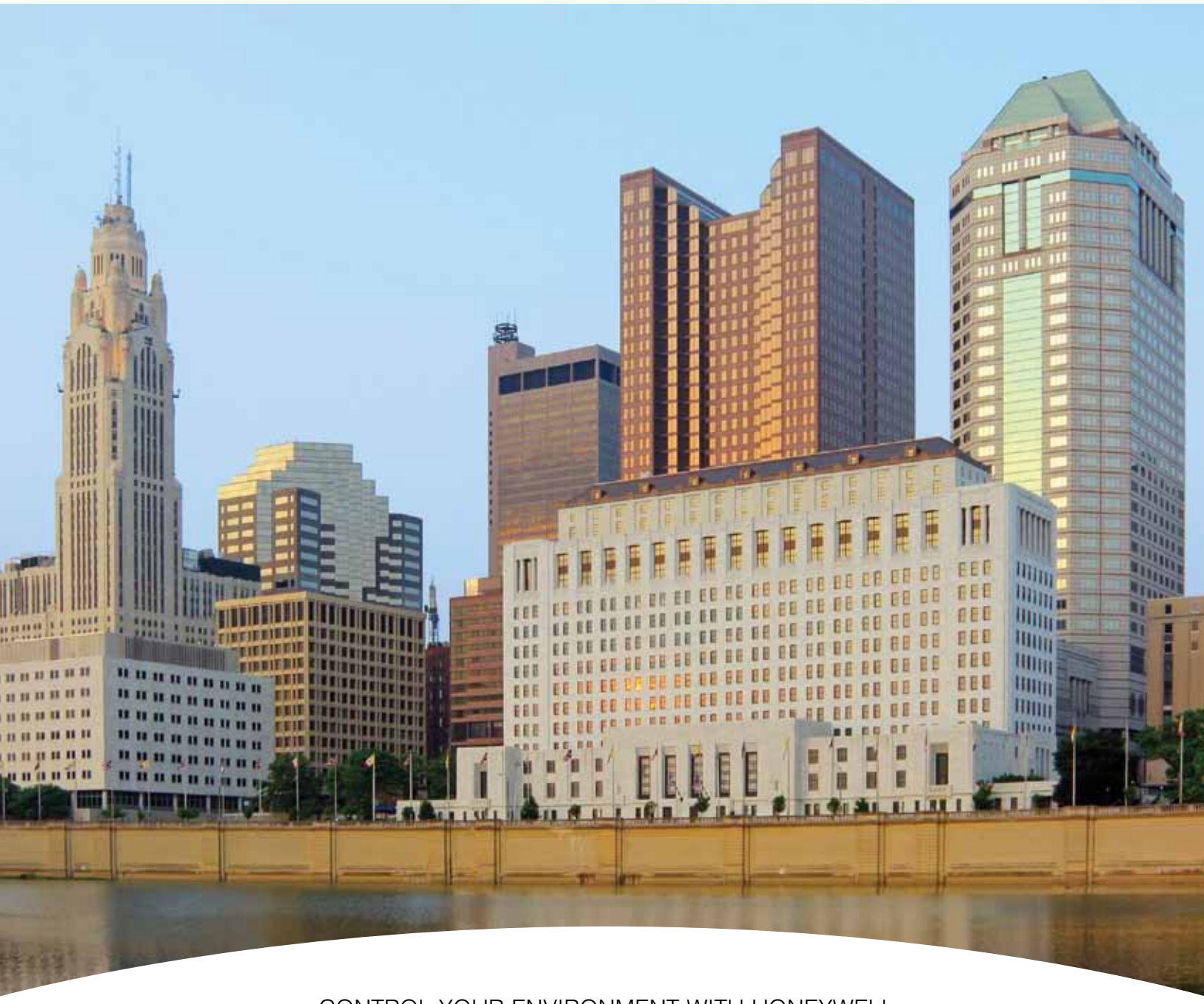
Dampers, Actuators and Valves

Honeywell



CONTROL YOUR ENVIRONMENT WITH HONEYWELL
DAMPERS, ACTUATORS AND VALVES

Application And Selection Guide

About valve selection

The valve selection section is constructed in one of two ways:

For unassembled product:
As a reference, pictures will represent the valves and actuators separately; and part numbers are highlighted in blue. To order a complete product one OS# must be chosen from each blue box.

For factory assembled product:
The complete assembled OS# will be displayed in the body of the chart (except for cartridge cage valves, both an actuator and valve must be chosen). Pictures will also reference the factory assembled configuration.

Additional product information

To find more detailed information on the individual products included in this document, go to: http://customer.honeywell.com and use the search text box to quickly locate product specific content.

SUPPORT

Contact Information	Phone	Fax
Commercial Components		
Technical Hotline	888-516-9347	
Customer Care		
Order Entry	888-793-8193	800-356-0149
Product Drop-Ship Team Butterfly & Flanged Control Ball Valve Ordering	763-954-4140	800-356-0149
Take-Off Service Let Honeywell Take-Off Service provide a complete job schedule for your projects for dampers, actuators, valves and VFDs.	888-664-4092	877-880-3386

Online Resources

Honeywell Customer Web Site A web site with a large amount of information, literature, pricing, and product selection tools that is available to you at any time.	http://customer.honeywell.com
Honeywell Consulting Engineer Web Site A web site developed for consulting engineers. Get product guide specs, wiring diagrams and more.	http://specifyhoneywell.com
Honeywell eLearning A convenient and smart way of learning about our products with 10 to 20 minute training modules. Register at the Honeywell customer website above for access.	http://customer.honeywell.com/learning

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Section 1: Damper & DCA Selection

Damper And Actuator Sizing

Use the following guidelines to determine the actuator quantity and torque requirements for your damper configuration.

Determine Damper Actuator Locations

Use the following configuration to determine the amount of actuator locations your damper will require.

Single Section ≤ 48 x 74 D2, D3
≤ 60 x 74 D1
Dampers will never ship more than 2 sections wide and one section high.

Configuration

A single section damper will have one actuator location.

A damper that is ≥ 48 x 74 ≤ 96 x 74 will have one actuator location. This is a two section damper jackshafted together.

A damper that is ≥ 96 x 74 ≤ 144 x 74 will have two actuator locations. This is a two section damper jackshafted together and a single section damper.

Exception: 3 section wide ≤ 42 SFT damper will have one actuator location.

If damper exceeds 74" height a second row is necessary. Apply same logic above to each row of dampers.

For dampers larger than 144 x 144, please contact the Take-Off Service (takeoff.service@honeywell.com) for a quote and actuator location.

Mounting

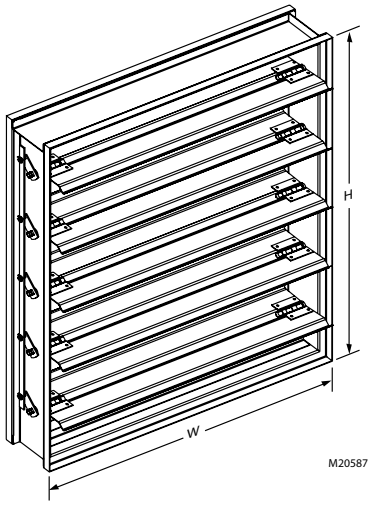
Internal Mount: Blade drive lever bracket provided only. Customer is responsible for providing mounting hardware.

External Mount: Actuator shaft will be provided as extension pin kit to be mounted on side or with jackshaft pre-mounted on damper.

Determining Damper Actuator Torque Requirements

Use the following procedure to determine the required torque for your damper.

NOTE: Damper area is measured using the H and W dimensions.



Measuring Damper Area

1. Calculate the damper area in square feet by multiplying the H dimension by the W dimension.
2. Multiply the damper area by the lb-in. per square foot value from Table 2 on page 9.

NOTE: The minimum lb-in. per square foot value that can accommodate tight closeoff and no leakage applications is 5, regardless of the value shown in the table.

3. Select the highest actuator torque value than the calculated value.

EXAMPLE:
Low leakage, parallel blade damper:
H dimension = 48 in.
W dimension = 96 in.
Static pressure (in. w.c.) = 2 in. w.c.
Face Velocity = 1000 fpm
48 in. x 96 in. ÷ 144 = 32 sq. ft.
32 sq. ft. x 7 lb-in./sq. ft. = 244 lb-in.
where 7 lb-in./sq. ft = value from Table 2.
In this case you would need an actuator with a minimum nominal torque of 224 lb-in.

Table 2. Approximate industry standard damper lb-in. per sq ft value.

		Face Velocity (fpm)/ Static Pressure (in. wc)				
Leakage	**Damper Blades**	**500/ 1**	**1000/ 2**	**1500/ 3**	**2000/ 4**	**2500/ 5**
Low	Parallel	4	7	10.5	12	14
Low	Opposed	3	5	7.5	8.5	10
Standard	Parallel	3	4.5	6.5	7	8
Standard	Opposed	2	3	4.5	5	6

Damper Sizing

Dampers can be sized using two different methods; actual sizing and nominal sizing. When actual sizing is used the damper dimensions will be the same as the sizes ordered. For example, when a 24 inch x 24 inch D640 damper is ordered, it will be made such that the height is 24 inches and the width is 24 inches. When nominal sizing is used, the damper dimensions will be ¼ inch smaller than the sizes ordered. For example, when a 24 inch x 24 inch D640 is ordered, it will be made such that the height is 23.75 inches and the width is 23.75 inches. No special allowances are required for dampers that are constructed of multiple sections. For example, a damper that is 24 inch x 60 inch will be constructed of two sections. When ordered using nominal sizing, the damper size will be 23.75 inches high by 59.75 inches wide.

Actual sizing is commonly used when the exact size of the opening is known or if the damper is not meant to be installed inside an opening or duct. Nominal sizing, with its ¼ inch undersizing is commonly used when the damper will be installed inside an opening or duct and space is needed for positioning or seal material.

Honeywell's sizing default is nominal sizing. If actual sizing is required, please make sure this is specified on the order. For more information on ordering Honeywell dampers, please contact your local Honeywell distributor or sales representative.

Damper And Actuator Sizing

HVAC performance depends largely upon airflow, and Honeywell Volume Control Dampers are built for both improved airflow and heavy-duty use. Honeywell has long been the leading source for airflow control, with Volume Control Dampers that meet AMCA-certified Air Performance Standards, the highest established standards for commercial control dampers. Designed to minimize leakage, Honeywell dampers will give you efficient, trouble-free operation for years to come.

Standard Rectangular Dampers

Durable construction details are the cornerstone of Honeywell D1, D2 and D3 Volume Control Dampers. They feature heavy-duty hat channel frames for dependable operation inside ductwork. And all models have low-profile top and bottom frames, creating more free area while reducing pressure loss and reducing actuator torque.

The Right Choice

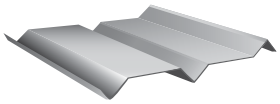
There's a Honeywell Volume Control Damper that's just right for your application. The D1 airfoil extremely low leakage damper presents a lower resistance to airflow typically used in high pressure systems. The D2 ultra-low leakage damper keeps leakage to a minimum with blade and jamb seals, and is designed for medium- to high-pressure and velocity systems. The D3 low leakage damper is ruggedly built for applications in medium pressure and velocity systems.

Blade Design

Airfoil Blades - D1 Dampers

Honeywell Airfoil Volume Control Dampers feature blades constructed of double skin galvanized steel. This design presents a lower resistance to airflow and has strength that is typically used in high pressure systems.

3-V Blades - D2 and D3 Dampers



Honeywell Volume Control Dampers feature a 3-V design that's proven to meet higher-level system requirements while minimizing flow-through system loss. Blades are fabricated from a single thickness of 16-gauge galvanized steel with three horizontal structural V-grooves running the length of the blade.

Applications And Operation

Honeywell Volume Control Dampers are designed to control airflow volume in medium- to high-pressure and velocity HVAC systems. Typical applications include volume control of airflow in zoning, air handler unit or economizer applications. Dampers are designed to operate with a wide range of Honeywell electric and pneumatic actuators. Operating range is from 2000 to 4000 fpm, and 2.5 to 6 inch wg. Spring return and non-spring return actuators are available with a wide range of output torque ratings to deliver the precise power needed for your damper application.

Certified Performance

Honeywell certifies that models D2 and D3 are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Programs. The AMCA Certified Ratings Seal applies to air performance ratings only.

				Material			Frame Gauge		Blade Seals		Bearings		Axles		Linkage Material		Flange	
S — Standard O — Optional	Leakage @ 1 in wg cfm/ft²	Max Velocity fpm	Max Pressure in wg	Galvanized	Stainless	Aluminum	16	14, 12	Vinyl	Silicone	Synthetic	Bronze, Stainless	Steel	Stainless	Steel	Stainless	None	Single, Double, Reverse
D1 Airfoil Extremely Low Leakage	3	4000	8	S	O	n/a	S	O	n/a	S	S	O	S	O	S	O	S	O
D2 Ultra-Low Leakage	3	3000	5	S	O	O	S	O	S	O	S	O	S	O	S	O	S	O
D3 Low Leakage	120	3000	5	S	O	O	S	O	n/a	n/a	S	O	S	O	S	O	S	O

For a copy of the specification sheet the D1 (63-2671) or D2 and D3 (63-2398), visit customer.honeywell.com.

Standard Round Dampers

D690

The 6" to 16" round dampers are used in zoning systems to control airflow in a round duct. These dampers come with neoprene and silicone seals for tight close off and low leakage. The DM7600 includes an actuator that is already attached to the round damper.

The D690 round damper is used in conventional air handling systems to control airflow in a round duct.

- Neoprene seal for tight closing and low leakage
- Oilite bearings for long life
- 90˚ damper travel for a variety of applications
- Single blade round dampers for use with ML6161 and ML7161 or W7751 VAV Controller
- Maximum approach velocity 2,500 ft/min
- Temperature range 32°F to 130°F (0°C to 54°C)

DM7600

D690 ROUND DAMPERS SELECTION GUIDE

Product Number	Damper Diameter	
	(inch)	(mm)
D690A1002	6	152
D690A1010	8	203
D690A1028	10	254
D690A1036	12	305
D690A1044	14	356
D690A1051	16	406

DM7600 ROUND DAMPERS SELECTION GUIDE

Product Number	Damper Diameter		Input Signal	Timing (sec, min.)
	(inch)	(mm)		
DM7600A1005	6	152	2 to 10 Vdc or 4 to 20 mA	90 sec
DM7600A1013	8	203	2 to 10 Vdc or 4 to 20 mA	90 sec
DM7600A1021	10	254	2 to 10 Vdc or 4 to 20 mA	90 sec
DM7600A1039	12	305	2 to 10 Vdc or 4 to 20 mA	90 sec
DM7600A1047	14	356	2 to 10 Vdc or 4 to 20 mA	90 sec
DM7600A1054	16	406	2 to 10 Vdc or 4 to 20 mA	90 sec
DM7600B1004	6	152	SPDT floating	90 sec
DM7600B1012	8	203	SPDT floating	90 sec
DM7600B1020	10	254	SPDT floating	90 sec
DM7600B1038	12	305	SPDT floating	90 sec
DM7600B1046	14	356	SPDT floating	90 sec
DM7600B1053	16	406	SPDT floating	90 sec

Custom Dampers

Need a custom damper? Contact the Take-Off Service. Below is a sample list of the products we frequently quote.

CUSTOM RECTANGULAR DAMPERS

Number	Description
VCD34	Galvanized Insulated Airfoil Damper
VCD40	Aluminum Narrow Frame Airfoil Damper
VCD42	Aluminum Airfoil Damper (Galvanized Frame)
VCD43	Aluminum Airfoil Damper
VCD45	Aluminum thermally broken insulated Damper

CUSTOM ROUND DAMPERS

Number	Description
VCDR53	Galvanized Round Damper – to 24 inches
VCDRM53	Galvanized Round Multi-Blade Damper – to 36 inches

Specification Take-off Service

Damper, Valve and VFD Pricing/Job Estimating Tools:

These tools can be used for the selection and pricing of dampers, valves and VFDs.
Click on the “Commercial Components Estimating Tools” link at customer.honeywell.com.

Specification Take-Off Service

The Honeywell Take-Off Service can create product schedules from:

- Product specifications
- Existing schedules
- Drawings
- Obsolete or competitive schedules

Our goal is to help provide you with the best possible solution for each job.

Products Supported by the Take-Off Service

- Commercial Water and Steam Valves
- Valve Actuators (Electric or Pneumatic)
- Commercial Control Dampers
- Custom Dampers
- Damper Actuators (Electric or Pneumatic)
- Variable Frequency Drives

1. Submit your information in one of the following ways:
   a) Email to takeoff.service@honeywell.com (preferred)
   b) Fax toll-free to 1-877-880-3386
2. Include your desired turn-around time.
3. Take-Off Service staff will send you a confirmation that your email or fax was received. We always attempt to have your request finished as soon as possible. Please note, however, that the quality of the submitted information largely determines the turn-around time. We will work closely with you to ensure that we have enough information to move forward as quickly as possible.
4. A final product schedule document will be returned to you following take-off completion.

Included In the Final Take-Off Document

We send a comprehensive spreadsheet, which contains:

- A complete product schedule
- Base price
- Directions on how to order Honeywell products
- Links to product submittals
- Quote identification number

Questions

If you have questions about the Honeywell Take-Off Service, please call the dedicated Take-Off Service phone number at 1.888.664.4092 or email us at takeoff.service@honeywell.com.

Product Selection Tool

Available for sizing and estimating of valves, dampers and actuators.
Click on the “Product Selection Tool” link at customer.honeywell.com.

Fire & Smoke Actuators

Honeywell's complete line of two-position, fast-acting spring-return actuators meet all of your needs for fire and smoke control applications. All models are designed to meet the UL-555 and UL-555S high temperature requirements for fire dampers and combined fire and smoke dampers.

Safety First

As a life safety system component Honeywell is dedicated to meeting the UL-555 and UL-555S requirements. The elevated temperature test can be performed at the temperature ratings of 250ºF or 350ºF. Honeywell only offers models at 350ºF to meet UL-555 and UL-555S for fire and combined fire and smoke applications to support the highest level of safety for building occupants.

Largest Torque Range in the Industry

Honeywell's fire and smoke actuators are available in 30, 80 and 175 lb-in with the 175 lb-in being the highest torque commercial fire and smoke actuator available on the market today.

Key Features and Benefits

- Integral spring return that ensures the proper level of torque
- Patented design that eliminated limit switches, reducing power consumption
- Reliable service in smoke control systems requiring Underwriter's Laboratories Inc. UL-555 and UL-555S
- Robust die-cast aluminum housing ensures the proper level of torque
- Full life of two-position spring return fire and smoke actuators rated up to 350ºF for all critical applications
- Fast acting with a maximum spring return timing of 15 seconds
- No audible noise during holding

	Torque	Voltage	Spring Direction	Description	Number of internal Auxiliary Switch	Model Number
	30 lb-in (3.4 Nm)	120 Vac	CCW	Fire and smoke, fast acting, two position spring return, UL-555 and UL-555S ratings up to 350ºF	External*	ML4115A1009
			CW		External*	ML4115B1008
		230 Vac	CCW		External*	ML4115C1007
			CW		External*	ML4115D1006
		24 Vac	CCW		External*	ML8115A1005
			CW		External*	ML8115B1004
	80 lb-in (9 Nm)	120 Vac	CW	Fire and smoke, fast acting, two position spring return, UL-555 and UL555S ratings up to 350ºF	External*	MS4209F1007
			CCW		External*	MS4309F1005
		230 Vac	CW		External*	MS4709F1014
			CCW		External*	MS4809F1012
		24 Vac	CW		External*	MS8209F1003
			CCW		External*	MS8309F1001
	175 lb-in (20 Nm)	120 Vac	Reversible Design	Fire and smoke, fast acting, two position spring return, UL-555 and UL-555S ratings up to 350ºF	0	MS4120F1006
					2 SPST	MS4120F1204
		230 Vac			0	MS4620F1005
					2 SPST	MS4620F1203
		24 Vac			0	MS8120F1002
					2 SPST	MS8120F1200

Note: Honeywell's spring return fire and smoke actuators are designed to pass UL-555 and UL-555S 350ºF requirements. They are not designed for HVAC applications. UL-555 and UL-555S requires that all new construction fire and smoke damper jobs have the actuator assembled and tested at the damper manufacturer. A like for like retrofit replacement or technically equal UL-555 and UL-555S approved device is recommended.

Direct Coupled Actuators

Spring Return, Low Torque

DIRECT COUPLED ACTUATORS QUICK SELECTION GUIDE

Precise, reliable performance. Lasting value. Ease of installation. Everything you look for in direct-coupled actuators hinges on quality. And quality engineering is what makes Honeywell's complete line of actuators the top performers in the industry. Our global engineering team designs and tests our direct-coupled actuators to exceed rigorous global standards — and to meet Honeywell's own demanding life testing.

But we don't stop there. Thanks to our continuous improvement process, Honeywell actuators are now easier than ever to install. You'll also benefit from consistent wiring regardless of signal type, common accessories and a simplified selection process.

Honeywell's complete line of building control products, including valves and actuators, are already proven in more than three million buildings worldwide. So when you need spring or non-spring return actuators for your damper and valve applications, specify Honeywell. We make precision easy.

Improve Installation Time

- Self-centering shaft adapter provides mounting flexibility and greater clamping force.
- Common wiring among families for every signal saves installation time.

Decrease Material Cost

- Detachable access cover allows direct wiring without a junction box.

Reduce Inventory

- Signal mode switch adapts models to two-position, floating (tri-state), or modulating (proportional) applications.

Increase Control and Accuracy

- More than 200 reposition steps for modulating models provide precise control.

Increased Flexibility

- Select models are available with or without three foot actuator whips cable.

Spring Return, High Torque

5-YEAR LIMITED WARRANTY

EASY-TO-SELECT MODEL NUMBERS

MS and MN Families

Non-Spring Return, Low Torque

MS 75 10 A 2 2 XX

Fail Safe Mode
- **MS** Spring Return
- **MN** Non-Spring Return

Input Signal Type
- **41** Two-Position, 100-250 Vac
- **61** Floating, 24 Vac/dc
- **75** Modulating/Floating, 24 Vac/dc
- **81** Two-Position, 24 Vac/dc

Torque
- **03** Nm = 27 in-lb
- **05** Nm = 44 in-lb
- **10** Nm = 88 in-lb
- **20** Nm = 175 in-lb
- **34** Nm = 300 in-lb

Application Type
- **A** Standard Model
- **H** Enhanced Model
- **W** Model with Whips Cable

Feedback
- **1** No Feedback
- **2** Voltage Feedback

Auxiliary Switches
- **0** No Internal Switches
- **2** Two Internal Switches

System Controlled Numbers

ML Family

Non-Spring Return, High Torque

ML 61 61 B 2 XXX

Fail Safe Mode
- **ML** Non-Spring Return

Input Signal Type
- **61** Floating, 24 Vac
- **71** Modulating, 24 Vac

Torque
- **61** (4 Nm) = 35 in-lb
- **74** (8 Nm) = 70 in-lb

Feedback & Conduit
- **A** Feedback w/Accessory
- **B** Standard
- **C** Feedback w/Accessory and Cover w/Conduit Connections
- **D** Cover w/Conduit Connections

Declutch
- **1** Standard
- **2** Includes Declutch Function

System Controlled Numbers

Direct Coupled Actuators

SPRING RETURN

	Order Specification Number (without whips)	Order Specification Number (with whips)	Damper Area (4.5 lb-in/ sq. ft.)	Running Time: Drive (sec)	Running Time: Spring Return (sec)	Power Supply: 24 Vac/dc	Power Supply: 120-230 Vac	VA Rating (Running)	Control Input/Output: On/Off	Control Input/Output: 0/2-10 Vdc, Floating	Control Input/Output: 3 kOhm NTC, 3-Position	Control Input/Output: Feedback (0/2-10 Vdc)	Control Input/Output: Adj. Zero and Span	Auxiliary Knob: SPDT Auxiliary Switches	Auxiliary Knob: IMPP*
	**S03 Series (3 Nm, 27 lb-in)**														
	MS8103A1030		6	45	<25	•		7	•					0	
	MS8103A1130		6	45	<25	•		7	•					1	
	MS4103A1030		6	45	<25		•	10	•					0	
	MS4103A1130		6	45	<25		•	10	•					1	
	MS7503A2030		6	90	<25	•		7		•		•		0	
	MS7503A2130		6	90	<25	•		7		•		•		1	
	MS7403A2030		6	90	<25	•		7		•	•	•		0	•
	**S05 Series (5 Nm, 44 lb-in)**														
	MS8105A1030	MS8105W1030	10	45	<25	•		8	•					0	
	MS8105A1130	MS8105W1130	10	45	<25	•		8	•					1	
	MS4105A1030		10	45	<25		•	11	•					0	
	MS4105A1130		10	45	<25		•	11	•					1	
	MS7505A2030	MS7505W2030	10	90	<25	•		8		•		•		0	
	MS7505A2130	MS7505W2130	10	90	<25	•		8		•		•		1	
	MS7405A2030		10	90	<25	•		8		•	•	•		0	•
	**S10 Series (10 Nm, 88 lb-in)**														
	MS8110A1008	MS8110W1008	20	45	<25	•		30	•					0	
	MS8110A1206	MS8110W1206	20	45	<25	•		30	•					2	
	MS4110A1002		20	45	<25		•	45	•					0	
	MS4110A1200		20	45	<25		•	45	•					2	
	MS7510A2008	MS7510W2008	20	90	<25	•		14		•		•		0	
	MS7510A2206	MS7510W2206	20	90	<25	•		14		•		•		2	
	MS7510H2209		20	90	<25	•		14		•		•	•	2	
	**S20 Series (20 Nm, 175 lb-in)**														
	MS8120A1007	MS8120W1007	39	45	<25	•		40	•					0	
	MS8120A1205	MS8120W1205	39	45	<25	•		40	•					2	
	MS4120A1001		39	45	<25		•	60	•					0	
	MS4120A1209		39	45	<25		•	60	•					2	
	MS7520A2007	MS7520W2007	39	90	<25	•		16		•		•		0	
	MS7520A2205	MS7520W2205	39	90	<25	•		16		•		•		2	
	MS7520H2208		39	90	<25	•		16		•		•	•	2	

NON-SPRING RETURN

	Order Specification Number (without whips)	Order Specification Number (with whips)	Damper Area (4.5 lb-in/ sq. ft.)	Running Time	Power Supply: 24 Vac/dc	Power Supply: 24 Vac	VA Rating (Running)	Control Input/Output: On/Off, Floating	Control Input/Output: 0/2-10 Vdc	Control Input/Output: 2-10 Vdc	Control Input/Output: Feedback (0/2-10 Vdc)	SPDT Auxiliary Switches
	**N05 Series (5 Nm, 44 lb-in)**											
	MN6105A1011	MN6105W1011	10	90	•		5	•				0
	MN6105A1201		10	90	•		5	•				2
	MN7505A2001	MN7505W2001	10	90	•		5	•	•		•	0
	MN7505A2209		10	90	•		5	•	•		•	2
	N10 Series (10 Nm, 88 lb-in)											
	MN6110A1003		20	90	•		5	•				0
	MN6110A1201		20	90	•		5	•				2
	MN7510A2001		20	90	•		5	•	•		•	0
	MN7510A2209		20	90	•		5	•	•		•	2
	**N20 Series (20 Nm, 175 lb-in)**											
	MN6120A1002		39	90	•		6	•				0
	MN6120A1200		39	90	•		6	•				2
	MN7220A2007		39	90	•		6		•		•	0
	MN7220A2205		39	90	•		6		•		•	2
	N34 Series (34 Nm, 300 lb-in)											
	MN6134A1003		67	90	•		9	•				0
	MN7234A2008		67	90	•		8		•		•	0
	**ML6161/7161 (4 Nm, 35 lb-in)**											
	ML6161A2009		8	90		•	1.8	•			w/ accessory	0
	ML6161A2017		8	420		•	1.8	•			w/ accessory	0
	ML6161A2025		8	180		•	1.8	•			w/ accessory	0
	ML6161B2024		8	90		•	1.8	•				0
	MS6161B2032		8	420		•	1.8	•				0
	ML6161B2073		8	180		•	1.8	•				0
	ML6161C2007		8	90		•	1.8	•			w/ accessory	0
	ML6161D2006		8	90		•	1.8	•				0
	ML7161A2008		8	90		•	5.4			•		0
	**ML6174/7174 (8 Nm, 70 lb-in)**											
	ML6174A2002		16	90		•	2.4	•			w/ accessory	0
	ML6174A2010		16	180		•	2.4	•			w/ accessory	0
	ML6174B2019		16	90		•	2.4	•				0
	ML6174B2035		16	420		•	2.4	•				0
	ML6174D2009		16	90		•	2.4	•				0
	ML6174E2008		16	90		•	2.4	•				0
	ML7174A2001		16	90		•	5.4	•				0
	ML7174E2007		16	90		•	5.4	•				0

* Internal Minimum Position Potentiometer

Notes

Section 2: Valve Selection

Notes

		Control Valve Applications											
		Pipe Size, inches (DN)											
		1/2" DN15	3/4" DN20	1" DN25	1-1/4" DN32	1-1/2" DN40	2" DN50	2-1/2" DN65	3" DN80	4" DN100	5" DN125	6" DN150	8~20" >DN200
Unitary Equipment	Fan Coil Units	Fan coil/zone valves											
		Cartridge cage valves											
		Pressure regulated valves											
	Unit Heaters	Fan coil/zone valves											
		Cartridge cage valves											
		Pressure regulated valves											
	Convectors	Fan coil/zone valves											
		Cartridge cage valves											
		Cartridge globe valves											
		Pressure regulated valves											
	Radiant Panels	Fan coil/zone valves											
		Cartridge cage valves											
		Cartridge globe valves											
		Pressure regulated valves											
	Unit Ventilators	Cartridge cage valves											
		Cartridge globe valves											
		Control ball valves											
		Pressure regulated valves											
	Reheat Coils	Cartridge cage valves											
		Cartridge globe valves											
		Control ball valves											
		Pressure regulated valves											
	Water Source Heat Pump	Cartridge cage valves											
		Control ball valves											
		Pressure regulated valves											
	Blower Coil		Cartridge cage valves										
				Cartridge globe valves									
		Control ball valves											
		Pressure regulated valves											
Air Handling Units	Heating & Cooling Coils	Threaded globe valve											
		Threaded control ball valves											
								Flanged globe valve					
										Flanged ball valve			
		Pressure regulated valves											
	Chilled Ceiling	Threaded globe valve											
		Threaded control ball valves											
		Pressure regulated valves											
	Humidifiers	Threaded globe valve											
								Flanged globe valve					
Central Plant	Outdoor reset	Threaded globe valve											
		Threaded control ball valves											
								Flanged globe valve					
										Flanged ball valve			
	Boiler Bypass	Threaded globe valve											
		Threaded control ball valves											
								Flanged globe valve					
										Flanged ball valve			
							Resilient seat butterfly valves						
	Heat reclaim	Threaded globe valve											
		Threaded control ball valves											
	Steam Heat Exchangers	Threaded globe valve											
								Flanged globe valve					
	Greenhouse	Threaded globe valve											
		Threaded control ball valves											
								Flanged globe valve					
										Flanged ball valve			
							Resilient seat butterfly valves						
	Thermal Storage	Threaded globe valve											
		Threaded control ball valves											
								Flanged globe valve					
							Resilient seat butterfly valves						
	Chillers	Threaded globe valve											
		Threaded control ball valves											
								Flanged globe valve					
										Flanged ball valve			
							Resilient seat butterfly valves						
		Pressure regulated valves											
	Cooling Towers	Threaded globe valve											
		Threaded control ball valves											
							Resilient seat butterfly valves						
	Isolation valves	Threaded control ball valves											
							Resilient seat butterfly valves						

Control Valve Selection Criteria

2-Way

		Unitary				Globe					
		Fan Coil		Cartridge Cage	Cartridge Globe	Threaded			Flanged		
Attribute	Specification	VU52	VU53	VCzA/B	V58x2	V5011N...	V5011F	V5011G	V5011A	V5011B	VGF2xS
Pipe Size	1/2" [DN15]	•	•	•	•	•					
	3/4" [DN20]	•	•	•	•	•					
	1" [DN25]	•	•	•		•					
	1-1/4" [DN32]			•		•					
	1-1/2" [DN40]					•					
	2" [DN50]					•					
	2-1/2" [DN65]						•	•	•		•
	3" [DN80]						•	•	•		•
	4" [DN100]								•	•	•
	5" [DN125]								•	•	•
	6" [DN150]								•	•	•
	Other (maximum size)										
Pipe Fittings	Sweat	•	•	•	•						
	NPT Internal Thread	•	•	•	•	•	•	•			
	Inverted Flare	•	•	•							
	ANSI Flange								•	•	•
Static Pressure	ANSI 125/150					•	•	•	•	•	•
	ANSI 250/300										•
	Other	300 psi		300 psi	230 psi						
Media	Chilled Water	•	•	•	•	•	•	•	•	•	•
	Hot Water	•	•	•	•	•	•	•	•	•	•
	Low Pressure Steam					N1, N3	•	•	•	•	•
	High Pressure Steam					N2		•			•
Flow Capacity, Cv	Multiple ratings per pipe size	•	•	•	•	•	•	•			
	One rating/size above 1/2"					•	•	•	•	•	•
Valve Action	Direct Acting ****					N1, N2	•	•	•		•
	Reverse Acting *****			•	•	N3				•	
	Rotary N.O.	•									
	Rotary N.C.		•								
Flow Characteristic	Equal Percentage				•	•	•		•	•	•
	Modified Equal Percentage			•							
	Linear			•		•		•			•
	Quick Open	•	•	•							
Close-off pressure***	High** (100 psid minimum)				•						
	Medium (40 psid minimum)			•	•						
	Varies with actuator	•	•			•	•	•	•	•	•
Maximum Seat Leakage	ANSI Class III (0.10% Cv max.)				0.02%	0.05%					•
	ANSI Class IV (0.01% Cv max.)								•	•	
	Bubble-tight design			•							
	Other (see product data literature)	33 mL/m					0.5%	0.5%			
Rangeability	High (50:1 minimum)	N/A			•	•	•	•	•	•	•
	Medium* (15~50:1)			•							
	Low (under 15:1)										
Trim	Brass, plated brass, bronze					N3	•		•	•	
	Brass plug /Stainless seat					N1					
	Stainless Steel					N2		•			•
	Resilient materials	•	•	•	•						
In-line Serviceability	Cartridge	•	•	•	•						
	Packing					•	•	•	•	•	•
	Rebuild					•	•	•	•	•	
Actuation Options	Electronic Modulating			•	•	•	•	•	•	•	•
	Tri-state floating			•	•	•	•	•	•	•	•
	Pulse Width Modulation			•							
	2-position low voltage	•	•	•	o	•	•	•	•	•	•
	2-position line voltage	•	•	•		•	•	•	•	•	•
	Electric Spring Return	•	•		•	•	•	•	•	•	•
	Electronic Fail Safe			•							
	Pneumatic, low pressure				•	•	•	•	•	•	•
	Pneumatic bidirectional (Hi-Pr)										
	Pneumatic spring return (Hi-Pr)										

Notes
* Best used with supply water reset from outdoor air temperature.
** Can dead-head pumps. Use with VFD-controlled pumps with maximum pressure cut-out
*** Maximum operating differential pressure. Static close-off pressure may be higher. Maximum pressure for quiet service may be less.
**** Stem down to close
***** Stem up to close

2-Way

		Globe		Control Ball		Pressure-Regulated		Butterfly	
		Pressure-Balanced		Threaded	Flanged	Threaded	Wafer Flanged	Resilient Seat	
Attribute	**Specification**	**V5862A3**	**VGF2xP**	**VBN2**	**VBF2**	**VRN2**	**VRW2**	**VFF1**	**VFF2**
Pipe Size	1/2" [DN15]			•		•			
	3/4" [DN20]			•		•			
	1" [DN25]	•		•		•			
	1-1/4" [DN32]	•		•		•			
	1-1/2" [DN40]	•		•		•			
	2" [DN50]			•		•		•	•
	2-1/2" [DN65]		•	•		•	•	•	•
	3" [DN80]		•	•		•	•	•	•
	4" [DN100]		•		•		•	•	•
	5" [DN125]		•		•		•	•	•
	6" [DN150]		•		•		•	•	•
	Other (maximum size)							20" [DN500]	
Pipe Fittings	Sweat								
	NPT Internal Thread	•		•		•			
	Inverted Flare								
	ANSI Flange		•		•		•	•	•
Static Pressure	ANSI 125/150		•		•		•		
	ANSI 250/300						•		
	Other	230 psi		360 psi		360 psi		250 psi	
Media	Chilled Water	•	•	•	•	•	•	•	•
	Hot Water	•	•	•	•	•	•	•	•
	Low Pressure Steam		•						
	High Pressure Steam		•						
Flow Capacity, Cv	Multiple ratings per pipe size	•		•	•	x (gpm)	x (gpm)		
	One rating/size above 1/2"		•					•	•
Valve Action	Direct Acting ****	•	•						
	Reverse Acting *****								
	Rotary N.O.			o	o	o	o	•	o
	Rotary N.C.			•	•	•	•		•
Flow Characteristic	Equal Percentage		•			•	•		
	Modified Equal Percentage			•	•			•	•
	Linear	•	•			•			
	Quick Open								
Close-off pressure***	High** (100 psid minimum)	•	•	•	•	•	•	•	•
	Medium (40 psid minimum)							•	•
	Varies with actuator								
Maximum Seat Leakage	ANSI Class III (0.10% Cv max.)					•			
	ANSI Class IV (0.01% Cv max.)	•	•	•	•			•	•
	Bubble-tight design							•	•
	Other (see product data literature)						< 0.2%		
Rangeability	High (50:1 minimum)	•	•	•	•	•	•		
	Medium* (15~50:1)			o		< 10 gpm			
	Low (under 15:1)							•	•
Trim	Brass, plated brass, bronze			•		•			
	Brass plug /Stainless seat								
	Stainless Steel	•	•	•	•	•	•		
	Resilient materials					•	•	•	•
In-line Serviceability	Cartridge					•	•		
	Packing	•	•	•	•	•	•		
	Rebuild				•	Regulator			
Actuation Options	Electronic Modulating	•	•	•	•	•	•	•	•
	Tri-state floating	•	•	•	•	•	•	•	•
	Pulse Width Modulation								
	2-position low voltage		•	•	•	o	o	Limited	
	2-position line voltage		•	o	o	o	o	•	•
	Electric Spring Return	•	•	•	•	•		Limited	
	Electronic Fail Safe						•		
	Pneumatic, low pressure		•					Limited	
	Pneumatic bidirectional (Hi-Pr)							•	•
	Pneumatic spring return (Hi-Pr)							•	•

Notes
* Best used with supply water reset from outdoor air temperature.
** Can dead-head pumps. Use with VFD-controlled pumps with maximum pressure cut-out
*** Maximum operating differential pressure. Static close-off pressure may be higher. Maximum pressure for quiet service may be less.
**** Stem down to close
***** Stem up to close

Control Valve Selection Criteria

3-Way

		Unitary				Globe				
		Fan Coil	Cartridge Cage	Cartridge Globe		Threaded	Flanged			
Attribute	Specification	VU54	VCzM/N	V58x3	V5863A3	V5013N...	V5013B	V5013C	VGF3xLD	VGF3xEM
Pipe Size	1/2" [DN15]	•	•	•		•				
	3/4" [DN20]	•	•	•		•				
	1" [DN25]	•	•		•	•				
	1-1/4" [DN32]		•		•	•				
	1-1/2" [DN40]				•	•				
	2" [DN50]					•				
	2-1/2" [DN65]						•		•	•
	3" [DN80]						•		•	•
	4" [DN100]						•	•	•	•
	5" [DN125]						•	•	•	•
	6" [DN150]						•	•	•	•
	Other (maximum size)									
Pipe Fittings	Sweat	•	•	•						
	NPT Internal Thread	•	•	•	•	•				
	Inverted Flare	•	•							
	ANSI Flange						•	•	•	•
Static Pressure	ANSI 125/150					•	•	•	•	•
	ANSI 250/300								•	•
	Other	300 psi	300 psi	230 psi	230 psi					
Media	Chilled Water	•	•	•	•	•	•	•	•	•
	Hot Water	•	•	•	•	•	•	•	•	•
Flow Capacity, Cv	Multiple ratings per pipe size	•	•	•	•	•				
	One rating/size above 1/2"					•	•	•	•	•
Valve Action	Mixing A-B-AB porting			•	•	•	•			•
	Mixing A-AB-B porting	•	•							
	Diverting AB-B-A porting							•	•	
	Diverting A-AB-B porting		•							
A-port Flow Characteristic	Equal Percentage			•		•				•
	Modified Equal Percentage		•							
	Linear		•		•		•	•	•	
	Quick Open	•	•							
B-port Flow Characteristic	Modified Equal Percentage									
	Linear		•			•	•	•	•	•
	Linear, Reduced Cv			•	•					
	Total Constant Flow			•	•	•	•	•	•	
	Quick Open	•								
Close-off pressure***	High (60 psid minimum)		•	•	•					
	Medium (30 psid minimum)			•						
	Varies with actuator	•				•	•	•	•	•
Maximum Seat Leakage**	ANSI Class III (0.10% Cv max.)			•	•	•			•	
	ANSI Class IV (0.01% Cv max.)						•	•		
	Bubble-tight design		•							
	Other (see product data literature)	33 mL/m								A = 0.5%
Rangeability	High (50:1 minimum)	N/A		•	•	•	•	•	•	•
	Medium* (15~50:1)		•							
	Low (under 15:1)									
Trim	Brass, plated brass, bronze				•	•	•	•		
	Stainless Steel					o			•	•
	Resilient materials	•	•	•						
In-line Serviceability	Cartridge	•	•	•						
	Packing				•	•	•	•	•	•
	Rebuild					•	•	•		
Actuation Options	Electronic Modulating		•	•	•	•	•	•	•	•
	Tri-state floating		•	•	•	•	•	•	•	•
	Pulse Width Modulation		•							
	2-position low voltage	•	•	o	o	•	•	•	•	•
	2-position line voltage	•	•			•	•	•	•	•
	Electric Spring Return	•		•	•	•	•	•	•	•
	Electronic Fail Safe		•							
	Pneumatic, low pressure			•		•	•	•	•	•
	Pneumatic bidirectional (Hi-Pr)									
	Pneumatic spring return (Hi-Pr)									

Notes
* Best used with supply water reset from outdoor air temperature.
** A port specification
*** A-port maximum operating differential pressure. Static close-off pressure may be higher. Maximum pressure for quiet service may be less.
**** Stem down to close
***** Stem up to close
"Limited" = not available in large sizes

3-Way

		Control Ball		Butterfly	
		Threaded	Flanged	Resilient Seat	
Attribute	Specification	VBN3	VBF3	VFF3	VFF6
Pipe Size	1/2" [DN15]	•			
	3/4" [DN20]	•			
	1" [DN25]	•			
	1-1/4" [DN32]	•			
	1-1/2" [DN40]	•			
	2" [DN50]	•		•	•
	2-1/2" [DN65]	•		•	•
	3" [DN80]			•	•
	4" [DN100]		•	•	•
	5" [DN125]		•	•	•
	6" [DN150]		•	•	•
	Other (maximum size)			20" [DN500]	
Pipe Fittings	Sweat				
	NPT Internal Thread	•			
	Inverted Flare				
	ANSI Flange		•	•	•
Static Pressure	ANSI 125/150		•		
	ANSI 250/300				
	Other	360 psi		250 psi	
Media	Chilled Water	•	•	•	•
	Hot Water	•	•	•	•
Flow Capacity, Cv	Multiple ratings per pipe size	•	•		
	One rating/size above 1/2"			•	•
Valve Action	Mixing A-B-AB porting	•	•	•	
	Mixing A-AB-B porting				•
	Diverting AB-B-A porting	•	o	•	
	Diverting A-AB-B porting				•
A-port Flow Characteristic	Equal Percentage				
	Modified Equal Percentage	•	•	•	•
	Linear				
	Quick Open				
B-port Flow Characteristic	Modified Equal Percentage			•	•
	Linear				
	Linear, Reduced Cv	•	•		
	Total Constant Flow				
	Quick Open				
Close-off pressure***	High (60 psid minimum)		•	•	•
	Medium (30 psid minimum)	•		•	•
	Varies with actuator				
Maximum Seat Leakage**	ANSI Class III (0.10% Cv max.)				
	ANSI Class IV (0.01% Cv max.)	•	A-port	•	•
	Bubble-tight design			•	•
	Other (see product data literature)		B-port		
Rangeability	High (50:1 minimum)	•	•		
	Medium* (15~50:1)	o			
	Low (under 15:1)			•	•
Trim	Brass, plated brass, bronze	•			
	Stainless Steel		•		
	Resilient materials			•	•
In-line Serviceability	Cartridge				
	Packing	•	•		
	Rebuild		•		
Actuation Options	Electronic Modulating	•	•	•	•
	Tri-state floating	•	•	•	•
	Pulse Width Modulation				
	2-position low voltage	•	•	Limited	
	2-position line voltage	o	o	•	•
	Electric Spring Return	•	•	Limited	
	Electronic Fail Safe				
	Pneumatic, low pressure			Limited	
	Pneumatic bidirectional (Hi-Pr)			•	•
	Pneumatic spring return (Hi-Pr)			•	•

Notes
* Best used with supply water reset from outdoor air temperature.
** A port specification
*** A-port maximum operating differential pressure. Static close-off pressure may be higher. Maximum pressure for quiet service may be less.
**** Stem down to close
***** Stem up to close
"Limited" = not available in large sizes

Fan Coil and Zone Valves

Honeywell Fan Coil and Zone Valves family (VU Series) have withstood the test of time as a reliable and dependable product.

With a Cv range suitable for anything from radiator panels to fan coil units and both normally open and normally closed spring return functions, it's easy to select a model that fits your needs. Additionally you can choose between line voltage or low voltage actuators as well as three different types of pipe fittings: Female NPT, Sweat, and Inverted flare.

Common Features

- Maximum static water pressure: 300 psig
- Ambient temp range: 34-104°F (at 34-250°F medium temperature)
- 3-way valve is diverting type
- Long service life with patented ball seal
- Quick opening / soft closing for optimal 2-position control
- Manual opener

Actuator O.S. Number		VU443A1008	VU443A1024	VU443A1115	VU443A1180	VU443E1009	VU444A1007
Power Supply	Voltage	120 Vac	208 Vac	230 Vac	120 Vac	120 Vac	120 Vac
	Frequency	60 Hz	60 Hz	50 / 60 Hz	60 Hz	60 Hz	60 Hz
	Power (60 Hz)	5 VA	5 VA	5 VA	5 VA	5 VA	5 VA
Control	2-Position SPST	•	•	•	•	•	•
Aux Switch	SPST					2.2 A/120 Vac	
Maximum Timing	Seconds @ 60 Hz, Driving	15	15	15	15	15	15
	Fail Safe	6	6	6	6	6	6
Fail Safe Action		N.C.	N.C.	N.C.	N.C.	N.C.	2-way N.O. 3-way N.O./N.C.
Electrical Connections	Leadwire Length, in.	6	18	6	6	18	6
	1/2 in. flexible conduit hole	•	•	•	•	•	•
Manual Override	(on power failure, auto reset)	•	•	•	•	•	•
Nickel plated motors	Condensing Atmosphere				•		

2-Way

Valve Size (inches)	Connection Type	Flow Capacity (Cv)	Valve Action	Valve O.S. Number	2-way Valves Close-off					
1/2"	f NPT	1.0	Normally Open	VU52N1027						50
	Sweat	1.0		VU52S2002						50
	f NPT	2.5		VU52N1035						30
	Sweat	2.5		VU52S2010						30
	f NPT	3.5		VU52N1019						20
	Sweat	3.5		VU52S2028						20
3/4"	f NPT	3.5		VU52N1076						20
	Sweat	3.5		VU52S2036						20
	Sweat	5.0		VU52S2044						15
	f NPT	8.0		VU52N1001						10
	Sweat	8.0		VU52S2051						10
1''	f NPT	8.0		VU52N1068						10
1/2"	f NPT	1.0	Normally Closed	VU53N1041	50	50	50	50	50	
	Sweat	1.0		VU53S2018	50	50	50	50	50	
	f NPT	2.5		VU53N1058	30	30	30	30	30	
	Sweat	2.5		VU53S2026	30	30	30	30	30	
	Inverted Flare	3.5		VU53F1024	20	20	20	20	20	
	f NPT	3.5		VU53N1009	20	20	20	20	20	
	Sweat	3.5		VU53S2034	20	20	20	20	20	
3/4"	f NPT	3.5		VU53N1033	20	20	20	20	20	
	Sweat	3.5		VU53S2042	20	20	20	20	20	
	f NPT	5.0		VU53N1066	15	15	15	15	15	
	Sweat	5.0		VU53S2075	15	15	15	15	15	
	f NPT	8.0		VU53N1017	10	10	10	10	10	
	Sweat	8.0		VU53S2059	10	10	10	10	10	
1"	f NPT	8.0		VU53N1026	10	10	10	10	10	
	Sweat	8.0		VU53S2000	10	10	10	10	10	

3-Way

Valve Size (inches)	Connection Type	Flow Capacity (Cv)	Valve Action	Valve O.S. Number	3-way Valves Close-off					
1/2"	Inverted Flare	4.0	Mixing	VU54F1022						20
	f NPT	4.0		VU54N1007						20
	Sweat	4.0		VU54S2008						10
3/4"	f NPT	4.0		VU54N1031						20
	f NPT	5.0		VU54N1049						15
	Sweat	5.0		VU54S2057						15
	f NPT	7.0		VU54N1015						10
	Sweat	7.0		VU54S2016						10
1"	f NPT	7.0		VU54N1023						10
	Sweat	7.0		VU54S2024						10

					Actuator O.S. Number	VU444A1098	VU444A1106	VU444A1155	VU843A1004	VU843A1087	VU844A1003	VU844A1060
					Power Supply Voltage	227 Vac	230 Vac	120 Vac	24 Vac	24 Vac	24 Vac	24 Vac
					Frequency	60 Hz	50 / 60 Hz	60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
					Power (60 Hz)	5 VA	5 VA	5 VA	0.32 A	0.32 A	0.32 A	0.32 A
					Control 2-Position SPST	•	•	•	•	•	•	•
					Aux Switch SPST							
					Maximum Timing Seconds @ 60 Hz, Driving	15	15	15	15	15	15	15
					Fail Safe	6	6	6	6	6	6	6
					Fail Safe Action	2-way N.O. 3-way N.O./N.C.	2-way N.O. 3-way N.O./N.C.	2-way N.O. 3-way N.O./N.C.	N.C.	N.C.	2-way N.O. 3-way N.O./N.C.	2-way N.O. 3-way N.O./N.C.
					Electrical Connections Leadwire Length, in.	18	6	6	6	6	6	6
					1/2 in. flexible conduit hole	•	•	•	•	•	•	•
					Manual Override (on power failure, auto reset)	•	•	•	•	•	•	•
					Nickel plated motors Condensing Atmosphere			•		•		•
	Valve Size (inches)	**Connection Type**	**Flow Capacity (Cv)**	**Valve Action**	**Valve O.S. Number**	**2-way Valves Close-off**						
2-Way	1/2"	f NPT	1.0	Normally Open	VU52N1027	50	50	50			50	50
		Sweat	1.0		VU52S2002	50	50	50			50	50
		f NPT	2.5		VU52N1035	30	30	30			30	30
		Sweat	2.5		VU52S2010	30	30	30			30	30
		f NPT	3.5		VU52N1019	20	20	20			20	20
		Sweat	3.5		VU52S2028	20	20	20			20	20
	3/4"	f NPT	3.5		VU52N1076	20	20	20			20	20
		Sweat	3.5		VU52S2036	20	20	20			20	20
		Sweat	5.0		VU52S2044	15	15	15			15	15
		f NPT	8.0		VU52N1001	10	10	10			10	10
		Sweat	8.0		VU52S2051	10	10	10			10	10
	1"	f NPT	8.0		VU52N1068	10	10	10			10	10
	1/2"	f NPT	1.0	Normally Closed	VU53N1041				50	50		
		Sweat	1.0		VU53S2018				50	50		
		f NPT	2.5		VU53N1058				30	30		
		Sweat	2.5		VU53S2026				30	30		
		Inverted Flare	3.5		VU53F1024				20	20		
		f NPT	3.5		VU53N1009				20	20		
		Sweat	3.5		VU53S2034				20	20		
	3/4"	f NPT	3.5		VU53N1033				20	20		
		Sweat	3.5		VU53S2042				20	20		
		f NPT	5.0		VU53N1066				15	15		
		Sweat	5.0		VU53S2075				15	15		
		f NPT	8.0		VU53N1017				10	10		
		Sweat	8.0		VU53S2059				10	10		
	1"	f NPT	8.0		VU53N1026				10	10		
		Sweat	8.0		VU53S2000				10	10		
	Valve Size (inches)	**Connection Type**	**Flow Capacity (Cv)**	**Valve Action**	**Valve O.S. Number**	**3-way Valves Close-off**						
3-Way	1/2"	Inverted Flare	4.0	Mixing	VU54F1022	20	20	20			20	20
		f NPT	4.0		VU54N1007	20	20	20			20	20
		Sweat	4.0		VU54S2008	10	10	10			10	10
	3/4"	f NPT	4.0		VU54N1031	20	20	20			20	20
		f NPT	5.0		VU54N1049	15	15	15			15	15
		Sweat	5.0		VU54S2057	15	15	15			15	15
		f NPT	7.0		VU54N1015	10	10	10			10	10
		Sweat	7.0		VU54S2016	10	10	10			10	10
	1"	f NPT	7.0		VU54N1023	10	10	10			10	10
		Sweat	7.0		VU54S2024	10	10	10			10	10

Cartridge Cage Valves

Honeywell Cartridge Cage Valves family (VC Series) are highly serviceable and completely rebuildable.

Select from 2-position (both low and line voltage), floating, and modulating actuators, and fail-safe actuators with configurable open/closed functionality on power failure depending on the application. Since these valves are not sensitive to flow direction; they can do both mixing and diverting without changing anything except the piping.

				Non-Fail Safe						
			Actuator O.S. Number	VC6834ZZ11	VC6934ZZ11	VC7934ZZ11	VC4011ZZ11	VC4013ZZ11	VC8114ZZ11	VC8714ZZ11
		Power Supply	Voltage	24 Vac	24 Vac	24 Vac	100-130 Vac	200-240 Vac	24 Vac	24 Vac
			Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	60 Hz	60 Hz
			Power	6 VA	6 VA	6 VA	6 VA	6 VA	6 VA	6 VA
		Control	2-10 Vdc			•				
			4-20 mA (external 500 Ohm resistor)			•				
			Floating	•	•					
			2-Position SPDT	•	•					
			2-Position SPST				•	•	•	•
			Pulse Width Modulation							
		Aux Switch	SPDT Class II	2.2 A						2.2 A
		Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place
		Reversible Operation	Wiring Change	•	•					
			DIP Switch							
		Stroke Timing	Seconds @ 60 Hz (Drive)	120	120	120	6	6	6	6
			Fail Safe							
		Electrical Connection	Cable length, in.	60	60	60	39.4	39.4	60	60
			Plenum-rated cable	•	•	•			•	•
			1/2 in. flexible conduit adapter	•	•	•			•	•
	Valve Size (inches)	**Connection Type**	**Flow Capacity (Cv)**	**Flow Characteristic**	**Valve O.S. Number**						
2-Way	1/2"	f NPT	0.7	Modified Equal %	VCZBB3500	VCZBB3500	VCZBB3500				
		Sweat	0.7		VCZAA3500	VCZAA3500	VCZAA3500				
		f NPT	1.3		VCZBB3600	VCZBB3600	VCZBB3600				
		Sweat	1.3		VCZAA3600	VCZAA3600	VCZAA3600				
		Sweat	1.9		VCZAA3800	VCZAA3800	VCZAA3800				
		f NPT	1.9		VCZBB3800	VCZBB3800	VCZBB3800				
		Sweat	2.3		VCZAA3400	VCZAA3400	VCZAA3400				
		f NPT	2.3		VCZBB3400	VCZBB3400	VCZBB3400				
		f NPT	3.5	Linear	VCZBB3100	VCZBB3100	VCZBB3100	VCZBB1100	VCZBB1100	VCZBB1100	VCZBB1100
		Sweat	3.5	Linear	VCZAA3100	VCZAA3100	VCZAA3100	VCZAA1100	VCZAA1100	VCZAA1100	VCZAA1100
	3/4"	f NPT	3.9	Modified Equal %	VCZAL3400	VCZAL3400	VCZAL3400				
		Sweat	3.9	Modified Equal %	VCZAM3400	VCZAM3400	VCZAM3400				
		f NPT	4.7	Linear	VCZAL3100	VCZAL3100	VCZAL3100	VCZAL1100	VCZAL1100	VCZAL1100	VCZAL1100
		Sweat	4.7	Linear	VCZAM3100	VCZAM3100	VCZAM3100	VCZAM1100	VCZAM1100	VCZAM1100	VCZAM1100
	1"	f NPT	4.2	Modified Equal %	VCZAR3400	VCZAR3400	VCZAR3400				
		Sweat	4.2	Modified Equal %	VCZAS3400	VCZAS3400	VCZAS3400				
		f NPT	6.6	Linear	VCZAR3100	VCZAR3100	VCZAR3100	VCZAR1100	VCZAR1100	VCZAR1100	VCZAR1100
		Sweat	6.6		VCZAS3100	VCZAS3100	VCZAS3100	VCZAS1100	VCZAS1100	VCZAS1100	VCZAS1100
	1-1/4"	f NPT	7		VCZBD3100	VCZBD3100	VCZBD3100	VCZBD1100	VCZBD1100	VCZBD1100	VCZBD1100
		Sweat	7		VCZBE3100	VCZBE3100	VCZBE3100	VCZBE1100	VCZBE1100	VCZBE1100	VCZBE1100
	Valve Size (inches)	**Connection Type**	**Flow Capacity (Cv)**	**Flow Characteristic**	**Valve O.S. Number**						
3-Way Mixing/ Diverting	1/2"	f NPT	0.7	Modified Equal %	VCZNB7500	VCZNB7500	VCZNB7500				
		Sweat	0.7		VCZMA7500	VCZMA7500	VCZMA7500				
		f NPT	1.5		VCZNB7600	VCZNB7600	VCZNB7600				
		Sweat	1.5		VCZMA7600	VCZMA7600	VCZMA7600				
		f NPT	1.5		VCZNB7800	VCZNB7800	VCZNB7800				
		Sweat	1.5		VCZMA7800	VCZMA7800	VCZMA7800				
		f NPT	2.7		VCZNB7400	VCZNB7400	VCZNB7400				
		Sweat	2.7		VCZMA7400	VCZMA7400	VCZMA7400				
		f NPT	3.7	Linear	VCZNB7100	VCZNB7100	VCZNB7100	VCZNB6100	VCZNB6100	VCZNB6100	VCZNB6100
		Sweat	3.7	Linear	VCZMA7100	VCZMA7100	VCZMA7100	VCZMA6100	VCZMA6100	VCZMA6100	VCZMA6100
	3/4"	f NPT	4.2	Modified Equal %	VCZMK7400	VCZMK7400	VCZMK7400				
		Sweat	4.2	Modified Equal %	VCZML7400	VCZML7400	VCZML7400				
		f NPT	6.6	Linear	VCZMK7100	VCZMK7100	VCZMK7100	VCZMK6100	VCZMK6100	VCZMK6100	VCZMK6100
		Sweat	6.6		VCZML7100	VCZML7100	VCZML7100	VCZML6100	VCZML6100	VCZML6100	VCZML6100
	1"	f NPT	8.3		VCZMR7100	VCZMR7100	VCZMR7100	VCZMR6100	VCZMR6100	VCZMR6100	VCZMR6100
		Sweat	8.3		VCZMS7100	VCZMS7100	VCZMS7100	VCZMS6100	VCZMS6100	VCZMS6100	VCZMS6100
	1-1/4"	f NPT	9		VCZND7100	VCZND7100	VCZND7100	VCZND6100	VCZND6100	VCZND6100	VCZND6100
		Sweat	9		VCZNE7100	VCZNE7100	VCZNE7100	VCZNE6100	VCZNE6100	VCZNE6100	VCZNE6100

Common Features

- 2-way straight-through or 3-way mixing/diverting body configurations
- Corrosion resistant, engineered plastic actuator housing
- 60 psid close-off on all models
- Fast acting 2-position actuator with soft close technology
- Position indicator/manual override lever standard
- Replaceable cartridge rebuilds valve to factory specifications without removing valve body from piping
- 300 psi operating pressure
- Combination position indicator/manual flush-and-fill manual lever on all actuators

		Fail Safe	
Actuator O.S. Number		VC6936ZZ11-530	VC7936ZZ11-529
Power Supply	Voltage	24 Vac	24 Vac
	Frequency	50/60 Hz	50/60 Hz
	Power	12 VA	12 VA
Control	2-10 Vdc		•
	4-20 mA (external 500 Ohm resistor)		•
	Floating	•	•
	2-Position SPDT	•	•
	2-Position SPST		•
	Pulse Width Modulation	•	•
Aux Switch	SPDT Class II		
Fail Safe Action		Electronic NO/NC	Electronic NO/NC
Reversible Operation	Wiring Change	•	•
	DIP Switch		•
Stroke Timing	Seconds @ 60 Hz (Drive)	120	60 / 120
	Fail Safe	12	12
Electrical Connection	Cable length, in.	60	60
	Plenum-rated cable	•	•
	1/2 in. flexible conduit adapter	•	•

Honeywell's Cartridge Cage Valves feature a field replaceable cartridge for all working parts

	Valve Size (inches)	Connection Type	Flow Capacity (Cv)	Flow Characteristic	Y-pack O.S. Number		Replacement Cartridge Floating / Modulating	Replacement Cartridge Electronic Fail Safe
2-Way	1/2"	f NPT	0.7	Modified Equal %	VC6936BB1500	VC7936BB1500	VCZZ3500	VCZZ1500
		Sweat	0.7		VC6936AA1500	VC7936AA1500	VCZZ3500	VCZZ1500
		f NPT	1.3		VC6936BB1600	VC7936BB1600	VCZZ3600	VCZZ1600
		Sweat	1.3		VC6936AA1600	VC7936AA1600	VCZZ3600	VCZZ1600
		Sweat	1.9		VC6936AA1800	VC7936AA1800	VCZZ3800	VCZZ1800
		f NPT	1.9		VC6936BB1800	VC7936BB1800	VCZZ3800	VCZZ1800
		Sweat	2.3		VC6936AA1400	VC7936AA1400	VCZZ3400	VCZZ1400
		f NPT	2.3		VC6936BB1400	VC7936BB1400	VCZZ3400	VCZZ1400
		f NPT	3.5	Linear	VC6936BB1100	VC7936BB1100	VCZZ3100	VCZZ1100*
		Sweat	3.5	Linear	VC6936AA1100	VC7936AA1100	VCZZ3100	VCZZ1100*
	3/4"	f NPT	3.9	Modified Equal %	VC6936AL1400	VC7936AL1400	VCZZ3400	VCZZ1400
		Sweat	3.9	Modified Equal %	VC6936AM1400	VC7936AM1400	VCZZ3400	VCZZ1400
		f NPT	4.7	Linear	VC6936AL1100	VC7936AL1100	VCZZ3100	VCZZ1100*
		Sweat	4.7	Linear	VC6936AM1100	VC7936AM1100	VCZZ3100	VCZZ1100*
	1"	f NPT	4.2	Modified Equal %	VC6936AR1400	VC7936AR1400	VCZZ3400	VCZZ1400
		Sweat	4.2	Modified Equal %	VC6936AS1400	VC7936AS1400	VCZZ3400	VCZZ1400
		f NPT	6.6	Linear	VC6936AR1100	VC7936AR1100	VCZZ3100	VCZZ1100*
		Sweat	6.6		VC6936AS1100	VC7936AS1100	VCZZ3100	VCZZ1100*
	1-1/4"	f NPT	7		VC6936BD1100	VC7936BD1100	VCZZ3100	VCZZ1100*
		Sweat	7		VC6936BE1100	VC7936BE1100	VCZZ3100	VCZZ1100*
	Valve Size (inches)	**Connection Type**	**Flow Capacity (Cv)**	**Flow Characteristic**	**Y-pack O.S. Number**		**Replacement Cartridge Floating / Modulating**	**Replacement Cartridge Electronic Fail Safe**
3-Way Mixing/ Diverting	1/2"	f NPT	0.7	Modified Equal %	VC6936NB6500	VC7936NB6500	VCZZ7500	VCZZ6500
		Sweat	0.7		VC6936MA6500	VC7936MA6500	VCZZ7500	VCZZ6500
		f NPT	1.5		VC6936NB6600	VC7936NB6600	VCZZ7600	VCZZ6600
		Sweat	1.5		VC6936MA6600	VC7936MA6600	VCZZ7600	VCZZ6600
		f NPT	1.5		VC6936NB6800	VC7936NB6800	VCZZ7800	VCZZ6800
		Sweat	1.5		VC6936MA6800	VC7936MA6800	VCZZ7800	VCZZ6800
		f NPT	2.7		VC6936NB6400	VC7936NB6400	VCZZ7400	VCZZ6400
		Sweat	2.7		VC6936MA6400	VC7936MA6400	VCZZ7400	VCZZ6400
		f NPT	3.7	Linear	VC6936NB6100	VC7936NB6100	VCZZ7100	VCZZ6100*
		Sweat	3.7	Linear	VC6936MA6100	VC7936MA6100	VCZZ7100	VCZZ6100*
	3/4"	f NPT	4.2	Modified Equal %	VC6936MK6400	VC7936MK6400	VCZZ7400	VCZZ6400
		Sweat	4.2	Modified Equal %	VC6936ML6400	VC7936ML6400	VCZZ7400	VCZZ6400
		f NPT	6.6	Linear	VC6936MK6100	VC7936MK6100	VCZZ7100	VCZZ6100*
		Sweat	6.6		VC6936ML6100	VC7936ML6100	VCZZ7100	VCZZ6100*
	1"	f NPT	8.3		VC6936MR6100	VC7936MR6100	VCZZ7100	VCZZ6100*
		Sweat	8.3		VC6936MS6100	VC7936MS6100	VCZZ7100	VCZZ6100*
	1-1/4"	f NPT	9		VC6936ND6100	VC7936ND6100	VCZZ7100	VCZZ6100*
		Sweat	9		VC6936NE6100	VC7936NE6100	VCZZ7100	VCZZ6100*

* Also applies to 2-position valve-actuator applications

Cartridge Globe Valves

For more than 50 years, Honeywell has manufactured the V58 series of premium Cartridge Globe Valves. The compact size and replacement capabilities make it a great choice for controlling modulating unitary equipment.

Valves 1" and larger feature a pressure balanced design with enhanced close-off (levels).

Common Features

- Maximum static pressure 235 psi
- Long stroke allows for a wide range of control
- Leakage rate: 0.02% of Cv
- Insert replacement tool allows for the valve cartridge to be replaced or changed without draining the system (½" and ¾" models only)
- Brass body and stainless steel stem
- Threaded plastic valve cover/manual handle allows for manual operation
- Corrosion resistant

		Non-Fail Safe			
Actuator O.S. Number		**M6410A1029**	**M6410A3017**	**M7410F1000**	**M7410F3006**
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
	Power	0.7 VA	0.7 VA	1.4 VA	1.4 VA
	Stem Force (lb.)	40.5	67.5	40.5	67.5
Control	2-Position SPDT	•	•		
	Floating	•	•		
	0(2)-10 Vdc			DIP Switch	DIP Switch
	4-20 mA (external 500 Ohm resistor)			•	•
	Pneumatic Spring Range				
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place
Reversible Operation	Wiring Change	•	•		
	DIP Switch			•	•
Stroke Timing	Seconds @ 60 Hz (Drive)	125	125	125	125
	Fail Safe				
Manual Override	(Use valve dust cap)	•	•	•	•
Position Indicator		•	•	•	•
Electrical Connection	Cable length, in.	36	36	36	36
	Plenum-rated Cable	•	•	•	•
	Screw terminals				
	1/2 in. flexible conduit hub	•	•	•	•

2-Way

Valve Size (inches)	Pipe Connection Type	Flow Capacity (Cv)	Flow Characteristic	Valve Closes	Valve O.S. Number	Close-off Pressure, psid			
1/2"	f NPT	0.19	Equal%	Stem Down[2]	V5862A2005	232		232	
	Sweat	0.19			V5852A2007	232		232	
	f NPT	0.29			V5862A2013	232		232	
	Sweat	0.29			V5852A2015	232		232	
	f NPT	0.47			V5862A2021	232		232	
	Sweat	0.47			V5852A2023	232		232	
	f NPT	0.74			V5862A2039	232		232	
	Sweat	0.74			V5852A2031	232		232	
	f NPT	1.2			V5862A2047	174		174	
	Sweat	1.2			V5852A2049	174		174	
	f NPT	1.9			V5862A2054	174		174	
	Sweat	1.9			V5852A2056	174		174	
3/4"	f NPT	2.9			V5862A2062	58		58	
	Sweat	2.9			V5852A2064	58		58	
	f NPT	4.9			V5862A2070	58		58	
	Sweat	4.9			V5852A2072	58		58	
1"	f NPT	5.5	Linear	Stem Up	V5862A3003		232		232
	f NPT	7.8			V5862A3011		232		232
	f NPT	11			V5862A3029		232		232
1-1/4"	f NPT	18			V5862A3037		174		174
1-1/2"	f NPT	25			V5862A3045		145		145

3-Way

Valve Size (inches)	Pipe Connection Type	Flow Capacity (Cv)[1]	Flow Characteristic	Valve Closes	Valve O.S. Number	Close-off Pressure, psid			
1/2"	f NPT	0.29	A-AB Equal%, B-AB Linear	Stem Up	V5863A2004	116		116	
	Sweat	0.29			V5853A2006	116		116	
	f NPT	0.47			V5863A2012	116		116	
	Sweat	0.47			V5853A2014	116		116	
	f NPT	0.74			V5863A2020	36		36	
	Sweat	0.74			V5853A2022	36		36	
	f NPT	1.2			V5863A2038	36		36	
	Sweat	1.2			V5853A2030	36		36	
	f NPT	1.9			V5863A2046	34		34	
	Sweat	1.9			V5853A2048	34		34	
3/4"	f NPT	2.9			V5863A1006	34		34	
	Sweat	2.9			V5853A1008	34		34	
	f NPT	4.9			V5863A1014	34		34	
	Sweat	4.9			V5853A1016	34		34	
	f NPT	2.9			V5863A2053	7.25		7.25	
	Sweat	2.9			V5853A2055	7.25		7.25	
	f NPT	4.9			V5863A2061	7.25		7.25	
	Sweat	4.9			V5853A2063	7.25		7.25	
1"	f NPT	5.5	Linear		V5863A3002		232		232
	f NPT	7.8			V5863A3010		232		232
	f NPT	11			V5863A3028		232		232
1-1/4"	f NPT	18			V5863A3036		174		174
1-1/2"	f NPT	25			V5863A3044		145		145

[1] B port Cv is 20% less
[2] Fail safe position for 1/2" and 3/4" 2-way is Normally Open with Mx435 and MP958 spring return actuators. All other valves fail safe closed.

Actuator O.S. Number		Fail Safe				Pneumatic		
		M6435A1004	M6435A3000	M7435F1001	M7435F3007	MP958A1009	MP958A1017	MP958A1025
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac			
	Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz			
	Power	10 VA	10 VA	5 VA	5 VA			
	Stem Force (lb.)	40.5	90	40.5	90			
Control	2-Position SPDT	•	•					
	Floating	•	•					
	0(2)-10 Vdc			DIP Switch	DIP Switch			
	4-20 mA (external 500 Ohm resistor)			•	•			
	Pneumatic Spring Range					2-5 psi	3-10 psi	8-11 psi
Fail Safe Action		2-way N.O. 3-way N.C.	N.C.	2-way N.O. 3-way N.C.	N.C.	2-way N.O. 3-way N.C.	2-way N.O. 3-way N.C.	2-way N.O. 3-way N.C.
Reversible Operation	Wiring Change	•	•					
	DIP Switch			•	•			
Stroke Timing	Seconds @ 60 Hz (Drive)	50	50	50	50			
	Fail Safe	10	10	10	10			
Manual Override	(Use valve dust cap)	•	•	•	•	•	•	•
Position Indicator		•	•	•	•			
Electrical Connection	Cable length, in.							
	Plenum-rated Cable							
	Screw terminals	•	•	•	•			
	1/2 in. flexible conduit hub	•	•	•	•			

2-Way

Valve Size (inches)	Pipe Connection Type	Flow Capacity (Cv)	Flow Characteristic	Valve Closes	Valve O.S. Number	Close-off Pressure, psid				A-port Close-off Pressure, psid Full air pressure[3]			Replacement Insert[4]
1/2"	f NPT	0.19	Equal%	Stem Down[2]	V5862A2005	232		232		232	232	232	0902812
	Sweat	0.19			V5852A2007	232		232		232	232	232	0902812
	f NPT	0.29			V5862A2013	232		232		232	232	232	0902811
	Sweat	0.29			V5852A2015	232		232		232	232	232	0902811
	f NPT	0.47			V5862A2021	232		232		232	232	232	0902810
	Sweat	0.47			V5852A2023	232		232		232	232	232	0902810
	f NPT	0.74			V5862A2039	232		232		232	232	232	0902809
	Sweat	0.74			V5852A2031	232		232		232	232	232	0902809
	f NPT	1.2			V5862A2047	174		174		232	140	120	0902808
	Sweat	1.2			V5852A2049	174		174		232	140	120	0902808
	f NPT	1.9			V5862A2054	174		174		232	140	120	0902807
	Sweat	1.9			V5852A2056	174		174		232	140	120	0902807
3/4"	f NPT	2.9			V5862A2062	58		58		90	50	40	0902814
	Sweat	2.9			V5852A2064	58		58		90	50	40	0902814
	f NPT	4.9			V5862A2070	58		58		90	50	40	0902815
	Sweat	4.9			V5852A2072	58		58		90	50	40	0902815
1"	f NPT	5.5	Linear	Stem Up	V5862A3003		232		232				0903827
	f NPT	7.8			V5862A3011		232		232				0903827
	f NPT	11			V5862A3029		232		232				0903827
1-1/4"	f NPT	18			V5862A3037		174		174				0903828
1-1/2"	f NPT	25			V5862A3045		145		145				0903829

3-Way

Valve Size (inches)	Pipe Connection Type	Flow Capacity (Cv)[1]	Flow Characteristic	Valve Closes	Valve O.S. Number	Close-off Pressure, psid				A-port Close-off Pressure, psid Full air pressure[3]			Replacement Insert[4]
1/2"	f NPT	0.29	A-AB Equal%, B-AB Linear	Stem Up	V5863A2004	116		116		20	80	232	0902821
	Sweat	0.29			V5853A2006	116		116		20	80	232	0902821
	f NPT	0.47			V5863A2012	116		116		20	80	232	0902822
	Sweat	0.47			V5853A2014	116		116		20	80	232	0902822
	f NPT	0.74			V5863A2020	36		36		20	80	232	0902823
	Sweat	0.74			V5853A2022	36		36		20	80	232	0902823
	f NPT	1.2			V5863A2038	36		36		N / A	10	100	0902824
	Sweat	1.2			V5853A2030	36		36		N / A	10	100	0902824
	f NPT	1.9			V5863A2046	34		34		N / A	10	100	0902825
	Sweat	1.9			V5853A2048	34		34		N / A	10	100	0902825
3/4"	f NPT	2.9			V5863A1006	34		34					0902826
	Sweat	2.9			V5853A1008	34		34					0902826
	f NPT	4.9			V5863A1014	34		34					0902827
	Sweat	4.9			V5853A1016	34		34					0902827
	f NPT	2.9			V5863A2053[5]	7.25		7.25		N / A	N / A	35	0902818
	Sweat	2.9			V5853A2055[5]	7.25		7.25		N / A	N / A	35	0902818
	f NPT	4.9			V5863A2061[5]	7.25		7.25		N / A	N / A	35	0902819
	Sweat	4.9			V5853A2063[5]	7.25		7.25		N / A	N / A	35	0902819
1"	f NPT	5.5	Linear		V5863A3002		232		232				0903827
	f NPT	7.8			V5863A3010		232		232				0903827
	f NPT	11			V5863A3028		232		232				0903827
1-1/4"	f NPT	18			V5863A3036		174		174				0903828
1-1/2"	f NPT	25			V5863A3044		145		145				0903829

[1] B port Cv is 20% less
[2] Fail safe position for 1/2" and 3/4" 2-way is Normally Open with Mx435 and MP958 spring return actuators. All other valves fail safe closed.
[3] 20 psi for 2-way; 0 psi for 3-way
[4] Insert determines Cv for 1/2" and 3/4" bodies. Grouped inserts are interchangeable.
[5] B-port Close-off of 3-way valves is the same as A-port in 2-way valves

Control Ball Valves ½- 3"

2-Way NPT

Common Features

- Max static pressure 360 psi (250°F)
- Medium: Water/glycol solutions up to 50%. Use globe valves for steam control.
- Fluid temperature range: -22 to +250°F
- Spring return actuators field-configurable for A-port normally open or normally closed fail-safe.

VBN2 (Two-way)

- Equal % flow insert. Largest Cv rating in each valve size is full port, as noted
- Nickel-chrome plated brass or 316 stainless steel ball and stem
- ANSI class IV leakage (0.01% of Cv)

2-Way

Actuator Features		Non-fail Safe					
Actuator O.S. Number		ML6161A2009	ML6161A2009	MN6105A1011	MN6105A1011	MN7505A2001	MN7505A2001
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	1.8 VA	1.8 VA	5 VA	5 VA	5 VA	5 VA
Actuator Torque	(lb.-in.)	35	35	44	44	44	44
Control	(0)2-10 Vdc					•	•
	4-20 mA (external 500 Ohm Resistor)					•	•
	Floating	•	•	•	•	•	•
	Two-Position SPDT	•	•	•	•	•	•
	Two-Position SPST					•	•
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)		Closed	Closed	Closed	Closed	Closed	Closed
Actuator Stroke	(degrees)	90°	90°	95° ± 3°	95° ± 3°	95° ± 3°	95° ± 3°
Timing	(drive/spring return, seconds)	90	90	95	95	95	95
Aux Switch	2 x SPDT Add-on	201052B	201052B	SSW2-1M	SSW2-1M	SSW2-1M	SSW2-1M
Feedback	2-10 Vdc Built In			-	-	•	•
Valve Features	Trim	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel

Valve Size (inches)	Cv	Close-off Pressure (psid)	Valve O.S. Number					
1/2"	0.38	130	VBN2AB3P0F	VBN2AB3S0F	VBN2AB3P0A	VBN2AB3S0A	VBN2AB3P0B	VBN2AB3S0B
	0.68		VBN2AD3P0F	VBN2AD3S0F	VBN2AD3P0A	VBN2AD3S0A	VBN2AD3P0B	VBN2AD3S0B
	1.3		VBN2AE3P0F	VBN2AE3S0F	VBN2AE3P0A	VBN2AE3S0A	VBN2AE3P0B	VBN2AE3S0B
	2		VBN2AF3P0F	VBN2AF3S0F	VBN2AF3P0A	VBN2AF3S0A	VBN2AF3P0B	VBN2AF3S0B
	2.6		VBN2AG3P0F	VBN2AG3S0F	VBN2AG3P0A	VBN2AG3S0A	VBN2AG3P0B	VBN2AG3S0B
	4.7		VBN2AH3P0F	VBN2AH3S0F	VBN2AH3P0A	VBN2AH3S0A	VBN2AH3P0B	VBN2AH3S0B
	8		VBN2AJ3P0F	VBN2AJ3S0F	VBN2AJ3P0A	VBN2AJ3S0A	VBN2AJ3P0B	VBN2AJ3S0B
	11.7*		VBN2AK3P0F	VBN2AK3S0F	VBN2AK3P0A	VBN2AK3S0A	VBN2AK3P0B	VBN2AK3S0B
3/4"	0.31		VBN2BB3P0F	VBN2BB3S0F	VBN2BB3P0A	VBN2BB3S0A	VBN2BB3P0B	VBN2BB3S0B
	0.63		VBN2BD3P0F	VBN2BD3S0F	VBN2BD3P0A	VBN2BD3S0A	VBN2BD3P0B	VBN2BD3S0B
	1.2		VBN2BE3P0F	VBN2BE3S0F	VBN2BE3P0A	VBN2BE3S0A	VBN2BE3P0B	VBN2BE3S0B
	2.5		VBN2BG3P0F	VBN2BG3S0F	VBN2BG3P0A	VBN2BG3S0A	VBN2BG3P0B	VBN2BG3S0B
	4.3		VBN2BH3P0F	VBN2BH3S0F	VBN2BH3P0A	VBN2BH3S0A	VBN2BH3P0B	VBN2BH3S0B
	7.4		VBN2BJ3P0F	VBN2BJ3S0F	VBN2BJ3P0A	VBN2BJ3S0A	VBN2BJ3P0B	VBN2BJ3S0B
	10.1		VBN2BK3P0F	VBN2BK3S0F	VBN2BK3P0A	VBN2BK3S0A	VBN2BK3P0B	VBN2BK3S0B
	14.7*		VBN2BL3P0F	VBN2BL3S0F	VBN2BL3P0A	VBN2BL3S0A	VBN2BL3P0B	VBN2BL3S0B
	29*		VBN2BM3P0F	VBN2BM3S0F	VBN2BM3P0A	VBN2BM3S0A	VBN2BM3P0B	VBN2BM3S0B
1"	4.4	100			VBN2CH3P0A	VBN2CH3S0A	VBN2CH3P0B	VBN2CH3S0B
	9				VBN2CJ3P0A	VBN2CJ3S0A	VBN2CJ3P0B	VBN2CJ3S0B
	15.3				VBN2CL3P0A	VBN2CL3S0A	VBN2CL3P0B	VBN2CL3S0B
	26				VBN2CM3P0A	VBN2CM3S0A	VBN2CM3P0B	VBN2CM3S0B
	44*				VBN2CN3P0A	VBN2CN3S0A	VBN2CN3P0B	VBN2CN3S0B
	54*				VBN2CP3P0A	VBN2CP3S0A	VBN2CP3P0B	VBN2CP3S0B
1-1/4"	4.4				VBN2DH3P0A	VBN2DH3S0A	VBN2DH3P0B	VBN2DH3S0B
	8.3				VBN2DJ3P0A	VBN2DJ3S0A	VBN2DJ3P0B	VBN2DJ3S0B
	14.9				VBN2DK3P0A	VBN2DK3S0A	VBN2DK3P0B	VBN2DK3S0B
	25				VBN2DL3P0A	VBN2DL3S0A	VBN2DL3P0B	VBN2DL3S0B
	37				VBN2DM3P0A	VBN2DM3S0A	VBN2DM3P0B	VBN2DM3S0B
	41*				VBN2DN3P0A	VBN2DN3S0A	VBN2DN3P0B	VBN2DN3S0B
	102*				VBN2DS3P0A	VBN2DS3S0A	VBN2DS3P0B	VBN2DS3S0B
1-1/2"	23				VBN2EL3P0A	VBN2EL3S0A	VBN2EL3P0B	VBN2EL3S0B
	30				VBN2EM3P0A	VBN2EM3S0A	VBN2EM3P0B	VBN2EM3S0B
	41				VBN2EN3P0A	VBN2EN3S0A	VBN2EN3P0B	VBN2EN3S0B
	74*				VBN2ER3P0A	VBN2ER3S0A	VBN2ER3P0B	VBN2ER3S0B
	172*				VBN2E13P0A	VBN2E13S0A	VBN2E13P0B	VBN2E13S0B
2"	42				VBN2FN3P0A	VBN2FN3S0A	VBN2FN3P0B	VBN2FN3S0B
	57				VBN2FP3P0A	VBN2FP3S0A	VBN2FP3P0B	VBN2FP3S0B
	71				VBN2FR3P0A	VBN2FR3S0A	VBN2FR3P0B	VBN2FR3S0B
	100				VBN2FS3P0A	VBN2FS3S0A	VBN2FS3P0B	VBN2FS3S0B
	108*				VBN2FT3P0A	VBN2FT3S0A	VBN2FT3P0B	VBN2FT3S0B
	210				VBN2F13P0A	VBN2F13S0A	VBN2F13P0B	VBN2F13S0B
	266*				VBN2F23P0A	VBN2F23S0A	VBN2F23P0B	VBN2F23S0B
2-1/2"	45				VBN2GN3P0A	VBN2GN3S0A	VBN2GN3P0B	VBN2GN3S0B
	55				VBN2GP3P0A	VBN2GP3S0A	VBN2GP3P0B	VBN2GP3S0B
	72				VBN2GR3P0A	VBN2GR3S0A	VBN2GR3P0B	VBN2GR3S0B
	101				VBN2GS3P0A	VBN2GS3S0A	VBN2GS3P0B	VBN2GS3S0B
	162				VBN2GU3P0A	VBN2GU3S0A	VBN2GU3P0B	VBN2GU3S0B
	202*				VBN2G13P0A	VBN2G13S0A	VBN2G13P0B	VBN2G13S0B
3"	49				VBN2HN3P0A	VBN2HN3S0A	VBN2HN3P0B	VBN2HN3S0B
	63				VBN2HP3P0A	VBN2HP3S0A	VBN2HP3P0B	VBN2HP3S0B
	82				VBN2HR3P0A	VBN2HR3S0A	VBN2HR3P0B	VBN2HR3S0B
	124				VBN2HT3P0A	VBN2HT3S0A	VBN2HT3P0B	VBN2HT3S0B
	145*				VBN2HU3P0A	VBN2HU3S0A	VBN2HU3P0B	VBN2HU3S0B

* Full port ball. No flow characterizing insert.

2-Way NPT NEMA 2

Actuator Features		Fail Safe					
Actuator O.S. Number		MS8105A1030	MS8105A1030	MS7505A2030	MS7505A2030	Valve Only	Valve Only
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac		
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz		
	Power	8VA	8VA	7.5 VA	7.5 VA		
Actuator Torque	(lb.-in.)	44	44	44	44		
Control	(0)2-10 Vdc			•	•		
	4-20 mA (external 500 Ohm Resistor)			•	•		
	Floating			•	•		
	Two-Position SPDT			•	•		
	Two-Position SPST	•	•	•	•		
Fail Safe Action		Closed*	Closed*	Closed*	Closed*		
Normal Position (no signal)		Closed*	Closed*	Closed*	Closed*		
Actuator Stroke	(degrees)	95° ± 3°	95° ± 3°	95° ± 3°	95° ± 3°		
Timing	(drive/spring return, seconds)	45/25	45/25	45/25	45/25		
Aux Switch	2 x SPDT Add-on						
Feedback	2-10 Vdc Built In			•	•		
Valve Features	Trim	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel

Valve Size (inches)	Cv	Close-off Pressure (psid)	Valve O.S. Number					
1/2"	0.38	130	VBN2AB3P0C	VBN2AB3S0C	VBN2AB3P0D	VBN2AB3S0D	VBN2AB3P0X	VBN2AB3S0X
	0.68		VBN2AD3P0C	VBN2AD3S0C	VBN2AD3P0D	VBN2AD3S0D	VBN2AD3P0X	VBN2AD3S0X
	1.3		VBN2AE3P0C	VBN2AE3S0C	VBN2AE3P0D	VBN2AE3S0D	VBN2AE3P0X	VBN2AE3S0X
	2		VBN2AF3P0C	VBN2AF3S0C	VBN2AF3P0D	VBN2AF3S0D	VBN2AF3P0X	VBN2AF3S0X
	2.6		VBN2AG3P0C	VBN2AG3S0C	VBN2AG3P0D	VBN2AG3S0D	VBN2AG3P0X	VBN2AG3S0X
	4.7		VBN2AH3P0C	VBN2AH3S0C	VBN2AH3P0D	VBN2AH3S0D	VBN2AH3P0X	VBN2AH3S0X
	8		VBN2AJ3P0C	VBN2AJ3S0C	VBN2AJ3P0D	VBN2AJ3S0D	VBN2AJ3P0X	VBN2AJ3S0X
	11.7*		VBN2AK3P0C	VBN2AK3S0C	VBN2AK3P0D	VBN2AK3S0D	VBN2AK3P0X	VBN2AK3S0X
3/4"	0.31		VBN2BB3P0C	VBN2BB3S0C	VBN2BB3P0D	VBN2BB3S0D	VBN2BB3P0X	VBN2BB3S0X
	0.63		VBN2BD3P0C	VBN2BD3S0C	VBN2BD3P0D	VBN2BD3S0D	VBN2BD3P0X	VBN2BD3S0X
	1.2		VBN2BE3P0C	VBN2BE3S0C	VBN2BE3P0D	VBN2BE3S0D	VBN2BE3P0X	VBN2BE3S0X
	2.5		VBN2BG3P0C	VBN2BG3S0C	VBN2BG3P0D	VBN2BG3S0D	VBN2BG3P0X	VBN2BG3S0X
	4.3		VBN2BH3P0C	VBN2BH3S0C	VBN2BH3P0D	VBN2BH3S0D	VBN2BH3P0X	VBN2BH3S0X
	7.4		VBN2BJ3P0C	VBN2BJ3S0C	VBN2BJ3P0D	VBN2BJ3S0D	VBN2BJ3P0X	VBN2BJ3S0X
	10.1		VBN2BK3P0C	VBN2BK3S0C	VBN2BK3P0D	VBN2BK3S0D	VBN2BK3P0X	VBN2BK3S0X
	14.7*		VBN2BL3P0C	VBN2BL3S0C	VBN2BL3P0D	VBN2BL3S0D	VBN2BL3P0X	VBN2BL3S0X
	29*		VBN2BM3P0C	VBN2BM3S0C	VBN2BM3P0D	VBN2BM3S0D	VBN2BM3P0X	VBN2BM3S0X
1"	4.4	100	VBN2CH3P0C	VBN2CH3S0C	VBN2CH3P0D	VBN2CH3S0D	VBN2CH3P0X	VBN2CH3S0X
	9		VBN2CJ3P0C	VBN2CJ3S0C	VBN2CJ3P0D	VBN2CJ3S0D	VBN2CJ3P0X	VBN2CJ3S0X
	15.3		VBN2CL3P0C	VBN2CL3S0C	VBN2CL3P0D	VBN2CL3S0D	VBN2CL3P0X	VBN2CL3S0X
	26		VBN2CM3P0C	VBN2CM3S0C	VBN2CM3P0D	VBN2CM3S0D	VBN2CM3P0X	VBN2CM3S0X
	44*		VBN2CN3P0C	VBN2CN3S0C	VBN2CN3P0D	VBN2CN3S0D	VBN2CN3P0X	VBN2CN3S0X
	54*		VBN2CP3P0C	VBN2CP3S0C	VBN2CP3P0D	VBN2CP3S0D	VBN2CP3P0X	VBN2CP3S0X
1-1/4"	4.4		VBN2DH3P0C	VBN2DH3S0C	VBN2DH3P0D	VBN2DH3S0D	VBN2DH3P0X	VBN2DH3S0X
	8.3		VBN2DJ3P0C	VBN2DJ3S0C	VBN2DJ3P0D	VBN2DJ3S0D	VBN2DJ3P0X	VBN2DJ3S0X
	14.9		VBN2DK3P0C	VBN2DK3S0C	VBN2DK3P0D	VBN2DK3S0D	VBN2DK3P0X	VBN2DK3S0X
	25		VBN2DL3P0C	VBN2DL3S0C	VBN2DL3P0D	VBN2DL3S0D	VBN2DL3P0X	VBN2DL3S0X
	37		VBN2DM3P0C	VBN2DM3S0C	VBN2DM3P0D	VBN2DM3S0D	VBN2DM3P0X	VBN2DM3S0X
	41*		VBN2DN3P0C	VBN2DN3S0C	VBN2DN3P0D	VBN2DN3S0D	VBN2DN3P0X	VBN2DN3S0X
	102*		VBN2DS3P0C	VBN2DS3S0C	VBN2DS3P0D	VBN2DS3S0D	VBN2DS3P0X	VBN2DS3S0X
1-1/2"	23		VBN2EL3P0C	VBN2EL3S0C	VBN2EL3P0D	VBN2EL3S0D	VBN2EL3P0X	VBN2EL3S0X
	30		VBN2EM3P0C	VBN2EM3S0C	VBN2EM3P0D	VBN2EM3S0D	VBN2EM3P0X	VBN2EM3S0X
	41		VBN2EN3P0C	VBN2EN3S0C	VBN2EN3P0D	VBN2EN3S0D	VBN2EN3P0X	VBN2EN3S0X
	74*		VBN2ER3P0C	VBN2ER3S0C	VBN2ER3P0D	VBN2ER3S0D	VBN2ER3P0X	VBN2ER3S0X
	172*		VBN2E13P0C	VBN2E13S0C	VBN2E13P0D	VBN2E13S0D	VBN2E13P0X	VBN2E13S0X
2"	42		VBN2FN3P0C	VBN2FN3S0C	VBN2FN3P0D	VBN2FN3S0D	VBN2FN3P0X	VBN2FN3S0X
	57		VBN2FP3P0C	VBN2FP3S0C	VBN2FP3P0D	VBN2FP3S0D	VBN2FP3P0X	VBN2FP3S0X
	71		VBN2FR3P0C	VBN2FR3S0C	VBN2FR3P0D	VBN2FR3S0D	VBN2FR3P0X	VBN2FR3S0X
	100		VBN2FS3P0C	VBN2FS3S0C	VBN2FS3P0D	VBN2FS3S0D	VBN2FS3P0X	VBN2FS3S0X
	108*		VBN2FT3P0C	VBN2FT3S0C	VBN2FT3P0D	VBN2FT3S0D	VBN2FT3P0X	VBN2FT3S0X
	210		VBN2F13P0C	VBN2F13S0C	VBN2F13P0D	VBN2F13S0D	VBN2F13P0X	VBN2F13S0X
	266*		VBN2F23P0C	VBN2F23S0C	VBN2F23P0D	VBN2F23S0D	VBN2F23P0X	VBN2F23S0X
2-1/2"	45		VBN2GN3P0C	VBN2GN3S0C	VBN2GN3P0D	VBN2GN3S0D	VBN2GN3P0X	VBN2GN3S0X
	55		VBN2GP3P0C	VBN2GP3S0C	VBN2GP3P0D	VBN2GP3S0D	VBN2GP3P0X	VBN2GP3S0X
	72		VBN2GR3P0C	VBN2GR3S0C	VBN2GR3P0D	VBN2GR3S0D	VBN2GR3P0X	VBN2GR3S0X
	101		VBN2GS3P0C	VBN2GS3S0C	VBN2GS3P0D	VBN2GS3S0D	VBN2GS3P0X	VBN2GS3S0X
	162		VBN2GU3P0C	VBN2GU3S0C	VBN2GU3P0D	VBN2GU3S0D	VBN2GU3P0X	VBN2GU3S0X
	202*		VBN2G13P0C	VBN2G13S0C	VBN2G13P0D	VBN2G13S0D	VBN2G13P0X	VBN2G13S0X
3"	49		VBN2HN3P0C	VBN2HN3S0C	VBN2HN3P0D	VBN2HN3S0D	VBN2HN3P0X	VBN2HN3S0X
	63		VBN2HP3P0C	VBN2HP3S0C	VBN2HP3P0D	VBN2HP3S0D	VBN2HP3P0X	VBN2HP3S0X
	82		VBN2HR3P0C	VBN2HR3S0C	VBN2HR3P0D	VBN2HR3S0D	VBN2HR3P0X	VBN2HR3S0X
	124		VBN2HT3P0C	VBN2HT3S0C	VBN2HT3P0D	VBN2HT3S0D	VBN2HT3P0X	VBN2HT3S0X
	145*		VBN2HU3P0C	VBN2HU3S0C	VBN2HU3P0D	VBN2HU3S0D	VBN2HU3P0X	VBN2HU3S0X

2-Way

* Full port ball. No flow characterizing insert.

Control Ball Valves ½- 3"

2-Way NPT NEMA 3R

Common Features

- Max static pressure 360 psi (250°F)
- Medium: Water/glycol solutions up to 50%.
- Temperature range: -22 to +250°F
- Spring return actuators field-configurable for A-port normally open or normally closed fail-safe.
- Removable handle for manual operation
- ANSI class IV leakage (0.01% of Cv)

VBN2 (Two-way):

- Equal % flow insert. (Largest Cv rating in each valve size is full port, as noted.)
- Nickel-chrome plated brass or 316 stainless steel ball and stem

With optional NEMA 3R actuator enclosure

2-Way

Actuator Features		Non-fail Safe			
Actuator O.S. Number		MN6105A1011	MN6105A1011	MN7505A2001	MN7505A2001
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	5 VA	5 VA	5 VA	5 VA
Actuator Torque	(lb.-in.)	44	44	44	44
Control	(0)2-10 Vdc			•	•
	4-20 mA (external 500 Ohm Resistor)			•	•
	Floating	•	•	•	•
	Two-Position SPDT	•	•	•	•
	Two-Position SPST			•	•
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)		Closed	Closed	Closed	Closed
Actuator Stroke	(degrees)	95° ± 3°	95° ± 3°	95° ± 3°	95° ± 3°
Timing	(drive/spring return, seconds)	95	95	95	95
Aux Switch	2 x SPDT Add-on	SSW2-1M	SSW2-1M	SSW2-1M	SSW2-1M
Feedback	2-10 Vdc Built In			•	•
Valve Features	Trim	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel

Valve Size (inches)	Cv	Close-off Pressure (psid)	Valve O.S. Number			
1/2"	0.38	130	VBN2AB3PRA	VBN2AB3SRA	VBN2AB3PRB	VBN2AB3SRB
	0.68		VBN2AD3PRA	VBN2AD3SRA	VBN2AD3PRB	VBN2AD3SRB
	1.3		VBN2AE3PRA	VBN2AE3SRA	VBN2AE3PRB	VBN2AE3SRB
	2		VBN2AF3PRA	VBN2AF3SRA	VBN2AF3PRB	VBN2AF3SRB
	2.6		VBN2AG3PRA	VBN2AG3SRA	VBN2AG3PRB	VBN2AG3SRB
	4.7		VBN2AH3PRA	VBN2AH3SRA	VBN2AH3PRB	VBN2AH3SRB
	8		VBN2AJ3PRA	VBN2AJ3SRA	VBN2AJ3PRB	VBN2AJ3SRB
	11.7*		VBN2AK3PRA	VBN2AK3SRA	VBN2AK3PRB	VBN2AK3SRB
3/4"	0.31		VBN2BB3PRA	VBN2BB3SRA	VBN2BB3PRB	VBN2BB3SRB
	0.63		VBN2BD3PRA	VBN2BD3SRA	VBN2BD3PRB	VBN2BD3SRB
	1.2		VBN2BE3PRA	VBN2BE3SRA	VBN2BE3PRB	VBN2BE3SRB
	2.5		VBN2BG3PRA	VBN2BG3SRA	VBN2BG3PRB	VBN2BG3SRB
	4.3		VBN2BH3PRA	VBN2BH3SRA	VBN2BH3PRB	VBN2BH3SRB
	7.4		VBN2BJ3PRA	VBN2BJ3SRA	VBN2BJ3PRB	VBN2BJ3SRB
	10.1		VBN2BK3PRA	VBN2BK3SRA	VBN2BK3PRB	VBN2BK3SRB
	14.7*		VBN2BL3PRA	VBN2BL3SRA	VBN2BL3PRB	VBN2BL3SRB
	29*		VBN2BM3PRA	VBN2BM3SRA	VBN2BM3PRB	VBN2BM3SRB
1"	4.4	100	VBN2CH3PRA	VBN2CH3SRA	VBN2CH3PRB	VBN2CH3SRB
	9		VBN2CJ3PRA	VBN2CJ3SRA	VBN2CJ3PRB	VBN2CJ3SRB
	15.3		VBN2CL3PRA	VBN2CL3SRA	VBN2CL3PRB	VBN2CL3SRB
	26		VBN2CM3PRA	VBN2CM3SRA	VBN2CM3PRB	VBN2CM3SRB
	44*		VBN2CN3PRA	VBN2CN3SRA	VBN2CN3PRB	VBN2CN3SRB
	54*		VBN2CP3PRA	VBN2CP3SRA	VBN2CP3PRB	VBN2CP3SRB
1-1/4"	4.4		VBN2DH3PRA	VBN2DH3SRA	VBN2DH3PRB	VBN2DH3SRB
	8.3		VBN2DJ3PRA	VBN2DJ3SRA	VBN2DJ3PRB	VBN2DJ3SRB
	14.9		VBN2DK3PRA	VBN2DK3SRA	VBN2DK3PRB	VBN2DK3SRB
	25		VBN2DL3PRA	VBN2DL3SRA	VBN2DL3PRB	VBN2DL3SRB
	37		VBN2DM3PRA	VBN2DM3SRA	VBN2DM3PRB	VBN2DM3SRB
	41*		VBN2DN3PRA	VBN2DN3SRA	VBN2DN3PRB	VBN2DN3SRB
	102*		VBN2DS3PRA	VBN2DS3SRA	VBN2DS3PRB	VBN2DS3SRB
1-1/2"	23		VBN2EL3PRA	VBN2EL3SRA	VBN2EL3PRB	VBN2EL3SRB
	30		VBN2EM3PRA	VBN2EM3SRA	VBN2EM3PRB	VBN2EM3SRB
	41		VBN2EN3PRA	VBN2EN3SRA	VBN2EN3PRB	VBN2EN3SRB
	74*		VBN2ER3PRA	VBN2ER3SRA	VBN2ER3PRB	VBN2ER3SRB
	172*		VBN2E13PRA	VBN2E13SRA	VBN2E13PRB	VBN2E13SRB
2"	42		VBN2FN3PRA	VBN2FN3SRA	VBN2FN3PRB	VBN2FN3SRB
	57		VBN2FP3PRA	VBN2FP3SRA	VBN2FP3PRB	VBN2FP3SRB
	71		VBN2FR3PRA	VBN2FR3SRA	VBN2FR3PRB	VBN2FR3SRB
	100		VBN2FS3PRA	VBN2FS3SRA	VBN2FS3PRB	VBN2FS3SRB
	108*		VBN2FT3PRA	VBN2FT3SRA	VBN2FT3PRB	VBN2FT3SRB
	210		VBN2F13PRA	VBN2F13SRA	VBN2F13PRB	VBN2F13SRB
	266*		VBN2F23PRA	VBN2F23SRA	VBN2F23PRB	VBN2F23SRB
2-1/2"	45		VBN2GN3PRA	VBN2GN3SRA	VBN2GN3PRB	VBN2GN3SRB
	55		VBN2GP3PRA	VBN2GP3SRA	VBN2GP3PRB	VBN2GP3SRB
	72		VBN2GR3PRA	VBN2GR3SRA	VBN2GR3PRB	VBN2GR3SRB
	101		VBN2GS3PRA	VBN2GS3SRA	VBN2GS3PRB	VBN2GS3SRB
	162		VBN2GU3PRA	VBN2GU3SRA	VBN2GU3PRB	VBN2GU3SRB
	202*		VBN2G13PRA	VBN2G13SRA	VBN2G13PRB	VBN2G13SRB
3"	49		VBN2HN3PRA	VBN2HN3SRA	VBN2HN3PRB	VBN2HN3SRB
	63		VBN2HP3PRA	VBN2HP3SRA	VBN2HP3PRB	VBN2HP3SRB
	82		VBN2HR3PRA	VBN2HR3SRA	VBN2HR3PRB	VBN2HR3SRB
	124		VBN2HT3PRA	VBN2HT3SRA	VBN2HT3PRB	VBN2HT3SRB
	145*		VBN2HU3PRA	VBN2HU3SRA	VBN2HU3PRB	VBN2HU3SRB

* Full port ball. No flow characterizing insert.

