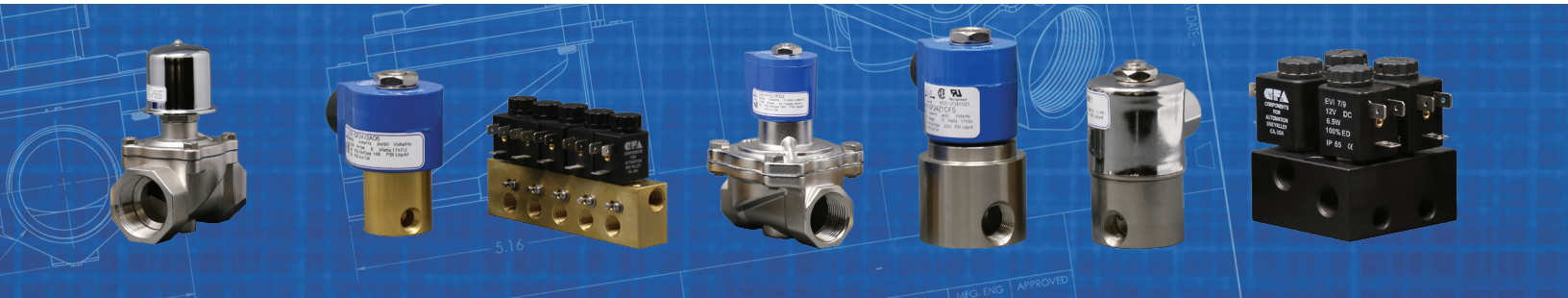
GC Valves LLC

A DEMA Company

SPECIALISTS IN FLUID CONTROL

VALVE SELECTION INFORMATION & ENGINEERING GUIDE



How To Select A Solenoid Valve

We offer a wide variety of General Purpose Solenoid Valves from which to choose. To select the valve that best suits your application, determine the following:

Valve Type and Operating Mode

Available configurations include:

2-Way Normally Closed - Two pipe connections (inlet and outlet) and one orifice to provide On-Off control. Valve is open when energized, closed when de-energized.

2-Way Normally Open - Two pipe connections (inlet and outlet) and one orifice to provide On-Off control. Valve is closed when energized, open when de-energized.

3-Way Normally Closed - Three pipe connections (one always open to one of the other two) and two orifices (one always open and one always closed) to regulate the direction of media flow. When energized, the flow is from the inlet port through the cylinder port; When de-energized, the flow is from the cylinder port through the exhaust port.

3-Way Normally Open - Three pipe connections (one always open to one of the other two) and two orifices (one always open and one always closed) to regulate the direction of media flow. When de-energized, the flow is from the inlet port through the cylinder port. When energized, the flow is from the cylinder port through the exhaust port.

3-Way Universal, Diverting & Selecting - Three pipe connections (one always open to one of the other two) and two orifices (one always open and one always closed) to regulate the direction of media flow. Valves can be installed to provide either normally closed (open when energized, closed when de-energized) or normally open (closed when energized, open when de-energized) operation. The valve can also be connected to select one of two flow media or to divert media flow from one port to another.

Pipe Connections

Pipe connections (ports) are openings that conduct the flow of the controlled media in and out of the valve. Factors influencing the selection of pipe sizes are the system's existing or designed pipe connection sizes and the flow requirements (Cv) of the application.

Cv Factor

Cv is the amount of water at standard conditions (60°F, specific gravity = 1) in GPM (gallons per minute) which will pass through the valve with a one psi (pound per square inch) pressure drop across the valve in the full open position. The appropriate Cv will determine which combination of pipe and orifice sizes will be required for the application. Refer to the "VALVE SIZING" and "Cv Factor" sections for additional information.

Maximum Operating Pressure Differential

The maximum operating pressure differential is the maximum difference in pressure (measured in psi or bar) between the inlet and the outlet valve ports. Factors influencing the maximum operating pressure rating include the pipe connection sizes, orifice size(s), and design of construction.

