TECHNICAL DATA SHEET
86 Series Ball Valves

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DESCRIPTION

86 Series, two-piece bar stock body style valve, standard port, offering broad applicability. Easily adaptable to pneumatic or electric automation

MATERIALS OF CONSTRUCTION

BODY: Brass - ASTM B-16, Carbon Steel - ASTM A108, 316 Stainless Steel - ASTM A276

BALL AND STEM: 316 Stainless Steel

SEATS AND STEM SEAL: Glass Reinforced P.T.F.E. (Teflon ®)

CONNECTION / STYLE — SIZES

Pipe / N.P.T.F. (Dryseal National Pipe Taper)	1/4" - 2"
Pipe / B.S.P.T. (British Standard Pipe Taper)	1/4" - 2"
Pipe / J.I.S. (Japanese Imperial Standard)	1/4" - 2"

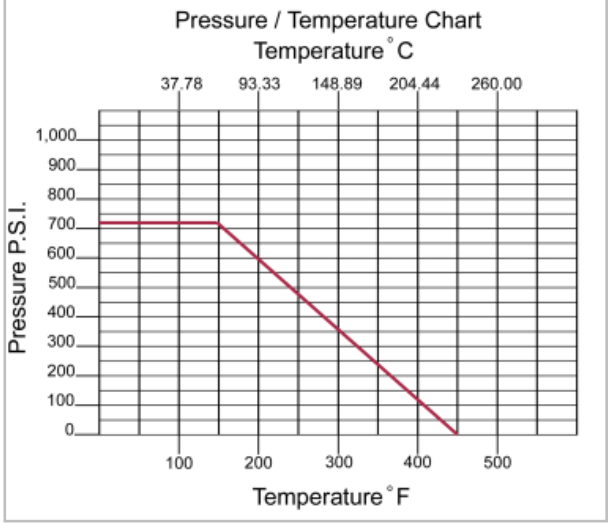
RATINGS

TEMPERATURE: -50°F to 450°F
(also see Pressure Temperature Chart)

PRESSURE: 720 p.s.i. C.W.P. (Cold Working Pressure to 150 F)
(also see Pressure Temperature Chart)

VACUUM: 20 Micron

SATURATED STEAM: 150 p.s.i.



RATINGS (continued)

FLOW CHARACTERISTICS

The approximate flow rate through a valve can be calculated as follows:

$$Q = Cv\sqrt{\frac{\Delta P}{G}}$$

where; Q = flow rate in gallons (U.S. Std.) per minute
Cv = valve constant
P = pressure drop across the valve in pounds per square inch
G = specific gravity of the media of relative to water

Note: The values derived from the flow equation are for estimating purposes only. Product variances or systemic factors may alter actual performance.

Size	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2
Cv	5.5	5.5	8	12	32	46	82	120

INSTALLATION INSTRUCTIONS

The following serves as a guideline for those experienced in pipe joint makeup. Otherwise, services of a certified pipe fitter should be utilized for installation.

1. Ensure that both the male pipe and female valve threads are free from dirt, debris and corrosion. Wire brushing of the male pipe threads is recommended to ensure a good metal-to-metal joint.

2. Apply a good quality thread lubricant (pipe dope) on the male threads. Lubricant reduces friction when pulling up the pipe joint. Note, thread lubricant is not intended to seal the joint and will not compensate for poor quality male pipe or fitting threads.

3. Turn the female valve threads onto the male pipe threads by hand. Upon free engagement of the threads, continue to turn the valve as far up as it will go (by hand). With the use of a wrench continue to tighten the valve onto the pipe. The pipe joint seal should occur within 1 to 3 turns after wrenching begins. Care should be taken not to exceed 3 turns in which damage to the threads can occur.

4. The pipe joint should be tested for leakage to ensure the pipe joint has been achieved.

MAINTENANCE

Like all Gemini Valves, the 86 Series utilizes our self compensating stem seal design. This design automatically compensates for wear as well as thermal expansion and contraction resulting in a leak tight, maintenance free, service life.

Once the stem seal has worn beyond the compensation afforded by the Belleville springs adjustment of the stem nut may enable valve to be returned to service. Holding the 'flats' of the stem, tighten the stem nut until Belleville springs become fully compressed (flattened); the torque required to tighten the nut further increases sharply when this point is reached. Do not tighten the stem nut beyond this point to avoid damage of the stem seal.