2-Way NPT NEMA 3R

Actuator Features		Fail Safe					
Actuator O.S. Number		MS8105A1030	MS8105A1030	MS7505A2030	MS7505A2030	Valve Only	Valve Only
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac		
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz		
	Power	8VA	8VA	7.5 VA	7.5 VA		
Actuator Torque	(lb.-in.)	44	44	44	44		
Control	(0)2-10 Vdc			•	•		
	4-20 mA (external 500 Ohm Resistor)			•	•		
	Floating			•	•		
	Two-Position SPDT			•	•		
	Two-Position SPST	•	•	•	•		
Fail Safe Action		Closed*	Closed*	Closed*	Closed*		
Normal Position (no signal)		Closed	Closed	Closed	Closed		
Actuator Stroke	(degrees)	95° ± 3°	95° ± 3°	95° ± 3°	95° ± 3°		
Timing	(drive/spring return, seconds)	45/25	45/25	90/25	90/25		
Aux Switch	2 x SPDT Add-on						
Feedback	2-10 Vdc Built In			•	•		
Valve Features	Trim	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel	Nickel-Plated Brass	Stainless Steel

Valve Size (inches)	Cv	Close-off Pressure (psid)	Valve O.S. Number					
1/2"	0.38	130	VBN2AB3PRC	VBN2AB3SRC	VBN2AB3PRD	VBN2AB3SRD	—	—
	0.68		VBN2AD3PRC	VBN2AD3SRC	VBN2AD3PRD	VBN2AD3SRD	—	—
	1.3		VBN2AE3PRC	VBN2AE3SRC	VBN2AE3PRD	VBN2AE3SRD	—	—
	2		VBN2AF3PRC	VBN2AF3SRC	VBN2AF3PRD	VBN2AF3SRD	—	—
	2.6		VBN2AG3PRC	VBN2AG3SRC	VBN2AG3PRD	VBN2AG3SRD	—	—
	4.7		VBN2AH3PRC	VBN2AH3SRC	VBN2AH3PRD	VBN2AH3SRD	—	—
	8		VBN2AJ3PRC	VBN2AJ3SRC	VBN2AJ3PRD	VBN2AJ3SRD	—	—
	11.7*		VBN2AK3PRC	VBN2AK3SRC	VBN2AK3PRD	VBN2AK3SRD	—	—
3/4"	0.31		VBN2BB3PRC	VBN2BB3SRC	VBN2BB3PRD	VBN2BB3SRD	—	—
	0.63		VBN2BD3PRC	VBN2BD3SRC	VBN2BD3PRD	VBN2BD3SRD	—	—
	1.2		VBN2BE3PRC	VBN2BE3SRC	VBN2BE3PRD	VBN2BE3SRD	—	—
	2.5		VBN2BG3PRC	VBN2BG3SRC	VBN2BG3PRD	VBN2BG3SRD	—	—
	4.3		VBN2BH3PRC	VBN2BH3SRC	VBN2BH3PRD	VBN2BH3SRD	—	—
	7.4		VBN2BJ3PRC	VBN2BJ3SRC	VBN2BJ3PRD	VBN2BJ3SRD	—	—
	10.1		VBN2BK3PRC	VBN2BK3SRC	VBN2BK3PRD	VBN2BK3SRD	—	—
	14.7*		VBN2BL3PRC	VBN2BL3SRC	VBN2BL3PRD	VBN2BL3SRD	—	—
	29*		VBN2BM3PRC	VBN2BM3SRC	VBN2BM3PRD	VBN2BM3SRD	—	—
1"	4.4	100	VBN2CH3PRC	VBN2CH3SRC	VBN2CH3PRD	VBN2CH3SRD	—	—
	9		VBN2CJ3PRC	VBN2CJ3SRC	VBN2CJ3PRD	VBN2CJ3SRD	—	—
	15.3		VBN2CL3PRC	VBN2CL3SRC	VBN2CL3PRD	VBN2CL3SRD	—	—
	26		VBN2CM3PRC	VBN2CM3SRC	VBN2CM3PRD	VBN2CM3SRD	—	—
	44*		VBN2CN3PRC	VBN2CN3SRC	VBN2CN3PRD	VBN2CN3SRD	—	—
	54*		VBN2CP3PRC	VBN2CP3SRC	VBN2CP3PRD	VBN2CP3SRD	—	—
1-1/4"	4.4		VBN2DH3PRC	VBN2DH3SRC	VBN2DH3PRD	VBN2DH3SRD	—	—
	8.3		VBN2DJ3PRC	VBN2DJ3SRC	VBN2DJ3PRD	VBN2DJ3SRD	—	—
	14.9		VBN2DK3PRC	VBN2DK3SRC	VBN2DK3PRD	VBN2DK3SRD	—	—
	25		VBN2DL3PRC	VBN2DL3SRC	VBN2DL3PRD	VBN2DL3SRD	—	—
	37		VBN2DM3PRC	VBN2DM3SRC	VBN2DM3PRD	VBN2DM3SRD	—	—
	41*		VBN2DN3PRC	VBN2DN3SRC	VBN2DN3PRD	VBN2DN3SRD	—	—
	102*		VBN2DS3PRC	VBN2DS3SRC	VBN2DS3PRD	VBN2DS3SRD	—	—
1-1/2"	23		VBN2EL3PRC	VBN2EL3SRC	VBN2EL3PRD	VBN2EL3SRD	—	—
	30		VBN2EM3PRC	VBN2EM3SRC	VBN2EM3PRD	VBN2EM3SRD	—	—
	41		VBN2EN3PRC	VBN2EN3SRC	VBN2EN3PRD	VBN2EN3SRD	—	—
	74*		VBN2ER3PRC	VBN2ER3SRC	VBN2ER3PRD	VBN2ER3SRD	—	—
	172*		VBN2E13PRC	VBN2E13SRC	VBN2E13PRD	VBN2E13SRD	—	—
2"	42		VBN2FN3PRC	VBN2FN3SRC	VBN2FN3PRD	VBN2FN3SRD	—	—
	57		VBN2FP3PRC	VBN2FP3SRC	VBN2FP3PRD	VBN2FP3SRD	—	—
	71		VBN2FR3PRC	VBN2FR3SRC	VBN2FR3PRD	VBN2FR3SRD	—	—
	100		VBN2FS3PRC	VBN2FS3SRC	VBN2FS3PRD	VBN2FS3SRD	—	—
	108*		VBN2FT3PRC	VBN2FT3SRC	VBN2FT3PRD	VBN2FT3SRD	—	—
	210		VBN2F13PRC	VBN2F13SRC	VBN2F13PRD	VBN2F13SRD	—	—
	266*		VBN2F23PRC	VBN2F23SRC	VBN2F23PRD	VBN2F23SRD	—	—
2-1/2"	45		VBN2GN3PRC	VBN2GN3SRC	VBN2GN3PRD	VBN2GN3SRD	—	—
	55		VBN2GP3PRC	VBN2GP3SRC	VBN2GP3PRD	VBN2GP3SRD	—	—
	72		VBN2GR3PRC	VBN2GR3SRC	VBN2GR3PRD	VBN2GR3SRD	—	—
	101		VBN2GS3PRC	VBN2GS3SRC	VBN2GS3PRD	VBN2GS3SRD	—	—
	162		VBN2GU3PRC	VBN2GU3SRC	VBN2GU3PRD	VBN2GU3SRD	—	—
	202*		VBN2G13PRC	VBN2G13SRC	VBN2G13PRD	VBN2G13SRD	—	—
3"	49		VBN2HN3PRC	VBN2HN3SRC	VBN2HN3PRD	VBN2HN3SRD	—	—
	63		VBN2HP3PRC	VBN2HP3SRC	VBN2HP3PRD	VBN2HP3SRD	—	—
	82		VBN2HR3PRC	VBN2HR3SRC	VBN2HR3PRD	VBN2HR3SRD	—	—
	124		VBN2HT3PRC	VBN2HT3SRC	VBN2HT3PRD	VBN2HT3SRD	—	—
	145*		VBN2HU3PRC	VBN2HU3SRC	VBN2HU3PRD	VBN2HU3SRD	—	—

2-Way

* Full port ball. No flow characterizing insert.

Control Ball Valves ½- 2½"

3-Way NPT

Common Features

VBN3 (Three-way):

- Equal % A to AB, linear B to AB
- B-port Cv reduction of 20% approximates constant total loop flow
- Nickel-chrome plated brass ball and stem
- Convert to 2-way by plugging B port (plug not provided)
- Spring return actuators field-configurable for A-port normally open or normally closed fail-safe.
- Mixing or diverting control with the same valve
- ANSI Class IV (0.01%) seat leakage on both A and B ports
- Available with NEMA 3R actuator enclosure

Actuator Features		Non-fail Safe			Fail Safe		
Actuator O.S. Number		ML6161A2009	MN6105A1011	MN7505A2001	MS8105A1030	MS7505A2030	Valve Only
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	
	Power	1.8 VA	5 VA	5 VA	8 VA	7.5 VA	
Actuator Torque	(lb.-in.)	35	44	44	44	44	
Control	(0)2-10 Vdc			•		•	
	4-20 mA (external 500 Ohm Resistor)			•		•	
	Floating	•	•	•		•	
	Two-Position SPDT	•	•	•		•	
	Two-Position SPST			•	•	•	
Fail Safe Action	(field configurable)	Stay in Place	Stay in Place	Stay in Place	A-AB Closed	A-AB Closed	
Normal Position (no signal)	(field configurable)	Closed	Closed	Closed	A-AB Closed	A-AB Closed	
Actuator Stroke	(degrees)	90°	95° ± 3°	95° ± 3°	95° ± 3°	95° ± 3°	
Timing	(drive/spring return, seconds)	90	95	95	45/25	90/25	
Aux Switch	2 x SPDT Add-on	201052B	SSW2-1M	SSW2-1M			
Feedback	2-10 Vdc Built In			•		•	
Valve Features	Trim	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass

3-Way

Valve Size (inches)	Cv	Close-off Pressure (psid)	Valve O.S. Number					
1/2"	0.33	50	VBN3AB3P0F	VBN3AB3P0A	VBN3AB3P0B	VBN3AB3P0C	VBN3AB3P0D	VBN3AB3P0X
	0.59		VBN3AC3P0F	VBN3AC3P0A	VBN3AC3P0B	VBN3AC3P0C	VBN3AC3P0D	VBN3AC3P0X
	1		VBN3AE3P0F	VBN3AE3P0A	VBN3AE3P0B	VBN3AE3P0C	VBN3AE3P0D	VBN3AE3P0X
	2.4		VBN3AF3P0F	VBN3AF3P0A	VBN3AF3P0B	VBN3AF3P0C	VBN3AF3P0D	VBN3AF3P0X
	4.3		VBN3AH3P0F	VBN3AH3P0A	VBN3AH3P0B	VBN3AH3P0C	VBN3AH3P0D	VBN3AH3P0X
	8*		VBN3AJ3P0F	VBN3AJ3P0A	VBN3AJ3P0B	VBN3AJ3P0C	VBN3AJ3P0D	VBN3AJ3P0X
3/4"	0.4		VBN3BC3P0F	VBN3BC3P0A	VBN3BC3P0B	VBN3BC3P0C	VBN3BC3P0D	VBN3BC3P0X
	0.66		VBN3BD3P0F	VBN3BD3P0A	VBN3BD3P0B	VBN3BD3P0C	VBN3BD3P0D	VBN3BD3P0X
	1.3		VBN3BE3P0F	VBN3BE3P0A	VBN3BE3P0B	VBN3BE3P0C	VBN3BE3P0D	VBN3BE3P0X
	2.4		VBN3BF3P0F	VBN3BF3P0A	VBN3BF3P0B	VBN3BF3P0C	VBN3BF3P0D	VBN3BF3P0X
	3.8		VBN3BG3P0F	VBN3BG3P0A	VBN3BG3P0B	VBN3BG3P0C	VBN3BG3P0D	VBN3BG3P0X
	7		VBN3BJ3P0F	VBN3BJ3P0A	VBN3BJ3P0B	VBN3BJ3P0C	VBN3BJ3P0D	VBN3BJ3P0X
	11*		VBN3BK3P0F	VBN3BK3P0A	VBN3BK3P0B	VBN3BK3P0C	VBN3BK3P0D	VBN3BK3P0X
1"	0.4			VBN3CC3P0A	VBN3CC3P0B	VBN3CC3P0C	VBN3CC3P0D	VBN3CC3P0X
	0.65			VBN3CD3P0A	VBN3CD3P0B	VBN3CD3P0C	VBN3CD3P0D	VBN3CD3P0X
	1.3			VBN3CE3P0A	VBN3CE3P0B	VBN3CE3P0C	VBN3CE3P0D	VBN3CE3P0X
	2.3			VBN3CF3P0A	VBN3CF3P0B	VBN3CF3P0C	VBN3CF3P0D	VBN3CF3P0X
	3.5			VBN3CG3P0A	VBN3CG3P0B	VBN3CG3P0C	VBN3CG3P0D	VBN3CG3P0X
	4.5			VBN3CH3P0A	VBN3CH3P0B	VBN3CH3P0C	VBN3CH3P0D	VBN3CH3P0X
	8.6			VBN3CJ3P0A	VBN3CJ3P0B	VBN3CJ3P0C	VBN3CJ3P0D	VBN3CJ3P0X
	14.9			VBN3CK3P0A	VBN3CK3P0B	VBN3CK3P0C	VBN3CK3P0D	VBN3CK3P0X
	22*			VBN3CL3P0A	VBN3CL3P0B	VBN3CL3P0C	VBN3CL3P0D	VBN3CL3P0X
	31*			VBN3CM3P0A	VBN3CM3P0B	VBN3CM3P0C	VBN3CM3P0D	VBN3CM3P0X
1-1/4"	4.1	40		VBN3DH3P0A	VBN3DH3P0B	VBN3DH3P0C	VBN3DH3P0D	VBN3DH3P0X
	8.7			VBN3DJ3P0A	VBN3DJ3P0B	VBN3DJ3P0C	VBN3DJ3P0D	VBN3DJ3P0X
	12.7			VBN3DK3P0A	VBN3DK3P0B	VBN3DK3P0C	VBN3DK3P0D	VBN3DK3P0X
	19.4*			VBN3DL3P0A	VBN3DL3P0B	VBN3DL3P0C	VBN3DL3P0D	VBN3DL3P0X
	27			VBN3DM3P0A	VBN3DM3P0B	VBN3DM3P0C	VBN3DM3P0D	VBN3DM3P0X
	34*			VBN3DN3P0A	VBN3DN3P0B	VBN3DN3P0C	VBN3DN3P0D	VBN3DN3P0X
1-1/2"	4			VBN3EH3P0A	VBN3EH3P0B	VBN3EH3P0C	VBN3EH3P0D	VBN3EH3P0X
	8.3			VBN3EJ3P0A	VBN3EJ3P0B	VBN3EJ3P0C	VBN3EJ3P0D	VBN3EJ3P0X
	13.4			VBN3EK3P0A	VBN3EK3P0B	VBN3EK3P0C	VBN3EK3P0D	VBN3EK3P0X
	24			VBN3EL3P0A	VBN3EL3P0B	VBN3EL3P0C	VBN3EL3P0D	VBN3EL3P0X
	32*			VBN3EM3P0A	VBN3EM3P0B	VBN3EM3P0C	VBN3EM3P0D	VBN3EM3P0X
	61*			VBN3EP3P0A	VBN3EP3P0B	VBN3EP3P0C	VBN3EP3P0D	VBN3EP3P0X
2"	24			VBN3FL3P0A	VBN3FL3P0B	VBN3FL3P0C	VBN3FL3P0D	VBN3FL3P0X
	38			VBN3FN3P0A	VBN3FN3P0B	VBN3FN3P0C	VBN3FN3P0D	VBN3FN3P0X
	57*			VBN3FP3P0A	VBN3FP3P0B	VBN3FP3P0C	VBN3FP3P0D	VBN3FP3P0X
	83			VBN3FR3P0A	VBN3FR3P0B	VBN3FR3P0C	VBN3FR3P0D	VBN3FR3P0X
	109*			VBN3FT3P0A	VBN3FT3P0B	VBN3FT3P0C	VBN3FT3P0D	VBN3FT3P0X
2-1/2"	38			VBN3GN3P0A	VBN3GN3P0B	VBN3GN3P0C	VBN3GN3P0D	VBN3GN3P0X
	74			VBN3GR3P0A	VBN3GR3P0B	VBN3GR3P0C	VBN3GR3P0D	VBN3GR3P0X
	100*			VBN3GS3P0A	VBN3GS3P0B	VBN3GS3P0C	VBN3GS3P0D	VBN3GS3P0X

* Full port ball. No flow characterizing insert.

3-Way NPT NEMA 3R

Actuator Features		Non-fail Safe		Fail Safe		
Actuator O.S. Number		MN6105A1011	MN7505A2001	MS8105A1030	MS7505A2030	Valve Only
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	
	Power	5 VA	5 VA	8 VA	7.5 VA	
Actuator Torque	(lb.-in.)	44	44	44	44	
Control	(0)2-10 Vdc		•		•	
	4-20 mA (external 500 Ohm Resistor)		•		•	
	Floating	•	•		•	
	Two-Position SPDT	•	•		•	
	Two-Position SPST		•	•	•	
Fail Safe Action	(field configurable)	Stay in Place	Stay in Place	A-AB Closed	A-AB Closed	
Normal Position (no signal)	(field configurable)	Closed	Closed	A-AB Closed	A-AB Closed	
Actuator Stroke	(degrees)	95° ± 3°	95° ± 3°	95° ± 3°	95° ± 3°	
Timing	(drive/spring return, seconds)	95	95	45/25	90/25	
Aux Switch	2 x SPDT Add-on	SSW2-1M	SSW2-1M			
Feedback	2-10 Vdc Built In		•		•	
Valve Features	Trim	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass	Nickel-Plated Brass

Valve Size (inches)	Cv	Close-off Pressure (psid)	Valve O.S. Number				
1/2"	0.33	50	VBN3AB3PRA	VBN3AB3PRB	VBN3AB3PRC	VBN3AB3PRD	—
	0.59		VBN3AC3PRA	VBN3AC3PRB	VBN3AC3PRC	VBN3AC3PRD	—
	1		VBN3AE3PRA	VBN3AE3PRB	VBN3AE3PRC	VBN3AE3PRD	—
	2.4		VBN3AF3PRA	VBN3AF3PRB	VBN3AF3PRC	VBN3AF3PRD	—
	4.3		VBN3AH3PRA	VBN3AH3PRB	VBN3AH3PRC	VBN3AH3PRD	—
	8*		VBN3AJ3PRA	VBN3AJ3PRB	VBN3AJ3PRC	VBN3AJ3PRD	—
3/4"	0.4		VBN3BC3PRA	VBN3BC3PRB	VBN3BC3PRC	VBN3BC3PRD	—
	0.66		VBN3BD3PRA	VBN3BD3PRB	VBN3BD3PRC	VBN3BD3PRD	—
	1.3		VBN3BE3PRA	VBN3BE3PRB	VBN3BE3PRC	VBN3BE3PRD	—
	2.4		VBN3BF3PRA	VBN3BF3PRB	VBN3BF3PRC	VBN3BF3PRD	—
	3.8		VBN3BG3PRA	VBN3BG3PRB	VBN3BG3PRC	VBN3BG3PRD	—
	7		VBN3BJ3PRA	VBN3BJ3PRB	VBN3BJ3PRC	VBN3BJ3PRD	—
	11*		VBN3BK3PRA	VBN3BK3PRB	VBN3BK3PRC	VBN3BK3PRD	—
1"	0.4		VBN3CC3PRA	VBN3CC3PRB	VBN3CC3PRC	VBN3CC3PRD	—
	0.65		VBN3CD3PRA	VBN3CD3PRB	VBN3CD3PRC	VBN3CD3PRD	—
	1.3		VBN3CE3PRA	VBN3CE3PRB	VBN3CE3PRC	VBN3CE3PRD	—
	2.3		VBN3CF3PRA	VBN3CF3PRB	VBN3CF3PRC	VBN3CF3PRD	—
	3.5		VBN3CG3PRA	VBN3CG3PRB	VBN3CG3PRC	VBN3CG3PRD	—
	4.5		VBN3CH3PRA	VBN3CH3PRB	VBN3CH3PRC	VBN3CH3PRD	—
	8.6		VBN3CJ3PRA	VBN3CJ3PRB	VBN3CJ3PRC	VBN3CJ3PRD	—
	14.9		VBN3CK3PRA	VBN3CK3PRB	VBN3CK3PRC	VBN3CK3PRD	—
	22*		VBN3CL3PRA	VBN3CL3PRB	VBN3CL3PRC	VBN3CL3PRD	—
	31*		VBN3CM3PRA	VBN3CM3PRB	VBN3CM3PRC	VBN3CM3PRD	—
1-1/4"	4.1	40	VBN3DH3PRA	VBN3DH3PRB	VBN3DH3PRC	VBN3DH3PRD	—
	8.7		VBN3DJ3PRA	VBN3DJ3PRB	VBN3DJ3PRC	VBN3DJ3PRD	—
	12.7		VBN3DK3PRA	VBN3DK3PRB	VBN3DK3PRC	VBN3DK3PRD	—
	19.4*		VBN3DL3PRA	VBN3DL3PRB	VBN3DL3PRC	VBN3DL3PRD	—
	27		VBN3DM3PRA	VBN3DM3PRB	VBN3DM3PRC	VBN3DM3PRD	—
	34*		VBN3DN3PRA	VBN3DN3PRB	VBN3DN3PRC	VBN3DN3PRD	—
1-1/2"	4		VBN3EH3PRA	VBN3EH3PRB	VBN3EH3PRC	VBN3EH3PRD	—
	8.3		VBN3EJ3PRA	VBN3EJ3PRB	VBN3EJ3PRC	VBN3EJ3PRD	—
	13.4		VBN3EK3PRA	VBN3EK3PRB	VBN3EK3PRC	VBN3EK3PRD	—
	24		VBN3EL3PRA	VBN3EL3PRB	VBN3EL3PRC	VBN3EL3PRD	—
	32*		VBN3EM3PRA	VBN3EM3PRB	VBN3EM3PRC	VBN3EM3PRD	—
	61*		VBN3EP3PRA	VBN3EP3PRB	VBN3EP3PRC	VBN3EP3PRD	—
2"	24		VBN3FL3PRA	VBN3FL3PRB	VBN3FL3PRC	VBN3FL3PRD	—
	38		VBN3FN3PRA	VBN3FN3PRB	VBN3FN3PRC	VBN3FN3PRD	—
	57*		VBN3FP3PRA	VBN3FP3PRB	VBN3FP3PRC	VBN3FP3PRD	—
	83		VBN3FR3PRA	VBN3FR3PRB	VBN3FR3PRC	VBN3FR3PRD	—
	109*		VBN3FT3PRA	VBN3FT3PRB	VBN3FT3PRC	VBN3FT3PRD	—
2-1/2"	38		VBN3GN3PRA	VBN3GN3PRB	VBN3GN3PRC	VBN3GN3PRD	—
	74		VBN3GR3PRA	VBN3GR3PRB	VBN3GR3PRC	VBN3GR3PRD	—
	100*		VBN3GS3PRA	VBN3GS3PRB	VBN3GS3PRC	VBN3GS3PRD	—

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* Full port ball. No flow characterizing insert.

VALVE SELECTION

Flanged Control Ball Valves 4"-6"

2-Way Flanged NEMA 2+3R

Common Features

- Maximum static pressure 240 psi (-22°F to 250°F)
- Spring return actuators field-configurable for A-port normally open or normally closed fail-safe
- Use globe valves for steam ratings
- Medium: Water/glycol solutions up to 50%
- ANSI class 125 flanged connections
- ANSI class IV leakage (0.01% of Cv)
- Valve ball and stem 316 stainless steel
- Equal percentage flow (laser-milled stainless steel ball)
- Cast iron body construction -- not for use with open systems such as cooling towers

2-Way

Actuator Features		Non-fail Safe		Fail Safe		Valve Only
Actuator O.S. Number		MN6110A1003 4 to 5 in. MN6134A1003 6 in.	MN7510A2001 4 to 5 in. MN7234A2008 6 in.	MS8110A1008 4 to 5 in. MS8120A1007 6 in.	MS7510A2008 4 to 5 in. MS7520A2007 6 in.	Valve Only
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	
	Power	5 / 9 VA	5 / 9 VA	30 / 40 VA	14 / 16 VA	
Actuator Torque	(lb.-in.)	88/300	88/300	88/175	88/175	
Control	(0)2-10 Vdc		•		•	
	4-20 mA (external 500 Ohm Resistor)		•		•	
	Floating	•	•		•	
	Two-Position SPDT	•	•		•	
	Two-Position SPST	•	•	•	•	
Fail Safe Action	(field configurable)	Stay in Place	Stay in Place	A-AB Closed	A-AB Closed	
Normal Position (no signal)	(field configurable)	Closed	Closed	Closed	Closed	
Actuator Stroke	(degrees)	95°	95°	95°	95°	
Timing	(drive/spring return, seconds)	95	95	45/20	90/20	
Aux Switch	2 x SPDT Add-on	SW2-US	SW2-US	SW2-US	SW2-US	
Feedback	2-10 Vdc Built In		•		•	
Valve Features	Trim	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel

Valve Size (inches)	Cv*	Close-off Pressure (psid)	Valve O.S. Number				
			NEMA 2 Actuator				
4"	91	70	VBF2JC1S0A	VBF2JC1S0B	VBF2JC1S0C	VBF2JC1S0D	VBF2JC1S0X
	118		VBF2JT1S0A	VBF2JT1S0B	VBF2JT1S0C	VBF2JT1S0D	VBF2JT1S0X
	152		VBF2JU1S0A	VBF2JU1S0B	VBF2JU1S0C	VBF2JU1S0D	VBF2JU1S0X
	197		VBF2J11S0A	VBF2J11S0B	VBF2J11S0C	VBF2J11S0D	VBF2J11S0X
	254		VBF2J21S0A	VBF2J21S0B	VBF2J21S0C	VBF2J21S0D	VBF2J21S0X
5"	144		VBF2KU1S0A	VBF2KU1S0B	VBF2KU1S0C	VBF2KU1S0D	VBF2KU1S0X
	185		VBF2K11S0A	VBF2K11S0B	VBF2K11S0C	VBF2K11S0D	VBF2K11S0X
	240		VBF2K21S0A	VBF2K21S0B	VBF2K21S0C	VBF2K21S0D	VBF2K21S0X
	309		VBF2K31S0A	VBF2K31S0B	VBF2K31S0C	VBF2K31S0D	VBF2K31S0X
	400		VBF2K41S0A	VBF2K41S0B	VBF2K41S0C	—	VBF2K41S0X
6"	208		VBF2L11S0A	VBF2L11S0B	VBF2L11S0C	VBF2L11S0D	VBF2L11S0X
	268		VBF2L21S0A	VBF2L21S0B	VBF2L21S0C	VBF2L21S0D	VBF2L21S0X
	346		VBF2L41S0A	VBF2L41S0B	VBF2L41S0C	—	VBF2L41S0X
	441		VBF2L51S0A	VBF2L51S0B	VBF2L51S0C	—	VBF2L51S0X
	577		VBF2L61S0A	VBF2L61S0B	VBF2L61S0C	—	VBF2L61S0X
	650		VBF2L71S0A	VBF2L71S0B	VBF2L71S0C	—	VBF2L71S0X
			NEMA 3R Actuator				
4"	91	70	VBF2JC1SRA	VBF2JC1SRB	VBF2JC1SRC	VBF2JC1SRD	—
	118		VBF2JT1SRA	VBF2JT1SRB	VBF2JT1SRC	VBF2JT1SRD	—
	152		VBF2JU1SRA	VBF2JU1SRB	VBF2JU1SRC	VBF2JU1SRD	—
	197		VBF2J11SRA	VBF2J11SRB	VBF2J11SRC	VBF2J11SRD	—
	254		VBF2J21SRA	VBF2J21SRB	VBF2J21SRC	VBF2J21SRD	—
5"	144		VBF2KU1SRA	VBF2KU1SRB	VBF2KU1SRC	VBF2KU1SRD	—
	185		VBF2K11SRA	VBF2K11SRB	VBF2K11SRC	VBF2K11SRD	—
	240		VBF2K21SRA	VBF2K21SRB	VBF2K21SRC	VBF2K21SRD	—
	309		VBF2K31SRA	VBF2K31SRB	VBF2K31SRC	VBF2K31SRD	—
	400		VBF2K41SRA	VBF2K41SRB	VBF2K41SRC	—	—
6"	208		VBF2L11SRA	VBF2L11SRB	VBF2L11SRC	VBF2L11SRD	—
	268		VBF2L21SRA	VBF2L21SRB	VBF2L21SRC	VBF2L21SRD	—
	346		VBF2L41SRA	VBF2L41SRB	VBF2L41SRC	—	—
	441		VBF2L51SRA	VBF2L51SRB	VBF2L51SRC	—	—
	577		VBF2L61SRA	VBF2L61SRB	VBF2L61SRC	—	—
	650		VBF2L71SRA	VBF2L71SRB	VBF2L71SRC	—	—

* Maximum flow 700 gpm

3-Way Flanged NEMA 2+3R

Common Features

- Mixing or diverting with the same 3-way valve
- Spring return actuators field-configurable for A-port normally open or normally closed fail-safe
- Globe valve A-B-AB flow pattern (side B port)
- Valve ball and stem 316 stainless steel
- Three-way: A-AB equal percentage, B-AB linear (80% of Cv on B-port) (laser-milled ball)
- ANSI Class IV (0.01%) seat leakage on A port, only
- Cast iron body construction -- not for use with open systems such as cooling towers

3-Way

Actuator Features		Non-fail Safe		Fail Safe		Valve Only
Actuator O.S. Number		MN6110A1003 4 to 5 in. MN6134A1003 6 in.	MN7510A2001 4 to 5 in. MN7234A2008 6 in.	MS8110A1008 4 to 5 in. MS8120A1007 6 in.	MS7510A2008 4 to 5 in. MS7520A2007 6 in.	Valve Only
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	
	Power	5 / 9 VA	5 / 9 VA	30 / 40 VA	14 / 16 VA	
Actuator Torque	(lb.-in.)	88/300	88/300	88/175	88/175	
Control	(0)2-10 Vdc		•		•	
	4-20 mA (external 500 Ohm Resistor)		•		•	
	Floating	•	•		•	
	Two-Position SPDT	•	•		•	
	Two-Position SPST	•	•	•	•	
Fail Safe Action	(field configurable)	Stay in Place	Stay in Place	A-AB Closed	A-AB Closed	
Normal Position (no signal)	(field configurable)	A-AB Closed	A-AB Closed	A-AB Closed	A-AB Closed	
Actuator Stroke	(degrees)	95°	95°	95°	95°	
Timing	(drive/spring return, seconds)	95	95	45/20	90/20	
Aux Switch	2 x SPDT Add-on	SW2-US	SW2-US	SW2-US	SW2-US	
Feedback	2-10 Vdc Built In		•		•	
Valve Features	Trim	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel

Valve Size (inches)	Cv*	Close-off Pressure (psid)	Valve O.S. Number				
			NEMA 2 Actuator				
4"	91	70	VBF3JS1S0A	VBF3JS1S0B	VBF3JS1S0C	VBF3JS1S0D	VBF3JS1S0X
	118		VBF3JT1S0A	VBF3JT1S0B	VBF3JT1S0C	VBF3JT1S0D	VBF3JT1S0X
	152		VBF3JU1S0A	VBF3JU1S0B	VBF3JU1S0C	VBF3JU1S0D	VBF3JU1S0X
	197		VBF3J11S0A	VBF3J11S0B	VBF3J11S0C	VBF3J11S0D	VBF3J11S0X
	254		VBF3J21S0A	VBF3J21S0B	VBF3J21S0C	VBF3J21S0D	VBF3J21S0X
	327		VBF3J31S0A	VBF3J31S0B	VBF3J31S0C	VBF3J31S0D	VBF3J31S0X
5"	144		VBF3KU1S0A	VBF3KU1S0B	VBF3KU1S0C	VBF3KU1S0D	VBF3KU1S0X
	185		VBF3K11S0A	VBF3K11S0B	VBF3K11S0C	VBF3K11S0D	VBF3K11S0
	240		VBF3K21S0A	VBF3K21S0B	VBF3K21S0C	VBF3K21S0D	VBF3K21S0X
	309		VBF3K31S0A	VBF3K31S0B	VBF3K31S0C	VBF3K31S0D	VBF3K31S0X
	400		VBF3K41S0A	VBF3K41S0B	VBF3K41S0C	—	VBF3K41S0X
6"	208		VBF3L11S0A	VBF3L11S0B	VBF3L11S0C	VBF3L11S0D	VBF3L11S0X
	268		VBF3L21S0A	VBF3L21S0B	VBF3L21S0C	VBF3L21S0D	VBF3L21S0X
	346		VBF3L41S0A	VBF3L41S0B	VBF3L41S0C	—	VBF3L41S0X
	441		VBF3L51S0A	VBF3L51S0B	VBF3L51S0C	—	VBF3L51S0X
	577		VBF3L61S0A	VBF3L61S0B	VBF3L61S0C	—	VBF3L61S0X
	650		VBF3L71S0A	VBF3L71S0B	VBF3L71S0C	—	VBF3L71S0X
			NEMA 3R Actuator				—
4"	91	70	VBF3JS1SRA	VBF3JS1SRB	VBF3JS1SRC	VBF3JS1SRD	—
	118		VBF3JT1SRA	VBF3JT1SRB	VBF3JT1SRC	VBF3JT1SRD	—
	152		VBF3JU1SRA	VBF3JU1SRB	VBF3JU1SRC	VBF3JU1SRD	—
	197		VBF3J11SRA	VBF3J11SRB	VBF3J11SRC	VBF3J11SRD	—
	254		VBF3J21SRA	VBF3J21SRB	VBF3J21SRC	VBF3J21SRD	—
	327		VBF3J31SRA	VBF3J31SRB	VBF3J31SRC	VBF3J31SRD	—
5"	144		VBF3KU1SRA	VBF3KU1SRB	VBF3KU1SRC	VBF3KU1SRD	—
	185		VBF3K11SRA	VBF3K11SRB	VBF3K11SRC	VBF3K11SRD	—
	240		VBF3K21SRA	VBF3K21SRB	VBF3K21SRC	VBF3K21SRD	—
	309		VBF3K31SRA	VBF3K31SRB	VBF3K31SRC	VBF3K31SRD	—
	400		VBF3K41SRA	VBF3K41SRB	VBF3K41SRC	—	—
6"	208		VBF3L11SRA	VBF3L11SRB	VBF3L11SRC	VBF3L11SRD	—
	268		VBF3L21SRA	VBF3L21SRB	VBF3L21SRC	VBF3L21SRD	—
	346		VBF3L41SRA	VBF3L41SRB	VBF3L41SRC	—	—
	441		VBF3L51SRA	VBF3L51SRB	VBF3L51SRC	—	—
	577		VBF3L61SRA	VBF3L61SRB	VBF3L61SRC	—	—
	650		VBF3L71SRA	VBF3L71SRB	VBF3L71SRC	—	—

* Maximum flow 700 gpm

NPT Globe Valves ½- 3"

With Dedicated Valve Actuators

For more than 50 years, Honeywell Globe Valves (V5011/13, VGF) have provided precise control for most applications.

Globe valves provide the rangeability and close-off needed to keep tight control of the environment.

Actuator Features		Non-Fail Safe					
Actuator O.S. Number		ML7984A4009	ML6984A4000	ML7420A3055	ML7420A3063	ML6420A3049	ML6420A3056
Power Supply	Voltage	24 Vac / 28 Vdc	24 Vac / 28 Vdc	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	0 / 50 / 60 Hz	0 / 50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	12 VA	12 VA	7 VA	7 VA	6 VA	6 VA
Actuator Stem Force	(lbs.)	160	160	135	135	135	135
Control	(0)2-10 Vdc	•		•	•		
	4-20 mA (external 500 Ohm Resistor)	Built-in		•	•		
	Floating		•			•	•
	Two-Position SPDT		•			•	•
	Two-Position SPST						
	135 Ohm	•					
Fail Safe Action		Stay in place	Stay in place	Stay in place	Stay in place	Stay in place	Stay in place
Normal Position (no signal)	(field configurable)	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up
Actuator Stroke	(inches)	0.5 - 1 self adj	0.5 - 1 self adj	0.75	0.75	0.75	0.75
Timing	(seconds at 0.75" stroke)	63	63	60	30	60	30
Aux Switch	1 x SPDT Add-On	272630D	272630D				
	2 x SPDT Add-On					43191680-105	43191680-105
Feedback	2-10 Vdc Built-in			•	•		
	2-10 Vdc Add-On			•	•		
	220 Ohm Add-On			43191679-112	43191679-112	43191679-112	43191679-112
	10 kOhm Add-On			43191679-111	43191679-111	43191679-111	43191679-111

	Valve Size (inches)	Cv	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid					
2-Way Water Valves Straight Through	1/2"	0.73	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1008	230	230	230	230	230	230
		1.16				Stem down to close	V5011N1016	230	230	230	230	230	230
		1.85				Stem down to close	V5011N1024	230	230	230	230	230	230
		2.9				Stem down to close	V5011N1032	230	230	230	230	230	230
		2.9				Stem up to close	V5011N3004	230	230	230	230	230	230
		4.7				Stem down to close	V5011N1040	230	230	230	230	230	230
		4.7				Stem up to close	V5011N3012	230	230	230	230	230	230
	3/4"	7.3				Stem down to close	V5011N1057	230	230	230	230	230	230
	3/4"	7.3				Stem up to close	V5011N3020	230	230	230	230	230	230
	1"	11.7				Stem down to close	V5011N1065	193	193	163	163	163	163
	1"	11.7				Stem up to close	V5011N3038	193	193	163	163	163	163
	1-1/4"	18.7				Stem down to close	V5011N1073	123	123	104	104	104	104
	1-1/4"	18.7				Stem up to close	V5011N3046	123	123	104	104	104	104
	1-1/2"	29.3				Stem down to close	V5011N1081	79	79	67	67	67	67
	2"	46.8				Stem down to close	V5011N1099	44	44	37	37	37	37
	2-1/2"	63	250 psi @ 100F			Stem down to close	V5011F1105	33	33	28	28	28	28
	3"	100				Stem down to close	V5011F1113	19	19	16	16	16	16
2-Way Steam Valves Straight Through	1/2"	0.73	217 psi @ 248 F	100 psig / 337 F	Linear	Stem down to close	V5011N2006	100	100	100	100	100	100
		1.16					V5011N2014	100	100	100	100	100	100
		1.85					V5011N2022	100	100	100	100	100	100
		2.9					V5011N2030	100	100	100	100	100	100
		4.7					V5011N2048	100	100	100	100	100	100
	3/4"	7.3					V5011N2055	100	100	100	100	100	100
	1"	11.7					V5011N2063	100	100	100	100	100	100
	1-1/4"	18.7					V5011N2071	100	100	100	100	100	100
	1-1/2"	29.3					V5011N2089	79	79	67	67	67	67
	2"	46.8					V5011N2097	44	44	37	37	37	37
	2-1/2"	63	250 psi @ 100F				V5011G1111	33	33	28	28	28	28
	3"	100					V5011G1129	19	19	16	16	16	16
3-Way Water Valves Mixing	1/2"	2.9	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	230	230	230	230	230	230
	1/2"	4.7					V5013N1048	230	230	230	230	230	230
	3/4"	7.3					V5013N1055	230	230	230	230	230	230
	1"	11.7					V5013N1063	193	193	163	163	163	163
	1-1/4"	18.7					V5013N1071	123	123	104	104	104	104
	1-1/2"	29.3					V5013N1089	79	79	67	67	67	67
	2"	46.8					V5013N1097	44	44	37	37	37	37

With Dedicated Valve Actuators

Common Features

- ANSI body class 150
- Close-off pressure = maximum differential pressure
- Maximum static water pressure (250°F): 240 psi
- Maximum steam pressure
  2-way steam valves, 337°F: 100 psi
  2-way water valves: 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Leakage < 0.05% of Cv
- Body material: Red brass, stainless steel stem (steam valve has stainless steel trim)

Actuator Features		Non-Fail Safe		Fail Safe			
Actuator O.S. Number		ML7421A1032	ML6421A1017	ML7425A3013	ML7425B3012	ML6425A3022	ML6425B3013
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	12 VA	11 VA	12 VA	12 VA	11 VA	11 VA
Actuator Stem Force	(lbs.)	404	404	135	135	135	135
Control	(0)2-10 Vdc	•		•	•		
	4-20 mA (external 500 Ohm Resistor)	•		•	•		
	Floating		•			•	•
	Two-Position SPDT		•			•	•
	Two-Position SPST					•	•
	135 Ohm						
Fail Safe Action		Stay in place	Stay in place	Stem Down	Stem Up	Stem Down	Stem Up
Normal Position (no signal)	(field configurable)	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up
Actuator Stroke	(inches)	0.75	0.75	0.75	0.75	0.75	0.75
Timing	(seconds at 0.75" stroke)	90	90	90	90	90	90
Aux Switch	1 x SPDT Add-On						
	2 x SPDT Add-On		43191680-102			43191680-105	43191680-105
Feedback	2-10 Vdc Built-in	•		•	•		
	2-10 Vdc Add-On						
	220 Ohm Add-On			43191679-112	43191679-112	43191679-112	43191679-112
	10 kOhm Add-On	43191679-101	43191679-101	43191679-111	43191679-111	43191679-111	43191679-111

	Valve Size (inches)	Cv	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid					
2-Way Water Valves Straight Through	1/2"	0.73	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1008			230*	230**	230*	230**
		1.16				Stem down to close	V5011N1016			230*	230**	230*	230**
		1.85				Stem down to close	V5011N1024			230*	230**	230*	230**
		2.9				Stem down to close	V5011N1032			230*	230**	230*	230**
		2.9				Stem up to close	V5011N3004			230**	230*	230**	230*
		4.7				Stem down to close	V5011N1040			230*	230**	230*	230**
		4.7				Stem up to close	V5011N3012			230*	230**	230*	230**
	3/4"	7.3				Stem down to close	V5011N1057			230*	230**	230*	230**
	3/4"	7.3				Stem up to close	V5011N3020			230**	230*	230**	230*
	1"	11.7				Stem down to close	V5011N1065	230	230	163*	163**	163*	163**
	1"	11.7				Stem up to close	V5011N3038	230	230	163**	163*	163**	163*
	1-1/4"	18.7				Stem down to close	V5011N1073	230	230	104*	104**	104*	104**
	1-1/4"	18.7				Stem up to close	V5011N3046	230	230	104**	104*	104**	104*
	1-1/2"	29.3				Stem down to close	V5011N1081	221	221	67*	67**	67*	67**
	2"	46.8				Stem down to close	V5011N1099	126	126	37*	37**	37*	37**
	2-1/2"	63	250 psi @ 100F			Stem down to close	V5011F1105	100	100	28*	28**	28*	28**
	3"	100				Stem down to close	V5011F1113	61	61	16*	16**	16*	16**
2-Way Steam Valves Straight Through	1/2"	0.73	217 psi @ 248 F	100 psig / 337 F	Linear	Stem down to close	V5011N2006			100*	100**	100*	100**
		1.16					V5011N2014			100*	100**	100*	100**
		1.85					V5011N2022			100*	100**	100*	100**
		2.9					V5011N2030			100*	100**	100*	100**
		4.7					V5011N2048			100*	100**	100*	100**
	3/4"	7.3					V5011N2055			100*	100**	100*	100**
	1"	11.7					V5011N2063	100	100	100*	100**	100*	100**
	1-1/4"	18.7					V5011N2071	100	100	100*	100**	100*	100**
	1-1/2"	29.3					V5011N2089	100	100	67*	67**	67*	67**
	2"	46.8					V5011N2097	100	100	37*	37**	37*	37**
	2-1/2"	63	250 psi @ 100F				V5011G1111	100	100	28*	28**	28*	28**
	3"	100					V5011G1129	61	61	16*	16**	16*	16**
3-Way Water Valves Mixing	1/2"	2.9	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030			230	230	230	230
	1/2"	4.7					V5013N1048			230	230	230	230
	3/4"	7.3					V5013N1055			230	230	230	230
	1"	11.7					V5013N1063	230	230	163	163	163	163
	1-1/4"	18.7					V5013N1071	230	230	104	104	104	104
	1-1/2"	29.3					V5013N1089	221	221	67	67	67	67
	2"	46.8					V5013N1097	126	126	37	37	37	37

* valve is Normally Closed on loss of power
** valve is Normally Open on loss of power.

NPT Globe Valves ½- 3"

With Direct Coupled Actuators and Valve Linkage

Common Features

- ANSI body class 150
- Close-Off pressure = maximum differential pressure
- Maximum static water pressure (250°F): 240 psi
- Maximum steam pressure
  2-way steam valves, 337°F: 100 psi
  2-way water valves: 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Leakage < 0.05% of Cv
- Body material: Red brass, stainless steel stem (steam valve has stainless steel trim)

Q5020A1003 Required

Actuator Features		Non-Fail Safe					
Actuator O.S. Number		ML7161A2008	ML6161B2024	ML7174A2001	ML6174B2019	MN7505A2001 MN7505A2209	MN6105A1011 MN6105A1201
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	5.4 VA	1.8 VA	5.4 VA	2.4 VA	5 VA	5 VA
Actuator Torque	(lb.-in.)	35	35	70	70	44	44
Linkage Stem Force	(lbs.)	46	46	93	93	58	58
Control	(0)2-10 Vdc	•		•		•	
	4-20 mA (external 500 Ohm Resistor)	•		•		•	
	Floating		•		•	•	•
	Two-Position SPDT		•		•	•	•
	Two-Position SPST					•	•
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(inches)	90°	90°	90°	90°	95°	95°
Timing	(seconds at 0.75" stroke)	90	90	90	90	95	95
Aux Switch	2 x SPDT Built In					0 / 2	0 / 2
	1 x SPDT Add-On	201052A	201052A	201052A	201052A		
	2 x SPDT Add-On	201052B	201052B	201052B	201052B	SSW2	SSW2
Feedback	(0)2-10 Vdc Built In					•	
	500 Ohm Add-On	200976A	200976A	200976A	200976A		
	2 kOhm Add-On	200976B	200976B	200976B	200976B		

	Valve Size (inches)	Cv	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid					
2-Way Water Valves Straight Through	1/2"	0.73	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1008	230	230	230	230	230	230
		1.16				Stem down to close	V5011N1016	230	230	230	230	230	230
		1.85				Stem down to close	V5011N1024	230	230	230	230	230	230
		2.9				Stem down to close	V5011N1032	230	230	230	230	230	230
		2.9				Stem up to close	V5011N3004	230	230	230	230	230	230
		4.7				Stem down to close	V5011N1040	143	143	230	230	188	188
		4.7				Stem up to close	V5011N3012	143	143	230	230	188	188
	3/4"	7.3				Stem down to close	V5011N1057	69	69	156	156	91	91
	3/4"	7.3				Stem up to close	V5011N3020	69	69	156	156	91	91
	1"	11.7				Stem down to close	V5011N1065	47	47	109	109	63	63
	1"	11.7				Stem up to close	V5011N3038	47	47	109	109	63	63
	1-1/4"	18.7				Stem down to close	V5011N1073	29	29	69	69	39	39
	1-1/4"	18.7				Stem up to close	V5011N3046	29	29	69	69	39	39
	1-1/2"	29.3				Stem down to close	V5011N1081	17	17	44	44	24	24
	2"	46.8				Stem down to close	V5011N1099	8	8	24	24	12	12
	2-1/2"	63	250 psi @ 100F			Stem down to close	V5011F1105	5	5	16	16	7	7
	3"	100				Stem down to close	V5011F1113	2	2	9	9	3	3
2-Way Steam Valves Straight Through	1/2"	0.73	217 psi @ 248 F	100 psig / 337 F	Linear	Stem down to close	V5011N2006	100	100	100	100	100	100
		1.16					V5011N2014	100	100	100	100	100	100
		1.85					V5011N2022	100	100	100	100	100	100
		2.9					V5011N2030	100	100	100	100	100	100
		4.7					V5011N2048	100	100	100	100	100	100
	3/4"	7.3					V5011N2055	69	69	100	100	91	91
	1"	11.7					V5011N2063	47	47	100	100	63	63
	1-1/4"	18.7					V5011N2071	29	29	69	69	39	39
	1-1/2"	29.3					V5011N2089	17	17	44	44	24	24
	2"	46.8					V5011N2097	8	8	24	24	12	12
	2-1/2"	63	250 psi @ 100F				V5011G1111	5	5	16	16	7	7
	3"	100					V5011G1129	2	2	9	9	3	3
3-Way Water Valves Mixing	1/2"	2.9	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	230	230	230	230	230	230
	1/2"	4.7					V5013N1048	143	143	230	230	188	188
	3/4"	7.3					V5013N1055	69	69	156	156	91	91
	1"	11.7					V5013N1063	47	47	109	109	63	63
	1-1/4"	18.7					V5013N1071	29	29	69	69	39	39
	1-1/2"	29.3					V5013N1089	17	17	44	44	24	24
	2"	46.8					V5013N1097	8	8	24	24	12	12

With Direct Coupled Actuators and Valve Linkage

Q5020A1003 Required

Actuator Features		Non-Fail Safe					
Actuator O.S. Number		MN7510A2001 MN7510A2209	MN6110A1003 MN6110A1201	MN7220A2007 MN7220A2205	MN6120A1002 MN6120A1200	MN7234A2008	MN6134A1003
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	5 VA	5 VA	6 VA	6 VA	9 VA	9 VA
Actuator Torque	(lb.-in.)	88	88	175	175	300	300
Linkage Stem Force	(lbs.)	117	117	234	234	402	402
Control	(0)2-10 Vdc	•		•		•	
	4-20 mA (external 500 Ohm Resistor)	•		•		•	
	Floating	•	•	•	•		•
	Two-Position SPDT	•	•	•	•		•
	Two-Position SPST	•	•	•	•	•	•
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(inches)	95°	95°	95°	95°	95°	95°
Timing	(seconds at 0.75" stroke)	95	95	95	95	95	95
Aux Switch	2 x SPDT Built In	0 / 2	0 / 2	0 / 2	0 / 2		
	1 x SPDT Add-On						
	2 x SPDT Add-On	SSW2	SSW2	SW2-US	SW2-US	SW2-US	SW2-US
Feedback	(0)2-10 Vdc Built In	•		•		•	
	500 Ohm Add-On						
	2 kOhm Add-On						

	Valve Size (inches)	Cv	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid					
2-Way Water Valves Straight Through	1/2"	0.73	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1008	230	230	230	230	230	230
		1.16				Stem down to close	V5011N1016	230	230	230	230	230	230
		1.85				Stem down to close	V5011N1024	230	230	230	230	230	230
		2.9				Stem down to close	V5011N1032	230	230	230	230	230	230
		2.9				Stem up to close	V5011N3004	230	230	230	230	230	230
		4.7				Stem down to close	V5011N1040	230	230	230	230	230	230
		4.7				Stem up to close	V5011N3012	230	230	230	230	230	230
	3/4"	7.3				Stem down to close	V5011N1057	192	192	230	230	230	230
	3/4"	7.3				Stem up to close	V5011N3020	192	192	230	230	230	230
	1"	11.7				Stem down to close	V5011N1065	135	135	230	230	230	230
	1"	11.7				Stem up to close	V5011N3038	135	135	230	230	230	230
	1-1/4"	18.7				Stem down to close	V5011N1073	85	85	168	168	230	230
	1-1/4"	18.7				Stem up to close	V5011N3046	85	85	168	168	230	230
	1-1/2"	29.3				Stem down to close	V5011N1081	55	55	113	113	180	180
	2"	46.8				Stem down to close	V5011N1099	30	30	63	63	103	103
	2-1/2"	63	250 psi @ 100F			Stem down to close	V5011F1105	19	19	42	42	74	74
	3"	100				Stem down to close	V5011F1113	11	11	26	26	45	45
2-Way Steam Valves Straight Through	1/2"	0.73	217 psi @ 248 F	100 psig / 337 F	Linear	Stem down to close	V5011N2006	100	100	100	100	100	100
		1.16					V5011N2014	100	100	100	100	100	100
		1.85					V5011N2022	100	100	100	100	100	100
		2.9					V5011N2030	100	100	100	100	100	100
		4.7					V5011N2048	100	100	100	100	100	100
	3/4"	7.3					V5011N2055	100	100	100	100	100	100
	1"	11.7					V5011N2063	100	100	100	100	100	100
	1-1/4"	18.7					V5011N2071	85	85	100	100	100	100
	1-1/2"	29.3					V5011N2089	55	55	100	100	100	100
	2"	46.8					V5011N2097	30	30	58	58	100	100
	2-1/2"	63	250 psi @ 100F				V5011G1111	19	19	42	42	74	74
	3"	100					V5011G1129	11	11	26	26	45	45
3-Way Water Valves Mixing	1/2"	2.9	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	230	230	230	230	230	230
	1/2"	4.7					V5013N1048	230	230	230	230	230	230
	3/4"	7.3					V5013N1055	192	192	230	230	230	230
	1"	11.7					V5013N1063	135	135	230	230	230	230
	1-1/4"	18.7					V5013N1071	85	85	168	168	230	230
	1-1/2"	29.3					V5013N1089	55	55	105	105	180	180
	2"	46.8					V5013N1097	30	30	103	103	103	103

NPT Globe Valves ½- 3"

With Direct Coupled Spring Return Actuators and Valve Linkage

Common Features

- ANSI body class 150
- Close-Off pressure = maximum differential pressure
- Maximum static water pressure (250°F): 240 psi
- Maximum steam pressure
  2-way steam valves, 337°F: 100 psi
  2-way water valves: 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Leakage < 0.05% of Cv
- Body material: Red brass, stainless steel stem (steam valve has stainless steel trim)

Q5020A1003 Required

Actuator Features		Fail Safe				
Actuator O.S. Number		MS7505A2030 MS7505A2130	MS8105A1030 MS8105A1130	MS4105A1030 MS4105A1130	MS7510A2008 MS7510A2206 MS7510H2209	MS8110A1008 MS8110A1206
Power Supply	Voltage	24 Vac	24 Vac	100-250 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	7.5VA	8 VA	11VA	14 VA	30 VA
Actuator Torque	(lb.-in.)	44	44	44	88	88
Linkage Stem Force	(lbs.)	58	58	58	117	117
Control	(0)2-10 Vdc	•			•	
	4-20 mA (external 500 Ohm Resistor)	•			•	
	Floating	•			•	
	Two-Position SPDT	•			•	
	Two-Position SPST	•	•	•	•	•
Fail Safe Action		Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(inches)	95°	95°	95°	95°	95°
Timing	(seconds at 0.75" stroke)	90	90	90	90	90
Aux Switch	SPDT Built In	0 / 1	0 / 1	0 / 1	0 / 2 / 2	0 / 2
	2 x SPDT Add-On				SW2-US	SW2-US
Feedback	2-10 Vdc Built In	•			•	

	Valve Size (inches)	Cv	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid				
2-Way Water Valves Straight Through	1/2"	0.73	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1008	230	230	230	230	230
		1.16				Stem down to close	V5011N1016	230	230	230	230	230
		1.85				Stem down to close	V5011N1024	230	230	230	230	230
		2.9				Stem down to close	V5011N1032	230	230	230	230	230
		2.9				Stem up to close	V5011N3004	230	230	230	230	230
		4.7				Stem down to close	V5011N1040	184	184	184	230	230
		4.7				Stem up to close	V5011N3012	184	184	184	230	230
	3/4"	7.3				Stem down to close	V5011N1057	79	79	79	150	150
	3/4"	7.3				Stem up to close	V5011N3020	79	79	79	150	150
	1"	11.7				Stem down to close	V5011N1065	66	66	66	136	136
	1"	11.7				Stem up to close	V5011N3038	66	66	66	136	136
	1-1/4"	18.7				Stem down to close	V5011N1073	40	40	40	84	84
	1-1/4"	18.7				Stem up to close	V5011N3046	40	40	40	84	84
	1-1/2"	29.3				Stem down to close	V5011N1081	26	26	26	55	55
	2"	46.8				Stem down to close	V5011N1099	13	13	13	30	30
	2-1/2"	63	250 psi @ 100F			Stem down to close	V5011F1105	9	9	9	21	21
	3"	100	250 psi @ 100F			Stem down to close	V5011F1113	6	6	6	13	13
2-Way Steam Valves Straight Through	1/2"	0.73	217 psi @ 248 F	100 psig / 337 F	Linear	Stem down to close	V5011N2006	100	100	100	100	100
		1.16					V5011N2014	100	100	100	100	100
		1.85					V5011N2022	100	100	100	100	100
		2.9					V5011N2030	100	100	100	100	100
		4.7					V5011N2048	100	100	100	100	100
	3/4"	7.3					V5011N2055	79	79	79	100	100
	1"	11.7					V5011N2063	66	66	66	100	100
	1-1/4"	18.7					V5011N2071	40	40	40	84	84
	1-1/2"	29.3					V5011N2089	26	26	26	55	55
	2"	46.8					V5011N2097	13	13	13	30	30
	2-1/2"	63	250 psi @ 100F				V5011G1111	9	9	9	21	21
	3"	100	250 psi @ 100F				V5011G1129	6	6	6	13	13
3-Way Water Valves Mixing	1/2"	2.9	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	230	230	230	230	230
	1/2"	4.7					V5013N1048	184	184	184	230	230
	3/4"	7.3					V5013N1055	79	79	79	150	150
	1"	11.7					V5013N1063	66	66	66	136	136
	1-1/4"	18.7					V5013N1071	40	40	40	84	84
	1-1/2"	29.3					V5013N1089	26	26	26	55	55
	2"	46.8					V5013N1097	13	13	13	30	30

With Direct Coupled Spring Return Actuators and Valve Linkage

Q5020A1003 Required

Actuator Features		Fail Safe			
Actuator O.S. Number		MS4110A1002 MS4110A1200	MS7520A2007 MS7520A2205 MS7520H2208	MS8120A1007 MS8120A1205	MS4120A1001 MS4120A1209
Power Supply	Voltage	100-250 Vac	24 Vac	24 Vac	100-250 Vac
	Frequency	60 Hz	50 / 60 Hz	50 / 60 Hz	60 Hz
	Power	45 VA	16 VA	40 VA	60 VA
Actuator Torque	(lb.-in.)	88	175	175	175
Linkage Stem Force	(lbs.)	117	234	234	234
Control	(0)2-10 Vdc		•		
	4-20 mA (external 500 Ohm Resistor)		•		
	Floating		•		
	Two-Position SPDT		•		
	Two-Position SPST	•	•	•	•
Fail Safe Action		Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(inches)	95°	95°	95°	95°
Timing	(seconds at 0.75" stroke)	90	90	90	90
Aux Switch	SPDT Built In	0 / 2	0 / 2 / 2	0 / 2	0 / 2
	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US	SW2-US
Feedback	2-10 Vdc Built In		•		

	Valve Size (inches)	Cv	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water Valves Straight Through	1/2"	0.73	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1008	230	230	230	230
		1.16				Stem down to close	V5011N1016	230	230	230	230
		1.85				Stem down to close	V5011N1024	230	230	230	230
		2.9				Stem down to close	V5011N1032	230	230	230	230
		2.9				Stem up to close	V5011N3004	230	230	230	230
		4.7				Stem down to close	V5011N1040	230	230	230	230
		4.7				Stem up to close	V5011N3012	230	230	230	230
	3/4"	7.3				Stem down to close	V5011N1057	150	230	230	230
	3/4"	7.3				Stem up to close	V5011N3020	150	230	230	230
	1"	11.7				Stem down to close	V5011N1065	136	230	230	230
	1"	11.7				Stem up to close	V5011N3038	136	230	230	230
	1-1/4"	18.7				Stem down to close	V5011N1073	84	171	171	171
	1-1/4"	18.7				Stem up to close	V5011N3046	84	171	171	171
	1-1/2"	29.3				Stem down to close	V5011N1081	55	113	113	113
	2"	46.8				Stem down to close	V5011N1099	30	63	63	63
	2-1/2"	63	250 psi @ 100F			Stem down to close	V5011F1105	21	45	45	45
	3"	100	250 psi @ 100F			Stem down to close	V5011F1113	13	27	27	27
2-Way Steam Valves Straight Through	1/2"	0.73	217 psi @ 248 F	100 psig / 337 F	Linear	Stem down to close	V5011N2006	100	100	100	100
		1.16					V5011N2014	100	100	100	100
		1.85					V5011N2022	100	100	100	100
		2.9					V5011N2030	100	100	100	100
		4.7					V5011N2048	100	100	100	100
	3/4"	7.3					V5011N2055	100	100	100	100
	1"	11.7					V5011N2063	100	100	100	100
	1-1/4"	18.7					V5011N2071	84	100	100	100
	1-1/2"	29.3					V5011N2089	55	100	100	100
	2"	46.8					V5011N2097	30	63	63	63
	2-1/2"	63	250 psi @ 100F				V5011G1111	21	45	45	45
	3"	100	250 psi @ 100F				V5011G1129	13	27	27	27
3-Way Water Valves Mixing	1/2"	2.9	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	230	230	230	230
	1/2"	4.7					V5013N1048	230	230	230	230
	3/4"	7.3					V5013N1055	150	230	230	230
	1"	11.7					V5013N1063	136	230	230	230
	1-1/4"	18.7					V5013N1071	84	171	171	171
	1-1/2"	29.3					V5013N1089	55	113	113	113
	2"	46.8					V5013N1097	30	63	63	63

Flanged Globe Valves 2½- 3"

With Direct Coupled Actuators and Valve Linkage

Common Features

- ANSI body class 125 or 250
- Close-off pressure = Maximum differential pressure
- Maximum static water pressure: Up to 400 psi
- Maximum steam pressure (VGF, 2-pos or modulating): 100 psi
- Maximum steam pressure (V5011, 2-pos): 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Body material: Cast iron
- Body trim: Stainless steel stem, brass seat (V5011/13), stainless steel (VGF)

Q5020A1003 Required

Actuator Features		Non-fail Safe			
Actuator O.S. Number		ML7174A2001	ML6174B2019	MN7510A2001 MN7505A2209	MN6110A1003 MN6110A1201
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	5.4 VA	2.4 VA	5 VA	5 VA
Actuator Torque	(lb.-in.)	70	70	88	88
Linkage Stem Force	(lbs.)	93	93	117	117
Control	(0)2-10 Vdc	•		•	
	4-20 mA (external 500 Ohm Resistor)	•		•	
	Floating		•	•	•
	Two-Position SPDT		•	•	•
	Two-Position SPST			•	•
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(degrees)	90°	90°	95°	95°
Timing	(seconds)	90	90	95	95
High Temperature Kit	Steam Application	43196000-001	43196000-001	43196000-001	43196000-001
Aux Switch	SPDT Built In			0 / 2	0 / 2
	1 x SPDT Add-On	201052A	201052A		
	2 x SPDT Add-On	201052B	201052B	SSW2	SSW2
Feedback	(0)2-10 Vdc Built In			•	
	500 Ohm Add-On	200976A	200976A		
	2 kOhm Add-On	200976B	200976B		

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	21	21	27	27
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	18	18	34	34
					175 psi @ 130 F		Linear		VGF21LS25	18	18	34	34
				250	400 psi @ 130 F		Equal %		VGF22ES25	18	18	34	34
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	9	9	11	11
		115			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	9	9	16	16
		125			175 psi @ 130 F		Linear		VGF21LS30	9	9	16	16
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	9	9	16	16
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	100	100	100	100
			Standard				Equal %		VGF21ES25				
			Pressure Balanced				Linear		VGF21LP25	100	100	100	100
			Standard				Linear		VGF21LS25				
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25				
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30				
		115	Standard				Equal %		VGF21ES30				
		120	Pressure Balanced				Linear		VGF21LP30				
		125	Standard				Linear		VGF21LS30				
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30				
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	21	21	27	27
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	21	21	27	27
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	23	23	44	44
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	18	18	34	34
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	23	23	44	44
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	18	18	34	34
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	9	9	11	11
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	9	9	11	11
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	15	15	29	29
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	9	9	16	16
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	15	15	29	29
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	9	9	16	16

Flanged Globe Valves 2½- 3"

With Direct Coupled Actuators and Valve Linkage

Q5020A1003 Required

Actuator Features		Non-fail Safe			
Actuator O.S. Number		MN7220A2007	MN6120A1002	MN7234A2008	MN6134A1003
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	6 VA	6 VA	9 VA	9 VA
Actuator Torque	(lb.-in.)	175	175	300	300
Linkage Stem Force	(lbs.)	234	234	402	402
Control	(0)2-10 Vdc	•		•	
	4-20 mA (external 500 Ohm Resistor)	•		•	
	Floating	•	•		•
	Two-Position SPDT	•	•		•
	Two-Position SPST	•	•	•	•
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(degrees)	95°	95°	95°	95°
Timing	(seconds)	95	95	95	95
High Temperature Kit	Steam Application	43196000-001	43196000-001	43196000-001	43196000-001
Aux Switch	SPDT Built In	0 / 2	0 / 2		
	1 x SPDT Add-On				
	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US	SW2-US
Feedback	(0)2-10 Vdc Built In	•		•	
	500 Ohm Add-On				
	2 kOhm Add-On				

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	52	52	88	88
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	52	52		
					175 psi @ 130 F		Linear		VGF21LS25	52	52		
				250	400 psi @ 130 F		Equal %		VGF22ES25	52	52		
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	24	24	42	42
		115			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	26	26		
		125			175 psi @ 130 F		Linear		VGF21LS30	26	26		
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	26	26		
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175	175	175	175
			Standard				Equal %		VGF21ES25			77	77
			Pressure Balanced				Linear		VGF21LP25	175	175	175	175
			Standard				Linear		VGF21LS25			77	77
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25			77	77
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175	175	175	175
		115	Standard				Equal %		VGF21ES30			38	38
		120	Pressure Balanced				Linear		VGF21LP30	175	175	175	175
		125	Standard				Linear		VGF21LS30			38	38
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30			38	38
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	52	52	88	88
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	52	52	88	88
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	66	66	97	97
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	52	52	97	97
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	66	66	97	97
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	52	52	97	97
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	24	24	42	42
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	24	24	42	42
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	44	44	65	65
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	26	26	65	65
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	44	44	65	65
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	26	26	65	65

Flanged Globe Valves 2½- 3"

With Direct Coupled Spring Return Actuators and Valve Linkage

Common Features

- ANSI body class 125 or 250
- Close-off pressure = Maximum differential pressure
- Maximum static water pressure: Up to 400 psi
- Maximum steam pressure (VGF, 2-pos or modulating): 100 psi
- Maximum steam pressure (V5011, 2-pos): 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Body material: Cast iron
- Body trim: Stainless steel stem, brass seat (V5011/13), stainless steel (VGF)

Q5020A1003 Required

Actuator Features		Fail Safe		
Actuator O.S. Number		MS7510A2008 MS7510A2206 MS7510H2209	MS8110A1008	MS4110A1002
Power Supply	Voltage	24 Vac	24 Vac	100-250 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	60 Hz
	Power	14 VA	30 VA	45VA
Actuator Torque	(lb.-in.)	88	88	88
Linkage Stem Force	(lbs.)	117	117	117
Control	(0)2-10 Vdc	•		
	4-20 mA (external 500 Ohm Resistor)	•		
	Floating	•		
	Two-Position SPDT	•		
	Two-Position SPST	•	•	•
Fail Safe Action		Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(degrees)	95°	95°	95°
Timing	(seconds)	90	90	90
High Temperature Kit	Steam Application	43196000-001	43196000-001	43196000-001
Aux Switch	SPDT Built In	0 / 2 / 2	0 / 2	0 / 2
	1 x SPDT Add-On			
	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US
Feedback	(0)2-10 Vdc Built In	•		
	500 Ohm Add-On			
	2 kOhm Add-On			

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid		
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	27	27	27
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	33	33	33
					175 psi @ 130 F		Linear		VGF21LS25	33	33	33
				250	400 psi @ 130 F		Equal %		VGF22ES25	33	33	33
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	11	11	11
		115			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	15	15	15
		125			175 psi @ 130 F		Linear		VGF21LS30	15	15	15
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	15	15	15
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	100	100	100
			Standard				Equal %		VGF21ES25			
			Pressure Balanced				Linear		VGF21LP25	100	100	100
			Standard				Linear		VGF21LS25			
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25			
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30			
		115	Standard				Equal %		VGF21ES30			
		120	Pressure Balanced				Linear		VGF21LP30			
		125	Standard				Linear		VGF21LS30			
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30			
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	27	27	27
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	27	27	27
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	43	43	43
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	33	33	33
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	43	43	43
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	33	33	33
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	11	11	11
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	11	11	11
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	28	28	28
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	15	15	15
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	28	28	28
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	15	15	15

With Direct Coupled Spring Return Actuators and Valve Linkage

Q5020A1003 Required

Actuator Features		Fail Safe		
Actuator O.S. Number		MS7520A2007 MS7520A2205 MS7520H2208	MS8120A1007	MS4120A1001
Power Supply	Voltage	24 Vac	24 Vac	100-250 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	60 Hz
	Power	16 VA	40 VA	60 VA
Actuator Torque	(lb.-in.)	175	175	175
Linkage Stem Force	(lbs.)	234	234	234
Control	(0)2-10 Vdc	•		
	4-20 mA (external 500 Ohm Resistor)	•		
	Floating	•		
	Two-Position SPDT	•		
	Two-Position SPST	•	•	•
Fail Safe Action		Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(degrees)	95°	95°	95°
Timing	(seconds)	90	90	90
High Temperature Kit	Steam Application	43196000-001	43196000-001	43196000-001
Aux Switch	SPDT Built In	0 / 2 / 2	0 / 2	0 / 2
	1 x SPDT Add-On			
	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US
Feedback	(0)2-10 Vdc Built In	•		
	500 Ohm Add-On			
	2 kOhm Add-On			

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid		
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	56	56	56
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	71	71	71
					175 psi @ 130 F		Linear		VGF21LS25	71	71	71
				250	400 psi @ 130 F		Equal %		VGF22ES25	71	71	71
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	25	25	25
		115			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	35	35	35
		125			175 psi @ 130 F		Linear		VGF21LS30	35	35	35
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	35	35	35
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175	175	175
			Standard				Equal %		VGF21ES25			
			Pressure Balanced				Linear		VGF21LP25	175	175	175
			Standard				Linear		VGF21LS25			
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25			
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175	175	175
		115	Standard				Equal %		VGF21ES30			
		120	Pressure Balanced				Linear		VGF21LP30	175	175	175
		125	Standard				Linear		VGF21LS30			
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30			
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	56	56	56
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	56	56	56
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	89	89	89
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	71	71	71
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	89	89	89
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	71	71	71
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	25	25	25
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	25	25	25
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	59	59	59
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	35	35	35
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	59	59	59
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	35	35	35

Threaded and Flanged Globe Valves 2"-3"

With Tandem Direct Coupled Actuators and Valve Linkage

Common Features

- Stem travel: 0.75"
- Rangeability: 50:1
- Body material: Bronze (V5011/13N), Cast iron
- Seat Material: Bronze (V5011/13), Stainless Steel (VGF2), Cast Iron (VGF3)
- Stem Material: Stainless Steel

Q5022A1001 Required

Actuator Features		Non-fail Safe			
Actuator O.S. Number (Two required per linkage/valve)		MN7220A2007	MN6120A1002	MN72342008	MN6134A1003
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Power	6 VA	6 VA	9 VA	9 VA
Actuator Torque	(lb.-in.)	175	175	300	300
Linkage Stem Force, Two Actuators	(lbs.)	655	655	1115	1115
Control	(0)2-10 Vdc	•		•	
	4-20 mA (external 500 Ohm Resistor)	•		•	
	Floating	•	•	•	•
	Two-Position SPDT	•	•	•	•
	Two-Position SPST	•	•	•	
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up/ Down	Stem Up/ Down	Stem Up/ Down	Stem Up/ Down
Actuator Stroke	(inches)	0.75	0.75	0.75	0.75
Timing	(seconds)	95	95	95	95
Aux Switch	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US	SW2-US
	2 x SPDT Built In				
Feedback	(0)2-10 Vdc Built In	•		•	

	Valve Size (inches)	Pipe Fitting	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2"	f NPT	47	Standard	150	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1099	162	162	240	240
	2"	f NPT	47		150	217 psi @ 248 F	100 psig / 337 F	Equal %		V5011N2097	100	100	100	100
	2-1/2"	Flanged	63		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1734	130	130	225	225
		f NPT			150	250 psi @ 100F	15 psi (2-position)	Equal %		V5011F1105	130	130	225	225
		f NPT			150	250 psi @ 100F	100 psig / 337 F	Linear		V5011G1111	100	100	100	100
		Flanged	70		125	175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	110	110	190	190
					125	175 psi @ 130 F		Linear		VGF21LS25	110	110	190	190
					250	400 psi @ 130 F		Equal %		VGF22ES25	110	110	190	190
	3"	Flanged	100		125	150 psi @ 250 F	15 psi (2-position)	Equal %		V5011A1767	66	66	115	115
		f NPT			150	250 psi @ 100F	15 psi (2-position)	Equal %		V5011F1113	65	65	115	115
		f NPT			150	250 psi @ 100F	100 psig / 337 F	Linear		V5011G1129	65	65	100	100
		Flanged	120		125	175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	55	55	94	94
					125	175 psi @ 130 F		Linear		VGF21LS30	55	55	94	94
					250	400 psi @ 130 F		Equal %		VGF22ES30	55	55	94	94
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	Flanged	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175*	175*	175*	175*
				Standard				Equal %		VGF21ES25	74	74	152	152
				Pressure Balanced				Linear		VGF21LP25	175*	175*	175*	175*
				Standard				Linear		VGF21LS25	74	74	152	152
				Standard	250	400 psi @ 130 F		Equal %		VGF22ES25	74	74	152	152
	3"		115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175*	175*	175*	175*
			120	Standard				Equal %		VGF21ES30	36	36	75	75
			115	Pressure Balanced				Linear		VGF21LP30	175*	175*	175*	175*
			120	Standard				Linear		VGF21LS30	36	36	75	75
			120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30	36	36	75	75
3-Way Water Valves	2"	f NPT	47	Mixing	150	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1097	162	162	240	240
	2-1/2"	Flanged	63	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1003	130	130	225	225
			63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	130	130	225	225
			70	Mixing		175 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF31EM25	141	141	240	240
				Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	110	110	190	190
				Mixing	250	400 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF32EM25	141	141	240	240
				Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	110	110	190	190
	3"		100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	65	65	115	115
			100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	65	65	115	115
			115	Mixing		175 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF31EM30	94	94	160	160
			120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	110	110	190	190
			115	Mixing	250	400 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF32EM30	94	94	160	160
			120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	110	110	190	190

*Only requires single actuator

** For high pressure steam-rated valves, close-off is the lesser of Maximum Steam Pressure or water close-off rating

With Tandem Direct Coupled Actuators and Valve Linkage

Q5022A1001 Required***

Actuator Features		Fail Safe		
Actuator O.S. Number (Two required per linkage/valve)		MS7520A2007 MS7520A2205	MS8120A1007	MS4120A1001
Power Supply	Voltage	24 Vac	24 Vac	100-250 Vac
	Frequency	60 Hz	60 Hz	60 Hz
	Power	16 VA	40 VA	60 VA
Actuator Torque	(lb.-in.)	175	175	175
Linkage Stem Force, Two Actuators	(lbs.)	655	655	655
Control	(0)2-10 Vdc	•		
	4-20 mA (external 500 Ohm Resistor)	•		
	Floating	•		
	Two-Position SPDT	•		
	Two-Position SPST	•	•	•
Fail Safe Action		Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up/ Down	Stem Up/ Down	Stem Up/ Down
Actuator Stroke	(inches)	0.75	0.75	0.75
Timing	(seconds)	90	90	90
Aux Switch	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US
	2 x SPDT Built In	0 / 2		
Feedback	(0)2-10 Vdc Built In	•		

	Valve Size (inches)	Pipe Fitting	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid		
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2"	f NPT	47	Standard	150	217 psi @ 248 F	15 psi (2-position)	Equal %	Stem down to close	V5011N1099	162	162	162
	2"	f NPT	47		150	217 psi @ 248 F	100 psig / 337 F	Equal %		V5011N2097	100	100	20
	2-1/2"	Flanged	63		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1734	130	130	130
		f NPT			150	250 psi @ 100F	15 psi (2-position)	Equal %		V5011F1105	130	130	130
		f NPT			150	250 psi @ 100F	100 psig / 337 F	Linear		V5011G1111	100	100	100
		Flanged	70		125	175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	110	110	110
					125	175 psi @ 130 F		Linear		VGF21LS25	110	110	110
					250	400 psi @ 130 F		Equal %		VGF22ES25	110	110	110
	3"	Flanged	100		125	150 psi @ 250 F	15 psi (2-position)	Equal %		V5011A1767	66	66	66
		f NPT			150	250 psi @ 100F	15 psi (2-position)	Equal %		V5011F1113	65	65	65
		f NPT			150	250 psi @ 100F	100 psig / 337 F	Linear		V5011G1129	65	65	65
		Flanged	120		125	175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	55	55	55
					125	175 psi @ 130 F		Linear		VGF21LS30	55	55	55
					250	400 psi @ 130 F		Equal %		VGF22ES30	55	55	55
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	Flanged	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175*	175*	175*
				Standard				Equal %		VGF21ES25	74	74	74
				Pressure Balanced				Linear		VGF21LP25	175*	175*	175*
				Standard				Linear		VGF21LS25	74	74	74
				Standard	250	400 psi @ 130 F		Equal %		VGF22ES25	74	74	74
	3"		115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175*	175*	175*
			120	Standard				Equal %		VGF21ES30	36	36	36
			115	Pressure Balanced				Linear		VGF21LP30	175*	175*	175*
			120	Standard				Linear		VGF21LS30	36	36	36
			120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30	36	36	36
3-Way Water Valves	2"	f NPT	47	Mixing	150	217 psi @ 248 F	N / A	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1097	162	162	162
	2-1/2"	Flanged	63	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1003	130	130	130
			63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	130	130	130
			70	Mixing		175 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF31EM25	141	141	141
				Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	110	110	110
				Mixing	250	400 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF32EM25	141	141	141
				Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	110	110	110
	3"		100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	65	65	65
			100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	65	65	65
			115	Mixing		175 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF31EM30	94	94	94
			120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	110	110	110
			115	Mixing	250	400 psi @ 130 F		Linear B-AB / Equal % A-AB	Stem up closes A-AB	VGF32EM30	94	94	94
			120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	110	110	110

*Only requires single actuator
** For high pressure steam-rated valves, close-off is the lesser of Maximum Steam Pressure or water close-off rating
***Q5022A linkage compatible with VGF valves with 1/4-28UNF stem thread (Manufactured after June, 2005)

Flanged Globe Valves 2½- 3"

With Dedicated Valve Actuators

Common Features

- ANSI body class 125 or 250
- Close-off pressure = Maximum differential pressure
- Maximum static water pressure: Up to 400 psi
- Maximum steam pressure (VGF, 2-pos or modulating): 100 psi
- Maximum steam pressure (V5011, 2-pos): 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Body material: Cast iron
- Body trim: Stainless steel stem, brass seat (V5011/13), stainless steel (VGF)

Actuator Features		Non-fail Safe			
Actuator O.S. Number		ML7984A4009**	ML6984A4000**	ML7420A3055	ML7420A3063
Power Supply	Voltage	24 Vac / 28 Vdc	24 Vac / 28 Vdc	24 Vac	24 Vac
	Frequency	0 / 50 / 60 Hz	0 / 50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	12 VA	12 VA	7 VA	7 VA
Actuator Torque	(lb.-in.)	160	160	135	135
Control	(0)2-10 Vdc	•		•	•
	4-20 mA (external 500 Ohm Resistor)	Built-in		•	•
	Floating		•		
	Two-Position SPDT		•		
	Two-Position SPST				
	135 Ohm	•			
Fail Safe Action		Stay in place	Stay in place	Stay in place	Stay in place
Normal Position (no signal)	(field configurable)	Stem Up	Stem Up	Stem Up	Stem Up
Actuator Stroke	(inches)	0.5 - 1 self adj	0.5 - 1 self adj	0.75	0.75
Timing	(seconds at 0.75" stroke)	63	63	60	30
High Temperature Kit	Steam Application			43196000-001	43196000-001
Aux Switch	1 x SPDT Add-On	272630D	272630D		
	2 x SPDT Add-On			43191680-105	43191680-105
Feedback	2-10 Vdc Built In			•	•
	2-10 Vdc Add-On	272630D	272630D		
	220 Ohm Add-On				
	10 kOhm Add-On				

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	33	33	28	28
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	27*	27*	23	23
					175 psi @ 130 F		Linear		VGF21LS25	27*	27*	23	23
				250	400 psi @ 130 F		Equal %		VGF22ES25	27*	27*	23	23
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	19	19	16	16
		115		125	175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	13*	13*	11	11
		125		125	175 psi @ 130 F		Linear		VGF21LS30	13*	13*	11	11
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	13*	13*	11	11
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175	175	175	175
			Standard				Equal %		VGF21ES25				
			Pressure Balanced				Linear		VGF21LP25	175	175	175	175
			Standard				Linear		VGF21LS25				
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25				
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175	175	175	175
		115	Standard				Equal %		VGF21ES30				
		120	Pressure Balanced				Linear		VGF21LP30	175	175	175	175
		125	Standard				Linear		VGF21LS30				
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30				
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	27	27	23	23
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	25	25	21	21
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	34	34	29	29
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	27	27	23	23
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	34	34	29	29
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	27	27	23	23
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	13	13	11	11
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	17	17	14	14
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	22	22	19	19
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	13	13	11	11
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	22	22	19	19
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	13	13	11	11

*Requires 272629A adapter kit to provide upper stop for actuator torque switch

With Dedicated Valve Actuators

Actuator Features		Non-fail Safe			
Actuator O.S. Number		ML6420A3049	ML6420A3056	ML7421A1032	ML6421A1017
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	6 VA	6 VA	12 VA	11 VA
Actuator Torque	(lb.-in.)	135	135	404	404
Control	(0)2-10 Vdc			•	
	4-20 mA (external 500 Ohm Resistor)			•	
	Floating	•	•		•
	Two-Position SPDT	•	•		•
	Two-Position SPST				
	135 Ohm				
Fail Safe Action		Stay in place	Stay in place	Stay in place	Stay in place
Normal Position (no signal)	(field configurable)	Stem Up	Stem Up	Stem Up	Stem Up
Actuator Stroke	(inches)	0.75	0.75	0.75	0.75
Timing	(seconds at 0.75" stroke)	60	30	90	90
High Temperature Kit	Steam Application	43196000-001	43196000-001	43196000-001	43196000-001
Aux Switch	1 x SPDT Add-On				
	2 x SPDT Add-On	43191680-105	43191680-105	43191680-102	43191680-102
Feedback	2-10 Vdc Built In			•	
	2-10 Vdc Add-On				
	220 Ohm Add-On	43191679-112	43191679-112		43191679-101
	10 kOhm Add-On	43191679-111	43191679-111		

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	28	28	77	77
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	23	23		
					175 psi @ 130 F		Linear		VGF21LS25	23	23		
				250	400 psi @ 130 F		Equal %		VGF22ES25	23	23		
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	16	16	53	53
		115		125	175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES30	11	11		
		125		125	175 psi @ 130 F		Linear		VGF21LS30	11	11		
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	11	11		
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175	175	175	175
			Standard				Equal %		VGF21ES25			69	69
			Pressure Balanced				Linear		VGF21LP25	175	175	175	175
			Standard				Linear		VGF21LS25			69	69
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25			69	69
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175	175	175	175
		115	Standard				Equal %		VGF21ES30			34	34
		120	Pressure Balanced				Linear		VGF21LP30	175	175	175	175
		125	Standard				Linear		VGF21LS30			34	34
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30			34	34
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	23	23	77	77
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	21	21	77	77
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	29	29	87	87
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	23	23	69	69
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	29	29	87	87
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	23	23	69	69
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	11	11	53	53
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	14	14	53	53
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	19	19	58	58
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	11	11	34	34
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	19	19	58	58
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	11	11	34	34

Flanged Globe Valves 2½- 3"

With Dedicated Valve Actuators

Common Features

- ANSI body class 125 or 250
- Close-off pressure = Maximum differential pressure
- Maximum static water pressure: Up to 400 psi
- Maximum steam pressure (VGF, 2-pos or modulating): 100 psi
- Maximum steam pressure (V5011, 2-pos): 15 psi
- Stem travel: 0.75"
- Rangeability: 50:1
- Body material: Cast iron
- Body trim: Stainless steel stem, brass seat (V5011/13), stainless steel (VGF)

Actuator Features		Fail Safe			
Actuator O.S. Number		ML7425A3013	ML7425B3012	ML6425A3022	ML6425B3013
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	12 VA	12 VA	11 VA	11 VA
Actuator Torque	(lb.-in.)	135	135	135	135
Control	(0)2-10 Vdc	•	•		
	4-20 mA (external 500 Ohm Resistor)	•	•		
	Floating			•	•
	Two-Position SPDT			•	•
	Two-Position SPST			•	•
	135 Ohm				
Fail Safe Action		Stem Down (2-way N.C.)	Stem Up (2-way N.O.)	Stem Down (2-way N.C.)	Stem Up (2-way N.O.)
Normal Position (no signal)	(field configurable)	Stem Up	Stem Up	Stem Up	Stem Up
Actuator Stroke	(inches)	0.75	0.75	0.75	0.75
Timing	(seconds at 0.75" stroke)	90	90	90	90
High Temperature Kit	Steam Application	43196000-001	43196000-001	43196000-001	43196000-001
Aux Switch	1 x SPDT Add-On				
	2 x SPDT Add-On	43191680-105	43191680-105	43191680-105	43191680-105
Feedback	2-10 Vdc Built In	•	•		
	2-10 Vdc Add-On				
	220 Ohm Add-On	43191679-112	43191679-112	43191679-112	43191679-112
	10 kOhm Add-On	43191679-111	43191679-111	43191679-111	43191679-111

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	2-1/2"	63	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	28	28	28	28
		70			175 psi @ 130 F	125 psig / 353 F	Equal %		VGF21ES25	23	23	23	23
					175 psi @ 130 F		Linear		VGF21LS25	23	23	23	23
				250	400 psi @ 130 F		Equal %		VGF22ES25	23	23	23	23
	3"	100		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1767	16	16	16	16
		115		125	175 psi @ 130 F		Equal %		VGF21ES30	11	11	11	11
		125		125	175 psi @ 130 F	125 psig / 353 F	Linear		VGF21LS30	11	11	11	11
		120		250	400 psi @ 130 F		Equal %		VGF22ES30	11	11	11	11
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	2-1/2"	70	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP25	175	175	175	175
			Standard				Equal %		VGF21ES25				
			Pressure Balanced				Linear		VGF21LP25	175	175	175	175
			Standard				Linear		VGF21LS25				
			Standard	250	400 psi @ 130 F		Equal %		VGF22ES25	23	23	23	23
	3"	115	Pressure Balanced	125	175 psi @ 130 F		Equal %		VGF21EP30	175	175	175	175
		115	Standard				Equal %		VGF21ES30				
		120	Pressure Balanced				Linear		VGF21LP30	175	175	175	175
		125	Standard				Linear		VGF21LS30				
		120	Standard	250	400 psi @ 130 F		Equal %		VGF22ES30				
3-Way Water Valves	2-1/2"	63	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1003	21	21	21	21
		63	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1001	21	21	21	21
		70	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM25	29	29	29	29
			Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD25	23	23	23	23
			Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM25	29	29	29	29
			Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	23	23	23	23
	3"	100	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1011	14	14	14	14
		100	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1019	14	14	14	14
		120	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM30	19	19	19	19
		120	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD30	11	11	11	11
		115	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM30	19	19	19	19
		120	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	11	11	11	11

Notes

Flanged Globe Valves 4"-6"

With Tandem Direct Coupled Actuators and Valve Linkage

Common Features

- Stem travel: 1.5"
- Rangeability: 50:1
- Body material: Cast iron
- Seat Material: Bronze (V5011/13), Stainless Steel (VGF)
- Stem Material: Stainless Steel
- Normal position field configurable to stem up or stem down

Q5022B1009 Required***

Actuator Features		Non-fail Safe			
Actuator O.S. Number (Two Actuators per valve/linkage)		MN7220A2007	MN6120A1002	MN72342008	MN6134A1003
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac
	Frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Power	6 VA	6 VA	9 VA	9 VA
Actuator Torque	(lb.-in.)	175	175	300	300
Linkage Stem Force, Two Actuators	(lbs.)	325	325	555	555
Control	(0)2-10 Vdc	•		•	
	4-20 mA (external 500 Ohm Resistor)	•		•	
	Floating	•	•	•	•
	Two-Position SPDT	•	•	•	•
	Two-Position SPST	•	•	•	
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(inches)	1.5	1.5	1.5	1.5
Timing	(seconds)	95	95	95	95
Aux Switch	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US	SW2-US
	2 x SPDT Built In				
Feedback	(0)2-10 Vdc Built In	•		•	

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid			
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	4"	160	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1858	20	20	34	34
		160			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1013	20	20	34	34
		150			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES40	27	27	47	47
		155			175 psi @ 130 F		Linear		VGF21LS40	27	27	47	47
		150		250	400 psi @ 130 F		Equal %		VGF22ES40	27	27	47	47
	5"	250		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1882	16	16	28	28
		250			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1047	16	16	28	28
		285			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES50	11	11	18	18
		320			175 psi @ 130 F		Linear		VGF21LS50	11	11	18	18
		320		250	400 psi @ 130 F		Equal %		VGF22ES50	11	11	18	18
	6"	360		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1916	11	11	19	19
		360			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1070	11	11	19	19
		365			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES60	11	11	18	18
		370			175 psi @ 130 F		Linear		VGF21LS60	11	11	18	18
		370		250	400 psi @ 130 F		Equal %		VGF22ES60	11	11	18	18
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	4"	150	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP40	175	175	175**	175**
		150					Linear		VGF21LP40	175	175	175**	175**
	5"	285					Equal %		VGF21EP50	175	175	175**	175**
		320					Linear		VGF21LP50	175	175	175**	175**
	6"	365					Equal %		VGF21EP60	175	175	175**	175**
		370					Linear		VGF21LP60	175	175	175**	175**
3-Way Water Valves	4"	160	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1029	20	20	34	34
		160	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1027	20	20	34	34
		150	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM40	27	27	47	47
		160	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD40	27	27	47	47
		170	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM40	27	27	47	47
		160	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD40	27	27	47	47
	5"	250	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1037	16	16	28	28
		250	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1035	16	16	28	28
		320	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM50	11	11	18	18
		285	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD50	11	11	18	18
		320	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM50	11	11	18	18
		285	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD50	11	11	18	18
	6"	360	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1045	11	11	19	19
		360	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1043	11	11	19	19
		370	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM60	11	11	18	18
		380	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD60	11	11	18	18
		370	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM60	11	11	18	18
		380	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD60	11	11	18	18

**Only requires single actuator

***Q5022B linkage compatible with VGF valves with 7/16-20UNF stem thread (Manufactured after June, 2005)

With Tandem Direct Coupled Actuators and Valve Linkage

Q5022B1009 Required***

Actuator Features		Fail Safe		
Actuator O.S. Number (Two Actuators per valve/linkage)		MS7520A2007 MS7520A2205	MS8120A1007	MS4120A1001
Power Supply	Voltage	24 Vac	24 Vac	100-250 Vac
	Frequency	60 Hz	60 Hz	60 Hz
	Power	16 VA	40 VA	60 VA
Actuator Torque	(lb.-in.)	175	175	175
Linkage Stem Force, Two Actuators	(lbs.)	325	325	325
Control	(0)2-10 Vdc	•		
	4-20 mA (external 500 Ohm Resistor)	•		
	Floating	•		
	Two-Position SPDT	•		
	Two-Position SPST	•	•	•
Fail Safe Action		Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up/Down	Stem Up/Down	Stem Up/Down
Actuator Stroke	(inches)	1.5	1.5	1.5
Timing	(seconds)	90	90	90
Aux Switch	2 x SPDT Add-On	SW2-US	SW2-US	SW2-US
	2 x SPDT Built In	0 / 2		
Feedback	(0)2-10 Vdc Built In	•		

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid		
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	4"	160	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1858	20	20	20
		160			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1013	20	20	20
		150			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES40	27	27	27
		155			175 psi @ 130 F		Linear		VGF21LS40	27	27	27
		150		250	400 psi @ 130 F		Equal %		VGF22ES40	27	27	27
	5"	250		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1882	16	16	16
		250			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1047	16	16	16
		285			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES50	11	11	11
		320			175 psi @ 130 F		Linear		VGF21LS50	11	11	11
		320		250	400 psi @ 130 F		Equal %		VGF22ES50	11	11	11
	6"	360		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1916	11	11	11
		360			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1070	11	11	11
		365			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES60	11	11	11
		370			175 psi @ 130 F		Linear		VGF21LS60	11	11	11
		370		250	400 psi @ 130 F		Equal %		VGF22ES60	11	11	11
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	4"	150	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP40	175	175	175
		150					Linear		VGF21LP40	175	175	175
	5"	285					Equal %		VGF21EP50	175	175	175
		320					Linear		VGF21LP50	175	175	175
	6"	365					Equal %		VGF21EP60	175	175	175
		370					Linear		VGF21LP60	175	175	175
3-Way Water Valves	4"	160	Mixing	125	150 psi @ 240 F	N / A	Constant Total	Stem up closes A-AB	V5013B1029	20	20	20
		160	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1027	20	20	20
		150	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM40	27	27	27
		160	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD40	27	27	27
		170	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM40	27	27	27
		160	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD40	27	27	27
	5"	250	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1037	16	16	16
		250	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1035	16	16	16
		320	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM50	11	11	11
		285	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD50	11	11	11
		320	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM50	11	11	11
		285	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD50	11	11	11
	6"	360	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1045	11	11	11
		360	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1043	11	11	11
		370	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM60	11	11	11
		380	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD60	11	11	11
		370	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM60	11	11	11
		380	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD60	11	11	11

***Q5022B linkage compatible with VGF valves with 7/16-20UNF stem thread (Manufactured after June, 2005)

Flanged Globe Valves 4"-6"

With Dedicated Valve Actuators

Common Features

- ANSI body class 125 or 250
- Close-off pressure = Maximum differential pressure
- Maximum static water pressure: Up to 400 psi
- Maximum steam pressure (VGF, 2-pos or modulating): 100 psi
- Maximum steam pressure (V5011, 2-pos): 15 psi
- Stem travel: 1.5"
- Rangeability: 50:1
- Leakage < 0.05% of Cv
- Body material: Cast iron
- Body trim: Stainless steel stem, brass seat (V5011/13), stainless steel seat (VGF)

Actuator Features		Non-fail Safe	
Actuator O.S. Number		**ML7421B1023**	**ML6421B1040**
Power Supply	Voltage	24 Vac	24 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz
	Power	12 VA	11 VA
Actuator Torque	(lb.-in.)	404	404
Control	(0)2-10 Vdc	•	
	4-20 mA (external 500 Ohm Resistor)	•	
	Floating		•
	Two-Position SPDT		•
Fail Safe Action		Stay in Place	Stay in Place
Normal Position (no signal)	(field configurable)	Stem Up	Stay in Place
Actuator Stroke	(inches)	1.5	1.5
Stroke Timing	(seconds)	175	175
High Temperature Kit	Steam Application	43196000-038	43196000-038
Aux Switch	2 x SPDT (24 Vac) (add-on)	43191680-102	43191680-102
Feedback	1 x 220 Ohm Potentiometer (add-on)		43191679-102
	2-10 Vdc (built in)	•	

	Valve Size (inches)	Cv	Valve Type	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid	
2-Way Water & Steam Valves ANSI Class III (< 0.05% Cv) Seat Leakage	4"	160	Standard	125	150 psi @ 240 F	15 psi (2-position)	Equal %	Stem down to close	V5011A1858	29	29
		160			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1013	29	29
		150			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES40	34	34
		155			175 psi @ 130 F		Linear		VGF21LS40	34	34
		150		250	400 psi @ 130 F		Equal %		VGF22ES40	34	34
	5"	250		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1882	18	18
		250			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1047	18	18
		285			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES50	13	13
		320			175 psi @ 130 F		Linear		VGF21LS50	13	13
		320		250	400 psi @ 130 F		Equal %		VGF22ES50	13	13
	6"	360		125	150 psi @ 240 F	15 psi (2-position)	Equal %		V5011A1916	12	12
		360			150 psi @ 240 F	15 psi (2-position)	Equal %	Stem up to close	V5011B1070	12	12
		365			175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21ES60	13	13
		370			175 psi @ 130 F		Linear		VGF21LS60	13	13
		370		250	400 psi @ 130 F		Equal %		VGF22ES60	13	13
2-Way Water & Steam Valves ANSI Class IV (< 0.01% Cv) Seat Leakage	4"	150	Pressure Balanced	125	175 psi @ 130 F	125 psig / 353 F	Equal %	Stem down to close	VGF21EP40	175	175
		150					Linear		VGF21LP40	175	175
	5"	285					Equal %		VGF21EP50	175	175
		320					Linear		VGF21LP50	175	175
	6"	365					Equal %		VGF21EP60	175	175
		370					Linear		VGF21LP60	175	175
3-Way Water Valves	4"	160	Mixing	125	150 psi @ 240 F	N/A	Constant Total	Stem up closes A-AB	V5013B1029	29	29
		160	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1027	29	29
		150	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM40	34	34
		160	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD40	34	34
		170	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM40	34	34
		160	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD40	34	34
	5"	250	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1037	18	18
		250	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1035	18	18
		320	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM50	13	13
		285	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD50	13	13
		320	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM50	13	13
		285	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD50	13	13
	6"	360	Mixing	125	150 psi @ 240 F		Constant Total	Stem up closes A-AB	V5013B1045	12	12
		360	Diverting		150 psi @ 240 F		Constant Total	Stem up closes B-AB	V5013C1043	12	12
		370	Mixing		175 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF31EM60	13	13
		380	Diverting		175 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF31LD60	13	13
		370	Mixing	250	400 psi @ 130 F		Equal % A-AB	Stem up closes A-AB	VGF32EM60	13	13
		380	Diverting	250	400 psi @ 130 F		Linear, Constant Total	Stem up closes B-AB	VGF32LD60	13	13

The V5051 series advantage lies in its ability to perform like a globe valve while achieving high close-off pressures with a single spring return actuator. This premium valve delivers a high close-off using a single spring return actuator on all valves up to 6". It is highly suitable for medium-pressure steam applications.

