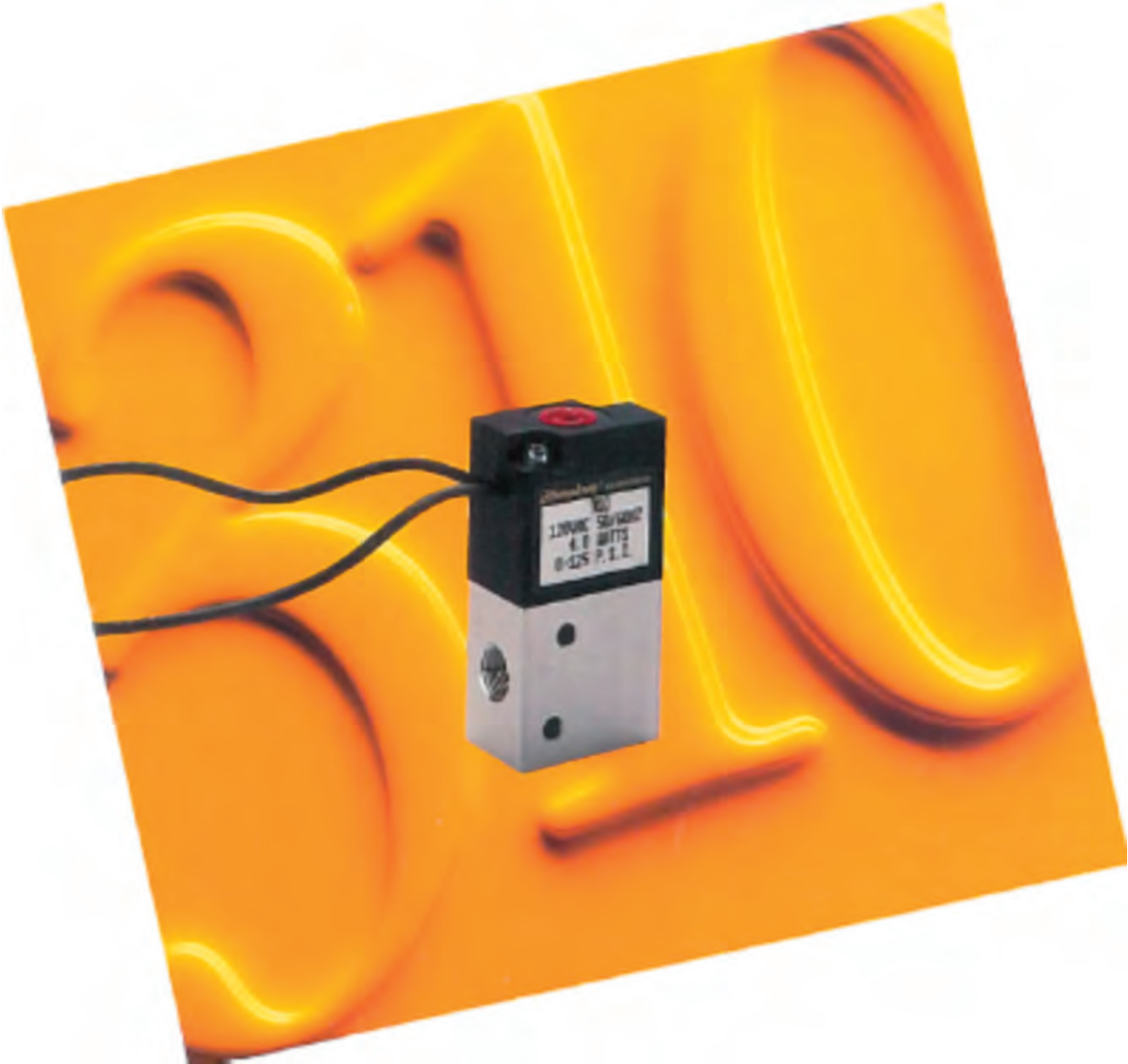


**310/410 Series
Inline Solenoid Valves**

Humphrey[®]





310/410 Inline Solenoid Valves

Humphrey offers a series of 1/8-inch ported 3-way and 4-way single solenoid valves. These rugged industrial valves are designed for long hours of operation in tough working conditions.

The 310/410 Series valves feature a direct-acting molded coil and Class B insulation system for resistance to ambient contamination. Their poppet design is field-proven by years of reliable service in thousands of demanding applications worldwide.

Small size, light weight, and low power make these valves ideal for today's precise, energy efficient equipment.

Four-way models are available with integral dual flow controls which eliminate the need, expense, and plumbing costs of externally applied flow controls.

Solid engineering and technical expertise are only the beginning. Humphrey's 310/410 valves have a great look and are designed to complement the appearance of your finished product.

Humphrey 310/410 valves meet the challenges of new technology's demanding pneumatic control applications.

Use them with confidence.

INDEX

Features, Advantages and Benefits	3
310/410 Series Technical Information	4-5
310/410 Series Inline General Information	6-7
Valve Dimensions, Assembly Instructions	8-10
410M Series Manifolds	11-12
Ordering Information.....	13

FEATURES

ADVANTAGES

BENEFITS

Designed for rigorous applications

Tolerant of many ambient/media conditions.

Reliable.

Small size/light weight

Reduced size and weight of control valves in your finished product.

Lower material cost; lower shipping cost; less floor space in final setting.

Poppet design

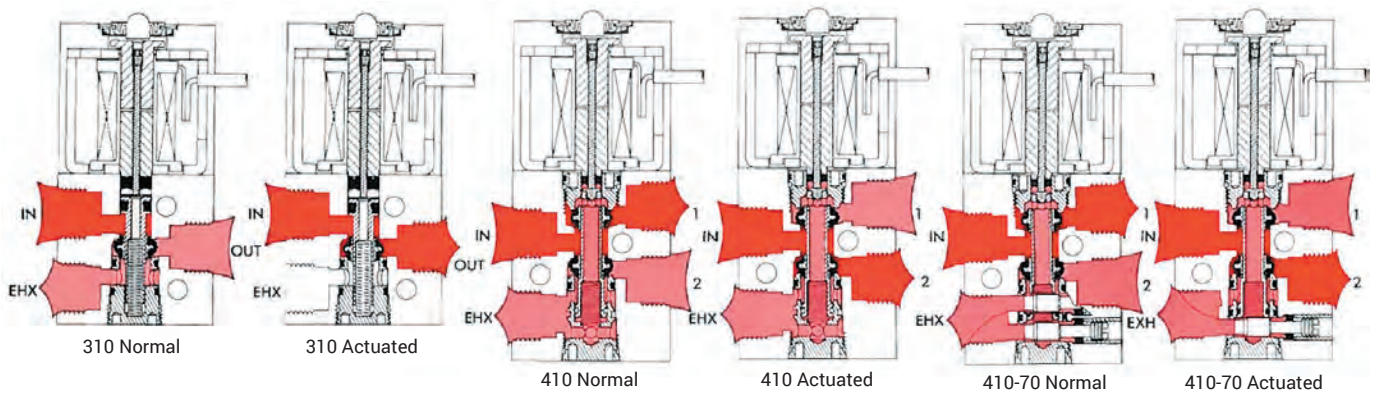
Needs no lubrication. Tolerates impure media.