Operating Temperature

Sealing materials, coil class, body materials, and duty cycle all influence the valve's temperature capabilities. Operating temperature is determined by a combination of media and ambient temperatures.

Flow Media

Flow media is the substance being controlled by the valve. The media's temperature, pressure, and concentration will determine the type of body and sealing materials required for the application.

Power Requirements

Voltage and Cycles (Hertz) will usually be determined by the system's existing power specifications. VA is a measure of the solenoid's power consumption. The "inrush" VA rating is the maximum initial surge of current required to energize the coil, while "holding" VA is a lesser current required to hold the valve in its energized position. In either case, the solenoid's amperage is determined by dividing the VA rating by the applied voltage. Inrush and holding currents are identical for DC solenoids, and the rating is given in watts (watts DC = volts x amperes).

GC SOLENOID VALVES

Series	Media	Connection	Function	Orifice Range	Pressure Range	Max Fluid Temp	Cv Range	Approvals	Valve Body	Seal Materials
 S20		3/8”-1 1/2” NPT	NC, NO	5/8”-1 1/4”	0-200 PSI	295 ° F	4.3-23		316	Nitrile, FKM, GFLT, EPDM
 S21		3/8”-2” NPT	NC, NO	5/8”-1 1/2”	4-250 PSI	366 ° F	4.3-29		316	Nitrile, FKM, GFLT, EPDM
 S27		1”-2” NPT	NC, NO	1”-1 1/4”	0-125 PSI	295 ° F	13-27		316	Nitrile, FKM, GFLT, EPDM
 SC91		10/32”-1/4” NPT	NC, NO	0.8mm-3.0mm	0-580 PSI	266 ° F	0.035-0.280		316	Nitrile, FKM, EPDM, PTFE, FFKM
 SC31		1/8”-1/4” NPT	NC, NO	0.8mm-3.0mm	0-580 PSI	122 ° F	0.035-0.280			Nitrile, FKM, EPDM, PTFE, FFKM
 SC41		1/4”-3/8” NPT	NC, NO	0.8mm-6.0mm	0-2030 PSI	284 ° F	0.035-0.350		304	Nitrile, FKM, EPDM, PTFE, FFKM
 S30		1/8”-3/8” NPT	NC, NO, 3-way	1/32”-3/8”	0-2400 PSI	366 ° F	.03-1.3		304	Nitrile, FKM, GFLT, EPDM, PTFE, FFKM, Rulon
 S31		1/8”-3/8” NPT	NC, NO, 3-way	1/32”-3/8”	0-2000 PSI	366 ° F	.03-1.3		304	Nitrile, FKM, GFLT, EPDM, PTFE, FFKM, Rulon
 S33		1/8”-1/4” NPT	3-way	1/16”-11/64”	0-200 PSI	295 ° F	.09-.38		304	Nitrile, FKM, EPDM
 S40		1/4”-1 1/4” NPT	NC, NO	3/8”-1 1/8”	0 -300 PSI	366 ° F	1.1-18.8		304	Nitrile, FKM, EPDM, PTFE

KEY

MEDIA

- Water
- Air & neutral gases
- Light Oil
- Slightly Aggressive media
- Aggressive media
- Steam

FUNCTION

NC – 2-way Normally Closed
NO – 2-way Normally Open
3-way – Normally Closed, Normally Open, Diverting, Universal, or Free Exhaust

VALVE BODY

- Brass
- Nylon
- 316 Stainless Steel
- PVC
- 304 Stainless Steel
- Lead-Free Brass