Common Features

- Pressure balanced design for high close-off
- Close-off pressure = Maximum differential pressure
- ANSI body class 125
- Stem travel 1.5”
- Body material: Cast iron
- Body valve trim: Stainless steel
- Leakage: 0.01% Cv 2.5”-4” and 0.03% Cv 5”-6”
- Max static water pressure: 150 psi
- Max static steam pressure: 55 psi
- Flow characteristic: Modified linear

Q5020C1009 Required

Actuator Features		Non-fail Safe		Fail Safe		
Actuator O.S. Number		MN6120A1002 MN6120A1200	MN7220A2007 MN7220A2205	MS7520A2007 MS7520A2205 MS7520H2208	MS8120A1007 MS8120A1205	MN4120A1001 MS4120A1209
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	100-250 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	60 Hz
	Power	6 VA	6 VA	16 VA	40 VA	60 VA
Actuator Torque	(lbs.)	175	175	175	175	175
Control	(0)2-10 Vdc		•	•		
	4-20 mA (external 500 Ohm Resistor)		•	•		
	Floating	•	•	•		
	Two-Position SPDT	•	•	•		
	Two-Position SPST		•	•	•	•
Fail Safe Action		Stay-in-Place	Stay-in-Place	Configurable Open/Closed	Configurable Open/Closed	Configurable Open/Closed
Normal Position (no signal)	(field configurable)	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up
Linkage Stroke	(inches)	1.5	1.5	1.5	1.5	1.5
Stroke Timing	(seconds)	95	95	90	90	90
High Temperature Kit	Steam Application					
Aux Switch	2 x SPDT (built in)	0 / 2	0 / 2	0 / 2 / 2	0 / 2	0 / 2
	2 x SPDT (add-on)	SW2-US	SW2-US	SW2-US	SW2-US	SW2-US
Feedback	2-10 Vdc (built in)		•	•		

2-Way Water & Steam Valves

Valve Size (inches)	Cv	ANSI Class	Max Static Water Pressure	Max Steam Pressure / Temperature	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure, psid				
2 1/2"	75	125	150 psi @ 100 F	55 psig / 300 F	Modified Linear	Stem down to close	V5051A3004	150	150	150	150	150
3"	116						V5051A3012	150	150	150	150	150
4"	178						V5051A3020	150	150	150	150	150
5"	318						V5051A3038	150	150	150	150	150
6"	390						V5051A3046	150	150	150	150	150

NPT Globe Valves ½- 3"

With Pneumatic Actuators

Common Features

- Rolling diaphragm for long life and low hysteresis
- Easily installation and attachment to the valve
- Direct or reverse acting
- No positive positioner

Actuator Features		Without Positive Positioner										
Actuator O.S. Number		MP953C1000	MP953C1018	MP953C1026	MP953C1067	MP953C1075	MP953C1083	MP953C1554	MP953C1562	MP953D1107	MP953D1131	MP953D1172
Direct / Reverse Acting	DA / RA	DA	DA	DA	DA	DA	DA	DA	DA	RA	RA	RA
Diaphragm Size		5"	5"	5"	8"	8"	8"	13"	13"	7-1/8"	7-1/8"	7-1/8"
Fail Safe Action		Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Down	Stem Down	Stem Down
Positioner	10psi span	N/A										
	5psi span											
	3psi span											

2-Way Water Valves Straight Through

2-Way Steam Valves Straight Through

3-Way Water Valves Mixing

Valve Size (inches)	Cv	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure - See Charts On Page 60-61									
	2.9	Equal %	Stem up to close	V5011N3004	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC	N/A	C-NO	C-NO	C-NO
1/2"	4.7			V5011N3012	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
3/4"	7.3			V5011N3020	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
1"	11.7			V5011N3038	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
1-1/4"	18.7			V5011N3046	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
1/2"	0.73		Stem down to close	V5011N1008	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1/2"	1.16			V5011N1016	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1/2"	1.85			V5011N1024	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1/2"	2.9			V5011N1032	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1/2"	4.7			V5011N1040	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
3/4"	7.3			V5011N1057	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1"	11.7			V5011N1065	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1-1/4"	18.7			V5011N1073	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
1-1/2"	29.3			V5011N1081	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
2"	46.8			V5011N1099	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
2-1/2"	63			V5011F1105	L-NO	L-NO	L-NO	L-NO	L-NO	L-NO		G-NC	G-NC	G-NC
3"	100			V5011F1113	L-NO	L-NO	L-NO	L-NO	L-NO	L-NO		G-NC	G-NC	G-NC
1/2"	0.73	Linear	Stem down to close	V5011N2006	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO	N/A	D*-NC	D*-NC	D*-NC
1/2"	1.16			V5011N2014	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
1/2"	1.85			V5011N2022	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
1/2"	2.9			V5011N2030	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
1/2"	4.7			V5011N2048	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
3/4"	7.3			V5011N2055	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
1"	11.7			V5011N2063	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
1-1/4"	18.7			V5011N2071	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
1-1/2"	29.3			V5011N2089	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
2"	46.8			V5011N2097	F*-NO	F*-NO	F*-NO	E*-NO	E*-NO	E*-NO		D*-NC	D*-NC	D*-NC
2-1/2"	63			V5011G1111	L*-NO	L*-NO	L*-NO	L*-NO	L*-NO	L*-NO		G*-NC	G*-NC	G*-NC
3"	100			V5011G1129	L*-NO	L*-NO	L*-NO	L*-NO	L*-NO	L*-NO		G*-NC	G*-NC	G*-NC
1/2"	2.9	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC	N/A	K-NC	K-NC	K-NC
1/2"	4.7			V5013N1048	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
3/4"	7.3			V5013N1055	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
1"	11.7			V5013N1063	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
1-1/4"	18.7			V5013N1071	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
1-1/2"	29.3			V5013N1089	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
2"	46.8			V5013N1097	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC

*The close-off pressure not to exceed rated pressure of steam valve
NC = Normally Closed
NO = Normally Open

With Pneumatic Actuators

Common Features

- Rolling diaphragm for long life and low hysteresis
- Easily installation and attachment to the valve
- Direct or reverse acting
- Integrated positive positioner

Actuator Features		With Positive Positioner										
Actuator O.S. Number		MP953E1301	MP953E1319	MP953E1327	MP953E1368	MP953E1376	MP953E1384	MP953E1435	MP953E1443	MP953F1093	MP953F1101	MP953F1119
Direct / Reverse Acting	DA / RA	DA	DA	DA	DA	DA	DA	DA	DA	RA	RA	RA\
Diaphragm Size		5"	5"	5"	8"	8"	8"	13"	13"	7-1/8"	7-1/8"	7-1/8"
Fail Safe Action		Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Down	Stem Down	Stem Down
Positioner	10psi span			•			•		•			•
	5psi span		•			•		•			•	
	3psi span	•			•					•		

	Valve Size (inches)	Cv	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure - See Charts On Page 60-61									
2-Way Water Valves Straight Through		2.9	Equal %	Stem up to close	V5011N3004	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC	N/A	C-NO	C-NO	C-NO
	1/2"	4.7			V5011N3012	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
	3/4"	7.3			V5011N3020	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
	1"	11.7			V5011N3038	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
	1-1/4"	18.7			V5011N3046	A-NC	A-NC	A-NC	B-NC	B-NC	B-NC		C-NO	C-NO	C-NO
	1/2"	0.73		Stem down to close	V5011N1008	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1/2"	1.16			V5011N1016	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1/2"	1.85			V5011N1024	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1/2"	2.9			V5011N1032	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1/2"	4.7			V5011N1040	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	3/4"	7.3			V5011N1057	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1"	11.7			V5011N1065	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1-1/4"	18.7			V5011N1073	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	1-1/2"	29.3			V5011N1081	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	2"	46.8			V5011N1099	F-NO	F-NO	F-NO	E-NO	E-NO	E-NO		D-NC	D-NC	D-NC
	2-1/2"	63			V5011F1105								G-NC	G-NC	G-NC
	3"	100			V5011F1113								G-NC	G-NC	G-NC
2-Way Steam Valves Straight Through	1/2"	0.73	Linear	Stem down to close	V5011N2006	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO	N/A	D*-NC	D*-NC	D*-NC
	1/2"	1.16			V5011N2014	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	1/2"	1.85			V5011N2022	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	1/2"	2.9			V5011N2030	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	1/2"	4.7			V5011N2048	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	3/4"	7.3			V5011N2055	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	1"	11.7			V5011N2063	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	1-1/4"	18.7			V5011N2071	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	1-1/2"	29.3			V5011N2089	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	2"	46.8			V5011N2097	F**-NO	F**-NO	F**-NO	E**-NO	E**-NO	E**-NO		D*-NC	D*-NC	D*-NC
	2-1/2"	63			V5011G1111								G*-NC	G*-NC	G*-NC
	3"	100			V5011G1129								G*-NC	G*-NC	G*-NC
3-Way Water Valves Mixing	1/2"	2.9	Linear B-AB / Equal % A-AB	Stem up closes A-AB	V5013N1030	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC	N/A	K-NC	K-NC	K-NC
	1/2"	4.7			V5013N1048	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
	3/4"	7.3			V5013N1055	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
	1"	11.7			V5013N1063	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
	1-1/4"	18.7			V5013N1071	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
	1-1/2"	29.3			V5013N1089	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC
	2"	46.8			V5013N1097	H-NC	H-NC	H-NC	J-NC	J-NC	J-NC		K-NC	K-NC	K-NC

*The close-off pressure not to exceed rated pressure of steam valve
**The close-off pressure not to exceed rated pressure of steam valve. Use 4-11 spring range for positive positioner models.
NC = Normally Closed
NO = Normally Open

Close-off Pressure Charts

Chart A

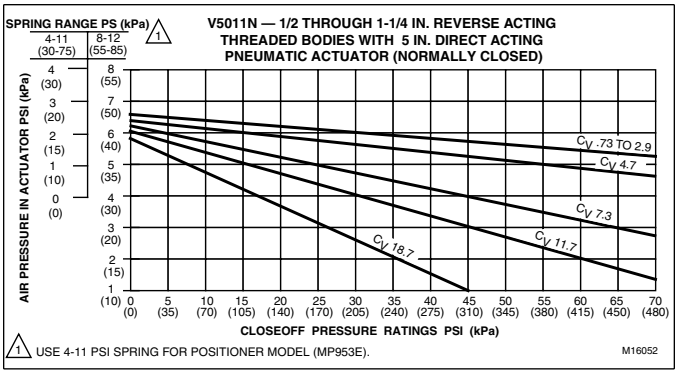


Chart B

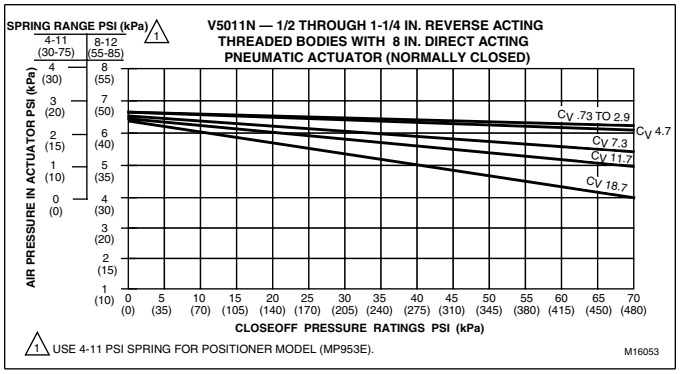


Chart E

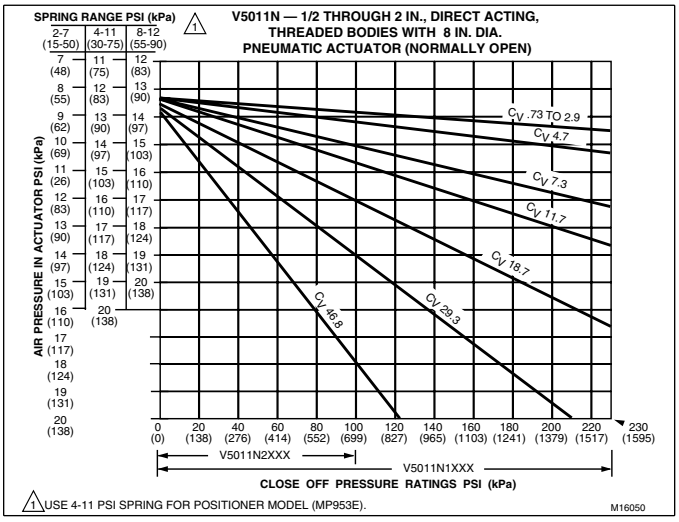


Chart F

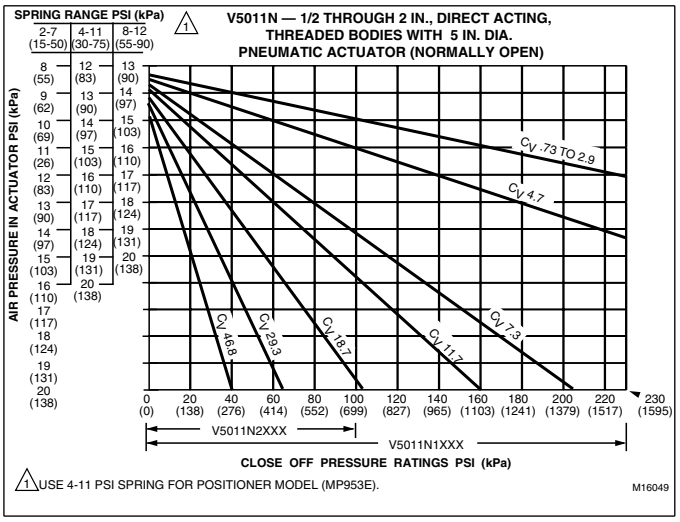


Chart J

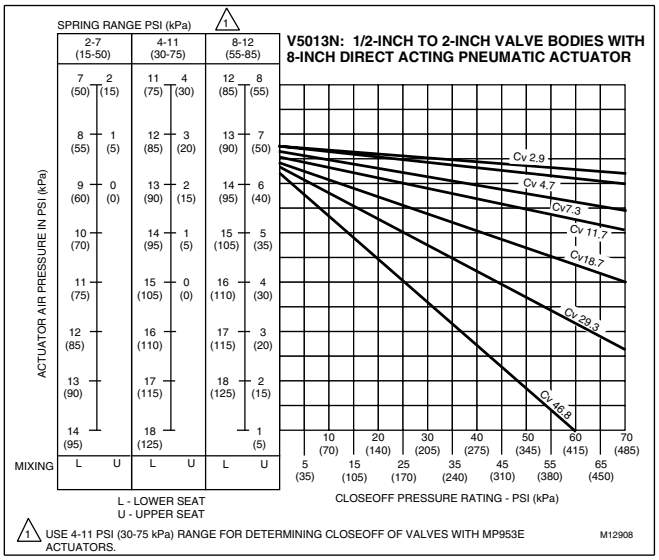
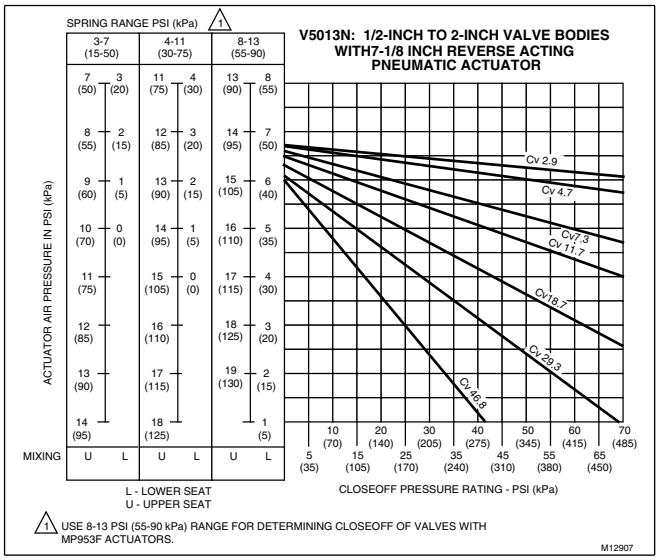


Chart K



Close-off Pressure Charts

Chart C

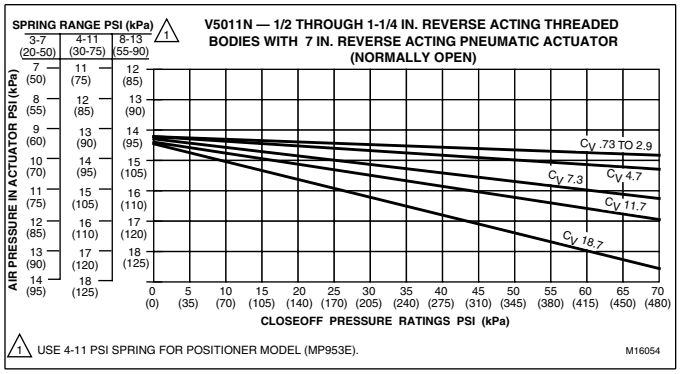


Chart D

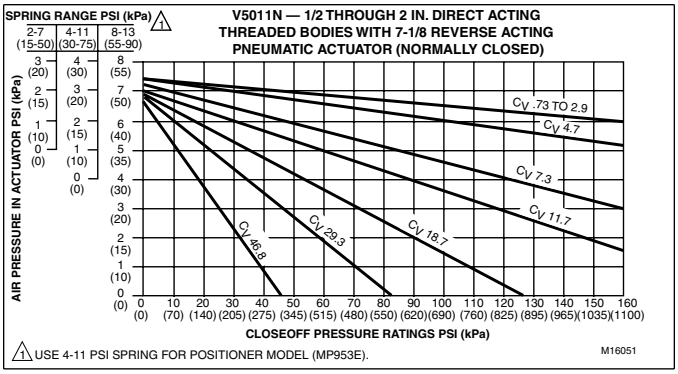


Chart G

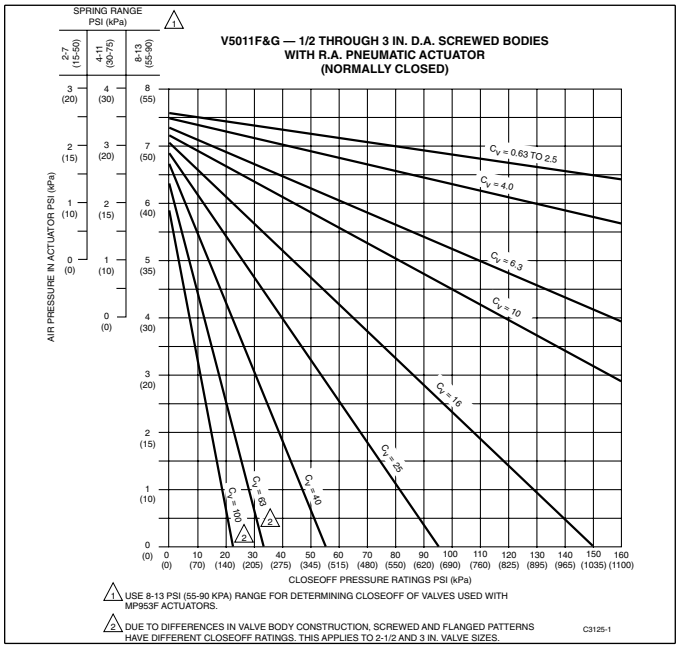


Chart H

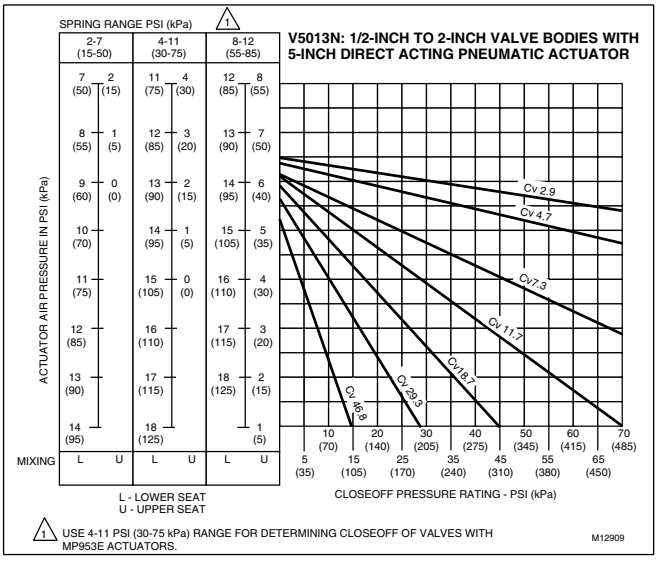
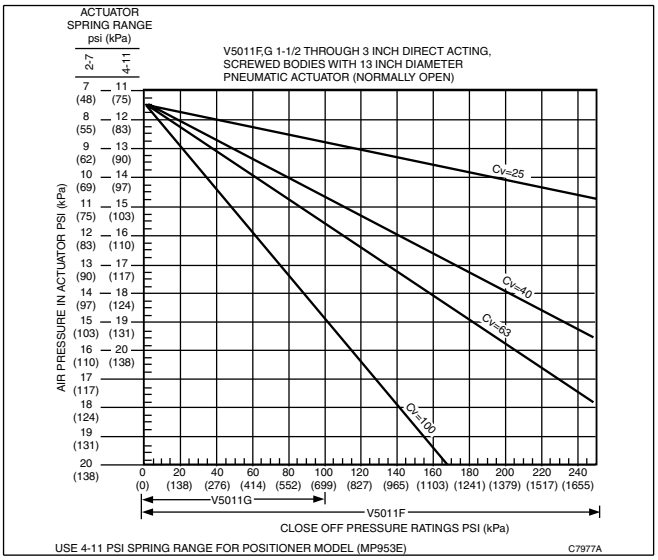


Chart L



Flanged Globe Valves 2½- 3"

With Pneumatic Actuators

Common Features

- Rolling diaphragm for long life and low hysteresis
- Easily installation and attachment to the valve
- Direct or reverse acting
- No positive positioner

Actuator Features		Without Positive Positioner							
Actuator O.S. Number		MP953C1067	MP953C1075	MP953C1083	MP953C1554	MP953C1562	MP953D1107	MP953D1131	MP953D1172
Direct / Reverse Acting	DA / RA	DA	DA	DA	DA	DA	RA	RA	RA
Diaphragm Size		8"	8"	8"	13"	13"	7-1/8"	7-1/8"	7-1/8"
Fail Safe Action		Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Down	Stem Down	Stem Down
Positioner	10psi span								
	5psi span								
	3psi span								

	Valve Size (inches)	Cv	Valve Type	Max Static Water Pressure	ANSI Class	Max Steam Pressure	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure - See Charts On Page 55							
2-Way Water & Steam Valves	2-1/2"	63	Standard	250 psi	125	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	M*-NO	M*-NO	M*-NO	P*-NO	P*-NO	N*-NC	N*-NC	N*-NC
		70	Pressure Balanced	175 psi		125 psig / 353 F	Equal %		VGF21EP25	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		70	Standard				Equal %		VGF21ES25	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		72	Pressure Balanced				Linear		VGF21LP25	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		70	Standard				Linear		VGF21LS25	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		70	Standard	400 psi	250		Equal %		VGF22ES25	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
	3"	100	Standard	250 psi	125	15 psi (2-position)	Equal %		V5011A1767	M*-NO	M*-NO	M*-NO	P*-NO	P*-NO	N*-NC	N*-NC	N*-NC
		115	Pressure Balanced	175 psi		125 psig / 353 F	Equal %		VGF21EP30	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		115	Standard				Equal %		VGF21ES30	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		120	Pressure Balanced				Linear		VGF21LP30	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		125	Standard				Linear		VGF21LS30	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
		120	Standard	400 psi	250		Equal %		VGF22ES30	L*-NO	L*-NO	L*-NO	O*-NO	O*-NO	R*-NC	R*-NC	R*-NC
3-Way Water Valves	2-1/2"	63	Mixing	250 psi	125	N/A	Constant Total	Stem up closes A-AB	V5013B1003	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		63	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1001	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		70	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		70	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		70	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		70	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
	3"	100	Mixing	250 psi	125		Constant Total	Stem up closes A-AB	V5013B1011	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		100	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1019	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		120	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		120	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		115	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		120	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO

*The close-off pressure not to exceed rated pressure of steam valve
NC = Normally Closed
NO = Normally Open

With Pneumatic Actuators

Common Features

- Rolling diaphragm for long life and low hysteresis
- Easily installation and attachment to the valve
- Direct or reverse acting
- Integrated positive positioner

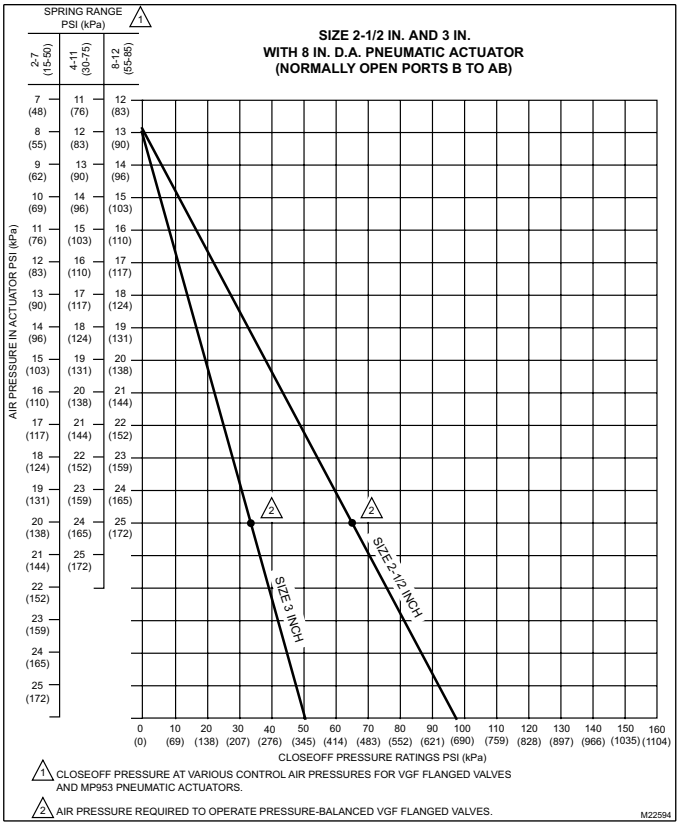
Actuator Features		With Positive Positioner							
Actuator O.S. Number		MP953E1368	MP953E1376	MP953E1384	MP953E1435	MP953E1443	MP953F1093	MP953F1101	MP953F1119
Direct / Reverse Acting	DA / RA	DA	DA	DA	DA	DA	RA	RA	RA\
Diaphragm Size		8"	8"	8"	13"	13"	7-1/8"	7-1/8"	7-1/8"
Fail Safe Action		Stem Up	Stem Up	Stem Up	Stem Up	Stem Up	Stem Down	Stem Down	Stem Down
Positioner	10psi span			•		•			•
	5psi span		•		•			•	
	3psi span	•					•		

	Valve Size (inches)	Cv	Valve Type	Max Static Water Pressure	ANSI Class	Max Steam Pressure	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure - See Charts On Page 57							
2-Way Water & Steam Valves	2-1/2"	63	Standard	250 psi	125	15 psi (2-position)	Equal %	Stem down to close	V5011A1734	M**-NO	M**-NO	M**-NO	P**-NO	P**-NO	N**-NC	N**-NC	N**-NC
		70	Pressure Balanced	175 psi		125 psig / 353 F	Equal %		VGF21EP25	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		70	Standard				Equal %		VGF21ES25	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		72	Pressure Balanced				Linear		VGF21LP25	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		70	Standard				Linear		VGF21LS25	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		70	Standard	400 psi	250		Equal %		VGF22ES25	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
	3"	100	Standard	250 psi	125	15 psi (2-position)	Equal %		V5011A1767	M**-NO	M**-NO	M**-NO	P**-NO	P**-NO	N**-NC	N**-NC	N**-NC
		115	Pressure Balanced	175 psi		125 psig / 353 F	Equal %		VGF21EP30	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		115	Standard				Equal %		VGF21ES30	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		120	Pressure Balanced				Linear		VGF21LP30	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		125	Standard				Linear		VGF21LS30	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
		120	Standard	400 psi	250		Equal %		VGF22ES30	L**-NO	L**-NO	L**-NO	O**-NO	O**-NO	R**-NC	R**-NC	R**-NC
3-Way Water Valves	2-1/2"	63	Mixing	250 psi	125	N/A	Constant Total	Stem up closes A-AB	V5013B1003	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		63	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1001	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		70	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		70	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		70	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		70	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD25	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
	3"	100	Mixing	250 psi	125		Constant Total	Stem up closes A-AB	V5013B1011	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		100	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1019	S-NC	S-NC	S-NC	T-NC	T-NC	U-NO	U-NO	U-NO
		120	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		120	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		115	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO
		120	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD30	L-NC	L-NC	L-NC	O-NC	O-NC	R-NO	R-NO	R-NO

*The close-off pressure not to exceed rated pressure of steam valve
**The close-off pressure not to exceed rated pressure of steam valve. Use 4-11 spring range for positive positioner models.
NC = Normally Closed
NO = Normally Open

Close-off Pressure Charts

Chart L

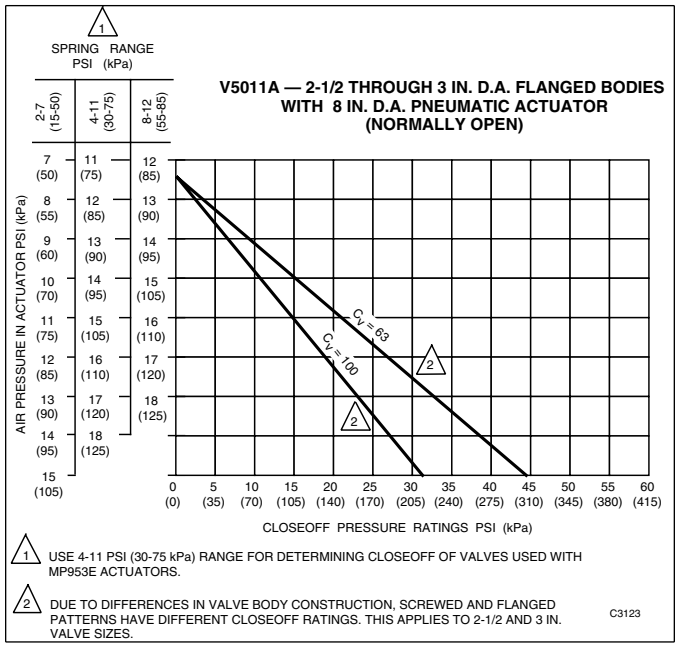


1 CLOSEOFF PRESSURE AT VARIOUS CONTROL AIR PRESSURES FOR VGF FLANGED VALVES AND MP953 PNEUMATIC ACTUATORS.

2 AIR PRESSURE REQUIRED TO OPERATE PRESSURE-BALANCED VGF FLANGED VALVES.

M22594

Chart M

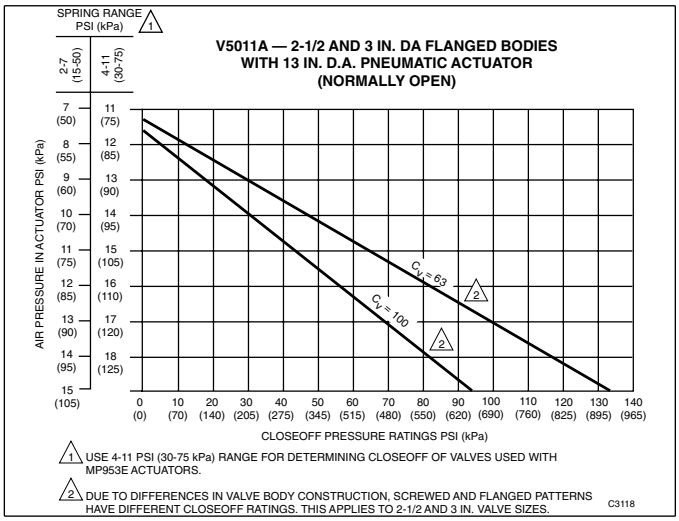


1 USE 4-11 PSI (30-75 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES USED WITH MP953E ACTUATORS.

2 DUE TO DIFFERENCES IN VALVE BODY CONSTRUCTION, SCREWED AND FLANGED PATTERNS HAVE DIFFERENT CLOSEOFF RATINGS. THIS APPLIES TO 2-1/2 AND 3 IN. VALVE SIZES.

C3123

Chart P

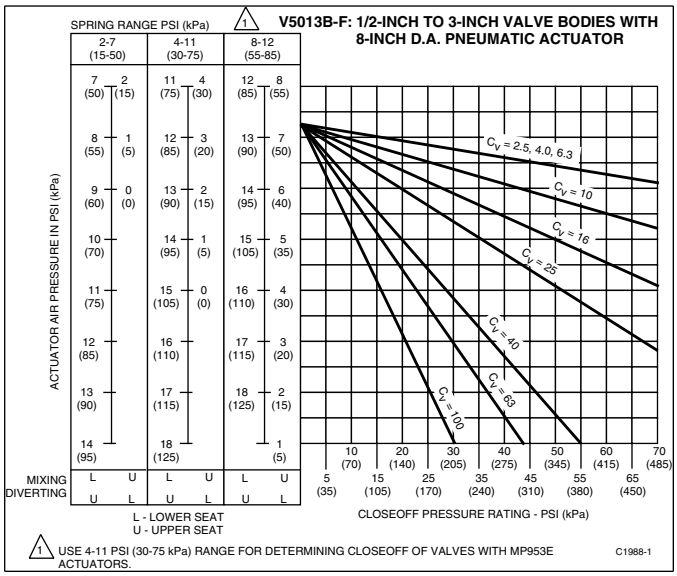


1 USE 4-11 PSI (30-75 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES USED WITH MP953E ACTUATORS.

2 DUE TO DIFFERENCES IN VALVE BODY CONSTRUCTION, SCREWED AND FLANGED PATTERNS HAVE DIFFERENT CLOSEOFF RATINGS. THIS APPLIES TO 2-1/2 AND 3 IN. VALVE SIZES.

C3118

Chart S

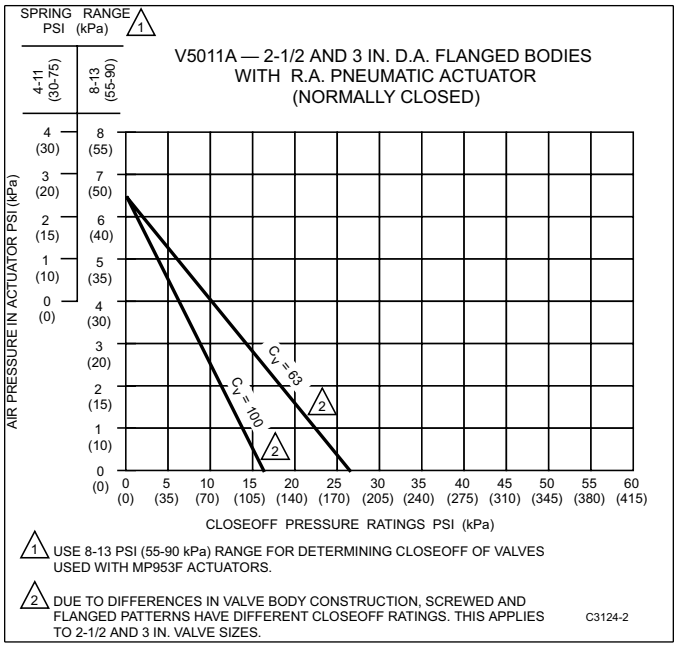


1 USE 4-11 PSI (30-75 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES WITH MP953E ACTUATORS.

C1988-1

Close-off Pressure Charts

Chart N

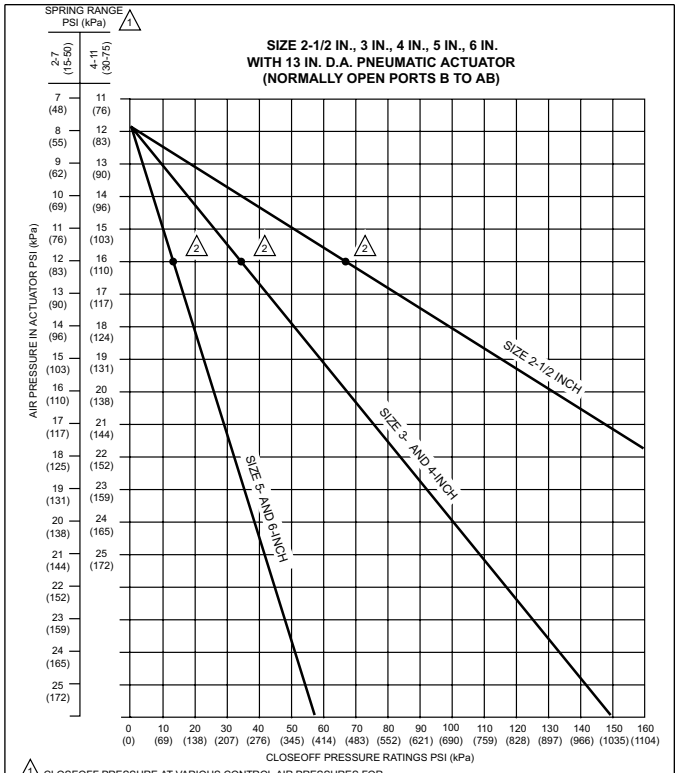


1 USE 8-13 PSI (55-90 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES USED WITH MP953F ACTUATORS.

2 DUE TO DIFFERENCES IN VALVE BODY CONSTRUCTION, SCREWED AND FLANGED PATTERNS HAVE DIFFERENT CLOSEOFF RATINGS. THIS APPLIES TO 2-1/2 AND 3 IN. VALVE SIZES.

C3124-2

Chart O

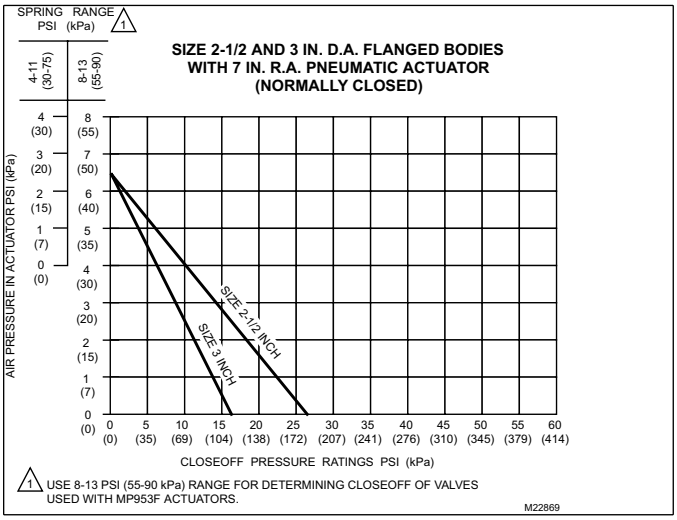


1 CLOSEOFF PRESSURE AT VARIOUS CONTROL AIR PRESSURES FOR VGF FLANGED VALVES AND MP953 PNEUMATIC ACTUATORS.

2 AIR PRESSURE REQUIRED TO OPERATE PRESSURE-BALANCED VGF VALVES.

M22595

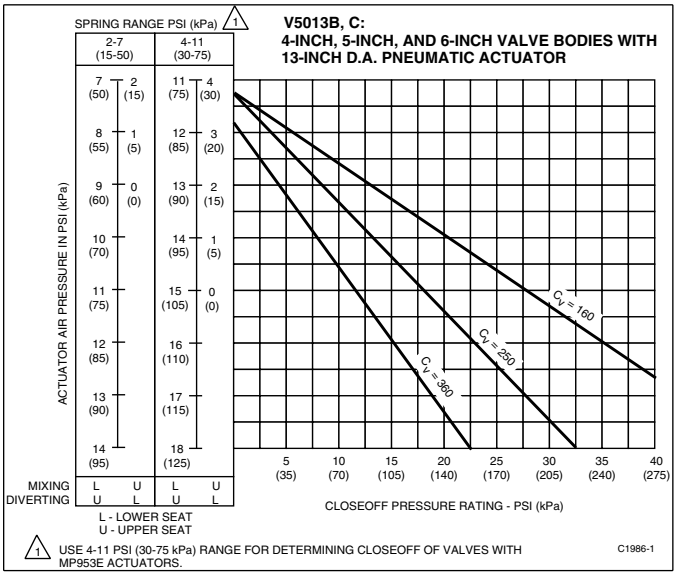
Chart R



1 USE 8-13 PSI (55-90 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES USED WITH MP953F ACTUATORS.

M22869

Chart T

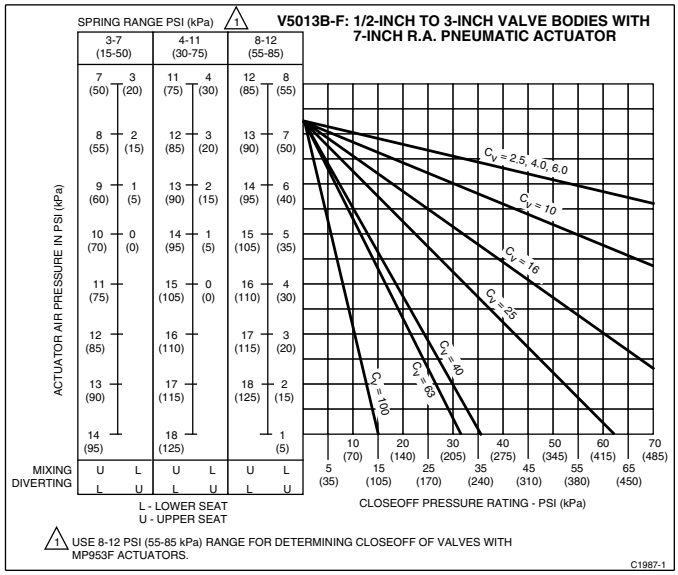


L - LOWER SEAT
U - UPPER SEAT

1 USE 4-11 PSI (30-75 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES WITH MP953E ACTUATORS.

C1986-1

Chart U



L - LOWER SEAT
U - UPPER SEAT

1 USE 8-12 PSI (55-85 kPa) RANGE FOR DETERMINING CLOSEOFF OF VALVES WITH MP953F ACTUATORS.

C1987-1

Flanged Globe Valves 4"-6"

With Pneumatic Actuators

Common Features

- Rolling diaphragm for long life and low hysteresis
- Easily installation and attachment to the valve
- Direct or reverse acting

Actuator Features	Without Positive Positioner			With Positive Positioner		
Actuator .S. Number	MP953C1471	MP953C1489	MP953C1547	MP953E1285	MP953E1400	MP953E1418
Diaphragm	13"	13"	8"	8"	13"	13"
Action	DA	DA	DA	DA	DA	DA
Spring Range	2-7psi	4-11psi	3-15psi	4-11psi	4-11psi	4-11psi
Positioner Span	n/a	n/a	n/a	5psi range	5psi range	10psi range
Stroke	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"

	Valve Size (inches)	Cv	Valve Type	Max Static Water Pressure	ANSI Class	Max Steam Pressure	Flow Characteristic	Valve Action	Valve OS Number	Close-off Pressure - See Charts On Page 57					
2-Way Water & Steam Valves	4"	160	Standard	250 psi	125	15 psi (2-position)	Equal %	Stem down to close	V5011A1858	V*-NO	V*-NO	V*-NO	V**-NO	V**-NO	V**-NO
		160	Standard	250 psi		15 psi (2-position)		Stem up to close	V5011B1013	W*-NO	W*-NO	W*-NO	W**-NO	W**-NO	W**-NO
		150	Pressure Balanced	175 psi		125 psig / 353 F		Stem down to close	VGF21EP40	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		150	Standard	175 psi					VGF21ES40	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		150	Pressure Balanced	175 psi			Linear		VGF21LP40	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		155	Standard	175 psi			Linear		VGF21LS40	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		150		400 psi	250		Equal %		VGF22ES40	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
	5"	250		250 psi	125	15 psi (2-position)			V5011A1882	V*-NO	V*-NO	V*-NO	V**-NO	V**-NO	V**-NO
		250		250 psi		15 psi (2-position)		Stem up to close	V5011B1047	W*-NO	W*-NO	W*-NO	W**-NO	W**-NO	W**-NO
		285	Pressure Balanced	175 psi		125 psig / 353 F		Stem down to close	VGF21EP50	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		285	Standard	175 psi					VGF21ES50	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		320	Pressure Balanced	175 psi			Linear		VGF21LP50	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		320	Standard	175 psi			Linear		VGF21LS50	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		320		400 psi	250		Equal %		VGF22ES50	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
	6"	360		250 psi	125	15 psi (2-position)			V5011A1916	V*-NO	V*-NO	V*-NO	V**-NO	V**-NO	V**-NO
		360		250 psi		15 psi (2-position)		Stem up to close	V5011B1070	W*-NO	W*-NO	W*-NO	W**-NO	W**-NO	W**-NO
		365	Pressure Balanced	175 psi		125 psig / 353 F		Stem down to close	VGF21EP60	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		365	Standard	175 psi					VGF21ES60	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		370	Pressure Balanced	175 psi			Linear		VGF21LP60	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		370	Standard	175 psi			Linear		VGF21LS60	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
		370	Standard	400 psi	250		Equal %		VGF22ES60	O*-NO	O*-NO	O*-NO	O**-NO	O**-NO	O**-NO
3-Way Water Valves	4"	160	Mixing	250 psi	125	N/A	Constant Total	Stem up closes A-AB	V5013B1029	T-NC	T-NC	T-NC	T-NC	T-NC	T-NC
		160	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1027	T-NC	T-NC	T-NC	T-NC	T-NC	T-NC
		150	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM40	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		160	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD40	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		170	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM40	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		160	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD40	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
	5"	250	Mixing	250 psi	125		Constant Total	Stem up closes A-AB	V5013B1037	T-NC	T-NC	T-NC	T-NC	T-NC	T-NC
		250	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1035	T-NC	T-NC	T-NC	T-NC	T-NC	T-NC
		320	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM50	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		285	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD50	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		320	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM50	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		285	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD50	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
	6"	360	Mixing	250 psi	125		Constant Total	Stem up closes A-AB	V5013B1045	T-NC	T-NC	T-NC	T-NC	T-NC	T-NC
		360	Diverting	250 psi			Constant Total	Stem up closes B-AB	V5013C1043	T-NC	T-NC	T-NC	T-NC	T-NC	T-NC
		370	Mixing	175 psi			Equal % A-AB	Stem up closes A-AB	VGF31EM60	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		380	Diverting	175 psi			Linear, Constant Total	Stem up closes B-AB	VGF31LD60	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		370	Mixing	400 psi	250		Equal % A-AB	Stem up closes A-AB	VGF32EM60	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC
		380	Diverting	400 psi	250		Linear, Constant Total	Stem up closes B-AB	VGF32LD60	O-NC	O-NC	O-NC	O-NC	O-NC	O-NC

*The close-off pressure not to exceed rated pressure of steam valve
**The close-off pressure not to exceed rated pressure of steam valve. Use 4-11 spring range for positive positioner models.
NC = Normally Closed
NO = Normally Open

Chart V

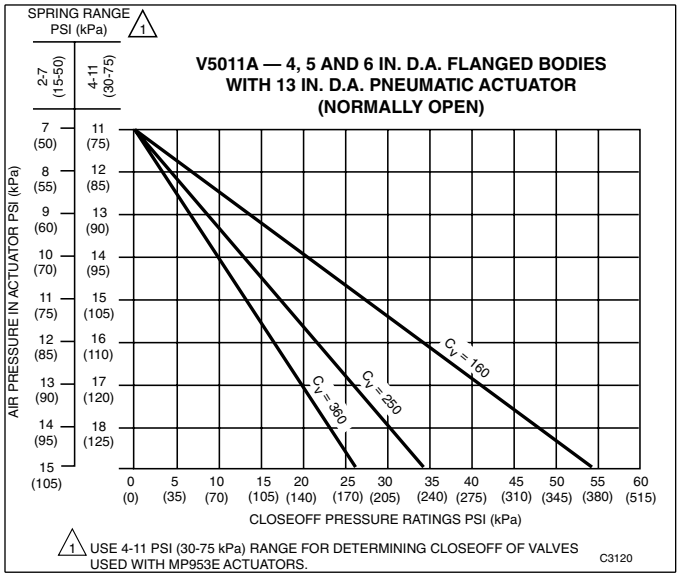


Chart W

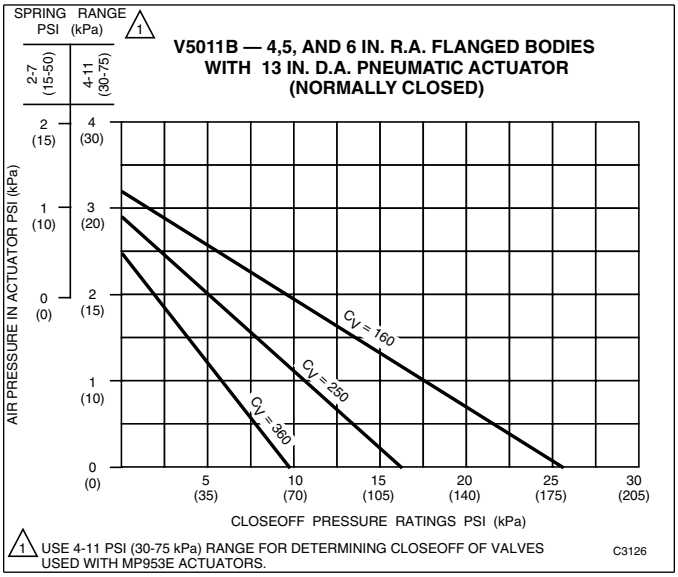


Chart O

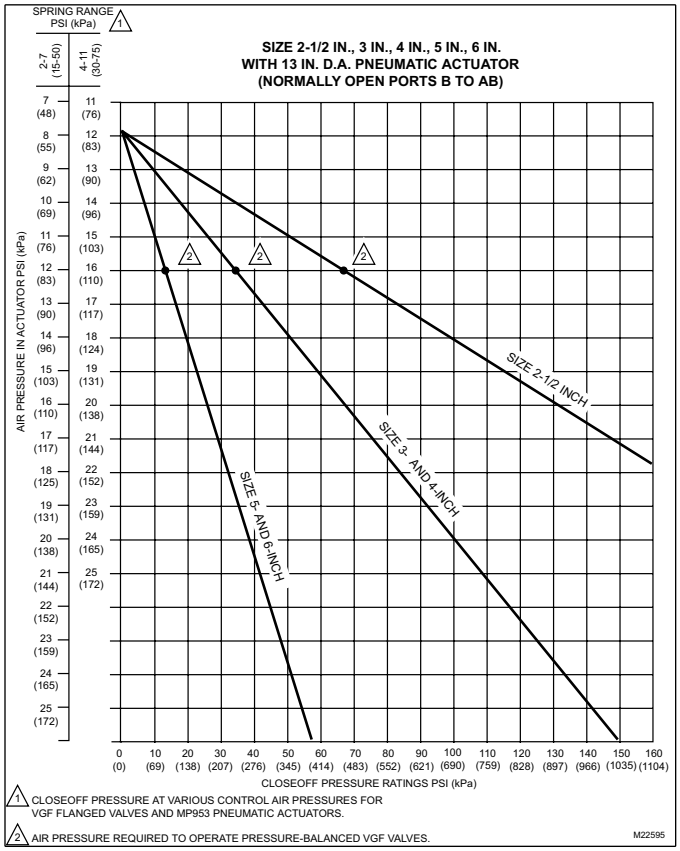
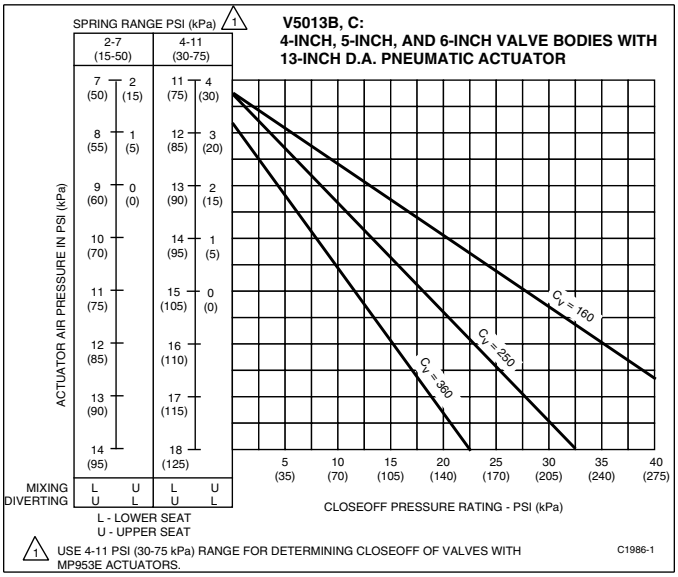


Chart T



Resilient Seat Butterfly Valves

2-Way Electrically-Actuated Control

Honeywell Resilient Seat Butterfly Valves family (VFF) offers options in sizes 2" to 20", highlighted with an industry unique tandem mount using Honeywell direct coupled actuators on valves up to 8" size.

Common Features

- Honeywell direct coupled actuators up to 8" size
- Maximum static pressure 175 psi at 250°F
- Body style: lugged butterfly valve, full-cut (150-175 psid close-off) or under-cut disc (50 psid close-off)
- ANSI 125/150 flanged connections
- Bubble-tight ANSI class VI seat leakage at rated close-off
- Heaters built into NEMA 4X and NEMA 4 actuators
- Controlled media: Water or glycol solutions up to 50% concentration
- Flow characteristics: Equal percentage from 20°-60° stem rotation, modified linear over full stroke
- Normally closed configuration (field configurable)
- Resilient Seat Butterfly Valves come with factory-fitted actuators

Actuator Features		Non-fail Safe					
		Floating			Modulating		
Actuator O.S. Number		MN6134A1003	Industrial Actuators		MN7234A2008	Industrial Actuators	
		NEMA 2	NEMA 4X	NEMA 4	NEMA 2	NEMA 4X	NEMA 4
Power Supply	Voltage	24 Vac	120 Vac	120 Vac	24 Vac	120 Vac	120 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	9 / 18† VA	1.4 - 3.0 ALR	3.2 - 4.0 ALR	9 / 18† VA	1.4 - 3.0 ALR	3.2 - 4.0 ALR
Actuator Torque	lb.-in.	300 / 600†	300 - 6,500	8,850 - 31,000	300 / 600†	300 - 6,500	8,850 - 31,000
Control	(0)2-10 Vdc				•	•	•
	4-20 mA (external 500 ohm resistor)				•	In-built	In-built
	Floating	24 Vac	120 Vac	120 Vac	24 Vac		
	2-Position	•	•	•	•		
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position		Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed
Aux Switch	Built in		2 x SPDT	2 x SPDT		2 x SPDT	2 x SPDT
	Add-On	SW2-US			SW2-US		
Feedback	Built in				2-10 Vdc	4-20mA / 2-10Vdc	4-20mA / 2-10Vdc
Manual Override			•	•		•	•
Conduit Connection		•	•	•	•	•	•
Waterproof			•	•		•	•
Corrosion-resistant			•	•		•	•
Anti-condensate heater			•	•		•	•

2-Way Normally Closed (Field-Configurable Normally Open)

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number					
2"	61	144	175	VFF2FW1Y2A	VFF2FW1YXA		VFF2FW1Y2B	VFF2FW1YXB	
			250						
2-1/2"	107	282	175	VFF2GW1Y2A	VFF2GW1YXA		VFF2GW1Y2B	VFF2GW1YXB	
			250						
3"	154	461	175	VFF2HW1Y2A	VFF2HW1YXA		VFF2HW1Y2B	VFF2HW1YXB	
			250						
4"	274	841	50	VFF2JV1Y2A	VFF2JV1YXA		VFF2JV1Y2B	VFF2JV1YXB	
			175	VFF2JW1Y2A†	VFF2JW1YXA		VFF2JW1Y2B†	VFF2JW1YXB	
			250						
5"	428	1376	50	VFF2KV1Y2A*	VFF2KV1YXA		VFF2KV1Y2B*	VFF2KV1YXB	
			175	VFF2KW1Y2A†	VFF2KW1YXA		VFF2KW1Y2B†	VFF2KW1YXB	
			250						
6"	567	1850	50	VFF2LW1Y2A**	VFF2LV1YXA		VFF2LW1Y2B**	VFF2LV1YXB	
			175	VFF2LW1Y2A†	VFF2LW1YXA		VFF2LW1Y2B†	VFF2LW1YXB	
			250						
8"	1081	3316	50	VFF2MV1Y2A†	VFF2MV1YXA		VFF2MV1Y2B†	VFF2MV1YXB	
			175		VFF2MW1YXA			VFF2MW1YXB	
			250						
10"	1710	5430	50		VFF2NV1YXA			VFF2NV1YXB	
			175		VFF2NW1YXA			VFF2NW1YXB	
			250						
12"	2563	8077	50		VFF2PV1YXA			VFF2PV1YXB	
			175		VFF2PW1YXA			VFF2PW1YXB	
			250						
14"	3384	10538	50		VFF2RV1YXA			VFF2RV1YXB	
			150		VFF2RW1YXA			VFF2RW1YXB	
			250						
16"	4483	13966	50		VFF2SV1YXA			VFF2SV1YXB	
			150			VFF2SW1Y4A			VFF2SW1Y4B
			250						
18"	5736	17214	50		VFF2TV1YXA			VFF2TV1YXB	
			150			VFF2TW1Y4A			VFF2TW1Y4B
			250						
20"	7144	22339	50			VFF2UV1Y4A			VFF2UV1Y4B
			150			VFF2UW1Y4A			VFF2UW1Y4B
			250						

†Tandem mount
*Chilled water service only
**Use full cut valves – requires same actuator torque

2-Way Electrically-Actuated Control

2-Way Normally Closed (Field-Configurable Normally Open)

Actuator Features		Fail Safe			Valve Only Manual operation for end-of-line service	
		2-Position		Modulating		
Actuator O.S. Number		MS8120A1007	MS4120A1001	MS7520A2007		
		NEMA 2	NEMA 2	NEMA 2		
Power Supply	Voltage	24 Vac	100-250 Vac	24 Vac		
	Frequency	60 Hz	60 Hz	50 / 60 Hz		
	Power	40 / 80† VA	60 / 120† VA	16 / 32† VA		
Actuator Torque	lb.-in.	175 / 350†	175 / 350†	175 / 350†		
Control	(0)2-10 Vdc			•		
	4-20 mA (external 500 ohm resistor)			•		
	Floating			24 Vac		
	2-Position	•	•	•		
Fail Safe Action		Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed		
Normal Position		Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed		
Aux Switch	Built in					
	Add-On	SW2-US	SW2-US	SW2-US		
Feedback	Built in			2-10 Vdc		
Manual Override					Lever	Gear Wheel
Conduit Connection		•	•	•		
Waterproof						
Corrosion-resistant						
Anti-condensate heater						

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number				
2"	61	144	175	VFF2FW1Y2C	VFF2FW1Y2E	VFF2FW1Y2D		
			250				VFF2FW2YLX	VFF2FW2YGX
2-1/2"	107	282	175	VFF2GW1Y2C	VFF2GW1Y2E	VFF2GW1Y2D		
			250				VFF2GW2YLX	VFF2GW2YGX
3"	154	461	175	VFF2HW1Y2C†	VFF2HW1Y2E†	VFF2HW1Y2D†		
			250				VFF2HW2YLX	VFF2HW2YGX
4"	274	841	50	VFF2JV1Y2C	VFF2JV1Y2E	VFF2JV1Y2D		
			175					
			250				VFF2JW2YLX	VFF2JW2YGX
5"	428	1376	50	VFF2KV1Y2C†*	VFF2KV1Y2E†*	VFF2KV1Y2D†*		
			175					
			250				VFF2KW2YLX	VFF2KW2YGX
6"	567	1850	50					
			175					
			250				VFF2LW2YLX	VFF2LW2YGX
8"	1081	3316	50					
			175					
			250				VFF2MW2YLX	VFF2MW2YGX
10"	1710	5430	50					
			175					
			250				VFF2NW2YLX	VFF2NW2YGX
12"	2563	8077	50					
			175					
			250				VFF2PW2YLX	VFF2PW2YGX
14"	3384	10538	50					
			150					
			250					VFF2RW2YGX
16"	4483	13966	50					
			150					
			250					VFF2SW2YGX
18"	5736	17214	50					
			150					
			250					VFF2TW2YGX
20"	7144	22339	50					
			150					
			250					VFF2UW2YGX

†Tandem mount
*Chilled water service only

Resilient Seat Butterfly Valves

3-Way Electrically-Actuated Control

Common Features

- VFF3 – A-B-AB porting, full-cut (150-175 psid close-off) or under-cut disc (50 psid close-off)
- VFF6 – A-AB-B porting, full-cut (150-175 psid close-off) or under-cut disc (50 psid close-off)
- Honeywell direct coupled actuators up to 6" size
- Mixing or diverting control
- Standard right-angle cast-iron T-pipe
- A-port configured to closed position at factory
- Porting pattern field-configurable with valve linkage adjustment
- Resilient Seat Butterfly Valves come with factory-fitted actuators

Actuator Features		Non-fail Safe					
		Floating			Modulating		
Actuator O.S. Number		MN6134A1003	Industrial Actuators		MN7234A2008	Industrial Actuators	
		NEMA 2	NEMA 4X	NEMA 4	NEMA 2	NEMA 4X	NEMA 4
Power Supply	Voltage	24 Vac	120 Vac	120 Vac	24 Vac	120 Vac	120 Vac
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
	Power	9 / 18† VA	1.4 - 3.0 ALR	3.2 - 4.0 ALR	9 / 18† VA	1.4 - 3.0 ALR	3.2 - 4.0 ALR
Actuator Torque	lb.-in.	300 / 600†	300 - 6,500	8,850 - 31,000	300 / 600†	300 - 6,500	8,850 - 31,000
Control	(0)2-10 Vdc				•	•	•
	4-20 mA (external 500 ohm resistor)				•	In-built	In-built
	Floating	24 Vac	120 Vac	120 Vac	24 Vac		
	2-Position	•	•	•	•		
Fail Safe Action		Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Stay in Place
Normal Position		Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed
Aux Switch	Built in		2 x SPDT	2 x SPDT		2 x SPDT	2 x SPDT
	Add-On	SW2-US			SW2-US		
Feedback	Built in				2-10 Vdc	4-20mA / 2-10Vdc	4-20mA / 2-10Vdc
Manual Override			•	•		•	•
Conduit Connection		•	•	•	•	•	•
Waterproof			•	•		•	•
Corrosion-resistant			•	•		•	•
Anti-condensate heater			•	•		•	•

3-Way Mixing / Diverting Valve Porting

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number					
2"	61	144	175	VFF3FW1Y2A	VFF3FW1YXA		VFF3FW1Y2B	VFF3FW1YXB	
2-1/2"	107	282	175	VFF3GW1Y2A	VFF3GW1YXA		VFF3GW1Y2B	VFF3GW1YXB	
3"	154	461	175	VFF3HW1Y2A	VFF3HW1YXA		VFF3HW1Y2B	VFF3HW1YXB	
4"	274	841	50	VFF3JV1Y2A	VFF3JV1YXA		VFF3JV1Y2B	VFF3JV1YXB	
			175	VFF3JW1Y2A†	VFF3JW1YXA		VFF3JW1Y2B†	VFF3JW1YXB	
5"	428	1376	50	VFF3KW1Y2A*	VFF3KV1YXA		VFF3KW1Y2B*	VFF3KV1YXB	
			175	VFF3KW1Y2A†	VFF3KW1YXA		VFF3KW1Y2B†	VFF3KW1YXB	
6"	567	1850	50	VFF3LV1Y2A†	VFF3LV1YXA		VFF3LV1Y2B†	VFF3LV1YXB	
			175		VFF3LW1YXA			VFF3LW1YXB	
8"	1081	3316	50		VFF3MV1YXA			VFF3MV1YXB	
			175		VFF3MW1YXA			VFF3MW1YXB	
10"	1710	5430	50		VFF3NV1YXA			VFF3NV1YXB	
			175		VFF3NW1YXA			VFF3NW1YXB	
12"	2563	8077	50		VFF3PV1YXA			VFF3PV1YXB	
			175		VFF3PW1YXA			VFF3PW1YXB	
14"	3384	10538	50		VFF3RV1YXA	VFF3RV1Y4A		VFF3RV1YXB	VFF3RV1Y4B
			150			VFF3RW1Y4A			VFF3RW1Y4B
16"	4483	13966	50		VFF3SV1YXA	VFF3SV1Y4A		VFF3SV1YXB	VFF3SV1Y4B
			150			VFF3SW1Y4A			VFF3SW1Y4B
18"	5736	17214	50			VFF3TV1Y4A			VFF3TV1Y4B
			150			VFF3TW1Y4A			VFF3TW1Y4B
20"	7144	22339	50			VFF3UV1Y4A			VFF3UV1Y4B
			150			VFF3UW1Y4A			VFF3UW1Y4B

3-Way Mixing / Diverting Center Common Port

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number					
2"	61	144	175	VFF6FW1Y2A	VFF6FW1YXA		VFF6FW1Y2B	VFF6FW1YXB	
2-1/2"	107	282	175	VFF6GW1Y2A	VFF6GW1YXA		VFF6GW1Y2B	VFF6GW1YXB	
3"	154	461	175	VFF6HW1Y2A	VFF6HW1YXA		VFF6HW1Y2B	VFF6HW1YXB	
4"	274	841	50	VFF6JV1Y2A	VFF6JV1YXA		VFF6JV1Y2B	VFF6JV1YXB	
			175	VFF6JW1Y2A†	VFF6JW1YXA		VFF6JW1Y2B†	VFF6JW1YXB	
5"	428	1376	50	VFF6KW1Y2A*	VFF6KV1YXA		VFF6KW1Y2B*	VFF6KV1YXB	
			175	VFF6KW1Y2A†	VFF6KW1YXA		VFF6KW1Y2B†	VFF6KW1YXB	
6"	567	1850	50	VFF6LV1Y2A†	VFF6LV1YXA		VFF6LV1Y2B†	VFF6LV1YXB	
			175		VFF6LW1YXA			VFF6LW1YXB	
8"	1081	3316	50		VFF6MV1YXA			VFF6MV1YXB	
			175		VFF6MW1YXA			VFF6MW1YXB	
10"	1710	5430	50		VFF6NV1YXA			VFF6NV1YXB	
			175		VFF6NW1YXA			VFF6NW1YXB	
12"	2563	8077	50		VFF6PV1YXA			VFF6PV1YXB	
			175		VFF6PW1YXA			VFF6PW1YXB	
14"	3384	10538	50		VFF6RV1YXA	VFF6RV1Y4A		VFF6RV1YXB	VFF6RV1Y4B
			150			VFF6RW1Y4A			VFF6RW1Y4B
16"	4483	13966	50		VFF6SV1YXA	VFF6SV1Y4A		VFF6SV1YXB	VFF6SV1Y4B
			150			VFF6SW1Y4A			VFF6SW1Y4B
18"	5736	17214	50			VFF6TV1Y4A			VFF6TV1Y4B
			150			VFF6TW1Y4A			VFF6TW1Y4B
20"	7144	22339	50			VFF6UV1Y4A			VFF6UV1Y4B
			150			VFF6UW1Y4A			VFF6UW1Y4B

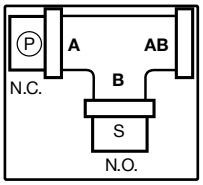
†Tandem mount
*Chilled water service only

3-Way Electrically-Actuated Control

Actuator Features		Fail Safe			Valve Only End-of-line Service
		2-Position		Modulating	
Actuator O.S. Number		MS8120A1007	MS4120A1001	MS7520A2007	
		NEMA 2	NEMA 2	NEMA 2	
Power Supply	Voltage	24 Vac	100-250 Vac	24 Vac	
	Frequency	60 Hz	60 Hz	50 / 60 Hz	
	Power	40 / 80† VA	60 / 120† VA	16 / 32† VA	
Actuator Torque	lb.-in.	175 / 350†	175 / 350†	175 / 350†	
Control	(0)2-10 Vdc			•	
	4-20 mA (external 500 ohm resistor)			•	
	Floating			24 Vac	
	2-Position	•	•	•	
Fail Safe Action		Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	
Normal Position		Configurable Open / Closed	Configurable Open / Closed	Configurable Open / Closed	
Aux Switch	Built in				
	Add-On	SW2-US	SW2-US	SW2-US	
Feedback	Built in			2-10 Vdc	
Manual Override					
Conduit Connection		•	•	•	
Waterproof					
Corrosion-resistant					
Anti-condensate heater					

3-Way Mixing / Diverting Valve Porting

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number			
2"	61	144	175	VFF3FW1Y2C	VFF3FW1Y2E	VFF3FW1Y2D	Use a pair of 2-way valves with standard flanged Tee
2-1/2"	107	282	175	VFF3GW1Y2C	VFF3GW1Y2E	VFF3GW1Y2D	
3"	154	461	175	VFF3HW1Y2C†	VFF3HW1Y2E†	VFF3HW1Y2D†	
4"	274	841	50	VFF3JV1Y2C	VFF3JV1Y2E	VFF3JV1Y2D	
			175				
5"	428	1376	50	VFF3KV1Y2C†*	VFF3KV1Y2E†*	VFF3KV1Y2D†*	
			175				
6"	567	1850	50				
			175				
8"	1081	3316	50				
			175				
10"	1710	5430	50				
			175				
12"	2563	8077	50				
			175				
14"	3384	10538	50				
			150				
16"	4483	13966	50				
			150				
18"	5736	17214	50				
			150				
20"	7144	22339	50				
			150				



VFF3 Default Configuration

Notes:

Viewed from above

P = Actuator and Primary Valve

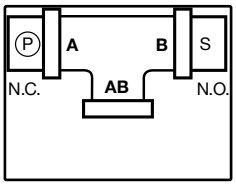
S = Slave Valve

VFF3 valve action is mixing for fluid flow from left to right.

VFF3 valve action is diverting for fluid flow from right to left

3-Way Mixing / Diverting Center Common Port

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number			
2"	61	144	175	VFF6FW1Y2C	VFF6FW1Y2E	VFF6FW1Y2D	Use a pair of 2-way valves with standard flanged Tee
2-1/2"	107	282	175	VFF6GW1Y2C	VFF6GW1Y2E	VFF6GW1Y2D	
3"	154	461	175	VFF6HW1Y2C†	VFF6HW1Y2E†	VFF6HW1Y2D†	
4"	274	841	50	VFF6JV1Y2C	VFF6JV1Y2E	VFF6JV1Y2D	
			175				
5"	428	1376	50	VFF6KV1Y2C†*	VFF6KV1Y2E†*	VFF6KV1Y2D†*	
			175				
6"	567	1850	50				
			175				
8"	1081	3316	50				
			175				
10"	1710	5430	50				
			175				
12"	2563	8077	50				
			175				
14"	3384	10538	50				
			150				
16"	4483	13966	50				
			150				
18"	5736	17214	50				
			150				
20"	7144	22339	50				
			150				



VFF6 Default Configuration

Notes:

Viewed from above

P = Actuator and Primary Valve

S = Slave Valve

VFF6 may be piped for mixing control with water exiting port AB, or for diverting control with water entering port AB

†Tandem mount

*Chilled water service only

Resilient Seat Butterfly Valves

2-Way Pneumatically-Actuated Control

Common Features

Honeywell offers a wide selection of pneumatic actuators:

- 20 psi spring return (up to 10" size)
- 80 psi spring return
- 80 psi double acting bi-directional

Configurable with accessories:

- Positioner
- Electro-pneumatic positioner (80 psi only)
- Electro-pneumatic solenoid (80 psi only)
- VFF1 configured normally open and VFF2 normally closed at factory for spring return actuators
- Body style: lugged butterfly valve with full-cut (150-175 psid close-off) or under-cut disc (50 psid close-off)
- Bi-directional actuator 175 psid close-off on all sizes with full cut disc (2-way only)
- Normally-open configuration (VFF1 spring return)
- Normally-closed configuration (VFF2 spring return)

Actuator Features		Non-fail Safe (Bidirectional)				
Actuator		80 psi Actuator				
		Standard	E-P Solenoid	E-P Solenoid	Positioner	E-P Positioner
Power Supply	Voltage		24 Vac	120 VAc		24 Vac
	Frequency		50 / 60 Hz	50 / 60 Hz		50 / 60 Hz
	Power		6 W	6 W		
Control	Modulating Pneumatic	•			•	
	2-Position		•	•		
	4-20 mA					•
Auxiliary Switch	Add-On	VFF50-0400	VFF50-0400	VFF50-0400		
Manual Override		•				
Conduit Connection			•	•		•
Waterproof						•
Fail Safe						

	Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number				
2-Way Normally Open	2"	61	144	175	Use VFF2 models for Bi-directional pneumatic operation				
	2-1/2"	107	282	175					
	3"	154	461	175					
	4"	274	841	50					
				175					
	5"	428	1376	50					
				175					
	6"	567	1850	50					
				175					
	8"	1081	3316	50					
				175					
	10"	1710	5430	50					
				175					
	12"	2563	8077	50					
				175					
	14"	3384	10538	50					
				150*					
	16"	4483	13966	50					
				150*					
	18"	5736	17214	50					
				150*					
	20"	7144	22339	50					
				150*					
	Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number				
2-Way Normally Closed	2"	61	144	175	VFF2FW1YXR	VFF2FW1YCR	VFF2FW1YER	VFF2FW1YPR	VFF2FW1YDR
	2-1/2"	107	282	175	VFF2GW1YXR	VFF2GW1YCR	VFF2GW1YER	VFF2GW1YPR	VFF2GW1YDR
	3"	154	461	175	VFF2HW1YXR	VFF2HW1YCR	VFF2HW1YER	VFF2HW1YPR	VFF2HW1YDR
	4"	274	841	50	VFF2JV1YXR	VFF2JV1YCR	VFF2JV1YER	VFF2JV1YPR	VFF2JV1YDR
				175	VFF2JW1YXR	VFF2JW1YCR	VFF2JW1YER	VFF2JW1YPR	VFF2JW1YDR
	5"	428	1376	50	VFF2KV1YXR	VFF2KV1YCR	VFF2KV1YER	VFF2KV1YPR	VFF2KV1YDR
				175	VFF2KW1YXR	VFF2KW1YCR	VFF2KW1YER	VFF2KW1YPR	VFF2KW1YDR
	6"	567	1850	50	VFF2LV1YXR	VFF2LV1YCR	VFF2LV1YER	VFF2LV1YPR	VFF2LV1YDR
				175	VFF2LW1YXR	VFF2LW1YCR	VFF2LW1YER	VFF2LW1YPR	VFF2LW1YDR
	8"	1081	3316	50	VFF2MV1YXR	VFF2MV1YCR	VFF2MV1YER	VFF2MV1YPR	VFF2MV1YDR
				175	VFF2MW1YXR	VFF2MW1YCR	VFF2MW1YER	VFF2MW1YPR	VFF2MW1YDR
	10"	1710	5430	50	VFF2NV1YXR	VFF2NV1YCR	VFF2NV1YER	VFF2NV1YPR	VFF2NV1YDR
				175	VFF2NW1YXR	VFF2NW1YCR	VFF2NW1YER	VFF2NW1YPR	VFF2NW1YDR
	12"	2563	8077	50	VFF2PV1YXR	VFF2PV1YCR	VFF2PV1YER	VFF2PV1YPR	VFF2PV1YDR
				175	VFF2PW1YXR	VFF2PW1YCR	VFF2PW1YER	VFF2PW1YPR	VFF2PW1YDR
	14"	3384	10538	50	VFF2RV1YXR	VFF2RV1YCR	VFF2RV1YER	VFF2RV1YPR	VFF2RV1YDR
				175*	VFF2RW1YXR	VFF2RW1YCR	VFF2RW1YER	VFF2RW1YPR	VFF2RW1YDR
	16"	4483	13966	50	VFF2SV1YXR	VFF2SV1YCR	VFF2SV1YER	VFF2SV1YPR	VFF2SV1YDR
				175*	VFF2SW1YXR	VFF2SW1YCR	VFF2SW1YER	VFF2SW1YPR	VFF2SW1YDR
	18"	5736	17214	50	VFF2TV1YXR	VFF2TV1YCR	VFF2TV1YER	VFF2TV1YPR	VFF2TV1YDR
				175*	VFF2TW1YXR	VFF2TW1YCR	VFF2TW1YER	VFF2TW1YPR	VFF2TW1YDR
	20"	7144	22339	50	VFF2UV1YXR	VFF2UV1YCR	VFF2UV1YER	VFF2UV1YPR	VFF2UV1YDR
				175*	VFF2UW1YXR	VFF2UW1YCR	VFF2UW1YER	VFF2UW1YPR	VFF2UW1YDR

* Full cut valves with bi-directional pneumatic actuators feature 175 psi close-off in all body sizes

2-Way Pneumatically-Actuated Control

Actuator Features		Fail Safe						
Actuator		20 psi Actuator		80 psi Actuator				
		8-13 spring	Positioner	Standard	E-P Solenoid	E-P Solenoid	Positioner	E-P Positioner
Power Supply	Voltage				24 Vac	120 Vac		24 Vac
	Frequency				50 / 60 Hz	50 / 60 Hz		50 / 60 Hz
	Power				6 W	6 W		
Control	Modulating Pneumatic	•	•	•			•	
	2-Position				•	•		
	4-20 mA							•
Auxiliary Switch	Add-On			VFF50-0400	VFF50-0400	VFF50-0400		
Manual Override				•				
Conduit Connection					•	•		•
Waterproof								•
Fail Safe		•	•	•	•	•	•	•

2-Way Normally Open

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number						
2"	61	144	175	VFF1FW1Y8P	VFF1FW1YPP	VFF1FW1YXS	VFF1FW1YCS	VFF1FW1YES	VFF1FW1YPS	VFF1FW1YDS
2-1/2"	107	282	175	VFF1GW1Y8P	VFF1GW1YPP	VFF1GW1YXS	VFF1GW1YCS	VFF1GW1YES	VFF1GW1YPS	VFF1GW1YDS
3"	154	461	175	VFF1HW1Y8P	VFF1HW1YPP	VFF1HW1YXS	VFF1HW1YCS	VFF1HW1YES	VFF1HW1YPS	VFF1HW1YDS
4"	274	841	50	VFF1JV1Y8P	VFF1JV1YPP	VFF1JV1YXS	VFF1JV1YCS	VFF1JV1YES	VFF1JV1YPS	VFF1JV1YDS
			175	VFF1JW1Y8P	VFF1JW1YPP	VFF1JW1YXS	VFF1JW1YCS	VFF1JW1YES	VFF1JW1YPS	VFF1JW1YDS
5"	428	1376	50	VFF1KV1Y8P	VFF1KV1YPP	VFF1KV1YXS	VFF1KV1YCS	VFF1KV1YES	VFF1KV1YPS	VFF1KV1YDS
			175	VFF1KW1Y8P	VFF1KW1YPP	VFF1KW1YXS	VFF1KW1YCS	VFF1KW1YES	VFF1KW1YPS	VFF1KW1YDS
6"	567	1850	50	VFF1LW1Y8P*	VFF1LW1YPP*	VFF1LV1YXS	VFF1LV1YCS	VFF1LV1YES	VFF1LV1YPS	VFF1LV1YDS
			175	VFF1LW1Y8P	VFF1LW1YPP	VFF1LW1YXS	VFF1LW1YCS	VFF1LW1YES	VFF1LW1YPS	VFF1LW1YDS
8"	1081	3316	50	VFF1MV1Y8P	VFF1MV1YPP	VFF1MV1YXS	VFF1MV1YCS	VFF1MV1YES	VFF1MV1YPS	VFF1MV1YDS
			175	VFF1MW1Y8P†	VFF1MW1YPP†	VFF1MW1YXS	VFF1MW1YCS	VFF1MW1YES	VFF1MW1YPS	VFF1MW1YDS
10"	1710	5430	50	VFF1NV1Y8P†	VFF1NV1YPP†	VFF1NV1YXS	VFF1NV1YCS	VFF1NV1YES	VFF1NV1YPS	VFF1NV1YDS
			175			VFF1NW1YXS	VFF1NW1YCS	VFF1NW1YES	VFF1NW1YPS	VFF1NW1YDS
12"	2563	8077	50			VFF1PV1YXS	VFF1PV1YCS	VFF1PV1YES	VFF1PV1YPS	VFF1PV1YDS
			175			VFF1PW1YXS	VFF1PW1YCS	VFF1PW1YES	VFF1PW1YPS	VFF1PW1YDS
14"	3384	10538	50			VFF1RV1YXS	VFF1RW1YCS	VFF1RV1YES	VFF1RV1YPS	VFF1RV1YDS
			150			VFF1RW1YXS	VFF1RW1YCS	VFF1RW1YES	VFF1RW1YPS	VFF1RW1YDS
16"	4483	13966	50			VFF1SV1YXS	VFF1SV1YCS	VFF1SV1YES	VFF1SV1YPS	VFF1SV1YDS
			150			VFF1SW1YXS	VFF1SW1YCS	VFF1SW1YES	VFF1SW1YPS	VFF1SW1YDS
18"	5736	17214	50			VFF1TV1YXS	VFF1TV1YCS	VFF1TV1YES	VFF1TV1YPS	VFF1TV1YDS
			150			VFF1TW1YXS	VFF1TW1YCS	VFF1TW1YES	VFF1TW1YPS	VFF1TW1YDS
20"	7144	22339	50			VFF1UV1YXS	VFF1UV1YCS	VFF1UV1YES	VFF1UV1YPS	VFF1UV1YDS
			150			VFF1UW1YXS	VFF1UW1YCS	VFF1UW1YES	VFF1UW1YPS	VFF1UW1YDS

2-Way Normally Closed

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number						
2"	61	144	175	VFF2FW1Y8P	VFF2FW1YPP	VFF2FW1YXS	VFF2FW1YCS	VFF2FW1YES	VFF2FW1YPS	VFF2FW1YDS
2-1/2"	107	282	175	VFF2GW1Y8P	VFF2GW1YPP	VFF2GW1YXS	VFF2GW1YCS	VFF2GW1YES	VFF2GW1YPS	VFF2GW1YDS
3"	154	461	175	VFF2HW1Y8P	VFF2HW1YPP	VFF2HW1YXS	VFF2HW1YCS	VFF2HW1YES	VFF2HW1YPS	VFF2HW1YDS
4"	274	841	50	VFF2JV1Y8P	VFF2JV1YPP	VFF2JV1YXS	VFF2JV1YCS	VFF2JV1YES	VFF2JV1YPS	VFF2JV1YDS
			175	VFF2JW1Y8P	VFF2JW1YPP	VFF2JW1YXS	VFF2JW1YCS	VFF2JW1YES	VFF2JW1YPS	VFF2JW1YDS
5"	428	1376	50	VFF2KV1Y8P	VFF2KV1YPP	VFF2KV1YXS	VFF2KV1YCS	VFF2KV1YES	VFF2KV1YPS	VFF2KV1YDS
			175	VFF2KW1Y8P	VFF2KW1YPP	VFF2KW1YXS	VFF2KW1YCS	VFF2KW1YES	VFF2KW1YPS	VFF2KW1YDS
6"	567	1850	50	VFF2LW1Y8P*	VFF2LW1YPP*	VFF2LV1YXS	VFF2LV1YCS	VFF2LV1YES	VFF2LV1YPS	VFF2LV1YDS
			175	VFF2LW1Y8P	VFF2LW1YPP	VFF2LW1YXS	VFF2LW1YCS	VFF2LW1YES	VFF2LW1YPS	VFF2LW1YDS
8"	1081	3316	50	VFF2MV1Y8P	VFF2MV1YPP	VFF2MV1YXS	VFF2MV1YCS	VFF2MV1YES	VFF2MV1YPS	VFF2MV1YDS
			175	VFF2MW1Y8P†	VFF2MW1YPP†	VFF2MW1YXS	VFF2MW1YCS	VFF2MW1YES	VFF2MW1YPS	VFF2MW1YDS
10"	1710	5430	50	VFF2NV1Y8P†	VFF2NV1YPP†	VFF2NV1YXS	VFF2NV1YCS	VFF2NV1YES	VFF2NV1YPS	VFF2NV1YDS
			175			VFF2NW1YXS	VFF2NW1YCS	VFF2NW1YES	VFF2NW1YPS	VFF2NW1YDS
12"	2563	8077	50			VFF2PV1YXS	VFF2PV1YCS	VFF2PV1YES	VFF2PV1YPS	VFF2PV1YDS
			175			VFF2PW1YXS	VFF2PW1YCS	VFF2PW1YES	VFF2PW1YPS	VFF2PW1YDS
14"	3384	10538	50			VFF2RV1YXS	VFF2RW1YCS	VFF2RV1YES	VFF2RV1YPS	VFF2RV1YDS
			150			VFF2RW1YXS	VFF2RW1YCS	VFF2RW1YES	VFF2RW1YPS	VFF2RW1YDS
16"	4483	13966	50			VFF2SV1YXS	VFF2SV1YCS	VFF2SV1YES	VFF2SV1YPS	VFF2SV1YDS
			150			VFF2SW1YXS	VFF2SW1YCS	VFF2SW1YES	VFF2SW1YPS	VFF2SW1YDS
18"	5736	17214	50			VFF2TV1YXS	VFF2TV1YCS	VFF2TV1YES	VFF2TV1YPS	VFF2TV1YDS
			150			VFF2TW1YXS	VFF2TW1YCS	VFF2TW1YES	VFF2TW1YPS	VFF2TW1YDS
20"	7144	22339	50			VFF2UV1YXS	VFF2UV1YCS	VFF2UV1YES	VFF2UV1YPS	VFF2UV1YDS
			150			VFF2UW1YXS	VFF2UW1YCS	VFF2UW1YES	VFF2UW1YPS	VFF2UW1YDS

†Tandem mount
*Use full cut, 175psid close-off valves - No under-cut, 50psid close-off valve available

Resilient Seat Butterfly Valves

3-Way Pneumatically-Actuated Control

Common Features

Honeywell offers a wide selection of pneumatic actuators:

- VFF3 – A-B-AB porting, full-cut (150-175 psid close-off) or under-cut disc (50 psid close-off) (Figure 1 - from 63-2661-03 fig. 12)
- VFF6 – A-AB-B porting, full-cut (150-175 psid close-off) or under-cut disc (50 psid close-off) (Figure 2 - from 63-2661-03 fig. 12)
- 20 psi spring return (up to 8" size)
- 80 psi spring return
- 80 psi double acting bi-directional
- Mixing or diverting control
- Standard right-angle cast-iron T-pipe
- A-port configured to closed position at factory
- Porting pattern field-configurable with valve linkage adjustment

Actuator Features		Non-fail Safe (Bidirectional)				
Actuator		80 psi Actuator				
		Standard	E-P Solenoid	E-P Solenoid	Positioner	E-P Positioner
Power Supply	Voltage		24 Vac	120 VAc		24 Vac
	Frequency		50 / 60 Hz	50 / 60 Hz		50 / 60 Hz
	Power		6 W	6 W		
Control	Modulating Pneumatic	•			•	
	2-Position		•	•		
	4-20 mA					•
Auxiliary Switch	Add-On	VFF50-0400	VFF50-0400	VFF50-0400		
Manual Override		•				
Conduit Connection			•	•		•
Waterproof						•
Fail Safe						

3-Way Mixing / Diverting Valve Porting

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number				
2"	61	144	175	VFF3FW1YXR	VFF3FW1YCR	VFF3FW1YER	VFF3FW1YPR	VFF3FW1YDR
2-1/2"	107	282	175	VFF3GW1YXR	VFF3GW1YCR	VFF3GW1YER	VFF3GW1YPR	VFF3GW1YDR
3"	154	461	175	VFF3HW1YXR	VFF3HW1YCR	VFF3HW1YER	VFF3HW1YPR	VFF3HW1YDR
4"	274	841	50	VFF3JV1YXR	VFF3JV1YCR	VFF3JV1YER	VFF3JV1YPR	VFF3JV1YDR
			175	VFF3JW1YXR	VFF3JW1YCR	VFF3JW1YER	VFF3JW1YPR	VFF3JW1YDR
5"	428	1376	50	VFF3KV1YXR	VFF3KV1YCR	VFF3KV1YER	VFF3KV1YPR	VFF3KV1YDR
			175	VFF3KW1YXR	VFF3KW1YCR	VFF3KW1YER	VFF3KW1YPR	VFF3KW1YDR
6"	567	1850	50	VFF3LV1YXR	VFF3LV1YCR	VFF3LV1YER	VFF3LV1YPR	VFF3LV1YDR
			175	VFF3LW1YXR	VFF3LW1YCR	VFF3LW1YER	VFF3LW1YPR	VFF3LW1YDR
8"	1081	3316	50	VFF3MV1YXR	VFF3MV1YCR	VFF3MV1YER	VFF3MV1YPR	VFF3MV1YDR
			175	VFF3MW1YXR	VFF3MW1YCR	VFF3MW1YER	VFF3MW1YPR	VFF3MW1YDR
10"	1710	5430	50	VFF3NV1YXR	VFF3NV1YCR	VFF3NV1YER	VFF3NV1YPR	VFF3NV1YDR
			175	VFF3NW1YXR	VFF3NW1YCR	VFF3NW1YER	VFF3NW1YPR	VFF3NW1YDR
12"	2563	8077	50	VFF3PV1YXR	VFF3PV1YCR	VFF3PV1YER	VFF3PV1YPR	VFF3PV1YDR
			175	VFF3PW1YXR	VFF3PW1YCR	VFF3PW1YER	VFF3PW1YPR	VFF3PW1YDR
14"	3384	10538	50	VFF3RV1YXR	VFF3RV1YCR	VFF3RV1YER	VFF3RV1YPR	VFF3RV1YDR
			150	VFF3RW1YXR	VFF3RW1YCR	VFF3RW1YER	VFF3RW1YPR	VFF3RW1YDR
16"	4483	13966	50	VFF3SV1YXR	VFF3SV1YCR	VFF3SV1YER	VFF3SV1YPR	VFF3SV1YDR
			150	VFF3SW1YXR	VFF3SW1YCR	VFF3SW1YER	VFF3SW1YPR	VFF3SW1YDR
18"	5736	17214	50	VFF3TV1YXR	VFF3TV1YCR	VFF3TV1YER	VFF3TV1YPR	VFF3TV1YDR
			150	VFF3TW1YXR	VFF3TW1YCR	VFF3TW1YER	VFF3TW1YPR	VFF3TW1YDR
20"	7144	22339	50	VFF3UV1YXR	VFF3UV1YCR	VFF3UV1YER	VFF3UV1YPR	VFF3UV1YDR
			150	VFF3UW1YXR	VFF3UW1YCR	VFF3UW1YER	VFF3UW1YPR	VFF3UW1YDR

3-Way Mixing / Diverting Center Common Port

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number				
2"	61	144	175	VFF6FW1YXR	VFF6FW1YCR	VFF6FW1YER	VFF6FW1YPR	VFF6FW1YDR
2-1/2"	107	282	175	VFF6GW1YXR	VFF6GW1YCR	VFF6GW1YER	VFF6GW1YPR	VFF6GW1YDR
3"	154	461	175	VFF6HW1YXR	VFF6HW1YCR	VFF6HW1YER	VFF6HW1YPR	VFF6HW1YDR
4"	274	841	50	VFF6JV1YXR	VFF6JV1YCR	VFF6JV1YER	VFF6JV1YPR	VFF6JV1YDR
			175	VFF6JW1YXR	VFF6JW1YCR	VFF6JW1YER	VFF6JW1YPR	VFF6JW1YDR
5"	428	1376	50	VFF6KV1YXR	VFF6KV1YCR	VFF6KV1YER	VFF6KV1YPR	VFF6KV1YDR
			175	VFF6KW1YXR	VFF6KW1YCR	VFF6KW1YER	VFF6KW1YPR	VFF6KW1YDR
6"	567	1850	50	VFF6LV1YXR	VFF6LV1YCR	VFF6LV1YER	VFF6LV1YPR	VFF6LV1YDR
			175	VFF6LW1YXR	VFF6LW1YCR	VFF6LW1YER	VFF6LW1YPR	VFF6LW1YDR
8"	1081	3316	50	VFF6MV1YXR	VFF6MV1YCR	VFF6MV1YER	VFF6MV1YPR	VFF6MV1YDR
			175	VFF6MW1YXR	VFF6MW1YCR	VFF6MW1YER	VFF6MW1YPR	VFF6MW1YDR
10"	1710	5430	50	VFF6NV1YXR	VFF6NV1YCR	VFF6NV1YER	VFF6NV1YPR	VFF6NV1YDR
			175	VFF6NW1YXR	VFF6NW1YCR	VFF6NW1YER	VFF6NW1YPR	VFF6NW1YDR
12"	2563	8077	50	VFF6PV1YXR	VFF6PV1YCR	VFF6PV1YER	VFF6PV1YPR	VFF6PV1YDR
			175	VFF6PW1YXR	VFF6PW1YCR	VFF6PW1YER	VFF6PW1YPR	VFF6PW1YDR
14"	3384	10538	50	VFF6RV1YXR	VFF6RV1YCR	VFF6RV1YER	VFF6RV1YPR	VFF6RV1YDR
			175*	VFF6RW1YXR	VFF6RW1YCR	VFF6RW1YER	VFF6RW1YPR	VFF6RW1YDR
16"	4483	13966	50	VFF6SV1YXR	VFF6SV1YCR	VFF6SV1YER	VFF6SV1YPR	VFF6SV1YDR
			175*	VFF6SW1YXR	VFF6SW1YCR	VFF6SW1YER	VFF6SW1YPR	VFF6SW1YDR
18"	5736	17214	50	VFF6TV1YXR	VFF6TV1YCR	VFF6TV1YER	VFF6TV1YPR	VFF6TV1YDR
			175*	VFF6TW1YXR	VFF6TW1YCR	VFF6TW1YER	VFF6TW1YPR	VFF6TW1YDR
20"	7144	22339	50	VFF6UV1YXR	VFF6UV1YCR	VFF6UV1YER	VFF6UV1YPR	VFF6UV1YDR
			175*	VFF6UW1YXR	VFF6UW1YCR	VFF6UW1YER	VFF6UW1YPR	VFF6UW1YDR

* Full cut valves with bi-directional pneumatic actuators feature 175 psi close-off in all body sizes

Figure 1 (VFF3)

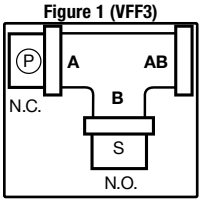
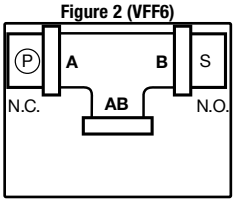


Figure 2 (VFF6)



Notes:

Viewed from above

P = Actuator and Primary Valve

S = Slave Valve

VFF3 valve action is mixing for fluid flow from left to right.

VFF3 valve action is diverting for fluid flow from right to left

VFF6 may be piped for mixing control with water exiting port AB, or for diverting control with water entering port AB

3-Way Pneumatically-Actuated Control

Actuator Features		Fail Safe						
Actuator		20 psi Actuator		80 psi Actuator				
		8-13 spring	Positioner	Standard	E-P Solenoid	E-P Solenoid	Positioner	E-P Positioner
Power Supply	Voltage				24 Vac	120 Vac		24 Vac
	Frequency				50 / 60 Hz	50 / 60 Hz		50 / 60 Hz
	Power				6 W	6 W		
Control	Modulating Pneumatic	•	•	•			•	
	2-Position				•	•		
	4-20 mA							•
Auxiliary Switch	Add-On			VFF50-0400	VFF50-0400	VFF50-0400		
Manual Override				•				
Conduit Connection					•	•		•
Waterproof								•
Fail Safe		•	•	•	•	•	•	•

3-Way Mixing / Diverting Valve Porting

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number						
2"	61	144	175	VFF3FW1Y8P	VFF3FW1YPP	VFF3FW1YXS	VFF3FW1YCS	VFF3FW1YES	VFF3FW1YPS	VFF3FW1YDS
2-1/2"	107	282	175	VFF3GW1Y8P	VFF3GW1YPP	VFF3GW1YXS	VFF3GW1YCS	VFF3GW1YES	VFF3GW1YPS	VFF3GW1YDS
3"	154	461	175	VFF3HW1Y8P	VFF3HW1YPP	VFF3HW1YXS	VFF3HW1YCS	VFF3HW1YES	VFF3HW1YPS	VFF3HW1YDS
4"	274	841	50	VFF3JV1Y8P	VFF3JV1YPP	VFF3JV1YXS	VFF3JV1YCS	VFF3JV1YES	VFF3JV1YPS	VFF3JV1YDS
			175	VFF3JW1Y8P	VFF3JW1YPP	VFF3JW1YXS	VFF3JW1YCS	VFF3JW1YES	VFF3JW1YPS	VFF3JW1YDS
5"	428	1376	50	VFF3KW1Y8P*	VFF3KW1YPP*	VFF3KV1YXS	VFF3KV1YCS	VFF3KV1YES	VFF3KV1YPS	VFF3KV1YDS
			175	VFF3KW1Y8P	VFF3KW1YPP	VFF3KW1YXS	VFF3KW1YCS	VFF3KW1YES	VFF3KW1YPS	VFF3KW1YDS
6"	567	1850	50	VFF3LV1Y8P	VFF3LV1YPP	VFF3LV1YXS	VFF3LV1YCS	VFF3LV1YES	VFF3LV1YPS	VFF3LV1YDS
			175	VFF3LW1Y8P†	VFF3LW1YPP†	VFF3LW1YXS	VFF3LW1YCS	VFF3LW1YES	VFF3LW1YPS	VFF3LW1YDS
8"	1081	3316	50	VFF3MV1Y8P†	VFF3MV1YPP†	VFF3MV1YXS	VFF3MV1YCS	VFF3MV1YES	VFF3MV1YPS	VFF3MV1YDS
			175			VFF3MW1YXS	VFF3MW1YCS	VFF3MW1YES	VFF3MW1YPS	VFF3MW1YDS
10"	1710	5430	50			VFF3NV1YXS	VFF3NV1YCS	VFF3NV1YES	VFF3NV1YPS	VFF3NV1YDS
			175			VFF3NW1YXS	VFF3NW1YCS	VFF3NW1YES	VFF3NW1YPS	VFF3NW1YDS
12"	2563	8077	50			VFF3PV1YXS	VFF3PV1YCS	VFF3PV1YES	VFF3PV1YPS	VFF3PV1YDS
			175			VFF3PW1YXS	VFF3PW1YCS	VFF3PW1YES	VFF3PW1YPS	VFF3PW1YDS
14"	3384	10538	50			VFF3RV1YXS	VFF3RV1YCS	VFF3RV1YES	VFF3RV1YPS	VFF3RV1YDS
			150			VFF3RW1YXS	VFF3RW1YCS	VFF3RW1YES	VFF3RW1YPS	VFF3RW1YDS
16"	4483	13966	50			VFF3SV1YXS	VFF3SV1YCS	VFF3SV1YES	VFF3SV1YPS	VFF3SV1YDS
			150							
18"	5736	17214	50			VFF3TV1YXS	VFF3TV1YCS	VFF3TV1YES	VFF3TV1YPS	VFF3TV1YDS
			150							
20"	7144	22339	50			VFF3UV1YXS	VFF3UV1YCS	VFF3UV1YES	VFF3UV1YPS	VFF3UV1YDS
			150							

3-Way Mixing / Diverting Center Common Port

Valve Size (inches)	Cv @ 60°	Cv @ 90°	Close-off (psid)	Valve O.S. Number						
2"	61	144	175	VFF6FW1Y8P	VFF6FW1YPP	VFF6FW1YXS	VFF6FW1YCS	VFF6FW1YES	VFF6FW1YPS	VFF6FW1YDS
2-1/2"	107	282	175	VFF6GW1Y8P	VFF6GW1YPP	VFF6GW1YXS	VFF6GW1YCS	VFF6GW1YES	VFF6GW1YPS	VFF6GW1YDS
3"	154	461	175	VFF6HW1Y8P	VFF6HW1YPP	VFF6HW1YXS	VFF6HW1YCS	VFF6HW1YES	VFF6HW1YPS	VFF6HW1YDS
4"	274	841	50	VFF6JV1Y8P	VFF6JV1YPP	VFF6JV1YXS	VFF6JV1YCS	VFF6JV1YES	VFF6JV1YPS	VFF6JV1YDS
			175	VFF6JW1Y8P	VFF6JW1YPP	VFF6JW1YXS	VFF6JW1YCS	VFF6JW1YES	VFF6JW1YPS	VFF6JW1YDS
5"	428	1376	50	VFF6KW1Y8P*	VFF6KW1YPP*	VFF6KV1YXS	VFF6KV1YCS	VFF6KV1YES	VFF6KV1YPS	VFF6KV1YDS
			175	VFF6KW1Y8P	VFF6KW1YPP	VFF6KW1YXS	VFF6KW1YCS	VFF6KW1YES	VFF6KW1YPS	VFF6KW1YDS
6"	567	1850	50	VFF6LV1Y8P	VFF6LV1YPP	VFF6LV1YXS	VFF6LV1YCS	VFF6LV1YES	VFF6LV1YPS	VFF6LV1YDS
			175	VFF6LW1Y8P†	VFF6LW1YPP†	VFF6LW1YXS	VFF6LW1YCS	VFF6LW1YES	VFF6LW1YPS	VFF6LW1YDS
8"	1081	3316	50	VFF6MV1Y8P†	VFF6MV1YPP†	VFF6MV1YXS	VFF6MV1YCS	VFF6MV1YES	VFF6MV1YPS	VFF6MV1YDS
			175			VFF6MW1YXS	VFF6MW1YCS	VFF6MW1YES	VFF6MW1YPS	VFF6MW1YDS
10"	1710	5430	50			VFF6NV1YXS	VFF6NV1YCS	VFF6NV1YES	VFF6NV1YPS	VFF6NV1YDS
			175			VFF6NW1YXS	VFF6NW1YCS	VFF6NW1YES	VFF6NW1YPS	VFF6NW1YDS
12"	2563	8077	50			VFF6PV1YXS	VFF6PV1YCS	VFF6PV1YES	VFF6PV1YPS	VFF6PV1YDS
			175			VFF6PW1YXS	VFF6PW1YCS	VFF6PW1YES	VFF6PW1YPS	VFF6PW1YDS
14"	3384	10538	50			VFF6RV1YXS	VFF6RV1YCS	VFF6RV1YES	VFF6RV1YPS	VFF6RV1YDS
			150			VFF6RW1YXS	VFF6RW1YCS	VFF6RW1YES	VFF6RW1YPS	VFF6RW1YDS
16"	4483	13966	50			VFF6SV1YXS	VFF6SV1YCS	VFF6SV1YES	VFF6SV1YPS	VFF6SV1YDS
			150							
18"	5736	17214	50			VFF6TV1YXS	VFF6TV1YCS	VFF6TV1YES	VFF6TV1YPS	VFF6TV1YDS
			150							
20"	7144	22339	50			VFF6UV1YXS	VFF6UV1YCS	VFF6UV1YES	VFF6UV1YPS	VFF6UV1YDS
			150							

†Tandem mount
*Use full cut, 175psid close-off valves - No under-cut, 50psid close-off valve available

Pressure-Regulated Flow Control Valves

VRN

Threaded Dynamic Pressure-Regulated Control Valves										
Actuator Features		**Non-Fail Safe**				**Fail Safe**		**Valve Only**	
									
Actuator OS Number		MN6105A1011	MN6105A1011	MN7505A2001	MN7505A2001	MS7505A2030	MS7505A2030	N/A	N/A
Power Supply	Voltage	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac	24 Vac		
	Frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz		
	Power	5 VA	5 VA	5 VA	5 VA	8 VA	8 VA		
Enclosure	(conduit connection)	NEMA 2	NEMA 2	NEMA 2	NEMA 2	NEMA 2	NEMA 2		
Actuator Torque	(lb.-in.)	44	44	44	44	44	44		
Control	(0)2-10 Vdc			•	•	•	•		
	4-20 mA (w/ external 500 Ohm Resistor)			•	•	•	•		
	Floating	•	•	•	•	•	•		
	Two-Position SPDT	•	•	•	•	•	•		
	Two-Position SPST	•	•	•	•	•	•		
Fail Safe Action	(field configurable)	Stay in Place	Stay in Place	Stay in Place	Stay in Place	Selectable	Selectable		
Normal Position	(no signal, field configurable)	Closed	Closed	Closed	Closed	Closed	Closed		
Actuator Stroke	(degrees)	95°	95°	95°	95°	95°	95°		
Timing	(seconds, 60 Hz)	90	90	90	90	90	90		
Aux. Switch	(2 x SPDT Add-on)	SSW2	SSW2	SSW2	SSW2				
Feedback	2-10 Vdc Built in			•	•	•	•		
VALVE FEATURES	**Trim**	**Stainless Steel**	**Plated Brass**	**Stainless Steel**	**Plated Brass**	**Stainless Steel**	**Plated Brass**	**Stainless Steel**	**Plated Brass**
	Regulator	**Stainless steel cage, positive pressure rolling diaphragm**							
	Test Port	**Two 1/4 in. NPT**							

Valve Size	Max. gpm	Differential Pressure, psid			Valve O.S. Number							
		Min.**	Max.**	Close-off								
1/2 in.	1.0	3.0	35	100	VRN2AB3S2A	VRN2AB3D2A	VRN2AB3S2B	VRN2AB3D2B	VRN2AB3S2D	VRN2AB3D2D	VRN2AB3SFX	VRN2AB3DFX
	2.0				VRN2AD3S2A	VRN2AD3D2A	VRN2AD3S2B	VRN2AD3D2B	VRN2AD3S2D	VRN2AD3D2D	VRN2AD3SFX	VRN2AD3DFX
	3.0				VRN2AE3S2A	VRN2AE3D2A	VRN2AE3S2B	VRN2AE3D2B	VRN2AE3S2D	VRN2AE3D2D	VRN2AE3SFX	VRN2AE3DFX
	4.0				VRN2AF3S2A	VRN2AF3D2A	VRN2AF3S2B	VRN2AF3D2B	VRN2AF3S2D	VRN2AF3D2D	VRN2AF3SFX	VRN2AF3DFX
	5.0				VRN2AG3S2A	VRN2AG3D2A	VRN2AG3S2B	VRN2AG3D2B	VRN2AG3S2D	VRN2AG3D2D	VRN2AG3SFX	VRN2AG3DFX
	6.0				VRN2AH3S2A	VRN2AH3D2A	VRN2AH3S2B	VRN2AH3D2B	VRN2AH3S2D	VRN2AH3D2D	VRN2AH3SFX	VRN2AH3DFX
	7.0				VRN2AJ3S2A	VRN2AJ3D2A	VRN2AJ3S2B	VRN2AJ3D2B	VRN2AJ3S2D	VRN2AJ3D2D	VRN2AJ3SFX	VRN2AJ3DFX
3/4 in.	1.0	3.0			VRN2BB3S2A	VRN2BB3D2A	VRN2BB3S2B	VRN2BB3D2B	VRN2BB3S2D	VRN2BB3D2D	VRN2BB3SFX	VRN2BB3DFX
	2.0				VRN2BD3S2A	VRN2BD3D2A	VRN2BD3S2B	VRN2BD3D2B	VRN2BD3S2D	VRN2BD3D2D	VRN2BD3SFX	VRN2BD3DFX
	3.0				VRN2BE3S2A	VRN2BE3D2A	VRN2BE3S2B	VRN2BE3D2B	VRN2BE3S2D	VRN2BE3D2D	VRN2BE3SFX	VRN2BE3DFX
	4.0				VRN2BF3S2A	VRN2BF3D2A	VRN2BF3S2B	VRN2BF3D2B	VRN2BF3S2D	VRN2BF3D2D	VRN2BF3SFX	VRN2BF3DFX
	5.0				VRN2BG3S2A	VRN2BG3D2A	VRN2BG3S2B	VRN2BG3D2B	VRN2BG3S2D	VRN2BG3D2D	VRN2BG3SFX	VRN2BG3DFX
	6.0				VRN2BH3S2A	VRN2BH3D2A	VRN2BH3S2B	VRN2BH3D2B	VRN2BH3S2D	VRN2BH3D2D	VRN2BH3SFX	VRN2BH3DFX
	7.0				VRN2BJ3S2A	VRN2BJ3D2A	VRN2BJ3S2B	VRN2BJ3D2B	VRN2BJ3S2D	VRN2BJ3D2D	VRN2BJ3SFX	VRN2BJ3DFX
	8.0	6.0			VRN2BK3S2A	VRN2BK3D2A	VRN2BK3S2B	VRN2BK3D2B	VRN2BK3S2D	VRN2BK3D2D	VRN2BK3SFX	VRN2BK3DFX
	9.0				VRN2BL3S2A	VRN2BL3D2A	VRN2BL3S2B	VRN2BL3D2B	VRN2BL3S2D	VRN2BL3D2D	VRN2BL3SFX	VRN2BL3DFX
	10*				VRN2BM3S2A	VRN2BM3D2A	VRN2BM3S2B	VRN2BM3D2B	VRN2BM3S2D	VRN2BM3D2D	VRN2BM3SFX	VRN2BM3DFX
1 in.	1.0	3.0			VRN2CB3S2A	VRN2CB3D2A	VRN2CB3S2B	VRN2CB3D2B	VRN2CB3S2D	VRN2CB3D2D	VRN2CB3SFX	VRN2CB3DFX
	2.0				VRN2CD3S2A	VRN2CD3D2A	VRN2CD3S2B	VRN2CD3D2B	VRN2CD3S2D	VRN2CD3D2D	VRN2CD3SFX	VRN2CD3DFX
	3.0				VRN2CE3S2A	VRN2CE3D2A	VRN2CE3S2B	VRN2CE3D2B	VRN2CE3S2D	VRN2CE3D2D	VRN2CE3SFX	VRN2CE3DFX
	4.0				VRN2CF3S2A	VRN2CF3D2A	VRN2CF3S2B	VRN2CF3D2B	VRN2CF3S2D	VRN2CF3D2D	VRN2CF3SFX	VRN2CF3DFX
	5.0				VRN2CG3S2A	VRN2CG3D2A	VRN2CG3S2B	VRN2CG3D2B	VRN2CG3S2D	VRN2CG3D2D	VRN2CG3SFX	VRN2CG3DFX
	6.0				VRN2CH3S2A	VRN2CH3D2A	VRN2CH3S2B	VRN2CH3D2B	VRN2CH3S2D	VRN2CH3D2D	VRN2CH3SFX	VRN2CH3DFX
	7.0				VRN2CJ3S2A	VRN2CJ3D2A	VRN2CJ3S2B	VRN2CJ3D2B	VRN2CJ3S2D	VRN2CJ3D2D	VRN2CJ3SFX	VRN2CJ3DFX
	8.0	6.0			VRN2CK3S2A	VRN2CK3D2A	VRN2CK3S2B	VRN2CK3D2B	VRN2CK3S2D	VRN2CK3D2D	VRN2CK3SFX	VRN2CK3DFX
	9.0				VRN2CL3S2A	VRN2CL3D2A	VRN2CL3S2B	VRN2CL3D2B	VRN2CL3S2D	VRN2CL3D2D	VRN2CL3SFX	VRN2CL3DFX
	10	3.0	50		VRN2CM3S2A	VRN2CM3D2A	VRN2CM3S2B	VRN2CM3D2B	VRN2CM3S2D	VRN2CM3D2D	VRN2CM3SFX	VRN2CM3DFX
	15				VRN2CN3S2A	VRN2CN3D2A	VRN2CN3S2B	VRN2CN3D2B	VRN2CN3S2D	VRN2CN3D2D	VRN2CN3SFX	VRN2CN3DFX
	20	4.0			VRN2CP3S2A	VRN2CP3D2A	VRN2CP3S2B	VRN2CP3D2B	VRN2CP3S2D	VRN2CP3D2D	VRN2CP3SFX	VRN2CP3DFX

* Full port ball
** Differential pressure regulator operating range, ±5%

Threaded Dynamic Pressure-Regulated Control Valves												
Actuator Features				Non-Fail Safe				Fail Safe		Valve Only	
											
Actuator OS Number				MN6105A1011	MN6105A1011	MN7505A2001	MN7505A2001	MS7505A2030	MS7505A2030	N/A	N/A
VALVE FEATURES			Trim	Stainless Steel	Plated Brass	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Plated Brass
			Regulator	Stainless steel cage, positive pressure rolling diaphragm							
			Test Port	Two 1/4 in. NPT							
Valve Size	Max. gpm	Differential Pressure, psid			Valve O.S. Number							
		Min.**	Max.**	Close-off								
1-1/4 in.	10	3.0	50	100	VRN2DM3S2A	VRN2DM3D2A	VRN2DM3S2B	VRN2DM3D2B	VRN2DM3S2D	VRN2DM3D2D	VRN2DM3SFX	VRN2DM3DFX
	15				VRN2DN3S2A	VRN2DN3D2A	VRN2DN3S2B	VRN2DN3D2B	VRN2DN3S2D	VRN2DN3D2D	VRN2DN3SFX	VRN2DN3DFX
	20	4.0			VRN2DP3S2A	VRN2DP3D2A	VRN2DP3S2B	VRN2DP3D2B	VRN2DP3S2D	VRN2DP3D2D	VRN2DP3SFX	VRN2DP3DFX
	25	5.0			VRN2DQ3S2A	VRN2DQ3D2A	VRN2DQ3S2B	VRN2DQ3D2B	VRN2DQ3S2D	VRN2DQ3D2D	VRN2DQ3SFX	VRN2DQ3DFX
	30				VRN2DR3S2A	VRN2DR3D2A	VRN2DR3S2B	VRN2DR3D2B	VRN2DR3S2D	VRN2DR3D2D	VRN2DR3SFX	VRN2DR3DFX
	35*	6.5	58		VRN2DS3S2A	VRN2DS3D2A	VRN2DS3S2B	VRN2DS3D2B	VRN2DS3S2D	VRN2DS3D2D	VRN2DS3SFX	VRN2DS3DFX
1-1/2 in.	10	3.0	50		VRN2EM3S2A	VRN2EM3D2A	VRN2EM3S2B	VRN2EM3D2B	VRN2EM3S2D	VRN2EM3D2D	VRN2EM3SFX	VRN2EM3DFX
	15				VRN2EN3S2A	VRN2EN3D2A	VRN2EN3S2B	VRN2EN3D2B	VRN2EN3S2D	VRN2EN3D2D	VRN2EN3SFX	VRN2EN3DFX
	20	4.0			VRN2EP3S2A	VRN2EP3D2A	VRN2EP3S2B	VRN2EP3D2B	VRN2EP3S2D	VRN2EP3D2D	VRN2EP3SFX	VRN2EP3DFX
	25	5.0			VRN2EQ3S2A	VRN2EQ3D2A	VRN2EQ3S2B	VRN2EQ3D2B	VRN2EQ3S2D	VRN2EQ3D2D	VRN2EQ3SFX	VRN2EQ3DFX
	30				VRN2ER3S2A	VRN2ER3D2A	VRN2ER3S2B	VRN2ER3D2B	VRN2ER3S2D	VRN2ER3D2D	VRN2ER3SFX	VRN2ER3DFX
	35	4.0	58		VRN2ES3S2A	VRN2ES3D2A	VRN2ES3S2B	VRN2ES3D2B	VRN2ES3S2D	VRN2ES3D2D	VRN2ES3SFX	VRN2ES3DFX
	40	6.0			VRN2ET3S2A	VRN2ET3D2A	VRN2ET3S2B	VRN2ET3D2B	VRN2ET3S2D	VRN2ET3D2D	VRN2ET3SFX	VRN2ET3DFX
	45				VRN2EU3S2A	VRN2EU3D2A	VRN2EU3S2B	VRN2EU3D2B	VRN2EU3S2D	VRN2EU3D2D	VRN2EU3SFX	VRN2EU3DFX
	50				VRN2E13S2A	VRN2E13D2A	VRN2E13S2B	VRN2E13D2B	VRN2E13S2D	VRN2E13D2D	VRN2E13SFX	VRN2E13DFX
2 in.	25	4.0			VRN2FQ3S2A	VRN2FQ3D2A	VRN2FQ3S2B	VRN2FQ3D2B	VRN2FQ3S2D	VRN2FQ3D2D	VRN2FQ3SFX	VRN2FQ3DFX
	30				VRN2FR3S2A	VRN2FR3D2A	VRN2FR3S2B	VRN2FR3D2B	VRN2FR3S2D	VRN2FR3D2D	VRN2FR3SFX	VRN2FR3DFX
	35				VRN2FS3S2A	VRN2FS3D2A	VRN2FS3S2B	VRN2FS3D2B	VRN2FS3S2D	VRN2FS3D2D	VRN2FS3SFX	VRN2FS3DFX
	40	6.0			VRN2FT3S2A	VRN2FT3D2A	VRN2FT3S2B	VRN2FT3D2B	VRN2FT3S2D	VRN2FT3D2D	VRN2FT3SFX	VRN2FT3DFX
	45				VRN2FU3S2A	VRN2FU3D2A	VRN2FU3S2B	VRN2FU3D2B	VRN2FU3S2D	VRN2FU3D2D	VRN2FU3SFX	VRN2FU3DFX
	50				VRN2F13S2A	VRN2F13D2A	VRN2F13S2B	VRN2F13D2B	VRN2F13S2D	VRN2F13D2D	VRN2F13SFX	VRN2F13DFX
	55	7.0			VRN2F23S2A	VRN2F23D2A	VRN2F23S2B	VRN2F23D2B	VRN2F23S2D	VRN2F23D2D	VRN2F23SFX	VRN2F23DFX
	60				VRN2F33S2A	VRN2F33D2A	VRN2F33S2B	VRN2F33D2B	VRN2F33S2D	VRN2F33D2D	VRN2F33SFX	VRN2F33DFX
	65				VRN2F43S2A	VRN2F43D2A	VRN2F43S2B	VRN2F43D2B	VRN2F43S2D	VRN2F43D2D	VRN2F43SFX	VRN2F43DFX
	70				VRN2F53S2A	VRN2F53D2A	VRN2F53S2B	VRN2F53D2B	VRN2F53S2D	VRN2F53D2D	VRN2F53SFX	VRN2F53DFX
	75				VRN2F63S2A	VRN2F63D2A	VRN2F63S2B	VRN2F63D2B	VRN2F63S2D	VRN2F63D2D	VRN2F63SFX	VRN2F63DFX
2-1/2 in.	25	4.0			VRN2GQ3S2A	VRN2GQ3D2A	VRN2GQ3S2B	VRN2GQ3D2B	VRN2GQ3S2D	VRN2GQ3D2D	VRN2GQ3SFX	VRN2GQ3DFX
	30				VRN2GR3S2A	VRN2GR3D2A	VRN2GR3S2B	VRN2GR3D2B	VRN2GR3S2D	VRN2GR3D2D	VRN2GR3SFX	VRN2GR3DFX
	35				VRN2GS3S2A	VRN2GS3D2A	VRN2GS3S2B	VRN2GS3D2B	VRN2GS3S2D	VRN2GS3D2D	VRN2GS3SFX	VRN2GS3DFX
	40	6.0			VRN2GT3S2A	VRN2GT3D2A	VRN2GT3S2B	VRN2GT3D2B	VRN2GT3S2D	VRN2GT3D2D	VRN2GT3SFX	VRN2GT3DFX
	45				VRN2GU3S2A	VRN2GU3D2A	VRN2GU3S2B	VRN2GU3D2B	VRN2GU3S2D	VRN2GU3D2D	VRN2GU3SFX	VRN2GU3DFX
	50				VRN2G13S2A	VRN2G13D2A	VRN2G13S2B	VRN2G13D2B	VRN2G13S2D	VRN2G13D2D	VRN2G13SFX	VRN2G13DFX
	55	7.0			VRN2G23S2A	VRN2G23D2A	VRN2G23S2B	VRN2G23D2B	VRN2G23S2D	VRN2G23D2D	VRN2G23SFX	VRN2G23DFX
	60				VRN2G33S2A	VRN2G33D2A	VRN2G33S2B	VRN2G33D2B	VRN2G33S2D	VRN2G33D2D	VRN2G33SFX	VRN2G33DFX
	65				VRN2G43S2A	VRN2G43D2A	VRN2G43S2B	VRN2G43D2B	VRN2G43S2D	VRN2G43D2D	VRN2G43SFX	VRN2G43DFX
	70				VRN2G53S2A	VRN2G53D2A	VRN2G53S2B	VRN2G53D2B	VRN2G53S2D	VRN2G53D2D	VRN2G53SFX	VRN2G53DFX
	75				VRN2G63S2A	VRN2G63D2A	VRN2G63S2B	VRN2G63D2B	VRN2G63S2D	VRN2G63D2D	VRN2G63SFX	VRN2G63DFX
	80	10			VRN2G73S2A	VRN2G73D2A	VRN2G73S2B	VRN2G73D2B	VRN2G73S2D	VRN2G73D2D	VRN2G73SFX	VRN2G73DFX
	85				VRN2G83S2A	VRN2G83D2A	VRN2G83S2B	VRN2G83D2B	VRN2G83S2D	VRN2G83D2D	VRN2G83SFX	VRN2G83DFX
	95*	12			VRN2G93S2A	VRN2G93D2A	VRN2G93S2B	VRN2G93D2B	VRN2G93S2D	VRN2G93D2D	VRN2G93SFX	VRN2G93DFX
3 in.	25	4.0			VRN2HQ3S2A	VRN2HQ3D2A	VRN2HQ3S2B	VRN2HQ3D2B	VRN2HQ3S2D	VRN2HQ3D2D	VRN2HQ3SFX	VRN2HQ3DFX
	30				VRN2HR3S2A	VRN2HR3D2A	VRN2HR3S2B	VRN2HR3D2B	VRN2HR3S2D	VRN2HR3D2D	VRN2HR3SFX	VRN2HR3DFX
	35				VRN2HS3S2A	VRN2HS3D2A	VRN2HS3S2B	VRN2HS3D2B	VRN2HS3S2D	VRN2HS3D2D	VRN2HS3SFX	VRN2HS3DFX
	40	6.0			VRN2HT3S2A	VRN2HT3D2A	VRN2HT3S2B	VRN2HT3D2B	VRN2HT3S2D	VRN2HT3D2D	VRN2HT3SFX	VRN2HT3DFX
	45				VRN2HU3S2A	VRN2HU3D2A	VRN2HU3S2B	VRN2HU3D2B	VRN2HU3S2D	VRN2HU3D2D	VRN2HU3SFX	VRN2HU3DFX
	50				VRN2H13S2A	VRN2H13D2A	VRN2H13S2B	VRN2H13D2B	VRN2H13S2D	VRN2H13D2D	VRN2H13SFX	VRN2H13DFX
	55	7.0			VRN2H23S2A	VRN2H23D2A	VRN2H23S2B	VRN2H23D2B	VRN2H23S2D	VRN2H23D2D	VRN2H23SFX	VRN2H23DFX
	60				VRN2H33S2A	VRN2H33D2A	VRN2H33S2B	VRN2H33D2B	VRN2H33S2D	VRN2H33D2D	VRN2H33SFX	VRN2H33DFX
	65				VRN2H43S2A	VRN2H43D2A	VRN2H43S2B	VRN2H43D2B	VRN2H43S2D	VRN2H43D2D	VRN2H43SFX	VRN2H43DFX
	70				VRN2H53S2A	VRN2H53D2A	VRN2H53S2B	VRN2H53D2B	VRN2H53S2D	VRN2H53D2D	VRN2H53SFX	VRN2H53DFX
	75				VRN2H63S2A	VRN2H63D2A	VRN2H63S2B	VRN2H63D2B	VRN2H63S2D	VRN2H63D2D	VRN2H63SFX	VRN2H63DFX
	80	10			VRN2H73S2A	VRN2H73D2A	VRN2H73S2B	VRN2H73D2B	VRN2H73S2D	VRN2H73D2D	VRN2H73SFX	VRN2H73DFX
	85				VRN2H83S2A	VRN2H83D2A	VRN2H83S2B	VRN2H83D2B	VRN2H83S2D	VRN2H83D2D	VRN2H83SFX	VRN2H83DFX
	95*	12			VRN2H93S2A	VRN2H93D2A	VRN2H93S2B	VRN2H93D2B	VRN2H93S2D	VRN2H93D2D	VRN2H93SFX	VRN2H93DFX

* Full port ball
** Differential pressure regulator operating range, ±5%

Pressure-Regulated Flow Control Valves

VRW

Flanged Dynamic Pressure-Regulated Control Valves							
Actuator Features						**Non-Fail Safe**	**Fail Safe**
Power Supply					Voltage	24 Vac/30 Vdc	24 Vac/30 Vdc
					Frequency	50 / 60 Hz	50 / 60 Hz
					Power	20 VA	20 VA
Enclosure					(ingress protection)	IP44	IP44
Control					2-10 Vdc	•	•
					4-20 mA (w/external 500 Ohm Resistor)	•	•
					Pulse-width Modulating	•	•
					Floating	•	•
					Two-Position SPDT	•	•
Fail Safe Action					(field configurable*)	Stay in Place	Open/Closed*
Normal Position (no signal)					(field configurable)	Open/Closed	Open/Closed
Actuator Stroke					(degrees)	6 x 360°	6 x 360°
Timing					(seconds, 60 Hz)	150	150
Feedback					4-20 mA (2-10 Vdc) Built in	•	•
						Trim	**Stainless Steel**
						Body	**Cast Iron**
						Pressure Ratings	**ANSI 150/300**
Valve Features						**Test Ports**	**Two - 1/4" ISO**
Valve Size	Flow, gpm*		Differential Pressure (psid)			**Valve O.S. Number**	
	Min.	Max.	Min.**	Max.**	Close-off		
2-1/2 and 3 in. [DN65-DN80]	39	112	5.1	58	100	**VRW2JV4SMB**	**VRW2JV4SMD**
	56	155	11.6			**VRW2JW4SMB**	**VRW2JW4SMD**
3 and 4 in. [DN80-DN100]	55	147	5.1			**VRW2KV4SMB**	**VRW2KV4SMD**
	73	222	8.6			**VRW2KW4SMB**	**VRW2KW4SMD**
5 and 6 in. [DN125-DN150]	103	370	5.1			**VRW2LV4SMB**	**VRW2LV4SMD**
	118	469	8.6			**VRW2LW4SMB**	**VRW2LW4SMD**

* Field adjustable
** Differential pressure regulator operating range, ±5%

Section 3: Submittal Sheets

Rectangular Volume Control Dampers

D1 Series

The D1 series is an extremely low leakage damper with rugged steel airfoil blades designed to meet the highest standards established. It is intended for application in medium to high pressure and velocity ratings.

