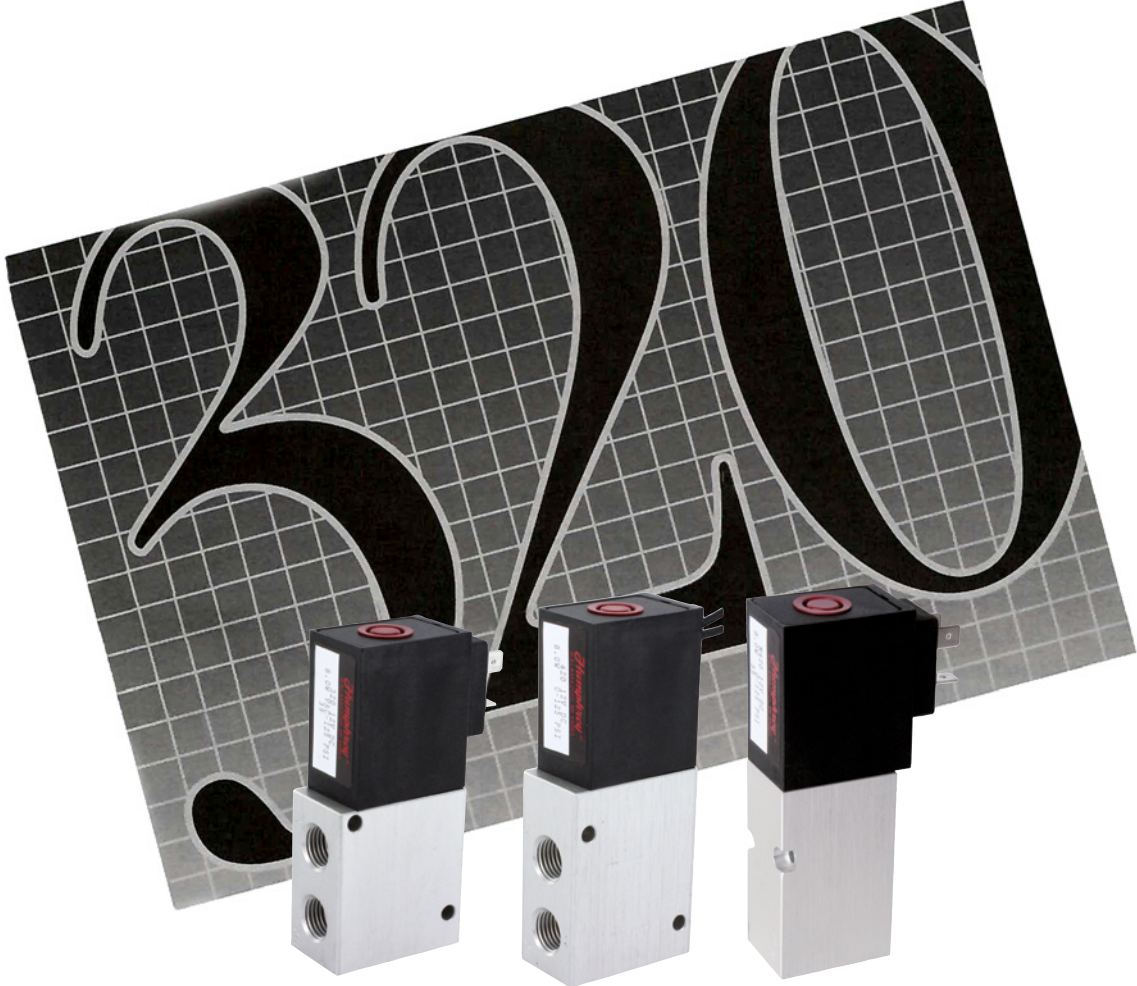


**320/420/M420 Series
Solenoid Valves**





320/420 Solenoid Valves

The Humphrey 320/420 Series is a family of 3-way and 4-way, single solenoid air valves. These 1/4 pipe direct acting valves are compact, light weight and high flow. They are ideal for equipment makers seeking basic function, low cost and “plug and play” reliability.

The 320 and 420 Series starts with great versatility. With a balanced poppet construction, both 3-way and 4-way types are classified as multi-purpose. They function reliably across a full pressure spectrum of vacuum to 125 PSI, and regardless of when pressure can fluctuate. Pipe any 320 Series valve for normally closed or normally open, 2- or 3-way function, or as a diverter or selector valve. And apply any 420 Series as a traditional 4-way function, or plug ports for any three-port function, such as normally closed or open, diverter or selector. Great value for a single valve! These direct-acting solenoid valves boast a flow co-efficient (Cv) of 1.0, making them the highest flowing valve of their kind. The fast-switching coil, short stroke and poppet design opens a full 1/4 inch diameter flow path instantly, for millions of cycles.



Both valves are offered as inline with 1/4 NPSF pipe ports. Optionally, the M420 4-way model is offered in a subbase, manifold mount body configuration.



Twenty-four inch lead wire electrical entry is standard. Optional DIN type plug-in connector or conduit connection are available for all models. All valves come equipped with a non-locking manual override, and optionally without override.

Humphrey 320/420 valves. Quality. Reliability. Performance. And attractive international styling that compliments the appearance of your finished product.

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HUMPHREY 320/420/M420 SERIES SOLENOID VALVES

TECHNICAL SECTION

320 is a two-position, single solenoid, spring return, 3-way inline valve with 1/4 NPSF pipe ports. 420 is a two-position, single solenoid, spring return, 4-way inline valve with 1/4 NPSF pipe ports.

INSTALLATION

Valves should be mounted using the .185" (4.70mm) diameter side mounting holes and #8 or M4 mounting screws. The optional 8-388A mounting bracket kit consists of a bracket, two screws, and two captive lockwasher nuts. Mounting bracket adapts to any 320/420 valve on either side of valve.

Plumbing 320/420 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 the sealant does not enter valve causing malfunction and/or leaks.

Lubrication 320/420 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.

Media/Pressure 320/420 valves are designed for use with compressed air or inert gases from 28" Hg. vacuum to 125 psig (8.5 bar). Compressed air should be clean and uncontaminated. When in doubt, install an air filter with filtering capacity of 40 microns. Periodically, remove and clean or replace filter element. Consult factory if using any other media.