GC SOLENOID VALVES

Series	Media	Connection	Function	Orifice Range	Pressure Range	Max Fluid Temp	Cv Range	Approvals	Valve Body	Seal Materials
 S71		3/8”-2” NPT	NC, NO	3/8”-2”	7-225 PSI	295 ° F	4.5-48			Nitrile, FKM, EPDM
 S80		1/4”-1/2” NPT	NC, NO	3/8”	0-290 PSI	230 ° F	1.6			Nitrile, FKM
 SP31		3/8”-2” NPT	NC, NO	12mm-55mm	5-150 PSI	122 ° F	2.4 - 41			Nitrile, FKM, EPDM
 SP91		1/2”-1” NPT	NC, NO	4.0mm-25mm	8-200 PSI	266 ° F	4.5 - 12		304	Nitrile, FKM, EPDM
 H40		1/4”-1/2” NPT	NC, NO	3/8”	0-2200 PSI	230 ° F	1 - 1.5		304	FKM, PTFE
 H90		1/2”-1” NPT	NC	15mm-25mm	0-1200 PSI	230 ° F	4.2-7		304	FKM, PTFE
 NS20		3/8”-1 1/2” NPT	NC, NO	5/8”-1 1/4”	0-100 PSI	295 ° F	4.3-18	NSF	316	EPDM, Santoprene
 NS21		3/8”- 2” NPT	NC, NO	5/8”-1 1/4”	4-200 PSI	295 ° F	4.3-13	NSF	316	EPDM, Santoprene
 NS30		1/8”-3/8” NPT	NC, NO	1/32”-9/32”	0-150 PSI	295 ° F	.03-1	NSF	304	EPDM
 NS31		1/8”-3/8” NPT	NC, NO	1/32”-9/32”	0-150 PSI	366 ° F	.03-.65	NSF	304	EPDM
 NS71		3/8”- 2” NPT	NC, NO	3/8”-2”	7-225 PSI	295 ° F	4.5-48	NSF		EPDM

KEY

MEDIA

- Water
- Air & neutral gases
- Light Oil
- Slightly Aggressive media
- Aggressive media
- Steam

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NC – 2-way Normally Closed
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VALVE BODY

- Brass
- Nylon
- 316 Stainless Steel
- PVC
- 304 Stainless Steel
- Lead-Free Brass

ENCLOSURE TYPES

The following information is transcribed from the requirements of **NEMA** and the **American Institute of Electrical Engineers** covering various classifications of the Underwriters' Laboratories. These requirements are listed for reference purposes only. They are taken from the requirements of the approval associations or engineering groups. They are not necessarily an indication of what should be sold in the way of control apparatus. GC Valves does not supply all types of enclosures on all valves designs. (Contact GC Valves Customer Service for specific combinations.)

NEMA Enclosure Types

In non-hazardous locations, the specific enclosure types, their applications, and the environmental conditions they are designed to protect against, when completely and properly installed, are as follows:

Type 1 - Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt.

Type 4 - Enclosures constructed for either indoor or outdoor use to provide a degree of protection against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

Type 4X - Enclosures constructed for either indoor or outdoor use to provide a degree of protection against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure.

Type 7 - (C or D) Hazardous Locations Class I - Air-Break (Specific to our rating)

These enclosures are designed to meet the application requirements of the National Electrical Code for Class I, Hazardous Locations, which may be in effect from time to time. In this type of equipment, the circuit interruption occurs in air.

Group C - Atmospheres containing ethyl-ether vapors, ethylene, or cyclo-propane.

Group D - Atmospheres containing gasoline, hexane, naptha, benzine, butane, propane, alcohol, acetone, benzol, lacquer solvent vapors, or natural gas.

GROUP E - Atmospheres containing metal dust, including aluminum, magnesium and their commercial alloys, and other metals of similar hazardous characteristics.

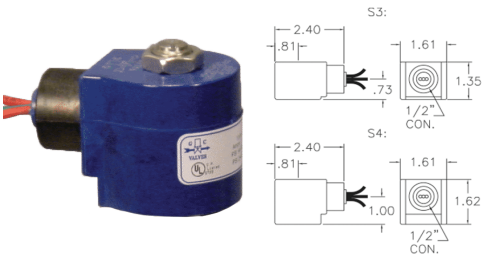
GROUP F - Atmospheres containing carbon black, coal, or coke dust.

GROUP G - Atmospheres containing flour, starch, or grain dust.