PERFORMANCE DATA

D1 Pressure and Velocity Limits.

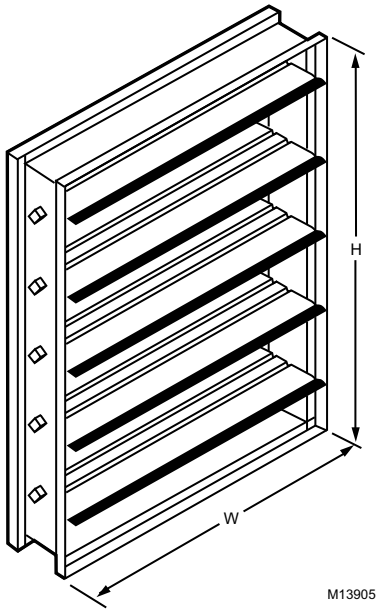
Damper Size in inches.	Maximum System Pressure	Maximum System Velocity
12 x 12	8.0 in. wg	4000 fpm
24 x 24	8.0 in. wg	4000 fpm
36 x 36	6.3 in. wg	3500 fpm
48 x 48	4.7 in. wg	3000 fpm
60 x 60	2.0 in. wg	2500 fpm

SPECIFICATIONS

Size Range[1]
Minimum Size
One Blade ..... 6 in. wide by 6 in. high
Two Blade..... 6 in. wide by 10 in. high
Maximum Size
Single Section ..... 60 in. wide by 74 in. high
Multiple Section..... unlimited
Temperature Rating..... 180 F (82 C) maximum[2]
Standard Construction[3]Blade: ..... 14 gauge galvanized steel, airfoil shaped
Action: ..... Parallel or Opposed
Frame[3]:..... 16 gauge galvanized steel Hat-channel
Bearings[3] ..... Synthetic (Acetal)
Linkage[3]..... Steel Side linkage out of airstream (concealed in frame)
Axles[3] ..... 1/2 in. diameter plated steel
Jamb Seals[3] ..... 304 Stainless Steel
Blade Edge Seals[3]..... Silicone

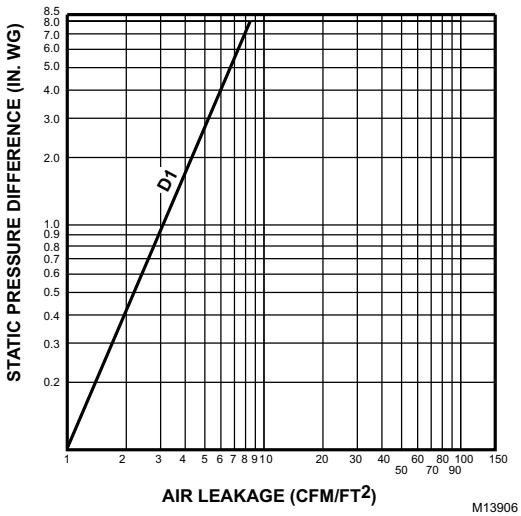
[1] Width and height dimensions furnished 1/4 in. undersized - standard
[2] Temperature rating with standard options
[3] Customized options are available

DIMENSIONS DIAGRAM



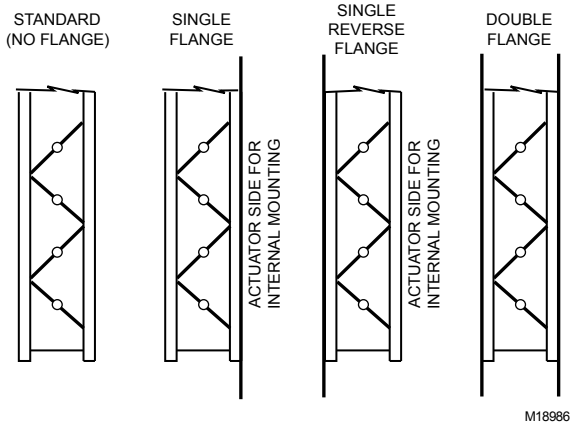
M13905

LEAKAGE RATE



M13906

FLANGE OPTIONS



M18986

D2 and D3 Series

D2 series is an ultra-low leakage control damper which includes blade and jamb seals. The D3 series is a general purpose damper intended for applications where low leakage performance is not necessary.

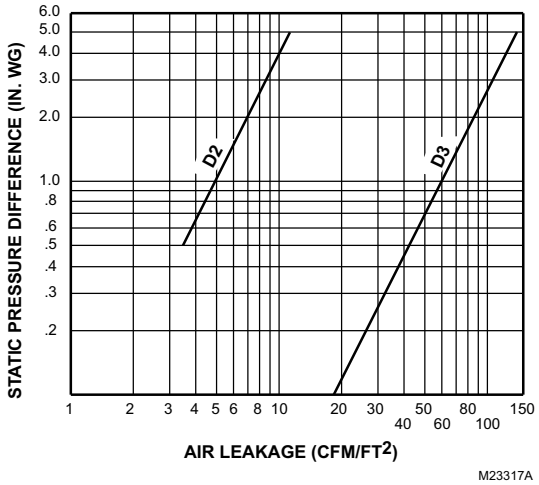
Honeywell International, Inc. certifies that the models D2, and D3 shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Programs. The AMCA Certified Ratings Seal applies to air performance ratings only. March 2008.

SPECIFICATIONS

Size Range[1]
Minimum Size
One Blade ..... 6 in. wide by 6 in. high
Two Blade ..... 6 in. wide by 10 in. high
Maximum Size .....
Single Section ..... 48 in. wide by 72 in. high
Multiple Section ..... unlimited
Temperature Rating ..... 180 F (82 C) maximum
Standard Construction[2] ..... Blade:16 gauge galvanized steel 3-V
Action: ..... Parallel or Opposed
Frame[2]: ..... 16 gauge galvanized steel Hat-channel
Bearings[2] ..... Synthetic (Acetal)
Linkage ..... Side linkage out of airstream (concealed in frame)
Axles ..... 1/2 in. square plated steel
Jamb Seals[3] ..... Compression-type Stainless Steel
Blade Edge Seals[2] ..... Extruded Vinyl

[1] Width and height dimensions furnished 1/4 in. undersized - standard
[2] Customized options are available
[3] D2 Dampers only

LEAKAGE RATE

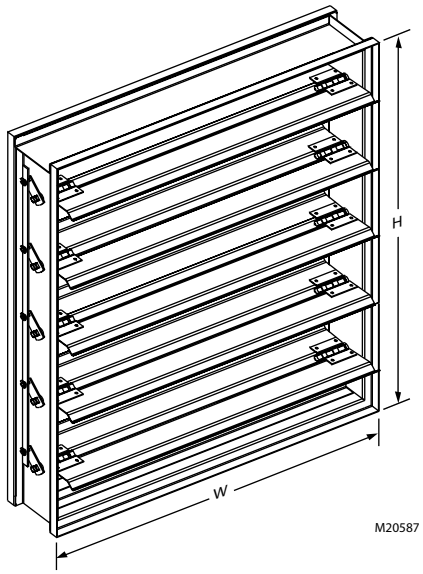


PERFORMANCE DATA

D2, D3 Pressure and Velocity Limits.

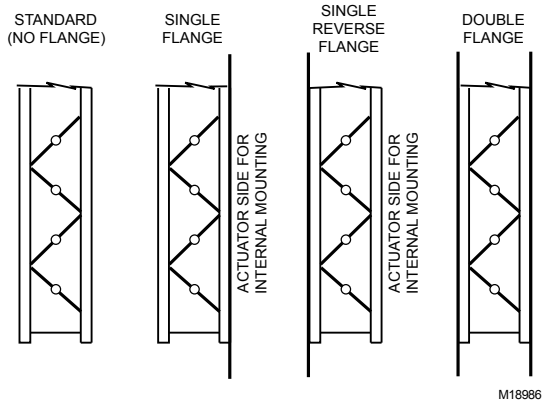
Damper Size in inches.	Maximum System Pressure	Maximum System Velocity
12 x 12	5.0 in. wg	3000 fpm
24 x 24	5.0 in. wg	3000 fpm
36 x 36	4.0 in. wg	2500 fpm
48 x 48	2.5 in. wg	2000 fpm

DIMENSIONS DIAGRAM



NOTE: D2 and D3 will withstand higher pressures and velocities. Displayed ratings are conservative to prevent misapplication. Consult Honeywell if you have an application outside these limitations.

FLANGE OPTIONS



SUBMITTAL SHEETS

Round Volume Control Dampers

D690

The D690 Round Damper is used in conventional air handling systems to control airflow in a round duct. The damper is designed for use with Honeywell ML6161 and ML7161 Direct Coupled Actuators.

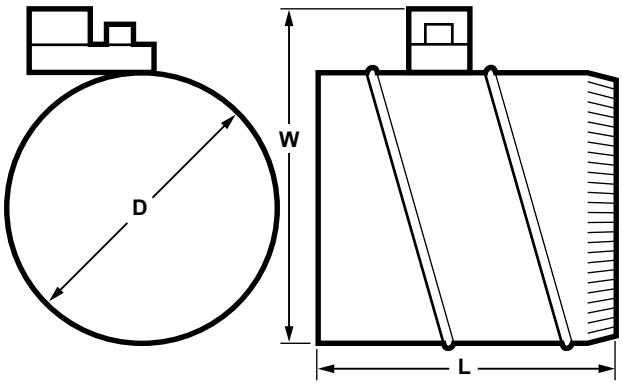
FEATURES

- Neoprene seal for tight closing and low leakage.
- Oilite bearings for long life.
- 90 degree damper travel for a variety of applications.

SPECIFICATIONS

Application	heating, cooling, ventilating
Type of Blade	Single-blade, round
Temperature Range	32 F to 130 F (0 C to 54 C)
Integral Actuator	None
Input Signal	none
Used With	ML6161; ML7161; W7751 VAV Controller

DIMENSIONS DIAGRAM



DAMPER DIAMETER (D)		WIDTH (W)		LENGTH (L)	
in.	mm	in.	mm	in.	mm
6	152	9-1/2	241	12	305
8	203	11-1/2	292	12	305
10	254	13-1/2	343	12	305
12	305	15-1/2	394	13	330
14	356	17-1/2	445	15	381
16	406	19-1/2	495	17	432

M17412

DM7600

The DM7600 Commercial Zone Damper is used in zoning systems to control airflow in a round duct. A Honeywell ML6161 or ML7161 Direct Coupled Actuator is factory mounted to the damper to simplify field installation.

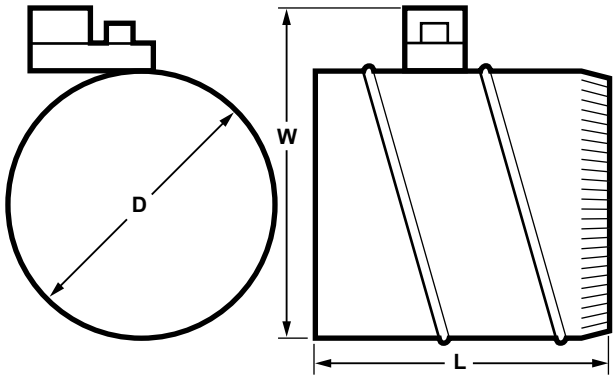
FEATURES

- Neoprene seal for tight closing and low leakage.
- Oilite bearings for long life.
- 90 degree damper travel for a variety of applications.
- Magnetic coupling requires no limit switches or mechanical stops.

SPECIFICATIONS

Application .....heating, cooling, ventilating
Type of Blade.....Single-blade, round
Temperature Range.....32 F to 130 F (0 C to 54 C)
Voltage.....24 Vac
Frequency .....50 Hz; 60 Hz

DIMENSIONS DIAGRAM



DAMPER DIAMETER (D)		WIDTH (W)		LENGTH (L)	
in.	mm	in.	mm	in.	mm
6	152	9-1/2	241	12	305
8	203	11-1/2	292	12	305
10	254	13-1/2	343	12	305
12	305	15-1/2	394	13	330
14	356	17-1/2	445	15	381
16	406	19-1/2	495	17	432

M17412

Spring Return Direct Coupled Actuator

S03 Series (MS4103; MS7403; MS7503; MS8103)

MS4103, MS7403, MS7503, and MS8103 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	27 lb-in. (3 Nm)
Spring Return Torque	27 lb-in (3 Nm)
Spring Return Direction	By orientation
External Auxiliary Switches Available	No
Electrical Connections	Enclosed screw terminal strip (22 to 14 AWG)
Ingress Protection Rating	IP54
Environmental Rating	NEMA2
Frequency	50 Hz; 60 Hz
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	50
Rotation to Open	By switch
Rotational Stroke Adjustment	Mechanically limited 5 degree increments
Compatible Damper Shafts	3/8 to 5/8 in. round or 1/4 to 1/2 in. square (9 to 16 mm round or 6 to 13 mm square)
Shaft Adapter Type	Self-centering clamping
Materials	Plenum rated plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +149F F (-40 C to +65 C) -22 F to +149F (-30 C to +65 C) for two-position actuators only
Temperature Ratings (Shipping)	-40 F to +150F (-40 C to +65 C)
Storage Temperature Range	-40 F to +150F (-40 C to +65 C)
Weight	3.5 lb (1.6 kg)
Includes	Mounting bracket, self-centering shaft adapter

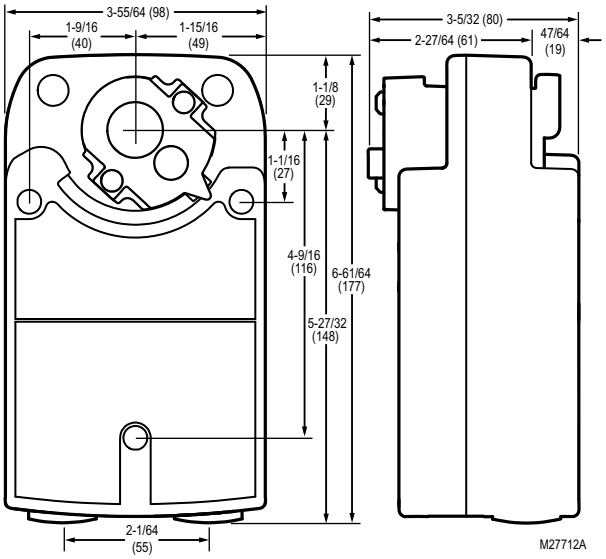
APPROVALS

CE	EMC 2004/108/EC; Certification Low Voltage Directive 2006/95/EC; IEC 60730-1 and Part 2-14
C-Tick	N314
Underwriters Laboratories, Inc.	UL 873
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

FEATURES

- Brushless DC submotor with electronic stall protection on all models
- Self-centering shaft adaptor (shaft coupling) for wide range of shaft sizes
- Models available for use with two-position, SPST, line- (Series 40) or low- (Series 80) voltage controls
- Models available for use with floating or switched SPDT (Series 60) controls
- Models avail able for use with proportional current or voltage (Series 70) controls
- Models available with combined floating and modulating control in a single device
- Models available with an internal end switch
- Access cover to facilitate connectivity
- Durable plastic housing with built-in mechanical end limits
- Spring return direction field selectable
- Shaft position indicator and scale
- UL (cUL) listed and CE compliant
- All models are plenum rated per UL873

DIMENSIONS DIAGRAM



Spring Return Direct Coupled Actuator

S05 Series (MS4105; MS7405; MS7505; MS8105)

MS4105, MS7405, MS7505, and MS8105 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

FEATURES

- Brushless DC submotor with electronic stall protection on all models
- Self-centering shaft adaptor (shaft coupling) for wide range of shaft sizes
- Models available for use with two-position, SPST, line- (Series 40) or low- (Series 80) voltage controls
- Models available for use with floating or switched SPDT (Series 60) controls
- Models available for use with proportional current or voltage (Series 70) controls
- Models available with combined floating and modulating control in a single device
- Models available with an internal end switch
- Access cover includes enclosed screw terminal strip (22 to 14 AWG) for electrical connections.
- Models available with 3 foot 18 AWG color-coded cable
- Durable plastic housing with built-in mechanical end limits
- Spring return direction field selectable
- Shaft position indicator and scale
- UL (cUL) listed and CE compliant
- All models are plenum rated per UL873

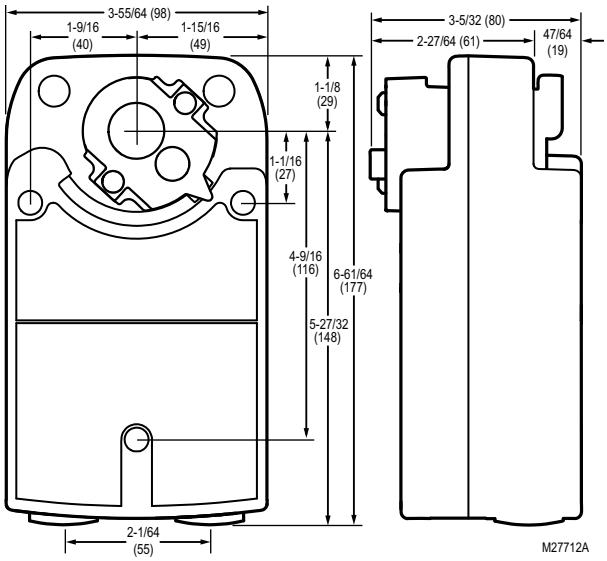
SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	44 lb-in. (5 Nm)
Spring Return Torque	44 lb-in. (5 Nm)
Spring Return Direction	By orientation
External Auxiliary Switches Available	No
Environmental Rating	NEMA2
Ingress Protection Rating	IP54
Frequency	50 Hz; 60 Hz
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	50
Rotation to Open	By switch
Rotational Stroke Adjustment	Mechanically limited 5 degree increments
Compatible Damper Shafts	3/8 to 5/8 in. round or 1/4 to 1/2 in. square (9 to 16 mm round or 6 to 13 mm square)
Shaft Adapter Type	Self-centering clamping
Materials	Plenum rated plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +149F F (-40 C to +65 C) -22 F to +149F (-30 C to +65 C) for two-position actuators only
Temperature Ratings (Shipping)	-40 F to +150F (-40 C to +65 C)
Storage Temperature Range	-40 F to +150F (-40 C to +65 C)
Weight	3.5 lb (1.6 kg)
Includes	Mounting bracket, self-centering shaft adapter

APPROVALS

CE	EMC 2004/108/EC; Certification Low Voltage Directive 2006/95/EC; IEC 60730-1 and Part 2-14
C-Tick	N314
Underwriters Laboratories, Inc.	UL 873
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Spring Return Direct Coupled Actuator

S10 Series (MS4110; MS7510; MS8110)

MS4110, MS7510, and MS8110 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

FEATURES

- Brushless DC submotor with electronic stall protection for floating/modulating models.
- Brush DC submotor with electronic stall protection for 2-position models.
- Self-centering shaft adapter (shaft coupling) for wide range of shaft sizes.
- Models available for use with two-position, single pole single throw (spst), line- (Series 40) or low- (Series 80) voltage controls.
- Models available for use with proportional current or voltage (Series 70) controls.
- Models available with combined floating/modulating control in a single device.
- Models available with adjustable zero and span.
- Models available with line-voltage internal end switches.
- Access cover includes enclosed screw terminal strip (22 to 14 AWG) for electrical connections.
- Models available with 3 foot 18 AWG color-coded cable.
- Metal housing with built-in mechanical end limits.
- Spring return direction field-selectable.
- Shaft position indicator and scale.
- Manual winding capability with locking function.
- UL (cUL) listed and CE compliant.
- All Models are plenum-rated per UL873.

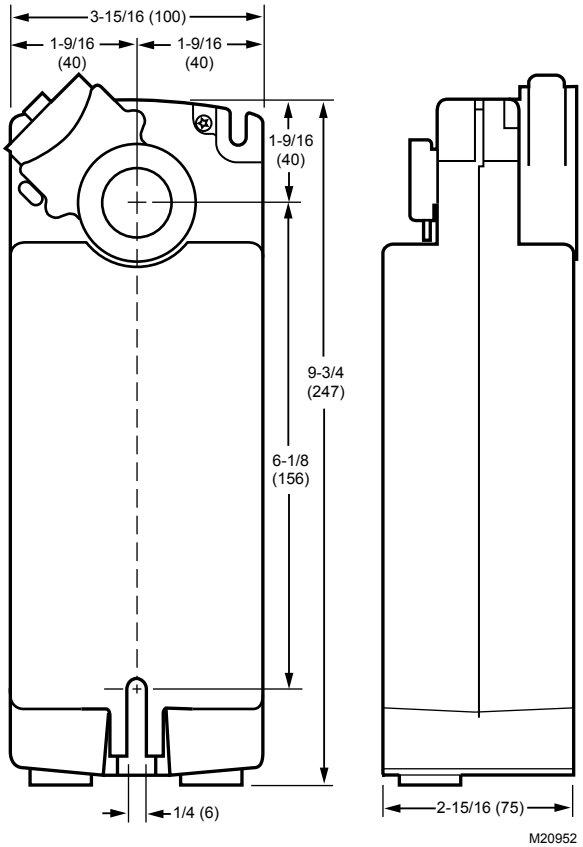
SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	88 lb-in. (10 Nm)
Spring Return Torque	88 lb-in. (10 Nm)
Spring Return Direction	By orientation
External Auxiliary Switches Available	Yes, SW2-US
Environmental Rating	NEMA2
Frequency	50 Hz; 60 Hz
Manual operation	Manual crank
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	40
Rotational Stroke Adjustment	Mechanically limited 5 degree increments
Compatible Damper Shafts	3/8 to 1.06 in. round or 3/8 to 11/16 in. square (10 to 27 mm round or 10 to 18 mm square)
Shaft Adapter Type	Self-centering clamping
Materials	Aluminum housing, Plenum rated plastic access cover
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +140 F (-40 C to +60 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	6 lb (2.72 kg)
Includes	Mounting bracket, self-centering shaft adapter, 3mm crank
Comments	Integral 1/2 in. NPSM conduit connection.

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



Spring Return Direct Coupled Actuator

S20 Series (MS4120; MS7520; MS8120)

MS4120, MS7520, and MS8120 Spring Return Direct Coupled Actuators (DCA) are used within heating, ventilating, and air-conditioning (HVAC) systems. They can drive a variety of quarter-turn, final control elements requiring spring return fail-safe operation.

SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	175 lb-in. (20 Nm)
Spring Return Torque	175 lb-in. (20 Nm)
Spring Return Direction	By orientation
External Auxiliary Switches Available	Yes, SW2-US
Environmental Rating	NEMA2
Frequency	50 Hz; 60 Hz
Manual operation	Manual crank
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	40
Rotational Stroke Adjustment	Mechanically limited 5 degree increments
Compatible Damper Shafts	3/8 to 1.06 in. round or 3/8 to 11/16 in. square (10 to 27 mm round or 10 to 18 mm square)
Shaft Adapter Type	Self-centering clamping
Materials	Aluminum housing, Plenum rated plastic access cover
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +140 F (-40 C to +60 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	6 lb (2.72 kg)
Includes	Mounting bracket, self-centering shaft adapter, 3mm crank
Comments	Integral 1/2 in. NPSM conduit connection.

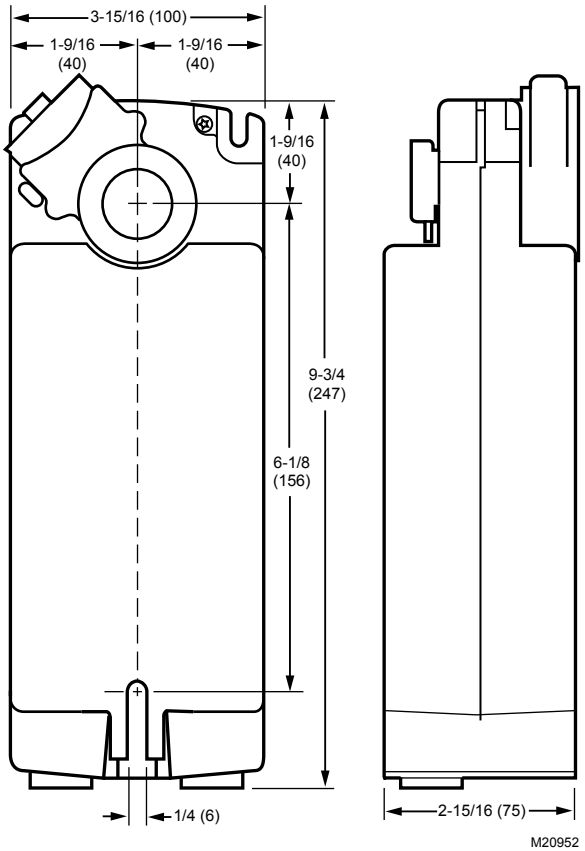
APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

FEATURES

- Brushless DC submotor with electronic stall protection for floating/modulating models.
- Brush DC submotor with electronic stall protection for 2-position models.
- Self-centering shaft adapter (shaft coupling) for wide range of shaft sizes.
- Models available for use with two-position, single pole single throw (spst), line- (Series 40) or low- (Series 80) voltage controls.
- Models available for use with proportional current or voltage (Series 70) controls.
- Models available with combined floating/modulating control in a single device.
- Models available with adjustable zero and span.
- Models available with line-voltage internal end switches.
- Access cover includes enclosed screw terminal strip (22 to 14 AWG) for electrical connections.
- Models available with 3 foot 18 AWG color-coded cable.
- Metal housing with built-in mechanical end limits.
- Spring return direction field-selectable.
- Shaft position indicator and scale.
- Manual winding capability with locking function.
- UL (cUL) listed and CE compliant.
- All models are plenum-rated per UL873.

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Spring Return Direct Coupled Actuator

ML4135; ML8135

The ML8135 Fast-Acting, Two-Position Actuators are spring return direct coupled actuators (DCA) with an integral junction box for on/off damper control.

FEATURES

- Integral spring return.
- -40 C to 130 F (-40 C to 54 C) operating temperature range.
- No audible noise during holding.
- Electronic circuitry provides efficient operation while eliminating the need for limit switches.
- Ninety-five degree angle of rotation.
- Die-cast aluminum housing. Housing design allows flush mounting to damper.
- Integral junction box with three conduit openings eliminates need for separate wiring box.
- Direct mounting to 3/8 or 1/2 in. round or square shaft.
- Not intended for smoke control systems.

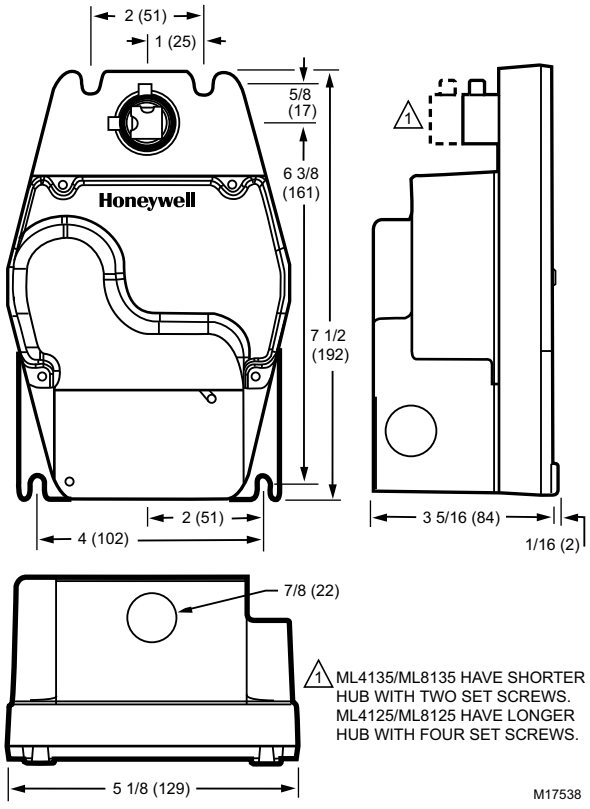
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	40 lb-in. (4.5 Nm)
Spring Return Torque	40 lb-in. (4.5 Nm)
External Auxiliary Switches Available	Yes, 32003532-005
Electrical Connections	Two color-coded leads
Electrical Connection Length	16 in. (406 mm)
Environmental Rating	NEMA1
Frequency	60 Hz
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	65
Compatible Damper Shafts	3/8 to 1/2 in. square or round (10 to 13 mm square/round)
Shaft Adapter Type	Aluminum Hub, four set screws
Materials	Aluminum housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +130 F (-18 C to +55 C)
Storage Temperature Range	-40 F to +140 F (-18 C to +60 C)
Weight	6 lb (2.72 kg)
Comments	Integral junction box with three 7/8 in. conduit openings (fittings not included)

APPROVALS

Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



Spring Return Direct Coupled Actuator

ML4125; ML8125

The ML8125 Fast-Acting, Two-Position Actuators are spring return direct coupled actuators (DCA) with an integral junction box for on/off damper control.

FEATURES

- Integral spring return.
- -40 C to 130 F (-40 C to 54 C) operating temperature range.
- No audible noise during holding.
- Electronic circuitry provides efficient operation while eliminating the need for limit switches.
- Ninety-five degree angle of rotation.
- Die-cast aluminum housing. Housing design allows flush mounting to damper.
- Integral junction box with three conduit openings eliminates need for separate wiring box.
- Direct mounting to 3/8 or 1/2 in. round or square shaft.
- Not intended for smoke control systems.

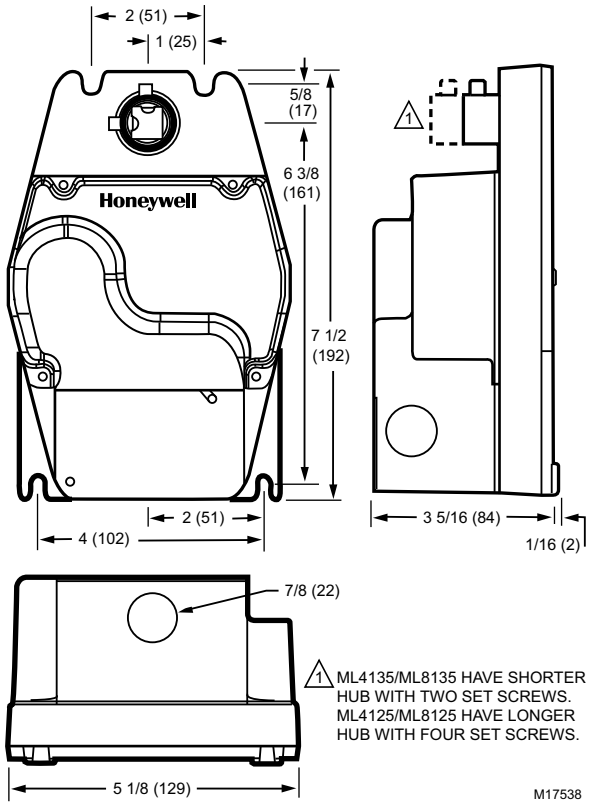
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	100 lb-in. (11.3 Nm)
Spring Return Torque	100 lb-in. (11.3 Nm)
External Auxiliary Switches Available	Yes, 32003532-005
Electrical Connections	Two color-coded leads
Electrical Connection Length	16 in. (406 mm)
Environmental Rating	NEMA1
Frequency	60 Hz
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	65
Compatible Damper Shafts	3/8 to 1/2 in. square or round (10 to 13 mm square/round)
Shaft Adapter Type	Aluminum Hub, two set screws
Materials	Aluminum housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +130 F (-18 C to +55 C)
Storage Temperature Range	-40 F to 140 F (-40 C to +60 C)
Weight	6 lb (2.72 kg)
Comments	Integral junction box with three 7/8 in. conduit openings (fittings not included)

APPROVALS

Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Non-Spring Return Direct Coupled Actuator

ML6161; ML7161

Used to control dampers in applications such as variable air volume (VAV) terminal units and for mounting on ball valves; suitable for use with SPDT or floating thermostats or building automation controls.

FEATURES

- Control for air damper applications with up to 10 sq.ft. assuming 3.5 in-lb per sq.ft. of damper area, velocity independent.
- Superior A/C synchronous submotor for consistent timing and actuator longevity.
- Eliminate need for limit switches or mechanical stops by providing magnetic coupling.
- All models include manual declutch lever, and bag assembly with two minimum position setscrews.
- Mount directly on 3/8 inch or 1/2 inch square or round damper shaft.
- Selectable 45, 60, and 90 stroke in either clockwise or counterclockwise direction.

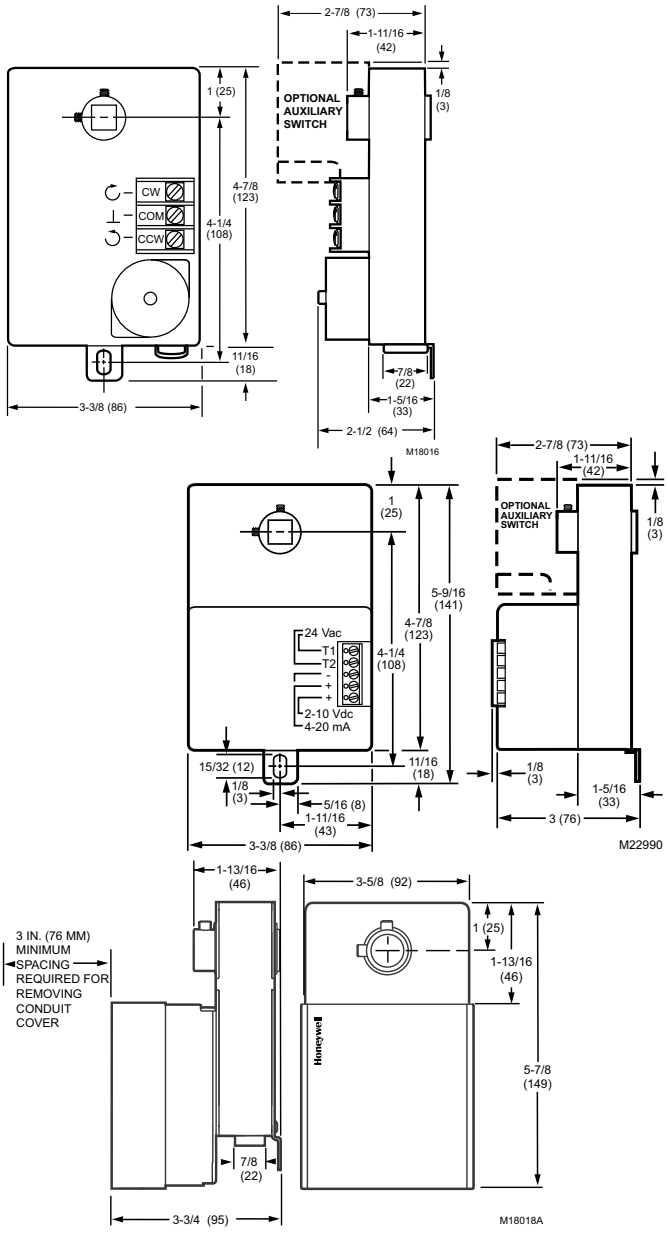
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	90 degrees
Fail Safe Mode	Non-Spring Return
Torque	35 lb-in. (4 Nm)
External Auxiliary Switches Available	Yes, 201052B
Electrical Connections	Screw terminals
Environmental Rating	NEMA1
Feedback	With accessory
Frequency	50 Hz; 60 Hz
Manual operation	Declutch mechanism
Mounting	Direct Coupled
Maximum Noise Rating, Driving (dBA @ 1m)	45
Rotation to Open	By wiring
Rotational Stroke Adjustment	Mechanically limited at 45 or 60 degrees in cw or ccw directions
Compatible Damper Shafts	3/8 to 1/2 in. square or round (10 to 13 mm square/round)
Shaft Adapter Type	Aluminum Hub, two set screws
Supply Voltage	24 Vac ±20%
Materials	Steel plate and Plenum rated plastic
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	20 F to 125 F (-18 C to +50 C)
Storage Temperature Range	20 F to 130 F (-18 C to +54 C)
Weight	1.5 lb (0.68 kg)
Includes	4074ENY Bag Assembly

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAMS



Non-Spring Return Direct Coupled Actuator

ML6174; ML7174

Used to control dampers in applications such as variable air volume (VAV) terminal units and for mounting on ball valves; suitable for use with SPDT or floating thermostats or building automation controls.

FEATURES

- Control for air damper applications with up to 20 sq.ft. assuming 3.5 in-lb per sq.ft. of damper area, velocity independent.
- Magnetic coupling eliminates the need for mechanical stops or limit switch adjustments by limiting stall torque to 130 lb-in. maximum.
- Mount directly on 3/8 to 1/2 in. round and square damper shafts. All models include manual declutch lever for ease of mounting, and bag assembly with two minimum position setscrews. 90 second timing models are suitable for use with pressure independent VAV systems.
- Selectable 45, 60, and 90 degree stroke in either clockwise or counterclockwise direction.

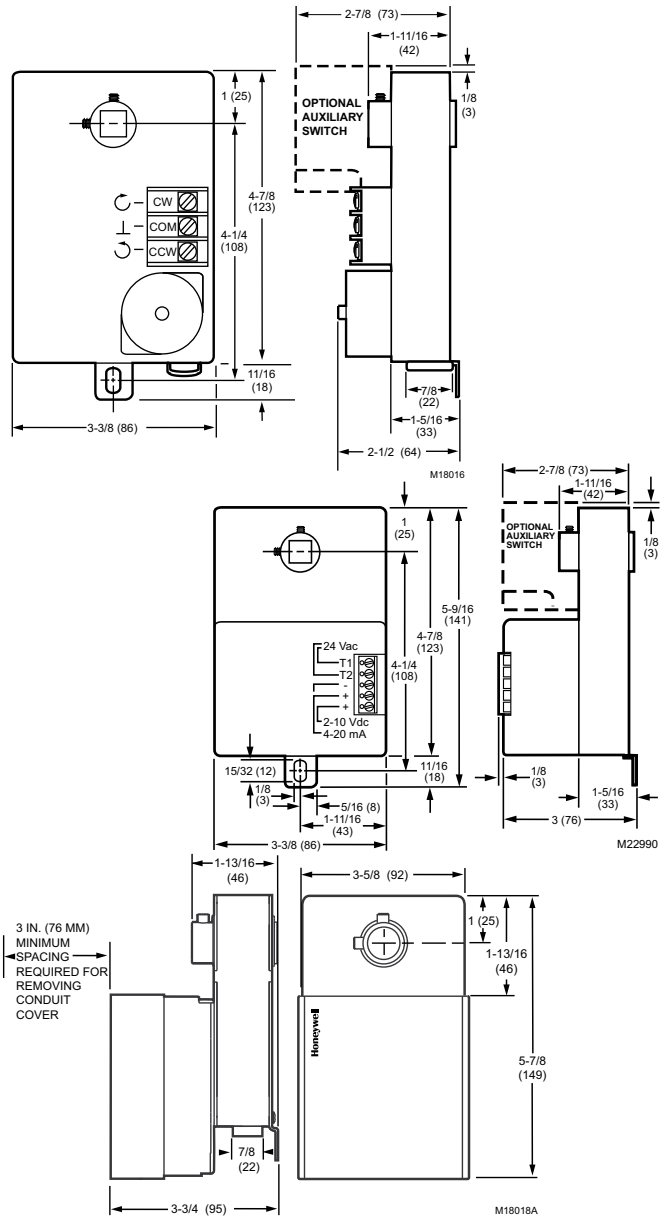
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	90 degrees
Fail Safe Mode	Non-Spring Return
Torque	70 lb-in (8 Nm)
External Auxiliary Switches Available	Yes, 201052B
Environmental Rating	NEMA1
Feedback	With accessory
Frequency	50 Hz; 60 Hz
Manual operation	Declutch mechanism
Mounting	Direct Coupled
Maximum Noise Rating, Driving (dBA @ 1m)	45
Rotation to Open	By wiring
Rotational Stroke Adjustment	Mechanically limited at 45 or 60 degrees in cw or ccw directions
Compatible Damper Shafts	3/8 to 1/2 in. square or round (10 to 13 mm square/round)
Shaft Adapter Type	Aluminum Hub, two set screws
Supply Voltage	24 Vac ±20%
Materials	Steel plate and Plenum rated plastic
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	20 F to 125 F (-18 C to +50 C)
Storage Temperature Range	20 F to 130 F (-18 C to +54 C)
Weight	1.5 lb (0.68 kg)
Includes	4074ENY Bag Assembly

APPROVALS

Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAMS



Non-Spring Return Direct Coupled Actuator

N05 Series (MN6105; MN7505)

This non-spring return direct-coupled damper actuator provides modulating and floating/2-position control for: air dampers, air handlers, ventilation flaps, louvers, and reliable control for air damper applications with up to 10 sq. ft./ 44lb.-in. (5 Nm) and 20 sq. ft./88 lb.-in. (10 Nm) (seal-less damper blades; air friction-dependent).

FEATURES

- Declutch for manual adjustment
- Adjustable mechanical end limits
- Access cover includes enclosed screw terminal strip (22 to 14 AWG) for electrical connections
- Models available with 3 foot 18 AWG color-coded cable
- Mountable in any orientation
- Function selection switch for selecting modulating or floating/2-position control

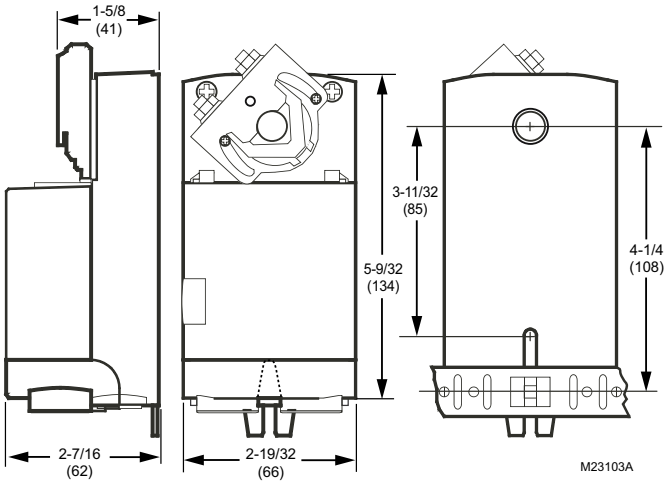
SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Non-Spring Return
Torque	44 lb-in. (5 Nm)
External Auxiliary Switches Available	Yes, SSW2-1M
Environmental Rating	NEMA2
Frequency	50 Hz; 60 Hz
Manual operation	Declutch mechanism
Mounting	Direct Coupled
Maximum Noise Rating, Driving (dBA @ 1m)	35
Rotation to Open	By switch
Rotational Stroke Adjustment	Dual Integral Adj. Stops (3 degree increments)
Compatible Damper Shafts	1/4 to 1/2 in. square or 3/8 to 5/8 in. round (6 to 13 mm square or 8 to 16 mm round)
Shaft Adapter Type	U-bolt clamp
Supply Voltage	24 Vac +20%, -15%, 24 Vdc
Materials	Plenum rated plastic housing
Ingress Protection Rating	IP54
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-5 F to +140 F (-20 C to +60 C)
Storage Temperature Range	-22 F to +176 F (-30 C to +80 C)
Weight	1 lb (0.45 kg)
Includes	Mounting bracket, screws, shaft adapter, water-tight strain-relief cable fittings
Comments	Integral 1/2 in. NPSM conduit connection.

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



Non-Spring Return Direct Coupled Actuator

N10 Series (MN6110; MN7510)

This non-spring return direct-coupled damper actuator provides modulating and floating/2-position control for air dampers, air handlers, ventilation flaps, louvers, and reliable control for air damper applications with up to 20 sq ft/88 lb-in. (10 Nm) (seal-less damper blades; air friction-dependent).

FEATURES

- Declutch for manual adjustment
- Adjustable mechanical end limits
- Removable access cover for direct wiring
- Mountable in any orientation
- Function selection switch for selecting modulating or floating/2-position control

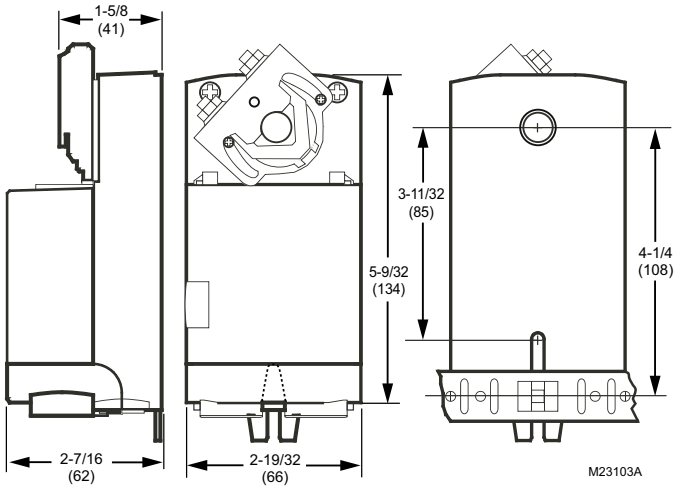
SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Non-Spring Return
Torque	88 lb-in. (10 Nm)
External Auxiliary Switches Available	Yes, SSW2-1M
Electrical Connections	Enclosed screw terminal strip (22 to 14 AWG)
Environmental Rating	NEMA2
Frequency	50 Hz; 60 Hz
Manual operation	Declutch mechanism
Mounting	Direct Coupled
Maximum Noise Rating, Driving (dBA @ 1m)	35
Rotation to Open	By switch
Rotational Stroke Adjustment	Dual Integral Adj. Stops (3 degree increments)
Compatible Damper Shafts	1/4 to 1/2 in. square or 3/8 to 5/8 in. round (6 to 13 mm square or 8 to 16 mm round)
Shaft Adapter Type	U-bolt clamp
Supply Voltage	24 Vac +20%, -15%, 24 Vdc
Materials	Plenum rated plastic housing
Ingress Protection Rating	IP54
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-5 F to +140 F (-20 C to +60 C)
Storage Temperature Range	-22 F to +176 F (-30 C to +80 C)
Weight	1 lb (0.45 kg)
Includes	Mounting bracket, screws, shaft adapter, water-tight strain-relief cable fittings
Comments	Integral 1/2 in. NPSM conduit connection.

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Non-Spring Return Direct Coupled Actuator

N20 Series (MN6120; MN7220)

These direct-coupled damper actuators provide adjustable modulating control for: air dampers, air handling units, ventilation flaps, louvers, and reliable control for air damper applications with up to 4.6 m^2/50 sq ft (seal-less dampers; air friction-dependent).

FEATURES

- Control for air damper applications with up to 50 sq ft assuming 3.5 in-lb per sq ft of damper area, velocity independent.
- Patented self-centering shaft adapter.
- Access cover to facilitate connectivity.
- Declutch for manual adjustment.
- Mechanical end limits.
- Field-installable auxiliary switches.
- Rotation direction selectable by switch.
- Mountable in any orientation (no IP54 if upside down).
- Mechanical position indicator.
- CE approved. UL approved.

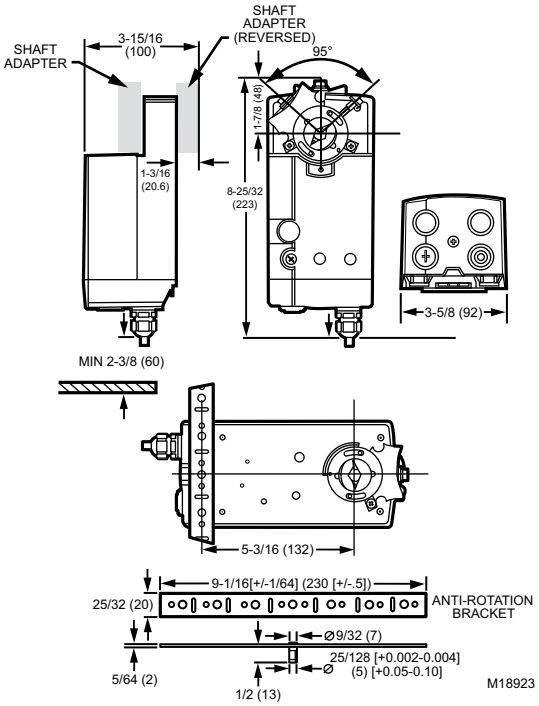
SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Non-Spring Return
Torque	175 lb-in. (20 Nm)
External Auxiliary Switches Available	Yes, SW2-US
Electrical Connections	Enclosed screw terminal strip (22 to 14 AWG)
Environmental Rating	NEMA2; IP54
Frequency	50 Hz; 60 Hz
Manual operation	Declutch mechanism
Mounting	Direct Coupled
Maximum Noise Rating, Driving (dBA @ 1m)	40
Rotation to Open	By switch
Rotational Stroke Adjustment	Dual Integral Adj. Stops (3 degree increments)
Compatible Damper Shafts	3/8 to 1.06 in. round or 3/8 to 11/16 in. square (10 to 27 mm round or 10 to 18 mm square)
Shaft Adapter Type	Self-centering clamping
Materials	Plenum rated plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-5 F to +140 F (-20 C to +60 C)
Storage Temperature Range	-40 F to +175 F (-40 C to +80 C)
Weight	3.2 lb (1.45 kg)
Includes	Mounting bracket, self-centering shaft adapter
Comments	Integral 1/2 in. NPSM conduit connection.

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



Non-Spring Return Direct Coupled Actuator

N34 Series (MN6134; MN7234)

These direct coupled damper actuators provide adjustable modulating control for air dampers, air handling units, ventilation flaps, louvers, and reliable control for air damper applications with up to 7.9 m2/85 sq ft (seal-less dampers; air friction-dependent).

FEATURES

- Control for air damper applications with up to 85 sq ft assuming 3.5 in-lb per sq ft of damper area, velocity independent.
- Patented self-centering shaft adapter.
- Access cover to facilitate connectivity.
- Declutch for manual adjustment.
- Mechanical end limits.
- Field-installable auxiliary switches.
- Rotation direction selectable by switch.
- Mountable in any orientation (no IP54 if upside down).
- Mechanical position indicator.
- CE approved. UL approved.

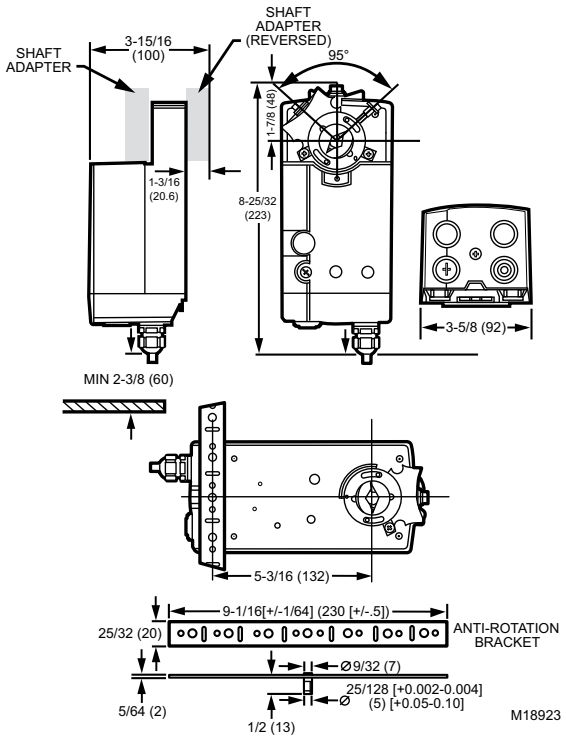
SPECIFICATIONS

Actuator Type	Damper; Valve
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Non-Spring Return
Torque	300 lb-in. (34 Nm)
External Auxiliary Switches Available	Yes, SW2-US
Electrical Connections	Enclosed screw terminal strip (22 to 14 AWG)
Environmental Rating	NEMA2
Frequency	50 Hz; 60 Hz
Manual operation	Declutch mechanism
Mounting	Direct Coupled
Maximum Noise Rating, Driving (dBA @ 1m)	40
Rotation to Open	By switch
Compatible Damper Shafts	3/8 to 1.06 in. round or 3/8 to 11/16 in. square (10 to 27 mm round or 10 to 18 mm square)
Shaft Adapter Type	Self-centering clamping
Materials	Plenum rated plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-5 F to +140 F (-20 C to +60 C)
Storage Temperature Range	-40 F to +175 F (-40 C to +80 C)
Weight	3.2 lb (1.45 kg)
Includes	Mounting bracket, self-centering shaft adapter
Comments	Integral 1/2 in. NPSM conduit connection.

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Fire And Smoke Actuator

ML4115; ML8115

Spring return direct coupled actuators (DCA) for on/off damper control with an integral junction box. The actuator accepts an on/off signal from a single-pole, single-throw (SPST) controller. They are designed to operate reliably in smoke control systems requiring Underwriter's Laboratories Inc. UL555S ratings up to 350 F.

FEATURES

- Integral spring return.
- No audible noise during holding.
- Electronic circuitry provides efficient operation while eliminating the need for limit switches.
- Ninety-five degree angle of rotation for tight damper closure.
- Die-cast aluminum housing.
- Housing design allows flush mounting to damper.
- Integral junction box with three conduit openings eliminates need for separate wiring box.
- Mounts to 3/8 or 1/2 in. round or square shaft.

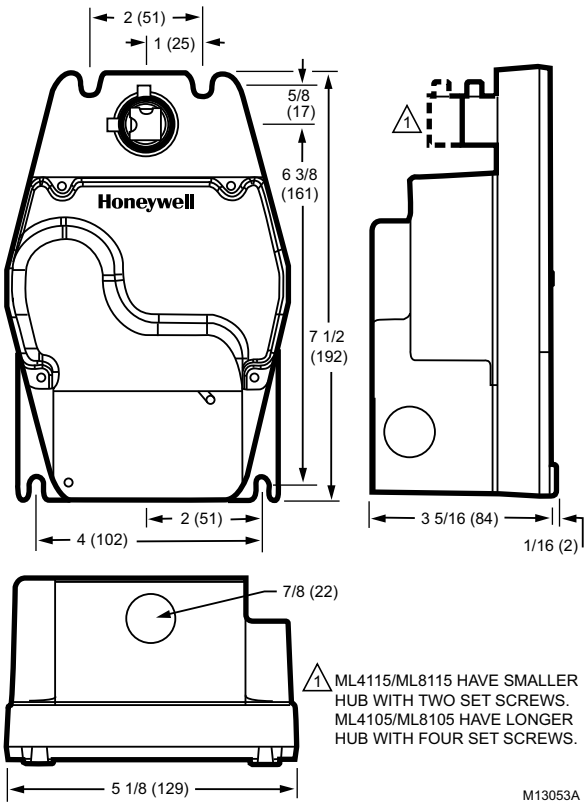
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	30 lb-in. (3.4 Nm)
Minimum Driving Torque at 350 F	30 lb-in.
Spring Return Torque	30 lb-in. (3.4 Nm)
External Auxiliary Switches Available	Yes, 32003532-005
Number of Internal Auxiliary Switches:	0
Electrical Connections	Two color-coded leads
Electrical Connection Length	16 in. (406 mm)
Environmental Rating	NEMA1
Frequency	60 Hz
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	65
Compatible Damper Shafts	3/8 to 1/2 in. square or round (10 to 13 mm square/round)
Shaft Adapter Type	Aluminum Hub, two set screws
Materials	Aluminum housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	0 F to +130 F (-18 C to +55 C)
Storage Temperature Range	-40 F to 140 F (-40 C to +60 C)
Weight	6 lb (2.72 kg)
Comments	Integral junction box with three 7/8 in. conduit openings (fittings not included)

APPROVALS

Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



MS4209F; MS4309F; MS4709F; MS4809F; MS8209F; MS8309F

Spring return direct coupled actuators (DCA) for on/off damper control with an integral junction box. The actuator accepts an on/off signal from a single-pole, single-throw (SPST) controller. They are designed to operate reliably in smoke control systems requiring Underwriter's Laboratories Inc. UL555S ratings up to 350 F.

FEATURES

- Integral spring return ensures level of return torque.
- Fifteen-second spring return timing.
- No special cycling required during long-term holding.
- No audible noise during holding.
- Patent pending design eliminates need for limit switches to reduce power consumption.
- Models available for 24, 120, and 230 Vac.
- Ninety-five degree angle of rotation for tight damper closure.
- Actuator holds rated torque at reduced power level.
- Die-cast aluminum housing. Housing design allows flush mounting to damper.
- Integral junction box with three conduit openings eliminates need for separate wiring box.

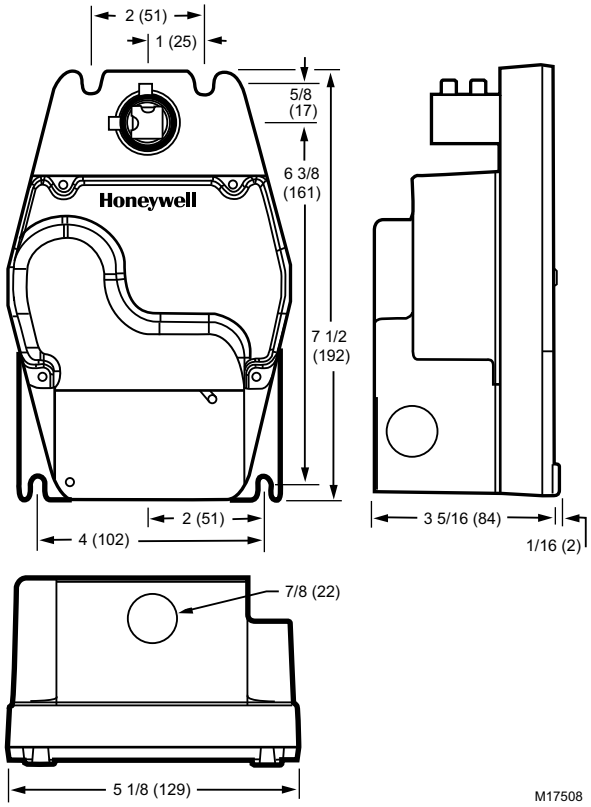
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	80 lb-in. (9 Nm)
Minimum Driving Torque at 350 F	80 lb-in.
Spring Return Torque	80 lb-in. (9 Nm)
External Auxiliary Switches Available	Yes, 32003532-005
Number of Internal Auxiliary Switches:	0
Environmental Rating	NEMA1
Frequency	60 Hz
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	80
Compatible Damper Shafts	3/8 to 1/2 in. square or round (10 to 13 mm square/round)
Shaft Adapter Type	Aluminum Hub, four set screws
Supply Voltage	120 Vac +10%, -15%
Materials	Aluminum housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	0 F to +130 F (-18 C to +55 C)
Storage Temperature Range	-40 F to 140 F (-40 C to +60 C)
Weight	6 lb (2.72 kg)
Comments	Integral junction box with three 7/8 in. conduit openings (fittings not included)

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Fire And Smoke Actuator

MS4120F; MS4620F; MS8120F

Spring return direct coupled actuators (DCA) for on/off damper control with an integral junction box. The actuator accepts an on/off signal from a single-pole, single-throw (SPST) controller. They are designed to operate reliably in smoke control systems requiring Underwriter's Laboratories Inc. UL555S ratings up to 350 F.

FEATURES

- Brush DC submotor with electronic stall protection for 2-position models
- Self-centering shaft adapter (shaft coupling) for wide range of shaft sizes
- Models available for use with two-position, single pole single throw (spst), line- (Series 40) or low- (Series 80) voltage controls
- Metal housing with built-in mechanical end limits
- Spring return direction field-selectable
- Shaft position indicator and scale
- Manual winding capability with locking function
- UL (cUL) listed and CE compliant
- All Models are plenum-rated per UL873

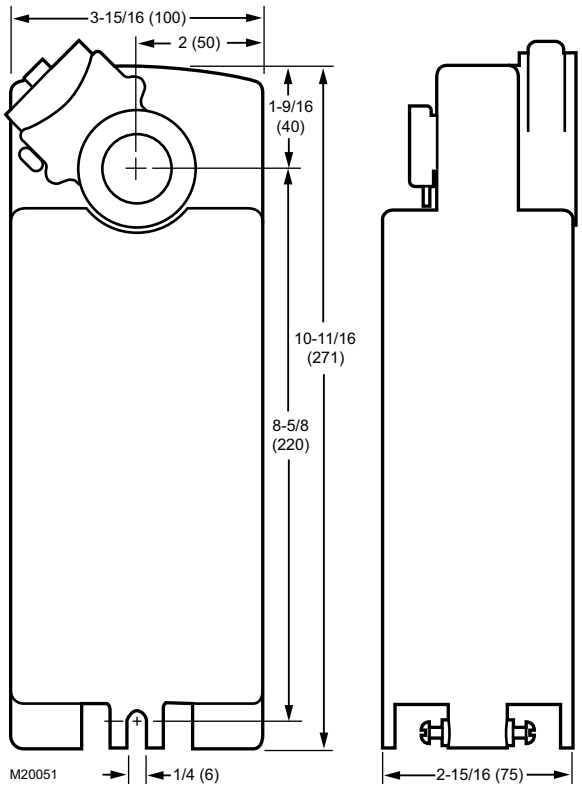
SPECIFICATIONS

Actuator Type	Damper
Rotational Stroke	95 ±3 degrees
Fail Safe Mode	Spring Return
Torque	175 lb-in. (20 Nm)
Minimum Driving Torque at 350 F	175 lb-in.
Spring Return Torque	175 lb-in. (20 Nm)
Spring Return Direction:	By orientation
External Auxiliary Switches Available	No
Electrical Connections	Teflon-jacketed cable
Electrical Connection Length	40 in. (1 m)
Environmental Rating	NEMA2
Ingress Protection Rating	IP54
Frequency	60 Hz
Manual operation	Manual crank
Mounting	Direct Coupled
Maximum Noise Rating, Holding (dBA @ 1m)	20 (no audible noise)
Maximum Noise Rating, Driving (dBA @ 1m)	70
Compatible Damper Shafts	3/8 to 1.06 in. round or 3/8 to 11/16 in. square (10 to 27 mm round or 10 to 18 mm square)
Shaft Adapter Type	Self-centering clamping
Supply Voltage	120 Vac ±10%
Materials	Aluminum housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Ambient Temperature Range	-40 F to +130 F (-40 C to +55 C)
Storage Temperature Range	-40 F to +140 F (-40 C to +60 C)
Weight	8 lb (3.63 kg)
Includes	Self-centering shaft adapter, 3mm crank
Comments	Two integral 3/8 in. flexible conduit connections

APPROVALS

CE	89/336/ECC, 73/23/EEC
C-Tick	N314
Underwriters Laboratories, Inc.	UL873, Plenum Rated
Canadian Underwriters Laboratories, Inc.	cUL C22.2 No. 24-93

DIMENSIONS DIAGRAM



Pneumatic Damper Actuator

MP909D

Used for pneumatic proportional control of variable volume terminal units and small damper. Available in various operating ranges for either individual or sequence operation with other actuators. Replacement devices are available for Johnson, Powers, Robertshaw, and older Honeywell actuator models.

FEATURES

- Rugged ribbed aluminum body.
- Low-friction shaft bearing.
- Close tolerance on operating range and stroke.
- Protected barb connector.
- Versatile mounting and connecting hardware options.
- Positive leakproof seal.

SPECIFICATIONS

Actuator Type	Damper
Actuator Force	Low
Fail Safe Mode	Spring Return
Air Connections	Barbed fitting for 3/32 in. O.D. tubing
Stroke	2.4 in. (61 mm)
Diaphragm Effective Area	3 sq in. (19.4 sq cm)
Temperature Range	50 F to 140 F (10 C to 60 C)
Maximum Operating Pressure	30 psi (207 kPa)
Humidity Range	5 to 95% RH

APPROVALS

Underwriters Laboratories, Inc.	Components Recognized: Report R18118

ACCESSORIES

14002850-001—Angle Bracket 5 3/8 in, 137 mm, long, 5 in, 127 mm, wide

14003640-001—Angle Bracket 3 in. (76 mm) long, 3 3/4 in. (95 mm) wide, 2 3/4 in. (70 mm) high

26025B—Damper crank arm for 3/8 in. (9.5 mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 40-50-60-75-90 degrees.

27174B—Damper crank arm for 7/16 in. (11.1 mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 40-50-60-75-90 degrees.

27520C—Push Rod (5/16 in. dia., 12 in. length)

27520G—Push Rod (5/16 in. dia., 24 in. length)

27520K—Push Rod (5/16 in. dia., 36 in. length)

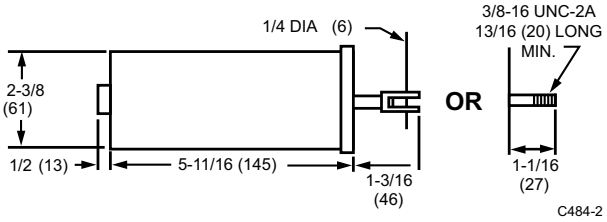
27520L—Push Rod (5/16 in. dia., 48 in. length)

312867C—Damper Crank Arm for 1/2 in. (12.7mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 45-60-75-90 degrees

315321—Crankarm Balljoint (with 1/4 in male threads), fits 5/16 in. diameter pushrod

315781—Motor shaft balljoint with 3/8 - 16 UNC female threads, fits 5/16 inch diameter pushrods.

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Pneumatic Damper Actuator

MP909E,H

These actuators are used for proportional control of variable volume terminal units, mixing boxes, and small to medium sized dampers. They are available in various operating ranges for either independent operation or sequence operation with other actuators. The MP909E has an optional adjustable stroke feature. The MP909H includes a positive positioner. Replacement devices are available for Johnson, Powers, Robertshaw, Barber-Colman, and older Honeywell actuator models.

SPECIFICATIONS

Actuator Type	Damper
Actuator Force	Medium
Fail Safe Mode	Spring Return
Air Connections	Dual Barbed fitting for 5/32 in. or 1/4 in. O.D. tubing
Diaphragm Effective Area	6.6 sq in. (43 sq cm)
Humidity Range	5 to 95% RH
Underwriters Laboratories, Inc.	Components Recognized: Report R18118

ACCESSORIES

14002850-001—Angle Bracket 5 3/8 in, 137 mm, long, 5 in, 127 mm, wide
14003640-001—Angle Bracket 3 in. (76 mm) long, 3 3/4 in. (95 mm) wide, 2 3/4 in. (70 mm) high
14004062-001—External Trunnion Mounting Bracket
14004062-002—Internal N.C. Trunnion Mounting Bracket
14004062-003—Internal N.O. Trunnion Mounting Bracket
14004106-001—Actuator pushrod for conversion of internal N.C. to external
14004107-001—Crankarm Assembly for conversion from internal N.C. to external Trunnion mounting
14004210-001—Feedback Spring Kit includes orange spring (3 psi [21kPa]), yellow spring (5 psi [34 kPa]), and blue spring (10 psi [69 kPa]).
14004236-001—Coupler, actuator shaft to 5/16 in, 8 mm, pushrod
14004241-002—Hitch Pin (Six Sets)
14004242-001—MP918 Top Mount Operator Assembly
14004667-001—Offset Crank arm assembly with 2 screws (304725-062), nuts (14004102-001), crank arm (14004655-001) for 1/2 in. Drive Axle
27518—Crankarm balljoint with 1/4 - 28 UNF male threads, fits 5-16 inch diameter push rods
26025B—Damper crank arm for 3/8 in. (9.5 mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 40-50-60-75-90 degrees.
27520C—Push Rod (5/16 in. dia., 12 in. length)
27520G—Push Rod (5/16 in. dia., 24 in. length)
27520K—Push Rod (5/16 in. dia., 36 in. length)
27520L—Push Rod (5/16 in. dia., 48 in. length)
312867C—Damper Crank Arm for 1/2 in. (12.7mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 45-60-75-90 degrees
312867H—Externally mounted Linkage Kit
314440A—MP909 - Clevis, Clevis Pin and Cotter Pin Assembly
315321—Crankarm Balljoint (with 1/4 in male threads), fits 5/16 in. diameter pushrod
315781—Motor shaft balljoint with 3/8 - 16 UNC female threads, fits 5/16 inch diameter pushrods.

REPLACEMENT PARTS

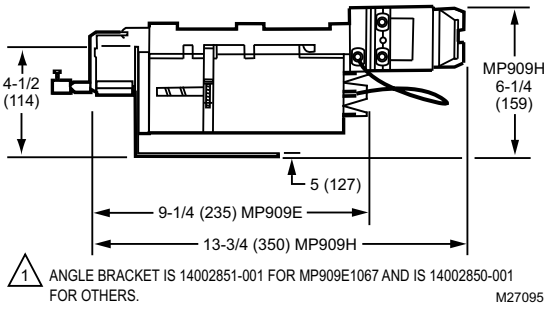
14004137-001—Retrofit Kit for adding positive positioner to MP909E or repair of MP909H

FEATURES

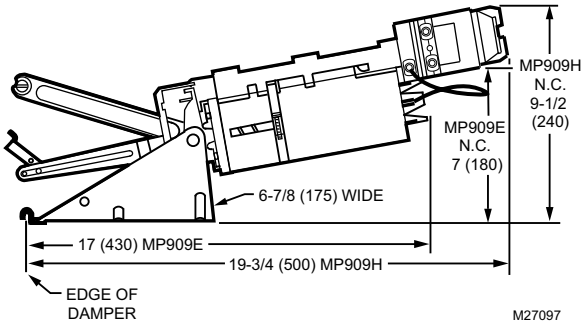
- Rolling diaphragm operated.
- Low friction shaft bearing.
- Close tolerance on operating range and stroke.
- Non-overlapping spring ranges for sequencing.
- Corrosion resistant materials.
- Reliable long life.

DIMENSIONS DIAGRAMS

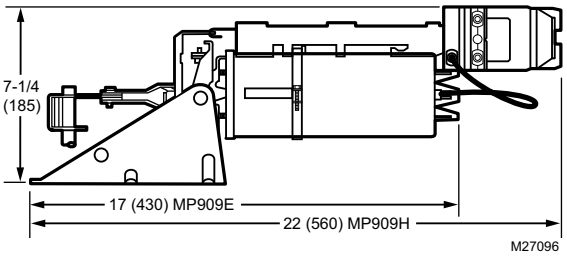
Actuator with Fixed External Mounting Bracket



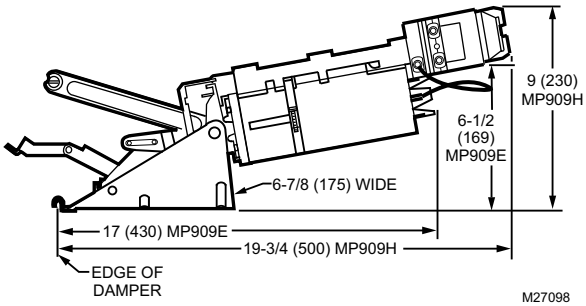
Actuator with Internal N.C. Trunnion Mounting Bracket



Actuator with External Trunnion Mounting Bracket



Actuator with Internal N.O. Trunnion Mounting Bracket



Pneumatic Damper Actuator

MP913

Provides proportional control of variable volume dampers in small high velocity mixing boxes. Replacement devices are available for Johnson and Robertshaw devices. Suitable for direct replacement only, do not attempt to replace larger damper actuators with this unit.

FEATURES

- Compact in size.
- Neoprene rolling diaphragm.
- The MP913 Operator can be used with or without a crankarm.

SPECIFICATIONS

Actuator Type	Damper
Dimensions, Approximate	2 5/8 in. high (add 3/4 in. for shaft) x 2 1/4 in. diameter [67 mm high (add 19 mm for shaft) x 57 mm diameter]
Actuator Force	Low
Fail Safe Mode	Spring Return
Air Connections	Barbed fitting for 1/4 in. O.D. plastic tubing
Stroke	1 in. (25 mm)
Temperature Range	50 F to 140 F (10 C to 60 C)
Maximum Operating Pressure	30 psi (207 kPa)
Humidity Range	5 to 95% RH

ACCESSORIES:

315321—Crankarm Balljoint (with 1/4 in male threads), fits 5/16 in. diameter pushrod
315781—Motor shaft balljoint with 3/8 - 16 UNC female threads, fits 5/16 inch diameter pushrods.
27520C—Push Rod (5/16 in. dia., 12 in. length)
27520G—Push Rod (5/16 in. dia., 24 in. length)
27520K—Push Rod (5/16 in. dia., 36 in. length)
27520L—Push Rod (5/16 in. dia., 48 in. length)

Pneumatic Damper Actuator

MP918A,B

Used for proportional control of medium- to large-size dampers in HVAC systems. The MP918A,B are rolling diaphragm, piston-type actuators. The MP918A has a positive positioner. Replacement devices are available for Johnson, Powers, Robertshaw, Barber-Colman, and older Honeywell actuator models.

FEATURES

- Rolling diaphragm operated.
- Low friction shaft bearing.
- Close tolerance on operating range and stroke.
- Versatile mounting and connecting hardware.
- Non-overlapping spring ranges for sequencing.
- Reliable-long life.

SPECIFICATIONS

Actuator Type	Damper
Actuator Force	High
Fail Safe Mode	Spring Return
Air Connections	5/32 in. push-on barb (Pilot), 1/4 in. push-on barb (main.)
Stroke	3 1/2 in. (90 mm)
Diaphragm Effective Area	(154 sq cm) 23.8 sq in.
Temperature Range	-20 F to +158 F (-29 C to +70 C)
Maximum Operating Pressure	(172 kPa) 25 psi
Humidity Range	5 to 95% RH

APPROVALS

Underwriters Laboratories, Inc.	Components Recognized: Report R18118

ACCESSORIES

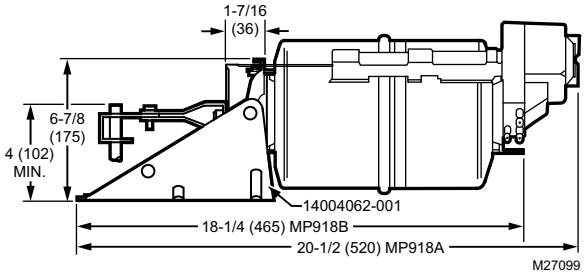
14004062-001—External Trunnion Mounting Bracket
14004062-002—Internal N.C. Trunnion Mounting Bracket
14004062-003—Internal N.O. Trunnion Mounting Bracket
14004106-001—Actuator pushrod for conversion of internal N.C. to external
14004107-001—Crankarm Assembly for conversion from internal N.C. to external Trunnion mounting
14004210-001—Feedback Spring Kit includes orange spring (3 psi [21kPa]), yellow spring (5 psi [34 kPa]), and blue spring (10 psi [69 kPa]).
14004236-001—Coupler, actuator shaft to 5/16 in, 8mm, pushrod
14004241-002—Hitch Pin (Six Sets)
14004242-001—MP918 Top Mount Operator Assembly
14004667-001—Offset Crank arm assembly with 2 screws (304725-062), nuts (14004102-001), crank arm (14004655-001) for 1/2 in. Drive Axle
CCT2718—Threaded rod for shaft extension
CCT2725—Rod coupling for shaft extension

REPLACEMENT PARTS

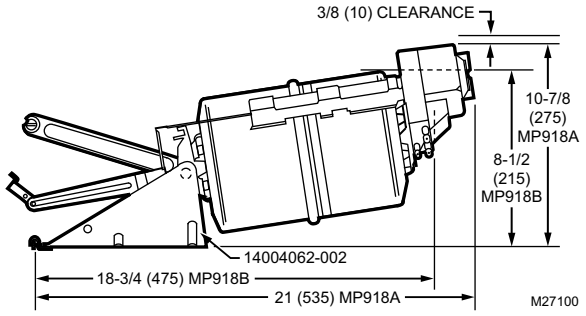
14004264-001—MP918 Repair kit including Positive Positioner, bracket assembly and fittings
14004264-002—MP918 Positive Positioner Retrofit Kit - includes 10 psi feedback spring

DIMENSIONS DIAGRAMS

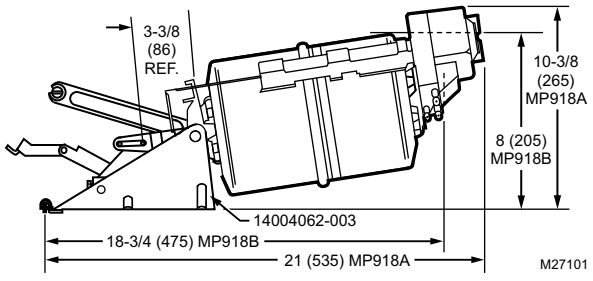
Actuator with External Trunnion Mounting Bracket



Actuator with Internal N.C. Trunnion Mounting Bracket



Actuator with Internal N.O. Trunnion Mounting Bracket



Pneumatic Damper Actuator

MP920

Provides proportional control of large dampers in HVAC systems or inlet vanes on a VAV fan. Positive positioner available separately. Replacement devices are available for Robertshaw actuator models.

FEATURES

- Rolling diaphragm operated.
- Fail safe on over pressure.
- Actuator can be swivel mounted from either end to pipe, floor, or wall surface.
- Optional positive positioner provides accurate positioning under varying load conditions.

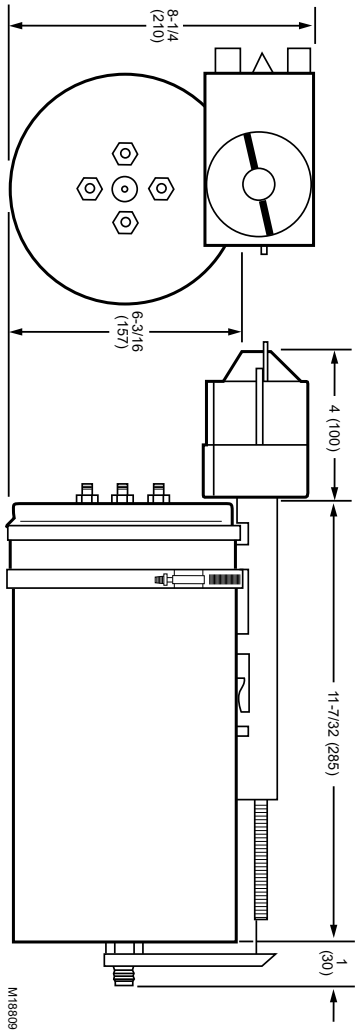
SPECIFICATIONS

Actuator Type	Damper
Actuator Force	High
Fail Safe Mode	Spring Return
Air Connections	Barbed fitting for 1/4 in. O.D. plastic tubing
Temperature Range	-20 F to +158 F (-30 C to +70 C)
Maximum Operating Pressure	29 psi (200 kPa)
Humidity Range	5 to 95% RH

ACCESSORIES:

14004062-001—External Trunnion Mounting Bracket
14004241-002—Hitch Pin (Six Sets)
14004345-001—Positive Positioner Kit, 10 psi feedback spring
AK3556—Pipe Mounting Assembly for 1-1/4 in. pipe
AK3557—Short Clevis Bag Assembly for 3/8-16 threaded rod
AK3558—Swivel Bracket Bag Assembly
AK3559—Long Clevis Bag Assembly with actuator shaft coupling for 5/8-11 threaded rod
AK3560—Balljoint, 3/8-24 threaded stud with couplings for 5/8-11 threaded rod and actuator shaft
AK3561—Balljoint, 3/8-24 threaded stud with couplings for 3/8-16 threaded rod

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Pneumatic Valve Actuator

MP953C,D

Pneumatic actuators provide proportional control of steam or hot or cold liquids in HVAC systems by operating V5011, V5013, and VGF valve assemblies. Replacement devices are available for older Honeywell actuators.

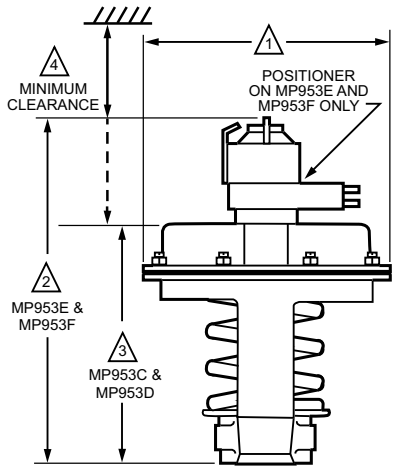
FEATURES

- Rolling diaphragm for long life and low hysteresis.
- Easily attached to valve.
- Can be installed after piping valve.
- Slide lock feature permits simple engagement to valve stem.
- Direct- or reverse-action control.
- Does not include positive positioner.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Spring Return
Air Connections	Dual barbed fitting for 5/32 in. O.D. and 1/4 in. O.D. plastic tubing
Temperature Range	0 F to 140 F (-18 C to +60 C)
Maximum Operating Pressure	(172 kPa) 25 psi
Humidity Range	5 to 95% RH

DIMENSIONS DIAGRAM



OPERATION SIZE NOMINAL DIA.	1	2	3	4
5 INCH	5-1/8 (130)	9-1/4 (235)	4-5/8 (117)	4-3/8 (111)
7-1/8 INCH	7-1/8 (181)	10-1/2 (267)	5-5/8 (143)	4-3/8 (111)
8 INCH	8-1/4 (210)	11-1/8 (283)	6-1/2 (165)	5-3/8 (137)
13 INCH	13-1/2 (343)	18-1/8 (460)	10 (254)	7-11/16 (195)

M13903

Pneumatic Valve Actuator

MP953E,F

Pneumatic actuators provide proportional control of steam or hot or cold liquids in HVAC systems by operating V5011, V5013, and VGF valve assemblies. Replacement devices are available for older Honeywell actuators.

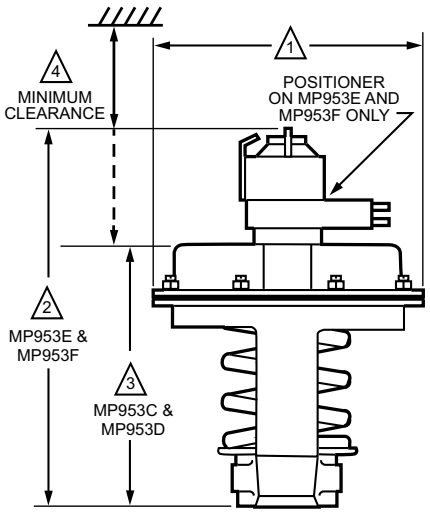
FEATURES

- Rolling diaphragm for long life and low hysteresis.
- Easily attached to valve.
- Can be installed after piping valve.
- Slide lock feature permits simple engagement to valve stem.
- Direct- or reverse-action control.
- Integral positive positioner relay provides positive positioning under varying load conditions.

SPECIFICATIONS

Actuator Type	Valve
Action	Direct Acting
Fail Safe Mode	Spring Return
Air Connections	Pilot: Barbed fitting for 5/32 in. O.D. plastic tubing Main: Barbed fitting for 1/4 in. O.D. plastic tubing
Temperature Range	0 F to 140 F (-18 C to +60 C)
Maximum Operating Pressure	(172 kPa) 25 psi
Humidity Range	5 to 95% RH

DIMENSIONS DIAGRAM



OPERATION SIZE NOMINAL DIA.	1	2	3	4
5 INCH	5-1/8 (130)	9-1/4 (235)	4-5/8 (117)	4-3/8 (111)
7-1/8 INCH	7-1/8 (181)	10-1/2 (267)	5-5/8 (143)	4-3/8 (111)
8 INCH	8-1/4 (210)	11-1/8 (283)	6-1/2 (165)	5-3/8 (137)
13 INCH	13-1/2 (343)	18-1/8 (460)	10 (254)	7-11/16 (195)

M13903

SUBMITTAL SHEETS

Pneumatic Valve Actuator

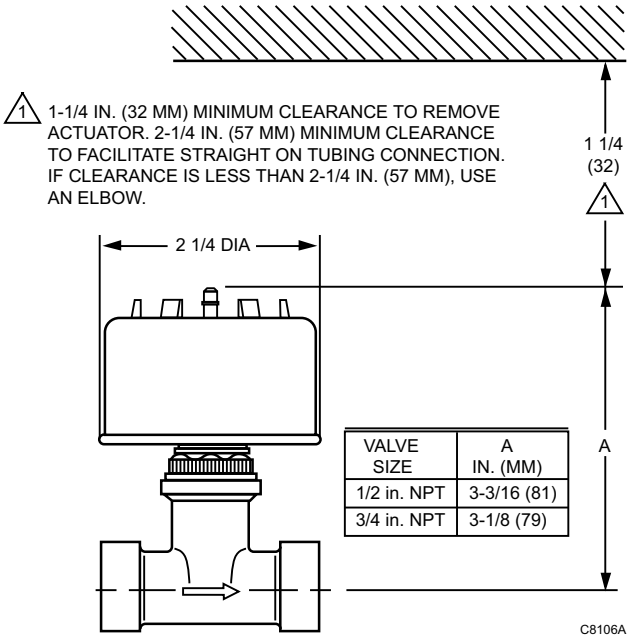
MP958

The MP958 Pneumatic Valve Actuator is direct-acting and used only with Honeywell V5852A2xx, V5862A2xx, V5853A2xx, and V5863A2xx Terminal Unit Valves to control hot and/or chilled water.

SPECIFICATIONS

Actuator Type ..... Valve
Action ..... Direct Acting
Fail Safe Mode ..... Spring Return
Air Connections ..... Barbed fitting for 1/4 in. O.D. plastic tubing
Maximum Operating Pressure ..... 30 psi

DIMENSIONS DIAGRAM



VALVE SIZE	A IN. (MM)
1/2 in. NPT	3-3/16 (81)
3/4 in. NPT	3-1/8 (79)

M4185; M8185

Series 41 and Series 81 Modutrol IV motors are 2-position (line- and low-voltage per motor control) spring-return motors. They are used to operate dampers or valves in applications where it is necessary or desirable to have the controlled element return to the starting position in the event of power failure or interruption.

FEATURES

- Fixed torque throughout the entire voltage range.
- Integral spring return returns motor to normal position in the event of power failure.
- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Motors are designed for either normally open or normally closed valves and dampers.
- Integral auxiliary switches are available factory mounted, or can be field added.
- Motors can operate valve linkages from the power end or auxiliary end shafts for normally closed or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Spring Return
Control Signal	Two position, SPST
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Clockwise (as viewed from power end) (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	9.5 lb

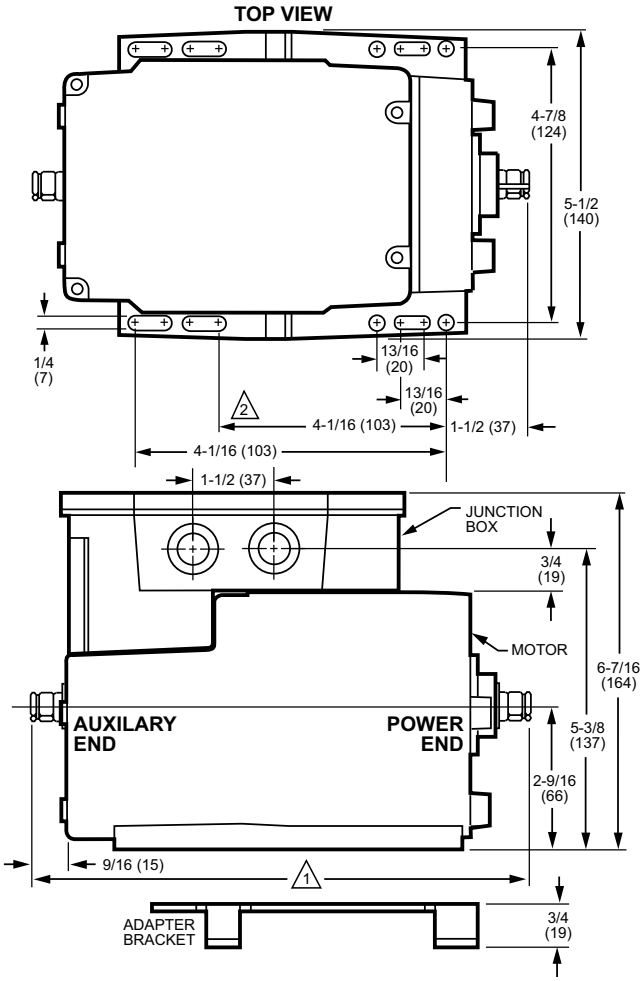
APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

ACCESSORIES:

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-TP—Screw Terminal Adapter Kit for 2 position Modutrol IV Series 2 motors - Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Modutrol IV Motor

M6184; M6194

Series 61 Modutrol IV™ Motors non-spring return floating control motors used with controllers that provide a switched spdt or floating output to operate dampers or valves.

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.
- Motors are designed for either normally open or normally closed valves and dampers.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Non-Spring Return
Control Signal	Floating
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Dependent on wiring (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	6.5 lb

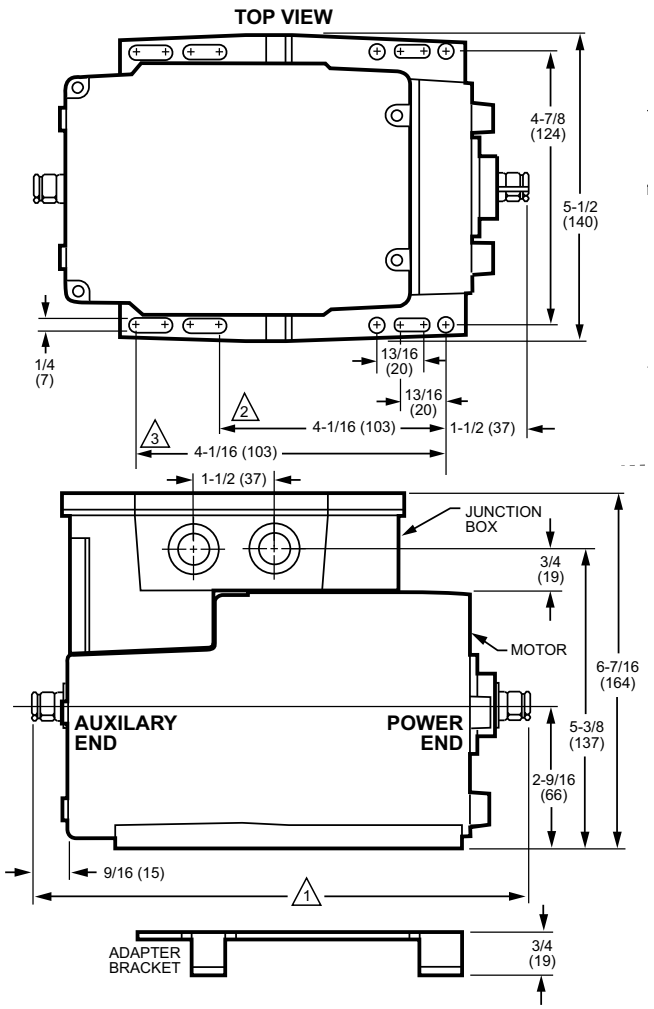
APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

ACCESSORIES:

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

DIMENSIONS DIAGRAM



M6284; M6294 for slaving applications

These Series 62 Modutrol IV™ Motors non-spring return floating control motors are used with controllers that provide a switched spdt or floating output to operate dampers or valves. These motors also have an internal electrically isolated feedback potentiometer that provides indication of the motor shaft position. Some models can be used for slaving Series 90 Motors.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Non-Spring Return
Control Signal	Floating
Feedback	Yes
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Dependent on wiring (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	7.5 lb
Comments	non-linear feedback, for slaving applications only

APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

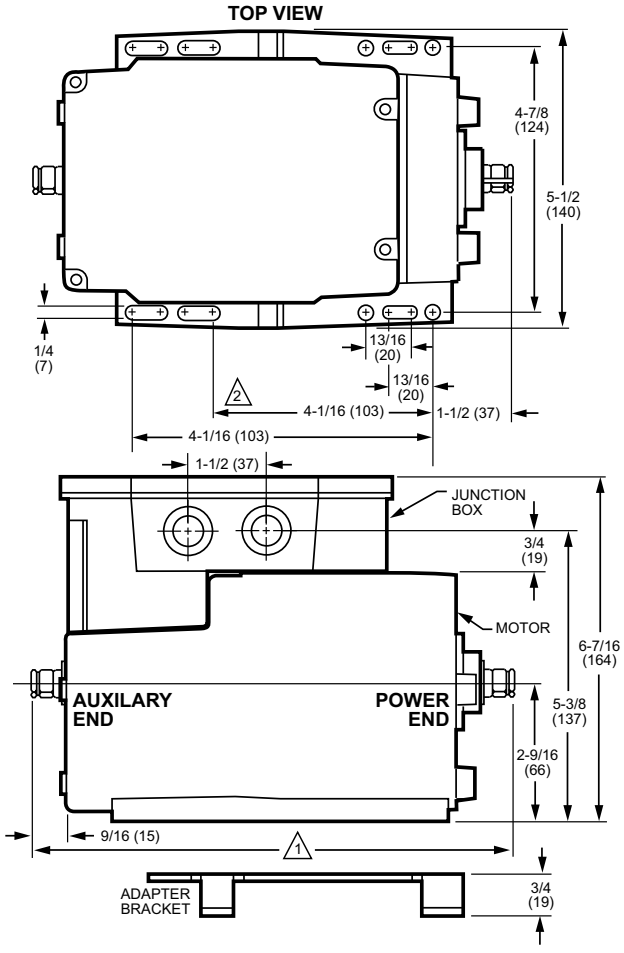
ACCESSORIES:

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-62—Screw Terminal Adapter Kit for Series 62 Series Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.
- Motors are designed for either normally open or normally closed valves and dampers.
- Include electrically isolated feedback potentiometer that provides shaft position indication.
- -S models with non-linear feedback are for slaving applications only.

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Modutrol IV Motor

M6285 for slaving applications

Series 62 Modutrol IV™ Motors are spring return floating control motors used with controllers that provide a switched spdt or floating output to operate dampers or valves. These motors also have an internal electrically isolated feedback potentiometer that provides indication of the motor shaft position and can be used for slaving Series 90 motors or rebalancing an external control circuit.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Spring Return
Control Signal	Floating
Feedback	Yes
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Dependent on wiring (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	8.5 lb
Comments	non-linear feedback, for slaving applications only

APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

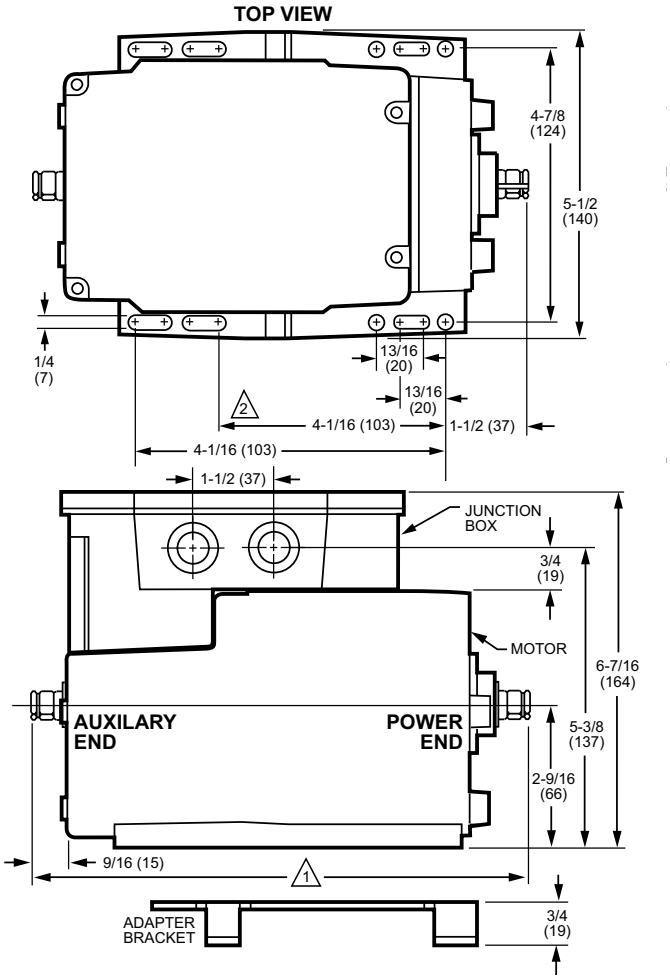
ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-62—Screw Terminal Adapter Kit for Series 62 Series Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Integral spring return returns motor to normal position in the event of power failure.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- Spring return motors can operate valve linkages from power end or auxiliary end shafts for normally closed or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.
- Motors are designed for either normally open or normally closed valves and dampers.
- Include electrically isolated feedback potentiometer that provides shaft position indication.

