCFM @ 100 PSI: 55.8

Cv VALUE: 1.5

RESPONES TIMES: Consult Factory.

FLOW PATTERN: When solenoid on the left (Looking at the 3-hole side) is energized, air flow comes out bottom port on the left.

REVERSE OPERATORS: See page 9 for ordering valves with reversed operator, e.g. ZNOS2 instead of the standard ZNSO2.

SOLENOID INFORMATION: See pages 13 through 18 for voltages and coil styles. *Voltage must be specified when ordering.*

REPLACEMENT SEAL KIT

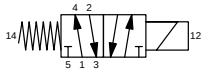
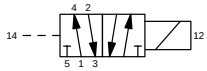
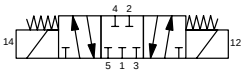
ERKV-3: One kit required for each 1/4" or 3/8" valve. Includes six V-39 Viton body O-rings, two EMG3 Buna-N solenoid gaskets, two ECG3 composition end cap gaskets, two V-565 Buna-N Namur mounting O-rings, one PBG3 gasket, one PBG3-1 gasket, five V-92 Buna-N subplate O-rings and two V-93 Buna-N subplate pilot O-rings (Seals used determined by valve model and style).

EXTERNAL PILOT OPERATION: To order a standard solenoid section factory assembled for “External Pilot” operation, add suffix “Z” following the regular model number (E.g. NSO2Z).

CONVERTING TO 3 PORT OPERATION: Standard models are assembled for 5 port operation. A valve may be converted to operate using only 3 ports. To convert, remove the 5/16"-32 plug on side of body and install same plug into threaded bottom port.

MODEL SELECTION — “NAMUR” SOLENOID VALVES

See pages 13 through 18 for solenoid information.

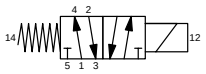
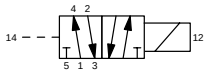
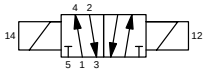
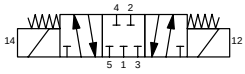
MODEL NUMBER	DESCRIPTION	SYMBOL
NSO2	Single solenoid, 2-position, spring return. Spool returns to original position when solenoid is de-energized.	
NSR2	Single solenoid, 2-position, pilot pressure returned spool. Pilot pressure (25 PSI minimum) from an external 3-way valve returns spool to its original position.	
NSS2	Double solenoid, 2-position, no springs. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized.	
NSY2	Double solenoid, 3-position, spring centered, closed center spool. All ports are blocked when both solenoids are de-energized (See page 121 for other spools).	

MARINE APPLICATIONS, CORROSIVE ENVIRONMENTS AND HAZARDOUS LOCATIONS

In response to customer requests for a "Namur" mount valve that can withstand harsh environments, we created a "Namur" body that is made of brass, and replaced all steel components with stainless steel. We also increased the height of the valve to incorporate the "Explosion Proof" solenoid coil without using an adapter plate. This valve will accommodate all standard solenoid coils listed on pages 13 through 18. To specify a different coil, replace the suffix "X" in the part number with the appropriate solenoid style or omit the suffix for the standard coil. All other characteristics, including flow, are similar to the standard "Namur" body.

MODEL SELECTION — BRASS "NAMUR" SOLENOID VALVES

See pages 13 through 18 for additional solenoid information.

MODEL NUMBER	DESCRIPTION	SYMBOL
ZNSO2X	Single solenoid, 2-position, spring return. Spool returns to original position when solenoid is de-energized.	
ZNSR2X	Single solenoid, 2-position, pilot pressure returned spool. Pilot pressure (25 PSI minimum) from an external 3-way valve returns spool to its original position.	
ZNSS2X	Double solenoid, 2-position, no springs. Spool shifts and remains shifted when one solenoid or the other is momentarily or continuously energized.	
ZNSY2X	Double solenoid, 3-position, spring centered, closed center spool. All ports are blocked when both solenoids are de-energized (See page 121 for other spools).	

OPERATOR STYLE X: EXPLOSION PROOF SOLENOID COIL

All "Explosion Proof" solenoid operators carry the FM and CSA label for Class I, Group C and D (Gasoline vapors, etc.), Class II, Groups E, F and G (Coal, coke and grain dusts). The connection is 1/2"-14 NPT conduit with 24" leads. **Note:** The FM and CSA label on an explosion proof solenoid operator covers only the electrical operator and does not cover the complete valve. To order solenoid valves with "Explosion Proof" operators, add suffix "X" to the basic part number (E.g. ZNSO2X 24 vdc). *Voltage must be specified when ordering.*

Voltages: This chart shows most common voltages. Consult the AAA factory for other voltages which may be available.

Coil Voltage and Frequency	Pick-Up	Holding	Resistance
120 volts, 60 Hz	11.5 VA	6.5 VA	530 ohms
12 volts D-C		4.5 Watts	31.6 ohms
24 volts D-C		4.5 Watts	121 ohms

Environmental Ratings: (With proper 1/2" NPT connection) IP 65 (NEMA 4 without structural rating).

Certifications: This operator carries both FM and CSA approval rating. The rating only applies to the operator and not the entire valve.

Voltage Tolerance: ±10%.

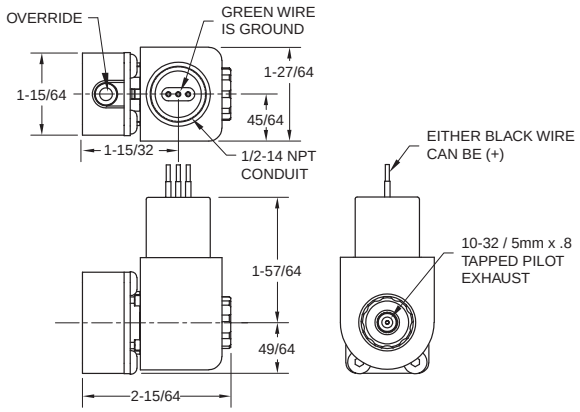
Resistance Tolerance: ±8% @ 20°C.

Operating Temperatures: -4°F to 120°F.

Moulding Material: Duroplast/thermoset resin (Duro).

Operating Pressures: 29" Hg vacuum - 250 PSIG. Standard models are assembled for "Internal Pilot" operation. They will operate reliably on line pressures from 150 PSIG down to 25 PSIG minimum for no spring models and down to 50 PSIG on spring return and spring centered models. Above 150 PSIG, below minimum pressure and for vacuum service, the valve must be configured for "External Pilot" (Between 50 PSIG and 150 PSIG).

Solenoid Seal Material: The internal gasket material is Viton, for both the plunger seat and override seal. Consult the factory for seals made of Buna-N or other materials.