The Gemini Series 86 valves are of two piece body design, which permits disassembly for inspection and repair. Care in cleaning and handling of valve components is particularly important when overhauling ball valves, as a small nick or scratch, causing by mishandling, can be the source of leakage in service. These instructions deal with valve equipped with lever handles. If your valve has another type handle or is equipped with an actuator, the steps required to complete the stem assembly will differ somewhat from those referred to in the instruction sheet.

1. Place valve body in vise with end plug facing upward. The use of smooth vice jaws will prevent maring of the valve. Break end plug loose with wrench; remove end plug.

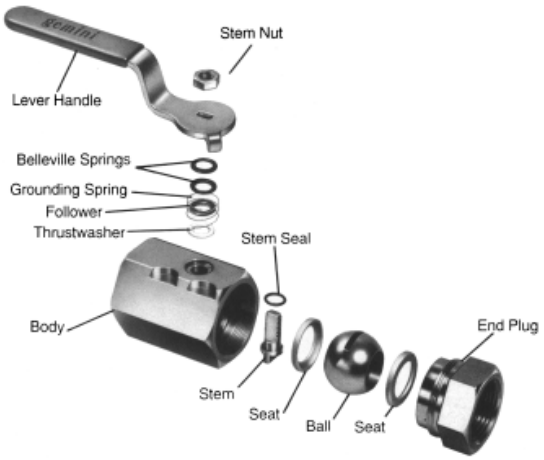
2. Remove valve from vise, turn handle to "closed" position. Remove ball. Remove seat from valve body. Remove stem nut, handle, grounding spring, Belleville springs, follower and thrustwasher. Remove stem by pushing into valve. Make sure stem seal is removed when stem is withdrawn from body. Remove seat from valve body and from end plug. Discard used seats, stem seal and thrustwasher.

3. Clean all parts. Inspect area of end plug and body, which forms metal to metal seal, for scratches and / or burrs. Lubricate all parts with a lubricant giving special attention to the end plug / body seal area and the end plug threads.

4. Place new stem seal on stem, position stem in body, place new thrustwasher over stem, install follower (small flat metal washer) over stem. Position two Belleville springs (cupped) on stem with concave surfaces facing one another, place grounding spring in position over stem. Complete stem assembly by placing handle on stem and securing with stem nut. Tighten stem nut until Belleville springs become fully compressed (flatten); the torque required to tighten the nut further increases sharply when this point is reached. Do not tighten the stem nut beyond this point.

5. Place new seat in body. Turn handle to closed position, insert ball, making sure that lower end of stem engages slot in ball. Turn handle to "open" position. Place valve body in vise as in step 1. Install new seat in end plug. Tighten end plug into body to torque given in chart.

6. Test valve. Reinstall.



Assembly Torque Specifications				
Valve Size		Foot - Pounds Values for End Plugs		
86 Series	96 Series	Brass	Carbon	Stainless
1/4	-	40	50	70
3/8	-	40	50	70
1/2	-	40	50	70
3/4	1/2	50	70	120
1	3/4	60	120	150
1-1/4	1	100	150	225
1-1/2	1-1/4	180	250	295
2	1-1/2	180	250	295