DIMENSIONS DIAGRAM



M6274; M6284; M6285; M6294 Motors with linear 10K feedback

Series 62 Modutrol IV™ Motors Spring Return and Non-Spring Return floating control motors used with controllers that provide a switched spdt or floating output to operate dampers or valves. These motors also have an internal electrically isolated feedback potentiometer that provides indication of the motor shaft position.

SPECIFICATIONS

Application Type	Electric
Control Signal	Floating
Feedback	Yes
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Mounting	Foot-mounted
Motor Shafts	2; Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Dependent on wiring (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	6.5 lb
Comments	Linear 10K feedback

APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

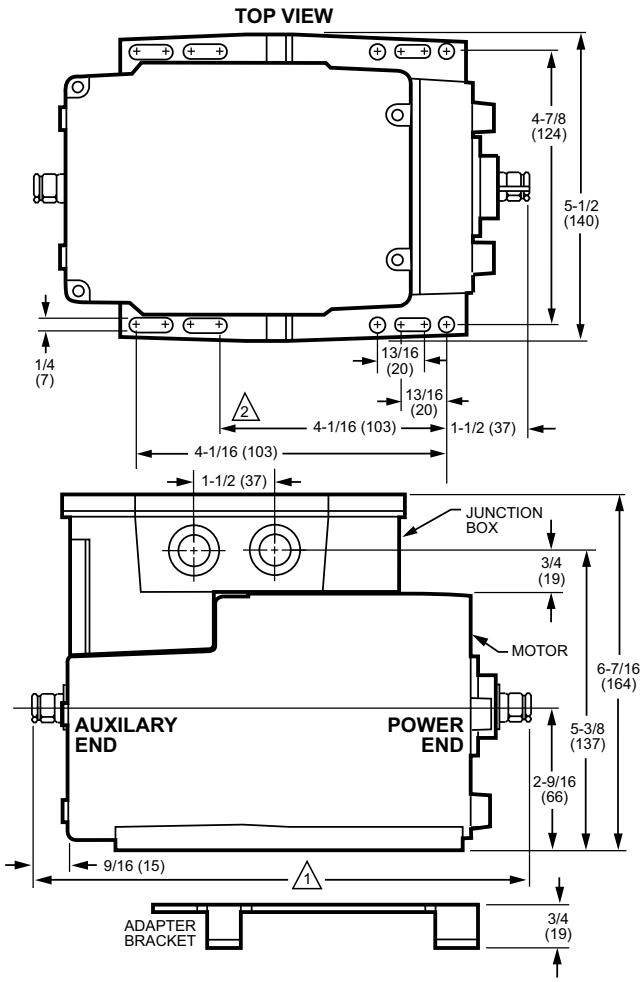
ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-62—Screw Terminal Adapter Kit for Series 62 Series Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.
- Motors are designed for either normally open or normally closed valves and dampers.
- -F models have an internal electrically isolated feedback potentiometer that provides indication of the motor shaft position.

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Modutrol IV Motor

M7164

Series 71 Modutrol IV™ Motors non-spring return motors used to control dampers and valves. These motors accept a voltage signal from an electronic controller to position a damper or valve at any point between open and closed.

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Non-Spring Return
Control Signal	Modulating, 10.5-13.5 Vdc
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Clockwise (as viewed from power end) (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	6.5 lb

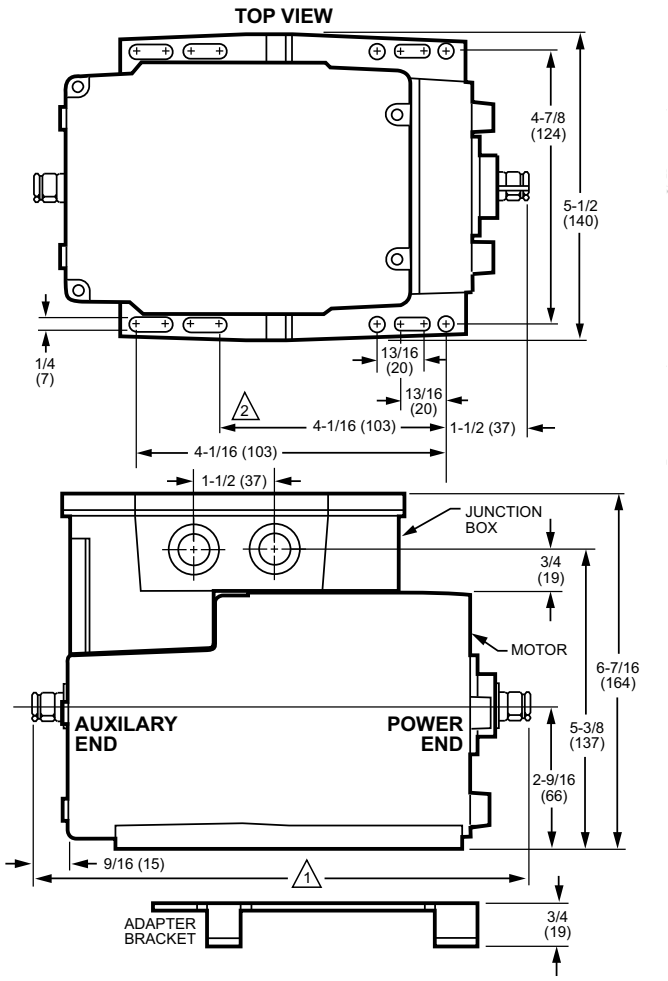
APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-71—Screw Terminal Adapter Kit for Series 71 Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

DIMENSIONS DIAGRAM



M7274

The Series 72 Modutrol IV Motors spring return and non-spring return motors are used to control dampers and valves. The motors accept a current or voltage signal from an electronic controller to position a damper or valve at any point between open and closed.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Non-Spring Return
Control Signal	Modulating, 4-20 mA
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Screw terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Clockwise (as viewed from power end) (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	7 lb

APPROVALS

Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

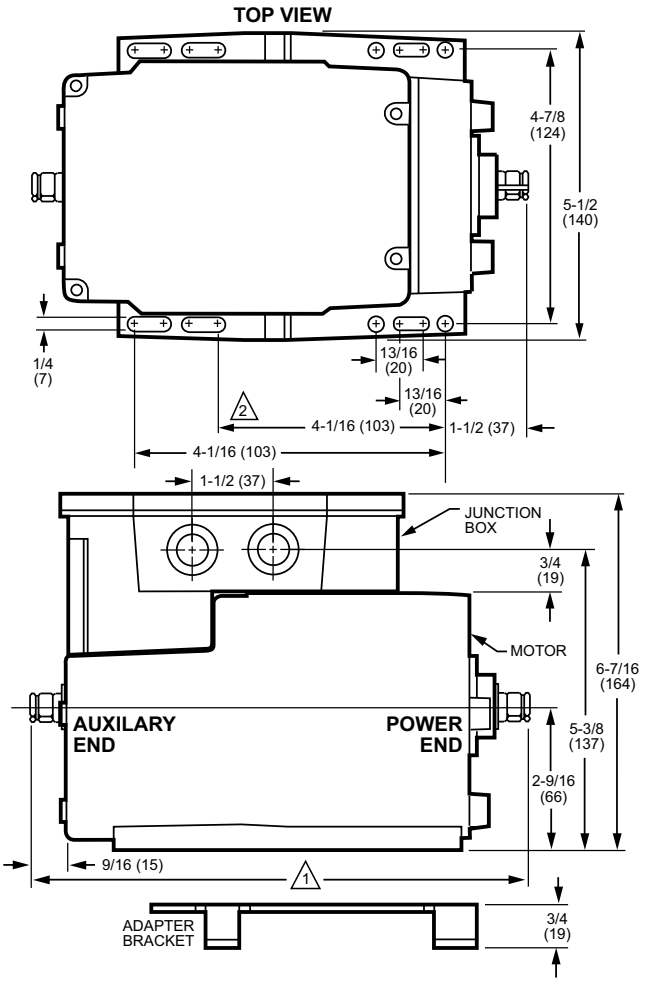
ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-72—Screw Terminal Adapter Kit for Series 72 Modutrol IV Series 2 motors - Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

FEATURES

- Integral spring return returns motor to normal position in the event of power failure on spring return models.
- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- Spring return motors can operate valve linkages from power end or auxiliary end shafts for normally closed or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.
- Motors are designed for either normally open or normally closed valves and dampers.
- Models available with adjustable start (zero) and span.
- Models available with 4 to 20 mA input signal.
- Die-cast aluminum housing.

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Modutrol IV Motor

M7284; M7285; M7286; M7294

Series 72 Modutrol IV Motors are spring return and non-spring return motors (per motor type) used to control dampers and valves. The motors accept a current or voltage signal from an electronic controller to position a damper or valve at any point between open and closed.

SPECIFICATIONS

Application Type	Electric
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	7.5 lb

APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

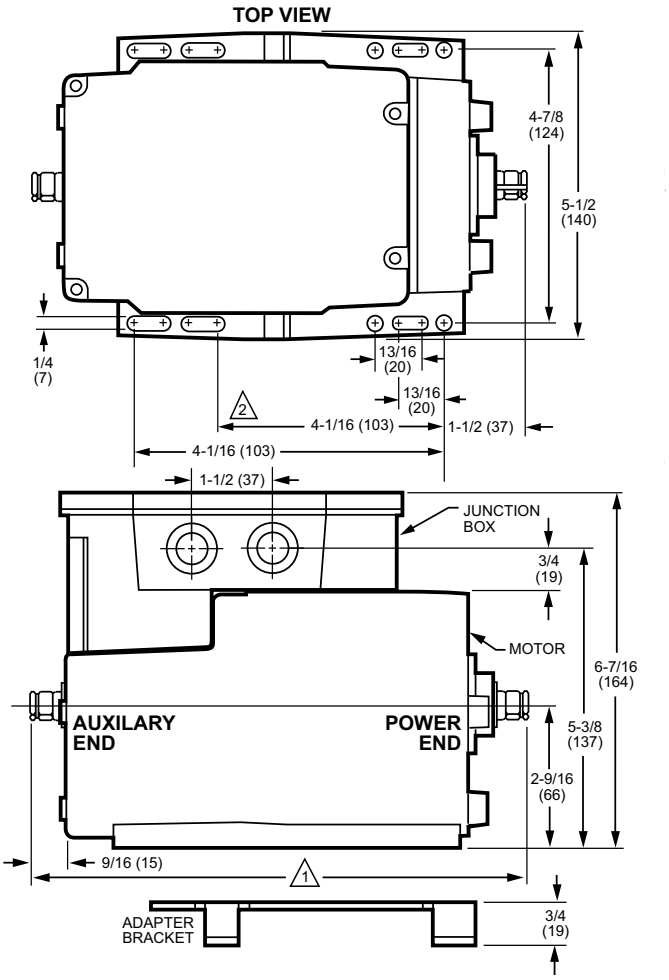
ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220741A2-72—Screw Terminal Adapter Kit for Series 72 Modutrol IV Series 2 motors - Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

FEATURES

- Integral spring return returns motor to normal position in the event of power failure on spring return models.
- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard--screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- Spring return motors can operate valve linkages from power end or auxiliary end shafts for normally closed or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.
- Motors are designed for either normally open or normally closed valves and dampers.
- Models available with adjustable start (zero) and span.
- Models available with 4 to 20 mA input signal.
- Models available with 2 to 10 Vdc input signal.
- Die-cast aluminum housing.

DIMENSIONS DIAGRAM



Modutrol IV Motor

M7685

Proportional, spring-return motors for use with Honeywell W7080 panel 14-17 Vdc output; with minimum position adjustment.

FEATURES

- Integral spring return returns motor to normal position in the event of power failure.
- Integral junction box provides NEMA 3 weather protection.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 deg. to 160 deg.).
- Integral auxiliary switches are available factory mounted, or can be field added.
- Spring return motors can operate valve linkages from power end or auxiliary end shafts for normally closed or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Spring Return
Control Signal	Modulating, 14-17 Vdc
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Clockwise (as viewed from power end) (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	8.5 lb

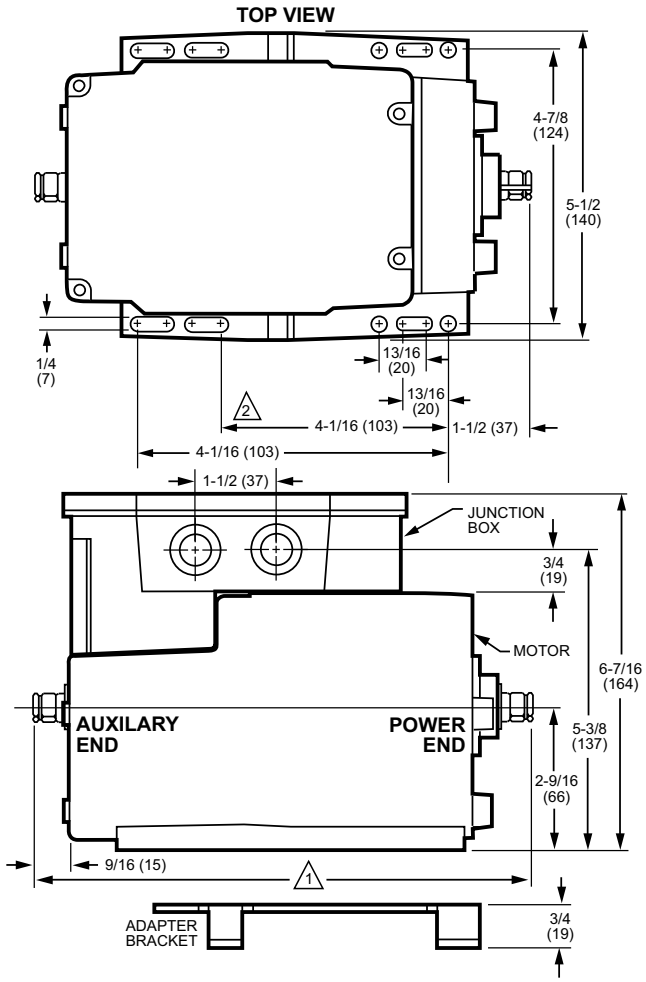
APPROVALS

Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Modutrol IV Motor

M9164; M9174; M9184; M9194

Series 90 Modutrol™ IV Motors non-spring return modulating proportional control motors used with controllers that provide a Series 90 output to operate dampers or valves.

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard; screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Non-Spring Return
Control Signal	Proportional, 135 ohm
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	7.5 lb

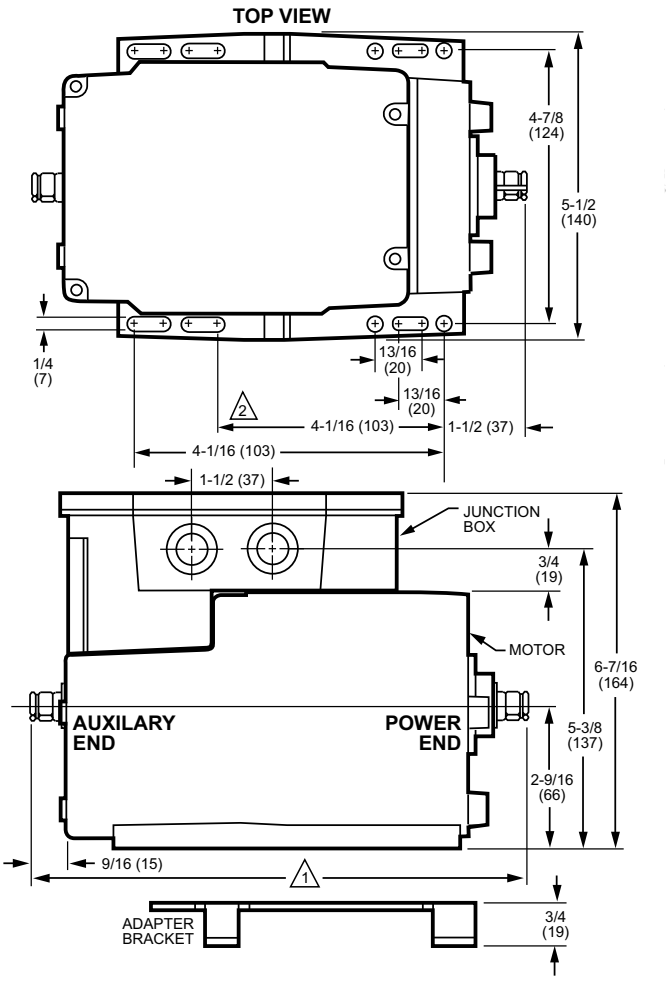
APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-90—Screw Terminal Adapter Kit for Series 90 Modutrol IV Series 2and Series 3 motors - Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

DIMENSIONS DIAGRAM



Modutrol IV Motor

M9175; M9185

Series 90 Modutrol™ Motors are spring return modulating proportional control motors used with controllers that provide a Series 90 output to operate dampers or valves.

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Integral spring return in the event of power failure.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard; screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- Spring return motors can operate valve linkages from power end or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Spring Return
Control Signal	Proportional, 135 ohm
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Clockwise (as viewed from power end) (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	8.5 lb

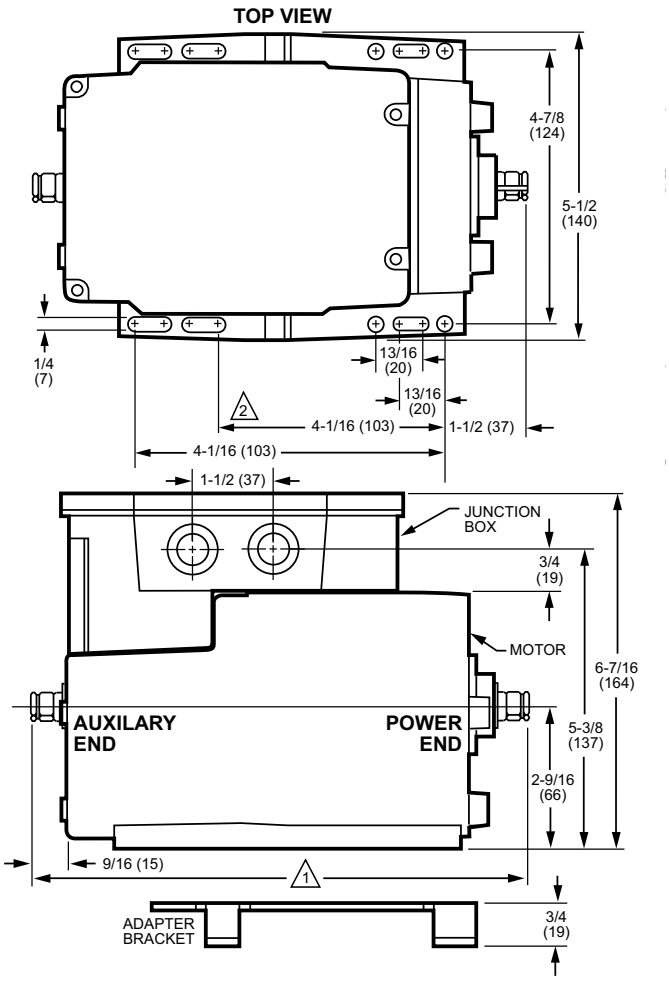
APPROVALS

CE	EN55011 (Emission) EN50082-2 (Immunity) 73/23/EEC (LVD)
Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-90—Screw Terminal Adapter Kit for Series 90 Modutrol IV Series 2and Series 3 motors - Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Modutrol IV Motor

M9182

Series 90 Modutrol™ IV Motors spring return modulating proportional control motors used with controllers that provide a Series 90 output to operate dampers or valves.

SPECIFICATIONS

Application Type	Electric
Fail Safe Mode	Spring Return
Control Signal	Proportional, 135 ohm
Feedback	No
Frequency	50 Hz; 60 Hz
External Auxiliary Switches Available	Yes
Auxiliary Switch Ratings AFL - 120 Vac	7.2A
Auxiliary Switch Ratings ALR - 120 Vac	43.2A
Auxiliary Switch Ratings AFL - 240 Vac	3.6A
Auxiliary Switch Ratings ALR - 240 Vac	21.6A
Electrical Connections	Quick-connect terminals
Mounting	Foot-mounted
Motor Shafts	Dual-ended shaft
Shaft Shape	square
Shaft Dimensions	0.375 in. (10 mm)
Shaft Rotation (upon control signal increase)	Clockwise (as viewed from power end) (normally closed)
Deadweight Load on Shaft (Either End)	200 lbs.
Deadweight Load (Combined on both Shafts)	300 lbs.
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	8.5 lb

APPROVALS

Underwriters Laboratories, Inc.	Listed: File No. E4436, Guide No. XAPX for USA and Canada

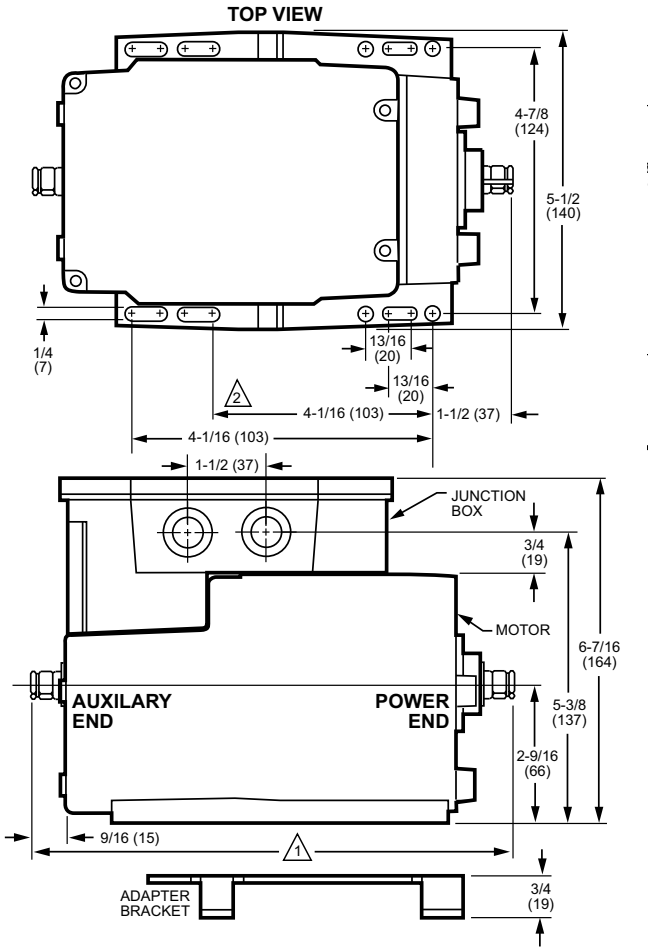
ACCESSORIES

Q7230A1005—Interface module, provides adjustable zero & span, voltage or current control
220736A—Internal Auxiliary Switch Assembly - 1 Switch
220736B—Internal Auxiliary Switch Assembly - 2 Switches
220738A—Adapter Bracket. Adjusts shaft height to match Modutrol III motors
220741A2-90—Screw Terminal Adapter Kit for Series 90 Modutrol IV Series 2and Series 3 motors - Converts quick-connect terminals to screw terminals
221455A—Infinitely adjustable Motor Crank Arm
4074ERU—Weatherproofing kit. Protects motor from driving rain when mounted in any position
50017460-001—24/120/230 Vac Internal Transformers for Series 2 Motors
50017460-003—120 Vac Internal Transformers for Series 2 Motors

FEATURES

- Integral junction box provides NEMA 3 weather protection if motor is mounted in the upright position.
- Integral spring return returns motor to normal position in the event of power failure.
- Motor and circuitry operate from 24 Vac.
- Quick-connect terminals are standard; screw terminal adapter is available.
- Adapter bracket for matching shaft height of older motors is available.
- Motors have field adjustable stroke (90 to 160 degrees).
- Integral auxiliary switches are available factory mounted, or can be field added.
- Spring return motors can operate valve linkages from power end or auxiliary end shafts for normally closed or normally open valve applications.
- All models have dual shafts (slotted and tapped on both ends).
- All models have auxiliary switch cams.
- Fixed torque throughout the entire voltage range.

DIMENSIONS DIAGRAM



Modutrol IV Motor

Q7130; Q7230; Q7330

For converting Series 90 Modutrol IV motors to Series 70 (electronic) control.

FEATURES

- Mounts and works inside wiring box of any series 90 Modutrol IV Motor.
- Protected from weather by motor's NEMA 3 wiring box.
- Mates to motor's quick-connect terminals and provides screw terminals for control wiring connections.
- Features solid-state circuitry with surface mount components.
- Cover holds module in place, screws not required.
- Includes (except Q7330A) reversing switch to allow replacement of electrically normally open or electrically normally closed motors.

SPECIFICATIONS

Application Type	Electric
Dimensions, Approximate	Fits inside wiring junction box of Modutrol IV Motor
Control Signal	Provides selectable voltage ranges: 4 to 7, 6 to 9, or 10.5 to 13.5 Vdc. Adapts M91XX to function as M71XX model
Frequency	60 Hz, 50 Hz
Electrical Connections	Terminal Board
Mounting	Mounts to quick-connects inside Mod Motor
Ambient Temperature Range	-40 F to +150 F (-40 C to +60 C)
Weight	0.3 lb

SUBMITTAL SHEETS

Unitary Valve Actuator

VU443; VU444; VU843; VU844

The VU844 Fan Coil Valve Actuators are used in conjunction with the VU52, VU53 and VU54 valves for controlling the flow of hot or chilled water in commercial HVAC equipment such as fan coil units, terminal reheat coils and convectors. These valves are humidity resistant and are suitable for use in condensing, non-corrosive environments.

FEATURES

- Compact construction for easy installation.
- Fits under the cover of most baseboard convectors with actuator fitted to valve body.
- One-button, quick release. Secure 3-point, metal latch to valve body.
- Spring return operation.
- Stainless steel case and aluminum cover. Rust-proof nickel-plated motors available.
- Line or low voltage, rust-resistant motors.
- Manual opener for installation and valve operation on power failure.
- Valve returns to automatic position when power is restored.
- Actuator may be reinstalled or serviced without draining the system or disassembling the valve.
- Slotted conduit hole for faster wiring.

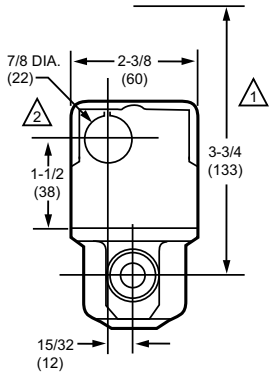
SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Spring Return
Electrical Connections	Leads
Frequency	60 Hz
Manual operation	Lever
Materials	Stainless Case, Aluminum Cover
Medium Temperature	200 F (94 C)
Ambient Temperature Range	34 F to 125 F ambient at 200 F Fluid (1 C to 52 C ambient at 93 C Fluid)
Maximum Differential Pressure Ratings (Close-off)	Depends on Cv rating of valve
Comments	For controlling the flow of hot or chilled water in commercial HVAC equipment such as fan coil units, terminal reheat coils and convectors

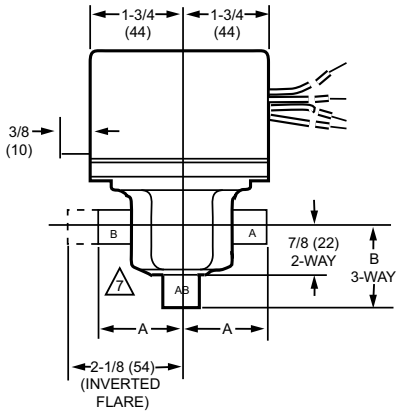
APPROVALS

Canadian Standards Association..... Certified C/US File No. LR1322

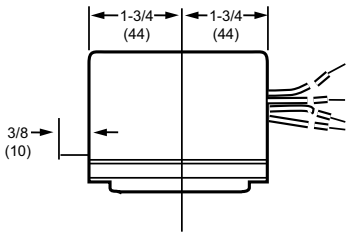
DIMENSIONS DIAGRAM



VU53 VALVE WITH VU448 ACTUATOR



VU53 AND VU54 VALVE WITH ACTUATOR



VU5 ACTUATOR

VALVE BODY SIZE	A	B
1/2 IN. SWEAT	1-5/6 (33)	1-5/6 (33)
3/4 IN. SWEAT	1-3/8 (35)	1-11/16 (43)
1 IN. SWEAT	1-11/16 (43)	1-11/16 (43)
1/2 IN. NPT	1-3/8 (35)	1-5/16 (33)
3/4 IN. NPT	1-11/16 (43)	1-7/16 (37)
1 IN. NPT	1-11/16 (43)	1-7/16 (37)

1 HEIGHT NEEDED TO REMOVE ACTUATOR OR COVER

2 OPENING FOR 1/2 IN. CONDUIT ON OPPOSITE SITE OF MANUAL LEVER FOR ALL MODELS.

M18261A

Unitary Valve Actuator

VC Series Two-position

Control central heating and/or cooling systems, fan coil systems, radiators and convectors. Depending on the model selected, it can be controlled by either a low or line voltage SPST or SPDT controller such as a room thermostat.

FEATURES

- Use with two-way or three-way valves.
- Minimal actuator power consumption.
- Quick-connect or one meter cable electrical connections available.
- Quick and easy replacement of moving parts.
- Actuator head installation does not require draining the system.
- On/Off models with six second nominal timing
- Use two-position actuators with 1000 Series 2 way and 6000 Series 3-way VC valve bodies only.
- All VC Series actuator-valve combinations provide 60 psi close-off.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stays in place
Maximum Differential Pressure Ratings (Close-off) (psi)	60 psid
Dimensions, Approximate	2.8 in. high x 3.7 in. wide x 2.7 in. deep (70 mm high x 94 mm wide x 68 mm deep)
Electrical Protection	Double Insulated
Electrical Connections	Plenum-rated cable
Ingress Protection Rating	IP40
Frequency	60 Hz
Manual operation	Lever
Mounting	Direct Coupled
Shaft Adapter Type	Self-alignment
Stroke	0.4 in. (10 mm)
Timing; Nominal Driving @ 60 Hz (sec)	6 sec
Materials	Plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Medium Temperature	203 F (95 C)
Ambient Temperature Range	32 F to 150 F (0 C to 65 C)
Temperature Ratings (Shipping)	-40 F to +150 F (-40 C to +65 C)
Storage Temperature Range	-40 F to +150 F (-40 C to +65 C)
Weight	0.57 lb (0.26 kg)

APPROVALS

Canadian Standards Association	CSA Certified: LR1322-367
CE	89/336/ECC, 73/23/EEC
Underwriters Laboratories, Inc.	UL Recognized, File# MH11826

Unitary Valve Actuator

VC Series Proportional

Control central heating and/or cooling systems, fan coil systems, radiators and convectors. Depending on the model selected, it can be controlled by a low voltage SPST or SPDT switch, pulse-width modulated 24 Vac signal, or floating input, modulating controller such as a room thermostat, Aquastat control, flow switch or a 0/2 to 10 Vdc controller.

FEATURES

- Use with two-way or three-way valves.
- Double insulated actuator.
- Five foot plenum-rated cable.
- Quick and easy replacement of moving parts.
- Actuator head installation does not require draining the system.
- Selectable/switchable electronic fail safe normally open or normally closed.
- Available with valve bodies with 1000-series 2-way and 6000-series 3-way cartridges for new construction.
- All VC Series actuator-valve combinations provide 60 psi close-off.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stays in place
Cable Entry	Molded strain relief, conduit clamp
Dimensions, Approximate	2.8 in. high x 3.7 in. wide x 2.7 in. deep (70 mm high x 94 mm wide x 68 mm deep)
Electrical Protection	Double Insulated
Electrical Connections	Plenum-rated cable
Electrical Connection Length	5 ft. (1.5 m)
Ingress Protection Rating	IP40
Frequency	50 Hz; 60 Hz
Manual operation	Lever
Mounting	Direct Coupled
Shaft Adapter Type	Self-alignment
Stroke	0.4 in. (10 mm)
Timing; Nominal Driving @ 60 Hz (sec)	120 sec
Supply Voltage	24 Vac
Power Consumption (Driving)	6 VA
Materials	Plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Medium Temperature	203 F (95 C)
Ambient Temperature Range	32 F to 150 F (0 C to 65 C)
Temperature Ratings (Shipping)	-40 F to +150 F (-40 C to +65 C)
Storage Temperature Range	-40 F to +150 F (-40 C to +65 C)
Weight	0.84 lb (0.38 kg)

APPROVALS

Canadian Standards Association	CSA Certified: LR1322-367
Underwriters Laboratories, Inc.	Listed 94-5V

Unitary Valve Actuator

VC Series Fail Safe Proportional

Control central heating and/or cooling systems, fan coil systems, radiators and convectors. Depending on the model selected, it can be controlled by either a low or line voltage SPST or SPDT or floating or modulating controller such as a room thermostat, Aquastat control, flow switch or a 0/2 to 10 Vdc controller.

FEATURES

- Use with two-way or three-way valves.
- Minimal actuator power consumption.
- Double insulated actuator.
- Five foot plenum-rated cable electrical connections available.
- Quick and easy replacement of moving parts.
- Actuator head installation does not require draining the system.
- Selectable/switchable electronic fail safe normally open or normally closed.
- Includes valve bodies with 1000-series 2-way and 3000-series 3-way cartridges.
- All VC Series actuator-valve combinations provide 60 psi close-off.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	N.O. or N.C., switchable electronic
Cable Entry	Molded strain relief, conduit clamp
Dimensions, Approximate	2.8 in. high x 3.7 in. wide x 2.7 in. deep (70 mm high x 94 mm wide x 68 mm deep)
Electrical Protection	Double Insulated
Electrical Connections	Plenum-rated cable
Electrical Connection Length	5 ft. (1.5 m)
Ingress Protection Rating	IP40
Frequency	50 Hz; 60 Hz
Manual operation	Lever
Mounting	Direct Coupled
Shaft Adapter Type	Self-alignment
Number of Internal Auxiliary Switch	0
Stroke	0.4 in. (10 mm)
Supply Voltage	24 Vac
Materials	Plastic housing
Operating Humidity Range (% RH)	5 to 95% RH, non-condensing
Medium Temperature	203 F (95 C)
Ambient Temperature Range	32 F to 150 F (0 C to 65 C)
Temperature Ratings (Shipping)	-40 F to +150 F (-40 C to +65 C)
Storage Temperature Range	-40 F to +150 F (-40 C to +65 C)
Weight	0.84 lb (0.38 kg)
Includes	Flexible conduit adapter

APPROVALS

Canadian Standards Association	CSA Certified: LR1322-367
CE	89/336/ECC, 73/23/EEC
Underwriters Laboratories, Inc.	Listed 94-5V

Unitary Valve Actuator

M6410; M7410

Cartridge Globe Valve Actuator are small electric actuators for individual room control that provide floating or modulating control of V5852, V5862 two-way or V5853, V5863 three-way valves.

FEATURES

- Suitable for Excel/IRC system or other controllers providing specified signals.
- Magnetic coupling for torque limitation independent of voltage supply and self-adjustment of the close-off port.
- No mounting tools required.
- Small size allows installation in limited space of fan coil units, induction units, and small reheaters or recoolers.
- Visual position indication (red pin).

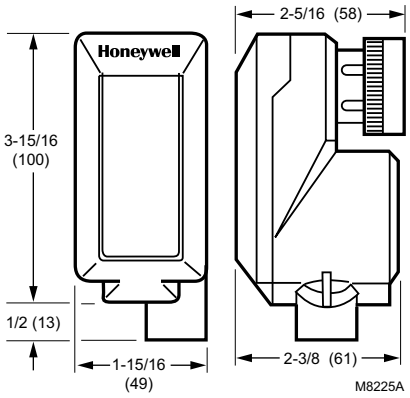
SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stays in place
Cable Entry	Threaded conduit connector
Electrical Protection	Class I Insulation (24 Vac)
Electrical Connections	Plenum-rated cable
Ingress Protection Rating	IP42
Feedback	No
Frequency	50 Hz; 60 Hz
Manual operation	None (use valve dust cap)
Mounting	Threads onto V58XX valve bonnet
Number of Internal Auxiliary Switch	0
Stroke	1/4 in. (6 mm)
Supply Voltage	24 Vac +10/-30%
Timing; Nominal Driving @ 60 Hz (sec)	125 sec
Materials	Low Maintenance Plastic Housing
Operating Humidity Range (% RH)	5 to 95% RH
Medium Temperature	266 F Maximum (130 C Maximum)
Ambient Temperature Range	32 F to 122 F (0 C to 50 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	0.3125 lb (0.15 kg)
Includes	1/2 in. conduit hub

APPROVALS

Underwriters Laboratories, Inc.	UL94-5V

DIMENSIONS DIAGRAM



M6435; M7435

Cartridge Globe Valve Spring Return Actuators are small electric actuators for individual room control that provide floating or modulating control of V5852, V5862 two-way or V5853, V5863 three-way valves.

FEATURES

- Stem actuator retracts up on power failure. Fail safe mode depends on valve seat rest position.
- Suitable for Excel/IRC system or other controllers providing specified signals.
- Magnetic coupling for torque limitation independent of voltage supply and self-adjustment of the close-off port.
- No mounting tools required.
- Compact size allows installation in limited space of fan coil units, induction units, and small reheaters or recoolers.
- Visual position indication (red disk).

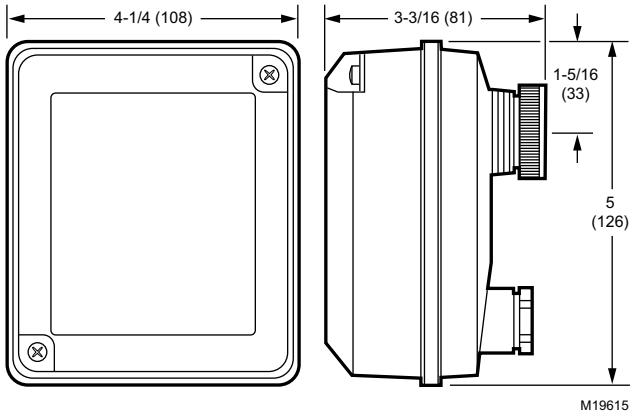
SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Spring Return, operator retracts up (Normally open for 1/2 in. and 3/4 in. V5852 and V5862. Normally closed for all other V58XX valves.)
Spring Return Direction	Stem up
Cable Entry	Threaded conduit connector
Electrical Protection	Class I Insulation (24 Vac)
Electrical Connections	Screw terminals
Ingress Protection Rating	IP54
Feedback	No
Frequency	50 Hz; 60 Hz
Manual operation	None (use valve dust cap)
Mounting	Threads onto V58XX valve bonnet
Number of Internal Auxiliary Switch	0
Stroke	1/4 in. (6 mm)
Supply Voltage	24 Vac +20%, -15%
Timing; Nominal Driving @ 60 Hz (sec)	50 sec
Spring Return Timing (Nominal (sec))	10 sec
Materials	Low Maintenance Plastic Housing
Operating Humidity Range (% RH)	5 to 95% RH
Medium Temperature	266 F Maximum (130 C Maximum)
Ambient Temperature Range	32 F to 122 F (0 C to 50 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	1.1 lb (0.5 kg)
Includes	1/2 in. conduit hub

APPROVALS

Underwriters Laboratories, Inc.	UL94-5V

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Direct Coupled Valve Actuator

ML6420; ML7420

Direct Coupled Globe Valve Actuators provide floating or modulating control of chilled water, hot water, or steam, and mount directly on VGF series, V5011, and V5013 globe valves from 1/2 to 3 inches.

FEATURES

- Easy and quick installation on valves with 1 3/8 in. bonnet and 3/4 in. stroke.
- No separate linkage required.
- Conduit connector standard.
- No adjustments required on linkage.
- Accurate valve positioning.
- Low power consumption.
- High close-off ratings.
- Force limiting end switches.
- Manual operator.
- Synchronous motor.
- Maintenance free.
- ML7420 has an internal selector plug that can be used to reverse the direction of action.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stays in place
Cable Entry	Conduit connector and one knockout on actuator case
Electrical Protection	Class I Insulation (24 Vac)
Electrical Connections	Screw terminals
Ingress Protection Rating	IP54
Frequency	50 Hz; 60 Hz
Manual operation	Knob
Mounting	Directly on V5011/V5013 Globe Valves and VGF Flanged Globe Valves (3/4 in. or 20mm stroke)
Number of Internal Auxiliary Switch	0
Stroke	3/4 in. (20 mm)
Supply Voltage	24 Vac ±15%
Materials	ABS-FR Plastic, aluminum yoke
Operating Humidity Range (% RH)	5 to 95% RH
Medium Temperature	300 F Maximum (150 C Maximum)
Ambient Temperature Range	14 F to 122 F (-10 C to +50 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	2.9 lb (1.3 kg)
Includes	1/2 in. conduit hub; 1/2 in. flexible conduit adapter

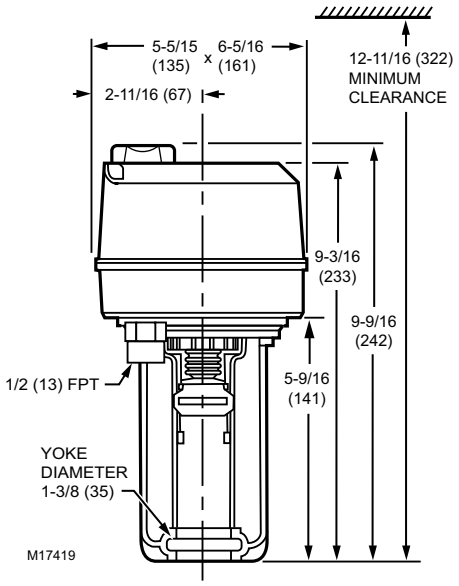
APPROVALS

Canadian Standards Association	Certified
CE	Listed
Underwriters Laboratories, Inc.	UL94-5V

ACCESSORIES

312495—Large stem button provides anti-spin for globe valves up to 3 in. (1/4-28UNF stem) with ML6420, ML7420, ML6421A, ML7421A, ML6425, and ML7425 actuators. Not required with ML6984/7984 actuators or Q5022A linkage; not compatible with Q5020 linkage.
43196000-001—High Temperature Kit for actuators with 3/4 inch (20 mm) stroke, stem button attachment
43191679-111—Potentiometer, 10k ohm, for ML6425, ML7425
43191679-112—Potentiometer, 220 ohm for ML6425, ML7425
43191680-105—Dual Auxiliary Switch for CREVAL actuators

DIMENSIONS DIAGRAM



Direct Coupled Valve Actuator

ML6421; ML7421

Direct Coupled Globe Valve Actuators provide floating or modulating control of chilled water, hot water, or steam, and mount directly on VGF series, V5011, and V5013 valves. These Non-Spring Return High Force Actuators will operate 1-1/2 to 6 inch valves.

FEATURES

- Easy and quick installation on valves with 1 3/8 in. bonnet and 3/4 in. stroke, or with 1 7/8 in. bonnet and 1 1/2 in. stroke.
- High force for VGF Pressure-balanced valves.
- No separate linkage required.
- Conduit connector standard.
- No adjustments required on linkage.
- Accurate valve positioning.
- Low power consumption.
- High close-off ratings.
- Force limiting end switches.
- Manual operator.
- Synchronous motor.
- Maintenance free.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stays in place
Cable Entry	Two knockout holes for 1/2 in. conduit standard on actuator case
Electrical Protection	Class I Insulation (24 Vac)
Electrical Connections	Screw terminals
Ingress Protection Rating	IP54
Frequency	50 Hz; 60 Hz
Manual operation	Knob
Mounting	Directly on V5011/V5013 Globe Valves and VGF Flanged Globe Valves
Number of Internal Auxiliary Switch	0
Materials	ABS Plastic
Operating Humidity Range (% RH)	5 to 95% RH
Medium Temperature	300 F Maximum (150 C Maximum)
Ambient Temperature Range	14 F to 122 F (-10 C to +50 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	5.1 lb (2.3 kg)
Includes	1/2 in. conduit hub; 1/2 in. flexible conduit adapter

APPROVALS

Canadian Standards Association	Certified
CE	Recognized
Underwriters Laboratories, Inc.	UL94-5V

ACCESSORIES

312495—Large stem button provides anti-spin for globe valves up to 3 in. (1/4-28UNF stem) with ML6420, ML7420, ML6421A, ML7421A, ML6425, and ML7425 actuators. Not required with ML6984/7984 actuators or Q5022A linkage; not compatible with Q5020 linkage.

43191679-101—Auxiliary Potentiometer for ML6421A

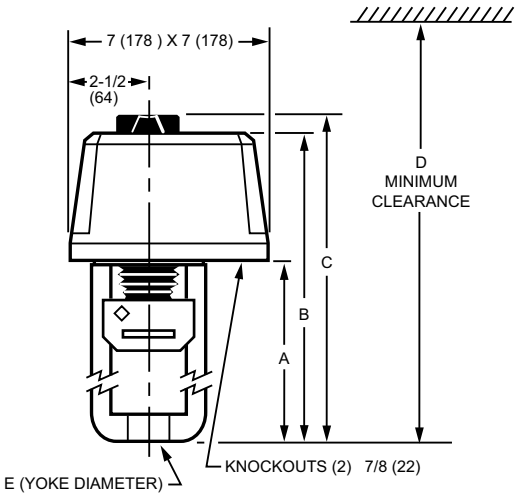
43191679-102—220 ohm Auxiliary Potentiometer for ML6421B

43191680-102—Dual Auxiliary Switch for CREVAL actuators

43196000-001—High Temperature Kit for actuators with 3/4 inch (20 mm) stroke, stem button attachment

43196000-038—High Temperature Kit for actuators with 1-1/2 inch (38 mm) stroke, stem button attachment

DIMENSIONS DIAGRAM



	ML6421A, ML7421A	ML6421B, ML7421B
A	5-5/8 (142)	8 (204)
B	9-3/8 (239)	11-7/8 (301)
C	10-3/8 (264)	12-3/4 (326)
D	14-1/4 (360)	16-7/8 (430)
E	1-3/8 (35)	1-7/8 (48)

M16827

SUBMITTAL SHEETS

Direct Coupled Valve Actuator

ML6425; ML7425

Direct Coupled Globe Valve Actuators provide floating and modulating control of chilled water, hot water, and steam, and mount directly on VGF series, V5011, and V5013 globe valves. These Spring Return Actuators will operate 1/2 to 3 inch valves.

FEATURES

- Easy and quick installation on valves with 1 3/8 in. bonnet and 3/4 in. stroke.
- No separate linkage required.
- Conduit connector standard.
- No adjustments required on linkage.
- Accurate valve positioning.
- Low power consumption.
- High close-off ratings.
- Force limiting end switches.
- Internal manual operator.
- Synchronous motor.
- Maintenance free.

SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stem down on power failure
Cable Entry	Conduit connector and one knockout on actuator case
Electrical Protection	Class I Insulation (24 Vac)
Electrical Connections	Screw terminals
Ingress Protection Rating	IP54
Frequency	50 Hz; 60 Hz
Manual operation	Manual override winding
Mounting	Directly on V5011/V5013 Globe Valves and VGF Flanged Globe Valves (3/4 in. or 20mm stroke)
Number of Internal Auxiliary Switch	0
Stroke	3/4 in. (20 mm)
Materials	ABS-FR Plastic, aluminum yoke
Operating Humidity Range (% RH)	5 to 95% RH
Medium Temperature	300 F Maximum (150 C Maximum)
Ambient Temperature Range	14 F to 122 F (-10 C to +50 C)
Storage Temperature Range	-40 F to +158 F (-40 C to +70 C)
Weight	5.1 lb (2.3 kg)
Includes	1/2 in. conduit hub; 1/2 in. flexible conduit adapter

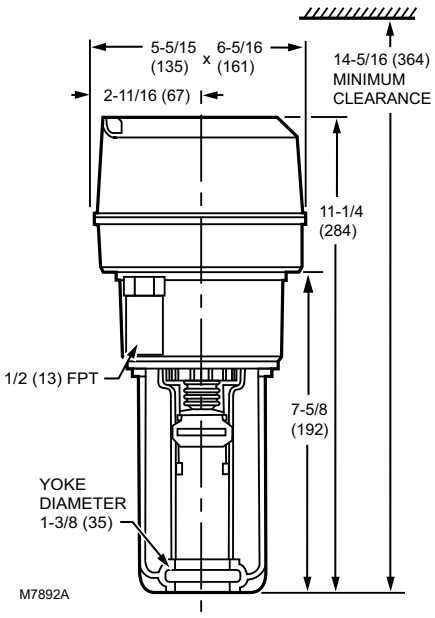
APPROVALS

CE	Recognized
Underwriters Laboratories, Inc.	UL94-5V

ACCESSORIES

312495—Large stem button provides anti-spin for globe valves up to 3 in. (1/4-28UNF stem) with ML6420, ML7420, ML6421A, ML7421A, ML6425, and ML7425 actuators. Not required with ML6984/7984 actuators or Q5022A linkage; not compatible with Q5020 linkage.
43191679-111—Potentiometer, 10k ohm, for ML6425, ML7425
43191679-112—Potentiometer, 220 ohm for ML6425, ML7425
43191680-105—Dual Auxiliary Switch for CREVAL actuators
43196000-001—High Temperature Kit for actuators with 3/4 inch (20 mm) stroke, stem button attachment

DIMENSIONS DIAGRAM



ML6984

The ML6984 is a self-contained, self-adjusting, motorized linkage that mounts directly onto V5011 two-way or V5013 three-way valves and provides up to 25 mm (1") of linear travel (stem lift). For use with low voltage 3-wire SPDT Series 20 (on-off); Series 60 (floating) electromechanical (dry) contacts; or electronic (triac output) controllers (3-wire installation).

FEATURES

- Allows the use of one common transformer power supply for multiple actuators and controllers.
- Self-contained, motorized valve linkage.
- Linkage self-adjusts to valve stroke of 12 to 25 mm (1/2 to 1 in.).
- Multi-pose mounting.
- Strong valve seat closing force 160 lbf (710 N).
- Compact size for easy installation in confined area.
- One device for either 24 Vac or 28 Vdc power supply application.
- Electronic current sensing provides internal protection and positive full closing force.
- Field-addable position feedback/auxiliary switch module available (5-wire control wiring only).
- Compatible with 3-wire control systems.

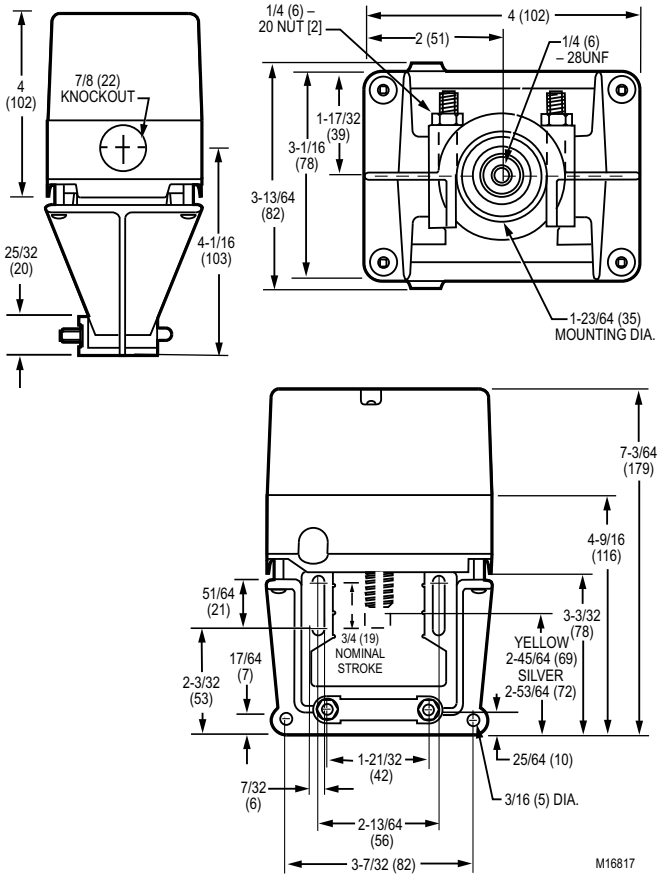
SPECIFICATIONS

Actuator Type	Valve
Fail Safe Mode	Stays in place
(Rated) Stem Force	160 lbf (710 N)
Cable Entry	7/8 in. hole for 1/2 in. conduit
External Auxiliary Switches Available	272630D
Electrical Protection	NEMA 3R
Electrical Connections	Screw terminals
Ingress Protection Rating	NEMA 3R, IP54 (mounted in vertical position)
Feedback	Position feedback available w/ 272630D; 2-10 Vdc
Frequency	50 Hz; 60 Hz
Manual operation	None
Mounting	Screws onto 1/4-28 UNF threaded valve stem
Number of Internal Auxiliary Switch	0
Stroke	1/2 to 1 in. (13 to 25 mm)
Supply Voltage	24 Vac; 28 Vdc
Materials	UV-stabilized plastic cover, aluminum base & yoke
Operating Humidity Range (% RH)	15 to 95% RH at 104 F (40 C)
Medium Temperature	300 F Maximum (150 C Maximum)
Ambient Temperature Range	32 F to 130 F (0 C to 50 C)
Temperature Ratings (Shipping)	-40 F to +150 F (-40 C to + 65 C)
Storage Temperature Range	-40 F to +150 F (-40 C to +65 C)
Weight	2.2 lb (1 kg)
Includes	Screw terminals
Comments	3 or 5-wire operation. (3-wire required for XL10 controllers)

ACCESSORIES

272629A—Adapter Kit for mounting ML6984/ML7984 to V5045 and VGF non-pressure balanced 2-way valves
272630D—Position feedback and SPDT pilot duty auxiliary switch

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Direct Coupled Valve Actuator

ML7984

The ML7984 is a self-contained, self-adjusting, motorized linkage that mounts directly onto V5011 two-way or V5013 three-way valves and provides up to 25 mm (1") of linear stem travel. For use with Series 70 2-10Vdc, 4-20mA; Series 90 135 ohm; and Electronic (Super Mod) modulating signals controllers.

FEATURES

- Allows the use of one common transformer power supply for multiple actuators and controllers.
- Self-contained, motorized valve linkage.
- Linkage self-adjusts to valve stroke from 12 to 25 mm (1/2 - 1 in.).
- Multi-pose mounting.
- Strong valve seat closing force 160 lbf (710 N).
- Compact size for easy installation in confined area.
- One device for either Vac or Vdc power supply application.
- Electronic current sensing provides internal protection and positive full closing force.
- Field-addable position feedback/auxiliary switch module available.

SPECIFICATIONS

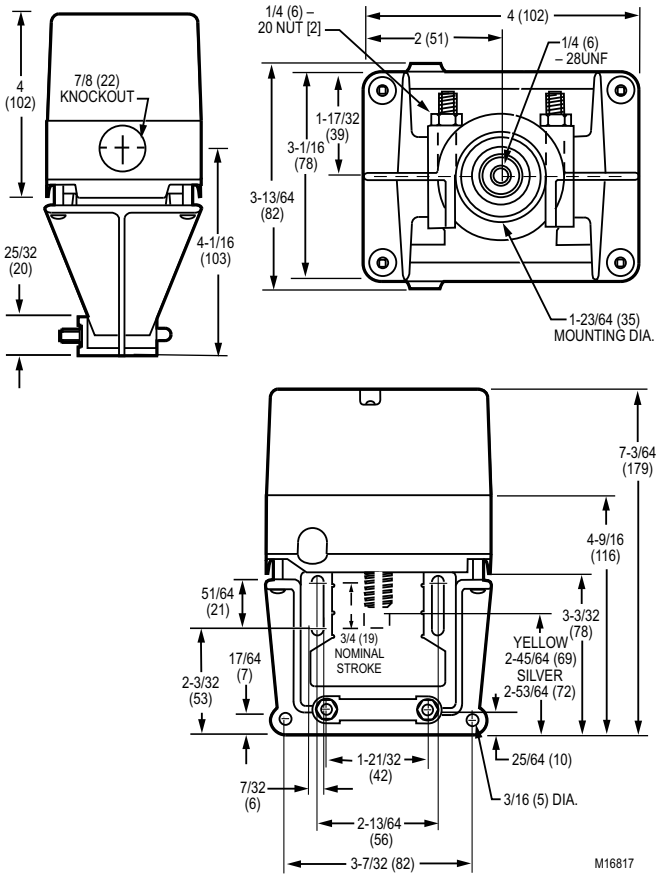
Actuator Type	Valve
Fail Safe Mode	Stays in place
Cable Entry	7/8 in. hole for 1/2 in. conduit
External Auxiliary Switches Available	272630D
Electrical Protection	NEMA 3R
Electrical Connections	Screw terminals
Ingress Protection Rating	NEMA 3R, IP54 (mounted in vertical position)
Feedback	Position feedback available w/ 272630D; 2-10 Vdc
Frequency	50 Hz; 60 Hz
Manual operation	None
Mounting	Screws onto 1/4-28 UNF threaded valve stem
Number of Internal Auxiliary Switch	0
Stroke	1/2 to 1 in. (13 to 25 mm)
Supply Voltage	24 Vac; 28 Vdc
Materials	UV-stabilized plastic cover, aluminum base & yoke
Operating Humidity Range (% RH)	15 to 95% RH at 104 F (40 C)
Ambient Temperature Range	32 F to 130 F (0 C to 55 C)
Temperature Ratings (Shipping)	-40 F to +150 F (-40 C to + 65 C)
Storage Temperature Range	-40 F to +150 F (-40 C to +65 C)
Weight	2.2 lb (1 kg)
Includes	Screw terminals
Comments	Direct/Reverse Acting Switch

ACCESSORIES:

272629A—Adapter Kit for mounting ML6984/ML7984 to V5045 and VGF non-pressure balanced 2-way valves

272630D—Position feedback and SPDT pilot duty auxiliary switch

DIMENSIONS DIAGRAM



VU52; VU53

Two-way Fan Coil Valves, the VU53 high pressure zone valves are used to control the flow of hot or chilled water in commercial HVAC equipment such as fan coil units, terminal reheat coils and convectors. IMPORTANT These valves are not for use in systems containing dissolved oxygen.

FEATURES

- Compact construction for easy installation.
- Fits under the cover of most baseboard convectors with actuator fitted to valve body.
- VU52 and VU53 provide 2-way, straight-through control of water.
- Available in normally closed (VU53) or normally open (VU52) configurations.
- 300 psi (2,000 kPa, PN20) operating pressure rating.
- Patented ball seal provides long service life, soft close off.
- Triple O-ring seal provides three lines of defense against corrosion and water leakage around drive shaft.
- Quick opening flow curve.
- Available with NPT end connections for iron or steel piping.

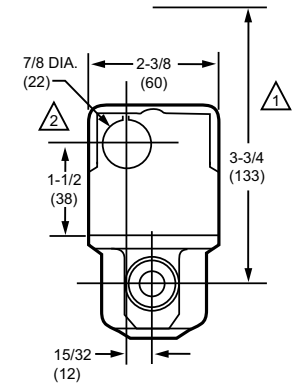
SPECIFICATIONS

Valve Type	Fan Coil Valve
Actuation:	Must be purchased separately
Flow Characteristic:	Quick opening
Body Pattern	Two-way, Straight-through
Controlled Fluid	Chilled or hot water with up to 60% Glycol
Maximum Safe Operating Pressure	300 psig (2068 kPA)
Ambient Temperature Range	34 F to 125 F at 200 F Fluid (1 to 52 C @ 94 C Fluid)
Materials	
(Body)	Brass
(Stem)	Brass
(Seat)	Brass
(Plug/Ball/Disc)	Buna-N rubber
(Packing)	EPDM rubber

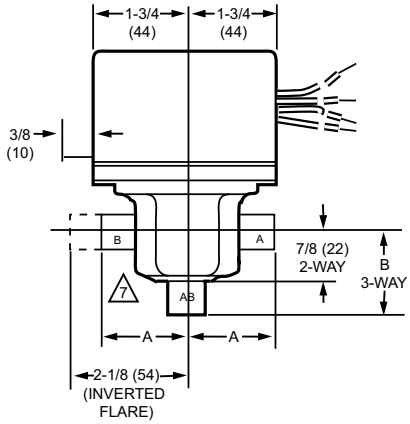
APPROVALS

Canadian Standards Association	CSA C/US

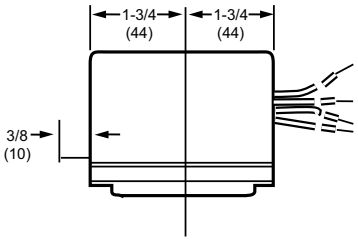
DIMENSIONS DIAGRAM



VU53 VALVE WITH VU448 ACTUATOR



VU53 AND VU54 VALVE WITH ACTUATOR



VU5 ACTUATOR

VALVE BODY SIZE	A	B
1/2 IN. SWEAT	1-5/6 (33)	1-5/6 (33)
3/4 IN. SWEAT	1-3/8 (35)	1-11/16 (43)
1 IN. SWEAT	1-11/16 (43)	1-11/16 (43)
1/2 IN. NPT	1-3/8 (35)	1-5/16 (33)
3/4 IN. NPT	1-11/16 (43)	1-7/16 (37)
1 IN. NPT	1-11/16 (43)	1-7/16 (37)

1 HEIGHT NEEDED TO REMOVE ACTUATOR OR COVER

2 OPENING FOR 1/2 IN. CONDUIT ON OPPOSITE SITE OF MANUAL LEVER FOR ALL MODELS.

M18261A

SUBMITTAL SHEETS

Unitary Valve

VU54

Three-way Fan Coil Valve, the VU54 high pressure zone valves are used to control the flow of hot or chilled water in commercial HVAC equipment such as fan coil units, terminal reheat coils and convectors.

IMPORTANT These valves are not for use in systems containing dissolved oxygen.

FEATURES

- Compact construction for easy installation.
- Fits under the cover of most baseboard convectors with actuator fitted to valve body.
- VU54 provides three-way diverting control of water.
- 300 psi (2,000 kPa, PN20) operating pressure rating.
- Patented ball seal provides long service life, soft close off.
- Triple O-ring seal provides three lines of defense against corrosion and water leakage around drive shaft.
- Quick opening flow curve.
- Choice of NPT end connections for iron or steel piping.

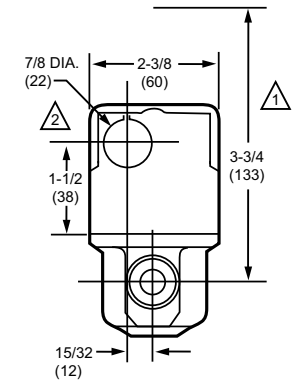
SPECIFICATIONS

Valve Type	Fan Coil Valve
Valve Action:	Mixing
Body Pattern	Three-way A-AB-B
Flow Characteristic:	quick opening
Controlled Fluid	Chilled or hot water with up to 60% Glycol
Maximum Safe Operating Pressure	300 psig (2068 kPA)
Ambient Temperature Range	34 F to 125 F at 200 F Fluid (1 to 52 C @ 94 C Fluid)
Actuation:	Must be purchased separately
Materials	
(Body)	Brass
(Stem)	Brass
(Seat)	Brass
(Plug/Ball/Disc)	Buna-N rubber
(Packing)	EPDM rubber

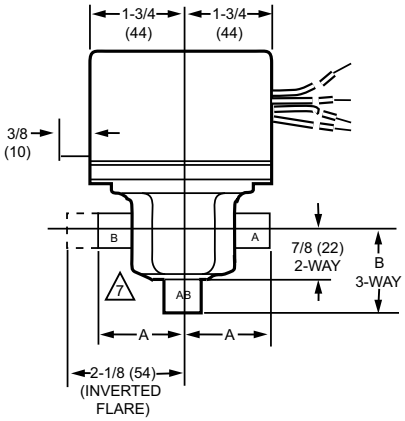
APPROVALS

Canadian Standards Association	CSA C/US

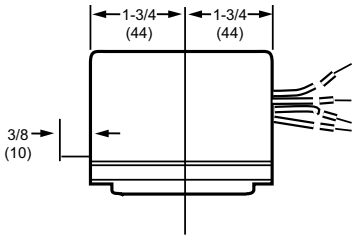
DIMENSIONS DIAGRAM



VU53 VALVE WITH VU448 ACTUATOR



VU53 AND VU54 VALVE WITH ACTUATOR



VU5 ACTUATOR

VALVE BODY SIZE	A	B
1/2 IN. SWEAT	1-5/6 (33)	1-5/6 (33)
3/4 IN. SWEAT	1-3/8 (35)	1-11/16 (43)
1 IN. SWEAT	1-11/16 (43)	1-11/16 (43)
1/2 IN. NPT	1-3/8 (35)	1-5/16 (33)
3/4 IN. NPT	1-11/16 (43)	1-7/16 (37)
1 IN. NPT	1-11/16 (43)	1-7/16 (37)

1 HEIGHT NEEDED TO REMOVE ACTUATOR OR COVER

2 OPENING FOR 1/2 IN. CONDUIT ON OPPOSITE SITE OF MANUAL LEVER FOR ALL MODELS.

M18261A

VCZA; VCZB

Two-way Cartridge Cage Valves are intended for hydronic applications in a normal indoor environment to control the flow of hot water or chilled water glycol solution to 60% concentration. These valves are designed for zone control of heating/cooling systems, or to control individual fan coil, baseboard radiator or convector applications. Depending on the model selected they can be controlled by SPST or SPDT two position controller, tristate (floating), or modulating proportional controller. For best control, outdoor temperature compensation of supply water temperature is recommended. For trouble-free operation of the product, good installation practice must include initial system flushing, chemical water treatment, and the use of a 50 micron (or finer) system side stream filter(s). Remove all filters before flushing.

FEATURES

- Quick open, linear, and equal percentage flow characteristics available
- Bi-directional installation
- 3000-series valves for floating and modulating non-fail safe applications
- 1000-series valves for two-position control
- High close-off rating independent of Cv
- Available with a variety of North American and international pipe fittings
- No tools required for actuator installation or removal
- Actuator removal does not require draining system
- Service is by replacement of cartridge, not valve body
- Cartridge replacement rebuilds valve to factory-new condition.

SPECIFICATIONS

Valve Type .....Cartridge Cage Valve
Valve Action: .....Stem up to close A port
Body Pattern.....Two-way, Straight-through
Connection Type.....Sweat
Controlled Fluid .....Chilled or hot water with up to 60% Glycol
Maximum Safe Operating Pressure.....300 psi (2068 kPA (20 Bar))
Maximum Differential Pressure Ratings
(Close-off)..... (414 kPa (4 bar)); 60 psi
Fluid Temperature Range .....34 F to 203 F (1 C to 95 C)
Ambient Temperature Range .....32 F to 150 F (0 C to 65 C)
Stem Travel .....0.4 in. (10 mm)
Materials
(Body).....Bronze
(Stem).....Stainless Steel
(Seat).....EPDM O-ring seals on Noryl piston
(Cartridge).....Ryton®, Noryl® engineering plastic
(Packing) .....EPDM rubber
Includes:.....Cartridge installation wrench

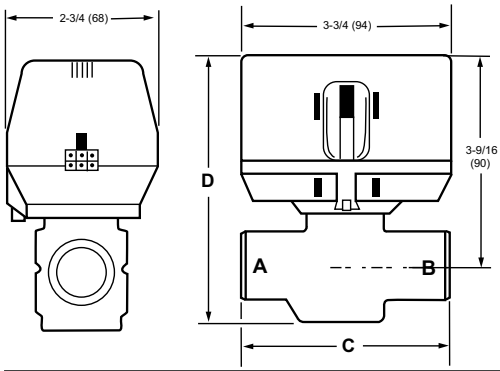
APPROVALS

Canadian Standards Association.....CSA Certified

ACCESSORIES

40007029-002—Wrench for cartridge (included with sweat valves and all replacement cartridges)

DIMENSIONS DIAGRAM



Pipe Fitting Sizes [4] North American Standard	C in.	C mm	D in.	D mm	Pipe Fitting Sizes [4]	C in.	C mm	D in.	D mm
3/8" FLARE [1]	3-7/8	98	4-3/8	111	1/2" BSPP (int.) [2]	3-7/8	98	4-3/8	111
1/2" SWEAT	3-1/2	89			1/2" BSPT (int.)				
1/2" FLARE [1]	3-7/8	98			3/4" BSPP (int.)	3-11/16	94	4-7/16	113
1/2" INVERTED FLARE [1]					3/4" BSPT (int.)				
1/2" NPT (int.)					3/4" BSPP (ext.)				
3/4" NPT (int.)	3-11/16	94	4-7/16	113	22 mm Compression [3]	4-7/16	112		
3/4" SWEAT					1" BSPP (int.)	3-11/16	94		
1" NPT (int.)					1" BSPP (ext.)	3-11/17	95	4-7/17	114
1" SWEAT					1" BSPT (int.)	3-11/16	94	4-7/16	113
1-1/4" SWEAT	4-5/16	110	4-5/8	118	28 mm Compression [3]	4-9/16	116		
1-1/4" NPT (int.)									

M18942

[1] NO ADAPTERS
[2] SUITABLE FOR USE AS15 MM COMPRESSION FITTING
[3] DIMENSIONS SHOWN WITH NUTS AND OLIVES INSTALLED
[4] SOME MODELS NOT AVAILABLE IN ALL COUNTRIES

Unitary Valve

VCZM; VCZN

Three-way Cartridge Cage Valves are intended for hydronic applications in a normal indoor environment to control the flow of hot water or chilled water glycol solution to 60% concentration. These valves are designed for zone control of heating/cooling systems, or to control individual fan coil, baseboard radiator or convector applications. Depending on the model selected they can be controlled by SPST or SPDT two position controller, tristate (floating), or modulating proportional controller. For best control, outdoor temperature compensation of supply water temperature is recommended. For trouble-free operation of the product, good installation practice must include initial system flushing, chemical water treatment, and the use of a 50 micron (or finer) system side stream filter(s). Remove all filters before flushing.

FEATURES

- Quick open and linear flow characteristics available
- Mixing or diverting application
- A-AB-B body pattern
- 7000-series valves for floating and modulating non-fail safe applications
- 6000-series valves for two-position control
- High close-off rating independent of Cv
- Available with a variety of North American and international pipe fittings
- No tools required for actuator installation or removal
- Actuator removal does not require draining system
- Service is by replacement of cartridge, not valve body
- Cartridge replacement rebuilds valve to factory-new condition

SPECIFICATIONS

Valve Type	Cartridge Cage Valve
Valve Action:	Stem up to close A port
Body Pattern	Three-way A-AB-B
Controlled Fluid	Chilled or hot water with up to 60% Glycol
Maximum Safe Operating Pressure	300 psi (2068 kPA (20 Bar))
Maximum Differential Pressure Ratings (Close-off)	(414 kPa (4 bar)); 60 psi
Fluid Temperature Range	34 F to 203 F (1 C to 95 C)
Ambient Temperature Range	32 F to 150 F (0 C to 65 C)
Stem Travel	0.4 in. (10 mm)
Includes:	Cartridge changing tool
Materials	
(Body)	Bronze
(Stem)	Stainless Steel
(Seat)	EPDM O-ring seals on Noryl piston
(Cartridge)	Ryton®, Noryl® engineering plastic
(Packing)	EPDM rubber

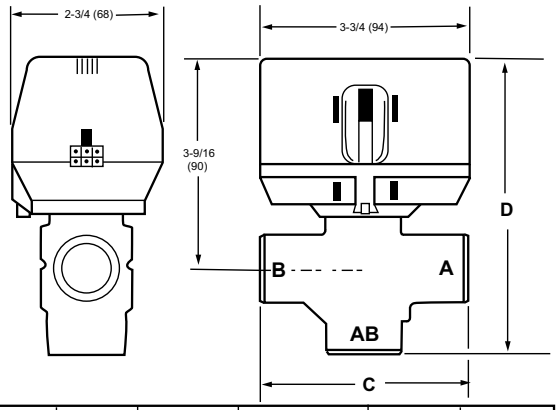
APPROVALS

Canadian Standards Association..... CSA Certified

ACCESSORIES

40007029-002—Wrench for cartridge (included with sweat valves and all replacement cartridges)

DIMENSIONS DIAGRAM



	C		D			C		D	
Pipe Fitting Sizes 4 North American Standard	in.	mm	in.	mm	Pipe Fitting Sizes 4	in.	mm	in.	mm
3/8" FLARE 1	3-7/8	98	5-11/32	136	1/2" BSPP (int.) 2	3-7/8	98	5-11/32	136
1/2" SWEAT	3-1/2	89	5-1/8	130	1/2" BSPT (int.)				
1/2" FLARE 1	3-7/8	98	5-11/32	136	3/4" BSPP (int.)	3-11/16	94	5-1/8	130
1/2" INVERTED FLARE 1					3/4" BSPT (int.)				
1/2" NPT (int.)					3/4" BSPP (ext.)				
3/4" NPT (int.)	3-11/16	94	5-1/8	130	22 mm Compression 3	4-7/16	112	5-1/2	140
3/4" SWEAT			5-3/16	132	1" BSPP (int.)	3-11/16	94	5-11/32	136
1" NPT (int.)				136	1" BSPP (ext.)	3-11/17	95	5-11/33	137
1" SWEAT			5-11/32		1" BSPT (int.)	3-11/16	94	5-11/32	136
1-1/4" SWEAT	4-5/16	110	5-5/8	142	28 mm Compression 3	4-9/16	116	5-13/16	147
1-1/4" NPT (int.)									

M18943

1 NO ADAPTERS

2 SUITABLE FOR USE AS15 MM COMPRESSION FITTING

3 DIMENSIONS SHOWN WITH NUTS AND OLIVES INSTALLED

V5852; V5862

Two-way Cartridge Globe Valves control hot and/or chilled water for VAV terminal units, fan coil units, small reheaters and recoolers in electric/electronic temperature control systems. Used with the M6410 3-position floating Non-Spring Return Valve Actuator and the M7410 selectable 0 to 10 Vdc or 2 to 10 Vdc Non-Spring Return Actuator. The 1/2 in. and 3/4 in. valves are compatible with the M6435 floating Spring Return Actuator, the M7435 selectable 0 to 10 Vdc or 2 to 10 Vdc Spring Return Actuator, and the MP958 Pneumatic Actuator. Larger valves (1 in. through 1-1/2 in.) are pressure balanced, which results in higher close-off pressures.

FEATURES

Long stroke allows wider range of control.

- Soft valve seat provides low leakage rate.
- Inserts for 1/2 in. and 3/4 in. valves are changeable without draining valve when used with an insert replacement tool.
- Brass body and Stainless Steel stem.
- Threaded plastic cover/manual handle allows manual operation.
- Easily installed in areas where space is limited.

SPECIFICATIONS

Valve Type	Cartridge Globe Valve
Body Pattern	Two-way
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	1/2 in. and 3/4 in. valves: ANSI Class IV (0.01% of Cv maximum) 1 in, 1-1/4 in, 1-1/2 in valves: ANSI Class III (less than 0.02% of Cv)
Maximum Safe Operating Pressure	235 psi (1620 kPA)
Fluid Temperature Range	36 F to 230 F (2 C to 110 C)
Stem Travel	1/4 in. (6.4 mm)
Actuation:	Must be purchased separately
Materials	
(Body)	Brass
(Stem)	Stainless Steel
(Seat)	Brass
(Cartridge)	Brass
(Plug/Ball/Disc)	Brass

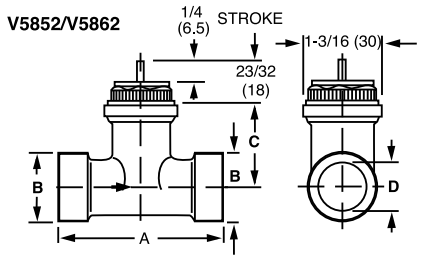
ACCESSORIES

0902807—Replacement Insert for 1/2 in. V5852/V5862, 1.9Cv
Interchangeable with 0902808
0902808—Replacement Insert for 1/2 in. V5852/V5862, 1.2 Cv
Interchangeable with 0902807
0902809—Replacement Insert for 1/2 in. V5852/V5862, 0.74 Cv
Interchangeable with 0902810 or 090212
0902810—Replacement Insert for 1/2 in. V5852/V5862, 0.47 Cv
Interchangeable with 0902809 or 090212

REPLACEMENT PARTS

0902812—Replacement Insert for 1/2 in. V5852/V5862, 0.19 Cv
Interchangeable with 0902809 or 090210
0902814—Replacement Insert for 3/4 in. V5852/V5862, 2.9 Cv
Interchangeable with 0902815
0902815—Replacement Insert for 3/4 in. V5852/V5862, 4.9 Cv
Interchangeable with 0902814
0903827—Replacement Packing for 1 in. V5862/63
0903828—Replacement Packing for 1-1/4 in. V5862/63
0903829—Replacement Packing for 1-1/2 in. V5862/63

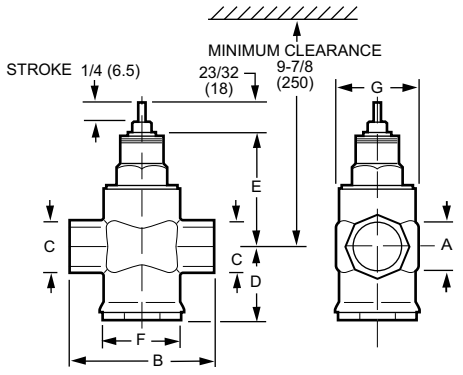
DIMENSIONS DIAGRAM



VALVE SIZE	A	B	C	D (NPT)	D (SWEAT)
1/2 (13)	3 (77)	3/4 (19)	1-5/16 (34)	1/2 (13)	5/8 (16)
3/4 (19)	3-1/2 (88)	1 (25)	1-1/4 (32)	3/4 (19)	7/8 (22)

NOTE: SOLDER ENDS CONFORM TO ANSI B16-18.

M18917



VALVE SIZE A (NPT)	B	C	D	E	F	G
1 (25)	4-1/8 (105)	1-5/8 (41)	2-1/16 (53)	3-5/8 (92)	2 (50)	1-3/4 (44)
1-1/4 (32)	4-15/16 (125)	2 (50)	2-7/16 (62)	3-5/8 (92)	2-3/16 (55)	2-1/4 (57)
1-1/2 (38)	5-1/8 (130)	2-3/16 (55)	2-9/16 (65)	3-7/8 (98)	2-3/8 (60)	2-5/8 (67)

Unitary Valve

V5853; V5863

Three-way Cartridge Globe Valves control hot and/or chilled water for VAV terminal units, fan coil units, small reheaters and recoolers in electric/ electronic temperature control systems. Used with the M6410 3-position floating Non-Spring Return Valve Actuator and the M7410 selectable 0 to 10 Vdc or 2 to 10 Vdc Non-Spring Return Actuator. The 1/2 in. and 3/4 in. valves are also compatible with the M6435 floating Spring Return Actuator, the M7435 selectable 0 to 10 Vdc or 2 to 10 Vdc Spring Return Actuator, and the MP958 Pneumatic Actuator.

FEATURES

- Long stroke allows wider range of control.
- Soft valve seat provides low leakage rate.
- Inserts for 1/2 in. and 3/4 in. valves are changeable without draining valve when used with an insert replacement tool.
- Brass body and stainless steel stem.
- Threaded plastic cover/manual handle allows manual operation.
- Easily installed in areas where space is limited.

SPECIFICATIONS

Valve Type	Cartridge Globe Valve
Body Pattern	Three-way
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	1/2 in. and 3/4 in. valves: ANSI Class IV (0.01% of Cv maximum) 1 in, 1-1/4 in, 1-1/2 in valves: ANSI Class III (less than 0.02% of Cv)
Maximum Safe Operating Pressure	235 psi (1620 kPA)
Maximum Differential Pressure Ratings	(Close-off)34 psi (234 kPa)
Fluid Temperature Range	36 F to 230 F (2 C to 110 C)
Stem Travel	1/4 in. (6.4 mm)
Actuation:	Must be purchased separately

Materials

(Body)	Brass
(Stem)	Stainless Steel
(Seat)	Brass
(Cartridge)	Brass
(Plug/Ball/Disc)	Brass

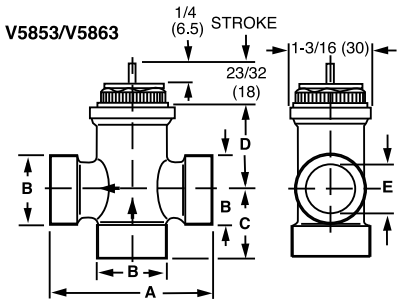
ACCESSORIES

0903827—Replacement Packing for 1 in. V5862/63

REPLACEMENT PARTS

0902821—Replacement Insert for 1/2 in. V5853/V5863, 0.29 Cv
Interchangeable with 0902822 or 0902823 or 0902824
0902822—Replacement Insert for 1/2 in. V5853/V5863, 0.47 Cv
Interchangeable with 0902821 or 0902823 or 0902824
0902823—Replacement Insert for 1/2 in. V5853/V5863, 0.74 Cv
Interchangeable with 0902821 or 0902822 or 0902824
0902824—Replacement Insert for 1/2 in. V5853/V5863, 1.2 Cv
Interchangeable with 0902821 or 0902822 or 0902823
0902825—Replacement Insert for 1/2 in. V5853/V5863, 1.9 Cv
Interchangeable with 0902827
0902827—Replacement Insert for 3/4 in. V5853/V5863, 4.9 Cv
Interchangeable with 0902825
0903827—Replacement Packing for 1 in. V5862/63
0903828—Replacement Packing for 1-1/4 in. V5862/63
0903829—Replacement Packing for 1-1/2 in. V5862/63

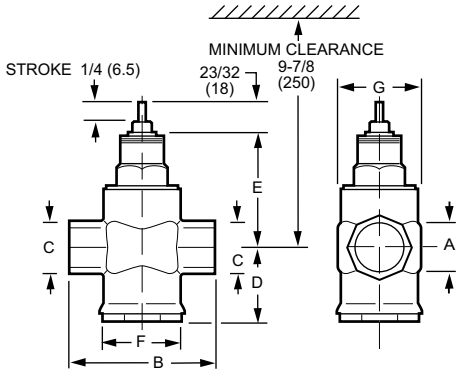
DIMENSIONS DIAGRAM



VALVE SIZE	A	B	C	D	E (NPT)	E (SWEAT)
1/2 (13)	3 (77)	3/4 (19)	1-5/16 (34)	1-5/16 (34)	1/2 (13)	5/8 (16)
3/4 (19)	3-1/2 (88)	1 (25)	1-1/2 (38)	1-1/4 (32)	3/4 (19)	7/8 (22)

NOTE: SOLDER ENDS CONFORM TO ANSI B16-18.

M18919



VALVE SIZE A (NPT)	B	C	D	E	F	G
1 (25)	4-1/8 (105)	1-5/8 (41)	2-1/16 (53)	3-5/8 (92)	2 (50)	1-3/4 (44)
1-1/4 (32)	4-15/16 (125)	2 (50)	2-7/16 (62)	3-5/8 (92)	2-3/16 (55)	2-1/4 (57)
1-1/2 (38)	5-1/8 (130)	2-3/16 (55)	2-9/16 (65)	3-7/8 (98)	2-3/8 (60)	2-5/8 (67)

The Fail Safe VC6936 Floating and VC7936 Modulating Control valves provides proportional control of hot or chilled water in commercial heating and cooling applications, such as unit ventilators. On a power failure, this patented actuator design drives the valve to the fail safe position, either fully open or closed according to the installer's wiring connections.

These actuators use a microprocessor-controlled, low voltage stepper motor with a super capacitor-based power supply capable of storing enough power to drive the valve to its when 24V power is removed from the actuator.

A VC hydronic valve consists of a valve body, a replaceable characterized cartridge assembly and a Honeywell VC6900 or VC7900-series actuator, providing proportional flow control. Three-way bodies may be used in either diverting or mixing applications. VC valves use cam-operated cartridge travel to resist water hammer. Limit switches prevent motor overrun. For best control, outdoor temperature compensation of supply water temperature is recommended.

SPECIFICATIONS

Valve Type	Cartridge Cage Valve
Valve Action:	Stem up to close A port
Controlled Fluid	Chilled or hot water with up to 60% Glycol
Maximum Safe Operating Pressure	300 psi (2068 kPA (20 Bar))
Maximum Differential Pressure Ratings (Close-off)	60 psi (414 kPa (4 bar))
Fluid Temperature Range	34 F to 203 F (1 C to 95 C)
Ambient Temperature Range	32 F to 150 F (0 C to 65 C)
Stem Travel	0.4 in. (10 mm)
Timing (sec, min.):	For VC6936: 2 minutes; For VC7936: installer-selectable 60 or 120 seconds.
Materials	
(Body)	Bronze
(Stem)	Stainless Steel
(Seat)	EPDM O-ring seals on Noryl piston
(Cartridge)	Ryton®, Noryl® engineering plastic
(Packing)	EPDM rubber

APPROVALS

Canadian Standards Association	CSA Certified

SUBMITTAL SHEETS

Control Ball Valve

VBN2

The VBN2 Two-Way Control Ball Valves control hot and chilled water with glycol solutions up to 50% in heating, ventilating, and air conditioning (HVAC) systems to provide two-position or modulating functions. These valve assemblies can be ordered with or without factory-mounted non-spring return or spring return direct-coupled actuators (DCA).

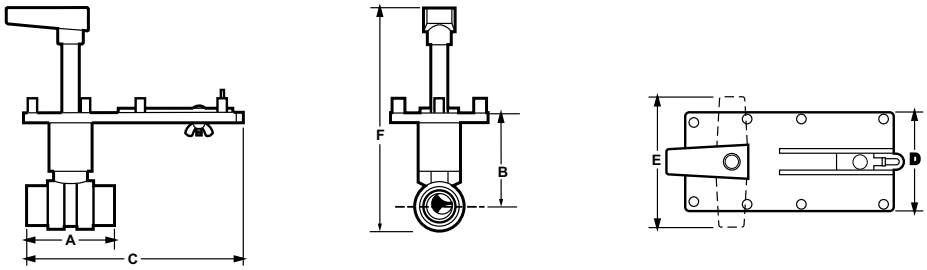
FEATURES

- Sizes from 1/2 to 3 inches with internal (female) NPT connections.
- Equal percentage or linear flow characteristics.
- Choice of four, factory-installed actuation control schemes: Floating, Modulating (2-10 V), Spring Return 2-Position, Spring Return Modulating/Floating.
- Field configurable for normally open or normally
- closed fail-safe position.
- Removable manual operating handle to control valve during installation or in an event of power failure.
- ANSI Class IV seat leakage specification (0.01% of Cv).
- Optional NEMA 3R (IP54) rated enclosure for outdoor applications.
- Actuator can be mounted on the valve in any of four positions.
- Field-serviceable stem assembly.
- Wide Cv choices from 0.38 to 266.
- Nickel-chrome plated brass or 316 stainless steel ball and stem.

SPECIFICATIONS

Valve Type	Control Ball Valve
Body Pattern	Two-way
Connection Type	Female NPT
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	ANSI Class IV (0.01% of Cv maximum)
Maximum Safe Operating Pressure	360 psi (2482 kPa)
Fluid Temperature Range	-22 F to +250 F (-30 C to +121 F)
Materials	
(Body)	Brass
(Seat)	Teflon® seals with EPDM O-rings
(Flow Control Insert)	Noryl®

DIMENSIONS DIAGRAM



Pipe Size	Model No.	C_V	Dimensions inches (mm) A	B	C	D	E	F	Weight lb (kg)
1/2"	VBN2A	0.38, 0.68, 1.3, 2.0, 2.6, 4.7, 11.7	2-3/8 (60)	3-7/16 (87)	6-5/8 (168)	3 (76)	4 (102)	8-1/8 (206)	1 (0.5)
		8.0	2-5/8 (67)	3-11/16 (94)	6-1/2 (165)	3 (76)	4 (102)	8-5/16 (211)	1 (0.5)
3/4"	VBN2B	0.31, 0.63, 1.2, 2.5, 4.3, 7.4, 14.7	2-3/8 (60)	3-7/16 (87)	6-7/16 (164)	3 (76)	4 (102)	8-1/8 (206)	1 (0.5)
		10.1, 29	2-5/8 (67)	3-11/16 (94)	6-1/2 (165)	3 (76)	4 (102)	8-5/16 (211)	1 (0.5)
1"	VBN2C	9.0	3-3/4 (95)	3-11/16 (94)	7-1/16 (179)	3 (76)	4 (102)	8-5/16 (211)	1 (0.5)
		4.4, 15.3, 54	3 (76)	3-15/16 (100)	6-3/4 (171)	3 (76)	4 (102)	8-11/16 (221)	1.4 (0.6)
		26, 44	4-3/8 (111)	4-7/16 (113)	7-3/8 (187)	3 (76)	4 (102)	8-7/8 (225)	2.4 (1.1)
1-1/4"	VBN2D	4.4, 8.3, 14.9, 25, 41	3 (76)	3-15/16 (100)	6-11/16 (170)	3 (76)	4 (102)	8-11/16 (221)	1.4 (0.6)
		37, 102	3-5/8 (92)	4-7/16 (113)	7 (178)	3 (76)	4 (102)	9-1/16 (231)	2.4 (1.1)
1-1/2"	VBN2E	23, 30, 74	3-3/8 (86)	3-15/16 (100)	6-15/16 (176)	3 (76)	4 (102)	9-1/16 (231)	2.4 (1.1)
		41, 172	3-3/4 (95)	5-3/16 (132)	7-1/16 (179)	3 (76)	4 (102)	8-7/8 (225)	3.2 (1.5)
2"	VBN2F	42, 108	4 (102)	5-3/16 (132)	7-3/16 (183)	3 (76)	4 (102)	8-7/8 (225)	3.2 (1.5)
		57, 71, 100, 210, 266	4-3/8 (111)	5-3/4 (146)	7-7/16 (189)	3 (76)	4 (102)	10-1/2 (267)	5 (2.3)
2-1/2"	VBN2G	45, 55, 72, 101, 162, 202	4-3/4 (121)	5-3/4 (146)	7-9/16 (192)	3 (76)	4 (102)	10-1/2 (267)	5.5 (2.5)
3"	VBN2H	49, 63, 82, 124, 145	5 (127)	5-7/8 (149)	7-11/16 (195)	3 (76)	4 (102)	10-11/16 (271)	5.9 (2.7)

M13729A

VBN3

The VBN3 Three-Way Control Ball Valves control hot and chilled water with glycol solutions up to 50% in heating, ventilating, and air conditioning (HVAC) systems to provide two-position or modulating functions. These valve assemblies can be ordered with or without factory-mounted non-spring return or spring return direct-coupled actuators (DCA).

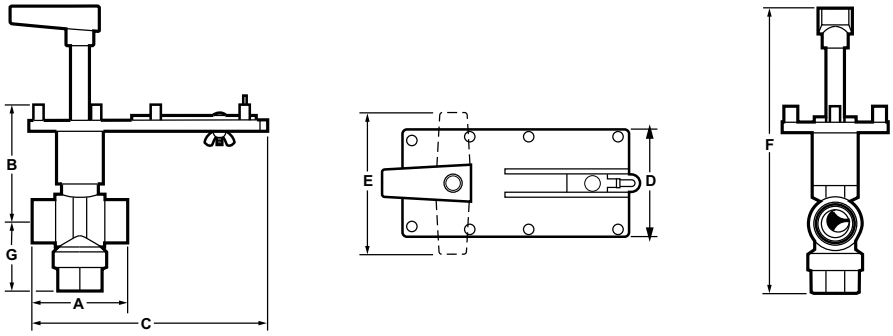
SPECIFICATIONS

Valve Type	Control Ball Valve
Body Pattern	Three-way
Flow Characteristic:	Linear (B-AB); Equal Percentage (A-AB)
Connection Type	Female NPT
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	ANSI Class IV (0.01% of Cv maximum)
Maximum Safe Operating Pressure	360 psi (2482 kPa)
Fluid Temperature Range	-22 F to +250 F (-30 C to +121 F)
Materials	
(Body)	Brass
(Stem):	Brass
(Seat)	Teflon® seals with EPDM O-rings
(Plug/Ball/Disc):	Nickel-plated brass ball
(Flow Control Insert)	Noryl®

FEATURES

- Sizes from 1/2 to 2-1/2 inches with internal (female) NPT connections.
- Equal percentage or linear flow characteristics.
- Reduced B-port Cv for constant loop flow.
- Choice of four, factory-installed actuation control schemes: Floating, Modulating (2-10 V), Spring Return 2-Position, Spring Return Modulating/Floating.
- Field configurable for normally open or normally
- closed fail-safe position.
- Removable manual operating handle to control valve during installation or in an event of power failure.
- ANSI Class IV seat leakage specification (0.01% of Cv).
- Optional NEMA 3R (IP54) rated enclosure for outdoor applications.
- Actuator can be mounted on the valve in any of four positions.
- Wide Cv choices from 0.33 to 109.
- Valve installs in a globe valve “T” pattern, no extra elbows or piping required.
- Field-serviceable stem assembly.
- Nickel-chrome plated brass ball and stem.
- Mixing or Diverting control.

DIMENSIONS DIAGRAM



Pipe Size	Model No.	C_V	Dimensions inches (mm) A	B	C	D	E	F	G	Weight lb (kg)
1/2"	VBN3A	0.33, 0.59, 1.0, 2.4, 4.3, 8.0	3-1/2 (90)	3-5/16 (84)	7 (178)	3 (76)	4 (102)	9-3/8 (238)	2-3/8 (60)	2.4 (1.1)
3/4"	VBN3B	0.40, 0.66, 1.3, 2.4, 3.8, 11.0	2-13/16 (71)	3-5/16 (84)	6-1/2 (168)	3 (76)	4 (102)	8-13/16 (224)	2 (51)	2 (0.9)
1"	VBN3C	0.40, 0.65, 1.3, 2.3, 3.5	3-13/16 (97)	3-5/16 (84)	7-5/16 (186)	3 (76)	4 (102)	9-1/2 (241)	2-3/4 (70)	2.8 (1.3)
		8.6, 22	3 (76)	3-13/16	6-13/16 (173)	3 (76)	4 (102)	9-13/16 (249)	2-5/8 (67)	2.6 (1.2)
		4.5, 14.9, 31	4-1/2 (114)	4 (102)	7-13/16 (198)	3 (76)	4 (102)	10-13/16 (275)	3-1/4 (83)	3.3 (1.5)
1-1/4"	VBN3D	4.1, 8.7, 19.0	3 (76)	3-13/16	6-13/16 (173)	3 (76)	4 (102)	9-13/16 (249)	2-1/2 (64)	2.5 (1.1)
		12.7, 27, 34	3-5/8 (92)	4 (102)	7-5/16 (186)	3 (76)	4 (102)	10-5/16 (262)	2-3/4 (70)	2.8 (1.3)
1-1/2"	VBN3E	4.0, 8.3, 13.4, 32	4-1/2 (114)	4 (102)	7-13/16 (198)	3 (76)	4 (102)	10-13/16 (275)	3-1/4 (83)	3.3 (1.5)
		24, 61	4 (102)	4-1/2 (114)	7-5/16 (186)	3 (76)	4 (102)	11 (279)	3-1/4 (83)	3.3 (1.5)
2"	VBN3F	24, 38, 57	4 (102)	4-1/2 (114)	7-5/16 (186)	3 (76)	4 (102)	11 (279)	3-1/4 (83)	3.3 (1.5)
		83, 109	5 (127)	5-13/16	7-13/16 (198)	3 (76)	4 (102)	12-5/16 (313)	3-3/4 (95)	3.8 (1.7)
2-1/2"	VBN3G	38, 74, 100	5 (127)	5-13/16	7-13/16 (198)	3 (76)	4 (102)	12-5/16 (313)	3-3/4 (95)	3.8 (1.7)

Control Ball Valve

VBF2

The VBF2 Two-Way Ball Valve Assemblies, with and without actuators, control hot and chilled water with glycol solutions up to 50% in closed loop heating, ventilating, and air conditioning (HVAC) systems to provide two-position or modulating functions. These valve assemblies can be ordered with or without factory-mounted non-spring return or spring return direct-coupled actuators (DCA).

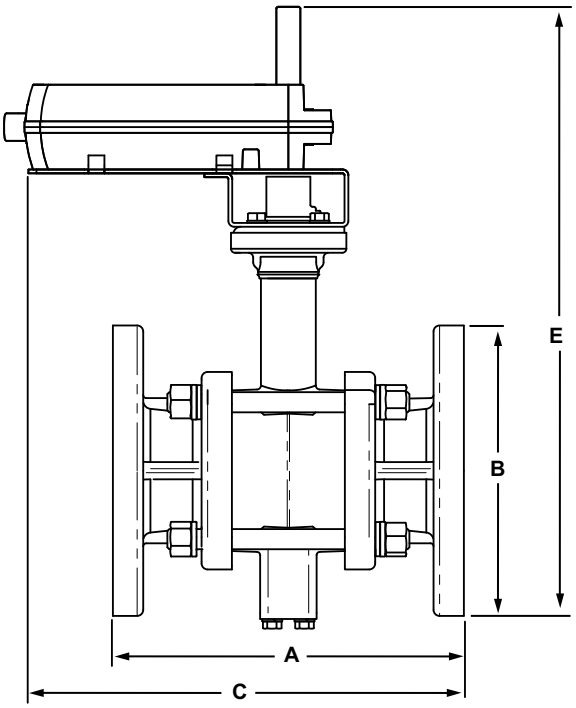
FEATURES

- Sizes from 4 to 6 inch with ANSI Class 125 flanged connections.
- Equal percentage or linear flow characteristics.
- Choice of four, factory-installed actuation control schemes: Floating, Modulating (2-10 V), Spring Return 24V 2-Position, Spring Return Modulating/Floating.
- Field configurable for normally open or normally
- closed fail-safe position.
- Removable manual operating handle to control valve
- during installation or in an event of power failure.
- ANSI Class IV leakage specification (0.01% of Cv).
- Optional NEMA 3R (IP54) rated enclosure for outdoor applications.
- Option of four actuator mounting positions on the valve.
- Wide range of Cv choices from 91 to 650.
- Valve ball and stem 316 stainless steel.

SPECIFICATIONS

Valve Type	Control Ball Valve
Body Pattern	Two-way
Connection Type	Flanged
Flow Characteristic:	Equal Percentage
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	ANSI Class IV (0.01% of Cv maximum)
Maximum Safe Operating Pressure	240 psi (1655 kPa)
Maximum Differential Pressure Ratings (Close-off)	70 psi (483 kPa)
Fluid Temperature Range	-22 F to +250 F (-30 C to +121 F)
Materials	
(Body)	Cast Iron
(Stem)	316 Stainless Steel
(Seat)	Teflon®
(Plug/Ball/Disc)	316 stainless steel

DIMENSIONS DIAGRAM



Size (in.)	Model Number	**A** in. (mm)	**B** in. (mm)	**C** in. (mm)	**D** (depth) (not shown) in. (mm)	**E** in. (mm)	**Wt.** lb (kg)
4	VBF2J	11 (278)	9 (229)	13-1/4 (337)	9 (229)	18-3/4 (476)	65 (31)
5	VBF2K	12-3/8 (352)	10 (254)	14-1/4 (362)	10 (254)	19 (483)	75 (34)
6	VBF2L	13-7/8 (352)	11 (278)	15-1/8 (384)	11 (278)	19-7/8 (505)	90 (41)

M13732

VBF3

The VBF3 Three-Way Ball Valve Assemblies, with and without actuators, control hot and chilled water with glycol solutions up to 50% in closed loop heating, ventilating, and air conditioning (HVAC) systems to provide two-position or modulating functions. These valve assemblies can be ordered with or without factory-mounted non-spring return or spring return direct-coupled actuators (DCA).

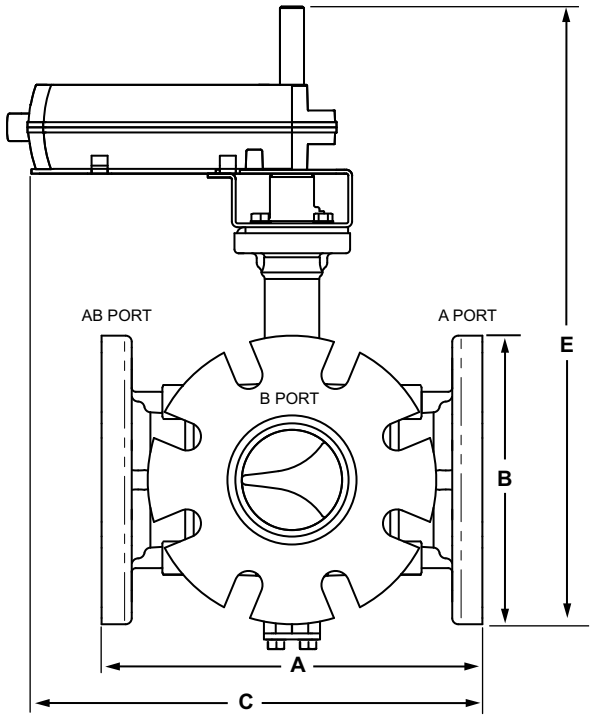
FEATURES

- Sizes from 4 to 6 inch with ANSI Class 125 flanged connections.
- Equal percentage or linear flow characteristics.
- Choice of four, factory-installed actuation control schemes: Floating, Modulating (2-10 V), Spring Return 24V 2-Position, Spring Return Modulating/Floating.
- Field configurable for normally open or normally
- closed fail-safe position.
- Removable manual operating handle to control valve
- during installation or in an event of power failure.
- ANSI Class IV A-port seat leakage (0.01% of Cv).
- Optional NEMA 3R (IP54) rated enclosure for outdoor applications.
- Option of four actuator mounting positions on the valve.
- Wide range of Cv choices from 91 to 650.
- Valve ball and stem 316 stainless steel.
- Non-isolating mixing or diverting control.

SPECIFICATIONS

Valve Type	Control Ball Valve
Body Pattern	Three-way
Connection Type	Flanged
Flow Characteristic:	Linear (B-AB); Equal Percentage (A-AB)
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	ANSI Class IV (A port only) B port ~2% leakage
Maximum Safe Operating Pressure	240 psi (1655 kPa)
Maximum Differential Pressure Ratings (Close-off)	70 psi (483 kPa)
Fluid Temperature Range	-22 F to +250 F (-30 C to +121 F)
Materials	
(Body)	Cast Iron
(Stem)	316 Stainless Steel
(Seat)	Teflon®
(Plug/Ball/Disc)	316 stainless steel

DIMENSIONS DIAGRAM



Size (in.)	Model Number	A in. (mm)	B in. (mm)	C in. (mm)	D (depth) (not shown) in. (mm)	E in. (mm)	Wt. lb (kg)
4	VBF3J	11-7/8 (278)	9 (229)	14-1/8 (337)	10-3/8 (229)	18-1/2 (470)	75 (34)
5	VBF3K	13-7/8 (352)	10 (254)	15-1/8 (362)	12 (254)	19-3/8 (483)	90 (41)
6	VBF3L	15-7/8 (403)	11 (278)	16-1/8 (410)	13-3/8 (521)	20-1/2 (521)	105 (48)

M13733A

NPT Globe Valve

V5011F,G

Used for two-position or modulating control of steam and water and glycol solutions (to 50 percent concentration) in heating or cooling systems.

FEATURES

- Sizes range from 2-1/2 to 3 inches.
- Direct acting
- High pressure steam models with stainless steel trim.
- Spring-loaded, self-adjusting packing.
- Stainless steel stem prevents corrosion.
- Valve designs provide equal percentage characteristics of flow for close control of water, and linear characteristic of flow for close control of steam or chilled water.
- Valves utilize direct mounting, electric or pneumatic linear valve actuators; Q5001 linkage with Modutrol Motor; or Q5020/Q5022A linkages with Direct Coupled Actuators to operate the valve.