Performs in adverse conditions.

Humphrey solenoid design

Field-proven in thousands of applications.

Proven performance.



Molded coil and electronic override seal

Both internal and external resistance to solenoid contamination.

Reliable.

Positive stop of solenoid armature

Prevents excessive impact and poppet overtravel.

Long product cycle life.

Short stroke

Fast response.

Rapid cycling.

Integral flow controls on model 410-70

Permits individual control of each exhaust in common exhaust port.

Eliminates need, cost and plumbing of external flow controls.

Pressure balanced

Permits connection of pressure to any port.

Great versatility.

Consistent effective surface areas

Same flow from IN to OUT and from OUT to EXH ports.

Uniform flow in all modes of use.

Universal mounting bracket

One bracket adapts to all 310/410 models.

Efficient, versatile and reduced inventory.

Attractive valve appearance

Complements appearance of your product.

Contemporary, trim look.

HUMPHREY 310/410 SERIES SOLENOID VALVES

TECHNICAL SECTION

MEDIA/PRESSURE

310/410 valves are designed for use with compressed air or inert gases from 0 to 125 psig (8.5 bar). 410 valves are also rated for vacuum service from 0 to 28" Hg. 310 models can be used with vacuum from 0 to 28" Hg. if ordered with the "V" prefix, i.e., V310, VS310, or VM310.

Media should be cleaned and uncontaminated. When in doubt, install a filter with filtering capacity of 40 microns. Periodically remove and clean or replace filter element. Consult factory if using any other media.

LUBRICATION

310/410 valves are pre-lubed and can be operated without air line lubrication to an estimated life of 20 million cycles, depending on application. If air pistons/cylinders or other devices require lubrication, ensure that lubricating oils are chemically compatible with Buna N elastomers and are of sufficient viscosity to assure adequate lubrication. Thin or low viscosity oils (spindle oil, machine oil, etc.) do not provide a good residual film of lubrication.

PLUMBING

310/410 valves are direct acting. When used with vacuum or low pressure, use largest possible tubing size and minimum tubing length for optimum performance.

Before connecting fittings and tubing, blow all foreign material from these components. If using a sealant, take extra care that sealant does not enter valves. This can potentially cause malfunction and/or leakage.

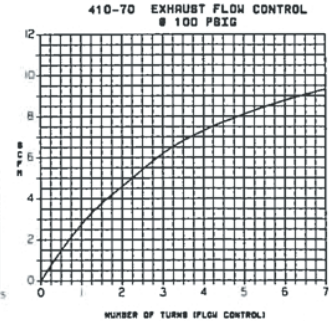
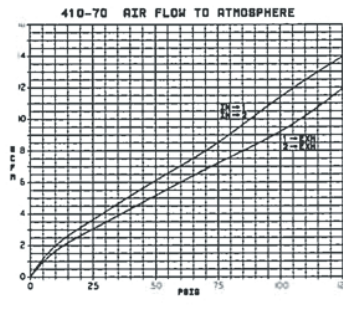
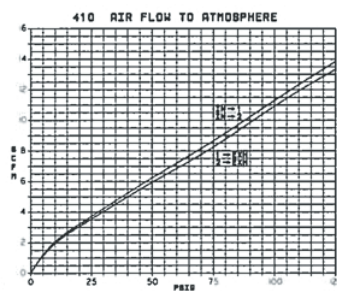
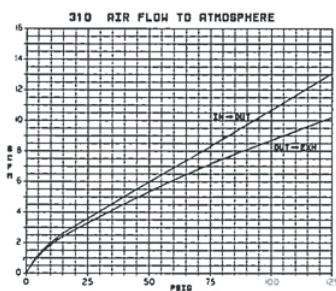
310/410 in-line valves are available for mounting to custom-made manifolds by specifying the Code 23 option (special mounting holes). Consult factory.

FLOW RATES/C_v

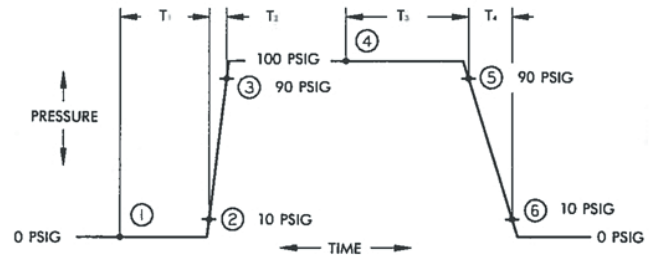
Humphrey recommends "fill/exhaust times," which are related to various chamber sizes, as the best method for calculating total valve and device (specifically, cylinder) response time. Humphrey recognizes the industry's use of flow coefficient C_v as a comparison standard.

Consequently, Humphrey offers three types of flow data. The National Fluid Power Association's standards for C_v, the scfm flow rate determined by flowing to atmosphere, and Humphrey's preferred "fill/exhaust times."

Model	C _v	SCFM @100 psig	Fill time (sec) (0 to 90 psig) chamber (cu. in.)			Exhaust time (sec) (100 to 10 psig) chamber (cu. in.)		
			1	10	100	1	10	100
310	.167	10.0	.020	.20	2.00	.032	.32	3.20
410	.167	10.0	.020	.20	2.00	.032	.32	3.20
410-70	.167	10.0	.020	.20	2.00	.032	.32	3.20



RESPONSE TIMES



IDENTIFICATION OF RESPONSE TIME AREAS

T₁ times are measured from point 1 (valve energization) to point 2 (10% of supply pressure detected at valve outlet port).

T₂ times are measured from point 2 (detection of outlet pressure) to point 3 (90% of supply pressure).

T₃ times are measured from point 4 (valve de-energization) to point 5 (10% of supply pressure exhausted from outlet port).