Housing Codes

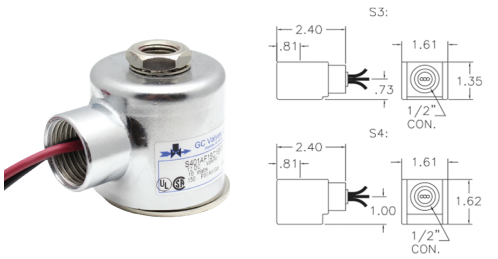
Conduit – Coil Family S3 & S4

G



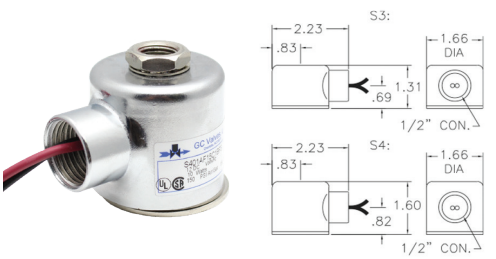
NEMA 4/4X; Fully encapsulated, 24 inch lead wires, 1/2" conduit hub

A



NEMA 1; Metallic housing, 24 inch lead wires, 1/2" conduit hub

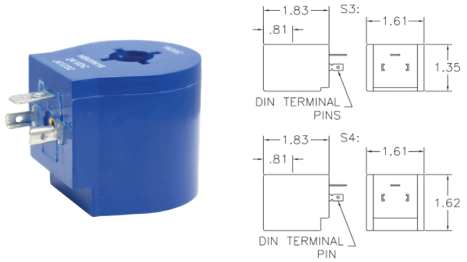
W



NEMA 1; Metallic housing, 24 inch lead wires, 1/2" conduit hub

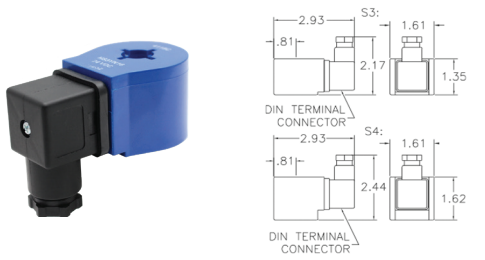
DIN – Coil Family S3 & S4

Y



ISO; Fully encapsulated, spade terminal, European configuration, NEMA 4

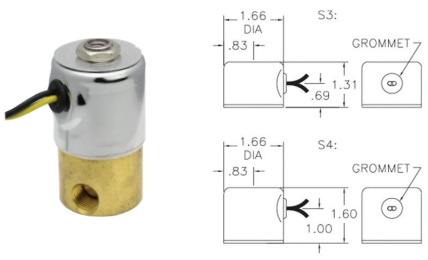
DIN OPTIONS



ISO; Molded connectors, cables, timers etc. designed for DIN coil/housing

Grommet - Coil Family S3 & S4

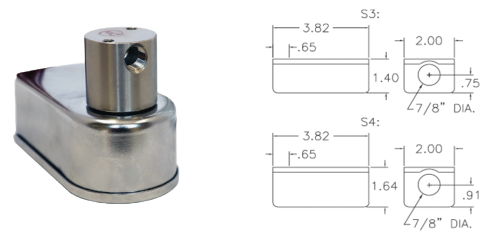
B



Metallic housing, 24 inch lead wires

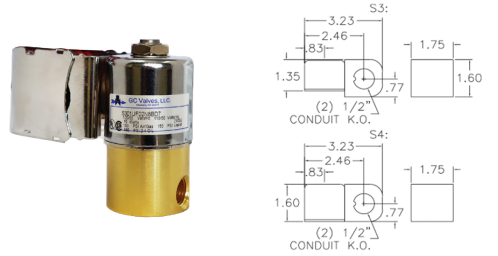
Junction Box – Coil Family S3 & S4

S



Standard – with 1/2" conduit knockout, lead wires

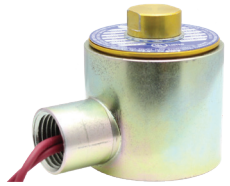
U



Compact with two 1/2" conduit knockouts, lead wires

NEMA 7 - Coil Family S3 & S4

X

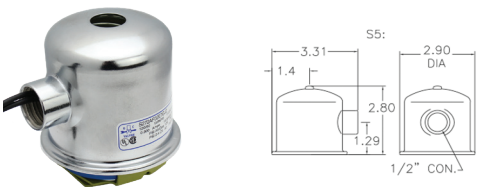


Contact GC Valves Customer Service for dimensions.