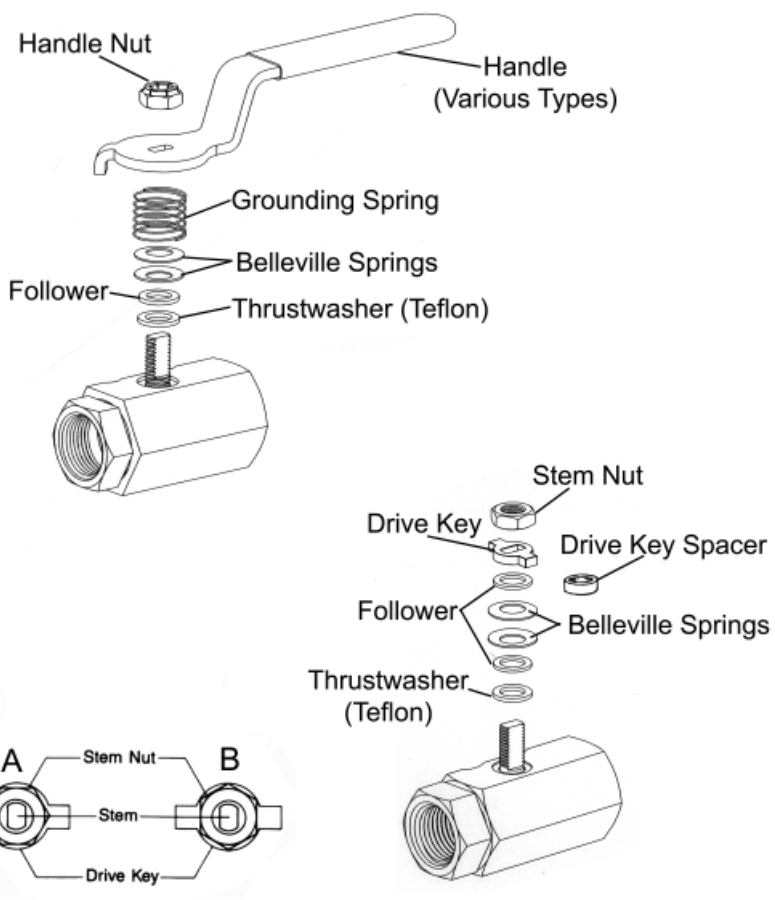
CONVERSION INSTRUCTIONS; MANUAL TO AUTOMATED

These instructions cover the conversion of manual (handle-operated) valves for actuated operation. In addition to the valve and actuator, a mounting kit is also necessary to complete the installation.

1. With the valve in the 'open' position remove, and put aside, the handle nut, handle and grounding spring from the valve on which the actuator will be mounted. Leave the thrustwasher, follower and Belleville springs on the valve stem.

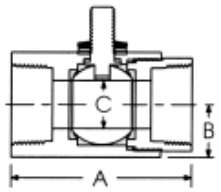
2. Assemble the drive key follower or spacer (if required, see the chart below), drive key, and stem nut from the kit. Do not reuse the handle nut from the manual valve assembly. Prevent the stem from turning as the nut is tightened by inserting a wooden or plastic dowel through the valve, then tighten the stem nut until the Belleville springs have just become fully compressed (flattened). Although the nut spins freely when first run onto the stem, the torque needed to continue tightening will increase progressively after the stem nut contacts the drive key and the Belleville springs begin to deflect. The torque required to tighten further will increase sharply once the Belleville springs have become fully flattened. Tightening beyond this point should not be attempted as damage to the stem seal may result.

3. The correct orientation of the stem nut to the drive key is shown in Figure 3; this orientation is necessary to permit engagement with the twelve-point socket in the actuator pinion driver. In order to achieve the desired orientation, loosen the stem nut until the nut / drive key relationship corresponds to either 'A' or 'B' in Figure 3. This adjustment should require less than one-twelfth (1/12) turn of the nut.

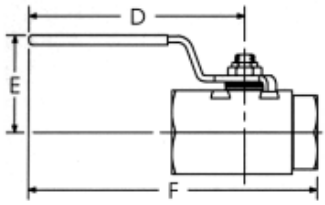


For Mounting To						
B410 & A420 Series				A500 Series		
Size	76 Series	86 Series	96 Series	76 Series	86 Series	96 Series
1/4	N/A	Follower	N/A	N/A	Follower	N/A
3/8	N/A	Follower	N/A	N/A	Follower	N/A
1/2	Follower	Follower	None	Follower	Follower	None
3/4	Follower	None	Spacer	Follower	None	None
1	None	Spacer	Spacer	None	None	Spacer
1-1/4	Spacer	Spacer	Spacer	None	Spacer	Spacer
1-1/2	Spacer	Spacer	Spacer	Spacer	Spacer	Spacer
2	Spacer	Spacer	N/A	Spacer	Spacer	N/A