T₄ times are measured from point 5 (detection of pressure drop) to point 6 (90% of supply pressure exhausted).

AC/DC VOLTAGES

Coil voltage	T ₁	T ₂	T ₃	T ₄
DC	0.010 sec.	0.001 sec.	0.005 sec.	0.002 sec.
AC	0.010 sec.	0.001 sec.	0.018 sec.	0.002 sec.

Measured at 70° F (21° C) with 100% voltage and 100 psig supply. Times shown are nominal performance of valves tested.

EXAMPLE OF HOW TO CALCULATE FILL/EXHAUST TIMES

Model 310, 24 VDC One Air Line (1/8-inch I.D. x 36-inch long)
100 psig supply Air Cylinder (1.062-inch bore x 4-inch stroke)
Volume = 0.785 x Diameter squared x stroke or length

Cylinder Volume = 3.54 cubic inches
Air Line Volume = 0.44 cubic inches
Total Circuit Volume = 3.98 or 4 cubic inches

T ₁ Time to energize valve	= 0.010 sec.
Time to fill 4 cubic inches	
40% of 0.6 sec. for 10 cubic inches	= 0.080 sec.
T ₃ Time to de-energize valve	= 0.005 sec.
Time to exhaust 4 cubic inches	
40% of 1 sec. for 10 cubic inches	= 0.128 sec.
Total Cycle Time	= 0.223 sec.*

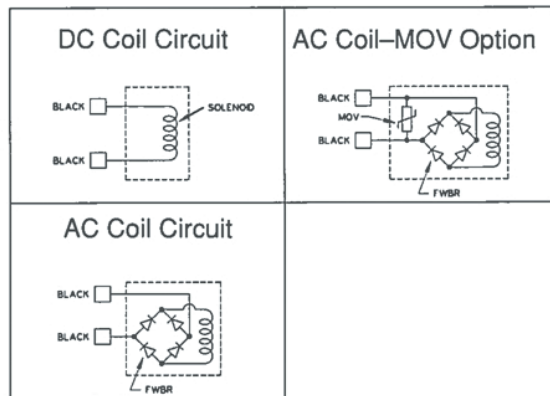
*Although this result is not exact, it is sufficient for most application needs and provides a simple, straightforward system.

ELECTRICAL SPECIFICATION CHART

Voltage	Resistance (Ohms)	Current (Milliamps)
12VDC	36	333
24VDC	144	167
24VAC	100	200
100VAC	2100	44
120VAC	3025	36
200VAC	8400	22
240VAC	12100	18

- All coils are standard with 24-inch black lead wires. Optional 72-inch lead wires are available.
- All AC coils are rated for 50/60 Hertz.
- All coils conform to Class B insulation systems.
- Resistance and current are nominal values.
- Valve assemblies are "hi-pot" tested at 1750 VAC for one second.
- Ensure proper voltage supply per voltage label rating, +10%, -15% for AC or DC voltages.

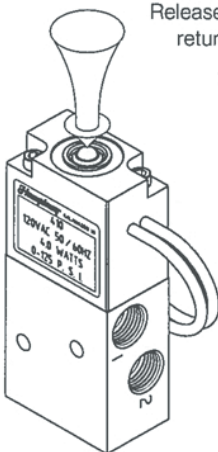
SOLENOID CIRCUIT SCHEMATICS



MANUAL OVERRIDE

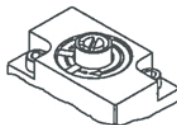
Push button/spring return manual override is standard. Manual override is located on top of coil.

Push red button shifts armature which actuates valve's main stem. Release of manual force permits valve spring to return valve to normal position.



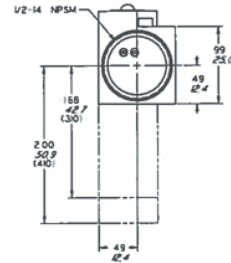
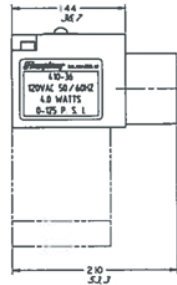
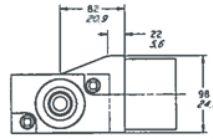
These valves are also available without manual override; specify Code 87 (example: 310-87 24VDC). On valves without manual override, a solid disk is installed on the coil. This replaces the punched disk which is used on valves with manual override.

A locking manual override is optional; specify Code 81 (example: 310-81 100VAC). To actuate valve, turn override screw clockwise to "On" position. Valve remains actuated until screw is returned to "Off" position by turning counterclockwise.



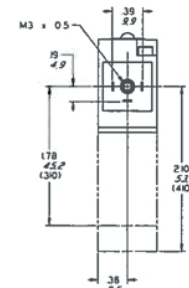
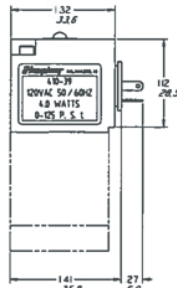
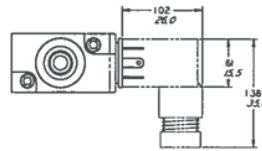
CONDUIT CONNECTOR

Conduit connector for closed wiring systems. Available on all in-line models. The connector option (Code 36) features a steel conduit insert molded into the valve coil. Order example: 310-36 24VDC.



CODE 39

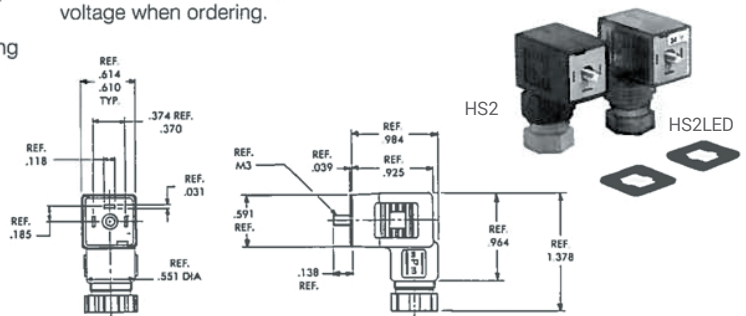
Humphrey Code 39 is an optional plug-in DIN-type connector that conforms to international standards. It provides simplicity, convenience, and fast, easy electrical installation. Available for all 310/410 series valves, this connector accepts screw-in sockets, which form a secure solderless electrical connection.



SOCKETS (Order separately)

Model HS2. This socket is available for all 310/410 series valves. Color is black.