Explosion Proof Solenoid Operator

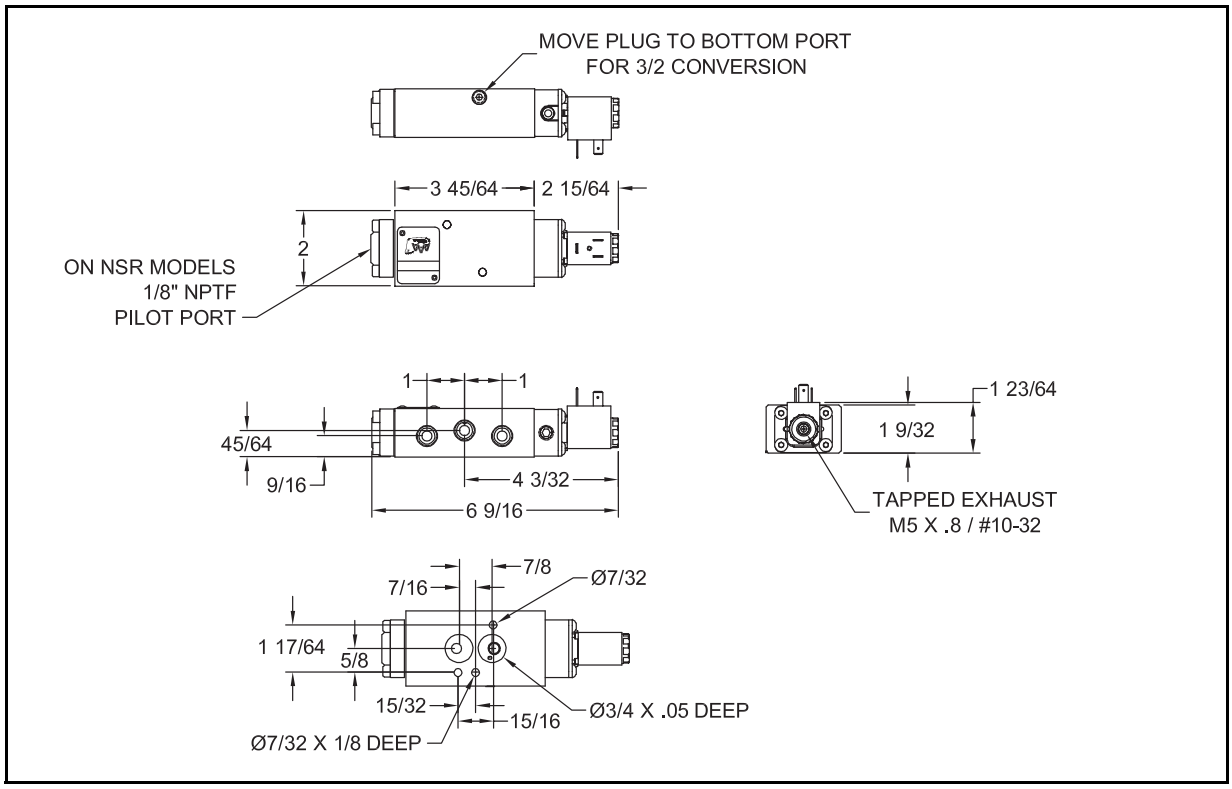
Mounting Gasket: The gasket that mounts the solenoid assembly to the valve is Buna-N.

Tapped Exhaust: Solenoid stems are tapped 10-32/5mm-0.8 for piped exhaust.

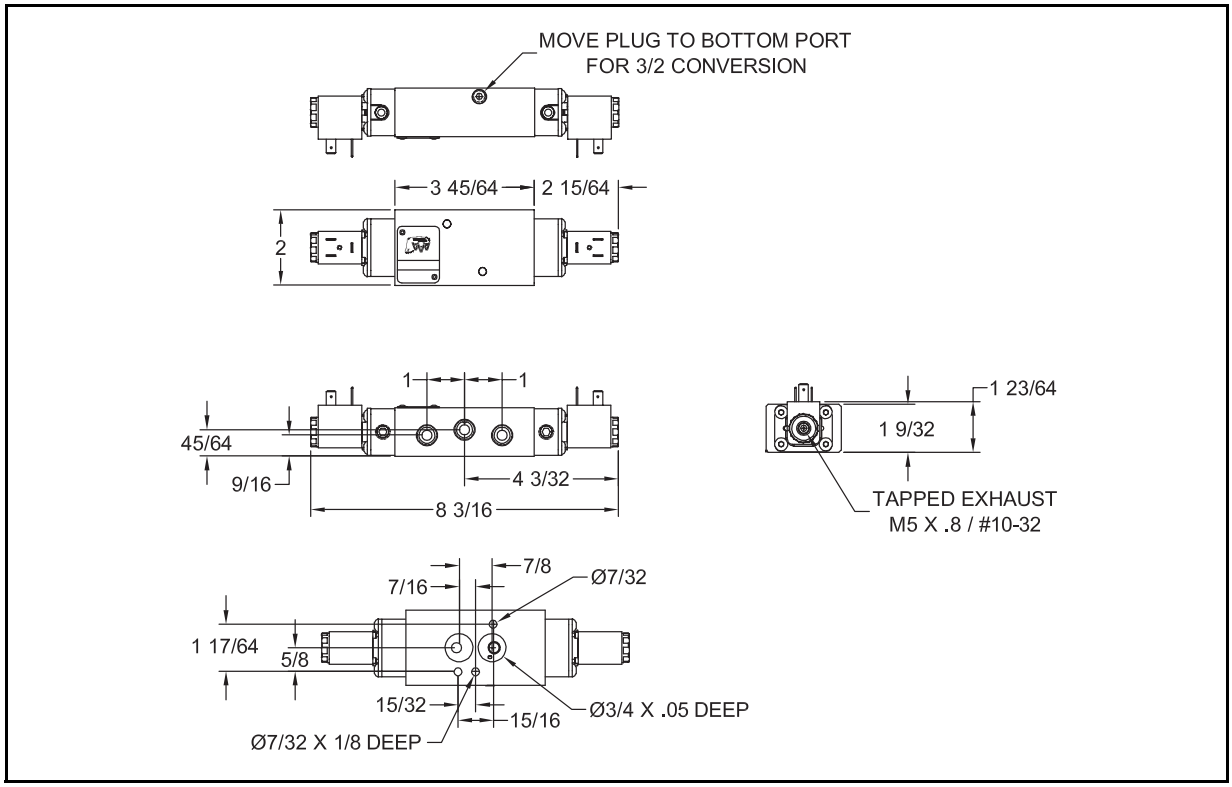
Manual Override: Solenoid structures are equipped with a non-locking manual override on the side of the solenoid structure. To activate manual override, the inset plunger must be depressed. Spool will shift while the plunger is depressed but will return to original position on spring models ZNSO and ZNSY when plunger is returned to normal (Sufficient shifting pressure and pilot source is assumed). Spool will remain shifted on springless models ZNSS and ZNSR. For locking overrides, see valve option "O" on page 20.