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.**

Port Identification

- IN Pressure Supply Port.
- OUT Delivery port for model 320.
- 1 Normally Open Delivery port for model 420.
- 2 Normally Closed Delivery port for model 420.
- EXH Exhaust port, vent to atmosphere.

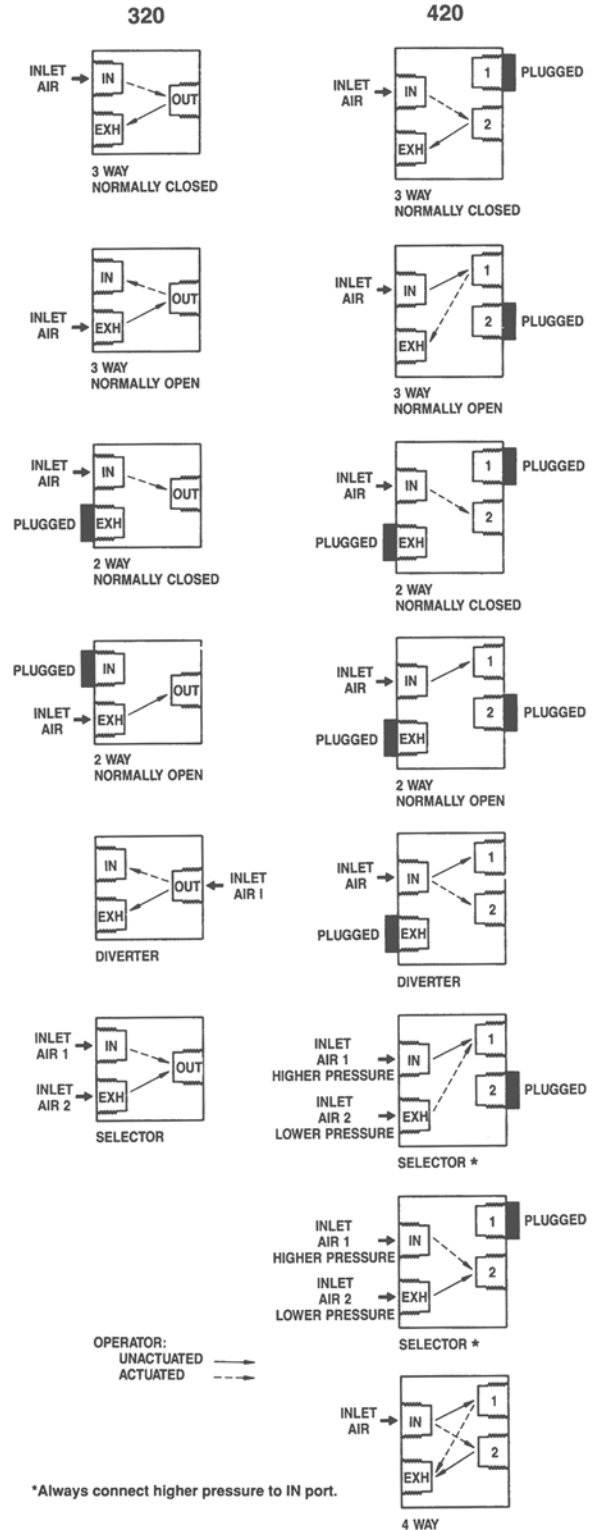
HUMPHREY M420 SERIES

M420 is a two position, single solenoid, spring return, 4-way valve, subbase mounted. Valve is shipped with subbase mounting screws and valve gasket.

Additionally, stacking subbase model SB-2 and end plate kit model 7-200A are offered to achieve multiple valve manifold assemblies. Subbases are designed to stack together easily, forming the multiple valve manifold. End plate kit terminates the manifold assembly and providing air supply and piped exhaust.

Final manifold assemblies can be mounted in any position in most environments, in keeping with valve specifications.

Porting Diagrams The 320/420 balanced poppet design allows the valve to function in a variety of pneumatic porting configurations. Typical porting diagrams are outlined below.



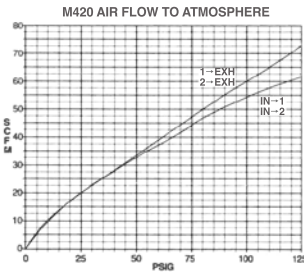
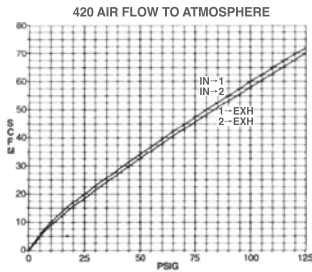
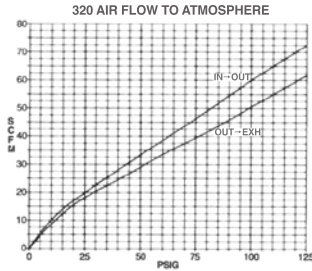
FLOW AND ELECTRICAL DATA

FLOW RATES/C_v

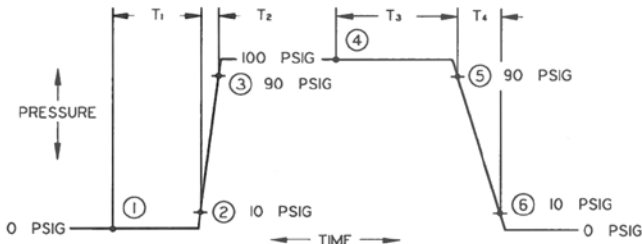
Humphrey recommends "fill/exhaust times," which are related to various chamber sizes, as the easiest method for calculating total valve and device (specifically, cylinder) response time. Humphrey recognizes the industry's use of flow coefficient C_v as a comparison standard.

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 80 psig) Chamber (cu. in.)			Exhaust Time (Sec) (100 to 20 psig) Chamber (cu. in.)		
			10	100	1000	10	100	1000
320	1.0	60	.032	.32	3.2	.049	.47	4.7
420	1.0	60	.032	.32	3.2	.049	.47	4.7
M420	.9	54	.037	.37	3.7	.054	.54	5.4



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 (320)

Coil Voltage	T ₁	T ₂	T ₃	T ₄
DC	.016 sec.	.002 sec.	.007 sec.	.002 sec.
AC	.016 sec.	.002 sec.	.035 sec.	.002 sec.