Model HS2LED. This socket is available for valves with 12VDC and 24VDC. Has indicator light and is housed in clear plastic. Specify voltage when ordering.



HUMPHREY 310/410 SERIES INLINE SOLENOID VALVES

GENERAL INFORMATION

DESCRIPTION

310

A 1/8-inch ported, 3-way, single solenoid, 2-position/spring return, Normally Open or Normally Closed, general purpose air valve. Additionally, model 310 can be used as a diverter valve by connecting the supply pressure to the OUT port; and as a two pressure selector by connecting the supply pressures to the IN and EXH ports.

410

A 1/8-inch ported, 4-way, single solenoid, 2-position/spring return general purpose air valve, capable of being used in a variety of 2-, 3- and 4-way functions. Model 410-70 offers built-in dual flow controls.

PORT IDENTIFICATION

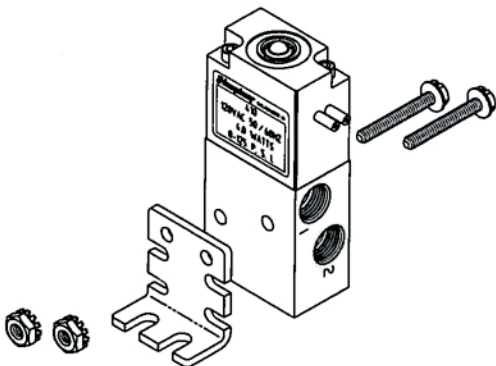
- IN Pressure Supply port.
- OUT Delivery port for model 310.
- 1 Normally Open Delivery port for model 410.
- 2 Normally Closed Delivery port for model 410.
- EXH Exhaust port, vent to atmosphere.

INSTALLATION

CAUTION: Compressed air is powerful and may be dangerous. Before attempting to remove a component from an air line or system, **always** disconnect the supply air and thoroughly exhaust the line or system. **Never** attempt to construct, operate, or service anything using compressed air unless you have been properly trained to do so. Failure to heed this warning could result in **SERIOUS, EVEN FATAL, PERSONAL INJURY.**

Valves can be mounted in any position in most environments, in keeping with the specifications. 310/410 valves feature a Class B insulation system and molded coil for ambient temperatures from 32° to 125° F (0° to 50° C).

Valves should be mounted using the .159" (4.04mm) diameter side mounting holes and #6 (M3.5) mounting screws. The optional 8-288A mounting bracket kit consists of a bracket, two #6-32 screws, and two captive lockwasher nuts. Mounting bracket adapts to any 310/410 valve on either side of valve.



USE AS A 3-WAY

310

Model 310 is a 2-position, 3-way valve and thus is ready for 3-way use. For Normally Closed use, connect supply to IN (OUT is the cylinder port). For Normally Open use, connect supply to EXH (OUT is the cylinder port; IN is the exhaust port).

410

Model 410 is a 2-position, 4-way valve, but can be used as a 3-way: Plug port 1 for use as a Normally Closed 3-way; plug port 2 for use as a Normally Open 3-way. Use 1/8 NPT plugs.

USE AS A 2-WAY

310

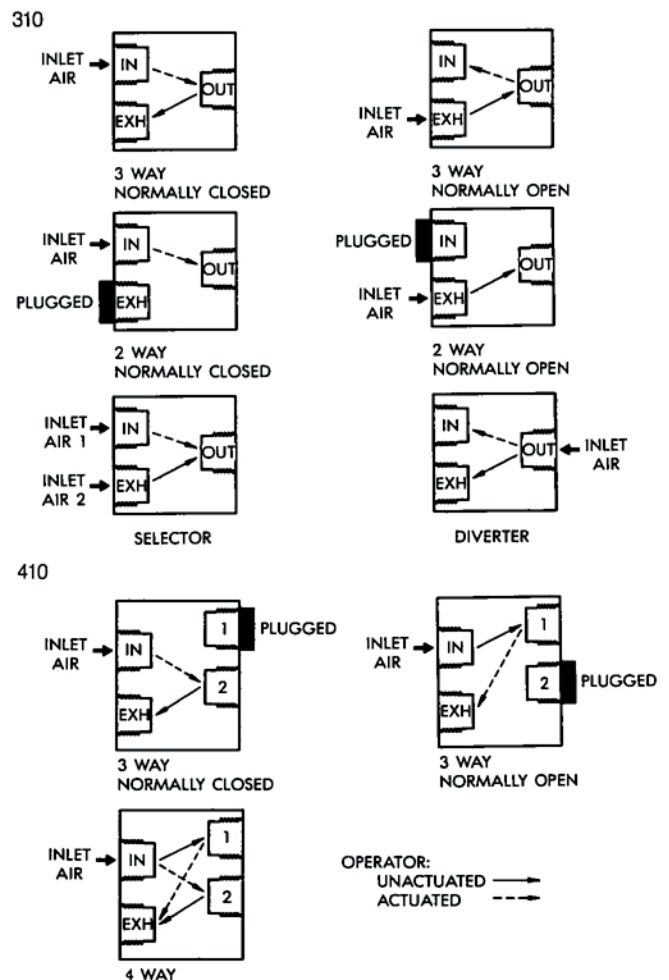
Model 310 can be used as a 2-way by plugging the EXH (exhaust) port.

410

Model 410 can be used as a 2-way by plugging the EXH (exhaust) port and port 1 for Normally Closed, or port 2 for Normally Open.

PORTING DIAGRAMS

The 310/410 balanced poppet design allows the valve to function in a variety of pneumatic porting configurations. Typical porting diagrams are outlined below.



METRIC PORTS/DIMENSIONS

Although these valves are produced using the inch system, all drawings show the metric equivalent in millimeters (indicated by slanted numbers).

All port connectors are available in metric sizes. The pipe ports are available in 1/8 BSP taper.

Specify metric port threads by using letter *E* as a model number prefix. Example: *E410* has metric size ports.

FLOW CONTROL OPTION (CODE 70)

Model 410-70 is equipped with integral dual flow controls. Clockwise rotation of each flow control screw reduces exhaust flow from the respective port. Flow control screw number 1 controls exhaust flow from Delivery port 1. Flow control screw number 2 controls exhaust flow from Delivery port 2. Each flow control screw takes seven full turns from fully closed to fully open, providing an excellent flow control range.



PACKAGING

Individual valves are packaged for cleanliness in 4x6 1/2-inch sealed plastic bags and shipped as individual units in corrugated cardboard boxes.