SEMI-DIMENSIONAL DRAWINGS:

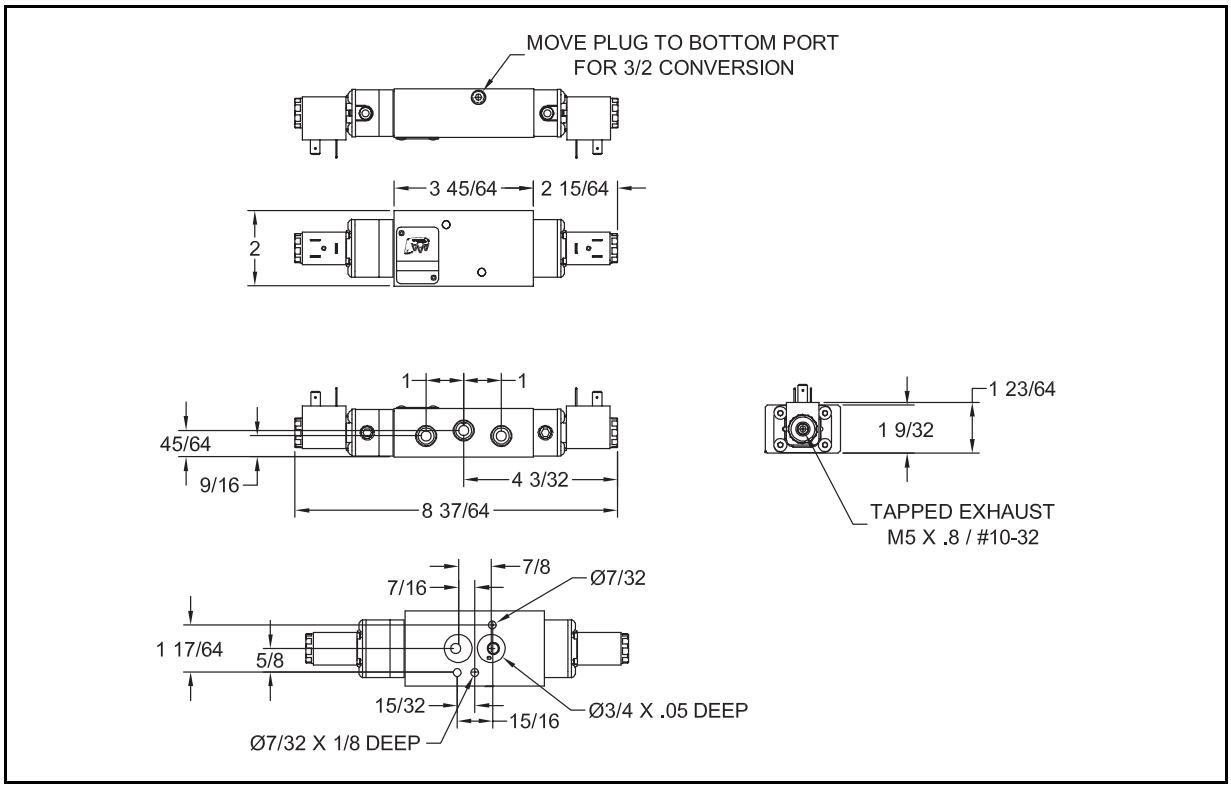
MODELS: NSO2 & NSR2



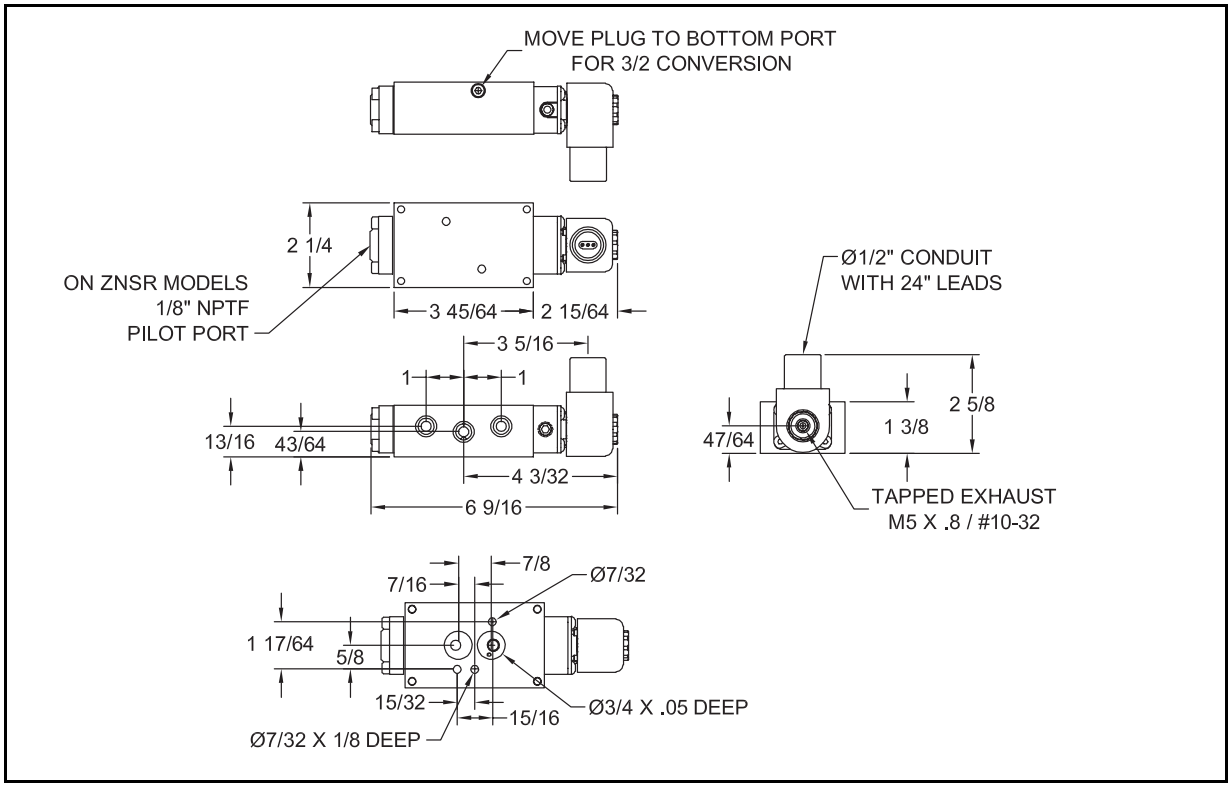
MODELS: NSS2



MODELS: NSY2

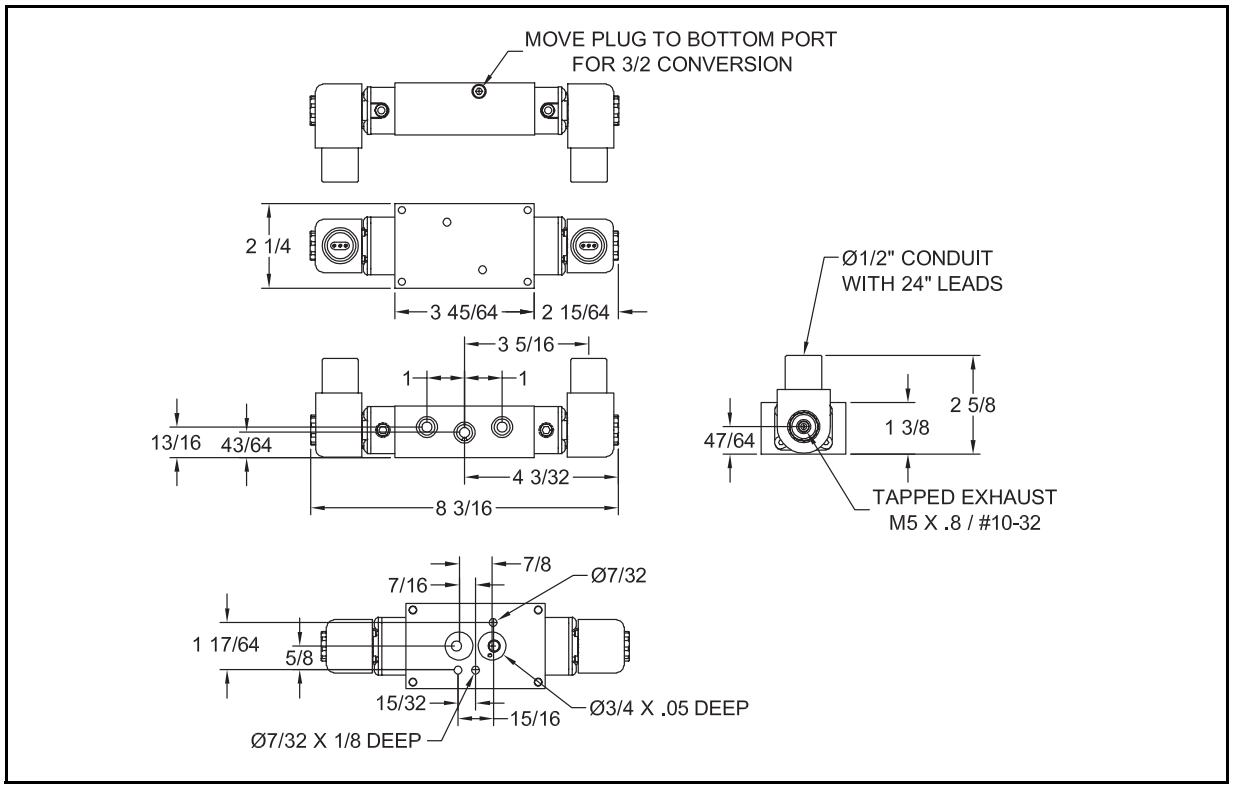


MODELS: ZNSO2X & ZNSR2X

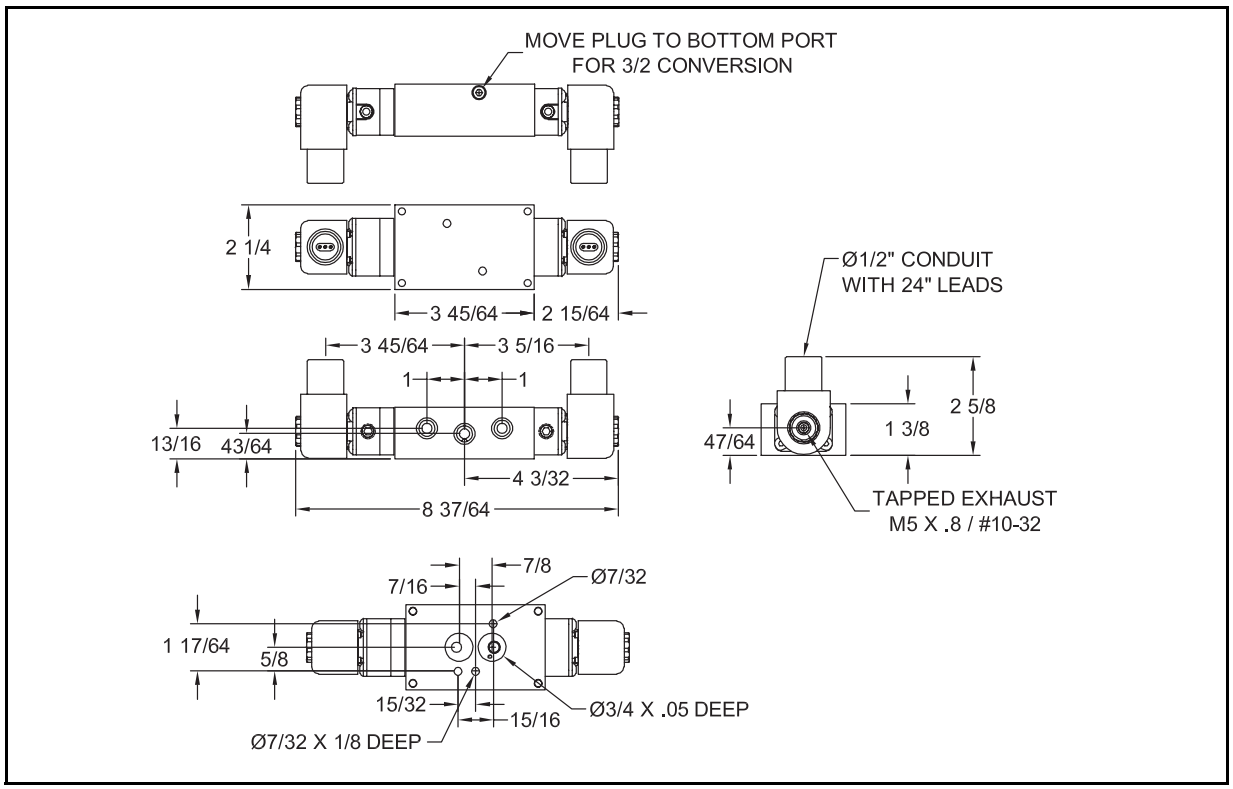


“NAMUR” DIRECT MOUNT

MODELS: ZNSS2X



MODELS: ZNSY2X

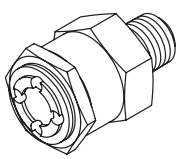


Notes:

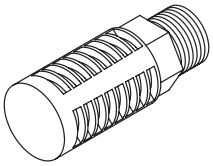
PREMIUM QUALITY - EXCEPTIONAL DELIVERY

ACCESSORIES FOR ALL AAA VALVES

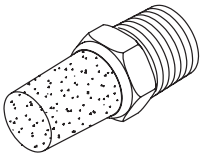
PNEUMATIC EXHAUST MUFFLERS



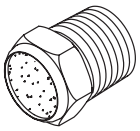
MFC Flow Control



PM Muffler



BM Muffler



BV Muffler

MODEL MFC MUFFLER/FLOW CONTROL

Adjustable needle valve with built-in noise muffler. Machined from brass bar stock. To adjust, loosen locknut, then use coin or screwdriver to adjust exhaust flow, then tighten locknut. For dual exhaust 4-way valves, one MFC flow control may be installed in each exhaust port to provide individual speed control in both directions of cylinder travel.