AC/DC Voltages (420)

Coil Voltage	T ₁	T ₂	T ₃	T ₄
DC	.020 sec.	.002 sec.	.005 sec.	.002 sec.
AC	.020 sec.	.002 sec.	.035 sec.	.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 320, 24VDC One Air Line (0.250 I.D. x 24-inch long)
 100 psig supply Air Cylinder (2.5-inch bore x 10-inch stroke)
 Volume = 0.785 x Diameter squared x stroke or length

Cylinder Volume	= 49.06 cubic inches
Air Line Volume	= 1.17 cubic inches
Total Circuit Volume	= 50.23 or 50 cubic inches
T1 Time to Energize Valve	= .018 sec.
Time to fill 50 cubic inches	
50% of .32 sec. for 100 cubic inches	= .160 sec.
T3 Time to De-energize Valve	= .009 sec.
Time to Exhaust 50 cubic inches	
50% of .47 sec. for 100 cubic inches	= .235 sec.
Total Cycle Time	= .422 sec.*

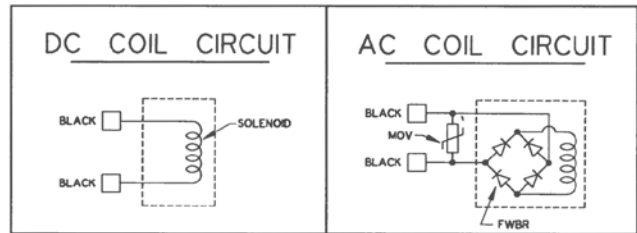
*Although this result is not exact, it is sufficient for most application needs and provides a simple, straight-forward system.

320/420 SERIES VALVES ELECTRICAL SPECIFICATIONS

Voltage	Resistance (Ohms)	Current (Milliamps)
12VDC	18.0	667
24VDC	72.0	333
24VAC	50.0	400
100VAC	1051.0	87
120VAC	1512.0	73
200VAC	4200.0	44
240VAC	6050.0	36

- 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 1750VAC for one second.
- Voltage operating range is +10%, -15% of rated voltage for AC or DC voltages.

SOLENOID CIRCUIT SCHEMATICS



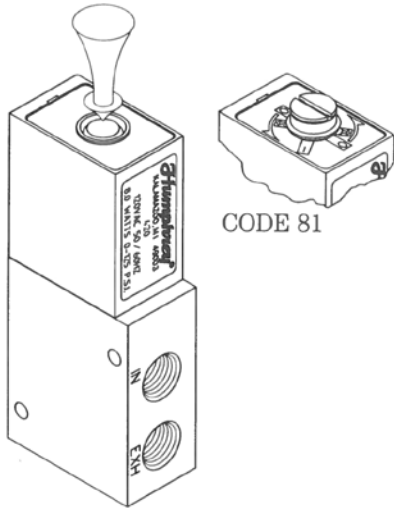
MANUAL OVERRIDE

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

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

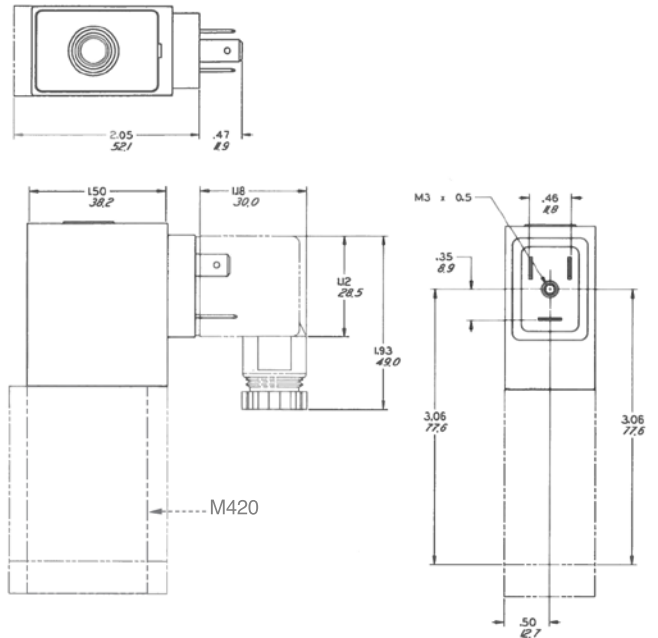
320/420 valves are available without manual override by specifying Code 87 (example is 320-87 24VDC). On valves without manual override, a solid cover is installed on the coil. This replaces the punched disk which is used on valves with manual override.

A locking manual override is optional; specify Code 81 (example: 320-81 24VDC). In the unactuated position the override is locked "Off" and will not operate the valve. Clockwise rotation of slotted screw approximately 30 degrees provides operation like the standard manual override; release of manual pressure permits spring to return valve to the normal position. Rotating an additional 90 degrees locks override and valve in the "On" position.



CODE 39

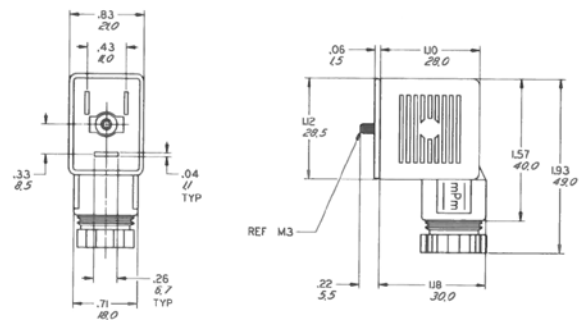
Humphrey Code 39 is an optional plug-in DIN-type connector base that conforms to international standards. It provides simplicity, convenience, and fast, easy electrical installation. Available for both 3-way and 4-way models, the connector base accepts DIN 43 650/ISO 4400 connectors which form a secure, solderless electrical connection.