Customers purchasing large valve quantities may prefer to reduce unpackaging costs by ordering in bulk quantities.

TROUBLESHOOTING

If valve fails to function when electrical power is supplied:

1. Check valve function using manual override. If valve functions by manual actuation, proceed to steps 2 and 3. If valve does not function, proceed to step 4. For valves without manual override, proceed to steps 2 and 3.
2. Check line voltage to determine compliance with valve electrical rating.
3. Check valve for inoperable (open) coil, measuring milliamps per Electrical Specification Chart.
4. Check that air supply has been delivered in adequate volume and pressure for proper functioning of the device. Ensure that there are no blockages due to air line contamination or defective/ blocked fittings.

WARRANTY

All valves have a one year warranty from date of manufacture. This warranty includes repair and/or replacement at no charge should the product be deemed defective due to workmanship and/or material. (See detailed Product Warranty in Humphrey's General Valve Catalog.)

SPECIFICATIONS

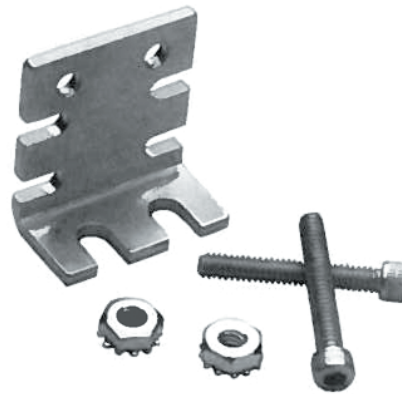
310/410 Models	
Media	Air or inert gas
Pressure range	0-125 psig (0-8.5 bar) 0-28" Hg vacuum (prefix "V" 3-way and all 4-way models)
Ambient temperature range	32 to 125° F (0 to 50° C)
Coil temperature rise (any voltage)	81° F (45° C)
Power consumption (AC/DC)	4.0 watts
Response time (on/off)	.012/.010 (DC), .012/.020 (AC) sec.
Voltage tolerance	Plus 10%, minus 15% of rated voltage
Coil voltages	12VDC, 24VDC, 24VAC, 100VAC, 120VAC, 200VAC, 240VAC
SCFM @ 100 psig	>10
Cv	.167
Fill/exhaust time @ 100 psig (7.0 bar)	1 cu. in. .020/.032 sec. 10 cu. in. .20/.32 sec. 100 cu. in. 2.00/3.20 sec.
Leak rate (max. allowed)	4cc/minute @ 100 psig
Type of operation	Direct solenoid
Effective area	Model 310 .0069-inch ² Model 410 .0064-inch ²
Stroke	.015-inch
Maximum cycle rate (cycles/min.)	2700 (DC), 1875 (AC)
Lubrication	None required, factory pre-lubed
Filtration	40 Micron recommended
Weight	Model 310 .26 lbs. (116 gms.) Model 410 .28 lbs. (128 gms.) Model 410-70 .28 lbs. (128 gms.)
Materials	Brass, Buna N, aluminum, stainless steel, acetal

310 SOLENOID VALVES



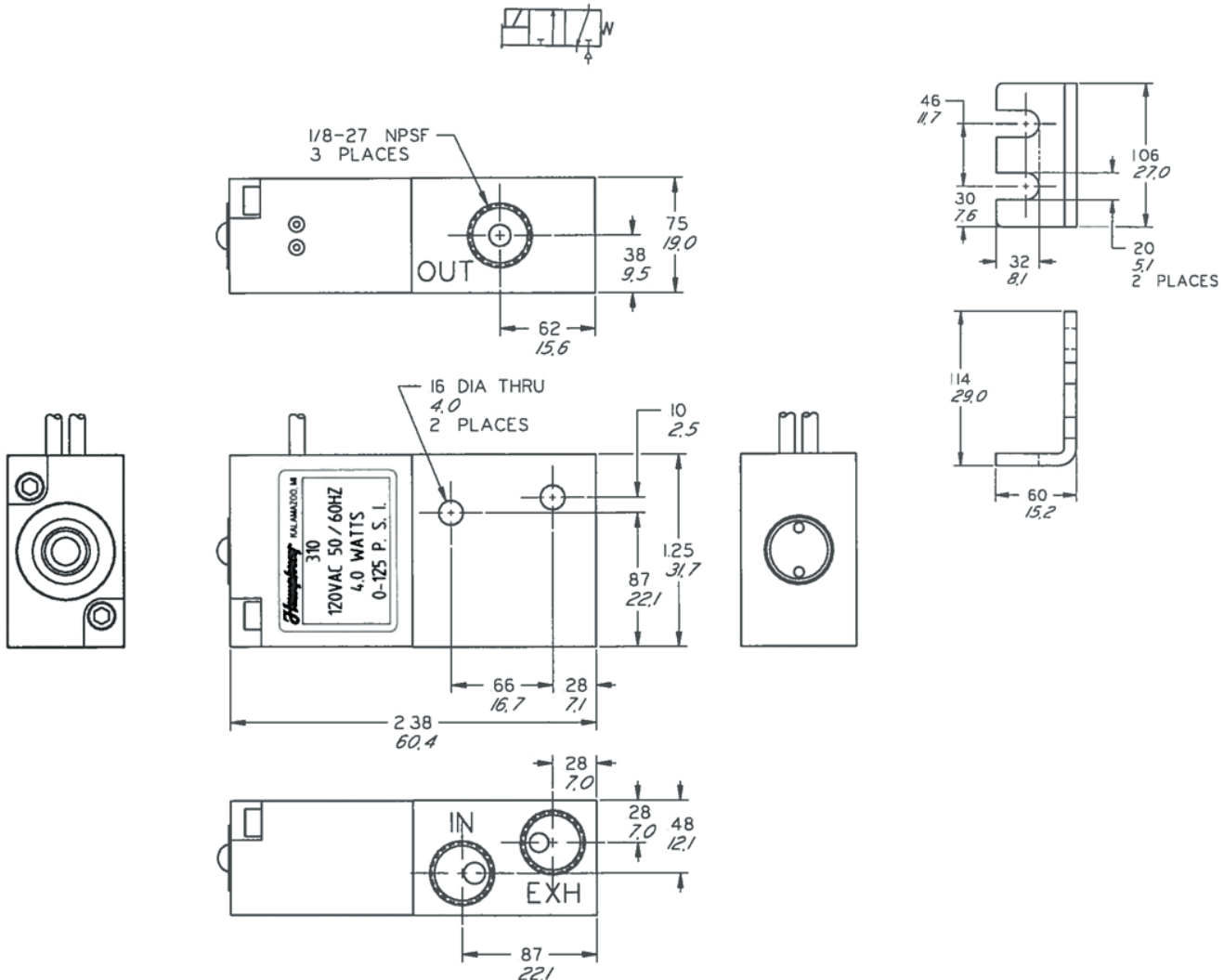
310

- 3-way
- 2-position, spring return
- Direct acting, single solenoid
- Continuous duty coil
- Three 1/8-27 NPSF ports (IN, OUT, EXH)
- Non-locking manual override
- 24-inch lead wires
- Specify model V310 for vacuum from 0" to 28" Hg.