Explosion Proof; 24 inch lead wires, 1/2" conduit hub Class I & II Groups C, D, E, F & G, Division 1 & 2

Conduit - Coil Family S5

A



NEMA 1; Metallic housing, 24 inch lead wires, 1/2" conduit hub

Seal Material & Shading Ring Codes

Code	Seal	Shading Ring	Code	Seal	Shading Ring	Code	Seal	Shading Ring
C	EPR	Copper	L	Viton	Silver	T (S21)	Teflon/EPR	Copper
E	EPR	Silver	N	Nitrile	Copper	T (H40)	Teflon/Viton	Copper
J	Nitrile	Silver	R	Rulon	Silver	V	Viton	Copper
K	Teflon	Silver	S	Teflon	Copper			
K (S21)	Viton	Copper	T	Teflon	Copper			

Voltage Codes

Code	Voltage	Code	Voltage	Code	Voltage
01	24 VAC/60Hz	14	6 VDC	24	24 vac/50hz
02	120 VAC/60Hz	15	12 VDC	33	48 vdc
03	208 VAC/60Hz	16	24 VDC	54	240 vac/50hz
04	240 VAC/60Hz 220 vac/50hz	17	32 VDC	55	380 vac/50hz
07	480 VAC/60Hz 440 vac/50hz	18	120 VDC	74	74 vdc

** For Additional Variations Contact GC Valves Customer Service.*

Valve Sizing & Cv Flow Factor

Valve Sizing Procedures

The successful operation of a controlled system depends on proper sizing of the valve. A practical method - utilizing a graphical presentation of valve sizing based on the Cv ("C" sub "v") ratings of valves - is presented for the GC Valves general purpose designs.

The Cv rating of any valve is the flow rate of water at standard conditions (60°F, specific gravity = 1) in GPM (gallons per minute), which will pass through the valve with a one psi (pound per square inch) pressure drop across the valve when in the fully open position. This rating is determined by the manufacturer's tests and is published in catalogs and specification sheets.

A valve so restricted or ported which passes 1 GPM of liquid with a specific gravity of 1 and an accompanying pressure drop of 1 psi is assigned a rating of Cv = 1. By comparison, a valve having a Cv = 2 would have twice the flow capacity with the same pressure drop.

Please contact GC Valves Customer Service for assistance in determining the required flow factor for your application.