CONNECTORS (Order separately)

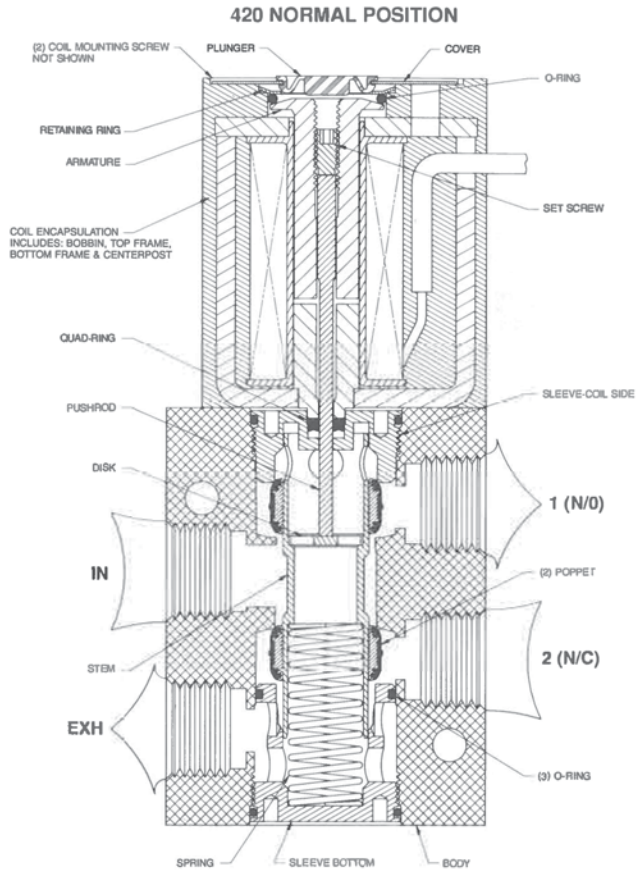
Model HS-3. This connector is available for all 320/420 series valves and has an internal socket for screw-type wire termination contained within a black housing. The housing is capable of being rotated 180 degrees with respect to the socket for flexibility of cable placement.

Model HS-3-LED. This connector is available for all 320/420 series valves and has a built-in AC/DC LED that can be ordered for 12V, 24V, 120V, or 240V coils. It has an internal socket for screw-type wire termination. The transparent housing can be rotated 180 degrees with respect to the socket for flexibility of cable placement. Specify voltage when ordering.

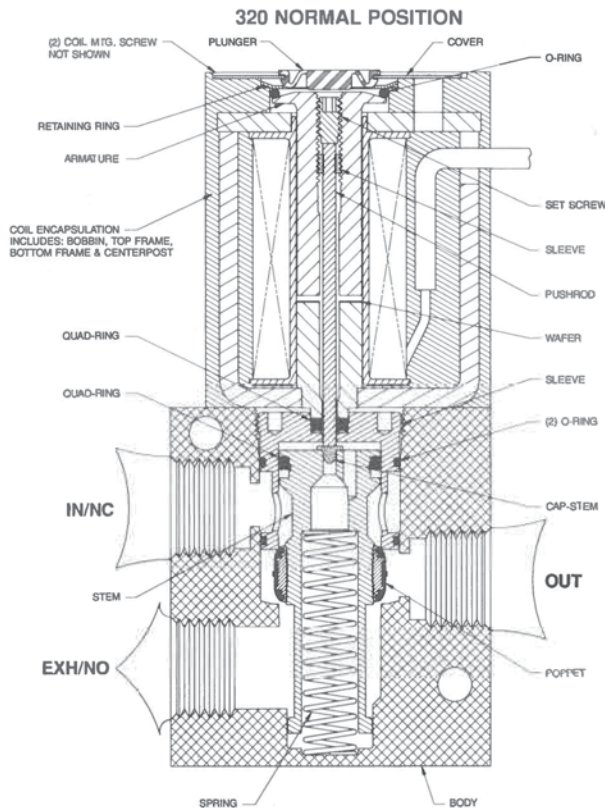
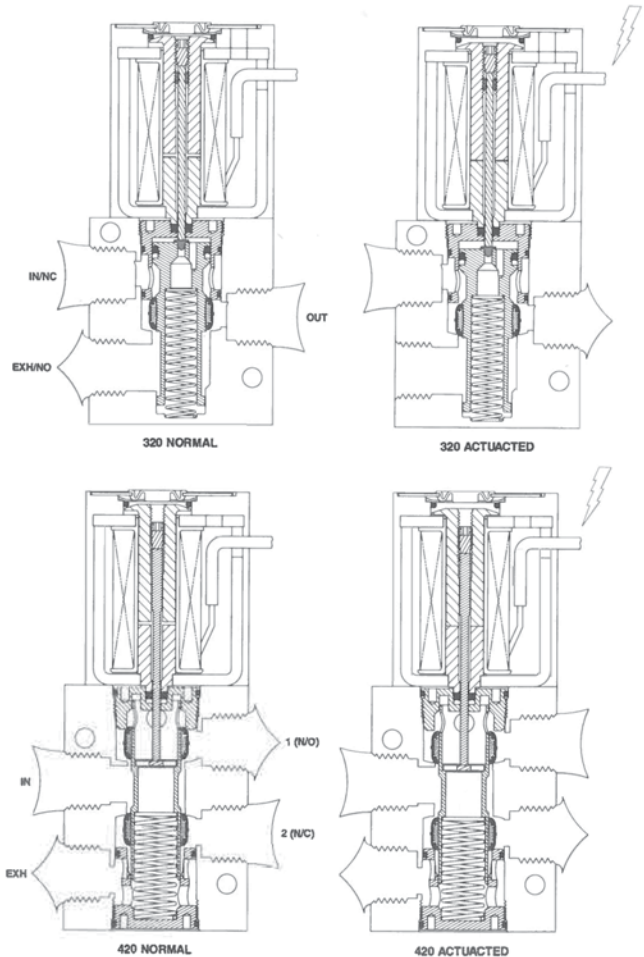