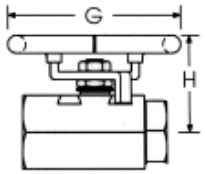
DIMENSIONS



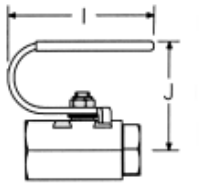
Valve



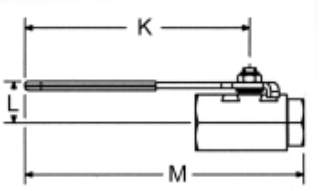
Valve with Lever Handle



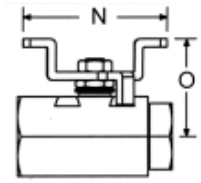
Valve with Oval Handle



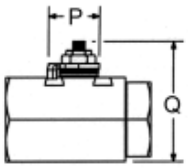
Valve with 'C' Handle



Valve with Flat Handle



Valve with Wing Handle



Valve with Handle Stop

Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1/4	2.18	0.50	0.36	4.00	1.75	5.09	2.31	1.58	2.72	2.03	4.64	0.77	5.75	2.15	1.37	0.87	1.58
3/8	2.18	0.50	0.36	4.00	1.75	5.09	2.31	1.58	2.72	2.03	4.64	0.77	5.75	2.15	1.37	0.87	1.58
1/2	2.61	0.59	0.49	4.00	1.84	5.30	2.31	1.67	2.72	2.12	4.64	0.88	5.94	2.15	1.46	0.87	1.77
3/4	2.94	0.75	0.62	5.38	2.00	6.85	3.41	1.91	3.50	2.96	5.95	1.08	7.42	2.73	1.89	1.18	2.22
1	3.32	1.00	0.80	5.38	2.28	7.04	3.41	2.13	3.50	3.18	5.95	1.30	7.61	2.73	2.10	1.18	2.62
1-1/4	3.70	1.06	0.97	6.75	2.93	8.60	3.41	2.42	4.24	3.88	7.65	1.44	9.50	3.16	2.14	1.33	3.04
1-1/2	4.25	1.31	1.25	6.75	3.19	8.87	3.41	2.67	4.24	4.13	7.65	1.69	9.77	3.16	2.39	1.33	3.54
2	4.57	1.50	1.50	6.75	3.37	9.41	3.41	2.88	4.24	4.32	7.65	1.88	9.93	3.16	2.60	1.33	3.93

400 Series Pneumatic Actuators

for 76, 86 & 96 Series Ball Valves

2 Otter Court, Raymond, New Hampshire 03077 •Tel. (603) 244-7931 • service@geminivalve.com •www.geminivalve.com

FEATURES

- **Compact, Lightweight Aluminum Body and Bracket featuring both Internal and External Teflon®-Impregnated Hard Anodized Surfaces**
- **Stainless Steel External Trim & Viton® O-rings Standard**
- **Direct Valve Stem Coupling to Actuator Shaft Minimizes Backlash**
- **Manual Override**
- **Available with Integral NAMUR Pilot Valve or can be Remotely Piloted**
- **Available with Limit Switches**
- **Easily Visible Open / Shut Position Read Out**

Gemini's 400 Series Pneumatic Actuators were the first in the ball valve industry to offer direct actuator to valve mounting. This patented design eliminated the need for bulky bracketry which lacked precise alignment and rigidity required for long trouble fee service life.

Gemini Actuator mounting is the key element of our pneumatically actuated ball valves. A quality valve and actuator, poorly mounted, results in an inferior actuated valve. The Gemini coupling eliminates this possibility. The actuator shaft is precisely coupled directly to the valve stem, thereby eliminating misalignment and backlash. The valve stem nut is fixed within the actuator shaft These features, combined with a rigid mounting bracket, result in a pneumatically actuated ball valve which minimizes backlash, assures optimum stem seal life and prevents any possibility of stem nut back off.

Designed to operate on 50 - 125 psi for double-acting models and 75 - 125 psi for spring-return models. Index (or Cycle) time is approximately 1/2 to 1 second depending on model.