1/4" NPT	3/8" NPT	1/2" NPT
MFC-2	MFC-3	MFC-4

MODEL PM MUFFLER

Lightweight plastic body muffler that incorporates a fail safe tip to prevent excessive buildup of back pressure. PM mufflers use a multiple layered, wire mesh element that is impervious to solvents. This element can be removed for cleaning. Cleaning solvents should be selected as best suits for removing the collected contaminates.

1/8" NPT	1/4" NPT	3/8" NPT	1/2" NPT
PM-1	PM-2	PM-3	PM-4

MODEL BM & BV MUFFLER

BM & BV series mufflers utilize a 40 micron porous sintered bronze filter directly bonded to a brass pipe thread fitting. Sintered bronze exhaust muffler provides superior mechanical strength for any industrial environment. They are highly resistant to various chemicals and solvents, capable of high temperatures and easy to clean with various industrial cleaners and de-greasers. The BV series is a low profile breather vent style best for high shock environments. Available in stainless steel, consult factory.

1/8" NPT	1/4" NPT	3/8" NPT	1/2" NPT	3/4" NPT	1" NPT
BM-1	BM-2	BM-3	BM-4	BM-6	BM-8
BV-1	BV-2	BV-3	BV-4	BV-6	BV-8

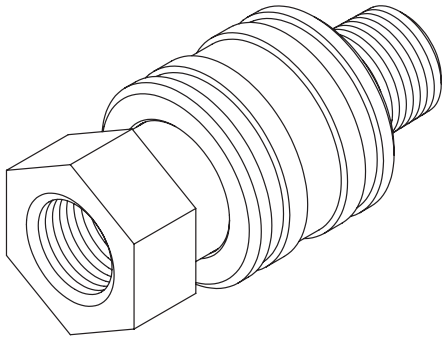
"IN-LINE" SLEEVE VALVE

3-Way — 1/4" to 1/2" — Vacuum to 175 PSI Air or Gas That Can be Vented to Atmosphere

Each "In-Line" valve has a sliding sleeve with a very short travel and can be shifted by fingertip operation. It can be installed in an air line and used, for example, to shut off the air while refilling the lubricator.

Valve will handle full flow with very little pressure loss. Machined from brass bar stock. O-ring seals give leak tight shut off.

When used as an air line shut off, trapped system air pressure is vented to atmosphere when sleeve is closed. When used as vacuum shut-off and vent, connect vacuum pump to male end.

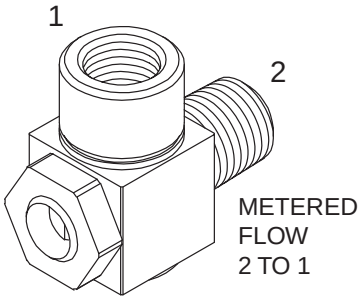


Model No.	Size, NPT	Length	Diameter
SV-2	**1/4"**	**2-1/8"**	**1"**
SV-3	**3/8"**	**2-5/8"**	**1-1/4"**
SV-4	**1/2"**	**3-9/32"**	**1-1/2"**

RIGHT ANGLE, "IN-LINE" FLOW CONTROL - Metered Out

1/4" to 1/2" — 1 to 10 BAR Operating Pressure

Flow control is installed in an air line and used to regulate the air flow. It can be located before the air valve or after. Operating temperature is 14°F to 158°F. Number of turns of adjustment screw is 8 to 10. Flow is approximately linear with the rotation of the adjustment screw.



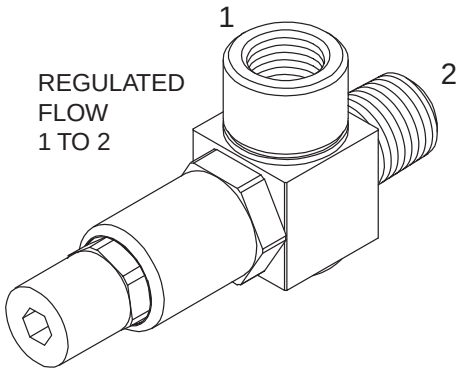
		Max. Flow		Rev. Flow*	
Model No.	Size, NPT	(SCFM)	(Cv)	(SCFM	(Cv)
FC-2	**1/4"**	**28**	**.80**	**12.0**	**.34**
FC-3	**3/8"**	**64**	**1.84**	**34.5**	**.99**
FC-4	**1/2"**	**80**	**2.32**	**50.2**	**1.45**

***Reverse flow with adjustment screw closed.**

RIGHT ANGLE, "IN-LINE" PRESSURE REDUCING VALVE

1/4" to 1/2" — 1 to 16 BAR Operating Pressure

Pressure reducing valve is installed in an air line and used to regulate the air pressure. It can be located before the air valve or after. Operating temperature is 14°F to 158°F. Number of turns of adjustment screw is 8 to 10. Pressure is approximately linear with the rotation of the adjustment screw. Non-relieving valves require line flow to activate pressure changes. As pressure is reduced, flow will also reduce. Greatest reduction starts to occurs below 60% of line pressure reduction.



Model No.	Size, NPT	Relieving	Max. Flow (SCFM)	(Cv)
PRV-2	1/4"	no	24.7	.71
PRV-3	3/8"	no	49.4	1.42
PRV-4	1/2"	no	77.7	2.24
PRVR-2	1/4"	yes	24.7	.71
PRVR-3	3/8"	yes	49.4	1.42
PRVR-4	1/2"	yes	77.7	2.24

"POWER REIN" - 1/4" ROTARY VALVE

4-WAY — Air, Oil, Water, Inert Gas - 200 PSI

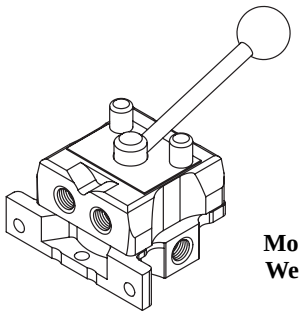
MODEL R2H. A rotary-type hand valve with lapped rotor for virtually leak tight operation. No seals to wear out. Excellent for throttling applications. Bronze body, stainless steel rotor.

Has standard 4-way action with all ports blocked in center position. Can be used as a 3-way valve by plugging the unused cylinder port. Threaded common exhaust 3/8" NPTF. Pressure and cylinder ports 1/4" NPTF. Valve will **NOT** function with exhaust port pressurized.

Universal mounting with two 1/4" screws: 2-15/16" between holes on foot or 2-19/32" between holes for flat mounting.

MODEL R2HD. A rotary-type hand valve with handle detented in all 3-positions.

MODEL R2HDQ. A rotary-type hand valve with handle detented in position "A" and position "C".



Model R2HD
Weight 3 lbs

VARIATIONS & SPECIALS

Most of the time, you can find what you need and what you want in a standard catalog. Most of the time you can even get these items at a short delivery time and within your budget.