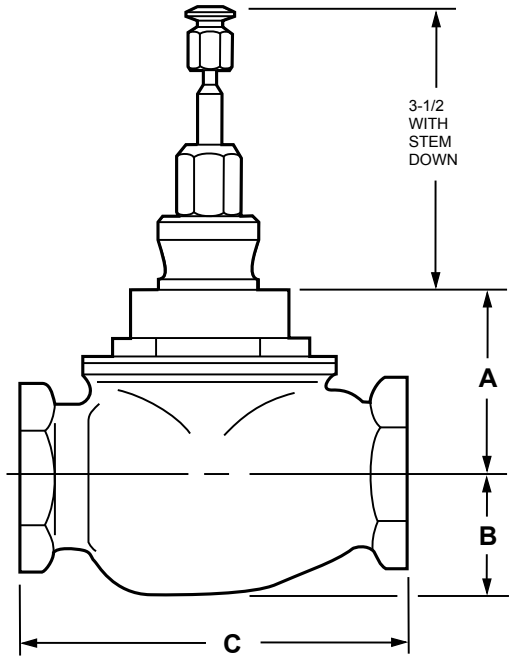
SPECIFICATIONS

Valve Type	Globe Valve
Body Pattern	Two-way, Straight-through
Connection Type	Female NPT
Leakage Rating	0.5% of Cv
Maximum Differential for Quiet Water Service	20 psid (138 kPa)
Fluid Temperature Range	40 F to 337 F (4 C to 169 C)
Stem Travel	3/4 in. (20 mm)
Bonnet Size:	1-3/8 in. (35 mm)
Valve Action:	Stem down to close
ANSI/ASME Rating:	150
Actuation:	Must be purchased separately
Materials	
(Body)	Red Brass
(Stem)	Stainless Steel
(Seat):	V5011F: Brass; V5011G: Stainless Steel
(Plug/Ball/Disc):	V5011F: Teflon disc; V5011G: Stainless steel plug with carbon-loaded Teflon disc
(Packing):	V5011F: Teflon and Nitrile; V5011G: Teflon Cone

APPROVALS

CRN Number	0C0861.9087YTN

DIMENSIONS DIAGRAM



V5011F,G

BODY STYLE	PIPE SIZE (in.)	DIMENSIONS					
		A		B		C	
		in	mm	in	mm	in	mm
V5011F,G THREADED DIRECT BODY	1/2	2	51	1-3/4	45	3-3/8	86
	3/4	1-3/4	45	1-3/4	45	3-3/8	86
	1	1-7/8	48	1-3/4	45	4-1/4	108
	1-1/4	2	51	1-5/8	42	4-7/8	124
	1-1/2	2-7/8	73	1-5/8	42	5-5/8	143
	2	3-1/8	80	2	51	5-5/8	143
	2-1/2	2-3/4	70	2-3/8	61	7-1/2	191
	3	3-1/8	80	2-5/8	67	8-7/8	226

M2804A

NPT Globe Valve

V5011N

Used for two-position or modulating control of steam and water and glycol solutions (to 50 percent concentration) in heating or cooling systems.

FEATURES

- Sizes range from 1/2 to 2 inches.
- Direct and reverse acting
- High pressure steam models with stainless steel trim
- Spring-loaded, self-adjusting packing.
- Stainless steel stem prevents corrosion.
- Valve designs provide equal percentage characteristics of flow for close control of water, and linear characteristic of flow for close control of steam or chilled water.
- Valves utilize direct mounting, electric or pneumatic linear valve actuators; Q5001 linkage with Modutrol Motor; or Q5020/Q5022A linkages with direct coupled rotary actuators to operate the valve.
- Not suitable for combustible gases.

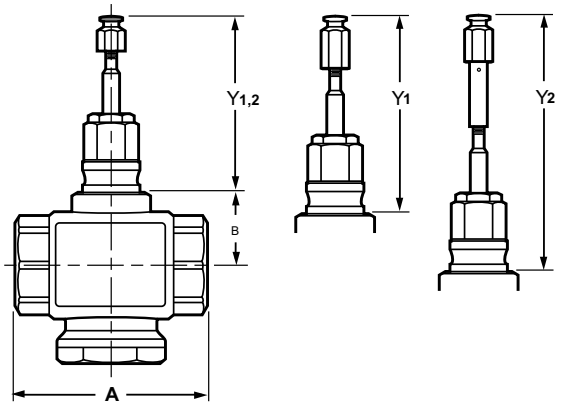
SPECIFICATIONS

Valve Type	Globe Valve
Body Pattern	Two-way
Connection Type	Female NPT
Leakage Rating	Seat: 0.05% of Cv
Maximum Differential f or Quiet Water Service	20 psid (138 kPa)
Maximum Differential Pressure Ratings (Close-off)	240 psi (1655 kPa)
Ambient Temperature Range	36 F to 248 F water (2 C to 120 C water)
Stem Travel	3/4 in. (20 mm)
Bonnet Size:	1-3/8 in. (35 mm)
ANSI/ASME Rating:	150
Actuation:	Must be purchased separately
Materials	
(Body)	Red Brass
(Stem)	Stainless Steel
(Packing)	Teflon

APPROVALS

CRN Number	0C0861.9087YTN/0C0861.99

DIMENSIONS DIAGRAM



VALVE SIZE (IN)	A in. (mm)	B in. (mm)
1/2	3-1/4 (83)	1-9/16 (40)
3/4		
1	4-1/16 (103)	
1-1/4	4-3/16 (106)	
1-1/2	4-3/4 (120)	1-13/16 (47)
2	5-1/4 (134)	

VALVE	Y1 in. (mm)	Y2[a] in. (mm)
V5011N1XXX OR V5011N2XXX	3-1/2 (89)	5-1/4 (133)
	STEM FULLY DOWN	
V5011N3XXX	4-3/16 (107)	5-15/16 (151)
	STEM FULLY UP	

[a]Y2 WITH STEM EXTENSION FOR MP953C,E (8 IN. ONLY)

M17378A

SUBMITTAL SHEETS

NPT Globe Valve

V5013N

The V5013N is a three-way threaded globe valve that controls hot water, cold water, and glycol solutions (up to 50 percent concentration) in heating or cooling HVAC applications. The valves are used for mixing service to direct flow from one or two inlets to a common outlet in two-position or modulating control systems.

FEATURES

- Red brass body with NPT-threaded connections.
- Stainless steel stem and brass plug.
- Low seat leakage rating, < 0.05%.
- Spring-loaded, self adjusting packing.
- 50:1 rangeability per VDI/VDE 2173.
- Constant total flow throughout full stem travel.
- Accurate positioning to ensure state-of-the-art temperature control.
- Sizes range from 1/2 inch to 2 inches.
- Valves utilize direct mounting, electric or pneumatic valve actuators; Q5001 linkage with Modutrol Motor; or Q5020/ Q5022 linkages with Direct Coupled Actuators to operate the valve.
- Repack and rebuild kits available for field servicing.
- Not suitable for combustible gases.

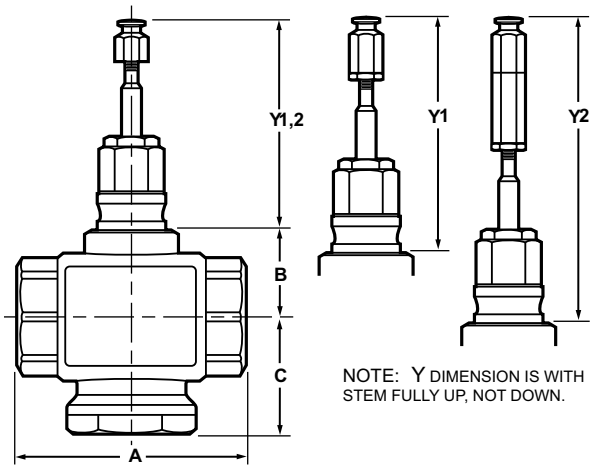
SPECIFICATIONS

Valve Type	Globe Valve
Body Pattern	Three-way mixing, A-B-AB porting
Flow Characteristic:	Linear (B-AB), Equal Percentage (A-AB)
Connection Type	Female NPT
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating	0.05% of Cv
Maximum Safe Operating Pressure	217 psi at 248 F (1500 kPa at 120 C)
Maximum Differential for Quiet Water Service	20 psid (138 kPa)
Maximum Differential Pressure Ratings (Close-off)	240 psi (1655 kPa)
Ambient Temperature Range	36 F to 248 F water (2 C to 120 C water)
Stem Travel	3/4 in. (20 mm)
Bonnet Size:	1-3/8 in. (35 mm)
Valve Action:	Mixing
ANSI/ASME Rating:	150
Actuation:	Must be purchased separately
Materials	
(Body)	Red Brass
(Stem)	Stainless Steel
(Plug/Ball/Disc)	Brass
(Packing)	Teflon/EPDM

APPROVALS

CRN Number	0C0861.9087YTN/0C0861.123

DIMENSIONS DIAGRAM



NOTE: Y DIMENSION IS WITH STEM FULLY UP, NOT DOWN.

VALVE SIZE	A	B	C	Y 1 STEM UP	Y 2 [a] STEM UP
1/2 (15)	3-1/4 (83)	1-9/16 (39.7)	2-9/16 (65)	4-3/16 (106)	5-15/16 (151)
3/4 (20)	3-1/4 (83)	1-9/16 (39.7)	2-9/16 (65)		
1 (25)	4-1/16 (103)	1-9/16 (39.7)	2-5/8 (66.5)		
1-1/4 (32)	4-3/16 (106)	1-9/16 (39.7)	2-7/8 (72.5)		
1-1/2 (40)	4-3/4 (120)	1-13/16 (46.5)	3 (77)		
2 (50)	5-1/4 (134)	1-13/16 (46.5)	3-5/16 (83.5)		

[a] Y2 WITH STEM EXTENSION FOR MP953C,E (8 IN. ONLY)

M12901A

Flanged Cage Valve

V5051A

Single-Seated Cage Valves control steam, air, liquids, or non-combustible gases in two-position, proportional, or floating control systems where line isolation is not required.

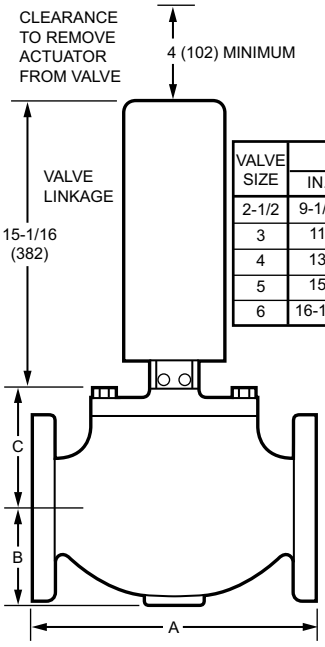
FEATURES

- Pressure balanced cage type construction.
- Low operating force allows fail safe operation with spring return actuator.
- Combines 1 3/8 in. bonnet with 1 1/2 in. stroke.
- Sizes range from 2-1/2 to 6 in. (DN65 to DN150).
- Spring-loaded Teflon V-ring packing.
- Requires Q5020C valve linkage with one rotary, direct coupled actuator, or Q5001D with Modutrol Motor.

SPECIFICATIONS

Valve Type	Cage Valves
Body Pattern	Two-way, Straight-through
Connection Type	Flanged
Flow Characteristic:	Modified Linear
Controlled Fluid	Steam; Chilled or hot water with up to 50% Glycol. Not for use with fuels
Leakage Rating	0.01% of Cv, 0.03% of Cv @ 5 & 6 in.
Maximum Safe Operating Pressure	55 psi steam (379 kPa steam); 150 psi water at 100F (1034 kPa water at 38 C)
Maximum Differential Pressure Ratings (Close-off)	150 psi (1034 kPa)
Ambient Temperature Range	35 F to 300 F (2 C to 150 C)
Stem Travel	1 1/2 in. (38 mm)
Bonnet Size:	1-3/8 in. (35 mm)
Valve Action:	Stem down to close
ANSI/ASME Rating:	125
Actuation:	Must be purchased separately
Comments:	Q5001D1000 requires 1/2 in. 220867A Cam.
Materials	
(Body)	Cast Iron
(Stem)	Stainless Steel
(Seat)	Resilient
(Plug/Ball/Disc)	Stainless Steel
(Packing)	Teflon

DIMENSIONS DIAGRAM



VALVE SIZE	A		B		C	
	IN.	MM	IN.	MM	IN.	MM
2-1/2	9-1/2	241	3-1/2	89	4-5/8	117
3	11	297	3-15/16	100	4-7/8	124
4	13	330	4-1/2	114	5-5/8	143
5	15	381	5-1/2	140	7-3/8	187
6	16-1/2	419	6-3/8	162	7-3/8	187

SUBMITTAL SHEETS

Flanged Globe Valve

V5011A,B

Used for proportional control of hot or chilled water and glycol solutions (to 50 percent concentration) and for two-position control of low pressure steam in closed loop HVAC systems.

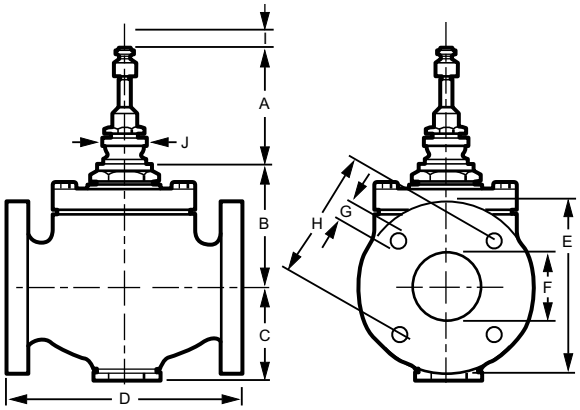
FEATURES

- Sizes range from 2-1/2 to 6 inches.
- Stainless steel stem with serviceable Teflon packing.
- Valves utilize direct mounting valve actuators, Q5020/ Q5022 linkages with Direct Coupled Actuators, or Pneumatic Valve Actuators to operate the valve.
- Equal Percentage flow characteristic.

SPECIFICATIONS

Valve Type	Globe Valve
Body Pattern	Two-way
Connection Type	Flanged
Flow Characteristic:	Equal percentage
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with fuels; Low pressure steam
Maximum Safe Operating Pressure	15 psi steam (100 kPa steam); 150 psi at 240 F water (1034 kPa at 115 C water)
Maximum Differential for Quiet Water Service	20 psid (138 kPa)
Ambient Temperature Range	40 F to 250 F (4 C to 121 C)
ANSI/ASME Rating:	125
Actuation:	Must be purchased separately
Materials	
(Body)	Cast Iron
(Stem)	316 Stainless Steel
(Seat)	Bronze
(Packing)	Teflon Cone

DIMENSIONS DIAGRAM



MODEL	VALVE SIZE	A[a]	B	C	D	E	F	G	H	I (TRAVEL)	J (DIAMETER)
V5011A	2-1/2 (64)	3-1/2 (89)	4-13/16 (122)	4 (102)	9-1/2 (241)	7 (178)	2-1/2 (64)	3/4 (19)	5-1/2 (140)	3/4 (19)	1-3/8 (35)
	3 (76)	3-1/2 (89)	3-1/2 (89)	4-5/8 (117)	11 (279)	7-1/2 (191)	3 (76)	3/4 (19)	6 (152)	3/4 (19)	1-3/8 (35)
	4 (102)	5-1/4 (133)	5-1/4 (133)	5-3/16 (132)	13 (330)	9 (229)	4 (102)	3/4 (19)	7-1/2 (191)	1-1/2 (38)	1-7/8 (48)
V5011B	4 (102)	6-3/4 (171)	6-3/4 (171)	8-1/16 (205)	13 (330)	9 (229)	4 (102)	3/4 (19)	7-1/2 (191)	1-1/2 (38)	1-7/8 (48)

M27256

Flanged Globe Valve

V5013B,C

The V5013B are three-way mixing valves. The V5013C are three-way diverting valves. These valves provide proportional or two-position control of hot or chilled water in closed loop heating or cooling systems. These valves are offered in sizes 2 1/2 in. through 6 in.

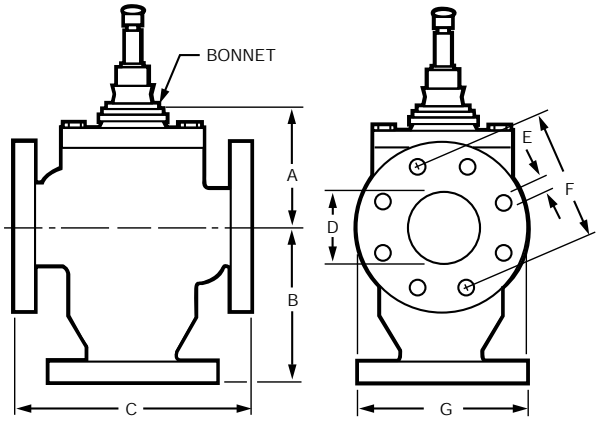
FEATURES

- Not suitable for combustible gases.
- Valves utilize direct mounting valve actuators, Q5020/ Q5022 linkages with Direct Coupled Actuators, or Pneumatic Valve Actuators to operate the valve.
- Constant total flow through full plug travel.
- Stainless steel stem prevents corrosion.
- Class IV (0.01% of Cv) Leakage Rating.

SPECIFICATIONS

Valve Type	Globe Valve
Body Pattern	Three-way
Flow Characteristic:	Linear (constant total)
Connection Type	Flanged
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Maximum Safe Operating Pressure	150 psi at 240 F water (1034 kPa at 115 C water)
Maximum Differential f or Quiet Water Service	20 psid (138 kPa)
Ambient Temperature Range	40 F to 250 F (4 C to 121 C)
ANSI/ASME Rating	125
Actuation:	Must be purchased separately
Materials	
(Body)	Cast Iron
(Stem)	Stainless Steel
(Seat)	Bronze
(Packing)	Teflon Cone

DIMENSIONS DIAGRAM



V5013B,C DIMENSIONS

	VALVE SIZE IN INCHES (MM)				
	2-1/2 (64)	3 (76)	4 (102)	5 (125)	6 (152)
A	4-1/2 (114)	5-1/4 (133)	5-7/8 (149)	6-1/4 (159)	7-1/4 (184)
B	6-7/17 (164)	6-5/8 (168)	8-11/16 (221)	9-5/8 (244)	10-11/16 (271)
C	9-1/2 (241)	11 (279)	13 (330)	15 (381)	16-1/2 (419)
D	2-1/2 (64)	3 (76)	4 (102)	5 (127)	6 (152)
E	3/4 (19)	3/4 (19)	3/4 (19)	7/8 (22)	7/8 (22)
F	5-1/2 (140)	6 (152)	7-1/2 (191)	8-1/2 (216)	9-1/2 (241)
G	7 (178)	7-1/2 (191)	9 (229)	10 (254)	11 (279)

VALVE SIZE	BONNET SIZE	NUMBER OF BOLT HOLES
2-1/2 (64)	1-3/8 (35)	4
3 (76)		
4 (102)	1-7/8 (48)	8
5 (125)		
6 (152)		

C7959B

Flanged Globe Valve

VGF2

VGF Flanged Globe Valves are used for 2-position or modulating control of steam, hot water, or chilled water-glycol solutions up to 50 percent concentration in closed loop heating, ventilation and air conditioning (HVAC) systems. They can be operated by ML6984/7984, ML6420/6425, ML6421/7421 Electric Linear Actuators, MP953 Pneumatic Actuators, Modutrol™ Motors with Q5001 valve linkage, or MN/MS Series

FEATURES

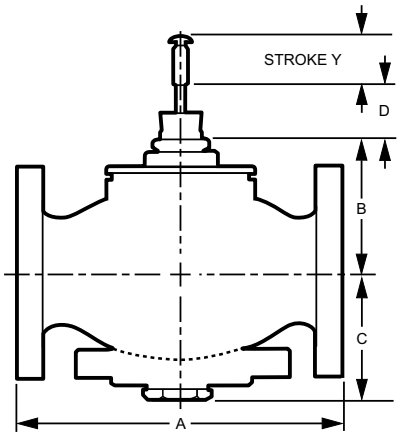
ANSI Class 125 and Class 250 cast iron bodies with flanged end connections

- Equal percentage and linear flow characteristics
- Face-to-face flange dimensions per ANSI/ISA S75.03 standard
- Sizes from 2-1/2 to 6 in.
- Stainless steel trim standard for long life span
- ANSI Class III or IV seat leakage
- Steam inlet pressure up to 125 psig and 353 F maximum temperature
- Self-adjusting packing
- Accurate positioning with equal percentage and linear flow characteristics to ensure precise temperature control
- Universal bonnet for direct-coupled electric and pneumatic actuators for easy mounting, or linkage coupled Modutrol™ Motors and MN/MS Series direct coupled actuators.
- Not suitable for combustible gasses.

SPECIFICATIONS

Valve Type	Globe Valve
Valve Action:	Stem down to close
Body Pattern	Two-way
Connection Type	Flanged
Controlled Fluid	Steam; Chilled or hot water with up to 50% Glycol. Not for use with fuels
Fluid Temperature Range	20 F to 250 F, steam 353 F (-7 C to +120 C, steam 180 C)
Actuation:	Must be purchased separately
Stem Travel	
2-1/2 and 3 inch valves	3/4 in. (20 mm)
4 to 6 inch valves:	1-1/2 in. (39 mm)
Bonnet Size	
2-1/2 and 3 inch valves	1-3/8 in. (35 mm)
4 to 6 inch valves:	1-7/8 in. (47.6 mm)
Materials	
(Body)	Cast Iron ASTM A126 Class B
(Stem)	Stainless Steel
(Seat)	Stainless Steel
(Cartridge)	Stainless Steel
(Plug/Ball/Disc):	Stainless Steel
(Packing)	Spring-loaded PTFE cone rings

DIMENSIONS DIAGRAM



1 DOTTED LINE REPRESENTS ANSI 125 VALVE BONNET.

MODEL NUMBER	DIMENSIONS, IN. (MM)				
	A	B	C	E	Y
2-WAY VALVES, ANSI CLASS 125. STEM DOWN TO CLOSE. EQUAL PERCENTAGE OR LINEAR FLOW CHARACTERISTIC					
VGF21_S25	10-7/8 (276)	4-3/8 (112)	7 (178)	3-1/2 (89)	13/16 (20)
VGF21_S30	11-3/4 (298)	6-3/8 (161)	7-1/2 (191)		
VGF21_S40	13-7/8 (352)	5-7/8 (150)	9 (229)	5-1/4 (133)	1-1/2 (38)
VGF21_S50	15-3/4 (400)	6-3/16 (157)	10 (254)		
VGF21_S60	17-3/4 (451)	6-3/16 (157)	11 (279)		
2-WAY VALVES, ANSI CLASS 250. STEM DOWN TO CLOSE. EQUAL PERCENTAGE FLOW CHARACTERISTIC					
VGF22ES25	11-1/2 (292)	4-3/8 (112)	7-1/2 (191)	3-1/2 (89)	13/16 (20)
VGF22ES30	12-1/2 (318)	6-3/8 (161)	8-1/4 (210)		
VGF22ES40	14-1/2 (368)	5-7/8 (150)	10 (254)	5-1/4 (133)	1-1/2 (38)
VGF22ES50	16-5/8 (422)	6-3/16 (157)	11 (279)		
VGF22ES60	18-5/8 (473)	6-3/16 (157)	12-1/2 (318)		
2-WAY VALVES, PRESSURE-BALANCED, ANSI CLASS 125. STEM DOWN TO CLOSE. EQUAL PERCENTAGE OR LINEAR FLOW CHARACTERISTIC					
VGF21_P25	10-7/8 (276)	4-3/16 (107)	7 (178)	3-1/2 (89)	13/16 (20)
VGF21_P30	11-3/4 (298)	5-7/8 (150)	7-1/2 (191)		
VGF21_P40	13-7/8 (352)	5-7/8 (150)	9 (229)	5-1/4 (133)	1-1/2 (38)
VGF21_P50	15-3/4 (400)	6-1/8 (156)	10 (254)		
VGF21_P60	17-3/4 (451)	6-1/8 (156)	11 (279)		

M27603

VGF3

VGF Flanged Globe Valves are used for 2-position or modulating control of hot water or chilled water-glycol solutions up to 50% concentration in closed loop heating, ventilation and air conditioning (HVAC) systems. They can be operated by ML6984/7984, ML6420/6425, ML6421/7421 Electric Linear Actuators, MP953 Pneumatic Actuators, Modutrol™ Motors with Q5001 valve linkage, or MN/MS Series Direct Coupled Actuators with Q5020 or Q5022 valve linkages. Three-way bodies are available in mixing or diverting style with equal percentage and linear flow characteristics, respectively. For boiler/chiller bypass applications requiring tight close-off, use VGF31/32LD diverting valves. For outdoor temperature compensation of building supply water, or modulating control of heat exchangers, use VGF31/32EM mixing valves.

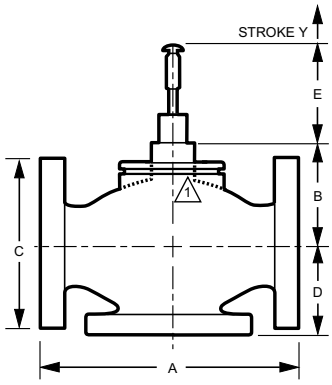
SPECIFICATIONS

Valve Type .....Globe Valve
Body Pattern.....Three-way
Connection Type.....Flanged
Controlled Fluid .....Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Leakage Rating .....Port A seat leakage: 0.5%; Port B seat leakage 1.0%.
Maximum Safe Operating Pressure.....175 psig at 130 F (66 C) (1206 kPa at 66 C (130 F))
Maximum Differential Pressure Ratings (Close-off).....87 psi (599 kPa)
Fluid Temperature Range .....20 F to 250 F (-7 C to +120 C)
Actuation: .....Must be purchased separately
Stem Travel
2-1/2 and 3 inch valves .....3/4 in. (20 mm)
4 to 6 inch valves:.....1-1/2 in. (39 mm)
Bonnet Size
2-1/2 and 3 inch valves .....1-3/8 in. (35 mm)
4 to 6 inch valves:.....1-7/8 in. (47.6 mm)
Materials
(Body).....Cast Iron ASTM A126 Class B
(Stem).....Stainless Steel
(Seat).....Stainless Steel
(Cartridge).....Stainless Steel
(Plug/Ball/Disc).....Stainless Steel
(Packing) .....Spring-loaded PTFE cone rings

FEATURES

- ANSI Class 125 and Class 250 cast iron bodies with flanged end connections.
- Face-to-face flange dimensions per ANSI/ISA S75.03 standard.
- Sizes from 2-1/2 to 6 inches.
- Stainless steel trim standard for long life span.
- Self-adjusting packing.
- Accurate positioning with equal percentage and linear flow characteristics to ensure precise temperature control.
- Universal bonnet for direct-coupled electric and pneumatic actuators for easy mounting, or linkage coupled Modutrol™ Motors and MN/MS Series direct coupled actuators.
- Constant total flow throughout full plug travel (3-way diverting models).
- Not suitable for combustible gasses.

DIMENSIONS DIAGRAM



1 DOTTED LINE REPRESENTS ANSI 125 VALVE BONNET.

MODEL NUMBER	DIMENSIONS, IN. (MM)					
	A	B	C	D	E	Y
3-WAY MIXING VALVES, ANSI CLASS 125. STEM UP TO CLOSE A-AB						
VGF31EM25	10-7/8 (276)	3 (76)	7 (178)	3-3/4 (95)	4-3/16 (107)	13/16 (20)
VGF31EM30	11-3/4 (298)	4-3/16 (107)	7-1/2 (191)	4-3/8 (111)		
VGF31EM40	13-7/8 (352)	5-8/16 (140)	9 (229)	5-1/8 (130)	6-11/16 (170)	1-1/2 (38)
VGF31EM50	15-3/4 (400)	5-3/8 (137)	10 (254)	5-3/4 (146)		
VGF31EM60	17-3/4 (451)	5-11/16 (145)	11 (279)	6-5/8 (168)		
3-WAY MIXING VALVES, ANSI CLASS 250. STEM UP TO CLOSE A-AB						
VGF32EM25	11-1/2 (292)	4-3/8 (112)	7-1/2 (191)	3-3/4 (95)	4-3/16 (107)	13/16 (20)
VGF32EM30	12-1/2 (318)	6-3/8 (161)	8-1/4 (210)	4-3/8 (111)		
VGF32EM40	14-1/2 (368)	5-7/8 (150)	10 (254)	5-1/8 (130)	6-11/16 (170)	1-1/2 (38)
VGF32EM50	16-5/8 (422)	6-3/16 (157)	11 (279)	5-3/4 (146)		
VGF32EM60	18-5/8 (473)	6-3/16 (157)	12-1/2 (318)	6-5/8 (168)		
3-WAY DIVERTING VALVES, ANSI CLASS 125. STEM DOWN TO CLOSE AB-A						
VGF31LD25	10-7/8 (276)	3 (76)	7 (178)	3-3/4 (95)	4-3/16 (107)	13/16 (20)
VGF31LD30	11-3/4 (298)	4-3/16 (107)	7-1/2 (191)	4-3/8 (111)		
VGF31LD40	13-7/8 (352)	5-8/16 (140)	9 (229)	5-1/8 (130)	6-11/16 (170)	1-1/2 (38)
VGF31LD50	15-3/4 (400)	5-3/8 (137)	10 (254)	5-3/4 (146)		
VGF31LD60	17-3/4 (451)	5-11/16 (145)	11 (279)	6-5/8 (168)		
3-WAY DIVERTING VALVES, ANSI CLASS 250. STEM DOWN TO CLOSE AB-A						
VGF32LD25	11-1/2 (292)	4-3/8 (112)	7-1/2 (191)	3-3/4 (95)	4-3/16 (107)	13/16 (20)
VGF32LD30	12-1/2 (318)	6-3/8 (161)	8-1/4 (210)	4-3/8 (111)		
VGF32LD40	14-1/2 (368)	5-7/8 (150)	10 (254)	5-1/8 (130)	6-11/16 (170)	1-1/2 (38)
VGF32LD50	16-5/8 (422)	6-3/16 (157)	11 (279)	5-3/4 (146)		
VGF32LD60	18-5/8 (473)	6-3/16 (157)	12-1/2 (318)	6-5/8 (168)		

M27604

Pressure-regulating Control Ball Valve

VRN2

The VRN2 two-way dynamic pressure-regulating control ball valves maintain constant flow of hot or chilled water in closed loop heating, ventilating, and air conditioning (HVAC) systems regardless of head pressure fluctuations above the minimum specified pressure drop. These valve assemblies can be used with Honeywell non-spring return or spring return direct coupled actuators (DCA) with minimum torque of 35 lb-in (4 Nm) on valve sizes up to 3 inches (DN80).

The built-in differential pressure regulator makes fluid flow through the valve independent of changes in supply pressure, eliminating "hunting" by the control system, even at low coil flow. The pressure regulator virtually eliminates cavitation in the valve, and decouples the control valve from the effects of piping components such as reducers and elbows.

Pressure independent control valves are sized to match design coil flow regardless of coil size. VRN2 valves eliminate the need to balance the system for proper flow, and allow chillers to be operated at design temperature differential for maximum efficiency at every load condition. When used in a system with variable speed pump drives, 3-way valves and coil bypass lines are not required. In new construction, VRN2 valves perform better than reverse return piping designs without the extra materials these systems need.

Systems that utilize the capabilities of properly installed and monitored pressure-independent control valves may qualify for LEED points. Pressure-independent control requires less flow, enabling use of smaller piping, pumps, and chillers.

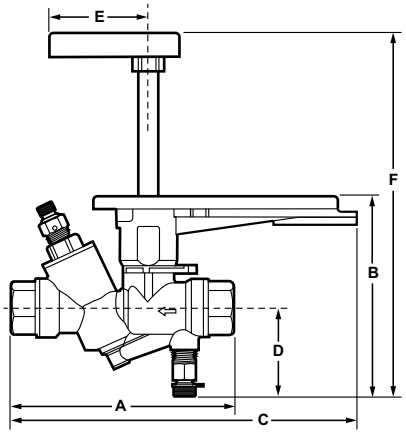
FEATURES

- Sizes from 1/2 to 3 in. with internal (female) NPT connections.
- Controls hot or chilled water with up to 50% glycol.
- Regulated flow rates available from 1 to 95 gpm.
- Differential pressure regulator for constant pressure drop across valve seat.
- Positive pressure, rolling diaphragm regulator design for long service life for flow control accuracy of ±5% over specified control range.
- Equal percentage flow characteristic using patented flow control ball insert.
- Multiple regulated flow rates available per valve size.
- Patented ball seals require low operating torque.
- Nickel-chrome plated brass or stainless steel trim.
- Choice of factory-installed actuation using Honeywell N05/S05-series direct-coupled actuators: Floating, Modulating (2-10 V), Spring Return Modulating/Floating.
- Spring return actuators field-configurable for normally open or normally closed fail-safe position.
- Actuators available with optional auxiliary switches.
- Removable, manual operating handle to control valve during installation or in an event of power failure.
- Upstream Test Port for venting or pressure gauge attachment.
- Three actuator orientations on the valve for cramped spaces.

SPECIFICATIONS

Valve Type	Dynamic pressure-regulated control valve
Body Pattern	2-way, straight-through
Pipe Connection Type	Female-NPT
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Valve Action	Quarter-turn rotary
Maximum Safe Operating Pressure	360 psi (2500 kPa)
Maximum Safe Operating Temperature	248 F (120 C)
Maximum Close-off Pressure	100 psid (690 kPa)
Fluid Temperature Range	-22 F to 250 F (-30 C to 121 C)
Ambient Temperature Range	14 F to 131 F (-10 C to 55 C)
Accuracy	±5% over specified pressure range
Stem Travel	90 deg. rotation
Materials	
(Body)	Forged Brass ASTM B584
(Seat)	Teflon seals/EPDM O-rings
(Regulator)	Stainless Steel
(Packing)	Teflon seals/EPDM O-rings
(Diaphragm)	Hydrogenated Acrylonitrile Butadiene Rubber
Comments	No feedback signal Full port ball; No feedback

DIMENSIONS DIAGRAM



VALVE SIZE (IN.)	DIMENSIONS IN INCHES (MM)						
	A	B	C	D	E	F_z [a]	F_s [a]
1/2	5-11/16 (145)	4-5/16 (109)	8-19/32 (218)	1 (26)	2-1/2 (64)	8-13/32 (213)	7-3/16 (182)
3/4							
1	5-29/32 (150)		8-45/64 (221)				
	9 (229)	4-19/32 (117)	10-57/64 (277)	1-5/8 (41)		9-13/32 (239)	8-3/16 (207)
1-1/4	8-3/32 (213)		10-19/32 (269)				
1-1/2	8-3/16 (208)		10-1/2 (267)				
	10 (254)	5-3/16 (132)	12-3/32 (307)	2-3/32 (53)		10-13/32 (264)	9-3/16 (232)
2	9-29/32 (251)		12 (305)				
2-1/2	10-9/32 (263)		12-3/16 (310)				
3	10-13/16 (274)		12-13/32 (314)				

[a] LONG SHAFT SUPPLIED WITH "ZELIX" (Z) DIRECT COUPLED ACTUATORS; SHORT SHAFT SUPPLIED WITH "SALT" (S) NON-SPRING RETURN DCAS.

M31310A

Pressure-regulating Control Ball Valve

VRW2

The VRW2 two-way dynamic pressure-regulating control valves maintain constant flow of hot and chilled water in closed-loop heating, ventilating, and air conditioning (HVAC) systems regardless of head pressure fluctuations above minimum specified pressure drop. These valves come complete with proportional, stay-in-place or electronic fail-safe actuators.

The built-in differential pressure regulator makes fluid flow through the valve independent of changes in supply pressure, eliminating “hunting” by the control system, even at low coil flow. The pressure regulator virtually eliminates cavitation in the valve, and decouples the control valve from the effects of piping components such as reducers and elbows.

Pressure independent control valves are sized to match design coil flow regardless of coil size. VRW2 valves eliminate the need to balance the system for proper flow, and allow chillers to be operated at design temperature differential for maximum efficiency at every load condition. When used in a system with variable speed pump drives, 3-way valves and coil bypass lines are not required.

Systems that utilize the capabilities of properly installed, adjusted, and monitored pressure-independent control valves may qualify for LEED points.

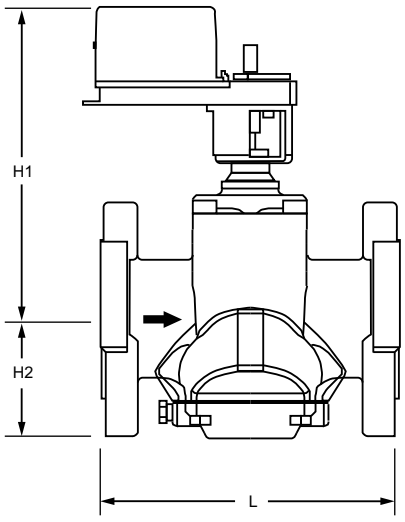
FEATURES

- Multi-sized bodies from 21/2 to 6 inch pipes with wafer flanged connections.
- Combination ANSI/ASME Class 150/300 pressure rating.
- Controls hot or chilled water with up to 50% glycol.
- Regulated flow rates available from 39 to 469 gpm.
- Stainless steel pressure regulator maintains constant pressure drop across valve seat.
- Positive pressure, rolling diaphragm regulator design provides flow control accuracy of ±5% over specified pressure range.
- Equal percentage flow characteristic using multi turn, non-rising, characterized plug.
- High close-off rating.
- 50 discrete, selectable flow rates available per valve size.
- Stainless steel trim.
- Six-turn actuator with floating or modulating inputs available with stay-in-place or electronic fail-safe action.
- Fail-safe actuators field-configurable for normally open or normally closed power failure return position.
- Two Test Ports for venting or pressure gauge attachment.

SPECIFICATIONS

Valve Type	Wafer flanged dynamic pressure-regulated control valve
Body Pattern	2-way, straight-through
Flow Characteristic	Equal Percentage
Pipe Connection Type	Wafer flange
Controlled Fluid	Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Valve Action	Multi-turn linear
Leakage Rating	0.2% max.
Maximum Safe Operating Pressure	580 psig (4000 kPa)
Maximum Safe Operating Temperature	248 F (120 C)
Maximum Close-off Pressure	101 psid (700 kPa)
Fluid Temperature Range	-4 F to 248 F (-20 C to 120 C)
Ambient Temperature Range	14 F to 131 F (-10 C to 55 C)
Accuracy	±5% over specified pressure range
Stem Travel	1 to 6 Rotations in 51 equal, field-selectable increments
ANSI/ ASME Class	150/300
Comments	2 - 10V position feedback signal
Materials	
(Body)	Ductile Iron, ASTM A536ñ65T, Class 60-45-18
(Stem)	Stainless Steel
(Seat)	316 Stainless steel
(Regulator)	316 Stainless steel
(Plug/Ball/Disc)	316 stainless steel
(Packing)	EPDM and Nitrile O-rings
(Diaphragm)	EPDM

DIMENSIONS DIAGRAM



L		H_1		H_2	
in.	mm	in.	mm	in.	mm
8 3/4	224	9 3/4	246	3 3/4	95
12 5/8	320	11 3/8	290	5 1/4	135
16 5/8	422	13 1/4	338	7 1/8	180

M31311

SUBMITTAL SHEETS

Resilient Seat Butterfly Valves

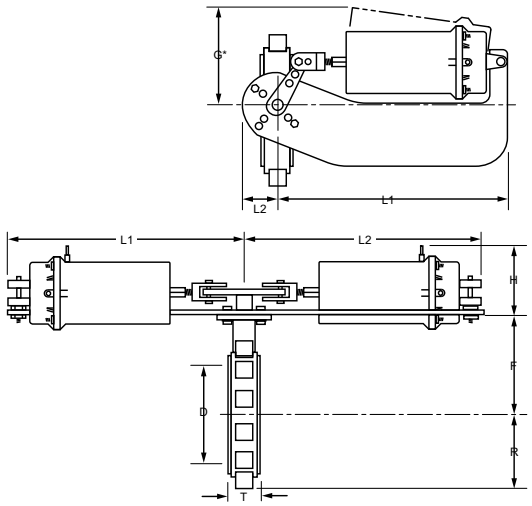
VFF1

Resilient seat in two-way valves, provide control for HVAC system applications including chilled water, hot water, cooling tower water, and thermal storage systems.

SPECIFICATIONS

Body Pattern ..... 2 way (S/R NO)
Valve Action..... Normally Open
Connection Type ..... Lugged
Controlled Fluid ..... Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Actuator Control Type..... Pneumatic
Type of Enclosure..... Pneumatic
Flow Characteristic..... Modified Equal Percent
Mounting ..... ANSI Flanged
Static Pressure Rating (max)..... 250 psi (1724 kPa)
Actuator Temperature Ratings ..... -20 F to 150 F (-29 C to 66 C)
Fluid Temperature Range..... -40 F to 250 F (-40 C to 121 C)
Number of Flange Bolts
For 2 in., 2-1/2 in., 3 in. valves: 4
For 4 in., 5 in., 6 in., 8 in., valves:..... 8
For 10 in., 12 in., 14 in. valves:..... 12
For 16 in., 18 in. valves: 16
For 20 in. valves: 20
Flange Bolt Thread
For 2 in., 2-1/2 in., 3 in. valves: ..... 5/8 in.-11 pitch
For 4 in., 5 in., 6 in., 8 in., valves:..... 3/4 in.-10 pitch
For 10 in., 12 in., 14 in. valves:..... 7/8 in.-9 pitch
For 16 in., 18 in., 20 in. valves:..... 1-1/8 in.-7 pitch
Materials
(Body)..... Polyester-coated cast iron ASTM A126 Class B
(Stem)..... 416 Stainless Steel
(Seat)..... Peroxide-cured EPDM resilient seat
(Plug/Ball/Disc)..... Nylon 11-coated ductile iron

DIMENSIONS DIAGRAM



PIPE SIZE IN. [mm]	FULL CUT DISK, 175 PSI CLOSE-OFF (VFF1/2_W1Y8P/PP)					THICKNESS	UNDER CUT DISK, 50 PSI CLOSE-OFF** (VFF1/2_V1Y8P/PP)				
	G	H	HP	L1	L2	T	G	H	HP	L1	L2*
2 [DN50]	5-5/8 [144]	3-1/8 [79]	6-1/4 [160]	16 [406]	3 [76]	1-5/8 [41]					
2-1/2 [DN65]						1-3/4 [44]					
3 [DN80]											
4 [DN100]	7-1/4 [186]	6-7/8 [175]	10 [254]	20 [506]		2 [51]	5-5/8 [144]	3-1/8 [79]	6-1/4 [160]	16 [406]	3 [76]
5 [DN125]	9 [227]		10-1/8 [257]	22-3/4 [578]		2-1/8 [54]	7-1/4 [186]	6-7/8 [175]	10 [254]	20 [506]	
6 [DN150]											
8 [DN200]					22-3/4 [578]	2-1/2 [64]	9 [227]		10-1/8 [257]	22-3/4 [578]	
10 [DN250]	LOW PRESSURE ACTUATORS NOT AVAILABLE IN THESE, AND LARGER BODY SIZES.										22-3/4 [578]
12 [DN300]											

**NOTE: VALVE SIZES 2 TO 3 INCHES ARE AVAILABLE ONLY WITH FULL CUT DISKS. VALVE STROKE IS LIMITED TO 70 DEGREES.

M16908

VFF2

Resilient seat two-way valves provide control for HVAC system applications including chilled water, hot water, cooling tower water, and thermal storage systems.

SPECIFICATIONS

Body Pattern.....2 way (NC, NC/NO; NSR)
Valve Action.....Normally Closed, convertible to Normally Open with Spring Return DCA
Connection Type.....Lugged
Controlled Fluid .....Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Flow Characteristic.....Modified Equal Percent
Mounting.....ANSI Flanged
Static Pressure Rating (max).....250 psi (1724 kPa)
Actuator Temperature Ratings.....-5 F to 140 F (-20 C to 60 C)
Fluid Temperature Range .....-40 F to 250 F (-40 C to 121 C)
Number of Flange Bolts
For 2 in., 2-1/2 in., 3 in. valves:.....4
For 4 in., 5 in., 6 in., 8 in., valves: 8
For 10 in., 12 in., 14 in. valves:.....12
For 16 in., 18 in. valves:.....16
For 20 in. valves: 20
Flange Bolt Thread
For 2 in., 2-1/2 in., 3 in. valves:.....5/8 in.-11 pitch
For 4 in., 5 in., 6 in., 8 in., valves: .....3/4 in.-10 pitch
For 10 in., 12 in., 14 in. valves:.....7/8 in.-9 pitch
For 16 in., 18 in., 20 in. valves:.....1-1/8 in.-7 pitch
Materials
(Body).....Polyester-coated cast iron ASTM A126 Class B
(Stem).....416 Stainless Steel
(Seat).....Peroxide-cured EPDM resilient seat
(Plug/Ball/Disc).....Nylon 11-coated ductile iron

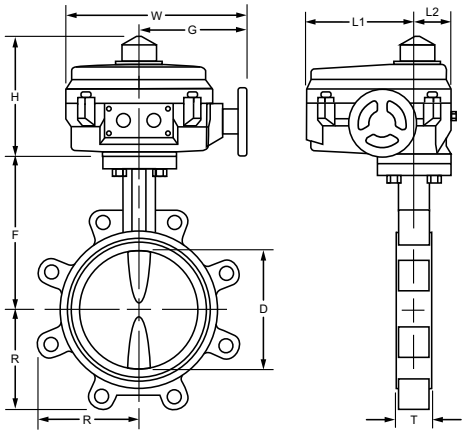
APPROVALS

CE.....Compliant
Underwriters Laboratories, Inc.....C/US UL873, Plenum Rated

ACCESSORIES

VFF50-0400—Position status monitor for VFF butterfly valves with high pressure pneumatic actuators

DIMENSIONS DIAGRAM



PIPE SIZE IN. [mm]	FULL CUT DISK, HIGH CLOSE-OFF* NEMA 4X (VFF2_W1YXA/B)					THICK-NESS	UNDER CUT DISK, 50 PSI CLOSE-OFF** NEMA 4X (VFF2_V1YXA/B)				
	W	H1	L1	L2	G	T	W	H1	L1	L2	G
2 [DN50]	7-1/2 [191]	6-3/4 [170]	5-1/2 [141]	2 [51]	5-3/4 [147]	1-5/8 [41]					
2-1/2 [DN65]						1-3/4 [44]					
3 [DN80]											
4 [DN100]						2 [51]	7-1/2 [191]	6-3/4 [170]	5-1/2 [141]	2 [51]	5-3/4 [147]
5 [DN125]	10-1/8 [257]	8-1/8 [206]	7-3/8 [188]	2-3/4 [68]	7-3/4 [198]	2-1/8 [54]					
6 [DN150]							10-1/8 [257]	8-1/8 [206]	7-3/8 [188]	2-3/4 [68]	7-3/4 [198]
8 [DN200]						2-1/2 [64]					
10 [DN250]	12-1/8 [307]	8-3/4 [224]	8-7/8 [226]	3-1/4 [81]	9-1/2 [241]						
12 [DN300]						3 [76]					
14 [DN350]							12-1/8 [307]	8-3/4 [224]	8-7/8 [226]	3-1/4 [81]	9-1/2 [241]
16 [DN400]	NEMA 4 (VFF2_W1Y4A/4B)					4 [102]					
18 [DN450]						4-1/4 [108]					
20 [DN500]	8-1/2 [217]	16 [406]	8-3/4 [221]	4-1/2 [115]	12-1/2 [320]	5 [127]	NEMA 4 (VFF2_V1Y4A/4B)				
							8-1/2 [217]	16 [406]	8-3/4 [221]	4-1/2 [115]	12-1/2 [320]

* 175 PSI [1206 KPA] CLOSE-OFF UP TO 12 INCHES [DN 300], 150 PSI [1034 KPA] OTHERWISE
**NOTE: VALVE SIZES 2 TO 3 INCHES HAVE 175 PSI [1206 KPA] CLOSE-OFF AND ARE AVAILABLE ONLY WITH FULL CUT DISKS.

⚠1 NEMA 4X ACTUATORS ARE WATERPROOF AND CORROSION-RESISTANT.

M16907

Resilient Seat Butterfly Valves

VFF3

Resilient seat three-way valves provide control for HVAC system applications including chilled water, hot water, cooling tower water, and thermal storage systems.

SPECIFICATIONS

Body Pattern ..... 3 way (A-B-AB porting)
Valve Action..... Normally Closed
Connection Type ..... Lugged
Controlled Fluid ..... Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Actuator Control Type..... Electric floating
Flow Characteristic..... Modified Equal Percent
Mounting ..... ANSI Flanged
Static Pressure Rating (max)..... 250 psi (1724 kPa)
Actuator Temperature Ratings ..... -5 F to 140 F (-20 C to 60 C)
Fluid Temperature Range..... -40 F to 250 F (-40 C to 121 C)
Number of Flange Bolts
For 2 in., 2-1/2 in., 3 in. valves: 4
For 4 in., 5 in., 6 in., 8 in., valves:..... 8
For 10 in., 12 in., 14 in. valves:..... 12
For 16 in., 18 in. valves: 16
For 20 in. valves: 20
Flange Bolt Thread
For 2 in., 2-1/2 in., 3 in. valves: ..... 5/8 in.-11 pitch
For 4 in., 5 in., 6 in., 8 in., valves:..... 3/4 in.-10 pitch
For 10 in., 12 in., 14 in. valves:..... 7/8 in.-9 pitch
For 16 in., 18 in., 20 in. valves:..... 1-1/8 in.-7 pitch
Materials
(Body)..... Polyester-coated cast iron ASTM A126 Class B
(Stem)..... 416 Stainless Steel
(Seat)..... Peroxide-cured EPDM resilient seat
(Plug/Ball/Disc)..... Nylon 11-coated ductile iron

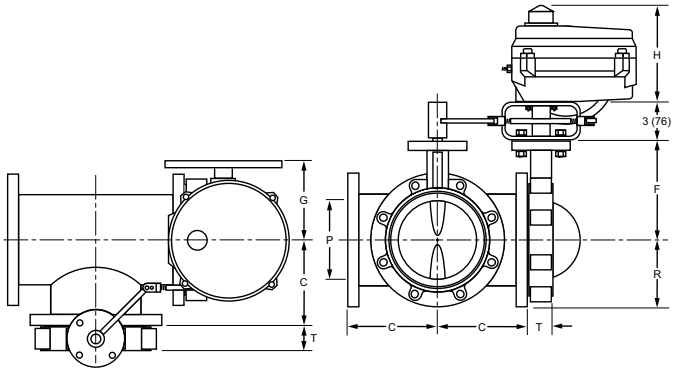
APPROVALS

CE..... Compliant
Underwriters Laboratories, Inc..... C/US UL873, Plenum Rated

ACCESSORIES

VFF50-0400—Position status monitor for VFF butterfly valves with high pressure pneumatic actuators

DIMENSIONS DIAGRAM



PIPE SIZE IN. [mm]	FULL CUT DISK, 175 PSI CLOSE-OFF NEMA 4X (VFF3/6_W1YXA/B) W	H	L1	L2	G	THICKNESS T	UNDER CUT DISK, 50 PSI CLOSE-OFF** NEMA 4X (VFF3/6_V1YXA/B) W	H	L1	L2	G
2 [DN50]						1-5/8 [41]					
2-1/2 [DN65]	7-1/2 [191]	6-3/4 [170]	5-1/2 [141]	2 [49]	5-3/4 [147]	1-3/4 [44]					
3 [DN80]											
4 [DN100]						2 [51]	7-1/2 [191]	6-3/4 [170]	5-1/2 [141]	2 [49]	5-3/4 [147]
5 [DN125]	10-1/8 [257]	8-1/8 [206]	7-3/8 [188]	2-3/4 [68]	7-3/4 [198]	2-1/8 [54]					
6 [DN150]							10-1/8 [257]	8-1/8 [206]	7-3/8 [188]	2-3/4 [68]	7-3/4 [198]
8 [DN200]						2-1/2 [64]					
10 [DN250]	12-1/8 [307]	8-3/4 [224]	8-7/8 [226]	3-1/4 [81]	9-1/2 [241]						
12 [DN300]						3 [76]	12-1/8 [307]	8-3/4 [224]	8-7/8 [226]	3-1/4 [81]	9-1/2 [241]
14 [DN350]	NEMA 4 (VFF3/6_W1Y4A/4B)										
16 [DN400]						4 [102]					
18 [DN450]	8-1/2 [217]	16 [406]	8-3/4 [221]	4-1/2 [115]	12-1/2 [320]	4-1/4 [108]	NEMA 4 (VFF3/6_V1Y4A/4B) 8-1/2 [217]	16 [406]	8-3/4 [221]	4-1/2 [115]	12-1/2 [320]
20 [DN500]						5 [127]					

* 175 PSI [1206 KPA] CLOSE-OFF UP TO 12 INCHES [DN 300], 150 PSI [1034 KPA] OTHERWISE
**NOTE: VALVE SIZES 2 TO 3 INCHES HAVE 175 PSI [1206 KPA] CLOSE-OFF AND ARE AVAILABLE ONLY WITH FULL CUT DISKS.

M16906

VFF6

Resilient seat three-way valves provide control for HVAC system applications including chilled water, hot water, cooling tower water, and thermal storage systems.

SPECIFICATIONS

Body Pattern.....3 way (A-AB-B porting)
Valve Action.....Normally Closed
Connection Type.....Lugged
Controlled Fluid .....Chilled or hot water with up to 50% Glycol. Not for use with steam or fuels.
Actuator Control Type.....Electric floating
Type of Enclosure .....NEMA 2 housing
Flow Characteristic.....Modified Equal Percent
Mounting.....ANSI Flanged
Static Pressure Rating (max).....250 psi (1724 kPa)
Actuator Temperature Ratings.....-5 F to 140 F (-20 C to 60 C)
Fluid Temperature Range .....-40 F to 250 F (-40 C to 121 C)
Number of Flange Bolts
For 2 in., 2-1/2 in., 3 in. valves:.....4
For 4 in., 5 in., 6 in., 8 in., valves: 8
For 10 in., 12 in., 14 in. valves:.....12
For 16 in., 18 in. valves:.....16
For 20 in. valves: 20
Flange Bolt Thread
For 2 in., 2-1/2 in., 3 in. valves:.....5/8 in.-11 pitch
For 4 in., 5 in., 6 in., 8 in., valves: .....3/4 in.-10 pitch
For 10 in., 12 in., 14 in. valves:.....7/8 in.-9 pitch
For 16 in., 18 in., 20 in. valves:.....1-1/8 in.-7 pitch
Materials
(Body).....Polyester-coated cast iron ASTM A126 Class B
(Stem).....416 Stainless Steel
(Seat).....Peroxide-cured EPDM resilient seat
(Plug/Ball/Disc).....Nylon 11-coated ductile iron

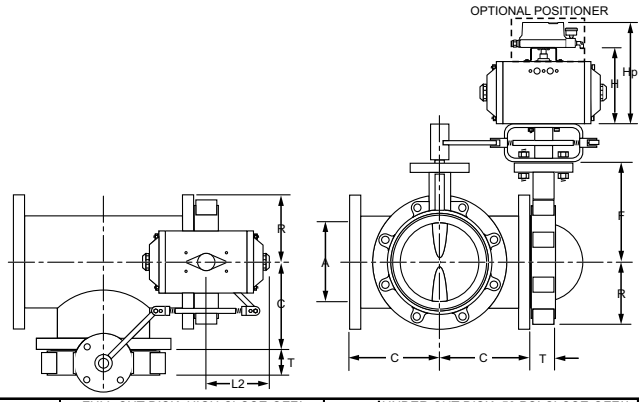
APPROVALS

CE.....Compliant
Underwriters Laboratories, Inc.....C/US UL873, Plenum Rated

ACCESSORIES

VFF50-0400—Position status monitor for VFF butterfly valves with high pressure pneumatic actuators

DIMENSIONS DIAGRAM



PIPE SIZE IN. [mm]	FULL CUT DISK, HIGH CLOSE-OFF* (VFF3/6_W1YCS/DS/ES/PS/XS)					THICK-NESS	UNDER CUT DISK, 50 PSI CLOSE-OFF** (VFF3/6_V1YCS/DS/ES/PS/XS)				
	W	H	HP	L1	L2	T	W	H	HP	L1	L2
2 [DN50]	2-3/4 [70]	4-1/4 [109]	10-1/4 [262]	3 [76]	3 [76]	1-5/8 [41]					
2-1/2 [DN65]	3-5/8 [91]	5-2/8 [132]	11-2/8 [284]	4 [100]	4 [100]	1-3/4 [44]					
3 [DN80]	4 [100]	5-1/2 [141]	11-1/2 [293]	4-1/2 [113]	4-1/2 [113]						
4 [DN100]	4-3/4 [120]	6-7/8 [176]	12-7/8 [328]	6 [154]	6 [154]	2 [51]	4 [100]	5-1/2 [141]	11-1/2 [293]	4-1/2 [113]	4-1/2 [113]
5 [DN125]	5-3/8 [137]	7-3/4 [196]	13-3/4 [349]	6-1/8 [157]	6-1/8 [157]	2-1/8 [54]	4-3/4 [120]	6-7/8 [176]	12-7/8 [328]	6 [154]	6 [154]
6 [DN150]	6-3/4 [172]	9-3/8 [238]	15-3/8 [391]	7-3/4 [196]	7-3/4 [196]						
8 [DN200]	8-7/8 [224]	11-5/8 [295]	17-5/8 [447]	9-1/2 [240]	9-1/2 [240]	2-1/2 [64]	6-3/4 [172]	9-3/8 [238]	15-3/8 [391]	7-3/4 [196]	7-3/4 [196]
10 [DN250]							8-7/8 [224]	11-5/8 [295]	17-5/8 [447]	9-1/2 [240]	9-1/2 [240]
12 [DN300]	10-3/4 [273]	13-1/2 [342]	19-1/2 [495]	13-3/8 [339]	13-3/8 [339]	3 [76]					
14 [DN350]											
16 [DN400]						4 [102]	10-3/4 [273]	13-1/2 [342]	19-1/2 [495]	13-3/8 [339]	13-3/8 [339]
18 [DN450]						4-1/4 [108]					
20 [DN500]						5 [127]					

* 175 PSI [1206 KPA] CLOSE-OFF UP TO 12 INCHES [DN 300], 150 PSI [1034 KPA] AT 14 INCHES AND NO PRODUCT AVAILABLE GREATER THAN 14 INCHES.
**NOTE: VALVE SIZES 2 TO 3 INCHES ARE AVAILABLE ONLY WITH FULL CUT DISKS.

M16905

SUBMITTAL SHEETS

Damper Linkage

Q605 Damper Linkage

Connect Modutrol® motor to standard damper or set of dampers to provide control of duct airflow.

FEATURES

- Adjustable to any degree of damper opening. Include ball joints, motor crank arm and damper arm for 1/2 in. (13 mm) diameter shaft.
- 27520 pushrod must be ordered separately.

SPECIFICATIONS

Linkage Type.....Damper
Mounting .....Mount motor externally on duct
Used with Actuator.....Modutrol Motor

ACCESSORIES

27520A—Push Rod (5/16 in. dia., 5 in. length) Used With: All Actuators and Dampers
27520B—Push Rod (5/16 in. dia., 10 in. length) Used With: All Actuators and Dampers
27520C—Push Rod (5/16 in. dia., 12 in. length)
27520D—Push Rod (5/16 in. dia., 15 in. length) Used With: All Actuators and Dampers
27520E—Push Rod (5/16 in. dia., 18 in. length) Used With: All Actuators and Dampers
27520G—Push Rod (5/16 in. dia., 24 in. length)
27520H—Push Rod (5/16 in. dia., 28 in. length) Used With: All Actuators and Dampers
27520K—Push Rod (5/16 in. dia., 36 in. length)
27520L—Push Rod (5/16 in. dia., 48 in. length)
27520Q—Push Rod (5/16 in. dia., 8 in. length) Used With: All Actuators and Dampers

Q5001

The Q5001 Valve Linkage connects a Modutrol® Motor to a 2- or 3-way valve. It is used primarily on V5011 or V5013 steam and water valves.

SPECIFICATIONS

Linkage Type	Valve
Mounting	Linkage mounts directly to the valve bonnet; motor mounts on linkage bracket.
Used with Actuator	Modutrol Motor
Stem Force Rating	80 or 160 lbf (356 N or 712 N)
Ambient Temperature Range	-40 F to +150 F (-40 C to +66 C)

ACCESSORIES

220829BCQ1—Barber-Colman Valve Adapter Kit
220829LGQ3—Landis and Gyr Powers Valve Adapter Kit

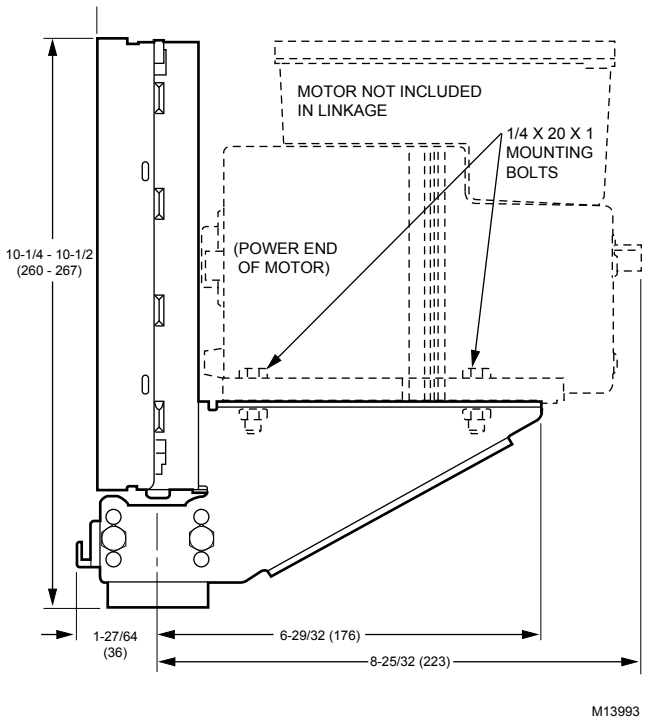
REPLACEMENT PARTS

220845/0767—Retainer button for Q5001

FEATURES

- Q5001 Valve Linkage is applicable to 2-Way or 3-Way valves in modulating or two-position service.
- Linkage requires no adjustment when used with Honeywell valves and Modutrol IV™ Motors.
- Q5001 Valve Linkage replaces Q601 and Q618 Valve Linkages.
- Linkage mounts directly to the valve bonnet; motor mounts to linkage bracket.
- Easy-to-read position indicator.
- Valve stem lift height cam selectable.
- Overtravel permits tight close-off without excessive motor strain.
- Available brackets make linkages adaptable to many valve bodies.
- Models available with 80 lb, 160 lb, and 320 lb stem force.
- Reversible cams on the Q5001 allow field selection of normally open or normally closed valve operation.
- All models have anti-spin clips.

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Globe Valve Linkage

Q5020

The Q5020 Globe Valve Linkages connect a Honeywell direct coupled actuator (DCA) to a steam or water globe valve. The Q5020 Linkages are compatible with two-way and three-way globe valves up to 3 inch (DN80).

FEATURES

- Used with two-way and three-way globe valves in modulating or two-position service.
- Used with 25, 50, and 142 lb-in. spring return and 35, 70, 150, and 300 lb-in. non-spring return DCA.
- Quick and simple installation with no disassembly required.
- Heavy-duty Steel rack and pinion construction and Aluminum Die-cast housing.
- Maintenance-free construction.
- Precision roller-bearing rack construction prevents premature valve packing wear and leakage.
- Flexible actuator mounting orientation.
- Adjustable manual override lever and valve position indicator.
- Can be mounted on specific non-Honeywell valves using a 32004629 Bonnet Adapter Kit.

SPECIFICATIONS

Linkage Type	Valve
Mounting	Linkage mounts directly to the valve bonnet; actuator mounts on linkage
Used with Actuator	Direct Coupled Actuator

ACCESSORIES

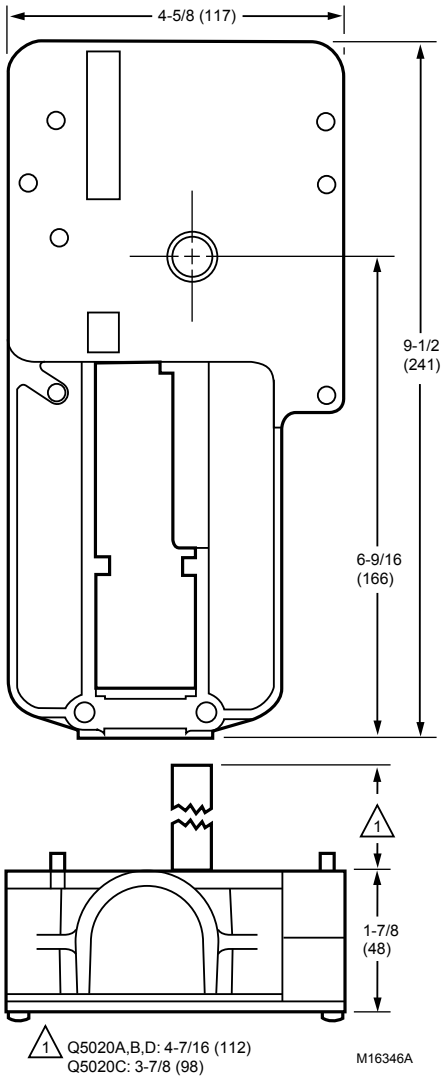
32004629-001—Bonnet adapter kit to adapt Seimens (Landis/Power) Flowrite 599 1/2 inch to 3 inch globe valves with Q5020A or Q5009B

32004629-002—Bonnet adapter kit to adapt Johnson VG7000 1/2 inch to 3/4 inch globe valves with Q5020D

32004629-003—Bonnet adapter kit to adapt Johnson VG7000 1 inch to 2 inch globe valves with Q5020A, Q5020B or Q5020D

32004629-004—Bonnet adapter kit to adapt Siebe VB7000 1/2 inch to 2 inch globe valves with Q5020D

DIMENSIONS DIAGRAM



Globe Valve Linkage

Q5022

The Q5022A,B Globe Valve Linkages connect one or two Honeywell direct coupled rotary actuators (DCA) to a globe valve for control of chilled water, hot water, or steam. The Q5022A,B Linkages are compatible with 2 and 3-way globe valves up to 6 in. (DN150) pipe size.

Q5022A is used to provide enhanced close-off ratings with Honeywell globe valves up to 3 in. with 1-3/8 in. diameter bonnet and 3/4 in. stem stroke.

Q5022B is used with Honeywell globe valves 4 to 6 in. with 1-7/8 in. diameter bonnet and 1-1/2 in. stem stroke.

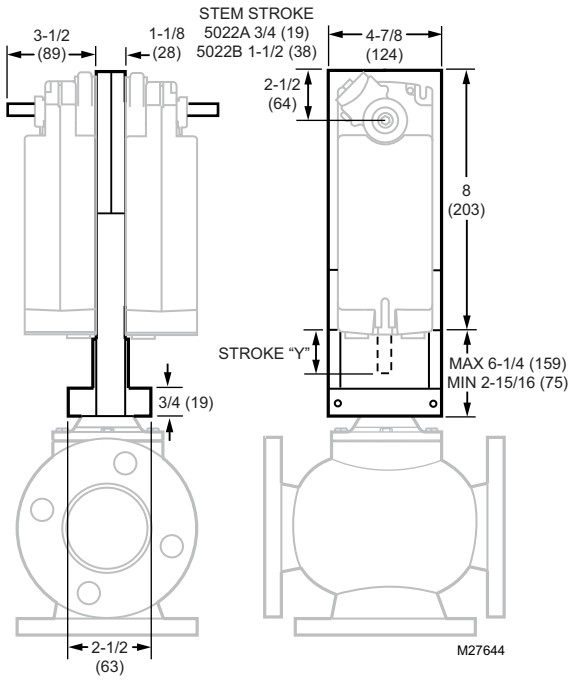
FEATURES

- For use with 2-way and 3-way globe valves in modulating or two-position service.
- For use with 175 lb.-in. (S20) spring return or 175 and 300 lb.-in. (N20, N34) non-spring return DCAs.
- Accepts single or dual matching actuators for higher close-off pressures.
- Fail-safe operation with spring return DCAs, field selectable normally open or normally closed for direct or reverse-acting valves.
- Linkage threads onto valve stem.
- Oilite™ self-lubricated actuator shaft bearing.
- Anodized extruded aluminum housing.
- Maintenance-free construction.
- Precision roller-bearing rack construction to prevent premature valve packing wear and leakage.
- Flexible actuator mounting orientation.

SPECIFICATIONS

Linkage Type	Valve
Mounting	Linkage mounts directly to the valve bonnet; actuator(s) mount on linkage
Used with Actuator	Direct Coupled Actuator
Stem Force Rating	1117 max. (4969 max.)
Includes	Anti-spin brackets
Comments	This linkage is not compatible with the 43196000 high temperature kits

DIMENSIONS DIAGRAM



SUBMITTAL SHEETS

Notes

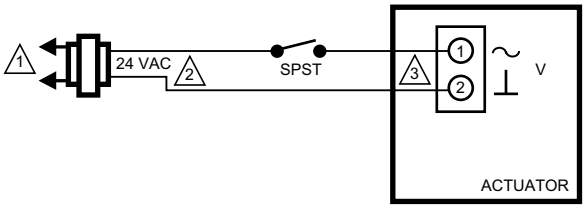
Section 4: Wiring Diagrams

Actuator Wiring Diagrams

Direct Coupled Actuators - Spring Return Models

S03 Series (MS4103, MS7403, MS7503, MS8103) and S05 Series (MS4105, MS7105, MS7405, MS7505, MS8105)

Wiring for low-voltage two-position control



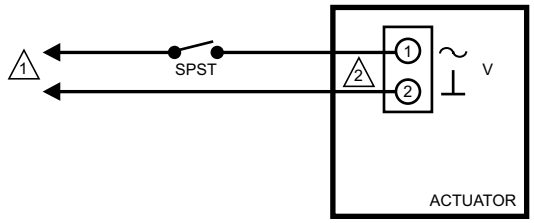
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M19718C

Wiring for line-voltage two-position control

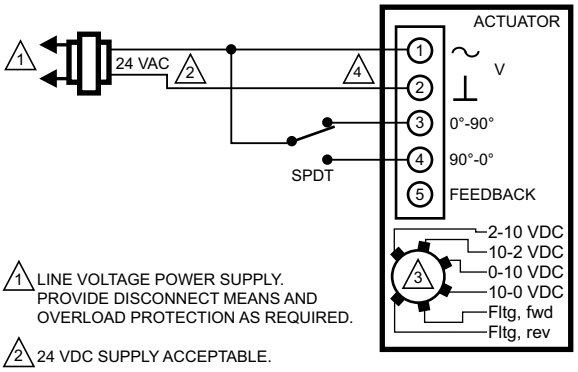


1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22289A

Wiring for SPDT on/off Control



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

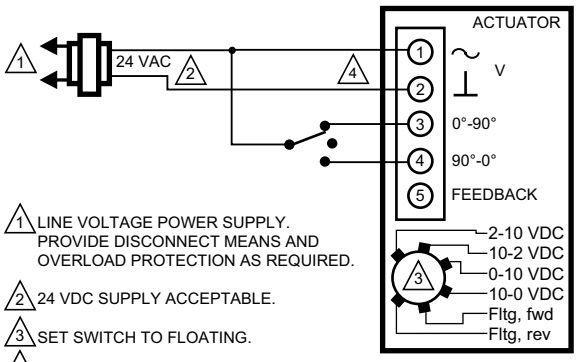
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO FLOATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M27822

Wiring for floating control



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

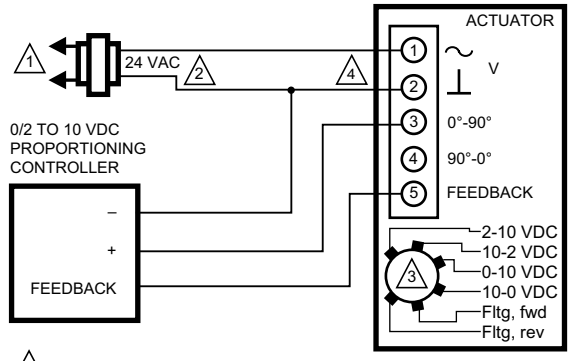
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO FLOATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M27823

Wiring for (0)2-10 VDC proportioning controllers



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

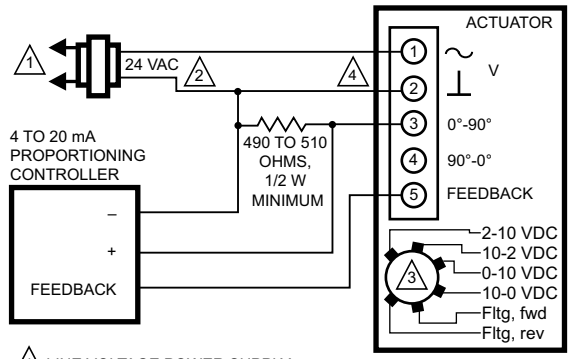
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M27824

Wiring for 4-20 mA proportioning controllers



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

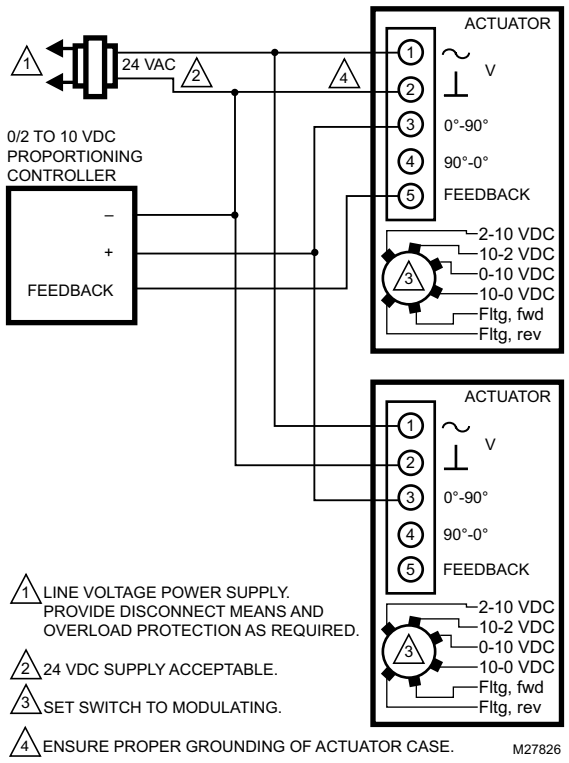
3 SET SWITCH TO MODULATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

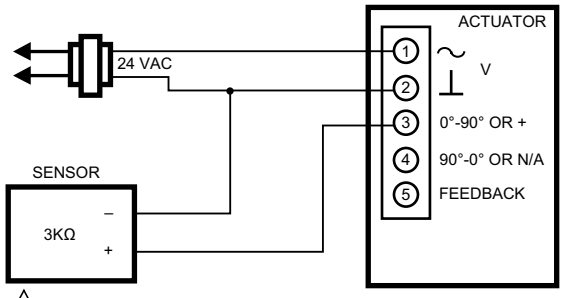
M27825

Direct Coupled Actuators - Spring Return Models

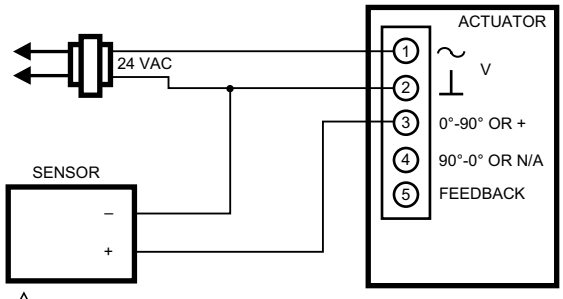
Wiring for (0)2-10 Vdc proportioning controller operating multiple actuators



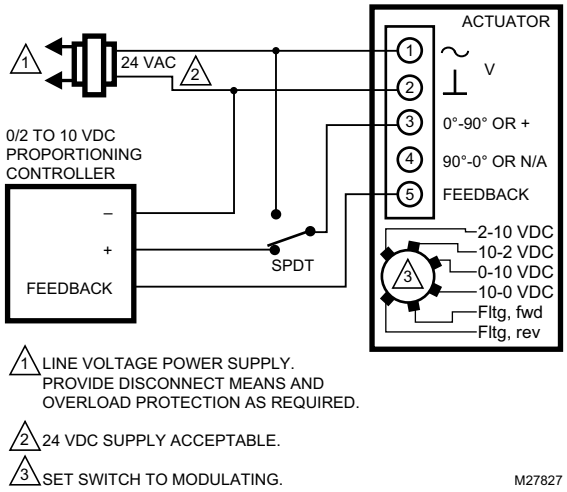
Wiring for 3 kOhm Economizer controllers



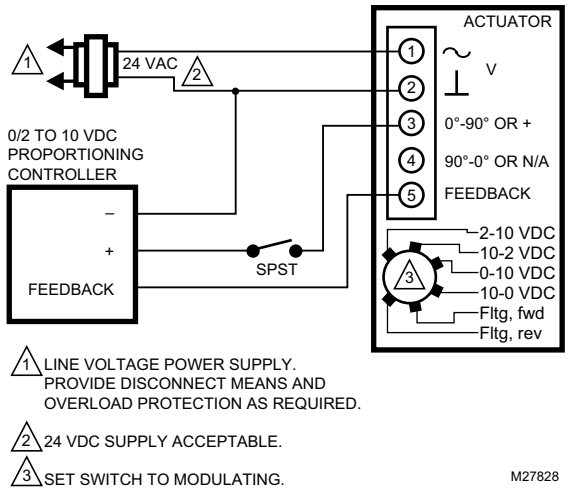
Wiring for 3 position Economizer controllers



Override to full open



Override to full close

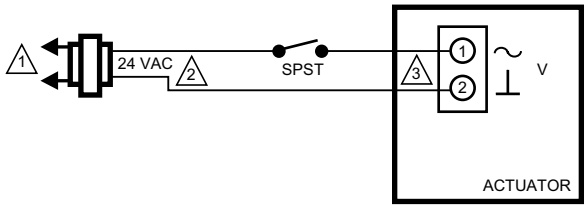


Actuator Wiring Diagrams

Direct Coupled Actuators - Spring Return Models

S10 Series (MS4110, MS7510, MS8110) and S20 Series (MS4120, MS7520, MS8120)

Wiring for On/Off Control

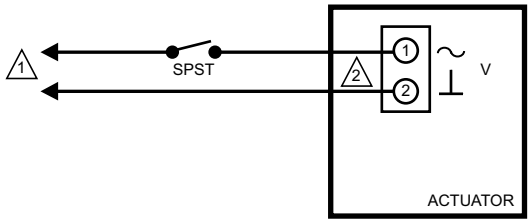


1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M19718C

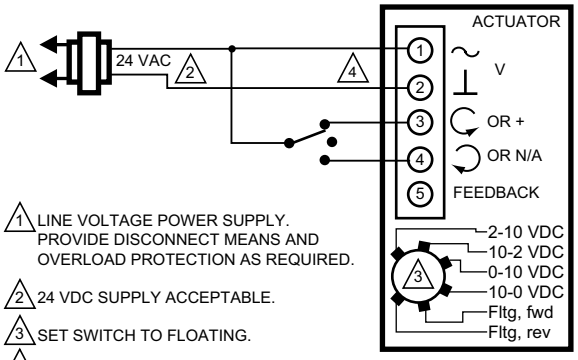


1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22289A

Wiring for Floating Control (Floating mode setting)



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

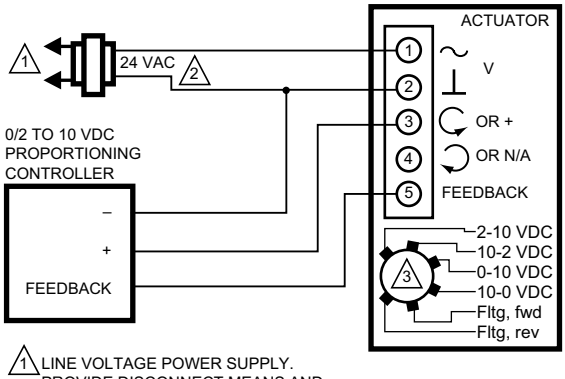
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO FLOATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M19573B

Wiring for Proportioning controllers (Modulating mode setting)

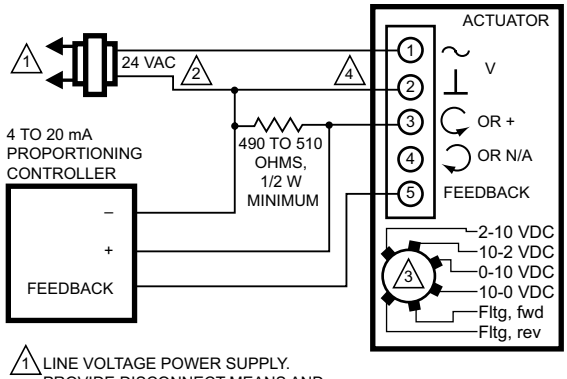


1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M19574A



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

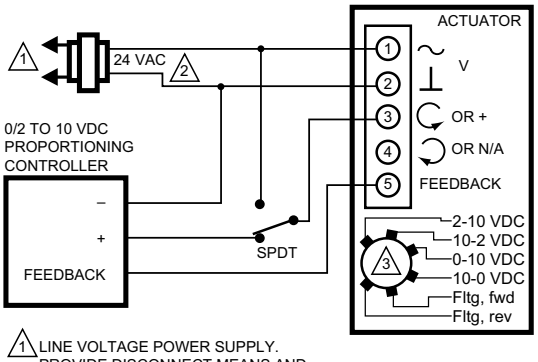
3 SET SWITCH TO MODULATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22282B

Direct Coupled Actuators - Spring Return Models

Override to full open (Modulating mode setting)



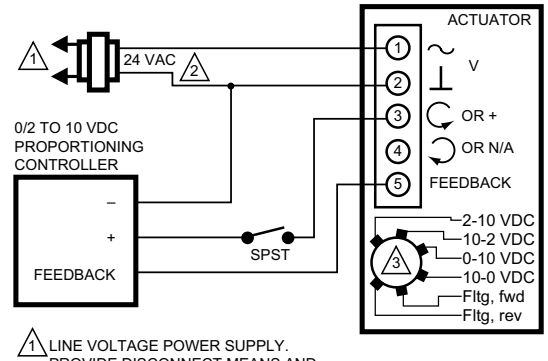
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M19576A

Override to full closed (Modulating mode setting)



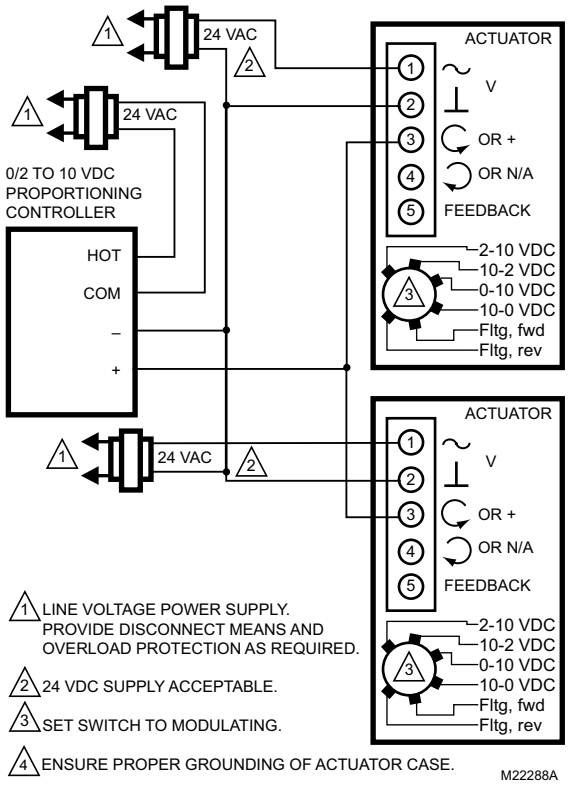
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

M19577A

Wiring for Proportioning controllers operating multiple actuators (Modulating mode setting)



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

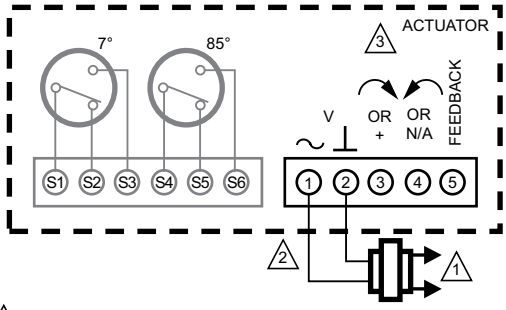
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22288A

Terminal Block Details



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 THE INTERNAL AUXILIARY SWITCHES MUST BE CONNECTED TO THE SAME POWER SOURCE; OR THE AUXILIARY SWITCHES SHALL BE CONNECTED TO THE SAME POLE OF THE SAME SUPPLY CIRCUIT, CONNECTED IN A SAME POLARITY MANNER.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

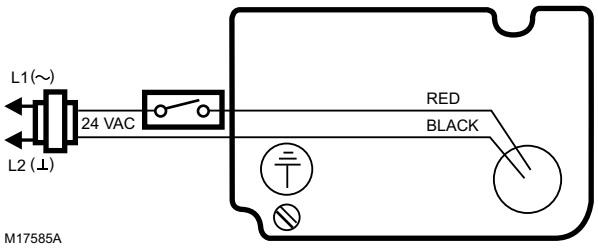
M19571B

Actuator Wiring Diagrams

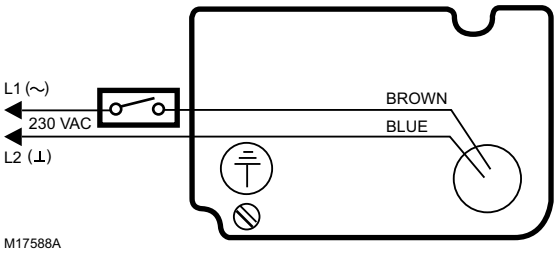
Direct Coupled Actuators - Spring Return Models

ML4125, ML8125, ML4135, and ML8135

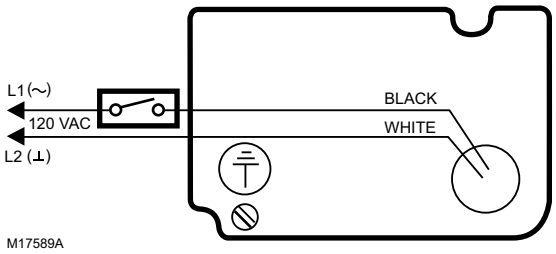
Typical 24 Vac wiring



Typical 230 Vac Wiring



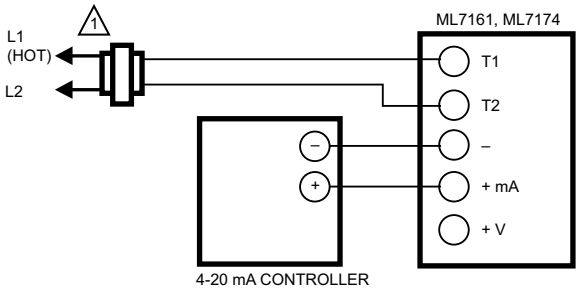
Typical 120 Vac Wiring



Direct Coupled Actuators - Non-Spring Return Models

ML6161 and ML7161

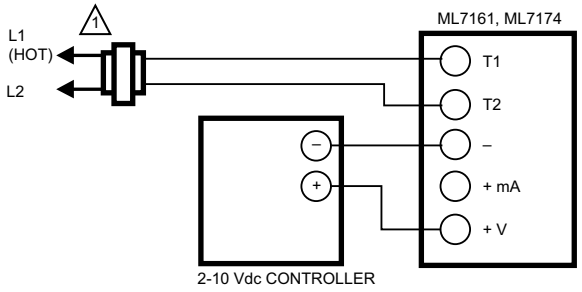
ML7161 used with 4-20 mA control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M18071

ML7161 used with 2-10 Vdc control

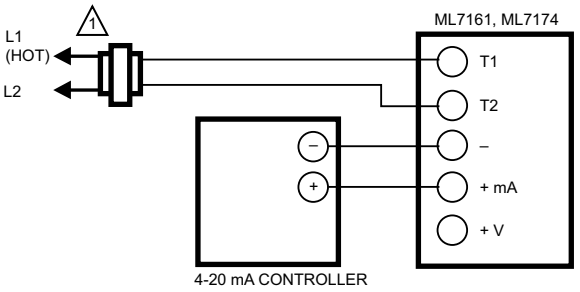


1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M18072

ML6174 and ML7174

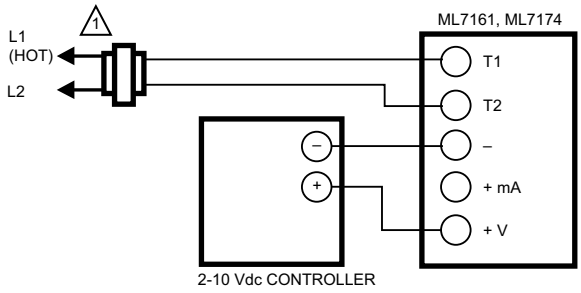
ML7174 used with 4-20 mA control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M18071

ML7174 used with 2-10 Vdc control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

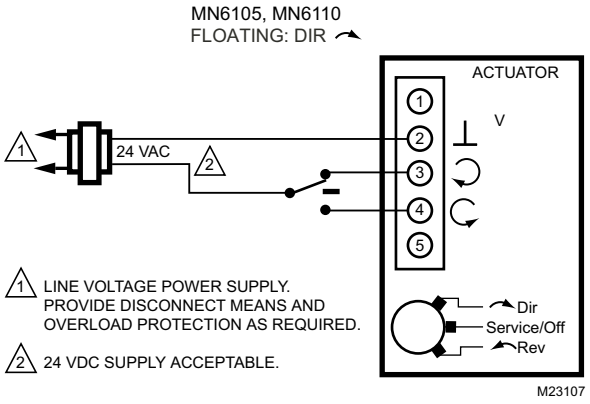
M18072

Actuator Wiring Diagrams

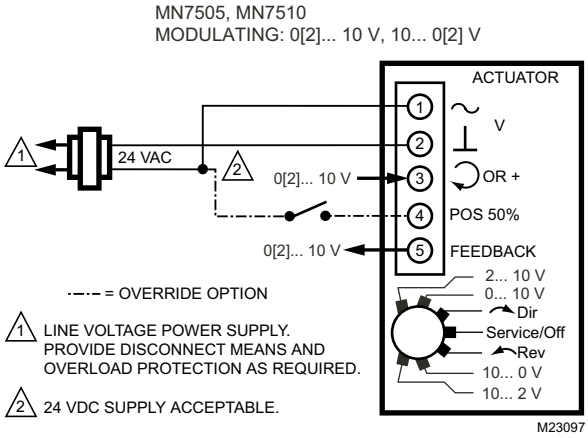
Direct Coupled Actuators - Non-Spring Return Models

N05 Series (MN6105, MN7505) and N10 Series (MN6110, MN7510)

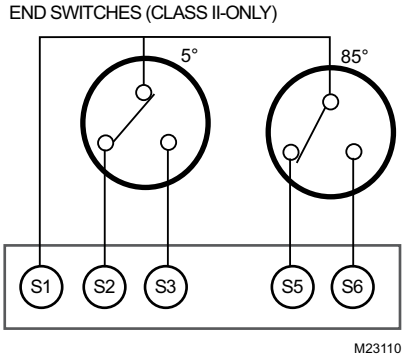
Wiring for Floating Control



Wiring for Voltage Control

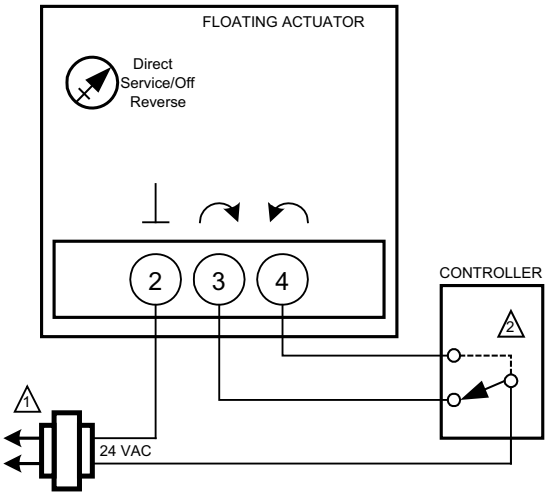


Wiring for Auxiliary Switches



N20 Series (MN6120, MN7220) and N34 Series (MN6134, MN7234)

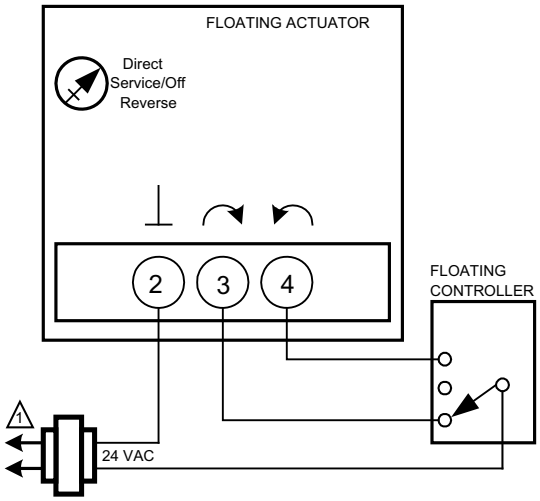
Used for On/Off Control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2 CONNECTION REQUIRED FOR SPST CONTROL.

M18945A

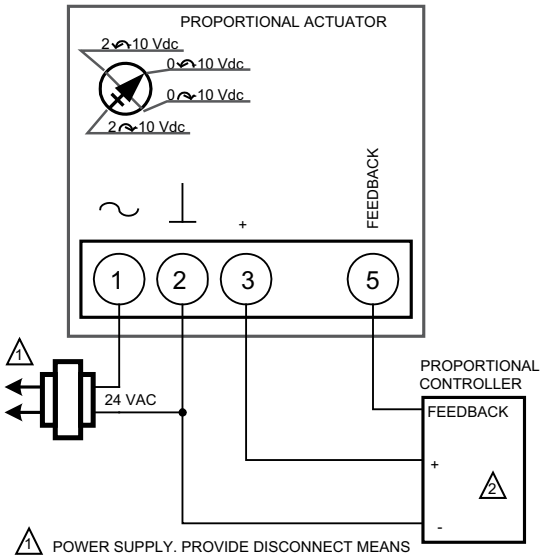
Wiring for Floating Control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M18946A

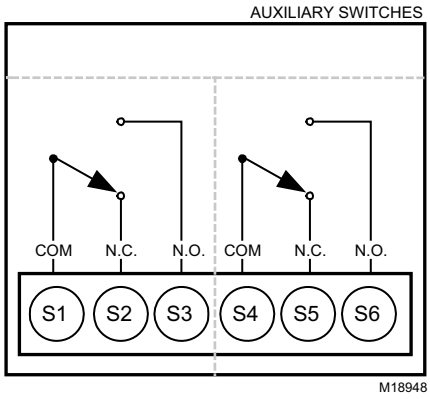
Wiring for Modulating Control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2 0(2)-10 VDC OF 0(4)-20 mA CONTROL SIGNAL ACCEPTABLE. SET CONTROL SIGNAL DIP SWITCH TO "OFF" FOR VOLTAGE. SET TO "ON" FOR CURRENT.

M18947A

Wiring for Auxiliary Switches



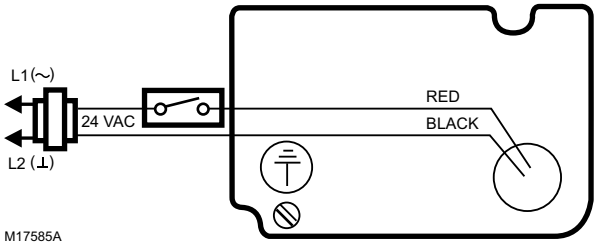
M18948

Actuator Wiring Diagrams

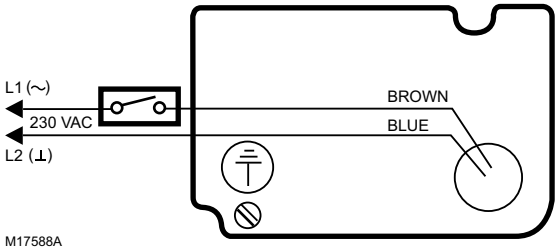
Direct Coupled Actuators - Fire and Smoke Actuators

ML4115, ML8115, MS4209F, MS4309F, MS4709F, MS4809F, MS8209F, and MS8309F

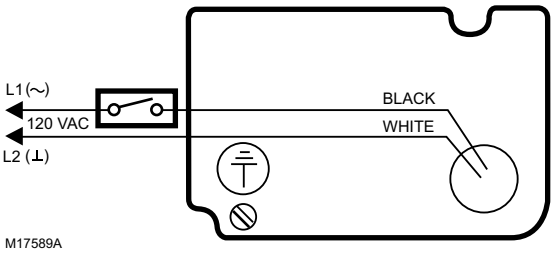
Typical 24 Vac wiring



Typical 230 Vac Wiring

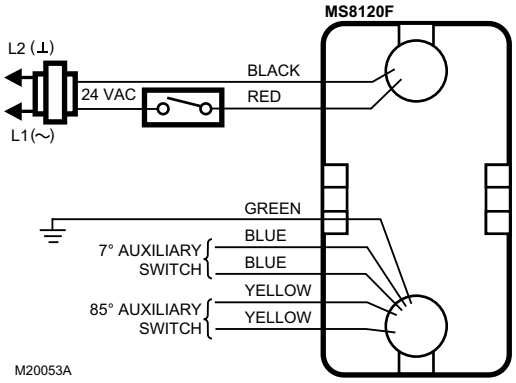


Typical 120 Vac wiring

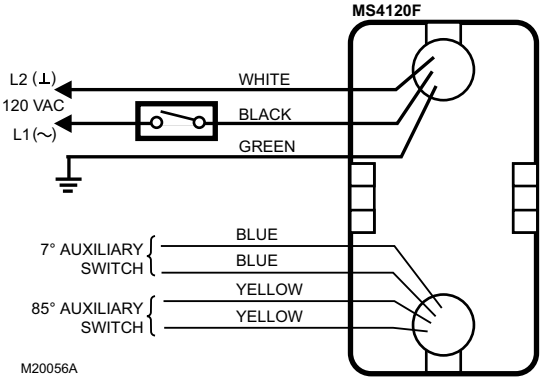


MS4120F, MS4620F, and MS8120F

Wiring for 24V Control

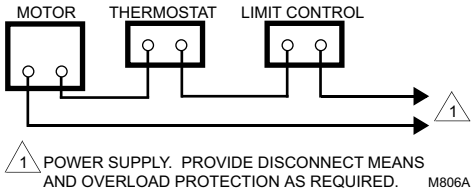


Wiring for 120V Control

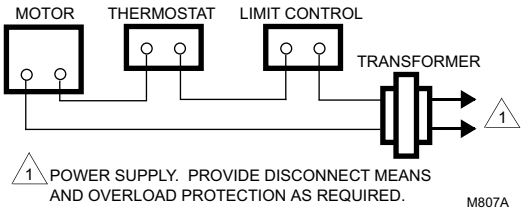


M4185 and M8185

Typical connections for Series 41 motors

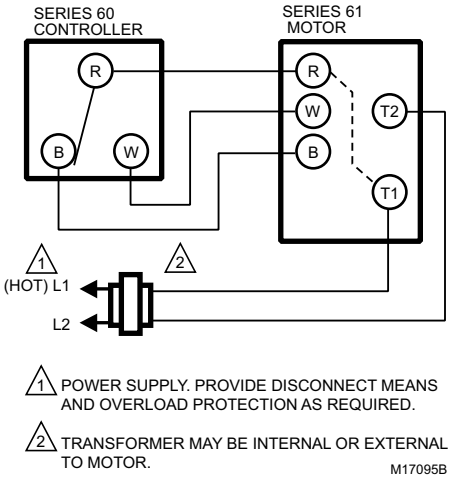


Typical connections for Series 81 motors



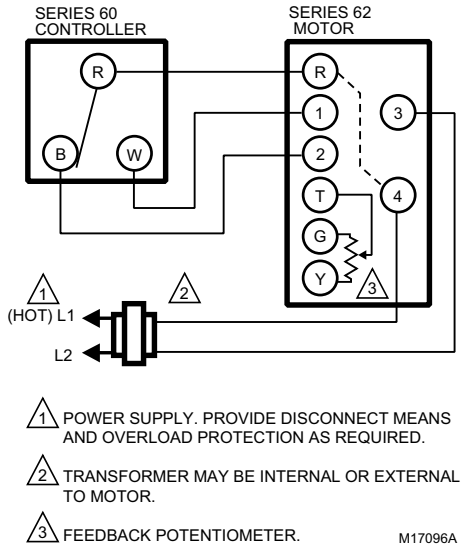
M6184 and M6194

Typical wiring for Series 61 motors

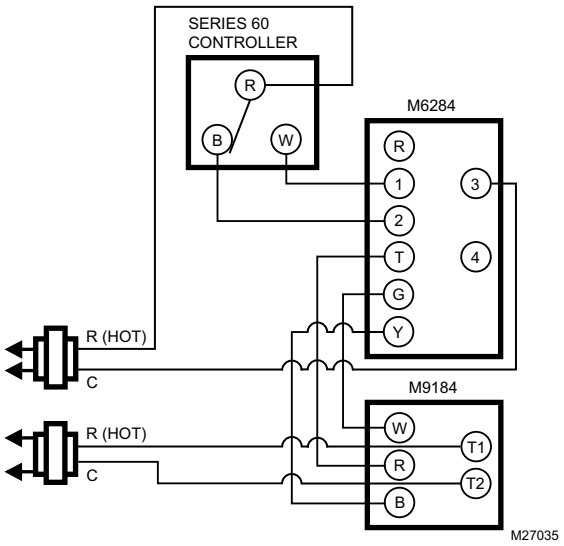


M6284, M6285, and M6294 for slaving applications

Typical wiring for Series 62 motors



Series 60 and Series 90 motors in slaving application

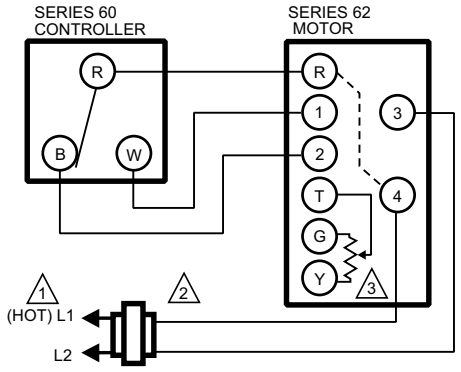


Actuator Wiring Diagrams

Foot Mounted Motors

M6274, M6284, M6285, and M6294 Motors with Linear 10K Feedback

Typical wiring for Series 62 motors



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

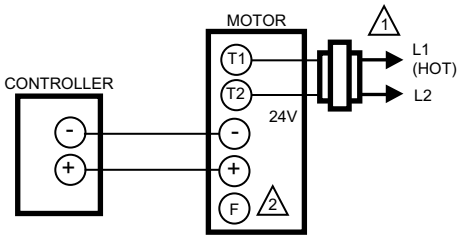
2 TRANSFORMER MAY BE INTERNAL OR EXTERNAL TO MOTOR.

3 FEEDBACK POTENTIOMETER.

M17096A

M7164, M7284, M7285, M7286, and M7294

Typical wiring for Series 70 motors



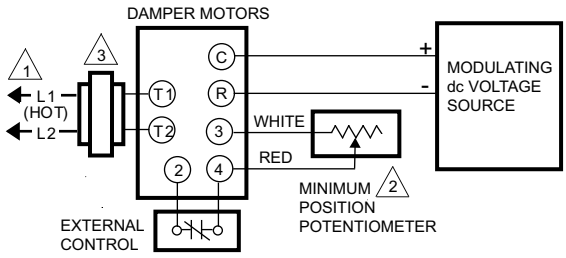
1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQURED.

2 CONNECTING F TO – WILL DRIVE MOTOR TO FULLY OPEN.

M5778

M7685

Typical wiring for M7685 motors



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLAOD PROTECTION AS REQUIRED.

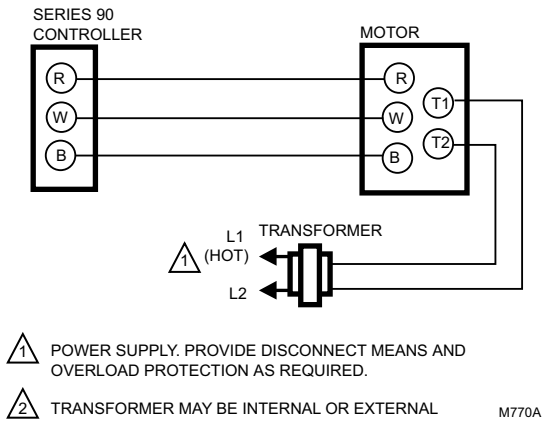
2 IF MINIMUM POSITION POTENTIOMENTER IS NOT USED, JUMPER TERMIALS 3 AND 4.