SPECIFICATIONS

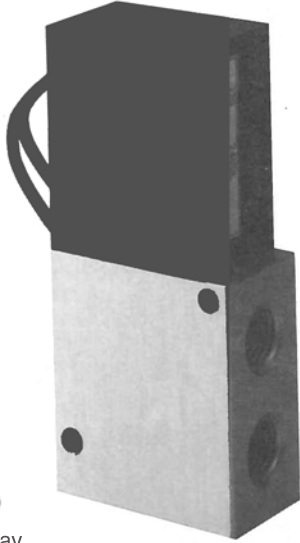
320/420 Models	
Media	Air, vacuum or inert gases
Pressure Range	28" Hg. (vacuum) to 125 psig (8.5 bar)
Ambient Temperature Range	32° to 125°F (0° to 50°C)
Coil Temperature Rise (any voltage)	108°F (60°C)
Power Consumption (AC/DC)	8.0 watts
Response Time (on/off)	Model 320 — .018/.009 (DC), .018/.037 (AC) sec. Model (M)420 — .023/.007 (DC), .022/.037 (AC) sec.
Voltage Tolerance	Plus 10%, minus 15% of rated voltage
Coil Voltages	12VDC, 24VDC, 24VAC, 100VAC, 120VAC, 200VAC, 240VAC
SCFM @ 100 psig	60 (54 for M420)
C _v	1.0 (0.9 for M420)
Leak Rate (max. allowed)	4cc/minute @ 100 psig
Type of Operation	Direct solenoid
Effective Area	Model 320 .041 inch ² Model (M)420 .045 inch ²
Stroke	.032 inch
Typ. Cycle Rate (cycles/min.)	1500 (DC), 725 (AC)
Lubrication	None required, factory pre-lubed
Filtration	40 Micron recommended
Weight	Model 320 .65 lbs. (295 gms) Model 420 .77 lbs. (350 gms) Model M420 .73 lbs. (332 gms)
Materials	Brass, Buna N, Aluminum, Stainless Steel, Acetal



FLOW PATH



320 SOLENOID VALVES

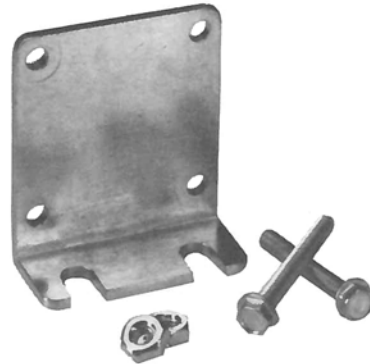
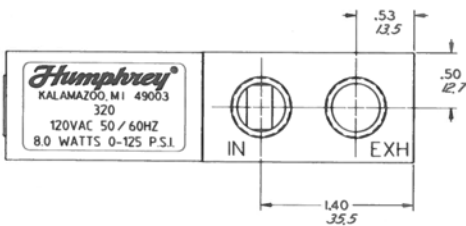
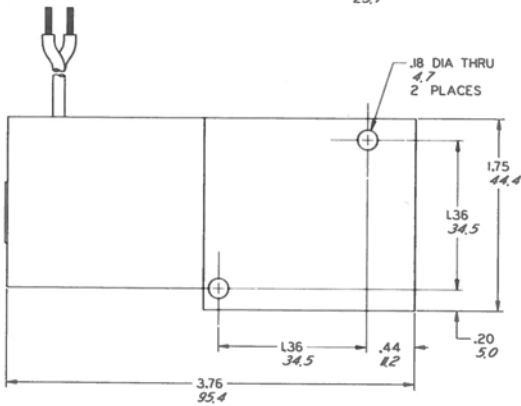
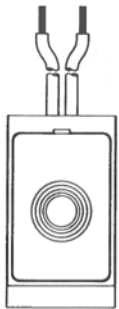
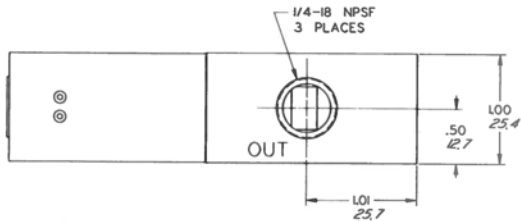


320

- 3-way
- 2-position, spring return
- Direct-acting, single solenoid
- Continuous duty coil
- Three 1/4-18 NPSF ports (IN, OUT, EXH)
- Non-locking manual override – standard
- Optional locking override or no override available
- 24-inch lead wires – standard
- Optional DIN receptacle or conduit connector available



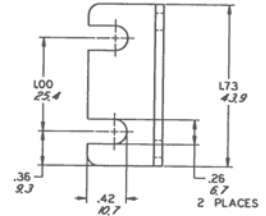
Order example: 320 24VDC



8-388A 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 screws, and two captive lockwasher nuts.

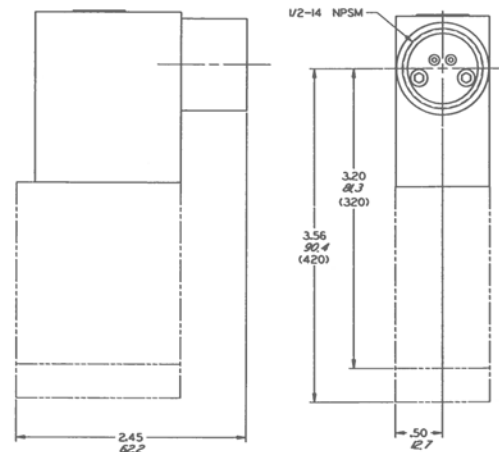
Order example: 8-388A



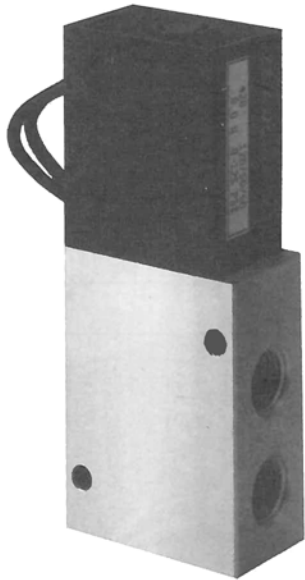
MODEL 320-36

This conduit connector (Order code -36) for closed wiring systems features a steel conduit assembly attached to the valve coil.