8-288A MOUNTING BRACKET

A convenient, optional plated steel mounting bracket kit is designed for use with both 3-way and 4-way valves. This kit consists of a bracket, two #6-32 screws, and two captive lockwasher nuts. Screws are plated steel, 1-inch (25.4mm) long.

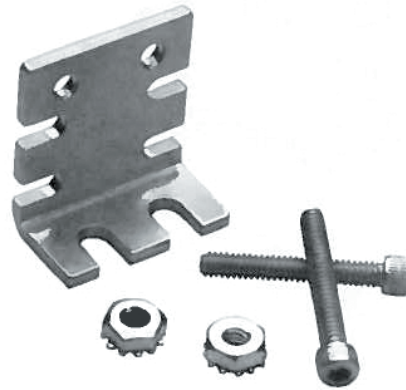


410 SOLENOID VALVES



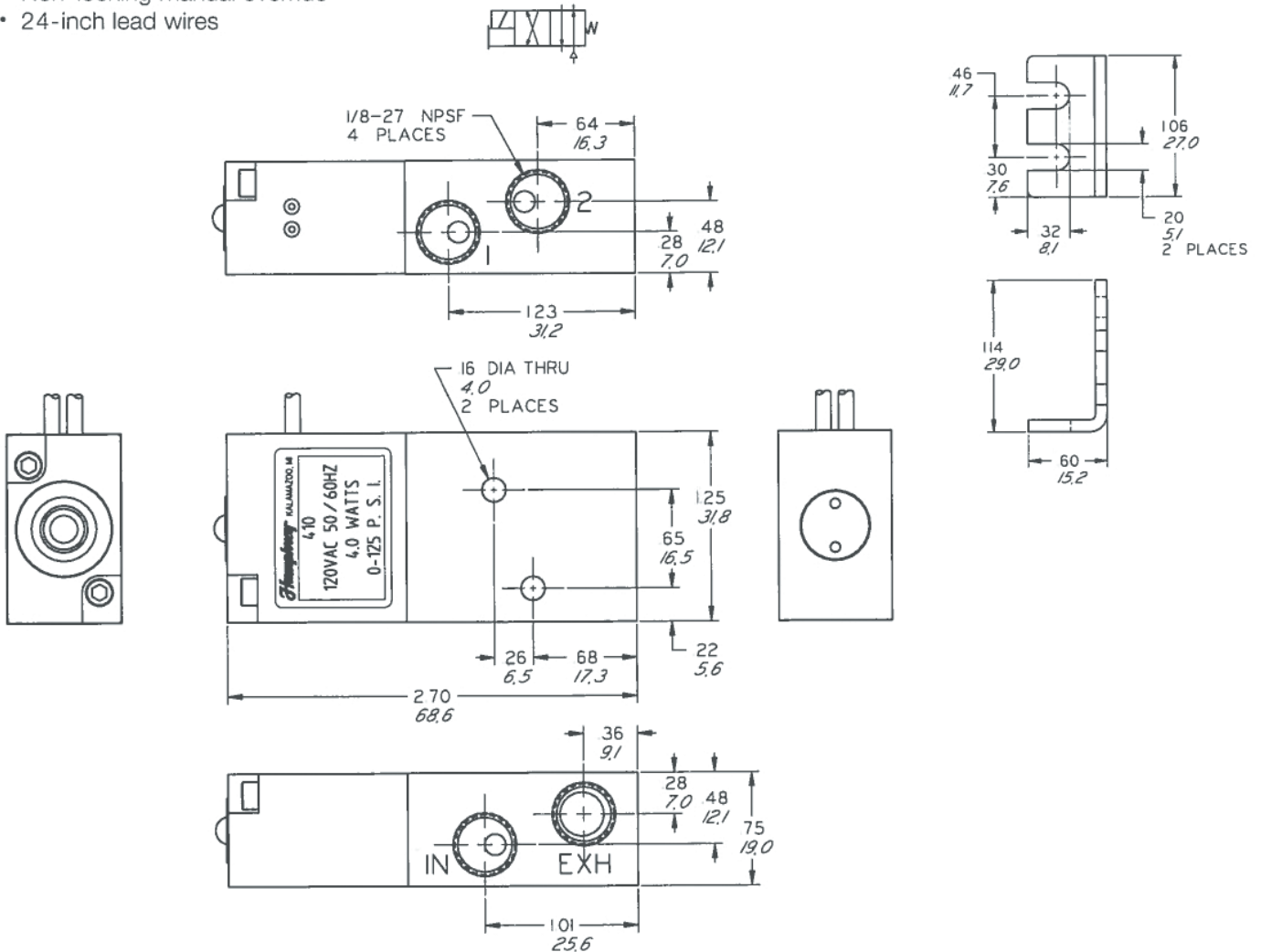
410

- 4-way, Normally Open/Normally Closed
- 2-position, spring return
- Direct acting, single solenoid
- Continuous duty coil
- Four 1/8-27 NPSF ports: IN, Delivery ports 1 & 2, and single exhaust port (EXH)
- Non-locking manual override
- 24-inch lead wires

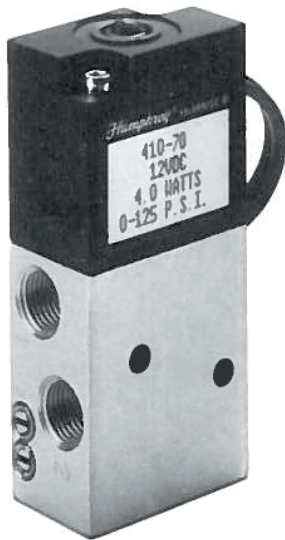


8-288A MOUNTING BRACKET

A convenient, optional plated steel mounting bracket kit is designed for use with both 3-way and 4-way valves. This kit consists of a bracket, two #6-32 screws, and two captive lockwasher nuts. Screws are plated steel, 1-inch (25.4mm) long.