3 TRANSFORMER MAY BE INTERNAL OR EXTERNAL.

M13727

M9161, M9164, M9171, M9172, M9174, M9175, M9181, M9182, M9184, M9185, M9186, and M9194

Typical wiring for Series 90 motors

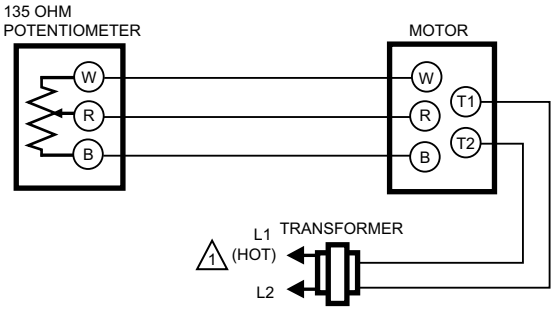


1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 TRANSFORMER MAY BE INTERNAL OR EXTERNAL

M770A

Wiring for Potentiometer Control



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 TRANSFORMER MAY BE INTERNAL OR EXTERNAL

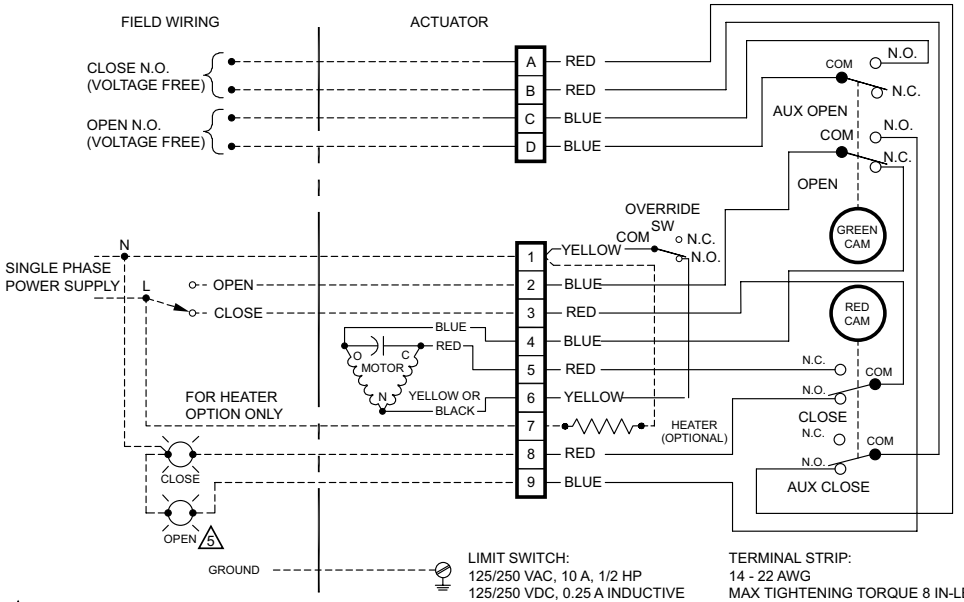
M13708

Actuator Wiring Diagrams

Actuators with Butterfly Valves

VFF1, VFF2, VFF3 and VFF6

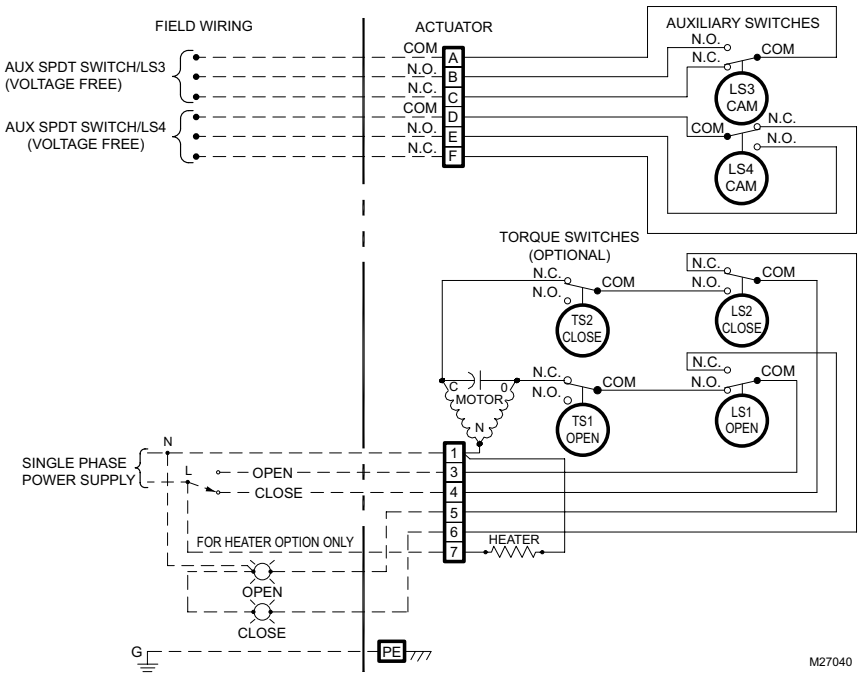
NEMA 4X floating/2-position industrial-grade actuator for valves up to 18"



1. ACTUATOR SHOWN IN CLOSED POSITION
2. MANUAL OVERRIDE NOT ENGAGED
3. HEATER OPTIONAL
4. TRAVEL, MANUAL OVERRIDE, AND TORQUE SWITCHES ARE SPDT (FORM C).
5. DO NOT WIRE ACTUATORS IN PARALLEL.
6. DO NOT INSTANTANEOUSLY SWITCH DIRECTION OF THE MOTOR WHILE THE ACTUATOR IS MOVING; ALLOW 0.5 TO 1 SECOND BETWEEN COMMAND CHANGES.

M27038

NEMA 4 floating/2-position industrial-grade actuator for valves 14" to 20"

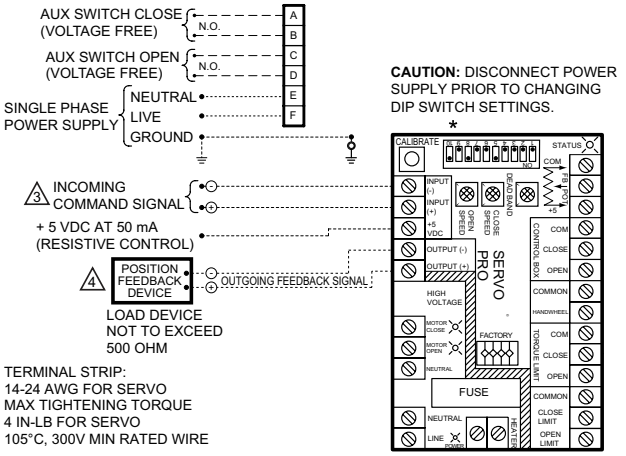


M27040

Actuators with Butterfly Valves

VFF1, VFF2, VFF3 and VFF6

NEMA 4X floating/2-position industrial-grade actuator for valves up to 18"



TERMINAL STRIP:
14-24 AWG FOR SERVO
MAX TIGHTENING TORQUE
4 IN-LB FOR SERVO
105°C, 300V MIN RATED WIRE

LIMIT SWITCH:
125/250 VAC, 10 A, 1/2 HP
125/250 VDC, 0.25 A INDUCTIVE
125/250 VDC, 0.5 A RESISTIVE

CALIBRATION: PLACE ACTUATOR IN MID-TRAVEL. HOLD THE CALIBRATION BUTTON DOWN UNTIL.ACTUATOR BEGINS CALIBRATING.

* SWITCHES SHOWN FOR 4-20 mA INPUT AND OUTPUT, FAIL IN CLOSED POSITION UPON LOSS OF SIGNAL, FORWARD ACTING MODE, AND TORQUE SWITCHES DISABLED.

FIELD WIRING

COMMAND INPUT		
SWITCH	4-20mA	0-10V
1	OFF	ON
2	OFF	ON
3	OFF	OFF
OUTPUT		
SWITCH	4-20mA	0-10V
4	OFF	ON
5	ON	OFF
6	OFF	OFF

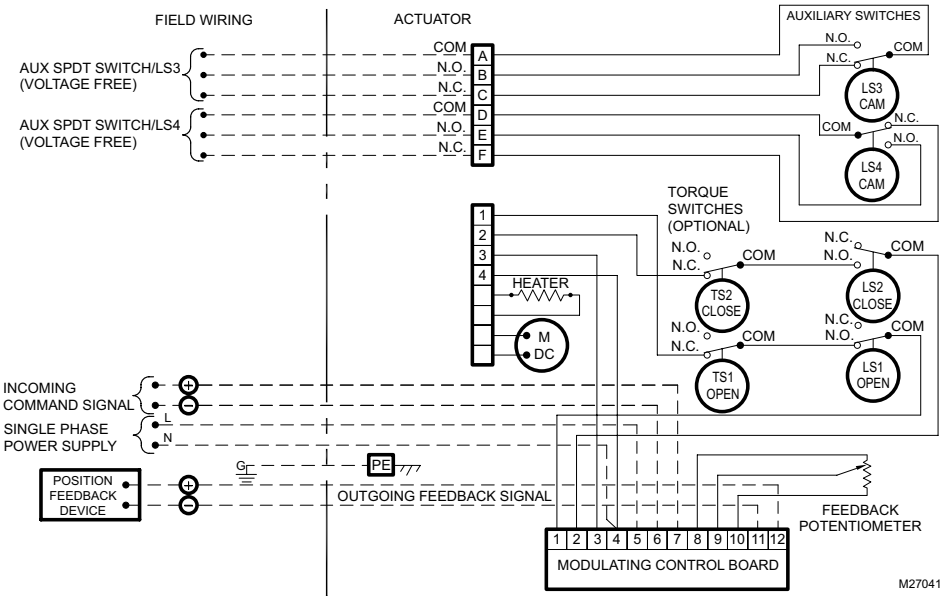
TORQUE SWITCHES		
SWITCH	ENABLE	DISABLE
10	OFF	ON

ACTING MODE			FAIL MODE (2-10V/4-20MA ONLY)			FAIL POSITION (SWITCH 8 ON)		
SWITCH	FORWARD	REVERSE	SWITCH	FAIL LAST	ENABLE	SWITCH	CLOSE	OPEN
7	OFF	ON	8	OFF	ON	9	OFF	ON

1. ACTUATOR SHOWN IN CLOSED POSITION.
2. MANUAL OVERRIDE NOT ENGAGED.
3. COMMAND SIGNAL AND FEEDBACK SIGNAL MUST BE ISOLATED FROM EACH OTHER AND ANY OTHER CIRCUIT.
4. FEEDBACK LOOP IS POWERED BY THE SERVO, DO NOT SUPPLY EXTERNAL POWER.
5. SEE MANUAL FOR DETAILS.
6. HEATER OPTIONAL.
7. TRAVEL LIMIT AND MANUAL OVERRIDE SWITCHES ARE SPDT (FORM C).
8. SEE NAME TAG FOR POWER RATING.

M27039

NEMA 4 modulating industrial-grade actuator for valves 14" to 20"



M27041

Notes

Section 5: Guide Specifications

Guide Specifications*

Threaded Globe Valves

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Threaded Globe Valves

Mounting

1. Two-way threaded globe valves shall be red brass with female national pipe thread fittings in sizes from ½ up to 3 inches (DN15 to DN80). Three-way valves shall be up to 2 inches (DN50).
2. Valves sized ½ inch (DN15) shall be available in multiple Cv ratings. Cv ratings shall be a geometric progression.
3. Valves shall offer equal percentage control characteristic on the A port. Valves rated for high pressure steam shall have linear control characteristic.
4. Two-way, direct acting valves up to 2 inches (DN50) shall have stainless steel seats. Valves rated for high pressure steam shall have stainless steel plug.
5. Two-way, direct acting valves 2 ½ to 3 inches shall have Teflon or carbon-loaded Teflon discs for water or steam service and brass seats.
6. Three-way and reverse-acting two way valves shall be constructed with brass plugs and seats.
7. Three-way valves shall feature A-B-AB porting for mixing control. Flow capacity of the B port shall have a linear flow characteristic and be reduced 20% to approximate constant loop flow in coil-bypass applications.
8. Bronze valves bodies shall have static pressure ratings ANSI/ASME Class 150, maximum temperature 337°F (169 C).
9. Valve stroke shall be ¾ inch (20 mm) for precise control.
10. Undercut bonnet of 1 3/8 inch (35 mm) diameter shall allow linkage or direct-coupled actuator attachment by U-bolt, twin set screws, or mating clamp.
11. Valves shall carry Canadian Registration Numbers.

Control

1. Actuation shall be electric or pneumatic. Actuators may be direct-coupled linear operators, or rotary actuators attached by means of a linkage. A dual tandem linkage for rotary actuators will provide enhanced close-off ratings.
2. Electric actuators shall provide two-position, floating, or proportional control. Proportional control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
3. Globe valves shall have minimum 50:1 rangeability with an equal percentage flow characteristic for water or linear flow characteristic for steam.

Other

1. Valves shall have spring-loaded, self-adjusting, Teflon® packing.
2. All valves must be field serviceable without the need to remove the valve from the piping, in order to minimize future service costs.
3. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
4. Valves controlling steam should be installed with the actuator beside the valve, not above it.
5. Operating pressure of high pressure steam-rated valves shall not exceed 100 psig (690 kPa). Superheated steam must not exceed the temperature rating of the valve.
6. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
7. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class III, 0.05% maximum. Seat leakage for valve with Teflon-based discs shall be 0.5% maximum.
8. Differential pressure for quiet operation shall be at least 20 psid (138 kPa).
9. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
10. Valves and actuators shall be as manufactured by Honeywell.

*The numbering of these guide specifications is based on MasterFormat™ 2010 (http://www.masterformat.com)

Pressure-Balanced Flanged Globe Valves

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Pressure-Balanced Flanged Globe Valves

Mounting

1. Flanged globe valves shall be cast iron with ANSI/ASME 125 flanges in sizes from 2 ½ up to 6 inches (DN65 to DN150), maximum temperature 353°F (178 C).
2. Valve dimensions will conform to ANSI/ISA S75.03.
3. Cv ratings shall be a geometric progression.
4. Valves shall offer equal percentage or linear control characteristic.
5. Valves shall have stainless steel stem, plug and seats.
6. Valve stroke, sizes 2 ½ and 3 inches (DN65-80), shall be ¾ inch (20 mm) for precise control. Undercut bonnet of 1 3/8 inch (35 mm) diameter shall allow linkage or direct-coupled actuator attachment by U-bolt, twin set screws, or mating clamp.
7. Valve stroke, sizes 4 to 6 inches (DN100-150), shall be 1 ½ inch (38 mm) for precise control. Undercut bonnet of 1 7/8 inch (48 mm) diameter shall allow linkage or direct-coupled actuator attachment by U-bolt, twin set screws, or mating clamp.

Control

1. Actuation shall be electric or pneumatic. Actuators may be direct-coupled linear operators, or rotary actuators attached by means of a linkage. A dual tandem linkage for rotary actuators will provide enhanced close-off ratings.
2. Electric actuators shall provide two-position, floating, or proportional control. Proportional control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
3. Globe valves shall have minimum 50:1 rangeability with an equal percentage flow characteristic for water or linear flow characteristic for steam or chilled water control.

Other

1. Valves shall have spring-loaded, self-adjusting, Teflon® packing.
2. All valves must be field serviceable without the need to remove the valve from the piping, in order to minimize future service costs.
3. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
4. Valves controlling steam should be installed with the actuator beside the valve, not above it.
5. Operating pressure of high pressure steam-rated valves shall not exceed 125 psig (860 kPa). Superheated steam must not exceed the temperature rating of the valve.
6. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
7. Actuated valves shall be capable of closing off against 175 psid (1200 kPa). Seat leakage when closed shall be ANSI/ASME Class IV, 0.01% maximum.
8. Differential pressure for quiet operation shall be at least 20 psid (138 kPa).
9. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
10. Valves and actuators shall be as manufactured by Honeywell.

Guide Specifications

Flanged Globe Valves

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Flanged Globe Valves

Mounting

1. Flanged globe valves shall be cast iron with ANSI/ASME 125 and ANSI/ASME250 flanges in sizes from 2 ½ up to 6 inches (DN65 to DN150), maximum temperature 353°F (178 C).
2. Valve dimensions will conform to ANSI/ISA S75.03.
3. Cv ratings shall be a geometric progression.
4. Valves shall offer equal percentage or linear control characteristic on the A port. Valves rated for high pressure steam shall have linear control characteristic.
5. Two-way and diverting valves shall have stainless steel stem, plug and seats. Mixing valves shall have seats integral to the body.
6. Three-way valves shall feature A-B-AB porting for mixing or diverting control. The B port shall have a linear flow characteristic.
7. Valve stroke, sizes 2 ½ and 3 inches (DN65-80), shall be ¾ inch (20 mm) for precise control. Undercut bonnet of 1 3/8 inch (35 mm) diameter shall allow linkage or direct-coupled actuator attachment by U-bolt, twin set screws, or mating clamp.
8. Valve stroke, sizes 4 to 6 inches (DN100-150), shall be 1 ½ inch (38 mm) for precise control. Undercut bonnet of 1 7/8 inch (48 mm) diameter shall allow linkage or direct-coupled actuator attachment by U-bolt, twin set screws, or mating clamp.

Control

1. Actuation shall be electric or pneumatic. Actuators may be direct-coupled linear operators, or rotary actuators attached by means of a linkage. A dual tandem linkage for rotary actuators will provide enhanced close-off ratings.
2. Electric actuators shall provide two-position, floating, or proportional control. Proportional control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
3. Globe valves shall have minimum 50:1 rangeability with an equal percentage flow characteristic for water or linear flow characteristic for steam, chilled water, or diverting control.

Other

1. Valves shall have spring-loaded, self-adjusting, Teflon® packing.
2. All valves must be field serviceable without the need to remove the valve from the piping, in order to minimize future service costs.
3. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
4. Valves controlling steam should be installed with the actuator beside the valve, not above it.
5. Operating pressure of high pressure steam-rated valves shall not exceed 125 psig (860 kPa). Superheated steam must not exceed the temperature rating of the valve.
6. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
7. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class III, 0.05% maximum.
8. Mixing valve shall rely on hydraulic pressure differences to control flow. A-port seat leakage for mixing valve shall be 0.5% maximum, 1% maximum on B port.
9. Differential pressure for quiet operation shall be at least 20 psid (138 kPa).
10. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
11. Valves and actuators shall be as manufactured by Honeywell.

Threaded Control Ball Valves and Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Threaded Control Ball Valves and Actuators

Mounting and Wiring

1. Valves shall be forged brass with female national pipe thread pipe fittings from ½ to 2 ½ inches (DN15 to DN65), and 3 inches (DN80) in two-way.
2. Valves shall provide modified equal percentage, or equal percentage flow control characteristics.
3. Valve ball and stem construction shall be nickel-plated brass. Stainless steel trim shall be optional on 2-way valves.
4. Valve shall have a blow-out proof stem with Teflon® trust bearings, EPDM O-ring, and silicon grease to prevent leakage.
5. Three-way valves shall be used for mixing or diverting control and provide A-B-AB port orientations in a "T" pattern with bottom B port. The Bypass port shall provide 20% reduced Cv rating using a linear flow characteristic to approximate constant flow through branch circuits.
6. Threaded valve bodies shall have maximum static pressure rating of 360 psig (2500 kPa) at 250°F (120 C).
7. Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 inches (50 mm) of pipe insulation.
8. Actuators shall provide internal wiring terminal connections with threaded holes for flexible conduit strain relief fittings where mechanical protection is required by local codes.
9. Valve actuator shall be capable of operating on 24 Vac Class II power (Safety Extra-Low Voltage), or be UL Recognized or CSA Certified to U.S. and Canadian Standards for use with line voltage.

Control

1. The actuator shall provide two-position, floating, or modulating control. Modulating control refers to direct acceptance of 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
2. Threaded control ball valves shall have minimum 50:1 rangeability with an equal percentage flow characteristic provided using a laser-cut flow control insert within the ball. The insert shall not make contact with valve seals and seats.
3. Multiple Cv ratings will be available in each valve size.
4. Modulating control models shall provide a 2-10 Vdc feedback signal.
5. Modulating actuators shall have a rotation direction control switch accessible on the cover to change between modulating or floating control.
6. Actuators shall have SPST or SPDT switch for position verification feedback as an available option.
7. Actuation will be available with fail-safe operation.

Other

1. Valve stems must be field serviceable.
2. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
4. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage of the A port when closed shall be ANSI/ASME Class IV, 0.01% maximum.
5. All spring return actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
6. All spring return actuators must be able to spring return from -40°F to 189°F
7. All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
8. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
9. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
10. Actuators shall have a five year warranty.
11. Valves and actuators shall be as manufactured by Honeywell.

Guide Specifications

Control Ball Valves and Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Control Ball Valves and Actuators

Mounting and Wiring

1. Valves shall be cast iron with ANSI/ASME 125 flange fittings from 4 to 6 inches (DN100 to DN150).
2. Valves shall provide equal percentage flow control characteristics. Valve ball and stem construction shall be stainless steel.
3. Valve shall have a blow-out proof stem.
4. Three-way valves shall be used for mixing control and provide A-B-AB port orientations in a "T" pattern with side B port. The Bypass port shall provide 20% reduced Cv rating using a linear flow characteristic to approach constant flow through branch circuits.
5. Threaded valve bodies shall have maximum static pressure rating of 240 psig (1650 kPa) at 250°F (120 C).
6. Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 inches (50 mm) of pipe insulation.
7. Actuators shall provide internal wiring terminal connections with threaded holes for flexible conduit strain relief fittings where mechanical protection is required by local codes.
8. Valve actuator shall be capable of operating on 24 Vac Class II power, or be UL Recognized or CSA Certified to U.S. and Canadian Standards for use with line voltage.

Control

1. The actuator shall provide two-position, floating, or modulating control. Modulating control refers to direct acceptance of 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
2. Flanged control ball valves shall have minimum 100:1 rangeability with an equal percentage flow characteristic provided by a laser-milled stainless steel ball.
3. Multiple Cv ratings will be available in each valve size.
4. Modulating control models provide a 2-10 Vdc feedback signal.
5. Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control.
6. Actuators shall have SPST or SPDT switch for position verification feedback as an available option.
7. Actuation will be available with fail-safe operation.

Other

1. Valve stems must be field serviceable.
2. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
4. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage of the A port when closed shall be ANSI/ASME Class IV, 0.01% maximum.
5. All spring return actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
6. All 10 and 20 Nm spring return actuators must be able to spring return from -40°F to 189°F
7. All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
8. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
9. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
10. Actuators shall have a five year warranty.
11. Valves and actuators shall be as manufactured by Honeywell.

Flanged Butterfly Valves and Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Flanged Butterfly Valves and Actuators

Mounting and Wiring

1. Valves shall be cast iron with ANSI/ASME 125 flange fittings from 2 to 20 inches (DN50 to DN500). Valve body shall be coated with polymer resin for corrosion protection.
2. Valves shall provide equal percentage flow control characteristics up to 60° disk rotation.
3. Valve disk construction shall be Nylon 11-coated cast iron. Valve seat shall be peroxide-cured EPDM combination seat and flange gasket. Valve stem shall be blow-out proof stainless steel.
4. Three-way valve assemblies with cast iron pipe T's shall be used for mixing or diverting control and provide either A-B-AB or A-AB-B port orientations in a "T" pattern with side port.
5. Valve bodies shall have maximum static pressure rating of 250 psig (1700 kPa) at 250°F (120 C).
6. Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage with 2-way valve bodies, and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 inches (50 mm) of pipe insulation.
7. Actuators shall provide internal wiring terminal connections with threaded holes for flexible conduit strain relief fittings for line voltage wiring or where mechanical protection is required by local codes.
8. Valve actuator shall be capable of operating on 24 Vac Class II power (Safety Extra-Low Voltage), or be UL Recognized or CSA Certified to U.S. and Canadian Standards for use with line voltage.

Control

1. Electric actuators shall provide two-position, floating, or modulating control. Modulating control refers to direct acceptance of 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 or 120 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 or 120 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 or 120 Vac power controlled by SPST switch.
2. High pressure pneumatic actuators shall be rack-and-pinion design, with or without spring return and provide two-position or proportional control by means of air pressure, electric solenoids, pneumatic positioner, or electro-pneumatic servo controllers.
3. Industrial grade direct-drive actuators shall have polymer-coated, water-tight enclosures rated NEMA 4.
4. Modulating actuators shall provide a 2-10 Vdc feedback signal.
5. Proportional non-industrial grade actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control.
6. Actuators shall have SPST or SPDT auxiliary switch for position verification as an available option.
7. Actuation will be available with fail-safe operation.

Other

1. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
2. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
3. Under-cut disks shall provide 50 psid (345 kPa) close-off. Full cut disks shall provide 150 psid (1034 kPa) minimum close-off. Seat leakage when closed shall be ANSI/ASME Class IV, maximum 0.01%.
4. All spring return actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
5. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
6. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.

Fan Coil Zone Valves and Dedicated Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Fan Coil Zone Valves and Dedicated Actuators

Mounting and Wiring

1. Valves shall be forged brass with sweat or female national pipe thread pipe fittings in sizes from ½ up to 1 inches (DN15 to DN25). Inverted flare pipe fittings shall be available for ½ inch (DN15) size, with sweat adapters for larger pipe sizes.
2. Valves shall be compact size capable of fitting inside terminal equipment such as fan coil units or unit ventilators.
3. Valves shall provide quick open flow control characteristics. Valve plug shall be rotating ball-plug style with brass seat construction.
4. Three-way valves shall have A-AB-B porting and be used for mixing control in coil-bypass applications.
5. Valves bodies shall have static pressure ratings of 300 psig (2000 kPa) at 200°F (93 C) minimum.
6. Actuators shall be direct coupled type requiring neither crank-arm nor linkage and direct mount to the associated Honeywell valve family using a snap-on engagement, and be removable without the use of tools.
7. Actuators shall provide lead wire connections with knock-out for ½ inch nominal flexible conduit where mechanical protection is required by local codes.
8. Valve actuator shall be capable of operating on 24 Vac Class II power, or be UL Recognized or CSA Certified to U.S. and Canadian Standards for use with line voltage.

Control

1. The actuator shall provide two-position control with spring return controlled by SPST switch.
2. Actuators shall have SPST pilot-duty auxiliary switch for position verification feedback as an available option.
3. Actuators will be standard with fail-safe operation.

Other

1. All valves must be field serviceable without the need to remove the valve from the piping, in order to minimize future service costs.
2. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3. If so rated, valves controlling steam should be installed with the actuator beside the valve, not above it, and use a Class F rated motor.
4. Superheated steam must not exceed the maximum operating temperature of the valve.
5. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
6. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall not exceed 0.009 gpm (33 mL/m).
7. All actuators must be able to operate from 32 to 120°F (0 to 50 C) ambient temperature, as measured at the actuator.
8. Actuators shall be constructed of materials resistant to condensation when used to control chilled water. Actuator damage due to condensation or falling water shall not be cause for warranty replacement.
9. Two-position actuators shall be designed for a minimum of 100,000 full-stroke cycles at rated load and temperature.
10. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
11. Valves and actuators shall be as manufactured by Honeywell.

Cartridge Cage Valves and Dedicated Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Cartridge Cage Valves and Dedicated Actuators

Mounting and Wiring

1. Valves shall be cast bronze with sweat or female national pipe thread pipe fittings in sizes from ½ up to 1 ¼ inches (DN15 to DN32). Flare or inverted flare pipe fittings shall be available for ½ inch (DN15) sizes, with inverted flare-to-sweat adapters for larger pipe sizes.
2. Valves shall be compact size capable of fitting inside terminal equipment such as fan coil units or unit ventilators.
3. Valves shall provide quick open, linear, or modified equal percentage flow control characteristics. Valve plug and seat construction shall be cage style using resilient seat materials for high differential pressure close-off. Two-way valves shall be capable of being used with flow in either direction.
4. Three-way valves shall have A-AB-B porting and may be used for mixing or diverting control with tight close-off in coil-bypass applications.
5. Valves bodies shall have static pressure ratings of 300 psig (2000 kPa) at 200°F (93 C) minimum.
6. Actuators shall be direct coupled type requiring neither crank-arm nor linkage and direct mount to the associated Honeywell valve family using a snap-on, twist-lock collar, and be removable without the use of tools.
7. Actuators shall provide plenum-rated, lead wire connections with adapter for ½ inch nominal flexible conduit where mechanical protection is required by local codes.
8. Valve actuator shall be capable of operating on 24 Vac Class II power (Safety Extra-Low Voltage), or be UL Recognized or CSA Certified to U.S. and Canadian Standards for use with line voltage.

Control

1. The actuator shall provide two-position, floating, or modulating control. Modulating control refers to direct acceptance of 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control shall be in the form of 24 Vac power controlled by SPST switch.
2. Two-position and floating control models shall be available with optional SPDT pilot-duty auxiliary switch for position verification feedback.
3. Actuators will be available with electronic fail-safe operation as optional, and shall also accept SPST pulse width modulated control signals.

Other

1. All valves must be field serviceable without the need to remove the valve from the piping, in order to minimize future service costs.
2. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty. A side stream mechanical filtration system, 50 micron or smaller, filtering no more than 10% of system flow, shall be required for the entire building.
4. Actuated valves shall be capable of closing off against a maximum operating differential pressure of 60 psid (400 kPa), without cavitation or water hammer. The valve seat shall be a bubble-tight design.
5. All actuators must be able to operate from 32 to 150°F (0 to 65 C) ambient temperature, as measured at the actuator.
6. Actuators shall be constructed of materials resistant to condensation when used to control chilled water. Actuator damage due to condensation or falling water shall not be cause for warranty replacement.
7. Proportional actuators shall be designed for a minimum of 50,000 full-stroke cycles, and 1,000,000 repositions at rated load and temperature.
8. Two-position actuators shall be designed for a minimum of 100,000 full-stroke cycles at rated load and temperature.
9. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
10. Valves and actuators shall be as manufactured by Honeywell.

Guide Specifications

Cartridge Globe Valves and Dedicated Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Cartridge Globe Valves and Dedicated Actuators

Mounting and Wiring

1. Valves shall be brass with female national pipe thread fittings in sizes from ½ up to 1 ¼ inches (DN15 to DN32) and sweat fittings from ½ to ¾ inches (DN15-20).
2. Valves shall be compact size capable of fitting inside terminal equipment such as fan coil units or unit ventilators.
3. Valves ½ to ¾ inches (DN15-20) shall use resilient seat materials for tight close-off, with equal percentage flow characteristics. Two-way valves shall be normally open.
4. Valves 1 to 1 ½ inches (DN25-40) shall use a pressure-balanced, metal seat construction for close-off not less than 145 psid (1000 kPa), with linear flow characteristics.
5. Multiple Cv ratings shall be available in valve sizes ½ to 1 inches (DN15-25).
6. Three-way valves shall feature A-B-AB porting for mixing control in coil-bypass applications. Flow capacity of the B port shall be reduced 20% to more closely balance loop pressure drops in coil-bypass applications.
7. Valves bodies shall have static pressure ratings of 230 psig (1600 kPa) at 230°F (110 C), minimum.
8. Actuators shall be direct coupled type requiring neither crank-arm nor linkage and direct mount to the associated Honeywell valve family using a threaded collar, and be removable without the use of tools.
9. Actuators shall provide plenum-rated, lead wire connections with threaded fittings for ½ inch nominal flexible conduit where mechanical protection is required by local codes.
10. Electronic valve actuators shall be capable of operating on 24 Vac, Class II power (Safety Extra-Low Voltage).

Control

1. The actuator shall provide two-position, floating, or modulating control. Modulating control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
2. Pneumatic actuators shall be available for ½ and ¾ inch (DN15-20) valves.
3. Globe valves shall have minimum 50:1 rangeability with an equal percentage or linear flow characteristic.
4. Globe valve proportional actuators shall have response range and travel direction selections.
5. Actuators will be available with optional spring return, fail-safe operation.

Other

1. All valves must be field serviceable without the need to remove the valve from the piping, in order to minimize future service costs.
2. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. The presence of excess rust in the system will void the manufacturer's warranty.
4. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class III, 0.02% maximum.
5. All actuators must be able to operate from 32 to 122°F (0 to 50 C) ambient temperature, as measured at the actuator.
6. Actuators shall be constructed of materials resistant to condensation when used to control chilled water. Actuator damage due to condensation or falling water shall not be cause for warranty replacement.
7. Proportional actuators shall be designed for a minimum of 50,000 full-stroke cycles, and 1,000,000 repositions at rated load and temperature.
8. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
9. Valves and actuators shall be as manufactured by Honeywell.

Electric Large Linear Globe Valve Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.13 Actuators and Operators

Electric Large Linear Globe Valve Actuators

Mounting and Wiring

1. Actuators shall be direct coupled type requiring neither crank-arm nor linkage and be capable of direct mounting to a globe valve.
2. The actuator shall connect to the valve stem using a quick-release engagement.
3. The actuator shall connect to the valve bonnet using set screws or U-bolt. Non-fail safe models shall be available for 1 3/8 inch (35 mm) or 1 7/8 inch (38 mm) diameter valve bonnets of undercut construction.
4. Actuators shall provide wiring terminals located within an integral access cover with conduit connections.
5. Actuators shall have splash-proof covers rated IP54.

Control

1. The actuator shall provide two-position, floating, or modulating control. Modulating control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or with addition of a 500 ohm resistor a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control for non-fail safe actuators shall be in the form of 24 Vac power controlled by an SPDT switch.
2. Modulating actuators shall have a travel direction control switch. Floating actuator travel will be selected by choice of terminal wiring.
3. Modulating control models shall have 0-10 or 2-10 Vdc feedback signal.
4. SPDT switch for position verification feedback shall be an available option.

Other

1. All spring return actuators must be designed for either stem extension or stem retraction fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 10-15 seconds of power loss.
2. Fail-safe spring return actuators shall be available with force rating of 135 lb (600 N). Valve stroke shall be ¾ inch (20 mm).
3. Non fail safe actuators shall be available with force ratings of 135 or 404 lb (600 or 1800 N), with valve stroke of ¾ or 1 ½ inch (20 or 38 mm).
4. All spring return actuators must be able to spring return from 14°F to 122°F (-10 to 70 C) ambient temperature, as measured at the actuator.
5. Valves controlling steam should be installed with the actuator beside the valve, not above it, with the actuator mounting yoke oriented to maximize convective air flow for cooling.
6. A high temperature kit shall be available for further isolation of the actuator from the valve body.
7. All actuators shall be designed for a minimum of 50,000 full-stroke cycles, and 1,000,000 repositions at rated force load and temperature.
8. All actuators shall be plenum-rated per UL873 and cUL (CSA22.2) Listed, and be manufactured under ISO 9001 International Quality Control Standards.
9. Actuators shall be as manufactured by Honeywell.

Guide Specifications

Direct-Coupled Electronic Globe Valve Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.13 Actuators and Operators

Direct-Coupled Electronic Digital Globe Valve Actuators

Mounting and Wiring

1. Actuators shall be direct coupled type requiring neither crank-arm nor linkage and be capable of direct mounting to a Honeywell globe valve from ½ to 3 inches in size (DN15 to DN80).
2. The actuator shall connect to the valve stem using an internally-threaded jackshaft.
3. The actuator shall connect to 1 3/8 inch (35 mm) valve bonnet using a U-bolt. Adapters shall be available for globe valves of other manufacture.
4. Actuators shall provide wiring terminals located within an integral access cover with conduit connections.
5. Actuators shall be available with splash-proof covers rated NEMA 3R for outdoor mounting.

Control

1. The actuator shall provide two-position or floating, or modulating control. Modulating control refers to direct acceptance of 135-270 ohm slide-wire, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control for non-fail safe actuators shall be in the form of SPDT 24 Vac power controlled by SPDT switch.
2. Valve actuator shall be capable of operating on 24 Vac or 28 Vdc power supplies.
3. Modulating actuators shall have a travel direction control switch. Floating actuator travel will be selected by choice of terminal wiring.
4. Floating model shall not require continuous power when controlled by triac-based controllers.
5. Continuously-powered models shall have 2-10 Vdc position feedback signal and SPDT pilot duty auxiliary relay as an available option.

Other

1. Non fail safe actuators shall be available with force ratings of 160 lb (710 N) with a self-adjusting, self-calibrating stroke of ½ to 1 inch (12 to 25 mm).
2. Valves controlling steam should be installed with the actuator beside the valve, not above it, with the actuator mounting yoke oriented to maximize convective air flow for cooling.
3. All actuators must be able to operate from 32 to 130°F (0 to 54 C) ambient temperature, as measured at the actuator.
4. All actuators shall be designed for a minimum of 50,000 full-stroke cycles, and 1,000,000 repositions at rated force load and temperature.
5. All actuators shall be plenum-rated per UL873 and cUL (CSA22.2) listed, and be manufactured under ISO 9001 International Quality Control Standards.
6. Actuators shall be as manufactured by Honeywell.

Direct-Coupled Rotary Actuator Globe Valve Linkage

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.13 Actuators and Operators

Direct-Coupled Rotary Actuator Globe Valve Linkage

Mounting and Wiring

1. Valve linkages shall be direct coupled type capable of adapting Honeywell direct-coupled rotary actuators for direct mounting to a Honeywell globe valve from ½ to 3 inches in size (DN15 to DN80).
2. The linkage shall connect to the valve stem using a quick release engagement with anti-spin guides.
3. The linkage will mount to the valve bonnet using a U-bolt.
4. The linkage shall accept one spring or non-spring return actuators up to 300 lb-in (34 Nm) torque, for maximum close-off.
5. The actuators shall connect to the linkage shaft using a removable output hub with a self centering shaft coupling if available or u-bolt hub. This self centering shaft coupling shall provide concentric mounting and include an integral adjustable range-stop mechanism.
6. Actuators shall provide wiring terminals located within an integral access cover with conduit connections.

Control

1. The actuator–linkage combination shall provide two-position or floating, or proportional control. Proportional control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or with addition of a 500 ohm resistor a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control for non-fail safe actuators shall be in the form of SPDT 24 Vac power controlled by SPDT switch.
1. Proportional control models provide a 2-10 Vdc feedback signal.
2. Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control.

Other

1. All spring return actuator-linkage combinations must be designed for either valve stem extend or retract fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
2. All spring return actuators must be able to spring return from -40 to 189°F (-40 to 87 C).
3. Valves controlling steam should be installed with the linkage beside the valve, not above it, with the actuator mounting yoke oriented to maximize convective air flow for cooling.
4. A high temperature kit shall be available for further isolation of the linkage and actuator from the valve body.
5. All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
6. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
7. All actuators shall be plenum-rated per UL873 and cUL (CSA22.2) listed, and be manufactured under ISO 9001 International Quality Control Standards.
8. Actuators shall be as manufactured by Honeywell.

Guide Specifications

Tandem Direct-Coupled Rotary Actuator Globe Valve Linkage

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.13 Actuators and Operators

Tandem Direct-Coupled Rotary Actuator Globe Valve Linkage

Mounting and Wiring

1. Valve linkages shall be direct coupled type capable of adapting Honeywell direct-coupled rotary actuators for direct mounting to a Honeywell globe valve from ½ to 3 inches in size (DN15 to DN80), or from 4 to 6 inches (DN100 to DN160).
2. Valve stem stroke will be ¾ or 1 ½ inches.
3. The linkage shall connect to the valve stem using a threaded jackshaft. The valve stem shall be prevented from spinning by use of a jam nut to lock the valve stem to the jackshaft.
4. The linkage shall mount to the valve bonnet using a full collar.
5. The linkage shall accept one or two, spring or non-spring return actuators up to 300 lb-in (34 Nm) torque each, for maximum close-off.
6. The actuators shall connect to the linkage shaft using a removable output hub with a self centering shaft coupling if available or u-bolt hub. This self centering shaft coupling shall provide concentric mounting and include an integral adjustable range-stop mechanism.
7. Actuators shall provide wiring terminals located within an integral access cover with conduit connections.

Control

1. The actuator–linkage combination shall provide two-position or floating, or proportional control. Proportional control refers to direct acceptance of 0-10 Vdc, 2-10 Vdc or with addition of a 500 ohm resistor a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control for non-fail safe actuators shall be in the form of SPDT 24 Vac power controlled by SPDT switch.
1. Proportional control models provide a 2-10 Vdc feedback signal.
2. Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control.

Other

1. All spring return actuator-linkage combinations must be designed for either valve stem extend or retract fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
2. All spring return actuators must be able to spring return from -40 to 189°F (-40 to 87 C).
3. Valves controlling steam should be installed with the linkage beside the valve, not above it, with the actuator mounting yoke oriented to maximize convective air flow for cooling.
4. All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
5. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
6. All actuators shall be plenum-rated per UL873 and cUL (CSA22.2) listed, and be manufactured under ISO 9001 International Quality Control Standards.
7. Actuators shall be as manufactured by Honeywell.

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.13 Actuators and Operators

Footmount Globe Valve Actuators

Mounting and Wiring

1. Actuators shall be direct coupled type requiring a Q5001 linkage and be capable of direct mounting to a Honeywell globe valve from ½ to 6 inches in size (DN15 to DN80).
2. The actuator shall connect to the valve stem using a stem button and clip retainer with an anti-spin clip to prevent the valve stem from spinning.
3. The actuator shall connect to the valve bonnet using a Q5001 linkage.
4. Actuators shall provide wiring terminals located within an integral access cover with conduit connections.
5. Actuators shall be available with splash-proof covers rated NEMA 3R for outdoor mounting.

Control

1. The actuator shall provide two-position or floating, or proportional control. Proportional control refers to direct acceptance of 135-270 ohm slide-wire, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control for non-fail safe actuators shall be in the form of SPDT 24 Vac power controlled by SPDT switch.
2. Valve actuator shall be capable of operating 24 Vac, 120 Vac, or Multi tap (24,120, 230 Vac) power supplies.
3. Proportional actuators shall have a travel direction by turning the motor around and running the linkage from the corresponding shaft. Floating actuator travel shall have a travel direction by turning the motor around and running the linkage from the corresponding shaft.
4. Proportional control models shall have 2-10 Vdc feedback signal with SPDT switch for position verification feedback as an available option.

Other

1. Non-Fail safe actuators shall be available with force ratings of 35 lb-in (4.0Nm), 75 lb-in (8.5Nm), 150 lb-in (17Nm), and 300 lb-in (34Nm).
2. Valves controlling steam should be installed with the actuator beside the valve, not above it, with the actuator mounting linkage oriented to maximize convective air flow for cooling.
3. All actuators must be able to operate from -40 to 150 F (0 to 60 C) ambient temperature, as measured at the actuator.
4. All actuators shall be designed for a minimum of 60,000 full-stroke cycles, and 1,500,000 repositions at rated force load and temperature.
5. All actuators shall be plenum-rated per cUL 174H listed, CE, and be manufactured under ISO 9001 International Quality Control Standards.
6. Actuators shall be as manufactured by Honeywell.

Guide Specifications

Footmount Globe Valve Actuators

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.13 Actuators and Operators

Footmount Globe Valve Actuators

Mounting and Wiring

1. Actuators shall be direct coupled type requiring a Q5001 linkage and be capable of direct mounting to a Honeywell globe valve from ½ to 6 inches in size (DN15 to DN80).
2. The actuator shall connect to the valve stem using a stem button and clip retainer with an anti-spin clip to prevent the valve stem from spinning.
3. The actuator shall connect to the valve bonnet using a Q5001 linkage.
4. Actuators shall provide wiring terminals located within an integral access cover with conduit connections.
5. Actuators shall be available with splash-proof covers rated NEMA 3R for outdoor mounting.

Control

1. The actuator shall provide two-position or floating, or proportional control. Proportional control refers to direct acceptance of 135-270 ohm slide-wire, 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control for non-fail safe actuators shall be in the form of SPDT 24 Vac power controlled by SPDT switch.
2. Valve actuator shall be capable of operating 24 Vac, 120 Vac, or Multi tap (24,120, 230 Vac) power supplies.
3. Proportional actuators shall change direction by turning the motor around and running the linkage from the corresponding shaft. Floating actuator travel shall change direction by turning the motor around and running the linkage from the corresponding shaft.
4. Proportional control models shall have 2-10 Vdc feedback signal with SPDT switch for position verification feedback as an available option.

Other

1. Fail safe actuators shall be available with force ratings of 60 lb-in (6.8Nm).
2. Valves controlling steam should be installed with the actuator beside the valve, not above it, with the actuator mounting linkage oriented to maximize convective air flow for cooling.
3. All actuators must be able to operate from -40 to 150 F (0 to 60 C) ambient temperature, as measured at the actuator.
4. All actuators shall be designed for a minimum of 60,000 full-stroke cycles, and 1,500,000 repositions at rated force load and temperature.
5. All actuators shall be plenum-rated per cUL 174H listed, CE, and be manufactured under ISO 9001 International Quality Control Standards.
6. Actuators shall be as manufactured by Honeywell.

VRN Pressure Regulated Flow Control Valves

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Quarter-Turn, Dynamic Pressure-Regulating Threaded Control Valve

Mounting and Wiring

1. Valves shall be available with female national pipe thread pipe fittings in sizes from ½ up to 3 inches (DN15 to DN80).
2. The valve shall have an integral differential pressure regulator to maintain constant pressure drop across valve seat to decouple valve flow from system pressure changes. Regulator will be constructed from stainless steel with a rolling diaphragm and operate under positive pressure. Regulator shall be located above axis of pipe and be available with optional ¼" ISO test port fittings to allow pressure measurement and venting. Control accuracy shall be +/-5% or better.
3. Flow control ball shall have minimum 50:1 rangeability with an equal percentage flow characteristic provided by a laser-milled, glass-filled polymer ball insert. Valve seat seals shall make contact with the ball only, and not the flow control element.
4. Valve ball and stem construction shall be nickel-plated brass or stainless steel.
5. Maximum operating differential pressure shall be no less than 35 psid. Close-off pressure shall be 100 psid with ANSI Class IV seat leakage.
6. Valve stem assembly shall be of a packless design and be field-replaceable without removing the valve body from the piping. Teflon™ seals shall hold the stem in alignment, and protect the O-ring from system temperature fluctuations. Stem O-ring shall be made of peroxide-cured EPDM and be isolated from system treatment chemicals by a reservoir of silicon grease. Valve shall have a blow-out proof stem with minimum 600 psi rating.
7. Threaded valves bodies shall have static pressure rating of 360 psig (2500 kPa) at 250°F (121 C).
8. Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 inches (50 mm) of pipe insulation.
9. Actuators shall provide screw terminal wiring connections with adapters for flexible conduit where mechanical protection is required by local codes.
10. Valve actuator shall be capable of operating on 24 Vac Class II power, or be UL Recognized or CSA Certified to U.S. and Canadian Standards where used with line voltage.

Control

1. The actuator shall provide two-position, floating, or proportional control. Proportional control refers to direct acceptance of 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
2. Multiple gpm flow ratings will be available in each valve size, with 26 discrete values available in 1 gpm increments up to 1" and 5 gpm increments up to 3". Intermediate flow settings will be set using mechanical stop in the actuator, or by characterized control signal from the controller.
1. Proportional and floating control actuators shall provide a 2-10 Vdc feedback signal.
3. Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control.
4. Control actuators shall be available with SPST or SPDT switch for position verification feedback as an available option.
5. Actuation will be available with fail-safe operation capable of returning the valve to a normally open or normally closed position following loss of power.

Other

1. Valve stems and differential pressure regulator must be field serviceable without removing valve from piping.
2. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. These requirements shall meet or exceed European Norm VDI 2035. The presence of excess rust in the system will void the manufacturer's warranty.

VRN Pressure Regulated Flow Control Valves (cont.)

4. Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class IV, minimum.
5. All spring return actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
6. All 5 Nm torque, spring return actuators must be able to spring return from -40°F to 150°F.
7. All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
8. Two-position actuators shall be designed for a minimum of 100,000 full-stroke cycles at rated load and temperature.
9. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
10. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
11. Actuators shall have a five year warranty.
12. Accessories Identification tags shall be available for all valves; tags shall be indelibly marked with gpm, model number, and tag location
13. Valves and actuators shall be as supplied by Honeywell.

VRW Pressure Regulated Flow Control Valves

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Multi-Turn, Dynamic Pressure-Regulating Wafer-Flanged Control Valve

Mounting and Wiring

1. Valves shall be available with wafer-flanges for use with either ANSI/ASME 125/150 or ANSI/ASME 250/300 pipe flanges in sizes from 2 ½ up to 6 inches (DN65 to DN150). Each wafer flange shall be useable with either of two successive pipe sizes.
2. The valve shall have an integral differential pressure regulator to maintain constant pressure drop across valve seat to decouple valve flow from system pressure changes. Regulator will be constructed from 316 stainless steel with a rolling diaphragm and operate under positive pressure. Regulator shall be located above axis of pipe with ¼" ISO test port fittings to allow pressure measurement and venting. Control accuracy shall be +/-5% or better.
3. Valves shall use a non-rising stem, characterized plug with equal percentage flow control characteristic. Valve trim shall be stainless steel.
4. Valve bodies shall have static pressure rating of 580 psig (4000 kPa) at 248°F (120 C).
5. Maximum operating differential pressure rating shall be no less than 58 psid. Close-off pressure shall be 100 psid minimum, at no more than 0.2% leakage.
6. Valve stem seals shall be a combination of EPDM and Nitrile O-rings.
7. Actuators shall be six turn rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket.
8. Actuators shall provide screw terminal wiring connections with adapters for flexible conduit where mechanical protection is required by local codes.
9. Valve actuator shall be capable of operating on 24 Vac Class II power, in both electronic fail-safe and stay-in-place configurations. Actuator fail-safe action in the event of power failure shall be field-selectable normally open or normally closed.

Control

1. The actuator shall provide two-position, floating, analog or digital proportional control. Analog proportional control refers to direct acceptance of 2-10 Vdc or a 4-20 mA input signal. . Digital proportional control refers to direct acceptance of 24 Vac pulse-width-modulated input signal. Floating control refers to direct acceptance of 24 Vac pulsed open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
2. Flow valve shall have minimum 50:1 rangeability with an equal percentage flow characteristic. Actuator shall have field-adjustable signal zero and span adjustments.
3. Flow settings shall be field-selectable from 50 unique settings.
4. Proportional and floating control actuators shall provide a 2-10 Vdc/4-20 mA feedback signal.
5. Actuators shall provide analog proportional, PWM, floating, or two-position control through wiring options.
6. Actuation will be available with electronic fail-safe operation.

Other

1. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
2. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. These requirements shall meet or exceed European Norm VDI 2035. The presence of excess rust in the system will void the manufacturer's warranty.
3. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
4. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
5. Actuators shall have a one year warranty from date of installation.
6. Accessories Identification tags shall be available for all valves; tags shall be indelibly marked with gpm, model number, and tag location
7. Valves and actuators shall be as supplied by Honeywell.

Notes

Section 6: Accessories

Damper And Actuator Accessories

Ball Joints, Push Rod Accessories

	Product Number	Description	Used With
	**27518**	Crankarm balljoint with 1/4 - 28 UNF male threads, fits 5-16 inch diameter push rods	All Actuators and Dampers
	**27520A**	Push Rod (5/16 in. dia., 5 in. length)	All Actuators and Dampers
	27520B	Push Rod (5/16 in. dia., 10 in. length)	All Actuators and Dampers
	27520C	Push Rod (5/16 in. dia., 12 in. length)	All Actuators and Dampers
	27520D	Push Rod (5/16 in. dia., 15 in. length)	All Actuators and Dampers
	27520E	Push Rod (5/16 in. dia., 18 in. length)	All Actuators and Dampers
	27520G	Push Rod (5/16 in. dia., 24 in. length)	All Actuators and Dampers
	27520H	Push Rod (5/16 in. dia., 28 in. length)	All Actuators and Dampers
	27520K	Push Rod (5/16 in. dia., 36 in. length)	All Actuators and Dampers
	27520L	Push Rod (5/16 in. dia., 48 in. length)	All Actuators and Dampers
	27520Q	Push Rod (5/16 in. dia., 8 in. length)	All Actuators and Dampers

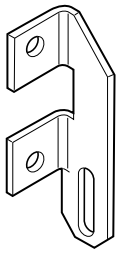
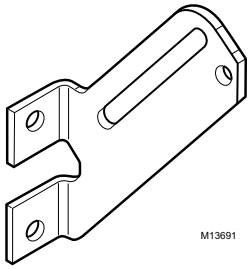
Control, Positioning, Feedback Accessories

	Product Number	Description	Used With
	**200976A**	Auxiliary Feedback Potentiometer (0 to 500 ohm)	ML6161, ML6174, ML7161, ML7174
	200976C	Auxiliary Feedback Potentiometer (0 to 2000 ohm)	ML6161, ML6174, ML7161, ML7174
	**201052A**	Auxiliary Switch Package, Single	ML6161, ML6174, ML7161, ML7174
	201052B	Auxiliary Switch Package, Double	ML6161, ML6174, ML7161, ML7174
	**205860**	Electronic Remote Minimum Position Potentiometer	Proportional Actuators
	**32003532-005**	High Temperature Dual Switch Assembly	ML4105, ML8105, ML4115, ML8115, ML4125, ML8125, ML4135, ML8135, MS4209, MS4309, MS4709, MS4809, MS8209, MS8309
	**32006306-001**	Resistor Kit (500 ohm, converts 4-20mA to 2-10Vdc)	Proportional Actuators

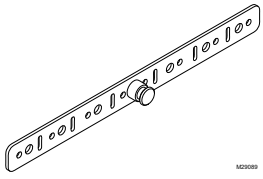
Control, Positioning, Feedback Accessories (cont.)

	Product Number	Description	Used With
	SSW2-1M	Auxiliary Switch Package - Low Torque Non Spring Return	MN Series Actuator (44 in-lb, 88 in-lb)
	SW2-US	Auxiliary Switch Package (2 adjustable SPDT switches)	MS and MN Series High Torque Actuators (MNXX20 and XX34)

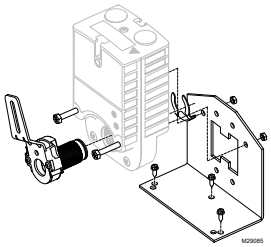
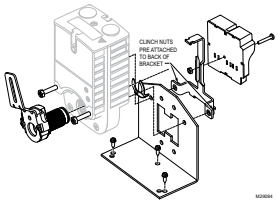
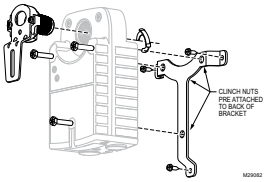
Mounting Accessories

	Product Number	Description	Used With
	205649	Mounting Bracket	150 and 300 lb-in. NSR and SR (except 25, 53 and 142 lb-in) Actuators
	32007205-001	Direct Coupled Actuator Mounting Bracket	Damper with External Actuator Mounting (i.e., 32007205-005 Kit)
	32007205-002	Damper Blade Drive Lever (Small)	All Actuators and Dampers
	32007205-003	Damper Blade Drive Lever (Large)	All Actuators and Dampers
	32007205-004	Retaining Clip, Damper External Drive Pin	Damper with External Actuator Mounting (i.e., 32007205-005 Kit)

Mounting Accessories (cont.)

	Product Number	Description	Used With
	**32007205-005**	Damper External Drive Pin Kit	Damper with External Actuator Mounting (i.e., 32007205-005 Kit)
	**32007205-006**	Damper Axle Coupling	Multi-Section Dampers
	**32007205-007**	Jumper Bracket	Multi-Section Dampers
	**50000407-001**	Actuator Tandem Mounting Kit	N20, N34 Actuators; S05, S10, S20 Actuators
	**50001194-001**	Foot Mounting Kit	MS and MN Series High Torque Actuators (MNXX20 and XX34)
	**50006427-001**	Flexible Anti-Rotation Bracket	N20, N34 Actuators; S05, S10, S20 Actuators
	**STRN-BRKT**	Anti-rotation Bracket for S03 and S05 Series Actuators	S03, S05 Actuator

Mounting Accessories (cont.)

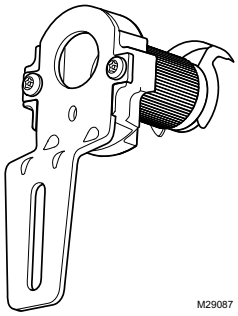
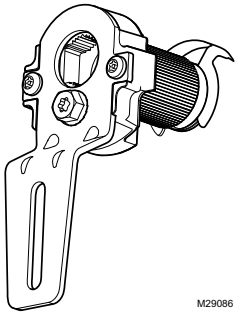
	Product Number	Description	Used With
	**STRN-CRK-01**	Crank arm kit for S03 and S05 Series Actuators	S03, S05 Actuators
	**STRN-ECONO-01**	Economizer Retrofit Kit for S03 and S05 Series Actuators	S03, S05 Actuators
	**STRN-WMK-01**	Wall mount kit for S03 and S05 Series Actuators	S03, S05 Actuators

Rotational Limiters, Position Indicators

	Product Number	Description	Used With
	**4074ENJ**	Minimum Position Kit	ML6161, ML6174, ML7161, ML7174

Damper And Actuator Accessories

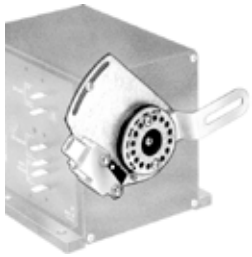
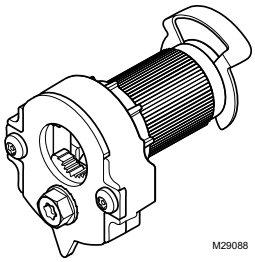
Crankarms

	Product Number	Description	Used With
	**205830A**	Rotary-to-Linear Kit Used With: 35 and 70 lb-in NSR Actuators	35 and 70 lb-in.NSR
	**26026G**	Damper Crank Arm, 1/2 in. damper shaft	All Actuators and Damper
 M29087	**STRN-CA-01**	Non Self-centering Crank Arm for S03 and S05 Series Actuators	S03, S05 Actuators
 M29086	**STRN-CA-02**	Self-centering Crank Arm for S03 and S05 Series Actuators	S03; S05 Actuators

Shaft Adapter Accessories

	Product Number	Description	Used With
	**32003167-001**	3/8 in. Shaft Adapter	ML6161; ML6174; ML7161; ML7174; ML7999
	**32003168-001**	Short Shaft Adapter (3/4 in. to 1/2 in.)	All Actuators and Dampers
	32003168-002	Short Shaft Adapter (5/8 in. to 1/2 in.)	All Actuators and Dampers
	32003168-003	Short Shaft Adapter (9/16 in. to 1/2 in.)	All Actuators and Dampers

Shaft Adapter Accessories (cont.)

	Product Number	Description	Used With
	**32004254-001**	Self-Centering Shaft Adapter	N20 Actuators
	32004254-001	Self-Centering Shaft Adapter	N20 Actuators
	32004254-002	Self-Centering Shaft Adapter	S10, S20 Actuators
	32004254-003	Self-Centering Shaft Adapter	N34 Actuators
	**4074ENY**	3/8 in. Shaft Kit	ML6161, ML6174, ML7161, ML7174
	**4074EVK**	Short Shaft Kit	ML6161, ML6174, ML7161, ML7174
	**STRN-SCSA**	Self-centering Shaft Adapter for S03 and S05 Series Actuators	S03, S05 Actuators

Damper And Actuator Accessories

Enclosure Accessories

	Product Number	Description	Used With
	**32003036-001**	Weather Enclosure	All Actuators
	**50005859-001**	NEMA 4 Enclosure for Direct Coupled Actuator	ML6161, ML6174, ML7161, ML7174; 150 lb-in. NSR Actuators (ML Series); N20, N34 Actuators; S03, S05, S10, S20 Actuators
	**7640QW**	Enclosure for Conduit Connection	ML6161, ML6174, ML7161, ML7174

Q7002 Interface Modules

	Product Number	Description	Used With
	**Q7002B1009**	Transducer, Accepts dc voltage, current, or resistive input and provides a voltage or current output	Direct-Coupled Proportional Actuators and Modutrol Motors
	Q7002C1007	Transducer, Accepts a pulse-width modulation (PWM) signal and provides a voltage output	Direct-Coupled Proportional Actuators and Modutrol Motors

Miscellaneous Accessories

	Product Number	Description	Used With
	**32000085-001**	Strain Relief Fitting (10 pack)	MS and MN Series Actuators
	STRN-STRNRLF	Strain Relief Fitting for S03 and S05 Series Actuators	S03; S05 Actuators

Valve Actuator Accessories

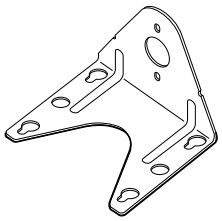
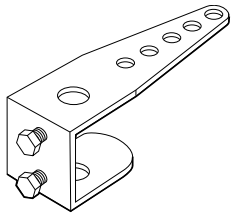
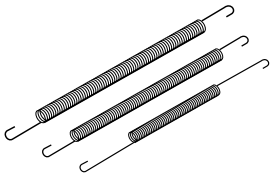
	Product Number	Description	Used With
	114191A	Auxiliary Switch Assembly	—
	127834A	Switch (made)	—
	272629A	Adapter Kit for mounting ML6984/ ML7984 to V5045 and VGF non-pressure balanced 2-way valves	ML6984 or ML7984, V5045; VGF21ES; VGF21LS, VGF22ES; VGF22LS
	272630D	Position feedback and SPDT pilot duty auxiliary switch	ML6984/ML7984 Series 4000 and higher (ML6984 in 5-wire mode only)
	312495	Large stem button provides anti-spin for CREVAL actuators with globe valves up to 3 in.	ML6420, ML6421, ML6425, ML7420, ML7421, or ML7425; Not required with ML6984/M7984 Actuators or Q5022A linkage; Not compatible with Q5020 linkage
	40003793-005	U-bolt bag assembly for ML6984 & ML7984.	ML6984 or ML7984
	43191679-101	Auxiliary Potentiometer for ML6421A	ML6421A
	43191679-102	220 ohm Auxiliary Potentiometer for ML6421B	ML6421B
	43191679-111	Potentiometer, 10k ohm, for ML6425, ML7425	ML6425 or ML7425
	43191679-112	Potentiometer, 220 ohm for ML6425, ML7425	ML6425 or ML7425
	43191680-102	Dual Auxiliary Switch for CREVAL actuators	ML6421, ML7421
	43191680-105	Dual Auxiliary Switch for CREVAL actuators	ML6420, ML6425, ML7420, ML7425
	43196000-001	High Temperature Kit for actuators with 3/4 inch (20 mm) stroke, stem button attachment	ML6420, ML6421, ML6425, ML7420, ML7421, or ML7425; Not compatible with Q5022A
	43196000-038	High Temperature Kit for actuators with 1-1/2 inch (38 mm) stroke, stem button attachment	ML6421, ML7421; Not compatible with Q5022B;

VU Series Fan Coil Actuator Accessories

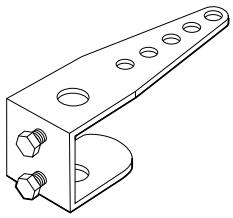
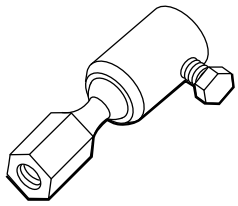
	Product Number	Description	Used With
	272885C	Nickel-plated replacement motor for 24V VU-series valve actuators	VU843A, VU844A
	272885D	Nickel-plated replacement motor for 120 VU-series valve actuators	VU443A1008/A1180/E1009; VU444A1007/A1155

Pneumatic Damper Accessories

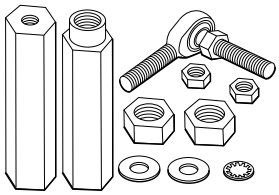
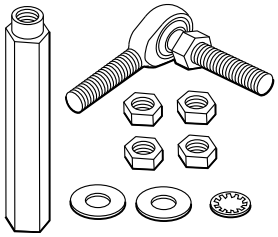
Pneumatic Damper Actuator Parts and Accessories

	Product Number	Description	Used With
	14001213-001	MP904A and B Diaphragm	MP904A,B
	14002061-001	Damper Linkage Kit w/ Template	MP909E,F
	14002850-001	Angle Bracket 5 3/8 in (137 mm) long, 5 in (127 mm) wide	MP909D,E
	**14003640-001**	Angle Bracket 3 in. (76 mm) long, 3 3/4 in. (95 mm) wide, 2 3/4 in. (70 mm) high	MP913; MP909D
	14004062-001	External Trunnion Mounting Bracket	MP918A,B; MP909E,H
	14004062-002	Internal N.C. Trunnion Mounting Bracket	MP918A,B; MP909E,H
	14004062-003	Internal N.O. Trunnion Mounting Bracket	MP918A,B; MP909E,H
	14004106-001	Actuator pushrod for conversion of internal N.C. to external	MP918A,B; MP909E,H
	14004106-002	Push rod assembly for internal N.C.	MP918A,B; MP909E,H
	**14004107-001**	Crankarm Assembly for conversion from internal N.C. to external Trunnion mounting	MP918A,B; MP909E,H
	14004136-001	MP904 Positive Positioner Retrofit Kit	MP904A
	14004137-001	Retrofit Kit for adding positive positioner to MP909E or repair of MP909H	MP909E; MP909H
	**14004210-001**	Feedback Spring Kit includes orange spring (3 psi [21kPa]), yellow spring (5 psi [34 kPa]), and blue spring (10 psi [69 kPa]).	MP909H; MP918A
	14004236-001	Coupler, actuator shaft to 5/16 in, 8 mm, pushrod	MP918
	14004237-002	Bag assembly including 4 hex head slotted drill point screws (14004513-001)	MP918A,B; MP909E,H
	14004241-002	Hitch Pin (Six Sets)	MP918A,B; MP909E,H
	14004242-001	MP918 Top Mount Operator Assembly	MP918A,B
	14004264-001	MP918 Repair kit including Positive Positioner, bracket assembly and fittings	MP918A
	14004264-002	MP918 Positive Positioner Retrofit Kit - includes 10 psi feedback spring	MP918B
	14004324-001	Kit for Alternate External Top-Mount, MP909E,H MP918A,B	MP918A,B; MP909E,H

Pneumatic Damper Actuator Parts and Accessories (cont.)

	Product Number	Description	Used With
	**14004345-001**	Positive Positioner Kit, 10 psi feedback spring	MP920B
	14004350-001	Steel Clevis Pin (1/4 x 7/8)	MP918
	14004577-001	MP953 A, C, and E (Direct Acting, 5 in. diameter) Yoke/Base Assembly	MP953A,C,E
	26025B	Damper crank arm for 3/8 in. (9.5 mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 40-50-60-75-90 degrees.	MP516; MP909D; MP909E, H;
	27174B	Damper crank arm for 7/16 in. (11.1 mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 40-50-60-75-90 degrees.	MP516; MP513
	309292	MP516A Diaphragm	MP516
	309389J	Mounting Bracket and Linkage	MP516
	312809C	MP904A and B Tube and Diaphragm Assembly	MP904A,B
	312817	MP953C (5 in. diameter) Cover	MP953C (5 in.)
	312867C	Damper Crank Arm for 1/2 in. (12.7mm) diameter axle. Elongated slot for linkage connection. Slot scaled for 45-60-75-90 degrees	MP516; MP909D; MP909E; MP909H
	312867H	Externally mounted Linkage Kit	MP516; MP909D,E,H
	314100	MP909A Replacement Diaphragm	MP909A
	314231	MP909B Replacement Diaphragm	MP909B
	314316A	Crank Arm Assembly	MP516
	314440A	MP909 - Clevis, Clevis Pin and Cotter Pin Assembly	MP909
	314503	MP909C Replacement Diaphragm	MP909C
	315321	Crankarm Balljoint (with 1/4 in male threads), fits 5/16 in. diameter pushrod	MP516; MP909D,E,H; MP913
	315321G	Crankarm and Linkage	MP909A,D
	315439/0062	Clevis	MP909D
	**315781**	Motor shaft balljoint with 3/8 - 16 UNC female threads, fits 5/16 inch diameter pushrods.	MP909D,E,H; MP913
	315782	Balljoint (9/16 in.-18 UNC) accepts 5/16 in. Pushrod	MP920B
	AK3558	Swivel Bracket Bag Assembly	MP920B

Pneumatic Damper Actuator Parts and Accessories (cont.)

	Product Number	Description	Used With
	**AK3560**	Balljoint, 3/8-24 threaded stud with couplings for 5/8-11 threaded rod and actuator shaft	MP920B
	**AK3561**	Balljoint, 3/8-24 threaded stud with couplings for 3/8-16 threaded rod	MP920B
	CCT2718	Threaded rod for shaft extension	MP918
	CCT2725	Rod coupling for shaft extension	MP918

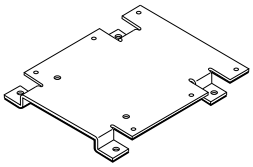
Pneumatic Valve Actuator Parts and Accessories

Product Number	Description	Used With
14002039-001	MP953D Diaphragm Sleeve	MP953B,D,F
14002040-002	MP953D Diaphragm	MP953B,D,F
14003124-002	MP953B,D,F Diaphragm Repair Kit (includes 14002039-001 and 14002040-002)	MP953B,D,F
14004138-001	MP953B,F (Reverse Acting) Positive Positioner Retrofit Kit	MP953B,F
14004139-001	MP953A,E (Direct Acting, 8 in. and 13 in. diameter, 3/4 in. stroke) Positive Positioner Retrofit Kit	MP953A,E
14004140-001	MP953A,E (Direct Acting, 8 in. and 13 in. diameter, 1-1/2 in. stroke) Positive Positioner Retrofit Kit	MP953A,E
14004211-001	MP953E (8 in. and 13 in. diameter, 3/4 in. stroke) Feedback Spring Kit	MP953E
14004212-001	MP953E (8 in. and 13 in. diameter, 1-1/2 in. stroke) Feedback Spring Kit	MP953E
14004213-001	MP953F (Reverse Acting) Feedback Spring Kit	MP953F
14004214-001	MP953A,E (5 in. diameter) 3/4 inch stroke Positive Positioner Retrofit Kit	MP953A,E
14004298-001	Thread forming Screw, Size 4-40	MP953D,F
14004298-003	MP953C,E (5 in. dia.) and MP953B,D,F (7-1/8 in. dia.) Actuator Base Screw, size 1/4-20	MP953B,D,F; MP953C,E (5 in.)
14004578-001	MP953 B, D, and F (Reverse Acting, 7-1/8 in. diameter) Yoke/Base Assembly	MP953B,D,F
14004660-001	Cup, aluminum die cast alloy 7 1/64 inch	MP953D
14004667-001	Offset Crank arm assembly with 2 screws (304725-062), nuts (14004102-001), crank arm (14004655-001) for 1/2 in. Drive Axle	Pneumatic Actuators
14004697-001	Stem extension for 13 in. MP953C,E with 3/4 in. Stroke	MP953C,E
310664	MP953A, C and E (5 in. and 8 in. models only) Tension Spring	MP953A,C,E
310665/0062	Spring Support for MP953	MP953A,C,E (5 in.)
310668	MP953A, C and E (5 in. diameter) High Temperature Silicone Diaphragm - Old Style	MP953A,C,E
311393	White Spring, 4-11 psi	MP953C,E
311616	MP953A, C and E (5 in. diameter) Main Spring (2-7 psi spring range - Brown)	MP953A,C,E (5 in.)
311618	MP953A, C and E (5 in. diameter) Main Spring (8-12 psi spring range - Gray)	MP953A,C,E (5 in.)
311749/0605	Cup diaphragm, 8 in. for MP953A, C, E	MP953A,C,E (8 in.)
311750	MP953A, C and E (8 in. diameter) Regular Temperature Neoprene Diaphragm - New Style	MP953A,C,E
311851/0062	Stem extension for 8 in. dia. 3/4 in. stroke MP953A,C,E	MP953A,C,E (8 in.)

Pneumatic Valve Actuator Parts and Accessories (cont.)

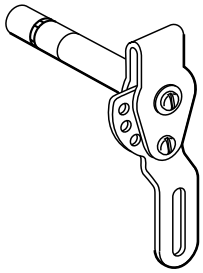
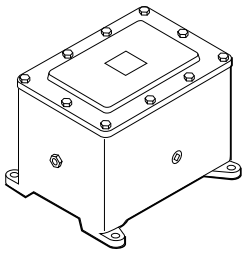
Product Number	Description	Used With
311852	Brown Spring for MP953A,C 3/4 inch stroke (8 inch diameter), 2-7 psi range	MP953A,C (8 in., 2-7 psi)
311855	Gray spring for MP953C (8 inch diameter), 8-12 psi range	MP953C
311863	Stem Retainer for the MP953C,E (8 in. diameter)	MP953C,E
312099	1-1/2 in. stroke Spider for 13 in. MP953C and E	MP953C,E
312203	Black Spring for MP953D,F for 8-13 psi range	MP953D,F
312466/0605	Stem Extension for MP953C1489, MP953C1471, MP953E1392, MP953E1400, and MP953E1418	MP953C,E
312471	White Spring for MP953C,E (13 in. dia. 1/2 in. stroke)	MP953C,E (13 in.)
312505	MP953A,C,E (13 in. diameter) regular temperature Neoprene diaphragm - New style	MP953A,C,E
312760	MP953A,C,E (5 in. diameter) regular temperature Neoprene diaphragm - New style	MP953A,C,E
313745	MP953A, C and E (5 in. diameter) High Temperature Silicone Diaphragm - New Style	MP953A,C,E
314153	MP953A, C and E (8 in. diameter) High Temperature Silicone Diaphragm - New Style	MP953A,C,E
314646A/0062	Plate, Spring for 13 in. diameter MP953A,C,E	MP953A,C,E
314650A	MP953B, D and F (Reverse Acting) Support Assembly (for Series-2 actuators only, use this Support Assembly and 316059A Yoke Assembly to Convert Series-1 MO/MP953)	MP953B,D,F
314651A	MP953B,D,F (Reverse Acting) yoke assembly for support assembly- with nylon insert for use with old style actuators not made with a Helicoil insert in yoke	MP953B,D,F
314652	Spring for MP953D,F (used in yoke assembly)	MP953D,F
314683/0062	Stem Retainer for 13 in. diameter MP953A,C,E (Latches on Stem Button)	MP953A,C,E (13 in.)
315020	Cup for MP953C,E (13 inch diameter)	MP593C,E (13 in.)
316059A	MP953B, D and F (Reverse Acting) Yoke Assembly for Support Assembly- with helicoil insert	MP953B,D,F

Foot Mounted Motor Accessories

	Product Number	Description	Used With
	**16230**	Adapter bushing for cast crank arm 18437 to be used with Modutrol IV Motor	Modutrol IV Motors
	**18437**	Cast crank arm for Modutrol Motors - need adapter bushing 16230	Modutrol IV Motors
	**203709D2**	Screw Terminal Adapter for Series 70 Mod IV Motors With Zero and Span Adjustment	Series 2 and Series 3 Modutrol IV™ motors
	**220736A**	Internal Auxiliary Switch Assembly includes one Micro Switch V3 precision switch	TRADELINE Modutrol IV Motors
	220736B	Internal Auxiliary Switch Assembly includes two Micro Switch V3 precision switches	TRADELINE Modutrol IV Motors
	**220738A**	Adapter Bracket. Adjusts shaft height to match Modutrol III motors	Mod IV Actuator to match shaft height of Mod III Actuator
	220741A2-61	Screw Terminal Adapter Kit for Series 61 Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals	Series 61 Mod IV Motor
	220741A2-62	Screw Terminal Adapter Kit for Series 62 Series Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals	Series 62 Mod IV Motor
	**220741A2-71**	Screw Terminal Adapter Kit for Series 71 Modutrol IV Series 2 motors- Converts quick-connect terminals to screw terminals	Series 71 Mod IV Motor
	220741A2-72	Screw Terminal Adapter Kit for Series 72 Modutrol IV Series 2 motors - Converts quick-connect terminals to screw terminals	Series 72 Mod IV Motor
	220741A2-90	Screw Terminal Adapter Kit for Series 90 Modutrol IV Series 2and Series 3 motors - Converts quick-connect terminals to screw terminals	Series 90 Mod IV Motor
	220741A2-TP	Screw Terminal Adapter Kit for 2 position Modutrol IV Series 2 motors - Converts quick-connect terminals to screw terminals	Two Position for use with M4XXX and M8XXX Mod IV Motors

Foot Mounted Motor Accessories

Foot Mounted Motor Accessories (cont.)

	Product Number	Description	Used With
	**221455A**	Infinitely adjustable Motor Crank Arm	Modutrol IV Motors
	**221508A2**	Resistor Board Assembly for Series 2 and 3 Modutrol IV Motors	Series 2 and Series 3 Modutrol IV™ motors
	**50017460-001**	24/120/230 Vac Internal Transformers for Series 2 and 3 Motors. Includes transformer, screws, instructions for mounting internally	Series 2 and Series 3 Modutrol IV™ motors
	**50017460-003**	120 Vac Internal Transformers for Series 2 and 3 Motors includes Transformer, screws, instructions for mounting internally	Series 2 and Series 3 Modutrol IV™ motors
	**4074ERU**	Weatherproofing kit. Protects motor from driving rain when mounted in any position	Fits all Modutrol IV motors
	**7617DM**	Coupling- Must be used with ES650117 explosion-proof housing	ES650117
	**ES-650-117**	Explosion-Proof Housing encloses motor for use in explosive atmospheres. To order contact: EGS Enclosures, Karen Barfield (281) 774-3763; or write to: EGS Enclosures in Houston, TX Karen.barfield@egseg.com Part number ES-650-117	Modutrol IV Motors, not for use with Q5001 (or any other valve linkages)
	**Q7230A1005**	Interface module, provides adjustable zero & span, voltage or current control	Series 90 for conversion to Series 70

Damper and Valve Linkage Accessories

Product Number	Description	Used With
102546	Ball Joint, 5/16 in.	Damper Linkages
101662A/0021	Motor Mounting Bracket Assembly for Q605	Q605
102931/0021	Adapter arm for less that 90 degree rotation for the Q605	Q605
104643A	Adapter for driving 2 dampers from 1 crank arm	Kit Mounted Motors; Modutrol IV Motors
220845/0767	Retainer button for Q5001	Q5001
220848A	Q5001 Cam	Q5001
220852A	Stroke Indicator, Q5001	Q5001
220861A	3/4 inch lift Q5001 linkage cam assembly	Q5001
220863A	1 inch lift Q5001 linkage cam assembly	Q5001
220864A	1 1/8 inch lift Q5001 linkage cam assembly	Q5001
220865A	1 1/4 inch lift Q5001 linkage cam assembly	Q5001
220867A	1 1/2 inch lift Q5001 linkage cam assembly	Q5001
220874/0767	9/16 inch anti spin clip for Q5001	Q5001
26025F	Damper Arm, 3/8 in. shaft	—
26026B	Damper Arm, 1/2 in. shaft, 3 in. long	—
32004629-001	Bonnet adapter kit to adapt Seimens (Landis/Power) Flowrite 599 1/2 inch to 3 inch globe valves with Q5020A or Q5009B	Siemens valves
32004629-002	Bonnet Adapter Kit, Johnson Controls 1/2 to 3/4 in., Q5020	Johnson valves; Q5020
32004629-003	Bonnet Adapter Kit, Johnson Controls 1 to 2 in., Q5020	Johnson valves; Q5020
32004629-004	Bonnet Adapter Kit, Siebe 1/2 to 2 in., Q5020	Siebe valves; Q5020
4074ETB	Antispin Kit, Q5001	Q5001
7617ACL	Bag Assembly, Q605	Q605

Notes

Section 8: Competitive Cross Reference

Direct Coupled Actuator

Belimo Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
LMB24-3-P5-T	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	0-5 kOhm	—	95	ML6174A2002 + 200976A	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac (±20%)	500 Ohm	—	95
							ML6174A2002 + 200976C		On/Off, Floating	24 Vac (±20%)	2 kOhm	—	95
LMB24-3-P10-T	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	0-10 kOhm	—	95	ML6174A2002 + 200976A	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac (±20%)	500 Ohm	—	95
							ML6174A2002 + 200976C		On/Off, Floating	24 Vac (±20%)	2 kOhm	—	95
LMB24-3	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
LMB24-3-T	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
LMB24-3-S	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	1 (0-95)	95	MN6105A1201	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
LMB24-SR	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX24-SR	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	95 (selectable 35-150)	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMB24-SR-T	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX24-SR-T	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95 (selectable 35-150)	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX24-MFT	45 lb-in. (5 Nm)	MFT	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 35-150)	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX24-MFT	45 lb-in. (5 Nm)	MFT	24 Vac/Vdc	Variable (0-10 Vdc)	Add-On	150 (selectable 35-150)	MN7505A2209	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
LMCB24-3	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	35	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
LMCB24-3-T	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	35	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
LMX24-3	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95 (selectable 35-150)	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
LMX24-3-T	45 lb-in. (5 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95 (selectable 35-150)	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
LMX120-3	45 lb-in. (5 Nm)	On/Off, Floating	100-240 Vac	—	—	95 (selectable 35-150)	—	—	—	—	—	—	—
LMCB24-SR	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	35	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMCB24-SR-T	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	35	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX120-SR	45 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	100-240 Vac	2-10 Vdc	—	95 (selectable 35-150)	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX24-MFT95	45 lb-in. (5 Nm)	0-135 Ohm	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 35-150)	MN7505A2001 + Q7002B1009	44 lb-in. (5 Nm)	0-135 OHM	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
LMX24-PC	45 lb-in. (5 Nm)	0-20 V Phase Cut	24 Vac/Vdc	2-10 Vdc	—	95	—	—	—	—	—	—	—
NMB24-3	90 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
NMCB24-3	90 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	45	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
NMX24-3	90 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95 (selectable 35-150)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95

Belimo Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
NMCB24-3-T	90 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	45	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
NMX24-3-T	90 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95 (selectable 35-150)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
NMX120-3	90 lb-in. (10 Nm)	On/Off, Floating	100-240 Vac	—	—	95 (selectable 35-150)	—	—	—	—	—	—	—
NMB24-SR	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMCB24-SR	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	45	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMX24-SR	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	95 (selectable 35-150)	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMCB24-SR-T	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	45	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMX24-SR-T	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95 (selectable 35-150)	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMX120-SR	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	100-240 Vac	2-10 Vdc	—	95 (selectable 35-150)	—	—	—	—	—	—	—
NMX24-MFT	90 lb-in. (10 Nm)	MFT	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 35-150)	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMX24-MFT95	90 lb-in. (10 Nm)	0-135 Ohm	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 45-170)	MN7510A2001 + Q7002B1009	88 lb-in. (10 Nm)	0-135 OHM	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMX24-PC	90 lb-in. (10 Nm)	0-20 Vdc Phase Cut	24 Vac/Vdc	2-10 Vdc	—	95	—	—	—	—	—	—	—
NMQ24-MFT US	90 lb-in. (10 Nm)	MFT	24 Vac/Vdc	—	—	150	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
NMB24-3+S2A	90 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc	—	2 (adj 0-95)	95	MN6110A1201	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
NMB24-SR + S2A	90 lb-in. (10 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	2 (adj 0-95)	95	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
AMB24-3	180 lb-in. (20 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
AMX24-3	180 lb-in. (20 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95 (selectable 95-300)	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
AMX24-3-T	180 lb-in. (20 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	95 (selectable 95-300)	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
AMB24-3-S	180 lb-in. (20 Nm)	On/Off, Floating	24 Vac/Vdc	—	1 (adj 0-95)	95	MN6120A1200	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (5, 85)	95
AMX120-3	180 lb-in. (20 Nm)	On/Off, Floating	100-240 Vac	—	—	95 (selectable 95-300)	—	—	—	—	—	—	—
AMB24-SR	180 lb-in. (20 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	95	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
AMX24-SR	180 lb-in. (20 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	95 (selectable 95-300)	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
AMX24-SR-T	180 lb-in. (20 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95 (selectable 95-300)	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
AMB24-SR+S2A	180 lb-in. (20 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	2 (adj 0-95)	95	MN7220A2205	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (5, 85)	95
AMX120-SR	180 lb-in. (20 Nm)	2-10 Vdc (4-20 mA)	100-240 Vac	2-10 Vdc	—	95 (selectable 95-300)	—	—	—	—	—	—	—

Direct Coupled Actuator

Belimo Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
AMX24-MFT	180 lb-in. (20 Nm)	MFT	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 95-300)	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
AMX24-MFT95	180 lb-in. (20 Nm)	0-135 Ohm	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 95-300)	MN7220A2007+ Q7002B1009	175 lb-in. (20 Nm)	0-135 OHM	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
AMX24-PC	180 lb-in. (20 Nm)	0-20 Vdc Phase Cut	24 Vac/Vdc	2-10 Vdc	—	150 (selectable 95-300)	—	—	—	—	—	—	—
GMB24-3	360 lb-in. (40 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	150	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
GMX24-3	360 lb-in. (40 Nm)	On/Off, Floating	24 Vac/Vdc	—	—	150	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
GMX120-3	360 lb-in. (40 Nm)	On/Off, Floating	100-240 Vac	—	—	150	—	—	—	—	—	—	—
GMB24-SR	360 lb-in. (40 Nm)	2-10 Vd (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	150	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GMX24-SR	360 lb-in. (40 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	150	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GMX24-MFT	360 lb-in. (40 Nm)	MFT	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 70-300)	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GMX24-MFT95	360 lb-in. (40 Nm)	0-135 Ohm	24 Vac/Vdc	Variable (0-10 Vdc)	—	150 (selectable 70-300)	MN7234A2008 + Q7002B1009	300 lb-in. (34 Nm)	0-135 OHM	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GMX24-PC	360 lb-in. (40 Nm)	0-20 Vdc Phase Cut	24 Vac/Vdc	2-10 Vdc	—	150 (selectable 70-300)	—	—	—	—	—	—	—
LF24 US	35 lb-in. (5 Nm)	On/Off	24 Vac/Vdc	—	—	40-75	MS8105A1030	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
LF24-S US	35 lb-in. (5 Nm)	On/Off	24 Vac/Vdc	—	1 (adj 0-95)	40-75	MS8105A1130	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	1 (Adjustable)	45
LF120 US	35 lb-in. (5 Nm)	On/Off	120 Vac	—	—	40-75	MS4105A1030	44 lb-in. (5 Nm)	On/Off	100-250 Vac	—	—	45
LF120-S US	35 lb-in. (5 Nm)	On/Off	120 Vac	—	1 (adj 0-95)	40-75	MS4105A1130	44 lb-in. (5 Nm)	On/Off	100-250 Vac	—	1 (Adjustable)	45
LF230 US	35 lb-in. (5 Nm)	On/Off	230 Vac	—	—	40-75	MS4105A1030	44 lb-in. (5 Nm)	On/Off	100-250 Vac	—	—	45
LF230-S US	35 lb-in. (5 Nm)	On/Off	230 Vac	—	1 (adj 0-95)	40-75	MS4105A1130	44 lb-in. (5 Nm)	On/Off	100-250 Vac	—	1 (Adjustable)	45
LF24-3 US	35 lb-in. (5 Nm)	Modulating	24 Vac/Vdc	—	—	150	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
LF24-3-S US	35 lb-in. (5 Nm)	Modulating	24 Vac/Vdc	—	1 (adj 0-95)	150	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
LFC24-3-R US	35 lb-in. (5 Nm)	Floating	24 Vac/Vdc	—	—	90	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
LFC24-3-S US	35 lb-in. (5 Nm)	Floating	24 Vac/Vdc	—	1 (adj 0-95)	90	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
LF24-SR US	35 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	150	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
LF24-SR-S US	35 lb-in. (5 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	1 (adj 0-95)	150	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
LF24-SR-E US	35 lb-in. (5 Nm)	2-10 Vdc, Built-in. minimum position	24 Vac/Vdc	2-10 Vdc	—	150	MS7405A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc, Economizer (3kOhm, 3-Position)	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc		90

Belimo Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
LF24-ECON-R03 US	35 lb-in. (5 Nm)	0-3 kOhm, type 10 thermistor	24 Vac/Vdc	2-10 Vdc	—	95	MS7405A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc, Economizer (3kOhm, 3-Position)	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc		90
LF24-ECON-R10 US	35 lb-in. (5 Nm)	0-10 kOhm, type 7 thermistor	24 Vac/Vdc	2-10 Vdc	—	95	—	—	—	—	—	—	—
LF24-MFT US	35 lb-in. (5 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	—	150	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
LF24-MFT-S US	35 lb-in. (5 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	1 (adj 0-95)	150	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
LF24-MFT-20 US	35 lb-in. (5 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	—	150	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
LF24-MFT-20-S US	35 lb-in. (5 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	1 (adj 0-95)	150	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
NF24 US	60 lb-in. (7 Nm)	On/Off	24 Vac/Vdc	—	—	< 75	MS8110A1008	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
NF24-S US	60 lb-in. (7 Nm)	On/Off	24 Vac/Vdc	—	1 (adj 5-85)	< 75	MS8110A1206	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
NF24-S2 US	60 lb-in. (7 Nm)	On/Off	24 Vac/Vdc	—	2 (5, and adj 25-85)	< 75	MS8110A1206	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
NF120 US	60 lb-in. (7 Nm)	On/Off	120 Vac	—	—	< 75	MS4110A1002	88 lb-in. (10 Nm)	On/Off	100-250 Vac	—	—	45
NF120-S US	60 lb-in. (7 Nm)	On/Off	120 Vac	—	1 (adj 5-85)	< 75	MS4110A1200	88 lb-in. (10 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
NF24-SR US	60 lb-in. (7 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	150	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
NF24-SR-S US	60 lb-in. (7 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	1 (adj 5-85)	150	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
NF24-MFT US	60 lb-in. (7 Nm)	MFT	24 Vac/Vdc	—	—	150	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
AF24 US	133 lb-in. (15 Nm)	On/Off	24 Vac/Vdc	—	—	150	MS8120A1007	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
AF24-S US	133 lb-in. (15 Nm)	On/Off	24 Vac/Vdc	—	2 (5, and adj 25-85)	150	MS8120A1205	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
AF120 US	133 lb-in. (15 Nm)	On/Off	120 Vac	—	—	150	MS4120A1001	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	—	45
AF120-S US	133 lb-in. (15 Nm)	On/Off	120 Vac	—	2 (5, and adj 25-85)	150	MS4120A1209	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
AF230 US	133 lb-in. (15 Nm)	On/Off	230 Vac	—	—	150	MS4120A1001	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	—	45
AF230-S US	133 lb-in. (15 Nm)	On/Off	230 Vac	—	2 (5, and adj 25-85)	150	MS4120A1209	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
AF24-SR US	133 lb-in. (15 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	2-10 Vdc	—	150	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
AF24-MFT US	133 lb-in. (15 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	—	150	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
AF24-MFT-S US	133 lb-in. (15 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	2 (5, and adj 25-85)	150	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
AF24-MFT-S US	133 lb-in. (15 Nm)	MFT	24 Vac/Vdc	2-10 Vdc	2 (5, and adj 25-85)	150	MS7520H2208	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
AF24-MFT95 US	133 lb-in. (15 Nm)	0-135 Ohm	24 Vac/Vdc	—	—	150	MS7520A2007 + Q7002B1009	175 lb-in. (20 Nm)	0-135 ohm	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90

Direct Coupled Actuator

Belimo Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
TF24 US	18 lb-in. (2 Nm)	On/Off	24 Vac/Vdc	—	—	<75	MS8103A1030	27 lb-in. (3 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
TF24-S US	18 lb-in. (2 Nm)	On/Off	24 Vac/Vdc	—	1 (adj 0-95)	<75	MS8103A1130	27 lb-in. (3 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	1 (Adjustable	45
TF120 US	18 lb-in. (2 Nm)	On/Off	100-240 Vac	—	—	<75	MS4103A1030	27 lb-in. (3 Nm)	On/Off	100-250 Vac	—	—	45
TF120-S US	18 lb-in. (2 Nm)	On/Off	100-240 Vac	—	1 (adj 0-95)	<75	MS4103A1130	27 lb-in. (3 Nm)	On/Off	100-250 Vac	—	1 (Adjustable	45
TF24-SR US	18 lb-in. (2 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	—	95	MS7503A2030	27 lb-in. (3 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
TF24-SR-S US	18 lb-in. (2 Nm)	2-10 Vdc (4-20 mA)	24 Vac/Vdc	—	1 (adj 0-95)	95	MS7503A2130	27 lb-in. (3 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%) 24 Vdc	(0) 2-10 Vdc	1 (Adjustable	90
TF24-3 US	18 lb-in. (2 Nm)	Floating	24 Vac/Vdc	—	—	95	MS7503A2030	27 lb-in. (3 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
TF24-3-S US	18 lb-in. (2 Nm)	Floating	24 Vac/Vdc	—	1 (adj 0-95)	95	MS7503A2130	27 lb-in. (3 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable	90

[a] All models described as (0) 2-10 Vdc can be used with a 4-20 mA control input. Shunt a 500 ohm, 1/2 W resistor across the input at the actuator.

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9104-AGA-2N	35 lb-in. (4 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	90 / 108 (at 60 / 50 Hz)	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
M9104-AGS-2N	35 lb-in. (4 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	90 / 108 (at 60 / 50 Hz)	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
M9106-IGA-2	53 lb-in. (6 Nm) and 35 lb-in. (4 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	Selectable: 60, 90, 120, 330, or 660 (at 60 Hz). 72, 108, 144, 396, or 792 (at 50 Hz).	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
M9106-IGC-2	53 lb-in. (6 Nm) and 35 lb-in. (4 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	Selectable: 60, 90, 120, 330, or 660 (at 60 Hz). 72, 108, 144, 396, or 792 (at 50 Hz).	MN6105A1201	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
M9106-AGA-2	53 lb-in. (6 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	60 / 72 (at 60 / 50 Hz)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc (+20 / -15%)	—	—	95
M9106-AGA-2N01	53 lb-in. (6 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	60 / 72 (at 60 / 50 Hz)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc (+20 / -15%)	—	—	95
M9106-AGA-2N02	53 lb-in. (6 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	120 / 144 (at 60 / 50 Hz)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc (+20 / -15%)	—	—	95
M9106-AGC-2	53 lb-in. (6 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	2	60 / 72 (at 60 / 50 Hz)	MN6110A1201	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/Vdc (+20 / -15%)	—	2 (5, 85)	95
M9106-AGF-2	53 lb-in. (6 Nm)	Floating	20 to 30 Vac at 50/60 Hz	0-10 kOhm	—	60 / 72 (at 60 / 50 Hz)	ML6174B2019 + 200976C	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac	0-2 kOhm	—	95
M9106-AGS-2N02	53 lb-in. (6 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	120 / 144 (at 60 / 50 Hz)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
M9106-GGA-2	53 lb-in. (6 Nm)	(0) 2-10 Vdc, (0) 4 to 20 mA	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	—	60 / 72 (at 60 / 50 Hz)	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9106-GGC-2	53 lb-in. (6 Nm)	(0) 2-10 Vdc, (0) 4 to 20 mA	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	2	60 / 72 (at 60 / 50 Hz)	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
M9108-AGA-2	70 lb-in. (8 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
M9108-AGC-2	70 lb-in. (8 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	MN6110A1201	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
M9108-AGD-2	70 lb-in. (8 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-135 Ohm	—	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	ML6174B2019 + 200976A	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac	0-500 Ohm	—	95
M9108-AGE-2	70 lb-in. (8 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-1 kOhm	—	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	ML6174B2019 + 200976C	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac	0-2 kOhm	—	95
M9108-GGA-2	70 lb-in. (8 Nm)	0-20 Vdc (selectable zero and span), (0) 4 to 20 mA, Reversible.	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	—	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
M9108-GGC-2	70 lb-in. (8 Nm)	0-20 Vdc (selectable zero and span), (0) 4 to 20 mA, Reversible.	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	2	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
M9108-HGA-2	70 lb-in. (8 Nm)	0-20 Vdc (adjustable zero and span), (0) 4 to 20 mA, Reversible.	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	—	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
M9108-HGC-2	70 lb-in. (8 Nm)	0-20 Vdc (adjustable zero and span), (0) 4 to 20 mA, Reversible.	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	2	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
M9108-JGA-2	70 lb-in. (8 Nm)	100-10 kOhms. Reversible.	20 to 30 Vac at 50/60 Hz	0-10 Vdc	—	25-50 for 0-70 lb-in. (0-8 Nm), 30 at 50% load.	—	—	—	—	—	—	—
M9108-JGC-2	70 lb-in. (8 Nm)	100-10 kOhms. Reversible.	20 to 30 Vac at 50/60 Hz	0-10 Vdc	2	25-50 for 0-70 lb-in (0-8 Nm), 30 at 50% load..	—	—	—	—	—	—	—
M9109-AGA-2	80 lb-in. (9 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	—	60 / 72 (at 60 / 50 Hz)	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
M9109-AGC-2	80 lb-in. (9 Nm)	Floating	20 to 30 Vac at 50/60 Hz	—	2	60 / 72 (at 60 / 50 Hz)	MN6110A1201	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
M9109-GGA-2	80 lb-in. (9 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	—	60 / 72 (at 60 / 50 Hz)	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95

Direct Coupled Actuator

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9109-GGC-2	80 lb-in. (9 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	2	60 / 72 (at 60 / 50 Hz)	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
M9116-AGA-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9116-AGC-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN6120A1200	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (5, 85)	95
M9116-AGD-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-135 Ohm	—	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9116-AGE-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-1 kOhm	—	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9116-GGA-2	140 lb-in. (16 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	—	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
M9116-GGC-2	140 lb-in. (16 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	2	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN7220A2205	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (5, 85)	95
M9116-HGA-2	140 lb-in. (16 Nm) & 280 lb- in. (32 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	—	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
M9116-HGC-2	140 lb-in. (16 Nm) & 280 lb- in. (32 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc). Corresponds to span selection.	2	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	MN7220A2205	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (5, 85)	95
M9116-JGA-2	140 lb-in. (16 Nm)	100-10 kOhms, Reversible	20 to 30 Vac at 50/60 Hz	0-10 Vdc for 90	—	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	—	—	—	—	—	—	—
M9116-JGC-2	140 lb-in. (16 Nm)	100-10 kOhms, Reversible	20 to 30 Vac at 50/60 Hz	0-10 Vdc for 90	2	70-115 for 0-140 lb-in. (0-16 Nm). 80 at 50% load.	—	—	—	—	—	—	—
M9124-AGA-2	210 lb-in. (24 Nm) & 420 lb- in. (48 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9124-AGC-2	210 lb-in. (24 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN6134A1003 + SW2	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (Adjustable)	95

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9124-AGD-2	210 lb-in. (24 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-1 35 Ohm	—	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9124-AGE-2	210 lb-in. (24 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-1 kOhm	—	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9124-GGA-2	210 lb-in. (24 Nm) & 420 lb- in. (48 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span selection.	—	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
M9124-GGC-2	210 lb-in. (24 Nm) & 420 lb- in. (48 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span selection.	2	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN7234A2008 + SW2	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (Adjustable)	95
M9124-HGA-2	210 lb-in. (24 Nm) & 420 lb- in. (48 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span selection.	—	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
M9206-BGA-2S	53 lb-in. (6 Nm)	On/Off	20 to 30 Vac at 50/60 Hz	—	—	10-40 for 0-53 lb-in. (0-6 Nm) 25 at 50% load. Spring return < 70.	MS8110A1008	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
M9206-BGB-2S	53 lb-in. (6 Nm)	On/Off	20 to 30 Vac at 50/60 Hz	—	1	10-40 for 0-53 lb-in. (0-6 Nm) 25 at 50% load. Spring return < 70.	MS8110A1206	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
M9206-BAA-2S	53 lb-in. (6 Nm)	On/Off	102 to 132 Vac at 60 Hz	—	—	10-40 for 0-53 lb-in. (0-6 Nm) 25 at 50% load. Spring return < 70.	MS4110A1002	88 lb-in. (10 Nm)	On/Off	100-250 Vac	—	—	45
M9206-BAB-2S	53 lb-in. (6 Nm)	On/Off	102 to 132 Vac at 60 Hz	—	1	10-40 for 0-53 lb-in. (0-6 Nm) 25 at 50% load. Spring return < 70.	MS4110A1200	88 lb-in. (10 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
M9206-AGA-2S	53 lb-in. (6 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	90	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9206-AGA-2MP	53 lb-in. (6 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	90	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9206-AGC-2	53 lb-in. (6 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	90	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
M9206-AGC-2MP	53 lb-in. (6 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	90	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90

Direct Coupled Actuator

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9124-HGC-2	210 lb-in. (24 Nm) & 420 lb- in. (48 Nm)	(0) 2-10 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span selection.	2	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	MN7234A2008 + SW2	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (Adjustable)	95
M9124-JGA-2	210 lb-in. (24 Nm)	100-10 kOhms, Reversible	20 to 30 Vac at 50/60 Hz	0-10 Vdc for 90 (1 mA at 10 Vdc)	—	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	—	—	—	—	—	—	—
M9124-JGC-2	210 lb-in. (24 Nm)	100-10 kOhms, Reversible	20 to 30 Vac at 50/60 Hz	0-10 Vdc for 90 (1 mA at 10 Vdc)	2	115-175 for 0-210 lb-in. (0-24 Nm). 130 at 50% load.	—	—	—	—	—	—	—
M9132-AGA-2	280 lb-in. (32 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	—	115-205 for 0-280 lb-in. (0-32 Nm). 140 at 50% load.	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9132-AGC-2	280 lb-in. (32 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	—	2	115-205 for 0-280 lb-in. (0-32 Nm). 140 at 50% load.	MN6134A1003 + SW2	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (Adjustable)	95
M9132-AGE-2	280 lb-in. (32 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz	0-1 kOhm	—	115-205 for 0-280 lb-in. (0-32 Nm). 140 at 50% load.	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
M9132-GGA-2	280 lb-in. (32 Nm) & 560 lb- in. (64 Nm)	(0) 2-10 Vdc, (0) 4 to 20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	—	115-205 for 0-280 lb-in. (0-32 Nm). 140 at 50% load.	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
M9132-GGC-2	280 lb-in. (32 Nm) & 560 lb-in. (64 Nm)	(0) 2-10 Vdc, (0) 4 to 20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	2	115-205 for 0-280 lb-in. (0-32 Nm). 140 at 50% load.	MN7234A2008 + SW2	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (Adjustable)	95
							MS4105A1002	44 lb-in. (5 Nm)	On/Off	100-250 Vac	—	—	45
M9206-GGA-2	53 lb-in. (6 Nm)	(0) 2-10 Vdc, 6-9 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	—	90	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9206-GGA-2MP	53 lb-in. (6 Nm)	(0) 2-10 Vdc, 6-9 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	—	90	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9206-GGC-2	53 lb-in. (6 Nm)	(0) 2-10 Vdc, 6-9 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	2	90	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
M9206-GGC-2MP	53 lb-in. (6 Nm)	(0) 2-10 Vdc, 6-9 Vdc, (0) 4-20 mA, Reversible	20 to 30 Vac at 50/60 Hz	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	2	90	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
							MS7510H2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9216-BAA-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	On/Off	120 Vac	—	—	—	MS4120A1001	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	—	45
M9216-BAC-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	On/Off	120 Vac	—	2	—	MS4120A1209	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
M9216-BGA-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	On/Off	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	—	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS8120A1007	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
M9216-BGC-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	On/Off	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	—	2	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS8120A1205	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
M9216-AGA-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	—	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9216-AGC-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	—	2	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
M9216-AGD-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	0-135 Ohms	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9216-AGE-2	140 lb-in. (16 Nm)	On/Off, Floating	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	0-1 kOhms	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9216-GGA-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	0-10 Vdc, 0-20 mA, Reversible	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
M9216-GGC-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	0-10 Vdc, 0-20 mA, Reversible	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	2	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90

Direct Coupled Actuator

Johnson Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
M9216-HGA-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	0-10 Vdc, 0-20 mA, Reversible	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520H2208	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
M9216-HGC-2	140 lb-in. (16 Nm) & 280 lb-in. (32 Nm)	100-10 kOhm Reversible	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	(0) 2-10 Vdc for 90 (1 mA at 10 Vdc) Corresponds to span and stroke limits	2	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	MS7520H2208	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
M9216-JGA-2	140 lb-in. (16 Nm)	100-10 kOhm Reversible	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	0 -10 Vdc for 90 (1 mA at 10 Vdc)	—	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	—	—	—	—	—	—	—
M9216-JGC-2	140 lb-in. (16 Nm)	100-10 kOhm Reversible	20 to 30 Vac at 50/60 Hz or 24 Vdc, 420 mA	0 -10 Vdc for 90 (1 mA at 10 Vdc)	2	70-130 for 0-140 lb-in. (0-16 Nm), 90 at 50% load. Spring return < 15.	—	—	—	—	—	—	—

[a] All models described as (0) 2-10 Vdc can be used with a 4-20 mA control input. Shunt a 500 ohm, 1/2 W resistor across the input at the actuator.