Order example: 320-36 24VDC



420 SOLENOID VALVES

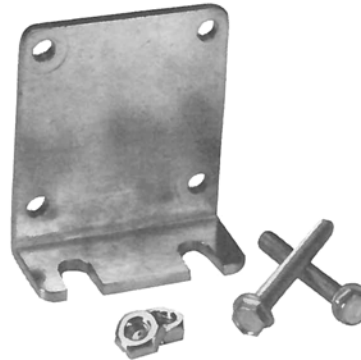
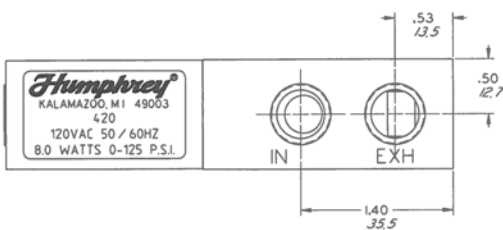
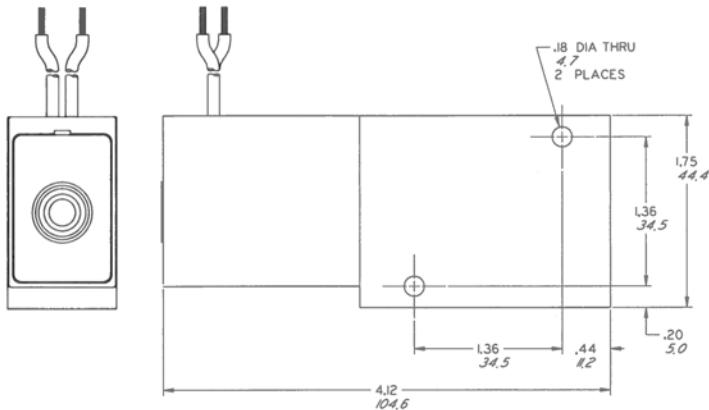
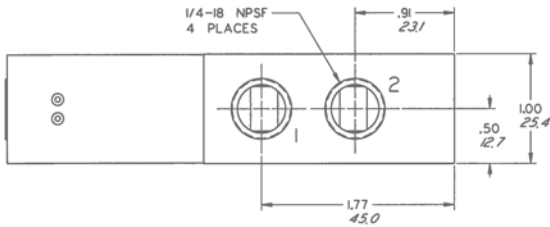


420

- 4-way, Normally Open/Normally Closed
- 2-position, spring return
- Direct-acting, single solenoid
- Continuous duty coil
- Four 1/4-18 NPSF ports: IN, Delivery ports 1 & 2, and single exhaust port (EXH)
- Non-locking manual override – standard
- Optional locking override or no override available
- 24-inch lead wires – standard
- Optional DIN receptacle or conduit connector available



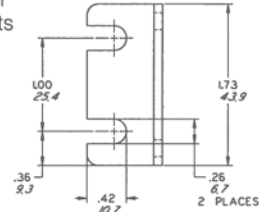
Order example: 420 120/50/60



8-388A 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 screws, and two captive lockwasher nuts.

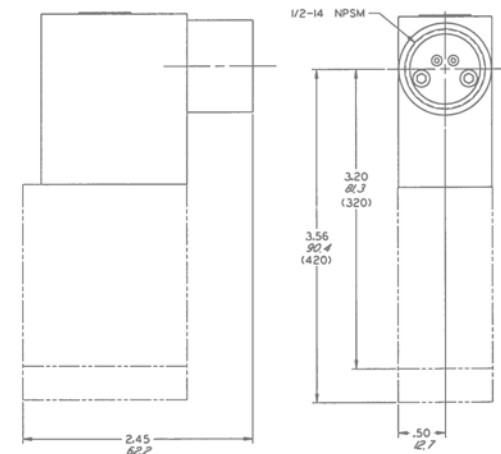
Order example: 8-388A



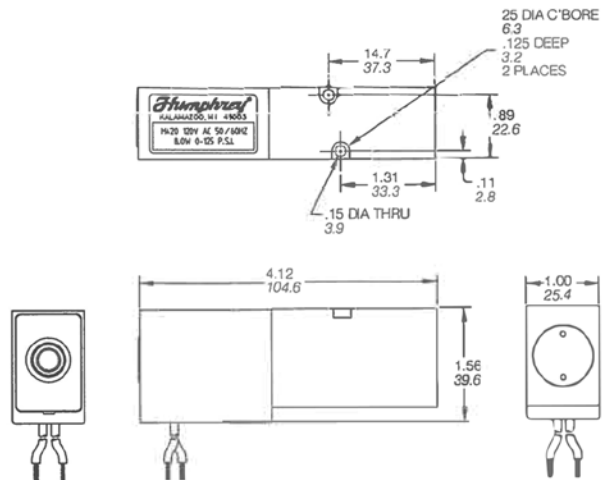
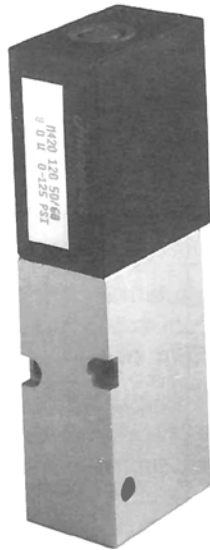
MODEL 420-36

This conduit connector (Order code -36) for closed wiring systems features a steel conduit assembly attached to the valve coil.

Order example: 420-36 120VAC 50/60

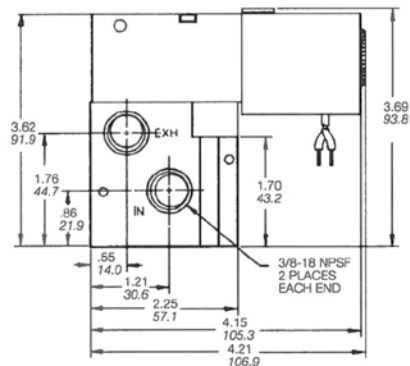
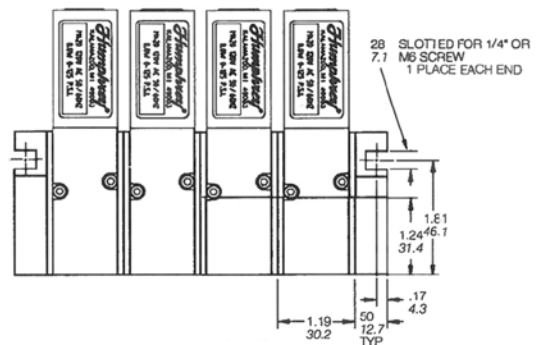