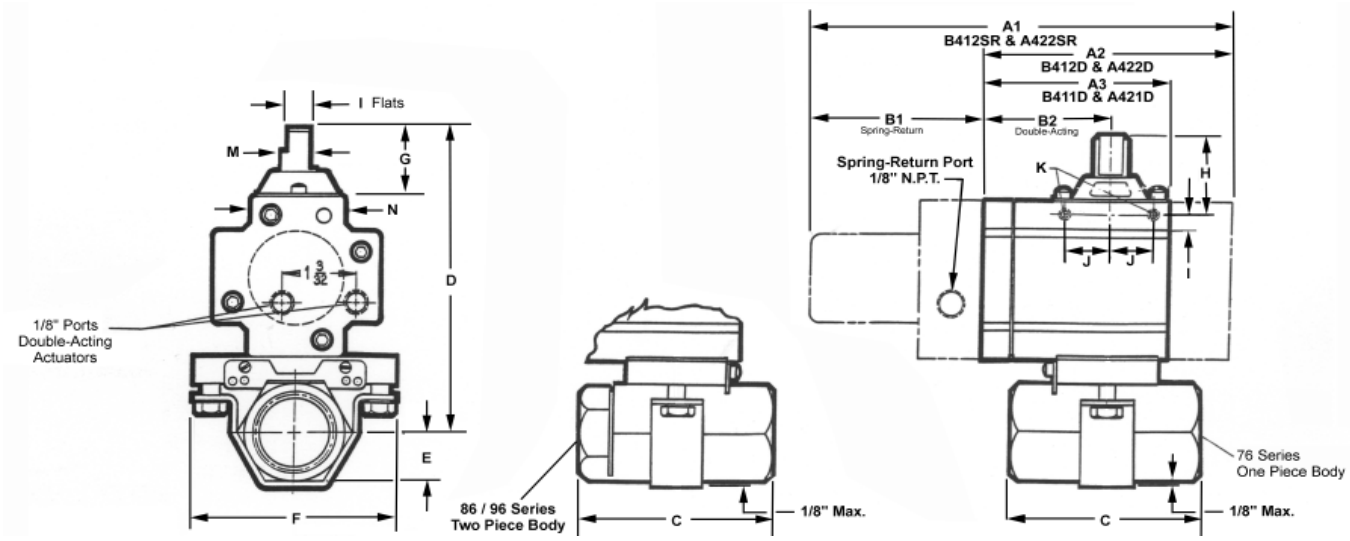
The 400 Series Pneumatic Actuators are suitable for Gemini's 76, 86 & 96 Series Barstock Ball Valves which are now part of our General Industrial Series.

The later introduction of the General Industrial Series Pneumatic Actuators (500 Model) provided a cost savings over the 400 Series by manufacturing the body from a standard shape extrusion and providing a simplified visual position indicator. The 400 Series Pneumatic Actuators today continue to have a following of loyal customers based upon it's history of performance and customer satisfaction.

Actuator Dimensions

Valve Size & Series			Actuator Model			Approximate Dimensions (Inches)																
76	86	96	Spring-Return 75 - 125 psi	Double-Acting 75 - 125 psi	Double-Acting 50-125 psi	A1	A2	A3	B1	B2	C 76	C 86	D	E	F	G	H	I	J	K	L	M	N
1/2	1/4 & 3/8	-	B412SR	B411D	B412D	7.64	3.64	2.73	5.85	1.85	2.18	2.18	4.26	.50	3.00	1.01	1.25	.19	.66	#10-24	.31	.47	1.31
3/4	1/2	-									2.22	2.61	4.35	.59									
1	3/4	1/2									2.76	2.94	4.51	.75									
1-1/4	1	3/4	A422SR	A421D	A422D	12.20	5.70	4.34	9.11	2.92	3.02	3.32	7.05	.97	4.80	1.59	1.96	.27	1.06	#10-24	.50	.81	2.12
1-1/2	1-1/4	1									3.45	3.70	7.14	1.06									
2	1-1/2	1-1/4									4.04	4.25	7.39	1.31									
-	2	1-1/2									-	4.57	7.58	1.50									

Specifications subject to change without notice and without obligation on the part of the manufacturer.



Actuator Specifications

Temperature

Pneumatic Actuators are designed to operate in ambient temperatures between -20° F (-28.0°C) and +350°F (+175°C). Care must be taken to assure that the moisture content of the air supply is sufficiently low to prevent icing within the actuator.

Air Supply

Sufficient air delivery must be available at the actuator to ensure dependable operation. The following precautions should be observed:

Air supply should be clean and dry. When dirty or wet air is a problem; a filter / separator should be specified; these units are most effective when installed as closely as possible to the actuator. A filter, when used, should permit a minimum flow of 4 scfm at an upstream pressure of 60 psi.

Eliminate severe restrictions to air flow (certain solenoid valves & fittings). The most restricted passage must have an area no smaller than .003" square, the area of 1/16" diameter orifice. If more than a single actuator is to be supplied by an individual pilot, the minimum passage requirement applies per actuator.

Tubing: For short runs up to 5 feet 5/32" I.D. is suitable, 1/4" I.D. will serve up to 30 feet. For longer runs, use 3/8" I.D. or larger.

Accessories

Solenoid pilot valves and limit switches are available. Please see our literature or contact us direct.