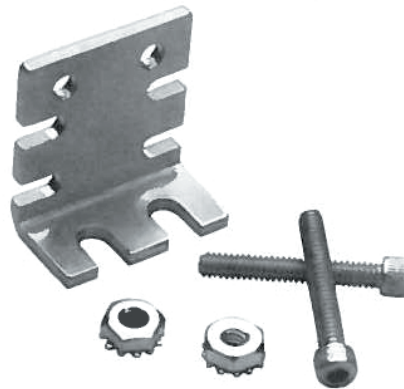


410-70 SOLENOID VALVES



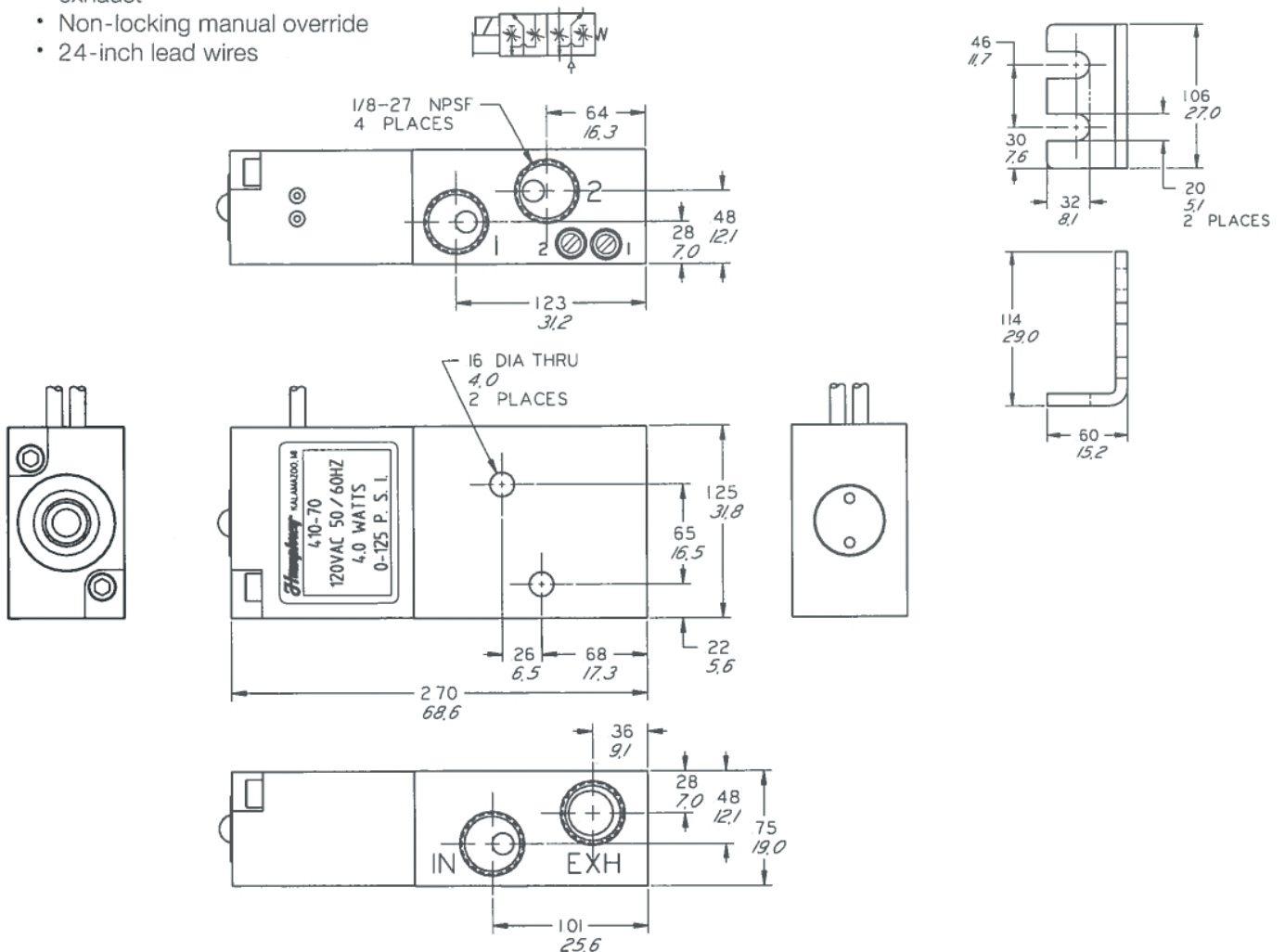
410-70

- 4-way, Normally Open/Normally Closed
- 2-position, spring return
- Direct acting, single solenoid
- Continuous duty coil
- Four 1/8-27 NPSF ports: IN, Delivery ports 1 & 2, and single exhaust port (EXH)
- Individual flow controls for each Delivery port exhaust
- Non-locking manual override
- 24-inch lead wires



8-288A MOUNTING BRACKET

A convenient, optional plated steel mounting bracket kit is designed for use with both 3-way and 4-way valves. This kit consists of a bracket, two #6-32 screws, and two captive lockwasher nuts. Screws are plated steel, 1-inch (25.4mm) long.