M420 SOLENOID VALVE



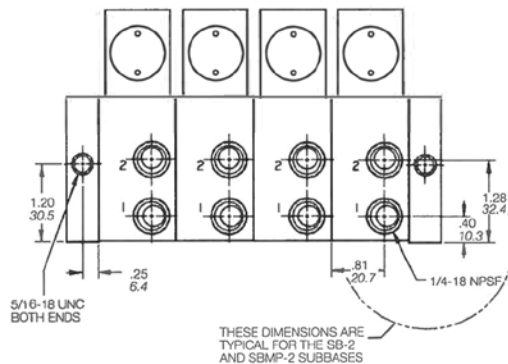
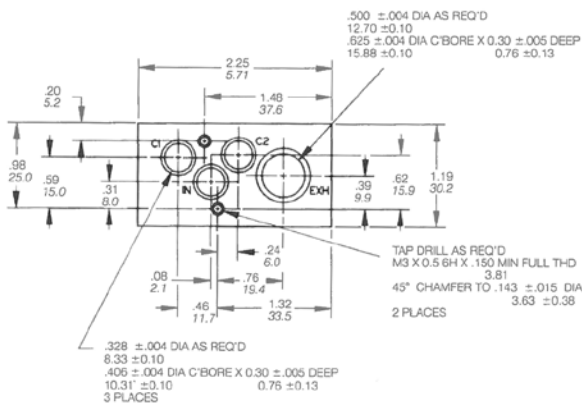
M420

- 4-way, Normally Open/Normally Closed
- 2-position, spring return
- Direct-acting, single solenoid
- Continuous duty coil
- Four internal ports: In, Delivery ports 1 & 2, Exhaust
- Non-locking manual override – standard
- Optional locking override or no override available
- 24-inch lead wires – standard
- Optional DIN receptacle or conduit connector available
- Two mounting screws and gasket included
- For 3-way function, plug either Port 1 or 2 of SB-2 subbase



PORTING FOOTPRINT

Humphrey M420 valves can be mounted to your equipment or to special manifolds using the dimensional data shown below.



HUMPHREY M420 SERIES SUBBASE MANIFOLD MOUNTED SOLENOID VALVES

TECHNICAL SECTION

DESCRIPTION

M420

A 4-way normally open/normally closed, single solenoid, 2-position/ spring return, general purpose air valve. Comes with two spacer screws and one gasket.

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

SB-2

Subbase with two 1/4-inch outlet ports, marked 1 and 2. Comes with two spacer screws and two o-rings.

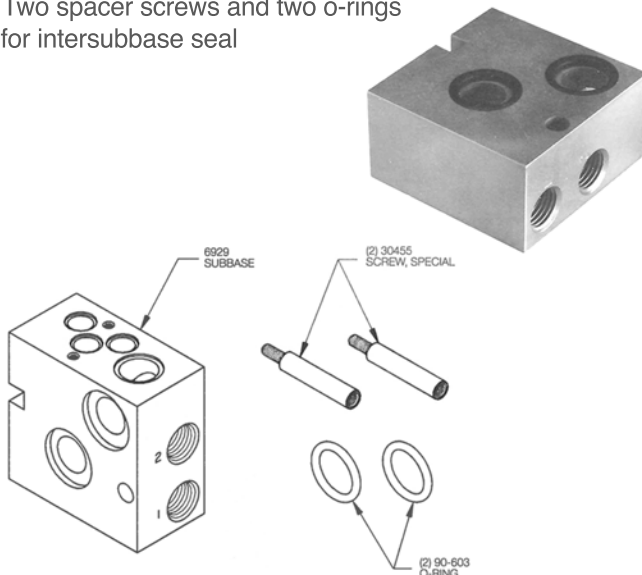
INSTALLATION

The assembled subbase manifold should be mounted using the slotted mounting hole in each End Cap and 1/4-inch or M6 socket head cap screws or fillister head screws. One threaded 5/16-18 mounting hole is provided in each End Cap for mounting the finished assembly.

If manifold consists of a large number of valves or if several valves are to be actuated at the same time, consider piping supply pressure to both end caps.

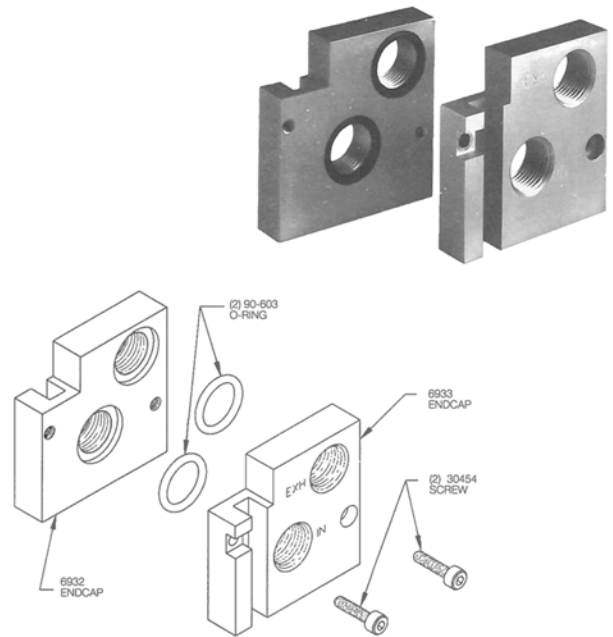
SB-2

- Subbase for M420 valve
- Two delivery ports, marked 1 and 2
 - Port 1 is normally open
 - Port 2 is normally closed
- Two spacer screws and two o-rings for intersubbase seal



END PLATE ASSEMBLY PART NUMBER 7-200A

The End Plate Assembly consists of two subbase end caps and fastening accessories. One End Plate is mounted to each end of a completed subbase assembly. Tighten screws to 50 lb.·in. of torque, maximum. Two slotted holes provide a method of mounting a subbase assembly. Includes two o-rings to seal subbase to end cap, and two M4 socket head cap screws to secure tie rod spacers.



BLOCK-OFF PLATE

Model 8-420A anodized aluminum block-off plate is used to suspend the use of any SB-2 subbase. It can also be used to permit future valve additions related to machine options. Supplied with screws and o-rings to mate with subbase.