What do you do when it is NOT in the CATALOG?

What do you do when you NEED decent DELIVERY?

What do you do when you DO NOT KNOW what to do?

CONTACT US! 214-357-3851 or info@aaaproducts.com

A catalog can only be so big and detailed. If we put all of our products and knowledge in this catalog, you would have already set it down.

Our goal is to show you the standards and hope you will call us if you don't see it here.

We specialize in rugged designs, rapid prototypes, harsh environments, internal standardization for custom applications and great service.

SPECIAL VARIATIONS AND MODIFICATIONS

AAA valves are versatile; they lend themselves to many possible modifications to suit special valving requirements. Most modifications are standard, but some modifications may require special tooling or assembly, so they are only available in production quantities. If you have a special requirement, consult the factory to see if one of the standard modifications, not involving special tooling, would be satisfactory. Contact us, you will be amazed at what we can do!

SPECIAL COATINGS AND PLATINGS

TUFRAM®:

A special surface process called TUFRAM® can be applied to all aluminum and aluminum alloy parts giving them enhanced surface properties. These properties include improved corrosion resistance, abrasion resistance, chemical resistance, moisture resistance, increased hardness, USDA-approved and FDA-approved. This process is ideal for AAA valves that are used in very harsh environments. For example, wash down areas in food processing plants that use caustic solutions for clean-up, off shore oil platforms that are subject to salt water spray, chemical processing plants or valves that must mount outdoors. Please contact us for more information on the use of TUFRAM® on your application.

Electroless Nickel Plate:

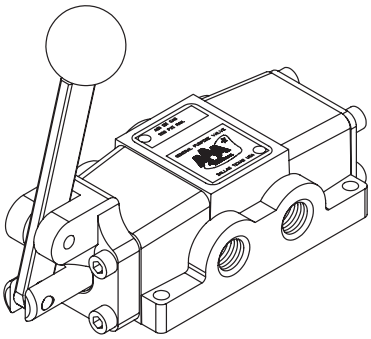
Some steel or steel alloy parts used in the construction of AAA valves can be nickel plated to enhance corrosion resistance, chemical resistance and moisture resistance. Contact us about your application and we will help determine if nickel platting would be cost effective and beneficial.

Stainless Steel:

Some parts used in the construction of AAA valves can be replaced with stainless steel to enhance corrosion resistance, chemical resistance and moisture resistance. Contact us about your application and we will help determine if this would be cost effective and beneficial.

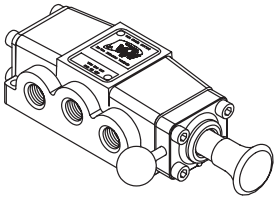
EXAMPLES OF SPECIAL VALVES MANUFACTURED TO MEET OUR CUSTOMERS NEEDS

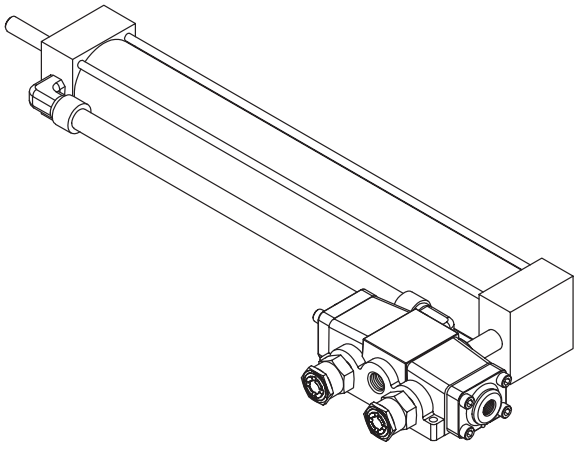
We have supplied valves in many applications where we have changed from a standard NPTF port to a SAE O-ring port. We have supplied valves with special O-rings, special solenoid override mechanisms, special solenoid coil voltages and coil leads. We have supplied more special valves than standard valves listed in this catalog. We have placed in our catalog the standard valve configurations in hopes that you will ask "Yes, but can you do-?" Consult the factory to find out.



Example 1: Customer wanted a valve that was manual lever, 3 positions and would spring to center when the handle was released from position "A", but would remain in position "C" when released from position "C". We manufactured a special stud that allowed the spool to be detented in position "C" and used a spring to return to center when released in position "A". This function is available on the 1/4", 3/8", 1/2", 3/4", 1", 1-1/2" and 2" valve sizes.

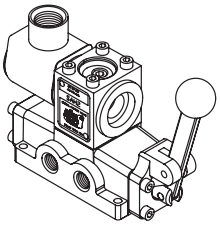
Example 2: Customer wanted a palm valve with a smaller knob, 2 position, friction position and with a pin-lock in position "C". This valve was also going to be used in a "Highway" application where the valve was going to be subjected to fine dust, rain and salt. We recommended the customer use a standard KO2E with a smaller knob and replace some internal parts that are steel to stainless steel. Also, we added internal wipers and plugs to reduce dust contamination and moisture seepage. Consult the factory or your distributor on special applications and especially where the valve must endure harsh conditions.





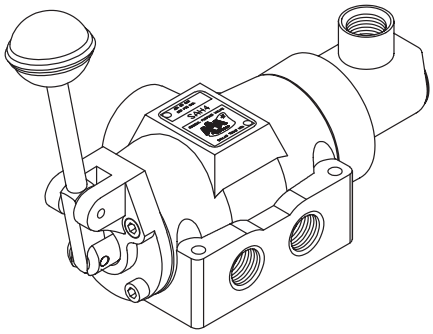
Example 3: Customer needed a solution that was compact and easily serviced with simple plumbing and mounting. We provided a cylinder valve combination that fit their application. This assembly is used in a saw mill for clamping lumber. It is a simple 2 position, spring return, pilot operated valve. When the valve receives a low pressure signal, the clamp is activated. The clamp is deactivated when the pilot signal is removed. We provide for them the entire assembly or just the valve, depending upon their needs at the time. The assembly can also use a solenoid valve when the signal needs to be electrical rather than low pressure air.

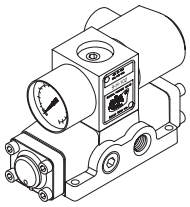
ADDITIONAL CUSTOMER VARIATIONS



Example 4: Customer wanted the “Classic” solenoid operator, 2 position valve with a manual lever override. We provided a modified SO2 and added a lever to allow the customer to override the operation of the solenoid or to shift the valve without the solenoid. This handle override is available on certain models and sizes.

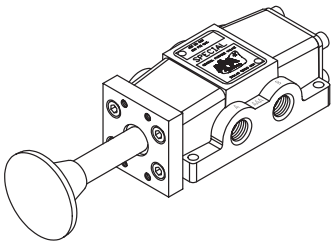
Example 5: A typical trucking application is called a “Belly Dump”. This is an application where the driver in the cab can initiate the opening of a bottom clam shell trailer by pushing a button. The operator can also regulate the opening manually by using a lever on the valve. This valve is a 2 position, spring return, solenoid operated valve with an alternate manual lever. This valve is rugged and reliable for trucking operations.