VALVE NOMENCLATURE

VALVE SERIES	OPERATING MODE	COIL HOUSING	COIL CLASS	COIL VOLTAGE	SEAT | SHADING RING	BODY MATERIAL	PIPE SIZE	2-WAY ORIFICE*	SUFFIX
S20	**1** - 2W NC	**A** - Metal Conduit	**F**	**01** - 24V/60HZ	**A** - FFKM | Silver	**1** - 316 SS	**A** - 1/8"	**C1** - 1/32"	**A** - Angle Body
S21	**2** - 2W NO	**B** - Grommet	**H**	**02** - 110/50HZ-120/60HZ	**C** - EPDM | Copper	**2** - 303 SS	**B** - 1/4"	**C3** - 3/64"	**B** - SS Split Washer
S27	**3** - 3W NC	**F** - DIN w/ C-4010		**03** - 208V/60HZ	**E** - EPDM | Silver	**3** - 303 SS	**C** - 3/8"	**C5** - 1/16"	**C** - CE Declaration
S30	**4** - 3W NO	**G** - 1/2" Conduit NEMA 4X		**04** - 240V/60HZ 220V/50HZ	**F** - EPDM + Sant | Copper	**4** - Brass	**D** - 1/2"	**C7** - 5/64"	**D** - Mounting Bracket
S31	**5** - 3W Selector	**P** - Open Frame with Leads		**24** - 24V/50-60HZ	**G** - GFLT | Silver	**5** - Brass	**E** - 3/4"	**C9** - 3/32"	**E** - CSA Certification
S33	**6** - 3W Universal	**S** - Long Junction Box		**14** - 6V DC	**J** - Nitrile | Silver	**6** - Aluminum	**F** - 1"	**D3** - 7/64"	**F** - Metering
S40	**7** - 3W Free Exhaust	**U** - Round Junction Box		**15** - 12V DC	**K** - FKM | Copper (S21)	**7** - 316 SS	**G** - 1-1/4"	**D5** - 1/8"	**G** - Gold Plated Plunger and Tube Head
S71		**W** - Rain Tight Metal Conduit		**16** - 24V DC	**K** - PTFE | Silver (S30, S31,S40)	**8** - Brass	**H** - 1-1/2"	**D7** - 5/32"	
H21		**X** - Explosion Proof NEMA 7/9		**18** - 120V DC	**L** - FKM | Silver	**9** - Brass	**J** - 2"	**E1** - 3/16"	**K** - Mounting Bracket
H40		**Y** - DIN		**33** - 48V DC	**N** - Nitrile | Copper	**P** - Nylon		**E7** - 1/4"	**L** - Latching
M20				**45** - 12V DC 14 Watt	**R** - Rulon | Silver			**F1** - 9/32"	**M** - Manual Override
M21				**46** - 24V DC 14 Watt	**S** - PTFE | Copper			**F5** - 3/8"	**N** - Cleaned for Oxygen Service
NS20				**74** - 74V DC	**T** - PTFE | Copper			**G1** - 1/2"	**NP** - Gaseous CO2
NS21					**V** - FKM | Copper			**G4** - 5/8"	**P** - Nickel Plating
NS30					**Z** - PTFE + FKM | Copper			**G5** - 3/4"	**S** - UL Safety Rated
NS31								**G7** - 15/16"	**T** - TimeSaver Conn
NS71								**G9** - 1"	**W** - Submersible
								J1 - 1-1/8"	**Z1** - 48" Coil Leads
								J2 - 1-1/4"	**Z2** - 36" Coil Leads
								J5 - 1-1/2"	**Z5** - Liquid CO2
								10 - 10mm	

K13 refer to catalog or price list

Please contact your GC Valves Sales Rep to verify model numbers and feature compatibility

*** 3-way orifices refer to catalog or price list**

DECADES OF INNOVATION & EXCELLENCE

GC Valves heritage has its roots in the founding of General Controls back in the 1930's. Through targeted acquisitions and partnerships, what started out as one company and one product line over 80 years ago is now a globally recognized and trusted brand covering dozens of markets and hundreds of applications. Despite our growth, we never lost focus of what's core to our business – our dedication to understanding our customers' needs and providing an exceptional experience. These values are what make us the trusted provider for solenoid valves and solutions to some of the most respected names in their respective industries. In its current form as GC Valves, LLC, it's the combination of two industry leading organizations, Components for Automation (Simi Valley, CA) and GC Valves (Charlotte, NC) under the DEMA Engineering Company umbrella.

GC Valves designs and manufactures world class solenoid valves to meet the requirements of a wide variety of markets and applications. Whether you're in a car wash, food manufacturing plant or medical facility, you'll likely find a GC Valves solenoid valve in operation. Variations are available to handle virtually any liquid or gas from vacuum to high flow / pressure; cryogenics to steam; natural gas to fuel oil; air and water to reagents and enzymes; ultra-pure to corrosive. Our versatile range of products can include pipe sizes from 10-32 to 2 inch in single valve, manifold, explosion proof and intrinsically safe designs. Our extensive design and development experience has contributed to a product catalog of over 35,000 solenoid valve variations. If we don't have what you need readily available, our design and development team will work with you to create a product that meets your requirements.

At GC Valves we are "Your Single Source For Solenoid Valves."