Port Connections: 1/8" N.P.T.

Materials of Construction

BODY, END CAPS: : Aluminium with Teflon® Impregnated Hard Anodized (PolyLube®) Sufaces

SPRING MODULES: Aluminium with Teflon® Impregnated Hard Anodized (PolyLube®) Sufaces

SHAFT / DRIVER & EXTERNAL TRIM: 300 Series Stainless Steel

How To Configure Model Number

Manually Actuated Valve

Select Valve Size and Product Code. Example: 1 86-6-RT-6-L
NOTE: 76 Sizes 1/2”- 2”, 86 Sizes 1/4” - 2”, 96 Sizes 1/2” - 1-1/2”

	Product Code						
Size	Valve Type / Model	Body Material	Seal Material	Ball & Stem Material	Optional Special Features	Operator Handle - Type
1/4	76 One-Piece Body Reduced Port **1/2" - 2"**	1 Brass	RT Glass Filled Reinforced P.T.F.E. (Teflon®)	6 316 Stainless Steel	B Internal Pressure Equalizing Vent - Upstream Type	L Lever
3/8		4 Carbon Steel		16 Alloy 20	FC0* NSF® / ANSI 169 Listed	SL Stainless Steel Lever
1/2	86 Two-Piece Body Standard Port **1/4" - 2"**	6 316 Stainless Steel		19 Monel	S**	LL Latching-Lockable
3/4		16 Alloy 20 76 Series Only 1/2" - 1"				R Round / Oval
1	96 Two-Piece Body Full Port **1/2" - 1-1/2"**					W Wing
1-1/4		19 Monel 76 Series Only 1/2" - 1"				Z Actuator Drive Key All Except Below
1-1/2						Z1 Actuator Drive Key for; 1-1/4" 76 1" 86 3/4" 96
2	**NOTE:** Suffix M after Valve Model indicated current stem geometry. Applies to: 1/2 - 3/4 76, 1/4 - 1/2 86					

Pneumatically Actuated Valve

1. Take **Manually Actuated Valve Model** and obmit Operator . Handle-Type. Example: 1 86-6-RT-6-
2. Based upon the Valve Model & Size Select Actuator Type and add to Valve Size & Model.
   Example: 1 86-6-RT-6-B412D
   NOTE: For Double-Acting Actuators, models which use 50-125 psi are recommended.

Valve Model			Actuator Type Air Supply Available		
			Double Acting		Spring Return
76	86	96	50-125 psi	75-125 psi	75-125 psi
1/2	1/4 & 3/8	-	B412D	B411D	B412SR
3/4	1/2	-	B412D	B411D	B412SR
1	3/4	1/2	B412D	B411D	B412SR
1-1/4	1	3/4	B412D	-	A422SR
1-1/2	1-1/4	1	A422D	-	A422SR
2	1-1/2	1-1/4	A422D	-	A422SR
	2	1-1/2	A422D	-	A422SR

How To Configure Model Number (continued)

Pneumatically Actuated Valve - Optional Accessories

1. Optional Accessory: Take the **Pneumatically Actuated Valve Model** and add suffix N with GP Series and or Limit Switch or both. NOTE: Actuator must be ordered / supplied with optional NAMUR Interface Suffix N
   Examples: 1 86-6-RT-6-B412DN-4GP-SC07D-120VAC-DS / 1 86-6-RT-6-B412DN-4GP-SC07D-120VAC-DS-LS-1
   1 86-6-RT-6-B412D-LS-1

Optional Actuator Accessory								
GP Series NAMUR Integral Solenoid Valve								Limit Switch
Type		Coil Style	Voltage Code	Connection Type		Voltage	Electrical Connector	
4GP (use with Double-Acting)	-	SC Standard	07 120VAC	D Mini DIN	-	VAC	DS DIN X Strain	- LS-1
Spring-Return Consult Gemini Valve		MR Manual Override	03 24VDC	L* Wire Leads		VDC	DC DIN X 1/2" Conduit	
		HL* Hazardous Locations	02 12VDC				DA DIN X Field Bus M12	
			06 24VAC				DM10 DIN X Molded 10' Lead	
			08 240VAC				DM15 DIN X Molded 15' Lead	
							DML10 DIN X Molded LED 10' Lead	
		* HL Coil Style Only Offered in 120VAC Conduit Hub with 24" Leads					C24* Conduit 24" Leads	

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