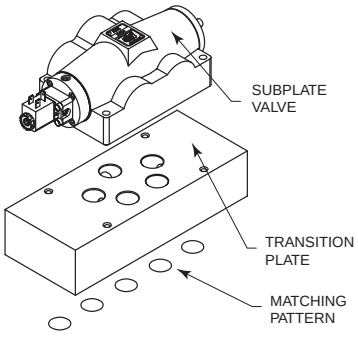
Example 6: In the designing and manufacturing of a rod threading machine, we needed to have a pressure gauge mounted in-line. We found the best solution was to mount it directly to the valve. If you have similar design problems, let us help you solve them.

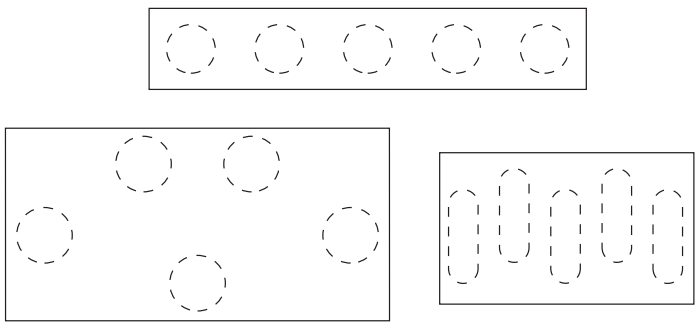
Example 8: Customer was having a problem with both quality and delivery of a valve used in a machine they used through out their manufacturing facility. The original valve was an O.E.M (Original Equipment Manufacture) product and was designed to fit their machine. We overcame their quality and delivery problems with this almost standard, off the shelf valve. We designed and manufactured a mounting plate so a standard KO2 (1/4" palm actuated, spring return) with an extended palm knob valve would match the old valve mounting and operational envelope. They no longer have a quality nor a delivery problem. Plus, they don’t need as many replacement valves on the shelf.



TRANSISTION PLATES

Another area where we can help you is in the converting of one sub plate valve mount pattern to another. We have designed and built many transition plates to accommodate either outdated valves or when the customer was not pleased with the current valve manufacturer. Below are some examples of mounting patterns that we have accommodated. We can also custom design manifolds or group assemblies.





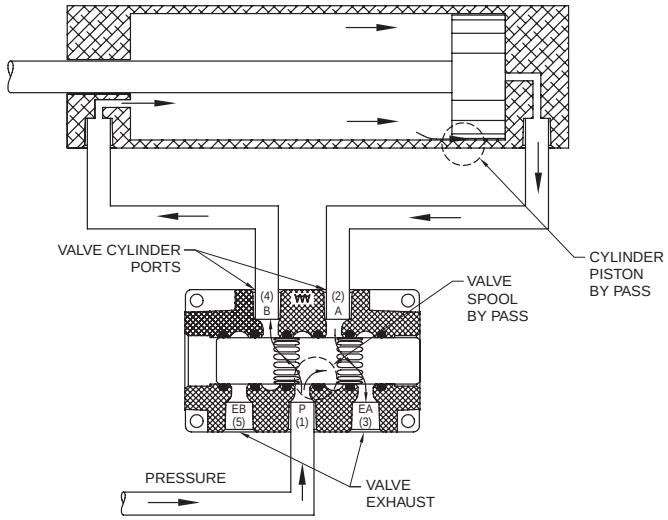
Notes:

DESIGN SECTION DATA
Cylinder and Valve Testing

On an air system, if air is detected escaping from a 4-way valve exhaust while the cylinder is stopped, this air is either blowing by worn-out piston seals or is leaking across the spool in the 4-way valve. These two by-pass paths are shown in the figure.

Most air cylinders and valves have soft seals and should be leak tight. However, those air valves having a metal-to-metal seal between spool and body may be expected to have a small amount of by-pass.

If by-pass is noted, it is more likely to be coming through the cylinder than across the valve spool and the cylinder should be tested first.



CYLINDER TESTING

Run the piston to one end of its stroke and leave it stalled in this position under pressure. Crack the fitting on the exhaust end of the cylinder to check for air by-pass. After checking, tighten the fitting and run the piston to the opposite end of the barrel and repeat the test. Occasionally a cylinder will leak at one point in its stroke due to a scratch or dent in the barrel. Check suspected positions in mid stroke by installing a positive stop at the suspected position and run the piston rod against it for testing. Once in a great while a piston seal may leak intermittently. This is usually caused by a soft packing or O-ring moving slightly or rolling into different positions on the piston and is more likely to happen on cylinders of large bore. Pistons with metal ring seals can be expected to have a small amount of by-pass across the rings and even those “leak-tight” soft seals may have a small by-pass during break-in of new seals or after seals are well worn.

4-WAY VALVE TESTING

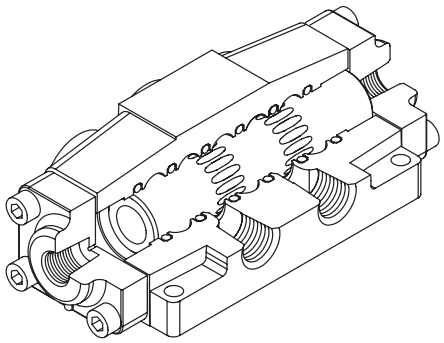
For testing 4-way valves, either air or hydraulic, it is necessary to obtain access to the exhaust or tank return ports so that the amount of by-pass can be observed. To make the test, disconnect both cylinder lines and plug these ports on the valve. Start up the system and shift the valve to one working position. Any flow out the exhausts or tank return line while the valve is under pressure is the amount of by-pass. Repeat the test in all other working positions of the valve.

INTERNALLY PILOTED SOLENOID VALVE TESTING

Standard solenoid models are assembled for “Internal Pilot” operation; that is, they derive shifting pressure for the spool from the valve inlet port. When testing an internally piloted solenoid valve, do not let air free flow through the cylinder port. This flow is normally so great, that back pressure to shift the spool can not be adequately generated. To test an internally piloted valve, either plug the cylinder port, place a muffler in the cylinder port or attach the cylinder port to a short piece of hose to generate a slight back pressure to shift the valve.

TO REPLACE O-rings

Use a sharp tool such as a pick or scribe to remove the old O-rings. Use an air hose and solvent, if necessary, to thoroughly clean out the grooves in the body. The new O-rings can be inserted with the fingers in the 1/2" and larger bodies. Install 3 O-rings from each end of the valve. For the 1/4" and 3/8" valve bodies, use a pair of tweezers with angle points, starting O-ring in groove in one side and working around. After installing O-rings, lightly grease the spool and body bore before assembly, using Magnalube®-G grease or O-ring grease. Never use oil or any other grease. If tweezers are not available, slip the spool into the bore, as a guide, to just below a groove and work the O-ring into the groove with a small rod.