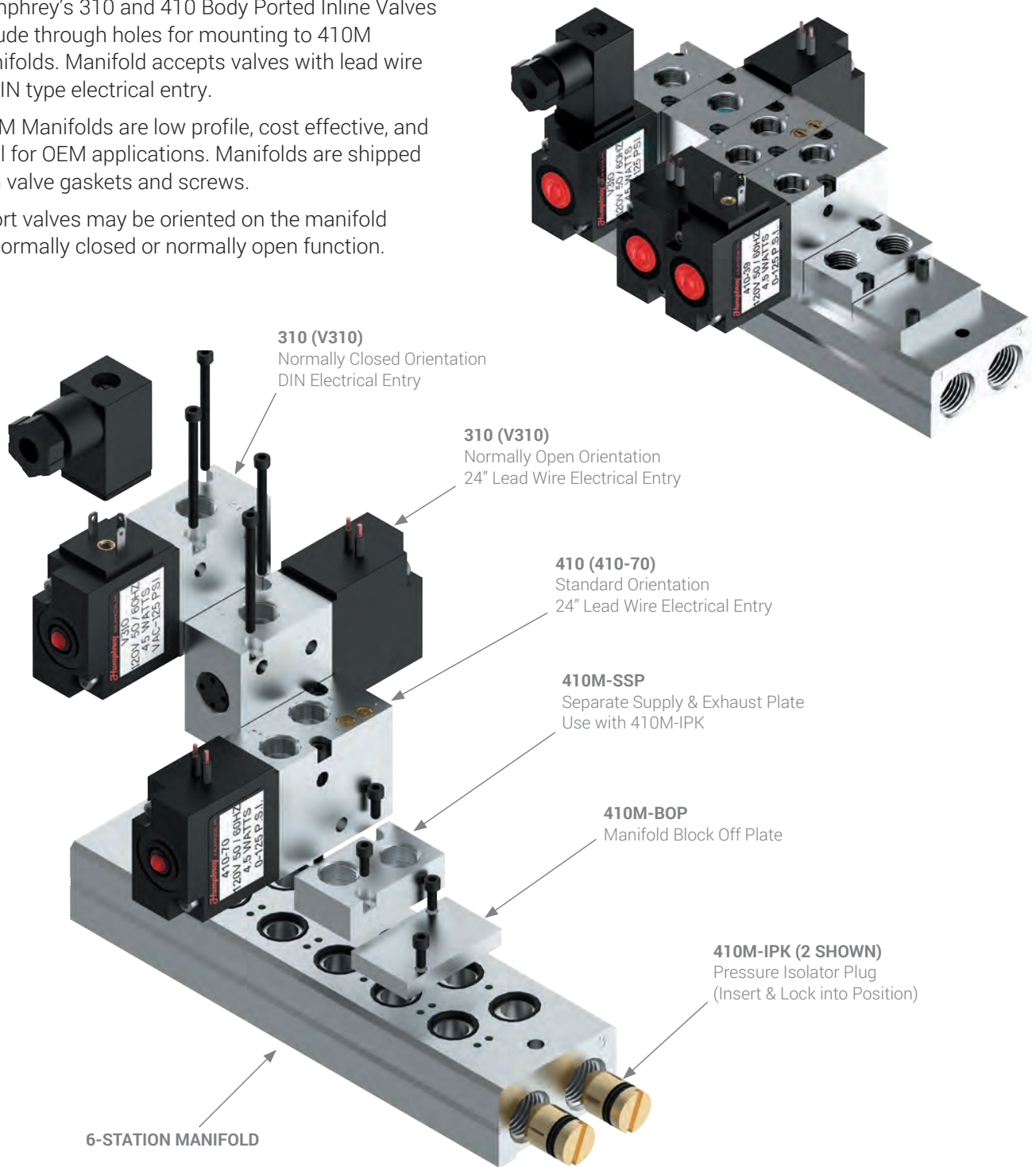


410M SERIES MANIFOLDS

Humphrey's 310 and 410 Body Ported Inline Valves include through holes for mounting to 410M manifolds. Manifold accepts valves with lead wire or DIN type electrical entry.

410M Manifolds are low profile, cost effective, and ideal for OEM applications. Manifolds are shipped with valve gaskets and screws.

3-port valves may be oriented on the manifold as normally closed or normally open function.



- Standard Model 310 and 410 Inline valves incorporate 0.11" diameter, counterbored mounting holes, permitting mounting of inline valves to the 410M manifold.
- Manifolds are available in 2, 4, 6, 8 or 12 station lengths and furnished with a 410M-VMK (Valve Mounting Kit/two "O" rings and two screws) per station. Consult factory for other manifold lengths.
- Manifold galley stamped 1 is common media supply port. Galley stamped 3 is common vent/exhaust port. Isolator plug 410M-IPK option permits isolation of galleys for separation of pressure/media/exhaust.
- Three-way valve Model 310 mounting orientation to manifold determines normally closed (NC) or normally open (NO) function.
Note: Valve port 1 is located nearest to valve's solenoid/coil.

ORDER INFORMATION

310/410 Series Inline Body Ported Valves
1/8-inch ports, 2-way, 3-way, 4-way

VALVES

Model NOTE 2	Option Description										Voltage
	Two-Way NOTE 1	With Mounting Bracket NOTE 1	Conduit Connector (24"ends)	DIN-Type Connector	Flow Controls	Locking Manual Override	No Manual Override	72" Lead Wires	Rotated Coil (180°)	Fluorocarbon Seals	
	Option Code										
	2	21	36	39	70	81	87	LL	RC	VAI	
310 3-way, Inline	SP	SP	SP	SP	NA	SP	SP	SP	SP	SP	12 VDC 24 VDC 24/50/60 100/50//60 120/50/60 200/50/60 240/50/60
V310 Vacuum 3-way, Inline					SP						
410 4-way, Inline	NA				SP						

NOTE: Standard valves are furnished with 24" flying lead wires and a non-locking manual override.
NOTE 1: 1/8" plug for 2-way and code 21 mounting bracket are furnished unattached to the valve.
NOTE 2: To specify metric ports, add an "E" prefix (i.e. E310 or EV310).

N/C = No charge
NA = Not available

STD = Standard
SP = Specify; Additional charge for this option

ACCESSORIES

Model	Description
8-288A	Universal mounting bracket
130-31	1/8" pipe plug
HS2	DIN receptacle for use with code 39 connector.
HS2LED	Lighted DIN receptacle for use with code 39 connector. Specify: 12V, 24V or 120V

HOW TO ORDER

Starting with Model Number, specify options in order from left to right.

Examples: **Model 310-2-21-LL 12VDC**
 2-Way Operation (310-2)
 Mounting Bracket (310-2-21)
 72" Flying Leads (310-2-21-LL)
 Voltage 12VDC (310-2-21-LL 12VDC)

Model 410-21-70-87 120/50/60
 Mounting Bracket (410-21)
 Flow Controls (410-21-70)
 No Manual Override (410-21-70-87)
 Voltage 120/50/60 (410-21-70-87 120/50/60)

310 and 410 Body Ported Inline Valves include through holes for mounting to 410M manifolds. Manifolds accept valves with standard lead wire or optional DIN type electrical entry. See page 11.

Model	Number of Stations (2 thru 12)
410M	_____

Order Example: 410M6

HUMPHREY-PRODUCTS.COM

A privately owned US company since 1901.

© 2021 Humphrey Products Company

Certified: ISO 9001:2015

310410INLINE21

Humphrey Products Company

5070 East N Avenue

Kalamazoo, MI 49048 USA

P: 269.381.5500

F: 269.381.4113

Humphrey[®]