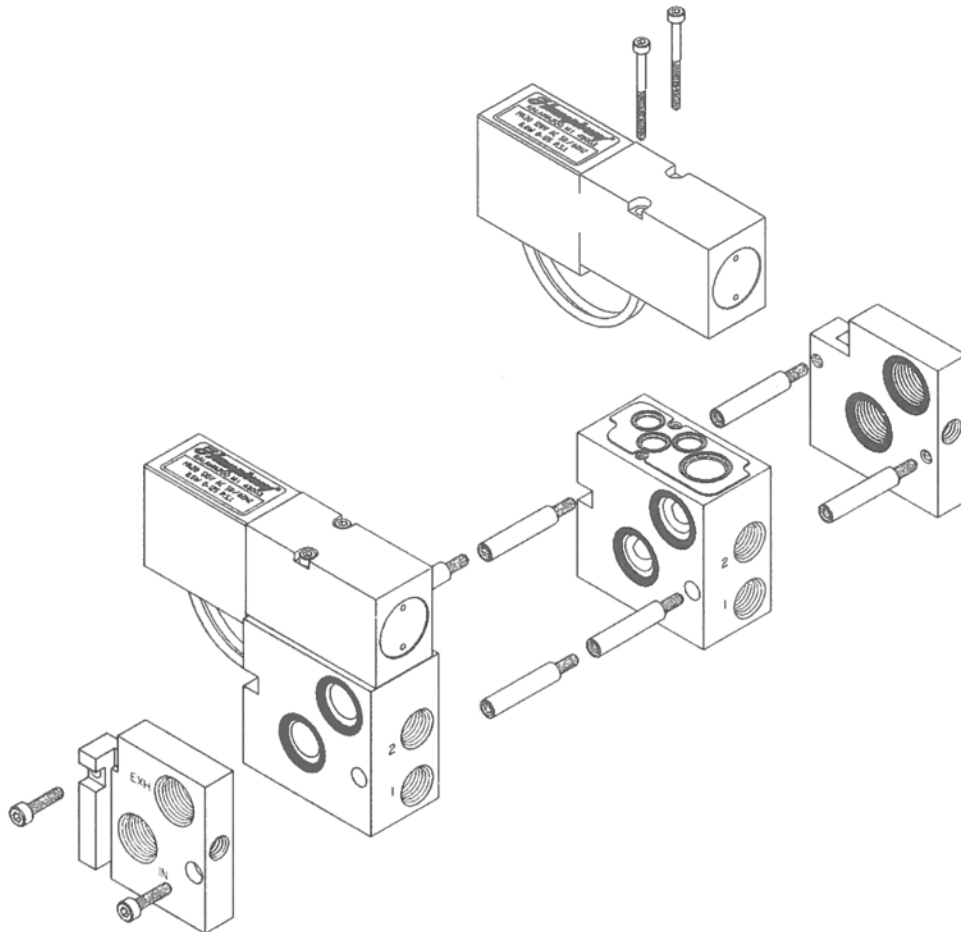


MANIFOLD ASSEMBLY INSTRUCTIONS

TO ASSEMBLE A VALVE MANIFOLD

1. Hand tighten each set of threaded spacers (two supplied per subbase) into units of equal length.
2. Ensure that o-ring seals (supplied) are placed in subbase side ports having o-ring grooves.
3. Place o-ring seals (two supplied) into End Cap that has o-ring grooves and thread spacers into this End Cap.
4. Assemble subbases onto spacers using subbase through-holes.
5. Secure entire assembly with M4 socket head screws (supplied with End Caps) and tighten with 3mm hex drive wrench (not supplied).
6. Place gasket (supplied with valve) onto the valve mounting surface on the subbase.
7. Mount valves to subbase assembly with M3 socket head cap screws (supplied with valve) and tighten with 2.5mm hex drive wrench (not supplied). Use 12 lb.·in. of torque, maximum.

NOTE: Coils face away from subbase Delivery ports.



ORDER INFORMATION

320/420/M420 Series Valves
1/4-inch ports, 2-way, 3-way, 4-way

VALVES

Model NOTE 2	Option Description								Voltage
	Two-Way NOTE 1	Conduit Connector	DIN-Type Connector	Locking Manual Override	No Manual Override	Flying Leads		Rotated Coil (180°)	
						24"	72"		
	Option Code								
2	36	39	81	87		LL	RC		
320 3-way, Inline	SP								12 VDC 24 VDC 24/50/60
420 4-way, Inline	NA	SP	SP	SP	SP	STD	SP	SP	100/50/60
M420 4-way, Manifold									120/50/60 200/50/60 240/50/60

NOTE: Standard valves are furnished with 24" flying lead wires and a non-locking manual override.
NOTE 1: 1/4" plug for 2-way is furnished unattached to valve.

NA = Not available
N/C = No charge
STD = Standard
SP = Specify; Additional charge for this option

ACCESSORIES

Model	Description
8-288A	Universal mounting bracket
130-15	Port Plug
HS3	DIN receptacle for use with code 39 connector
HS3LED	LED DIN receptacle for use with code 39 connector. Specify: 12V, 24V, 120V or 240V

HOW TO ORDER

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

EXAMPLES:

MODEL 320-2-LL 12VDC

320-2 2-Way Operation
320-2-LL 72" Flying Leads
320-2-LL 12VDC Voltage 12VDC

MODEL 420-87 120/50/60

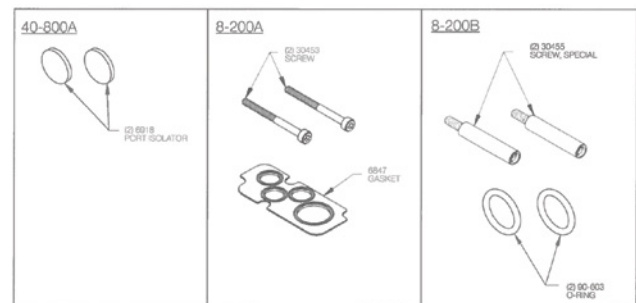
410-87) No Manual Override
420-87 120/50/60 Voltage 120/50/60

MODEL M420-39-81 24VDC

M420-39 Code 39 DIN connector
M420-39-81 Locking Manual Override
M420-39-81 24VDC Voltage 24VDC

M420 ACCESSORIES

Model	Description
SB-2	Subbase with two delivery ports (includes two spacer screws, two o-rings).
7-200A	End Cap Kit (two subbase EndCaps, two o-rings, and two screws).
8-200A	Valve Mounting Kit (one gasket, two screws).
8-200B	Subbase mounting kit (two spacer screws, two o-rings).
8-420A	Block-off plate for M420 series valves, gasket, two screws.
40-800A	Port isoator kit (two port isolators).
130-25	3/8" End Plate Port Plug



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