Cut-away View of 1/4" Double Piloted Valve

AAA PRODUCTS INTERNATIONAL NEMA Enclosure Classifications and Types

Type 1: General Purpose - intended for indoor use primarily to provide a degree of protection against contact with the enclosed parts in locations without unusual service conditions.

Type 2: Drip Proof - intended for indoor use primarily to provide a degree of protection against limited amounts of falling water or dirt.

Type. 3: Rain Tight, Dust Tight and Sleet (Ice) Resistant - intended for outdoor use primarily to provide a degree of protection against windblown dust, rain and sleet; undamaged by the formation of ice on the enclosure.

Type 3S: Rain Tight, Dust Tight and Sleet (Ice) Resistant - intended for outdoor use primarily to provide a degree of protection against windblown dust, rain and sleet; external mechanism remains operable when ice laden.

Type 3R: Rain Proof, Sleet (Ice) Resistant - intended for outdoor use primarily to provide a degree of protection against falling rain and sleet, undamaged by the formation of ice on the enclosure.

Type 4: Water Tight and Dust Tight - intended for indoor or outdoor use to provide a degree of protection against splashing water, water seepage, falling or hose-directed water and severe external condensation; undamaged by the formation of ice on the enclosure.

Type 4X: Water Tight, Dust Tight and Corrosion Resistant - same as Type 4 Enclosure, but provides additional protection to resist corrosion.

Type 6: Submersible - intended for indoor or outdoor use to provide a degree of protection against entry of water during submersion at a limited depth (Tested to 6' for 30 minutes).

Type 6p: Submersible - same as Type 6 Enclosure, but provides prolonged submersion protection at a limited depth (Tested to 6' for 24 hours).

Type 7 (A, B, C and D): Explosion Proof, Class I, Division I, Groups A, B, C and D Hazardous Locations - designed to contain an internal explosion without causing an external hazard when installed in the indicated atmospheres and locations. Class I, Division I locations are those in which hazardous atmospheres are or may be present under normal operating conditions. These enclosures are also suitable for Class I, Division 2 locations in which hazardous atmospheres are present only in case of accidental rupture or breakdown of equipment or abnormal operation. Type I General Purpose Enclosures may be permitted in a Class I, Division 2 location subject to the approval authority (Ref: National Electrical Code 501-3, b3).

Group designations are described in the National Electrical Code as follows:

Group A - Atmospheres containing acetylene.
Group B - Atmospheres containing hydrogen.
Group C - Atmospheres containing ethyl-ether vapors, ethylene or cyclopropane.
Group D - Atmospheres Containing gasoline, hexane, naphtha, benzene, butane, propane, alcohol, acetone, benzol, lacquer, solvent vapors or natural gas.

Type 9 (E, F and G): Dust Ignition Proof, Class II, Groups E, F and G Hazardous Locations- designed to prevent the entrance of dust and the enclosed devices do not produce sufficient heat to cause external surface temperatures capable of igniting dust on the enclosure or in the surrounding atmosphere. Class II, Division 1 locations are those in which combustible dust is or may be present under normal operating conditions. These enclosures are also suitable for Class II, Division 2 locations in which hazardous dust is present only under abnormal conditions.

Group designations are described in the National Electrical Code as follows:

Group E - Atmospheres containing metal dust, including aluminum, magnesium, their commercial alloys and other metals of similarly hazardous characteristics.
Group F - Atmospheres containing carbon black, coal or coke dust.
Group G - Atmospheres containing flour, starch or grain dust.

Type 12: Intended for indoor use primarily to provide a degree of protection against dust, falling dirt and dripping noncorrosive liquids.

Type 13: Intended for outdoor use primarily to provide a degree of protection against dust, spraying of water, oil and non corrosive material.

National Electrical Manufacturers Association (NEMA Standard 250)

AAA PRODUCTS INTERNATIONAL
IEC/IP Environmental Protection Ratings

The degree of protection provided by an enclosure is indicated by an IP code. This code is made up of two numbers. The first number is the degree of protection against solid foreign objects. The second number is the degree of protection against water.

For example, the IP rating of IP65 designates total protection from dust and protection from water jets from any direction.

First Number: Protection against solid foreign objects.

Number	Description
0	No Protection.
1	Protected against solid foreign objects of 50mm diameter and greater.
2	Protected against solid foreign objects of 12.5mm diameter and greater.
3	Protected against solid foreign objects of 2.5mm diameter and greater.
4	Protected against solid foreign objects of 1.0mm diameter and greater.
5	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety.
6	No ingress of dust.

Second Number: Protection against water.

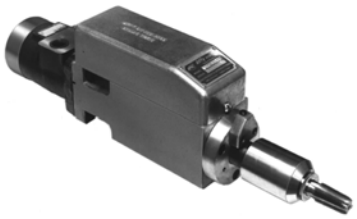
Number	Description
0	No Protection.
1	Vertically falling water drops shall have no harmful effects.
2	Vertically falling water drops shall have no harmful effects when the enclosure is tilted at any angle up to 15 degrees on either side of the vertical axis.
3	Water sprayed at an angle up to 60 degrees on either side of the vertical axis shall have no harmful effects.
4	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Water projected in powerful water jets against the enclosure from any direction shall have no harmful effects.
7	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under standardized conditions of pressure and time.
8	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for number 7.

Rough Conversions Between Ratings.

NEMA rating	UL rating	CSA Rating	Apprx. IEC/IP rating
1	1	1	IP23
2	2	2	IP30
3	3	3	IP64
3R	3R	3R	IP32
4	4	4	IP65
4X	4X	4X	IP66
6	6	6	IP67
12	12	12	IP55
13	13	13	IP65

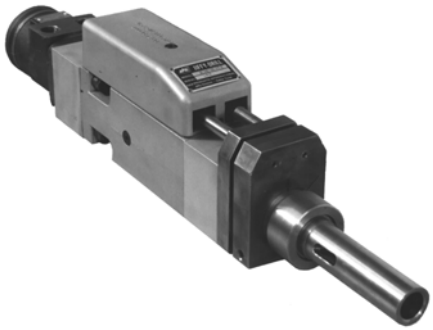
ADDITIONAL PRODUCTS

Jiffy-TAP



For production lead screw tapping or threading.
Taps up thru 1-1/2" iron, 6 to 40 threads per inch.
Compact - only 3-5/16" wide x 20" long.
Choice of hydraulic motors up to 6 HP.

Jiffy-DRILL



For production hole drilling, reaming, tapping, spot facing, etc.
Rapid advance, rapid retract or skip drilling.
Easily drills holes up to 1-1/2" in c.r. steel.
3-1/2" stroke, up to 6 HP.

HANDY-THREAD

A new concept in rod threading. Handy-Thread features standard rotating die heads, automatic air chucking, automatic die opening at precise thread length. Will cut a different thread length on each end of rod.

Designed for continuous duty, high production threading of rods from 1/8" through 5/8" diameter. Approximate size: 24" x 39" x 27" high. Weighs less than 300 lbs.