Invensys Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
MA40-7043	35 lb-in. (4 Nm)	On/Off	24 Vac ±20% 22-30 Vdc	—	-	< 50	MS8105A1030	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
MA40-7043-501	35 lb-in. (4 Nm)	On/Off	24 Vac ±20% 22-30 Vdc	—	1	< 50	MS8105A1130	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	1 (Adjustable)	45
MF40-7043	35 lb-in. (4 Nm)	Floating	24 Vac ±20% 22-30 Vdc	—	-	< 130	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MF40-7043-501	35 lb-in. (4 Nm)	Floating	24 Vac ±20% 22-30 Vdc	—	1	< 130	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
MS40-7043	35 lb-in. (4 Nm)	2-10 Vdc 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	-	< 130	MS7505A2030	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS40-7043-501	35 lb-in. (4 Nm)	2-10 Vdc 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	1	< 130	MS7505A2130	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	1 (Adjustable)	90
MA41-7073	60 lb-in. (7 Nm)	On/Off	24 Vac ±20% 22-30 Vdc	—	-	< 80	MS8110A1008	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
MA41-7073-502	60 lb-in. (7 Nm)	On/Off	24 Vac ±20% 22-30 Vdc	—	2	< 80	MS8110A1206	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
MF41-7073	60 lb-in. (7 Nm)	Floating	24 Vac ±20% 22-30 Vdc	—	-	< 195	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MF41-7073-502	60 lb-in. (7 Nm)	Floating	24 Vac ±20% 22-30 Vdc	—	2	< 195	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
MS41-7073	60 lb-in. (7 Nm)	2-10 Vdc 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	-	< 195	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS41-7073-502	60 lb-in. (7 Nm)	2-10 Vdc 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	2	< 195	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90

Invensys Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
MA41-7153	133 lb-in. (15 Nm)	On/Off	24 Vac ±20% 22-30 Vdc	—	-	< 190	MS8120A1007	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
MA41-7153-502	133 lb-in. (15 Nm)	On/Off	24 Vac ±20% 22-30 Vdc	—	2	< 190	MS8120A1205	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
MF41-7153	133 lb-in. (15 Nm)	Floating	24 Vac ±20% 22-30 Vdc	—	-	< 190	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MF41-7153-502	133 lb-in. (15 Nm)	Floating	24 Vac ±20% 22-30 Vdc	—	2	< 190	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
MS41-7153	133 lb-in. (15 Nm)	2-10 Vdc	24 Vac ±20% 22-30 Vdc	2-10 Vdc	-	< 190	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS41-7153-502	133 lb-in. (15 Nm)	2-10 Vdc	24 Vac ±20% 22-30 Vdc	2-10 Vdc	2	< 190	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
MA40-7170	150 lb-in. (17 Nm)	On/Off	120 Vac ±10%	—	-	< 145	MS4120A1001	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	—	45
MA40-7173	150 lb-in. (17 Nm)	On/Off	24 Vac ±20%	—	-	< 145	MS8120A1007	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
MF40-7173	150 lb-in. (17 Nm)	Floating	24 Vac ±20%	—	-	< 145	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS40-7170	150 lb-in. (17 Nm)	2-10 Vdc 4-20 mA	120 Vac ±10%	—	-	< 145	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS40-7173	150 lb-in. (17 Nm)	2-10 Vdc 4-20 mA	24 Vac ±20%	—	-	< 145	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MA4D-7033-100	30 lb-in. (3.4 Nm)	On/Off	24 Vac ±20% 20-30 Vdc	—	-	< 56	MS8105A1008	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
MA4D-8033-100	30 lb-in. (3.4 Nm)	On/Off	24 Vac ±20% 20-30 Vdc	—	-	< 56	MS8105A1008	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
MF4D-7033-100	30 lb-in. (3.4 Nm)	Floating	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MF4D-8033-100	30 lb-in. (3.4 Nm)	Floating	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS4D-7033-100	30 lb-in. (3.4 Nm)	(0) 2-10 Vdc, 4-20 mA	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS4D-7033-150	30 lb-in. (3.4 Nm)	(0) 2-10 Vdc, 4-20 mA	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS4D-7033-160	30 lb-in. (3.4 Nm)	(0) 2-10 Vdc, 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	—	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS4D-8033-100	30 lb-in. (3.4 Nm)	(0) 2-10 Vdc, 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	—	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS4D-8033-150	30 lb-in. (3.4 Nm)	(0) 2-10 Vdc, 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	—	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS4D-8033-160	30 lb-in. (3.4 Nm)	(0) 2-10 Vdc, 4-20 mA	24 Vac ±20% 22-30 Vdc	2-10 Vdc	—	< 85	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS50-E2301	150 lb-in. (17 Nm)	1-5 Vdc 4-20 mA	24 Vac ±10%	—	—	145	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS50-E2001	150 lb-in. (17 Nm)	1-5 Vdc 4-20 mA	120 Vac ±10%	—	—	145	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
MS50-E2101	150 lb-in. (17 Nm)	1-5 Vdc 4-20 mA	240 Vac ±10%	—	—	145	MS7520A2007	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90

Direct Coupled Actuator

Invensys Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
MF41-6043	30 lb-in. (3.4 Nm)	Floating	24 Vac 0.05	—	—	< 90	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
MF41-6043-510	30 lb-in. (3.4 Nm)	Floating	24 Vac 0.05	0-1kOhm	—	< 90	—	—	—	—	—	—	—
MF41-6043-502	30 lb-in. (3.4 Nm)	Floating	24 Vac 0.05	—	2	< 90	MN6105A1201	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (7, 85)	95
MS41-6043	30 lb-in. (3.4 Nm)	0-10 Vdc	24 Vac 0.05	0-10 Vdc	-	< 90	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS41-6043-520	30 lb-in. (3.4 Nm)	0-10 Vdc (adjustable)	24 Vac 0.05	0-10 Vdc	-	< 90	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS41-6043-522	30 lb-in. (3.4 Nm)	0-10 Vdc (adjustable)	24 Vac 0.05	0-10 Vdc	2	< 90	MN7505A2209	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
MS41-6043-502	30 lb-in. (3.4 Nm)	0-10 Vdc	24 Vac 0.05	0-10 Vdc	2	< 90	MN7505A2209	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
MF41-6083	70 lb-in. (8 Nm)	Floating	24 Vac 0.05	—	-	< 125	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
MF41-6083-510	70 lb-in. (8 Nm)	Floating	24 Vac 0.05	0-1kOhm	-	< 125	—	—	—	—	—	—	—
MF41-6083-502	70 lb-in. (8 Nm)	Floating	24 Vac 0.05	—	2	< 125	MN6110A1201	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
MS41-6083	70 lb-in. (8 Nm)	0-10 Vdc	24 Vac 0.05	0-10 Vdc	-	< 125	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS41-6083-520	70 lb-in. (8 Nm)	0-10 Vdc (adjustable)	24 Vac 0.05	0-10 Vdc	-	< 125	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS41-6083-522	70 lb-in. (8 Nm)	0-10 Vdc (adjustable)	24 Vac 0.05	0-10 Vdc	2	< 125	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
MS41-6083-502	70 lb-in. (8 Nm)	0-10 Vdc	24 Vac 0.05	0-10 Vdc	2	< 125	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
MF41-6153	133 lb-in. (15 Nm)	Floating	24 Vac 0.05	—	-	< 125	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
MS41-6153	133 lb-in. (15 Nm)	0-10 Vdc	24 Vac 0.05	0-10 Vdc	-	< 125	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
MS41-6153-502	133 lb-in. (15 Nm)	0-10 Vdc	24 Vac 0.05	0-10 Vdc	2	< 125	MN7220A2205	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (5, 85)	95
MF41-6343	300 lb-in. (34 Nm)	Floating	24 Vac ±20%	—	-	< 145	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
MS41-6340	300 lb-in. (34 Nm)	2-10 Vdc 4-20 mA	120 Vac ±10%	—	-	< 145	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
MS41-6343	300 lb-in. (34 Nm)	2-10 Vdc 4-20 mA	24 Vac ±20%	—	-	< 145	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
MS4D-6043-100	35 lb-in. (4 Nm)	2-10 Vdc	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS4D-6043-150	35 lb-in. (4 Nm)	0-10 Vdc	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS4D-6043-160	35 lb-in. (4 Nm)	4-20 mA	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS4D-6083-100	70 lb-in. (8 Nm)	2-10 Vdc	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MS4D-6083-150	70 lb-in. (8 Nm)	0-10 Vdc	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95

Invensys Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
MS4D-6083-160	70 lb-in. (8 Nm)	4-20 mA	24 Vac ±20% 20-30 Vdc	2-10 Vdc	-	< 85	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
MF4E-60430-100	35 lb-in. (4 Nm)	Floating	24 Vac + 20%- 15%	—	-	90	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
MF4E-60830-100	70 lb-in. (8 Nm)	Floating	24 Vac + 20%- 15%	—	-	90	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
MS50-H2301	300 lb-in. (34 Nm)	1-5 Vdc 4-20 mA	24 Vac ±10%	—	-	145	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
MS50-H2001	300 lb-in. (34 Nm)	1-5 Vdc 4-20 mA	120 Vac ±10%	—	-	145	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
MS50-H2101	300 lb-in. (34 Nm)	1-5 Vdc 4-20 mA	240 Vac ±10%	—	-	145	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
—	—	—	—	—	—	—	MN6120A1200	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (5, 85)	95

[a] All models described as (0) 2-10 Vdc can be used with a 4-20 mA control input. Shunt a 500 ohm, 1/2 W resistor across the input at the actuator.

Siemens Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
—	—	—	—	—	—	—	MN7505A2209	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/Vdc - 15%/+20%	(0) 2-10 Vdc	2 (5, 85)	95
GDE131.1U	44 lb-in. (5 Nm)	Floating	24 Vac	—	—	90	MN6105A1011	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
GDE131.1P	44 lb-in. (5 Nm)	Floating	24 Vac	—	—	90							
GDE131.1T	44 lb-in. (5 Nm)	Floating	24 Vac	—	—	90							
GDE161.1P	44 lb-in. (5 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	90	MN7505A2001	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
GDE161.IT	44 lb-in. (5 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	90							
GDE132.1P	44 lb-in. (5 Nm)	Floating	24 Vac	0-1kOhm	—	90	ML6174A2002 + 200976C	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac	0-2 kOhm	—	95
GDE136.1P	44 lb-in. (5 Nm)	Floating	24 Vac	—	2	90	MN6105A1201	44 lb-in. (5 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
GDE163.1P	44 lb-in. (5 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	90	—	—	—	—	—	—	—
GDE164.1P	44 lb-in. (5 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	90	—	—	—	—	—	—	—
GDE166.1P	44 lb-in. (5 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	90	—	—	—	—	—	—	—
GLB131.1P	88 lb-in. (10 Nm)	Floating	24 Vac	—	—	125	MN6110A1003	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	—	95
GLB161.1P	88 lb-in. (10 Nm)	0-10 Vdc	24 Vac	—	—	125	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
GLB132.1P	88 lb-in. (10 Nm)	Floating	24 Vac	0-1kOhm	—	125	ML6174A2002 + 200976C	70 lb-in. (8 Nm)	On/Off, Floating	24 Vac	0-2 kOhm	—	95
GLB136.1P	88 lb-in. (10 Nm)	Floating	24 Vac	—	2	125	MN6110A1201	88 lb-in. (10 Nm)	On/Off, Floating	24 Vac/ Vdc (+20 / -15%)	—	2 (5, 85)	95
GLB163.1P	88 lb-in. (10 Nm)	0-10 Vdc	24 Vac	—	—	125	MN7510A2001	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	—	95
GLB164.1P	88 lb-in. (10 Nm)	0-10 Vdc	24 Vac	—	2	125	—	—	—	—	—	—	—
GLB166.1P	88 lb-in. (10 Nm)	0-10 Vdc	24 Vac	—	2	125	MN7510A2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/ Vdc (+20 / -15%)	(0) 2-10 Vdc	2 (5, 85)	95
GEB131.1U	132 lb-in. (15 Nm)	Floating	24 Vac	—	—	125	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95

Direct Coupled Actuator

Siemens Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
GEB161.1U	132 lb-in. (15 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	125	—	—	—	—	—	—	—
GEB132.1U	132 lb-in. (15 Nm)	Floating	24 Vac	0-1kOhm	—	125	—	—	—	—	—	—	—
GEB136.1U	132 lb-in. (15 Nm)	Floating	24 Vac	—	2	125	MN6120A1200	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (5, 85)	95
GEB164.1U	132 lb-in. (15 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	125	—	—	—	—	—	—	—
GBB171.1U	177 lb-in. (20 Nm)	On/Off, Floating	24 Vac	—	—	150	—	—	—	—	—	—	—
GBB171.1P	177 lb-in. (20 Nm)	On/Off, Floating	24 Vac	—	—	150	MN6120A1002	175 lb-in. (20 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
GBB161.1U	177 lb-in. (20 Nm)	0-10 Vdc	24 Vac	—	—	150	—	—	—	—	—	—	—
GBB161.1P	177 lb-in. (20 Nm)	0-10 Vdc	24 Vac	—	—	150	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GBB151.1U	177 lb-in. (20 Nm)	4-20 mA	24 Vac	—	—	150	—	—	—	—	—	—	—
GBB151.1P	177 lb-in. (20 Nm)	4-20 mA	24 Vac	—	—	150	MN7220A2007	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GBB175.1U	177 lb-in. (20 Nm)	On/Off, Floating	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GBB175.1P	177 lb-in. (20 Nm)	On/Off, Floating	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GBB166.1U	177 lb-in. (20 Nm)	0-10 Vdc	24 Vac	—	2	150	—	—	—	—	—	—	—
GBB166.1P	177 lb-in. (20 Nm)	0-10 Vdc	24 Vac	—	2	150	MN7220A2205	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (5, 85)	95
GBB156.1U	177 lb-in. (20 Nm)	4-20 mA	24 Vac	—	2	150	—	—	—	—	—	—	—
GBB156.1P	177 lb-in. (20 Nm)	4-20 mA	24 Vac	—	2	150	MN7220A2205	175 lb-in. (20 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (5, 85)	95
GIB131.1U	310 lb-in. (35 Nm)	Floating	24 Vac	—	—	150	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
GIB131.1P	310 lb-in. (35 Nm)	Floating	24 Vac	—	—	150							
GIB132.1U	310 lb-in. (35 Nm)	Floating	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GIB132.1P	310 lb-in. (35 Nm)	Floating	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GIB136.1U	310 lb-in. (35 Nm)	Floating	24 Vac	—	2	150	MN6134A1003 + SW2	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	2 (Adjustable)	95
GIB136.1P	310 lb-in. (35 Nm)	Floating	24 Vac	—	2	150							
GIB163.1U	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GIB163.1P	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GIB164.1U	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	150	—	—	—	—	—	—	—
GIB164.1P	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	150	—	—	—	—	—	—	—
GIB171.1U	310 lb-in. (35 Nm)	On/Off, Floating	24 Vac	—	—	150	MN6134A1003	300 lb-in. (34 Nm)	On/Off, Floating	24 Vac (±15%), 24 Vdc	—	—	95
GIB171.1P	310 lb-in. (35 Nm)	On/Off, Floating	24 Vac	—	—	150							
GIB161.1U	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	—	—	150	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GIB161.1P	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	—	—	150							
GIB151.1U	310 lb-in. (35 Nm)	4-20 mA	24 Vac	—	—	150	MN7234A2008	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	95
GIB151.1P	310 lb-in. (35 Nm)	4-20 mA	24 Vac	—	—	150							
GIB175.1U	310 lb-in. (35 Nm)	On/Off, Floating	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—

Siemens Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
GIB175.1P	310 lb-in. (35 Nm)	On/Off, Floating	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GIB166.1U	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	—	2	150	MN7234A2008 + SW2	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (Adjustable)	95
GIB166.1P	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	—	2	150							
GIB156.1U	310 lb-in. (35 Nm)	4-20 mA	24 Vac	—	2	150	MN7234A2008 + SW2	300 lb-in. (34 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (Adjustable)	95
GIB156.1P	310 lb-in. (35 Nm)	4-20 mA	24 Vac	—	2	150							
GIB161.1P/MAS	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	150	—	—	—	—	—	—	—
GIB164.1P/MAS	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	150	—	—	—	—	—	—	—
GIB161.1P/SLA	310 lb-in. (35 Nm)	0-10 Vdc	24 Vac	—	—	150	—	—	—	—	—	—	—
—	—	—	—	—	—	—	MS4105A1002	44 lb-in. (5 Nm)	On/Off	100-250 Vac	—	—	45
—	—	—	—	—	—	—	MS7505A2008	44 lb-in. (5 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
—	—	—	—	—	—	—	MS8105A1008	44 lb-in. (5 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
—	—	—	—	—	—	—	MS7520H2208	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
—	—	—	—	—	—	—	MS7510H2209	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
GMA121.1U	62 lb-in. (7 Nm)	On/Off	24 Vac	—	—	90	MS8110A1008	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
GMA121.1P	62 lb-in. (7 Nm)	On/Off	24 Vac	—	—	90							
GMA121.1P/B	62 lb-in. (7 Nm)	On/Off	24 Vac	—	—	90							
GMA151.1U	62 lb-in. (7 Nm)	2-10 Vdc	24 Vac/ Vdc	0-1kOhm	—	90	ML7174A2001 + 200976C	70 lb-in. (8 Nm)	(0) 2-10 Vdc, (0) 4-20 mA	24 Vac/Vdc - 15%/+20%	0-2 kOhm	—	95
GMA151.1P	62 lb-in. (7 Nm)	2-10 Vdc	24 Vac/ Vdc	0-1kOhm	—	90							
GMA156.1U	62 lb-in. (7 Nm)	2-10 Vdc	24 Vac/ Vdc	0-1kOhm	2	90	—	—	—	—	—	—	—
GMA156.1P	62 lb-in. (7 Nm)	2-10 Vdc	24 Vac/ Vdc	0-1kOhm	2	90	—	—	—	—	—	—	—
GMA163.1U	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	—	90	—	—	—	—	—	—	—
GMA163.1P	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	—	90	—	—	—	—	—	—	—
GMA164.1U	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	2	90	—	—	—	—	—	—	—
GMA221.1U	62 lb-in. (7 Nm)	On/Off	120 Vac	—	—	90	MS4110A1002	88 lb-in. (10 Nm)	On/Off	100-250 Vac	—	—	45
GMA131.1U	62 lb-in. (7 Nm)	Floating	24 Vac/ Vdc	—	—	90	MS7510A2008	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/Vdc - 15%/+20%	(0) 2-10 Vdc	—	90
GMA161.1U	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	90	—	—	—	—	—	—	—
GMA161.1P	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac	0-1kOhm	—	90	—	—	—	—	—	—	—
GMA132.1U	62 lb-in. (7 Nm)	Floating	24 Vac	0-1kOhm	—	90	—	—	—	—	—	—	—
GMA126.1U	62 lb-in. (7 Nm)	On/Off	24 Vac	—	2	90	MS8110A1206	88 lb-in. (10 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
GMA126.1P	62 lb-in. (7 Nm)	On/Off	24 Vac	—	2	90							
GMA226.1U	62 lb-in. (7 Nm)	On/Off	120 Vac	—	2	90	MS4110A1200	88 lb-in. (10 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
GMA136.1U	62 lb-in. (7 Nm)	Floating	24 Vac	—	2	90	MS7510A2206	88 lb-in. (10 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac/Vdc - 15%/+20%	(0) 2-10 Vdc	2 (7, 85)	90

Direct Coupled Actuator

Siemens Model	Torque (lb-in.)	Control Signal	Power	Feedback	Switches	Timing (sec)	Honeywell Actuator	Torque (lb-in.)	Control Signal[a]	Power	Feedback[a]	Switches	Timing (sec)
GMA166.1U	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	90	—	—	—	—	—	—	—
GMA166.1P	62 lb-in. (7 Nm)	0-10 Vdc	24 Vac	0-1kOhm	2	90	—	—	—	—	—	—	—
GCA121.1U	142 lb-in. (16 Nm)	On/Off	24 Vac	—	—	90	MS8120A1007	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	—	45
GCA121.1P	142 lb-in. (16 Nm)	On/Off	24 Vac	—	—	90							
GCA221.1U	142 lb-in. (16 Nm)	On/Off	120 Vac	—	—	90	MS4120A1001	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	—	45
GCA131.1U	142 lb-in. (16 Nm)	Floating	24 Vac	—	—	90	—	—	—	—	—	—	—
GCA131.1P	142 lb-in. (16 Nm)	Floating	24 Vac	—	—	90	—	—	—	—	—	—	—
GCA132.1U	142 lb-in. (16 Nm)	Floating	24 Vac/ Vdc	0-1kOhm	—	90	—	—	—	—	—	—	—
GCA132.1P	142 lb-in. (16 Nm)	Floating	24 Vac/ Vdc	0-1kOhm	—	90	—	—	—	—	—	—	—
GCA136.1U	142 lb-in. (16 Nm)	Floating	24 Vac/ Vdc	—	2	90	—	—	—	—	—	—	—
GCA136.1P	142 lb-in. (16 Nm)	Floating	24 Vac/ Vdc	—	2	90	—	—	—	—	—	—	—
GCA161.1U	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac	—	—	90	—	—	—	—	—	—	—
GCA161.1P	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac	—	—	90	—	—	—	—	—	—	—
GCA163.1U	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	—	90	—	—	—	—	—	—	—
GCA163.1P	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	—	90	—	—	—	—	—	—	—
GCA164.1U	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	2	90	—	—	—	—	—	—	—
GCA164.1P	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac/ Vdc	0-1kOhm	2	90	—	—	—	—	—	—	—
GCA151.1U	142 lb-in. (16 Nm)	4-20 mA	24 Vac	—	—	90	MS7520A2007	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	—	90
GCA151.1P	142 lb-in. (16 Nm)	4-20 mA	24 Vac	—	—	90							
GCA126.1U	142 lb-in. (16 Nm)	On/Off	24 Vac	—	2	90	MS8120A1205	175 lb-in. (20 Nm)	On/Off	24 Vac (±20%), 24 Vdc	—	2 (7, 85)	45
GCA126.1P	142 lb-in. (16 Nm)	On/Off	24 Vac	—	2	90							
GCA226.1U	142 lb-in. (16 Nm)	On/Off	120 Vac	—	2	90	MS4120A1209	175 lb-in. (20 Nm)	On/Off	100-250 Vac	—	2 (7, 85)	45
GCA135.1U	142 lb-in. (16 Nm)	Floating	24 Vac	0-1kOhm	2	90	—	—	—	—	—	—	—
GCA135.1P	142 lb-in. (16 Nm)	Floating	24 Vac	0-1kOhm	2	90	—	—	—	—	—	—	—
GCA166.1U	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac	—	2	90	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90
GCA166.1P	142 lb-in. (16 Nm)	0-10 Vdc	24 Vac	—	2	90							
GCA156.1U	142 lb-in. (16 Nm)	4-20 mA	24 Vac	—	2	90	MS7520A2205	175 lb-in. (20 Nm)	On/Off, Floating, (0) 2-10 Vdc	24 Vac (±20%), 24 Vdc	(0) 2-10 Vdc	2 (7, 85)	90

[a] All models described as (0) 2-10 Vdc can be used with a 4-20 mA control input. Shunt a 500 ohm, 1/2 W resistor across the input at the actuator.

Control Ball Valve

2-Way Valve

Pipe Size	Cv	Siemens	Cv	Belimo	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell	
										Ni-Brass	Stainless Steel
1/2 in.	0.4	599-10203			0.38	VB-2213-500-9-01			0.38	VBN2AB3P0X	VBN2AB3S0X
	0.63	599-10204			0.68	VB-2213-500-9-02			0.68	VBN2AD3P0X	VBN2AD3S0X
	1.6	599-10205			1.3	VB-2213-500-9-03	1.2	VG1241AD	1.3	VBN2AE3P0X	VBN2AE3S0X
							1.9	VG1241AE	2	VBN2AF3P0X	VBN2AF3S0X
	2.5	599-10206			2.6	VB-2213-500-9-04	2.9	VG1241AF	2.6	VBN2AG3P0X	VBN2AG3S0X
	4	599-10207			4.7	VB-2213-500-9-05	4.7	VG1241AG	4.7	VBN2AH3P0X	VBN2AH3S0X
					8	VB-2213-500-9-06	7.4	VG1241AL	8	VBN2AJ3P0X	VBN2AJ3S0X
	10	599-10208			11.7	VB-2213-500-9-07	11.7	VG1241AN	11.7	VBN2AK3P0X	VBN2AK3S0X
3/4 in.					0.31	VB-2213-500-9-11			0.31	VBN2BB3P0X	VBN2BB3S0X
					0.63	VB-2213-500-9-12			0.63	VBN2BD3P0X	VBN2BD3S0X
					1.2	VB-2213-500-9-13			1.2	VBN2BE3P0X	VBN2BE3S0X
					2.5	VB-2213-500-9-14			2.5	VBN2BG3P0X	VBN2BG3S0X
					4.3	VB-2213-500-9-15	4.7	VG1241BG	4.3	VBN2BH3P0X	VBN2BH3S0X
							7.4	VG1241BL	7.4	VBN2BJ3P0X	VBN2BJ3S0X
	10	599-10209			10.1	VB-2213-500-9-16	11.7	VG1241BN	10.1	VBN2BK3P0X	VBN2BK3S0X
					14.7	VB-2213-500-9-17			14.7	VBN2BL3P0X	VBN2BL3S0X
	25	599-10210			28.6	VB-2213-500-9-18			29	VBN2BM3P0X	VBN2BM3S0X
1 in.					4.4	VB-2213-500-9-21	7.4	VG1241CL	4.4	VBN2CH3P0X	VBN2CH3S0X
	10	599-10211			9.0	VB-2213-500-9-22	11.7	VG1241CN	9.0	VBN2CJ3P0X	VBN2CJ3S0X
	16	599-10213			15.3	VB-2213-500-9-23	18.7	VG1241CP	15.3	VBN2CL3P0X	VBN2CL3S0X
	25	599-10212			26.1	VB-2213-500-9-24			26	VBN2CM3P0X	VBN2CM3S0X
					43.9	VB-2213-500-9-26			44	VBN2CN3P0X	VBN2CN3S0X
	63	599-10214			54.2	VB-2213-500-9-27			54	VBN2CP3P0X	VBN2CP3S0X
1-1/4 in.					4.4	VB-2213-500-9-41			4.4	VBN2DH3P0X	VBN2DH3S0X
					8.3	VB-2213-500-9-42	11.7	VG1241DN	8.3	VBN2DJ3P0X	VBN2DJ3S0X
	16	599-10215			14.9	VB-2213-500-9-43	18.7	VG1241DP	14.9	VBN2DK3P0X	VBN2DK3S0X
							29.2	VG1241DR	25.0	VBN2DL3P0X	VBN2DL3S0X
					36.5	VB-2213-500-9-44			37	VBN2DM3P0X	VBN2DM3S0X
	40	599-10216			41.1	VB-2213-500-9-45			41	VBN2DN3P0X	VBN2DN3S0X
	100	599-10217			102.3	VB-2213-500-9-46			102	VBN2DS3P0X	VBN2DS3S0X
1-1/2 in.	25	599-10218			22.8	VB-2213-500-9-51	18.7	VG1241EP	23	VBN2EL3P0X	VBN2EL3S0X
							29.2	VG1241ER	30.0	VBN2EM3P0X	VBN2EM3S0X
	40	599-10220			41.3	VB-2213-500-9-52	46.8	VG1241ES	41	VBN2EN3P0X	VBN2EN3S0X
	63	599-10219			73.9	VB-2213-500-9-53			74	VBN2ER3P0X	VBN2ER3S0X
	160	599-10221			171.7	VB-2213-500-9-54			172	VBN2E13P0X	VBN2E13S0X
							29.2	VG1241FR			
2 in.	40	599-10222			41.7	VB-2213-500-9-61	46.8	VG1241FS	42	VBN2FN3P0X	VBN2FN3S0X
	63	599-10224							57.0	VBN2FP3P0X	VBN2FP3S0X
					71.1	VB-2213-500-9-63	73.7	VG1241FT	71	VBN2FR3P0X	VBN2FR3S0X
	100	599-10223							100.0	VBN2FS3P0X	VBN2FS3S0X
					108.0	VB-2213-500-9-65			108.0	VBN2FT3P0X	VBN2FT3S0X
					210.0	VB-2213-500-9-66			210.0	VBN2F13P0X	VBN2F13S0X
	250	599-10225			266	VB-2213-500-9-67			266.0	VBN2F23P0X	VBN2F23S0X
2-1/2 in.					45.0	VB-2213-500-9-71			45.0	VBN2GN3P0X	VBN2GN3S0X
					55.0	VB-2213-500-9-72			55.0	VBN2GP3P0X	VBN2GP3S0X
					72.3	VB-2213-500-9-73			72	VBN2GR3P0X	VBN2GR3S0X
					101.0	VB-2213-500-9-74			101.0	VBN2GS3P0X	VBN2GS3S0X
					162.0	VB-2213-500-9-75			162.0	VBN2GU3P0X	VBN2GU3S0X
					202.0	VB-2213-500-9-76			202.0	VBN2G13P0X	VBN2G13S0X
3 in.					49.0	VB-2213-500-9-81			49.0	VBN2HN3P0X	VBN2HN3S0X
					63.0	VB-2213-500-9-82			63.0	VBN2HP3P0X	VBN2HP3S0X
					82.0	VB-2213-500-9-83			82.0	VBN2HR3P0X	VBN2HR3S0X
					124.0	VB-2213-500-9-84			124.0	VBN2HT3P0X	VBN2HT3S0X
					145.0	VB-2213-500-9-85			145.0	VBN2HU3P0X	VBN2HU3S0X
4 in.									91.0		VBF2JS1S0X
									118.0		VBF2JT1S0X
									152.0		VBF2JU1S0X
									197.0		VBF2J11S0X
									254.0		VBF2J21S0X
5 in.									144.0		VBF2KU1S0X
									185.0		VBF2K11S0X
									240.0		VBF2K21S0X
									309.0		VBF2K31S0X
									400.0		VBF2K41S0X
6'									208.0		VBF2L11S0X
									268.0		VBF2L21S0X
									346.0		VBF2L41S0X
									441.0		VBF2L51S0X
									577.0		VBF2L61S0X
									650.0		VBF2L71S0X

2-Way Valve + Non-Spring Return Floating Actuator

Pipe Size	Cv	Siemens	Cv	Belimo	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell	
										Ni-Brass	Stainless Steel
			0.3	B207+LRB24-3							
	0.4	171A-10203	0.46	B208+LRB24-3	0.38	VF-2213-505-9-01			0.38	VBN2AB3P0A	VBN2AB3S0A
	0.63	171A-10204	0.8	B209+LRB24-3	0.68	VF-2213-505-9-02			0.68	VBN2AD3P0A	VBN2AD3S0A
	1.6	171A-10205	1.2	B210+LRB24-3	1.3	VF-2213-505-9-03	1.2	VG1241AD - 9T4AGA	1.3	VBN2AE3P0A	VBN2AE3S0A
1/2 in.			1.9	B211+LRB24-3			1.9	VG1241AE - 9T4AGA	2	VBN2AF3P0A	VBN2AF3S0A
	2.5	171A-10206	3	B212+LRB24-3	2.6	VF-2213-505-9-04	2.9	VG1241AF - 9T4AGA	2.6	VBN2AG3P0A	VBN2AG3S0A
	4	171A-10207	4.7	B213+LRB24-3	4.7	VF-2213-505-9-05	4.7	VG1241AG - 9T4AGA	4.7	VBN2AH3P0A	VBN2AH3S0A
			7.4	B214+LRB24-3	8	VF-2213-505-9-06	7.4	VG1241AL - 9T4AGA	8	VBN2AJ3P0A	VBN2AJ3S0A
	10	171A-10208	10	B215+LRB24-3	11.7	VF-2213-505-9-07	11.7	VG1241AN - 9T4AGA	11.7	VBN2AK3P0A	VBN2AK3S0A
					0.31	VF-2213-505-9-11			0.31	VBN2BB3P0A	VBN2BB3S0A
					0.63	VF-2213-505-9-12			0.63	VBN2BD3P0A	VBN2BD3S0A
					1.2	VF-2213-505-9-13			1.2	VBN2BE3P0A	VBN2BE3S0A
					2.5	VF-2213-505-9-14			2.5	VBN2BG3P0A	VBN2BG3S0A
3/4 in.			4.7	B217+LRB24-3	4.3	VF-2213-505-9-15	4.7	VG1241BG - 9T4AGA	4.3	VBN2BH3P0A	VBN2BH3S0A
			7.4	B218+LRB24-3			7.4	VG1241BL - 9T4AGA	7.4	VBN2BJ3P0A	VBN2BJ3S0A
	10	171A-10209	10	B219+LRB24-3	10.1	VF-2213-505-9-16	11.7	VG1241BN - 9T4AGA	10.1	VBN2BK3P0A	VBN2BK3S0A
					14.7	VF-2213-505-9-17			14.7	VBN2BL3P0A	VBN2BL3S0A
	25	171A-10210	24	B220+LRB24-3	28.6	VF-2213-505-9-18			29	VBN2BM3P0A	VBN2BM3S0A
			7.4	B222+LRB24-3	4.4	VF-2213-505-9-21	7.4	VG1241CL - 9T4AGA	4.4	VBN2CH3P0A	VBN2CH3S0A
	10	171A-10211	10	B223+LRB24-3	9.0	VF-2213-505-9-22	11.7	VG1241CN - 9T4AGA	9.0	VBN2CJ3P0A	VBN2CJ3S0A
1 in.	16	171A-10213	19	B224+LRB24-3	15.3	VF-2213-505-9-23	18.7	VG1241CP - 9T4AGA	15.3	VBN2CL3P0A	VBN2CL3S0A
	25	171A-10212	30	B225+LRB24-3	26.1	VF-2213-505-9-24			26	VBN2CM3P0A	VBN2CM3S0A
					43.9	VF-2213-505-9-26			44	VBN2CN3P0A	VBN2CN3S0A
	63	171A-10214			54.2	VF-2213-505-9-27			54	VBN2CP3P0A	VBN2CP3S0A
					4.4	VF-2213-505-9-41			4.4	VBN2DH3P0A	VBN2DH3S0A
			10	B229+LRB24-3	8.3	VF-2213-505-9-42	11.7	VG1241DN - 906AGA	8.3	VBN2DJ3P0A	VBN2DJ3S0A
	16	171A-10215	19	B230+LRB24-3	14.9	VF-2213-505-9-43	18.7	VG1241DP - 906AGA	14.9	VBN2DK3P0A	VBN2DK3S0A
1-1/4 in.			25	B231+ARB24-3			29.2	VG1241DR - 906AGA	25.0	VBN2DL3P0A	VBN2DL3S0A
			37	B232+ARB24-3	36.5	VF-2213-505-9-44			37	VBN2DM3P0A	VBN2DM3S0A
	40	171A-10216			41.1	VF-2213-505-9-45			41	VBN2DN3P0A	VBN2DN3S0A
	100	171A-10217			102.3	VF-2213-505-9-46			102	VBN2DS3P0A	VBN2DS3S0A
	25	171B-10218	19	B238+ARB24-3	22.8	VF-2213-505-9-51	18.7	VG1241EP - 906AGA	23	VBN2EL3P0A	VBN2EL3S0A
			29	B239+ARB24-3			29.2	VG1241ER - 906AGA	30.0	VBN2EM3P0A	VBN2EM3S0A
1-1/2 in.	40	171B-10220	37	B240+ARB24-3	41.3	VF-2213-505-9-52	46.8	VG1241ES - 906AGA	41	VBN2EN3P0A	VBN2EN3S0A
	63	171B-10219			73.9	VF-2213-505-9-53			74	VBN2ER3P0A	VBN2ER3S0A
	160	171B-10221			171.7	VF-2213-505-9-54			172	VBN2E13P0A	VBN2E13S0A
			29	B248+ARB24-3			29.2	VG1241FR - 909AGA			
	40	171B-10222	46	B249+ARB24-3	41.7	VF-2213-505-9-61	46.8	VG1241FS - 909AGA	42	VBN2FN3P0A	VBN2FN3S0A
	63	171B-10224	57	B250+ARB24-3					57.0	VBN2FP3P0A	VBN2FP3S0A
2 in.			65	B251+ARB24-3	71.1	VF-2213-505-9-63	73.7	VG1241FT - 909AGA	71	VBN2FR3P0A	VBN2FR3S0A
	100	171B-10223	85	B252+ARB24-3	108.0	VF-2213-505-9-65			100.0	VBN2FS3P0A	VBN2FS3S0A
			120	B253+ARB24-3					108.0	VBN2FT3P0A	VBN2FT3S0A
					210.0	VF-2213-505-9-66			210.0	VBN2F13P0A	VBN2F13S0A
	250	171B-10225	240	B254+ARB24-3	266	VF-2213-505-9-67			266.0	VBN2F23P0A	VBN2F23S0A
					45.0	VF-2213-505-9-71			45.0	VBN2GN3P0A	VBN2GN3S0A
			60	B261+ARB24-3	55.0	VF-2213-505-9-72			55.0	VBN2GP3P0A	VBN2GP3S0A
2-1/2 in.			75	B262+ARB24-3	72.3	VF-2213-505-9-73			72	VBN2GR3P0A	VBN2GR3S0A
			110	B263+ARB24-3	101.0	VF-2213-505-9-74			101.0	VBN2GS3P0A	VBN2GS3S0A
			150	B264+ARB24-3	162.0	VF-2213-505-9-75			162.0	VBN2GU3P0A	VBN2GU3S0A
			210	B265+ARB24-3	202.0	VF-2213-505-9-76			202.0	VBN2G13P0A	VBN2G13S0A
					49.0	VF-2213-505-9-81			49.0	VBN2HN3P0A	VBN2HN3S0A
			70	B277+ARB24-3	63.0	VF-2213-505-9-82			63.0	VBN2HP3P0A	VBN2HP3S0A
3 in.					82.0	VF-2213-505-9-83			82.0	VBN2HR3P0A	VBN2HR3S0A
			130	B278+ARB24-3	124.0	VF-2213-505-9-84			124.0	VBN2HT3P0A	VBN2HT3S0A
			170	B280+ARB24-3	145.0	VF-2213-505-9-85			145.0	VBN2HU3P0A	VBN2HU3S0A
									91.0		VBF2JS1S0A
									118.0		VBF2JT1S0A
4 in.									152.0		VBF2JU1S0A
									197.0		VBF2J11S0A
									254.0		VBF2J21S0A
									144.0		VBF2KU1S0A
									185.0		VBF2K11S0A
5 in.									240.0		VBF2K21S0A
									309.0		VBF2K31S0A
									400.0		VBF2K41S0A
									208.0		VBF2L11S0A
									268.0		VBF2L21S0A
6 in.									346.0		VBF2L41S0A
									441.0		VBF2L51S0A
									577.0		VBF2L61S0A
									650.0		VBF2L71S0A

Control Ball Valve

2-Way Valve + Non-Spring Return Modulating Actuator

Pipe Size	Cv	Siemens	Cv	Belimo	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell	
										Ni-Brass	Stainless Steel
1/2 in.			0.3	B207+LRB24-SR							
	0.4	171C-10203	0.46	B208+LRB24-SR	0.38	VS-2213-505-9-01			0.38	VBN2AB3P0B	VBN2AB3S0B
	0.63	171C-10204	0.8	B209+LRB24-SR	0.68	VS-2213-505-9-02			0.68	VBN2AD3P0B	VBN2AD3S0B
	1.6	171C-10205	1.2	B210+LRB24-SR	1.3	VS-2213-505-9-03	1.2	VG1241AD - 9T4GGA	1.3	VBN2AE3P0B	VBN2AE3S0B
			1.9	B211+LRB24-SR			1.9	VG1241AE - 9T4GGA	2	VBN2AF3P0B	VBN2AF3S0B
	2.5	171C-10206	3	B212+LRB24-SR	2.6	VS-2213-505-9-04	2.9	VG1241AF - 9T4GGA	2.6	VBN2AG3P0B	VBN2AG3S0B
	4	171C-10207	4.7	B213+LRB24-SR	4.7	VS-2213-505-9-05	4.7	VG1241AG - 9T4GGA	4.7	VBN2AH3P0B	VBN2AH3S0B
			7.4	B214+LRB24-SR	8	VS-2213-505-9-06	7.4	VG1241AL - 9T4GGA	8	VBN2AJ3P0B	VBN2AJ3S0B
	10	171C-10208	10	B215+LRB24-SR	11.7	VS-2213-505-9-07	11.7	VG1241AN - 9T4GGA	11.7	VBN2AK3P0B	VBN2AK3S0B
3/4 in.					0.31	VS-2213-505-9-11			0.31	VBN2BB3P0B	VBN2BB3S0B
					0.63	VS-2213-505-9-12			0.63	VBN2BD3P0B	VBN2BD3S0B
					1.2	VS-2213-505-9-13			1.2	VBN2BE3P0B	VBN2BE3S0B
					2.5	VS-2213-505-9-14			2.5	VBN2BG3P0B	VBN2BG3S0B
			4.7	B217+LRB24-SR	4.3	VS-2213-505-9-15	4.7	VG1241BG - 9T4GGA	4.3	VBN2BH3P0B	VBN2BH3S0B
			7.4	B218+LRB24-SR			7.4	VG1241BL - 9T4GGA	7.4	VBN2BJ3P0B	VBN2BJ3S0B
	10	171C-10209	10	B219+LRB24-SR	10.1	VS-2213-505-9-16	11.7	VG1241BN - 9T4GGA	10.1	VBN2BK3P0B	VBN2BK3S0B
					14.7	VS-2213-505-9-17			14.7	VBN2BL3P0B	VBN2BL3S0B
	25	171C-10210	24	B220+LRB24-SR	28.6	VS-2213-505-9-18			29	VBN2BM3P0B	VBN2BM3S0B
1 in.			7.4	B222+LRB24-SR	4.4	VS-2213-505-9-21	7.4	VG1241CL - 9T4GGA	4.4	VBN2CH3P0B	VBN2CH3S0B
	10	171C-10211	10	B223+LRB24-SR	9.0	VS-2213-505-9-22	11.7	VG1241CN - 9T4GGA	9.0	VBN2CJ3P0B	VBN2CJ3S0B
	16	171C-10213	19	B224+LRB24-SR	15.3	VS-2213-505-9-23	18.7	VG1241CP - 9T4GGA	15.3	VBN2CL3P0B	VBN2CL3S0B
	25	171C-10212	30	B225+LRB24-SR	26.1	VS-2213-505-9-24			26	VBN2CM3P0B	VBN2CM3S0B
					43.9	VS-2213-505-9-26			44	VBN2CN3P0B	VBN2CN3S0B
	63	171C-10214			54.2	VS-2213-505-9-27			54	VBN2CP3P0B	VBN2CP3S0B
1-1/4 in.					4.4	VS-2213-505-9-41			4.4	VBN2DH3P0B	VBN2DH3S0B
			10	B229+LRB24-SR	8.3	VS-2213-505-9-42	11.7	VG1241DN - 906GGA	8.3	VBN2DJ3P0B	VBN2DJ3S0B
	16	171C-10215	19	B230+LRB24-SR	14.9	VS-2213-505-9-43	18.7	VG1241DP - 906GGA	14.9	VBN2DK3P0B	VBN2DK3S0B
			25	B231+ARB24-SR			29.2	VG1241DR - 906GGA	25.0	VBN2DL3P0B	VBN2DL3S0B
	40	171C-10216	37	B232+ARB24-SR	36.5	VS-2213-505-9-44			37	VBN2DM3P0B	VBN2DM3S0B
					41.1	VS-2213-505-9-45			41	VBN2DN3P0B	VBN2DN3S0B
	100	171C-10217			102.3	VS-2213-505-9-46			102	VBN2DS3P0B	VBN2DS3S0B
1-1/2 in.	25	171D-10218	19	B238+ARB24-SR	22.8	VS-2213-505-9-51	18.7	VG1241EP - 906GGA	23	VBN2EL3P0B	VBN2EL3S0B
			29	B239+ARB24-SR			29.2	VG1241ER - 906GGA	30.0	VBN2EM3P0B	VBN2EM3S0B
	40	171D-10220	37	B240+ARB24-SR	41.3	VS-2213-505-9-52	46.8	VG1241ES - 906GGA	41	VBN2EN3P0B	VBN2EN3S0B
	63	171D-10219			73.9	VS-2213-505-9-53			74	VBN2ER3P0B	VBN2ER3S0B
	160	171D-10221			171.7	VS-2213-505-9-54			172	VBN2E13P0B	VBN2E13S0B
2 in.			29	B248+ARB24-SR			29.2	VG1241FR - 909GGA			
	40	171D-10222	46	B249+ARB24-SR	41.7	VS-2213-505-9-61	46.8	VG1241FS - 909GGA	42	VBN2FN3P0B	VBN2FN3S0B
	63	171D-10224	57	B250+ARB24-SR					57.0	VBN2FP3P0B	VBN2FP3S0B
			65	B251+ARX24-MFT	71.1	VS-2213-505-9-63	73.7	VG1241FT - 909GGA	71	VBN2FR3P0B	VBN2FR3S0B
	100	171D-10223	85	B252+ARX24-MFT					100.0	VBN2FS3P0B	VBN2FS3S0B
			120	B253+ARX24-MFT	108.0	VS-2213-505-9-65			108.0	VBN2FT3P0B	VBN2FT3S0B
					210.0	VS-2213-505-9-66			210.0	VBN2F13P0B	VBN2F13S0B
	250	171D-10225	240	B254+ARX24-MFT	266	VS-2213-505-9-67			266.0	VBN2F23P0B	VBN2F23S0B
2-1/2 in.					45.0	VS-2213-505-9-71			45.0	VBN2GN3P0B	VBN2GN3S0B
			60	B261+ARX24-MFT	55.0	VS-2213-505-9-72			55.0	VBN2GP3P0B	VBN2GP3S0B
			75	B262+ARX24-MFT	72.3	VS-2213-505-9-73			72	VBN2GR3P0B	VBN2GR3S0B
			110	B263+ARX24-MFT	101.0	VS-2213-505-9-74			101.0	VBN2GS3P0B	VBN2GS3S0B
			150	B264+ARX24-MFT	162.0	VS-2213-505-9-75			162.0	VBN2GU3P0B	VBN2GU3S0B
			210	B265+ARX24-MFT	202.0	VS-2213-505-9-76			202.0	VBN2G13P0B	VBN2G13S0B
3 in.					49.0	VS-2213-505-9-81			49.0	VBN2HN3P0B	VBN2HN3S0B
			70	B277+ARX24-MFT	63.0	VS-2213-505-9-82			63.0	VBN2HP3P0B	VBN2HP3S0B
					82.0	VS-2213-505-9-83			82.0	VBN2HR3P0B	VBN2HR3S0B
			130	B278+ARX24-MFT	124.0	VS-2213-505-9-84			124.0	VBN2HT3P0B	VBN2HT3S0B
			170	B280+ARX24-MFT	145.0	VS-2213-505-9-85			145.0	VBN2HU3P0B	VBN2HU3S0B
4 in.									91.0		VBF2JS1S0B
									118.0		VBF2JT1S0B
									152.0		VBF2JU1S0B
									197.0		VBF2J11S0B
									254.0		VBF2J21S0B
5 in.									144.0		VBF2KU1S0B
									185.0		VBF2K11S0B
									240.0		VBF2K21S0B
									309.0		VBF2K31S0B
									400.0		VBF2K41S0B
6 in.									208.0		VBF2L11S0B
									268.0		VBF2L21S0B
									346.0		VBF2L41S0B
									441.0		VBF2L51S0B
									577.0		VBF2L61S0B
									650.0		VBF2L71S0B

2-Way Valve + Spring Return, 2-Position Actuator

Pipe Size	Cv	Siemens	Cv	Belimo	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell	
										Ni-Brass	Stainless Steel
			0.3	B207+TFX24 US							
	0.4	171E-10203	0.46	B208+TFX24 US	0.38	VA-2213-536-9-01			0.38	VBN2AB3P0C	VBN2AB3S0C
	0.63	171E-10204	0.8	B209+TFX24 US	0.68	VA-2213-536-9-02			0.68	VBN2AD3P0C	VBN2AD3S0C
	1.6	171E-10205	1.2	B210+TFX24 US	1.3	VA-2213-536-9-03	1.2	VG1241AD - 22TBGA	1.3	VBN2AE3P0C	VBN2AE3S0C
1/2 in.			1.9	B211+TFX24 US			1.9	VG1241AE - 22TBGA	2	VBN2AF3P0C	VBN2AF3S0C
	2.5	171E-10206	3	B212+TFX24 US	2.6	VA-2213-536-9-04	2.9	VG1241AF - 22TBGA	2.6	VBN2AG3P0C	VBN2AG3S0C
	4	171E-10207	4.7	B213+TFX24 US	4.7	VA-2213-536-9-05	4.7	VG1241AG - 22TBGA	4.7	VBN2AH3P0C	VBN2AH3S0C
			7.4	B214+TFX24 US	8	VA-2213-536-9-06	7.4	VG1241AL - 22TBGA	8	VBN2AJ3P0C	VBN2AJ3S0C
	10	171E-10208	10	B215+TFX24 US	11.7	VA-2213-536-9-07	11.7	VG1241AN - 22TBGA	11.7	VBN2AK3P0C	VBN2AK3S0C
					0.31	VA-2213-536-9-11			0.31	VBN2BB3P0C	VBN2BB3S0C
					0.63	VA-2213-536-9-12			0.63	VBN2BD3P0C	VBN2BD3S0C
					1.2	VA-2213-536-9-13			1.2	VBN2BE3P0C	VBN2BE3S0C
					2.5	VA-2213-536-9-14			2.5	VBN2BG3P0C	VBN2BG3S0C
3/4 in.			4.7	B217+TFX24 US	4.3	VA-2213-536-9-15	4.7	VG1241BG - 22TBGA	4.3	VBN2BH3P0C	VBN2BH3S0C
			7.4	B218+TFX24 US			7.4	VG1241BL - 22TBGA	7.4	VBN2BJ3P0C	VBN2BJ3S0C
	10	171E-10209	10	B219+TFX24 US	10.1	VA-2213-536-9-16	11.7	VG1241BN - 22TBGA	10.1	VBN2BK3P0C	VBN2BK3S0C
					14.7	VA-2213-536-9-17			14.7	VBN2BL3P0C	VBN2BL3S0C
	25	171E-10210	24	B220+TFX24 US	28.6	VA-2213-536-9-18			29	VBN2BM3P0C	VBN2BM3S0C
			7.4	B222+LF24 US	4.4	VA-2213-536-9-21	7.4	VG1241CL - 936BGA	4.4	VBN2CH3P0C	VBN2CH3S0C
	10	171E-10211	10	B223+LF24 US	9.0	VA-2213-536-9-22	11.7	VG1241CN - 936BGA	9.0	VBN2CJ3P0C	VBN2CJ3S0C
1 in.	16	171E-10213	19	B224+LF24 US	15.3	VA-2213-536-9-23	18.7	VG1241CP - 936BGA	15.3	VBN2CL3P0C	VBN2CL3S0C
	25	171E-10212	30	B225+LF24 US	26.1	VA-2213-536-9-24			26	VBN2CM3P0C	VBN2CM3S0C
					43.9	VA-2213-536-9-26			44	VBN2CN3P0C	VBN2CN3S0C
	63	171E-10214			54.2	VA-2213-536-9-27			54	VBN2CP3P0C	VBN2CP3S0C
					4.4	VA-2213-536-9-41			4.4	VBN2DH3P0C	VBN2DH3S0C
			10	B229+LF24 US	8.3	VA-2213-536-9-42	11.7	VG1241DN - 936BGA	8.3	VBN2DJ3P0C	VBN2DJ3S0C
	16	171E-10215	19	B230+LF24 US	14.9	VA-2213-536-9-43	18.7	VG1241DP - 936BGA	14.9	VBN2DK3P0C	VBN2DK3S0C
1-1/4 in.			25	B231+AF24 US			29.2	VG1241DR - 936BGA	25.0	VBN2DL3P0C	VBN2DL3S0C
			37	B232+AF24 US	36.5	VA-2213-536-9-44			37	VBN2DM3P0C	VBN2DM3S0C
	40	171E-10216			41.1	VA-2213-536-9-45			41	VBN2DN3P0C	VBN2DN3S0C
	100	171E-10217			102.3	VA-2213-536-9-46			102	VBN2DS3P0C	VBN2DS3S0C
	25	171E-10218	19	B238+AF24 US	22.8	VA-2213-536-9-51	18.7	VG1241EP - 936BGA	23	VBN2EL3P0C	VBN2EL3S0C
			29	B239+AF24 US			29.2	VG1241ER - 936BGA	30.0	VBN2EM3P0C	VBN2EM3S0C
1-1/2 in.	40	171E-10220	37	B240+AF24 US	41.3	VA-2213-536-9-52	46.8	VG1241ES - 936BGA	41	VBN2EN3P0C	VBN2EN3S0C
	63	171E-10219			73.9	VA-2213-536-9-53			74	VBN2ER3P0C	VBN2ER3S0C
	160	171E-10221			171.7	VA-2213-536-9-54			172	VBN2E13P0C	VBN2E13S0C
			29	B248+AF24 US			29.2	VG1241FR - 926BGA			
	40	171E-10222	46	B249+AF24 US	41.7	VA-2213-536-9-61	46.8	VG1241FS - 926BGA	42	VBN2FN3P0C	VBN2FN3S0C
	63	171E-10224	57	B250+AF24 US					57.0	VBN2FP3P0C	VBN2FP3S0C
2 in.			65	B251+AF24 US	71.1	VA-2213-536-9-63	73.7	VG1241FT - 926BGA	71	VBN2FR3P0C	VBN2FR3S0C
	100	171E-10223	85	B252+AF24 US					100.0	VBN2FS3P0C	VBN2FS3S0C
			120	B253+AF24 US	108.0	VA-2213-536-9-65			108.0	VBN2FT3P0C	VBN2FT3S0C
					210.0	VA-2213-536-9-66			210.0	VBN2F13P0C	VBN2F13S0C
	250	171E-10225	240	B254+AF24 US	266	VA-2213-536-9-67			266.0	VBN2F23P0C	VBN2F23S0C
					45.0	VA-2213-536-9-71			45.0	VBN2GN3P0C	VBN2GN3S0C
			60	B261+AF24 US	55.0	VA-2213-536-9-72			55.0	VBN2GP3P0C	VBN2GP3S0C
2-1/2 in.			75	B262+AF24 US	72.3	VA-2213-536-9-73			72	VBN2GR3P0C	VBN2GR3S0C
			110	B263+AF24 US	101.0	VA-2213-536-9-74			101.0	VBN2GS3P0C	VBN2GS3S0C
			150	B264+AF24 US	162.0	VA-2213-536-9-75			162.0	VBN2GU3P0C	VBN2GU3S0C
			210	B265+AF24 US	202.0	VA-2213-536-9-76			202.0	VBN2G13P0C	VBN2G13S0C
					49.0	VA-2213-536-9-81			49.0	VBN2HN3P0C	VBN2HN3S0C
			70	B277+AF24 US	63.0	VA-2213-536-9-82			63.0	VBN2HP3P0C	VBN2HP3S0C
3 in.					82.0	VA-2213-536-9-83			82.0	VBN2HR3P0C	VBN2HR3S0C
			130	B278+AF24 US	124.0	VA-2213-536-9-84			124.0	VBN2HT3P0C	VBN2HT3S0C
			170	B280+AF24 US	145.0	VA-2213-536-9-85			145.0	VBN2HU3P0C	VBN2HU3S0C
									91.0		VBF2JS1S0C
									118.0		VBF2JT1S0C
4 in.									152.0		VBF2JU1S0C
									197.0		VBF2J11S0C
									254.0		VBF2J21S0C
									144.0		VBF2KU1S0C
									185.0		VBF2K11S0C
5 in.									240.0		VBF2K21S0C
									309.0		VBF2K31S0C
									400.0		VBF2K41S0C
									208.0		VBF2L11S0C
									268.0		VBF2L21S0C
6 in.									346.0		VBF2L41S0C
									441.0		VBF2L51S0C
									577.0		VBF2L61S0C
									650.0		VBF2L71S0C

Control Ball Valve

2-Way Valve + Spring Return Floating Actuator

Pipe Size	Cv	Siemens	Cv	Belimo	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell	
										Ni-Brass	Stainless Steel
			0.3	B207+TF24-3 US							
	0.4	171F-10203	0.46	B208+TF24-3 US	0.38	VF-2213-536-9-01			0.38	VBN2AB3P0D	VBN2AB3S0D
	0.63	171F-10204	0.8	B209+TF24-3 US	0.68	VF-2213-536-9-02			0.68	VBN2AD3P0D	VBN2AD3S0D
	1.6	171F-10205	1.2	B210+TF24-3 US	1.3	VF-2213-536-9-03	1.2	VG1241AD - 22TAGA	1.3	VBN2AE3P0D	VBN2AE3S0D
1/2 in.			1.9	B211+TF24-3 US			1.9	VG1241AE - 22TAGA	2	VBN2AF3P0D	VBN2AF3S0D
	2.5	171F-10206	3	B212+TF24-3 US	2.6	VF-2213-536-9-04	2.9	VG1241AF - 22TAGA	2.6	VBN2AG3P0D	VBN2AG3S0D
	4	171F-10207	4.7	B213+TF24-3 US	4.7	VF-2213-536-9-05	4.7	VG1241AG - 22TAGA	4.7	VBN2AH3P0D	VBN2AH3S0D
			7.4	B214+TF24-3 US	8	VF-2213-536-9-06	7.4	VG1241AL - 22TAGA	8	VBN2AJ3P0D	VBN2AJ3S0D
	10	171F-10208	10	B215+TF24-3 US	11.7	VF-2213-536-9-07	11.7	VG1241AN - 22TAGA	11.7	VBN2AK3P0D	VBN2AK3S0D
					0.31	VF-2213-536-9-11			0.31	VBN2BB3P0D	VBN2BB3S0D
					0.63	VF-2213-536-9-12			0.63	VBN2BD3P0D	VBN2BD3S0D
					1.2	VF-2213-536-9-13			1.2	VBN2BE3P0D	VBN2BE3S0D
					2.5	VF-2213-536-9-14			2.5	VBN2BG3P0D	VBN2BG3S0D
3/4 in.			4.7	B217+TF24-3 US	4.3	VF-2213-536-9-15	4.7	VG1241BG - 22TAGA	4.3	VBN2BH3P0D	VBN2BH3S0D
			7.4	B218+TF24-3 US			7.4	VG1241BL - 22TAGA	7.4	VBN2BJ3P0D	VBN2BJ3S0D
	10	171F-10209	10	B219+TF24-3 US	10.1	VF-2213-536-9-16	11.7	VG1241BN - 22TAGA	10.1	VBN2BK3P0D	VBN2BK3S0D
					14.7	VF-2213-536-9-17			14.7	VBN2BL3P0D	VBN2BL3S0D
	25	171F-10210	24	2B20+TF24-3 US	28.6	VF-2213-536-9-18			29	VBN2BM3P0D	VBN2BM3S0D
			7.4	B222+LF24-3 US	4.4	VF-2213-536-9-21	7.4	VG1241CL - 936AGA	4.4	VBN2CH3P0D	VBN2CH3S0D
	10	171F-10211	10	B223+LF24-3 US	9.0	VF-2213-536-9-22	11.7	VG1241CN - 936AGA	9.0	VBN2CJ3P0D	VBN2CJ3S0D
1 in.	16	171F-10213	19	B224+LF24-3 US	15.3	VF-2213-536-9-23	18.7	VG1241CP - 936AGA	15.3	VBN2CL3P0D	VBN2CL3S0D
	25	171F-10212	30	B225+LF24-3 US	26.1	VF-2213-536-9-24			26	VBN2CM3P0D	VBN2CM3S0D
					43.9	VF-2213-536-9-26			44	VBN2CN3P0D	VBN2CN3S0D
	63	171F-10214			54.2	VF-2213-536-9-27			54	VBN2CP3P0D	VBN2CP3S0D
					4.4	VF-2213-536-9-41			4.4	VBN2DH3P0D	VBN2DH3S0D
			10	B229+LF24-3 US	8.3	VF-2213-536-9-42	11.7	VG1241DN - 936AGA	8.3	VBN2DJ3P0D	VBN2DJ3S0D
	16	171F-10215	19	B230+LF24-3 US	14.9	VF-2213-536-9-43	18.7	VG1241DP - 936AGA	14.9	VBN2DK3P0D	VBN2DK3S0D
1-1/4 in.							29.2	VG1241DR - 936AGA	25.0	VBN2DL3P0D	VBN2DL3S0D
					36.5	VF-2213-536-9-44			37	VBN2DM3P0D	VBN2DM3S0D
	40	171F-10216			41.1	VF-2213-536-9-45			41	VBN2DN3P0D	VBN2DN3S0D
	100	171F-10217			102.3	VF-2213-536-9-46			102	VBN2DS3P0D	VBN2DS3S0D
	25	171F-10218			22.8	VF-2213-536-9-51	18.7	VG1241EP - 936AGA	23	VBN2EL3P0D	VBN2EL3S0D
							29.2	VG1241ER - 936AGA	30.0	VBN2EM3P0D	VBN2EM3S0D
1-1/2 in.	40	171F-10220			41.3	VF-2213-536-9-52	46.8	VG1241ES - 936AGA	41	VBN2EN3P0D	VBN2EN3S0D
	63	171F-10219			73.9	VF-2213-536-9-53			74	VBN2ER3P0D	VBN2ER3S0D
	160	171F-10221			171.7	VF-2213-536-9-54			172	VBN2E13P0D	VBN2E13S0D
							29.2	VG1241FR - 926AGA			
	40	171F-10222			41.7	VF-2213-536-9-61	46.8	VG1241FS - 926AGA	42	VBN2FN3P0D	VBN2FN3S0D
	63	171F-10224							57.0	VBN2FP3P0D	VBN2FP3S0D
2 in.					71.1	VF-2213-536-9-63	73.7	VG1241FT - 926AGA	71	VBN2FR3P0D	VBN2FR3S0D
	100	171F-10223							100.0	VBN2FS3P0D	VBN2FS3S0D
					108.0	VF-2213-536-9-65			108.0	VBN2FT3P0D	VBN2FT3S0D
					210.0	VF-2213-536-9-66			210.0	VBN2F13P0D	VBN2F13S0D
	250	171F-10225			266	VF-2213-536-9-67			266.0	VBN2F23P0D	VBN2F23S0D
					45.0	VF-2213-536-9-71			45.0	VBN2GN3P0D	VBN2GN3S0D
					55.0	VF-2213-536-9-72			55.0	VBN2GP3P0D	VBN2GP3S0D
2-1/2 in.					72.3	VF-2213-536-9-73			72	VBN2GR3P0D	VBN2GR3S0D
					101.0	VF-2213-536-9-74			101.0	VBN2GS3P0D	VBN2GS3S0D
					162.0	VF-2213-536-9-75			162.0	VBN2GU3P0D	VBN2GU3S0D
					202.0	VF-2213-536-9-76			202.0	VBN2G13P0D	VBN2G13S0D
					49.0	VF-2213-536-9-81			49.0	VBN2HN3P0D	VBN2HN3S0D
					63.0	VF-2213-536-9-82			63.0	VBN2HP3P0D	VBN2HP3S0D
3 in.					82.0	VF-2213-536-9-83			82.0	VBN2HR3P0D	VBN2HR3S0D
					124.0	VF-2213-536-9-84			124.0	VBN2HT3P0D	VBN2HT3S0D
					145.0	VF-2213-536-9-85			145.0	VBN2HU3P0D	VBN2HU3S0D
									91.0		VBF2JS1S0D
									118.0		VBF2JT1S0D
4 in.									152.0		VBF2JU1S0D
									197.0		VBF2J11S0D
									254.0		VBF2J21S0D
									144.0		VBF2KU1S0D
									185.0		VBF2K11S0D
5 in.									240.0		VBF2K21S0D
									309.0		VBF2K31S0D
									400		VBF2K41S0D
									208.0		VBF2L11S0D
									268.0		VBF2L21S0D
6 in.									346		VBF2L41S0D
									441		VBF2L51S0D
									577		VBF2L61S0D
									650		VBF2L71S0D

2-Way Valve + Spring Return Modulating Actuator

Pipe Size	Cv	Siemens	Cv	Belimo	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell	
										Ni-Brass	Stainless Steel
			0.3	B207+TF24-SR US							
	0.4	171G-10203	0.46	B208+TF24-SR US	0.38	VS-2213-536-9-01			0.38	VBN2AB3P0D	VBN2AB3S0D
	0.63	171G-10204	0.8	B209+TF24-SR US	0.68	VS-2213-536-9-02			0.68	VBN2AD3P0D	VBN2AD3S0D
	1.6	171G-10205	1.2	B210+TF24-SR US	1.3	VS-2213-536-9-03	1.2	VG1241AD - 22TGGA	1.3	VBN2AE3P0D	VBN2AE3S0D
1/2 in.			1.9	B211+TF24-SR US			1.9	VG1241AE - 22TBGA	2	VBN2AF3P0D	VBN2AF3S0D
	2.5	171G-10206	3	B212+TF24-SR US	2.6	VS-2213-536-9-04	2.9	VG1241AF - 22TBGA	2.6	VBN2AG3P0D	VBN2AG3S0D
	4	171G-10207	4.7	B213+TF24-SR US	4.7	VS-2213-536-9-05	4.7	VG1241AG - 22TBGA	4.7	VBN2AH3P0D	VBN2AH3S0D
			7.4	B214+TF24-SR US	8	VS-2213-536-9-06	7.4	VG1241AL - 22TBGA	8	VBN2AJ3P0D	VBN2AJ3S0D
	10	171G-10208	10	B215+TF24-SR US	11.7	VS-2213-536-9-07	11.7	VG1241AN - 22TBGA	11.7	VBN2AK3P0D	VBN2AK3S0D
									0.31	VBN2BB3P0D	VBN2BB3S0D
					0.31	VS-2213-536-9-11			0.63	VBN2BD3P0D	VBN2BD3S0D
					0.63	VS-2213-536-9-12			1.2	VBN2BE3P0D	VBN2BE3S0D
					1.2	VS-2213-536-9-13			2.5	VBN2BG3P0D	VBN2BG3S0D
3/4 in.			4.7	B217+TF24-SR US	2.5	VS-2213-536-9-14	4.7	VG1241BG - 22TBGA	4.3	VBN2BH3P0D	VBN2BH3S0D
			7.4	B218+TF24-SR US	4.3	VS-2213-536-9-15	7.4	VG1241BL - 22TBGA	7.4	VBN2BJ3P0D	VBN2BJ3S0D
	10	171G-10209	10	B219+TF24-SR US	10.1	VS-2213-536-9-16	11.7	VG1241BN - 22TBGA	10.1	VBN2BK3P0D	VBN2BK3S0D
					14.7	VS-2213-536-9-17			14.7	VBN2BL3P0D	VBN2BL3S0D
	25	171G-10210	24	2B20+TF24-SR US	28.6	VS-2213-536-9-18			29	VBN2BM3P0D	VBN2BM3S0D
			7.4	B222+LF24-SR US	4.4	VS-2213-536-9-21	7.4	VG1241CL - 936GGA	4.4	VBN2CH3P0D	VBN2CH3S0D
	10	171G-10211	10	B223+LF24-SR US	9.0	VS-2213-536-9-22	11.7	VG1241CN - 22TBGA	9.0	VBN2CJ3P0D	VBN2CJ3S0D
1 in.	16	171G-10213	19	B224+LF24-SR US	15.3	VS-2213-536-9-23	18.7	VG1241CP - 22TBGA	15.3	VBN2CL3P0D	VBN2CL3S0D
	25	171G-10212	30	B225+LF24-SR US	26.1	VS-2213-536-9-24			26	VBN2CM3P0D	VBN2CM3S0D
					43.9	VS-2213-536-9-26			44	VBN2CN3P0D	VBN2CN3S0D
	63	171G-10214			54.2	VS-2213-536-9-27			54	VBN2CP3P0D	VBN2CP3S0D
					4.4	VS-2213-536-9-41			4.4	VBN2DH3P0D	VBN2DH3S0D
			10	B229+LF24-SR US	8.3	VS-2213-536-9-42	11.7	VG1241DN - 906GA	8.3	VBN2DJ3P0D	VBN2DJ3S0D
	16	171G-10215	19	B230+LF24-SR US	14.9	VS-2213-536-9-43	18.7	VG1241DP - 906GA	14.9	VBN2DK3P0D	VBN2DK3S0D
1-1/4 in.			25	B231+AF24-SR US			29.2	VG1241DR - 906GA	25.0	VBN2DL3P0D	VBN2DL3S0D
			37	B232+AF24-SR US	36.5	VS-2213-536-9-44			37	VBN2DM3P0D	VBN2DM3S0D
	40	171G-10216			41.1	VS-2213-536-9-45			41	VBN2DN3P0D	VBN2DN3S0D
	100	171G-10217			102.3	VS-2213-536-9-46			102	VBN2DS3P0D	VBN2DS3S0D
	25	171G-10218	19	B238+AF24-SR US	22.8	VS-2213-536-9-51	18.7	VG1241EP - 906GA	23	VBN2EL3P0D	VBN2EL3S0D
			29	B239+AF24-SR US			29.2	VG1241ER - 906GA	30.0	VBN2EM3P0D	VBN2EM3S0D
1-1/2 in.	40	171G-10220	37	B240+AF24-SR US	41.3	VS-2213-536-9-52	46.8	VG1241ES - 906GA	41	VBN2EN3P0D	VBN2EN3S0D
	63	171G-10219			73.9	VS-2213-536-9-53			74	VBN2ER3P0D	VBN2ER3S0D
	160	171G-10221			171.7	VS-2213-536-9-54			172	VBN2E13P0D	VBN2E13S0D
			29	B248+AF24-SR US			29.2	VG1241FR - 926GGA			
	40	171G-10222	46	B249+AF24-SR US	41.7	VS-2213-536-9-61	46.8	VG1241FS - 926GGA	42	VBN2FN3P0D	VBN2FN3S0D
	63	171G-10224	57	B250+AF24-SR US					57.0	VBN2FP3P0D	VBN2FP3S0D
2 in.			65	B251+AF24-MFT US	71.1	VS-2213-536-9-63	73.7	VG1241FT - 926GGA	71	VBN2FR3P0D	VBN2FR3S0D
	100	171G-10223	85	B252+AF24-MFT US					100.0	VBN2FS3P0D	VBN2FS3S0D
			120	B253+AF24-MFT US	108.0	VS-2213-536-9-65			108.0	VBN2FT3P0D	VBN2FT3S0D
					210.0	VS-2213-536-9-66			210.0	VBN2F13P0D	VBN2F13S0D
	250	171G-10225	240	B254+AF24-MFT US	266	VS-2213-536-9-67			266.0	VBN2F23P0D	VBN2F23S0D
					45.0	VS-2213-536-9-71			45.0	VBN2GN3P0D	VBN2GN3S0D
			60	B261+AF24-MFT US	55.0	VS-2213-536-9-72			55.0	VBN2GP3P0D	VBN2GP3S0D
			75	B262+AF24-MFT US	72.3	VS-2213-536-9-73			72	VBN2GR3P0D	VBN2GR3S0D
2-1/2 in.			110	B263+AF24-MFT US	101.0	VS-2213-536-9-74			101.0	VBN2GS3P0D	VBN2GS3S0D
			150	B264+AF24-MFT US	162.0	VS-2213-536-9-75			162.0	VBN2GU3P0D	VBN2GU3S0D
			210	B265+AF24-MFT US	202.0	VS-2213-536-9-76			202.0	VBN2G13P0D	VBN2G13S0D
					49.0	VS-2213-536-9-81			49.0	VBN2HN3P0D	VBN2HN3S0D
			70	B277+AF24-MFT US	63.0	VS-2213-536-9-82			63.0	VBN2HP3P0D	VBN2HP3S0D
3 in.					82.0	VS-2213-536-9-83			82.0	VBN2HR3P0D	VBN2HR3S0D
			130	B278+AF24-MFT US	124.0	VS-2213-536-9-84			124.0	VBN2HT3P0D	VBN2HT3S0D
			170	B280+AF24-MFT US	145.0	VS-2213-536-9-85			145.0	VBN2HU3P0D	VBN2HU3S0D
									91.0		VBF2JS1S0D
									118.0		VBF2JT1S0D
4 in.									152.0		VBF2JU1S0D
									197.0		VBF2J11S0D
									254.0		VBF2J21S0D
									144.0		VBF2KU1S0D
									185.0		VBF2K11S0D
5 in.									240.0		VBF2K21S0D
									309.0		VBF2K31S0D
									400		VBF2K41S0D
6 in.									208.0		VBF2L11S0D
									268.0		VBF2L21S0D

Control Ball Valve

Schneider/T.A.C. Erie Zone Valve

						Control Ball Valve Actuators											
						Honeywell VBN		Modulating Actuator		Floating Actuator		Modulating Fail-Safe Actuator			Floating Fail-Safe Actuator		
Service	Body	Valve P/N	Size	Fittings	Cv	Valve	Cv [a]	Erie	Honeywell	Erie	Honeywell	Erie NC	Erie NO	HWL NC/NO	Erie NC	Erie NO	HWL NC/NO
Proportional Control	2-way	VM2211	1/2"	Sweat	1.0	VBN2AE3P0X[1]	1.3	AP33A000	MN7505A (Actuator Code VBN…**0B**)	AT33A000 AT33A00T	MN6105A (Actuator Code VBN…**0A**)	AP13A000	AP23A000	MS7505A (Actuator Code VBN…**0D**)	AT13A00T	AT23A00T	MS7505A (Actuator Code VBN…**0D**)
		VM2212			2.0	VBN2AG3P0X[1]	2.6										
		VM2213			4.0	VBN2AH3P0X[1]	4.7										
		VM2221		NPT	1.0	VBN2AE3P0X	1.3										
		VM2222			2.0	VBN2AG3P0X	2.6										
		VM2223			4.0	VBN2AH3P0X	4.7										
		VM2311	3/4"	Sweat	1.0	VBN2BE3P0X[1]	1.2										
		VM2312			2.0	VBN2BG3P0X[1]	2.5										
		VM2313			4.0	VBN2BH3P0X[1]	4.3										
		VM2317			7.5[3]	VBN2BJ3P0X[1]	7.4										
		VM2321		NPT	1.0	VBN2BE3P0X	1.2										
		VM2322			2.0	VBN2BG3P0X	2.5										
		VM2323			4.0	VBN2BH3P0X	4.3										
		VM2327			7.5[3]	VBN2BJ3P0X	7.4										
		VM2413	1"	Sweat	4.0	VBN2CH3P0X[1]	4.4										
		VM2417			8.0[3]	VBN2CJ3P0X[1]	9										
		VM2423		NPT	4.0	VBN2CH3P0X	4.4										
		VM2427			8.0[3]	VBN2CJ3P0X	9.0										
		VM2517	1-1/4"	Sweat		VBN2DJ3P0X[1]	8.3										
	3-way	VM3211	1/2"	Sweat	1.0	VBN3AE3P0X[1]	1.0										
		VM3212			2.0	VBN3AF3P0X[1]	2.4										
		VM3213			4.0	VBN3AH3P0X[1]	4.3										
		VM3221		NPT	1.0	VBN3AE3P0X	1.0										
		VM3222			2.0	VBN3AF3P0X	2.4										
		VM3223			4.0	VBN3AH3P0X	4.3										
		VM3311	3/4"	Sweat	1.0	VBN3BE3P0X[1]	1.3										
		VM3312			2.0	VBN3BF3P0X[1]	2.4										
		VM3313			4.0	VBN3BG3P0X[1]	3.8										
		VM3317			7.5[3]	VBNAJG3P0X[123]	8.0										
		VM3321		NPT	1.0	VBN3BE3P0X	1.3										
		VM3322			2.0	VBN3BF3P0X	2.4										
		VM3323			4.0	VBN3BG3P0X	3.8										
		VM3327			7.5[3]	VBNAJG3P0X[2]	8.0										
		VM3413	1"	Sweat	4.0	VBN3CH3P0X[1]	4.5										
		VM3417			8.0[3]	VBN3CJ3P0X[1]	8.6										
		VM3423		NPT	4.0	VBN3CH3P0X	4.5										
		VM3427			8.0[3]	VBN3CJ3P0X	8.6										
		VM3517	1-1/4"	Sweat		VBN3DJ3P0X[1]	8.7										

[1] Use MPT-to-sweat adapters
[2] Requires pipe reducers
[3] Linear flow characteristic / full port ball
[a] Valves are usually oversized. Increase pressure drop if required flow is too low.
Differences less than ±10% are not considered significant.

Schneider/T.A.C. Erie Zone Valve

						VU Fan Coil Valve Actuators											
						Honeywell VU Valve		24Vac 50/60 Hz		120Vac, 60 Hz		208Vac, 60 Hz		230V/50 Hz; 240V/60 Hz		277Vac, 60 Hz	
Service	Body	Valve P/N	Size	Fittings	Cv	Body	Cv	Erie	Honeywell	Erie	Honeywell	Erie	Honeywell	Erie	Honeywell	Erie	Honeywell
2-Position (on-off, water)	2-way Normally Closed	VT2211	1/2"	Sweat	1.0	VU53S2018	1.0	AG13A000 AG13A020 AG13A02A	VU843A1004 VU843A1004† N/A	AG13B000 AG13B020 AG13B02A	VU443A1008 VU443A1032 VU443E1009	AG13D000 AG13D020 AG13D02A	VU443A1024† VU443A1024 N/A	AG13T000 AG13T020 AG13T02A	VU443A1115 VU443A1115† N/A	AG13U000 AG13U020 AG13U02A	VU443A1057† VU443A1057 N/A
		VT2212			2.5	VU53S2026	2.5										
		VT2213			3.5	VU53S2034	3.5										
		VT2221		NPT	1.0	VU53N1041	1.0										
		VT2222			2.5	VU53N1058	2.5										
		VT2223			3.5	VU53N1009	3.5										
		VT2311	3/4"	Sweat	1.0	VU53S2018[1]	1.0										
		VT2312			2.5	VU53S2026[1]	2.5										
		VT2313			3.5	VU53S2042	3.5										
		VT2315			5.0	VU53S2075	5.0										
		VT2317			7.5	VU53S2059	8.0										
		VT2321		NPT	1.0	VU53N1041[1]	1.0										
		VT2322			2.5	VU53N1058[1]	2.5										
		VT2323			3.5	VU53N1033	3.5										
		VT2325			5.0	VU53N1066	5.0										
		VT2327			7.5	VU53N1017	8.0										
		VT2413	1"	Sweat	3.5	VU53N1033[1]	3.5										
		VT2415			5.0	VU53N1066[1]	5.0										
		VT2417			8.0	VU53S2000	8.0										
		VT2427		NPT		VU53N1026	8.0										
		VT2517	1-1/4"	Sweat		VU53S2000[1]	8.0										
	2-way Normally Open	VT2211	1/2"	Sweat	1.0	VU52S2002	1.0	AG23A000 AG23A020 AG23A02A	VU844A1003 VU844A1003† N/A	AG23B000 AG23B020 AG23B02A	VU444A1007 VU444A1064 N/A	AG23D000 AG23D020 AG23D02A	Contact Marketing	AG23T000 AG23T020 AG23T02A	VU444A1106 VU444A1106† N/A	AG23U000 AG23U020 AG23U02A	VU444A1098† VU444A1098 N/A
		VT2212			2.5	VU52S2010	2.5										
		VT2213			3.5	VU52S2028	3.5										
		VT2221		NPT	1.0	VU52N1027	1.0										
		VT2222			2.5	VU52N1035	2.5										
		VT2223			3.5	VU52N1019	3.5										
		VT2311	3/4"	Sweat	1.0	VU52S2002[1]	1.0										
		VT2312			2.5	VU52S2010[1]	2.5										
		VT2313			3.5	VU52S2036	3.5										
		VT2315			5.0	VU52S2044	5.0										
		VT2317			7.5	VU52S2051	5.0										
		VT2321		NPT	1.0	VU52N1027[1]	1.0										
		VT2322			2.5	VU52N1035[1]	2.5										
		VT2323			3.5	VU52N1076	3.5										
		VT2325			5.0	Contact marketing[3]											
		VT2327			7.5	VU52N1001	8.0										
		VT2413	1"	Sweat	3.5	VU52N1076[1]	3.5										
		VT2415			5.0	VU52S2044[1]	5.0										
		VT2417			8.0	VU52S2093	8.0										
		VT2427		NPT		VU52N1068	8.0										
		VT2517	1-1/4"	Sweat		VU52S2093[1]	8.0										
	3-way Mixing N.C./N.O.	VT3211	1/2"	Sweat	1.5	VU54S2032	1.5	AG13A000 AG13A020 AG13A02A	VU844A1003 VU844A1003† N/A	AG13B000 AG13B020 AG13B02A	VU444A1007 VU444A1064 N/A	AG13D000 AG13D020 AG13D02A	Contact Marketing	AG13T000 AG13T020 AG13T02A	VU444A1106 VU444A1106† N/A	AG13U000 AG13U020 AG13U02A	VU444A1098† VU444A1098 N/A
		VT3212			3.0	VU54S2040	3.0										
		VT3213			4.0	VU54S2008	4.0										
		VT3221		NPT	1.5	VU54S2032[2]	1.5										
		VT3222			3.0	VU54S2040[2]	3.0										
		VT3223			4.0	VU54N1007	4.0										
		VT3311	3/4"	Sweat	1.5	VU54S2032[1]	1.5										
		VT3312			3.0	VU54S2040[1]	3.0										
		VT3313			4.0	VU54S2008[1]	4.0										
		VT3315			5.0	VU54S2057	5.0										
		VT3317			7.5	VU54S2016	7.0										
		VT3321		NPT	1.5	VU54S2032[12]	1.5										
		VT3322			3.0	VU54S2040[12]	3.0										
		VT3323			4.0	VU54N1031	4.0										
		VT3325			5.0	VU54N1049	5.0										
		VT3327			7.5	VU54N1015	7.0										
		VT3413	1"	Sweat	4.0	VU54N1031[12]	4.0										
		VT3415			5.0	VU54S2057[1]	5.0										
		VT3417			8.0	VU54S2024	7.0										
		VT3427		NPT		VU54N1023	7.0										
		VT3517	1-1/4"	Sweat		VU54S2024[1]	7.0										

[1] Requires pipe reducers
[2] Requires sweat-to-NPT adapters
[3] 2-way body exists (VU53N1066), but requires N.O. actuator mounting plate
† Connect to motor leads

CROSS REFERENCE

						VC Cartridge Cage Valve Actuators												
						Honeywell VC Valve			Modulating Actuator		Floating Actuator		Modulating Fail-safe			Floating Fail-Safe		
Service	Body	Valve P/N	Size	Fittings	Cv	Body	+ Cartridge[1]	Cv[a]	Erie	Honeywell	Erie	Honeywell	Erie NC Act'r	Erie NO Act'r	HWL NC/NO Y-pack	Erie NC Act'r	Erie NO Act'r	HWL NC/ NO Y-pack
Proportional Control	2-way	VM2211	1/2"	Sweat	1.0	VCZAA3600		1.3	AP33A000	VC7934ZZ11/U	AT33A000 AT33A00T	VC6934ZZ11/U	AP13A000	AP23A000	VC7936AA1600/U	AT13A00T	AT23A00T	VC6936AA1600/U
		VM2212			2.0	VCZAA3400		2.3							VC7936AA1400/U			VC6936AA1400/U
		VM2213			4.0	VCZAA3100[3]		3.3							VC7936AA1100/U			VC6936AA1100/U
		VM2221		NPT	1.0	VCZBB3600		1.3							VC7936BB1600/U			VC6936BB1600/U
		VM2222			2.0	VCZBB3400		2.3							VC7936BB1400/U			VC6936BB1400/U
		VM2223			4.0	VCZBB3100[3]		3.3							VC7936BB1100/U			VC6936BB1100/U
		VM2311	3/4"	Sweat	1.0	VCZAM3100[3]	VCZZ3600[1]	1.5							N/A			N/A
		VM2312			2.0	VCZAM3800		3.1							N/A			N/A
		VM2313			4.0	VCZAM3400		3.9							VC7936AM1400/U			VC6936AM1400/U
		VM2317			7.5[3]										VC7936AM1100/U			VC6936AM1100/U
		VM2321		NPT	1.0	VCZAL3100[3]	VCZZ3600[1]	1.3							N/A			N/A
		VM2322			2.0	VCZAL3800		3.1							N/A			N/A
		VM2323			4.0	VCZAL3400		3.9							VC7936AL1400/U			VC6936AL1400/U
		VM2327			7.5[3]										VC7936AL1100/U			VC6936AL1100/U
		VM2413	1"	Sweat	4.0	VCZAS3400		4.2							VC7936AS1400/U			VC6936AS1400/U
		VM2417			8.0[3]	VCZAS3100[3]		6.6							VC7936AS1100/U			VC6936AS1100/U
		VM2423		NPT	4.0	VCZAR3400		4.2							VC7936AR1400/U			VC6936AR1400/U
		VM2427			8.0[3]	VCZAR3100[3]		6.6							VC7936AR1100/U			VC6936AR1100/U
		VM2517	1-1/4"	Sweat		VCZBE3100[3]		7.0							VC7936BE1100/U			VC6936BE1100/U
	3-way	VM3211	1/2"	Sweat	1.0	VCZMA7600		1.3							VC7936MA6600/U			VC6936MA6600/U
		VM3212			2.0	VCZMA7400		2.7							VC7936MA6400/U			VC6936MA6400/U
		VM3213			4.0	VCZMA7100[3]		3.8							VC7936MA6100/U			VC6936MA6100/U
		VM3221		NPT	1.0	VCZNB7600		1.3							VC7936NB6600/U			VC6936NB6600/U
		VM3222			2.0	VCZNB7400		2.7							VC7936NB6400/U			VC6936NB6400/U
		VM3223			4.0	VCZNB7100[3]		3.8							VC7936NB6100/U			VC6936NB6100/U
		VM3311	3/4"	Sweat	1.0	VCZML7100[3]	VCZZ7600[1]	1.5							N/A			N/A
		VM3312			2.0	VCZML7800		3.4							N/A			N/A
		VM3313			4.0	VCZML7400		4.2							VC7936ML6400/U			VC6936ML6400/U
		VM3317			7.5[3]	VCZMR7100[23]		7.4							VC7936ML6100/U			VC6936ML6100/U
		VM3321		NPT	1.0	VCZMK7100[3]	VCZZ7600[1]	1.5							N/A			N/A
		VM3322			2.0	VCZMK7800		3.4							N/A			N/A
		VM3323			4.0	VCZMK7400		4.2							VC7936MK6400/U			VC6936MK6400/U
		VM3327			7.5[3]	VCZMS7100[23]		7.4							VC7936MK6100/U			VC6936MK6100/U
		VM3413	1"	Sweat	4.0	VCZMS7400		5.2							N/A			N/A
		VM3417			8.0[3]	VCZMS7100[3]		7.4							VC7936MS6100/U			VC6936MS6100/U
		VM3423		NPT	4.0	VCZMR7400		5.2							N/A			N/A
		VM3427			8.0[3]	VCZMR7100[3]		7.4							VC7936MR6100/U			VC6936MR6100/U
		VM3517	1-1/4"	Sweat		VCZNE7100[3]		8.3							VC7936NE6100/U			VC6936NE6100/U

[1] Replace factory-supplied cartridge with part number shown
[2] Requires pipe reducers
[3] Linear flow characteristic
[a] Valves are usually oversized. Increase pressure drop if required flow is too low
Differences less than ±10% are not considered significant

Threaded Globe Valves

	Pipe Size	Cv	Siemens Model	Cv	Belimo Model	Cv	Invensys	Cv	Johnson Controls	Cv	Honeywell Model
Direct-Acting, Brass Trim 2-Way Valves	1/2"	1	599-03162	0.4	G212	0.4	VB-7213-0-4-01	0.73	VG7241CT	0.73	V5011N1008
		1.6	599-03163	1.3	G213	1.3	VB-7213-0-4-02			1.16	V5011N1016
				2.2	G214	2.2	VB-7213-0-4-03	1.8	VG7241ET	1.85	V5011N1024
		2.5	599-03164							2.9	V5011N1032
		4	599-03165	4.4	G215	4.4	VB-7213-0-4-04	4.6	VG7241GT	4.7	V5011N1040
	3/4"	6.3	599-03166	7.5	G220	7.5	VB-7213-0-4-06	7.3	VG7241LT	7.3	V5011N1057
	1"	10	599-03167	10	G224	10	VB-7213-0-4-07	11.6	VG7241NT	11.7	V5011N1065
	1 1/4"	16	599-03168	20	G232	20	VB-7213-0-4-09	18.5	VG7241PT	18.7	V5011N1073
	1 1/2"	25	599-03169	28	G240	28	VB-7213-0-4-10	28.9	VG7241RT	29.3	V5011N1081
	2"	40	599-03170	40	G250	40	VB-7213-0-4-11	46.2	VG7241ST	46.8	V5011N1099
	2 1/2"					65	VB-9213-0-4-12			63	V5011F1105
	3"					85	VB-9213-0-4-13			100	V5011F1113
Direct-Acting, SS Trim 2-Way Valves	1/2"	1	599-03108					0.73	VG7243CT	0.73	V5011N2006
		1.6	599-03109							1.16	V5011N2014
								1.8	VG7243ET	1.85	V5011N2022
		2.5	599-03110							2.9	V5011N2030
		4	599-03111					4.6	VG7243GT	4.7	V5011N2048
	3/4"	6.3	599-03112					7.3	VG7243LT	7.3	V5011N2055
	1"	10	599-03113					11.6	VG7243NT	11.7	V5011N2063
	1 1/4"	16	599-03114					18.5	VG7243PT	18.7	V5011N2071
	1 1/2"	25	599-03115					28.9	VG7243RT	29.3	V5011N2089
	2"	40	599-03116					46.2	VG7243ST	46.8	V5011N2097
	2 1/2"									63	V5011G1111
	3"									100	V5011G1129
Reverse-Acting 2-Way Valves	1/2"	2.5	599-03182			2.2	VB7223-0-4-03	1.8	VG7441ET	2.9	V5011N3004
		4	599-03183			4.4	VB7223-0-4-04	4.6	VG7441GT	4.7	V5011N3012
	3/4"	6.3	599-03184			7.5	VB7223-0-4-06	7.3	VG7441LT	7.3	V5011N3020
	1"	10	599-03185			10	VB7223-0-4-07	11.6	VG7441NT	11.7	V5011N3038
	1 1/4"	16	599-03186			20	VB7223-0-4-09	18.5	VG7441PT	18.7	V5011N3046
3-Way Valves	1/2"	2.5	599-03200	2.2	G314	1.3	VB-7313-0-4-02	1.8	VG7842ET	2.9	V5013N1030
		4	599-03201	4.4	G315	4.4	VB-7313-0-4-04	4.6	VG7842GT	4.7	V5013N1048
	3/4"	6.3	599-03202	7.5	G320	7.5	VB-7313-0-4-06	7.3	VG7842LT	7.3	V5013N1055
	1"	10	599-03203	14	G325	14	VB-7313-0-4-08	11.6	VG7842NT	11.7	V5013N1063
	1 1/4"	16	599-03204	20	G332	20	VB-7313-0-4-09	18.5	VG7842PT	18.7	V5013N1071
	1 1/2"	25	599-03205	28	G340	28	VB-7313-0-4-10	28.9	VG7842RT	29.3	V5013N1089
	2"	40	599-03206	41	G350	40	VB-7313-0-4-11	46.2	VG7842ST	46.8	V5013N1097

Globe Valve

Flanged Globe Valves

	Pipe Size	Cv	Johnson Controls	Cv	Belimo Model	Cv	Invensys	Cv	Honeywell Model
Bronze Trim, ANSI 125 2-Way Valves	2 1/2"	51	VB-3752-19	65	G665	56	VB-9213-0-5-12	63	V3351A2008
	3"	83	VB-3752-22	90	G680	85	VB-9213-0-5-13	100	V3351A3006
	4"	150	VB-3752-25	170	G6100	145	VB-9213-0-5-14	160	V3351A4004
	5"	240	VB-3752-28	263	G6125	235	VB-9213-0-5-15	250	V3351A5001
	6"	350	VB-3752-31	344	G6150	350	VB-9213-0-5-16	400	V3351A6009
	2 1/2"	51	VB-3970-11			56	VB-9223-0-5-12	63	V3351C2004
	3"	83	VB-3970-14			85	VB-9223-0-5-13	100	V3351C3002
	4"	150	VB-3970-17			145	VB-9223-0-5-14	160	V3351C4000
	5"	240	VB-3970-20			235	VB-9223-0-5-15	250	V3351C5007
	6"	350	VB-3970-23			350	VB-9223-0-5-16	400	V3351C6005
Mixing, ANSI 125 3-Way Valves	2 1/2"	54	VB-4322-9	68	G765	56	VB-9313-0-5-12	63	V3360E2008
	3"	80	VB-4322-11	91	G780	85	VB-9313-0-5-13	100	V3360E3006
	4"	157	VB-4322-13	190	G7100	145	VB-9313-0-5-14	160	V3360E4004
	5"	238	VB-4322-19	280	G7125	235	VB-9313-0-5-15	250	V3360E5001
	6"	347	VB-4322-18	340	G7150	350	VB-9313-0-5-16	400	V3360E6009
Diverting, ANSI 125 3-Way Valves	2 1/2"			38	G765D	56	VB-9323-0-5-12	63	V5013C1001
	3"			85	G780D	85	VB-9323-0-5-13	100	V5013C1019
	4"			154	G7100D	145	VB-9323-0-5-14	160	V5013C1027
	5"			195	G7125D	235	VB-9323-0-5-15	250	V5013C1035
	6"			248	G7150D	350	VB-9323-0-5-16	360	V5013C1043

						Cartridge Globe Valve Actuators													
						Honeywell V58XX		Modulating Actuator		Floating Actuator		Modulating Fail-Safe Actuator				Floating Fail-Safe Actuator			
Service	Body	Valve P/N	Size	Fittings	Cv	Body	Cv[a]	Erie	Honeywell	Erie	Honeywell	Erie NC	HWL NC†	Erie NO	HWL NO†	Erie NC	HWL NC†	Erie NO	HWL NO†
Proportional Control	2-way	VM2211	1/2"	Sweat	1.0	V5852A2049	1.2	AP33A000	M7410F1000	AT33A000 AT33A00T	M6410A1029	AP13A000		AP23A000	M7435F1001	AT13A00T		AT23A00T	M6435A1004
		VM2212			2.0	V5852A2056	1.9												
		VM2213			4.0	V5852A2064[2]	2.9												
		VM2221		NPT	1.0	V5862A2047	1.2												
		VM2222			2.0	V5862A2054	1.9												
		VM2223			4.0	V5862A2062[2]	2.9												
		VM2311	3/4"	Sweat	1.0	V5852A2049[2]	1.2												
		VM2312			2.0	V5852A2064	2.9												
		VM2313			4.0	V5852A2072	4.9												
		VM2317			7.5[3]	V5862A3011[13]	7.8		M7410F3006		M6410A3017								
		VM2321		NPT	1.0	V5862A2047[2]	1.2												
		VM2322			2.0	V5862A2062	2.9		M7410F1000		M6410A1029								
		VM2323			4.0	V5862A2070	4.9												
		VM2327			7.5[3]	V5862A3011[3]	7.8		M7410F3006		M6410A3017		M7435F3007				M6435A3000		
		VM2413	1"	Sweat	4.0	V5852A2072[12]	4.9		M7410F1000		M6410A1029				M7435F1001				M6435A1004
		VM2417			8.0[3]	V5862A3011[13]	7.8		M7410F3006		M6410A3017		M7435F3007				M6435A3000		
		VM2423		NPT	4.0	V5862A2070[2]	4.9		M7410F1000		M6410A1029				M7435F1001				M6435A1004
		VM2427			8.0[3]	V5862A3011[3]	7.8		M7410F3006		M6410A3017		M7435F3007				M7435F3007		
		VM2517	1-1/4"	Sweat		V5862A3011[23]													
	3-way	VM3211	1/2"		1.0	V5853A2030	1.2		M7410F1000		M6410A1029		M7435F1001				M6435A1004		
		VM3212			2.0	V5853A2048	1.9												
		VM3213			4.0	V5853A1016[2]	4.9												
		VM3221		NPT	1.0	V5863A2038	1.2												
		VM3222			2.0	V5863A2046	1.9												
		VM3223			4.0	V5863A1014[2]	4.9												
		VM3311	3/4"	Sweat	1.0	V5853A2030[2]	1.2												
		VM3312			2.0	V5853A1008	2.9												
		VM3313			4.0	V5853A1016	4.9												
		VM3317			7.5[3]	V5863A3010[123]	7.8		M7410F3006		M6410A3017		M7435F3007				M6435A3000		
		VM3321		NPT	1.0	V5863A2038[2]	1.2		M7410F1000		M6410A1029		M7435F1001				M6435A1004		
		VM3322			2.0	V5863A1006	2.9												
		VM3323			4.0	V5863A1014	4.9												
		VM3327			7.5[3]	V5863A3010[23]	7.8		M7410F3006		M6410A3017		M7435F3007				M6435A3000		
		VM3413	1"	Sweat	4.0	V5852A2072[2]	4.9		M7410F1000		M6410A1029		M7435F1001				M6435A1004		
		VM3417			8.0[3]	V5863A3010[13]	7.8		M7410F3006		M6410A3017		M7435F3007				M6435A3000		
		VM3423		NPT	4.0	V5863A1014[2]	4.9		M7410F1000		M6410A1029		M7435F1001				M6435A1004		
		VM3427			8.0[3]	V5863A3010[3]	7.8		M7410F3006		M6410A3017		M7435F3007				M6435A3000		
		VM3517	1-1/4"	Sweat		V5863A3010[123]	8.3												

[1] Use MPT-to-sweat adapters above 3/4" valve size
[2] Requires pipe reducers
[3] Linear flow characteristic
[a] Valves are usually oversized. Increase pressure drop if required flow is too low
Differences less than ±10% are not considered significant
† Fail-safe position is determined by the valve body

Pneumatics

ITEM NUMBER	MANUFACTURER	HONEYWELL MODEL	TYPE OF REPLACEMENT	REMARKS
2463-863	ROBERTSHAW	MP516A1087	FUNCTIONAL	
2464-861	ROBERTSHAW	MP516A1087	FUNCTIONAL	
2466-011	ROBERTSHAW	MP920B1002 with 14004345-001	FUNCTIONAL	
2466-051	ROBERTSHAW	MP920B1002	FUNCTIONAL	
2472-020	ROBERTSHAW	MP909D1201	FUNCTIONAL	
2472-030	ROBERTSHAW	MP909D1227	FUNCTIONAL	
2472-040	ROBERTSHAW	MP909D1219	FUNCTIONAL	
2472-050	ROBERTSHAW	MP909A1660	FUNCTIONAL	
2472-110	ROBERTSHAW	MP909A1041	FUNCTIONAL	
2472-120	ROBERTSHAW	MP909D1201	FUNCTIONAL	
2472-140	ROBERTSHAW	MP909D1219	FUNCTIONAL	
2473-010	ROBERTSHAW	MP909E1018	FUNCTIONAL	
2473-020	ROBERTSHAW	MP909E1083	FUNCTIONAL	
2473-030	ROBERTSHAW	MP909E1034	FUNCTIONAL	
2473-110	ROBERTSHAW	MP909E1018	FUNCTIONAL	
2473-120	ROBERTSHAW	MP909E1083	FUNCTIONAL	
2473-140	ROBERTSHAW	MP909E1174	FUNCTIONAL	
2474-160	ROBERTSHAW	MP909H1331 or MP918A1024	FUNCTIONAL	
2566-002	ROBERTSHAW	V5013F1004 with MP953C1000	FUNCTIONAL	
2566-004	ROBERTSHAW	V5013F1004 with MP953C1018	FUNCTIONAL	
2566-006	ROBERTSHAW	V5013F1004 with MP953E1319	FUNCTIONAL	
2566-008	ROBERTSHAW	V5013F1020 with MP953C1000	FUNCTIONAL	
2566-010	ROBERTSHAW	V5013F1020 with MP953C1018	FUNCTIONAL	
2566-012	ROBERTSHAW	V5013F1020 with MP953E1319	FUNCTIONAL	
2566-014	ROBERTSHAW	V5013F1038 with MP953C1000	FUNCTIONAL	
2566-016	ROBERTSHAW	V5013F1038 with MP953C1018	FUNCTIONAL	
2566-018	ROBERTSHAW	V5013F1038 with MP953E1319	FUNCTIONAL	
2566-020	ROBERTSHAW	V5013F1046 with MP953C1000	FUNCTIONAL	
2566-022	ROBERTSHAW	V5013F1046 with MP953C1018	FUNCTIONAL	
2566-023	ROBERTSHAW	V5013F1046 with MP953C1319	FUNCTIONAL	
2566-025	ROBERTSHAW	V5013F1053 with MP953C1000	FUNCTIONAL	
2566-027	ROBERTSHAW	V5013F1053 with MP953C1018	FUNCTIONAL	
2566-028	ROBERTSHAW	V5013F1053 with MP953E1319	FUNCTIONAL	
2566-030	ROBERTSHAW	V5013F1061 with MP953C1000	FUNCTIONAL	
2566-032	ROBERTSHAW	V5013F1061 with MP953C1018	FUNCTIONAL	
2566-033	ROBERTSHAW	V5013F1061 with MP953E1319	FUNCTIONAL	
2566-102	ROBERTSHAW	V5013F1004 with MP958C1000	FUNCTIONAL	
2566-104	ROBERTSHAW	V5013F1004 with MP953C1018	FUNCTIONAL	
2566-106	ROBERTSHAW	V5013F1004 with MP953E1319	FUNCTIONAL	
2566-108	ROBERTSHAW	V5013F1004 with MP953C1000	FUNCTIONAL	
2566-110	ROBERTSHAW	V5013F1004 with MP953C1018	FUNCTIONAL	
2566-112	ROBERTSHAW	V5013F1004 with MP953E1319	FUNCTIONAL	
2567-001	ROBERTSHAW	V5011F1006 with MP953D1172	FUNCTIONAL	
2567-003	ROBERTSHAW	V5011F1006 with MP953D1107	FUNCTIONAL	
2567-004	ROBERTSHAW	V5011F1006 with MP953F1119	FUNCTIONAL	
2567-005	ROBERTSHAW	V5011F1022 with MP953D1172	FUNCTIONAL	
2567-007	ROBERTSHAW	V5011F1022 with MP953D1107	FUNCTIONAL	
2567-008	ROBERTSHAW	V5011F1022 with MP953F1119	FUNCTIONAL	

ITEM NUMBER	MANUFACTURER	HONEYWELL MODEL	TYPE OF REPLACEMENT	REMARKS
2567-009	ROBERTSHAW	V5011H1022 with MP953C1000	FUNCTIONAL	
2567-011	ROBERTSHAW	V5011H1022 with MP953C1018	FUNCTIONAL	
2567-012	ROBERTSHAW	V5011H1022 with MP953E1327	FUNCTIONAL	
2567-013	ROBERTSHAW	V5011H1022 with MP953C1000	FUNCTIONAL	
2567-015	ROBERTSHAW	V5011H1022 with MP953C1018	FUNCTIONAL	
2567-016	ROBERTSHAW	V5011H1022 with MP953E1327	FUNCTIONAL	
2567-017	ROBERTSHAW	V5011H1028 with MP953C1000	FUNCTIONAL	
2567-019	ROBERTSHAW	V5011H1028 with MP953C1018	FUNCTIONAL	
2567-020	ROBERTSHAW	V5011H1028 with MP953E1327	FUNCTIONAL	
2567-021	ROBERTSHAW	V5011H1036 with MP953C1000	FUNCTIONAL	
2567-023	ROBERTSHAW	V5011H1036 with MP953C1018	FUNCTIONAL	
2567-024	ROBERTSHAW	V5011H1036 with MP953E1327	FUNCTIONAL	
2567-025	ROBERTSHAW	V5011H1044 with MP953C1000	FUNCTIONAL	
2567-027	ROBERTSHAW	V5011H1044 with MP953C1018	FUNCTIONAL	
2567-028	ROBERTSHAW	V5011H1044 with MP953E1327	FUNCTIONAL	
2567-029	ROBERTSHAW	V5011H1089 with MP953D1172	FUNCTIONAL	
2567-031	ROBERTSHAW	V5011H1089 with MP953D1107	FUNCTIONAL	
2567-032	ROBERTSHAW	V5011H1089 with MP953F1119	FUNCTIONAL	
2567-033	ROBERTSHAW	V5011H1097 with MP953D1172	FUNCTIONAL	
2567-035	ROBERTSHAW	V5011H1097 with MP953D1107	FUNCTIONAL	
2567-036	ROBERTSHAW	V5011H1097 with MP953F1119	FUNCTIONAL	
2568-003	ROBERTSHAW	V5011F1014 with MP953C1018	FUNCTIONAL	
2568-004	ROBERTSHAW	V5011F1014 with MP953C1000	FUNCTIONAL	
2568-005	ROBERTSHAW	V5011F1014 with MP953E1327	FUNCTIONAL	
2568-008	ROBERTSHAW	V5011F1022 with MP953C1018	FUNCTIONAL	
2568-009	ROBERTSHAW	V5011F1022 with MP953C1000	FUNCTIONAL	
2568-010	ROBERTSHAW	V5011F1022 with MP953E1327	FUNCTIONAL	
2568-013	ROBERTSHAW	V5011F1030 with MP953C1018	FUNCTIONAL	
2568-014	ROBERTSHAW	V5011F1030 with MP953C1000	FUNCTIONAL	
2568-015	ROBERTSHAW	V5011F1030 with MP953E1327	FUNCTIONAL	
2568-018	ROBERTSHAW	V5011F1055 with MP953C1018	FUNCTIONAL	
2568-019	ROBERTSHAW	V5011F1055 with MP953C1000	FUNCTIONAL	3 psi positioner span
2568-020	ROBERTSHAW	V5011F1055 with MP953E1327	FUNCTIONAL	External Only, 3 psi positioner span
2568-023	ROBERTSHAW	V5011F1063 with MP953C1018	FUNCTIONAL	External Only, 5 psi positioner span
2568-024	ROBERTSHAW	V5011F1063 with MP953C1000	FUNCTIONAL	
2568-025	ROBERTSHAW	V5011F1063 with MP953E1327	FUNCTIONAL	
2568-028	ROBERTSHAW	V5011F1071 with MP953C1018	FUNCTIONAL	
2568-029	ROBERTSHAW	V5011F1071 with MP953C1000	FUNCTIONAL	
2568-030	ROBERTSHAW	V5011F1071 with MP953E1327	FUNCTIONAL	External Only, 10 psi positioner span
2568-033	ROBERTSHAW	V5011F1089 with MP953C1018	FUNCTIONAL	

ITEM NUMBER	MANUFACTURER	HONEYWELL MODEL	TYPE OF REPLACEMENT	REMARKS
2568-034	ROBERTSHAW	V5011F1089 with MP953C1000	FUNCTIONAL	
2568-035	ROBERTSHAW	V5011F1089 with MP953E1327	FUNCTIONAL	
2568-038	ROBERTSHAW	V5011F1097 with MP953C1018	FUNCTIONAL	Internal normally close only, 3 psi positioner span
2568-039	ROBERTSHAW	V5011F1097 with MP953C1000	FUNCTIONAL	Internal normally close only, 5 psi positioner span
2568-040	ROBERTSHAW	V5011F1097 with MP953E1327	FUNCTIONAL	Internal normally close only, 10 psi positioner span
657-8225	POWERS/LANDIS & GYR	V5013F1020 with MP953C1018	FUNCTIONAL	
658-0026	POWERS/LANDIS & GYR	V5013F1004 with MP953C1000	FUNCTIONAL	5 psi positioner span
658-0028	POWERS/LANDIS & GYR	V5013F1020 with MP953C1000	FUNCTIONAL	10 psi positioner span
D101	JOHNSON CONTROLS	MP909D1201 or MP909D1219 or MP909D1227	FUNCTIONAL	
D103	JOHNSON CONTROLS	MP909E1083 or MP909E1174	FUNCTIONAL	
D251	JOHNSON CONTROLS	MP909D1201 or MP909D1219 or MP909D1227	FUNCTIONAL	External Only
D251(4)	JOHNSON CONTROLS	MP918B1030 or MP918B1113 or MP918B1139 or MP918B1147	FUNCTIONAL	
D251(6)	JOHNSON CONTROLS	MP920B1002	FUNCTIONAL	External Only
D3031-3	JOHNSON CONTROLS	MP913A1052	FUNCTIONAL	Internal normally closed only
D3070-1	JOHNSON CONTROLS	MP516A1087	FUNCTIONAL	
D3073-2	JOHNSON CONTROLS	MP909E1174	FUNCTIONAL	Internal normally closed only
D3073-3	JOHNSON CONTROLS	MP909E1034	FUNCTIONAL	
D3073-7	JOHNSON CONTROLS	MP909E1083	FUNCTIONAL	
D3153-2	JOHNSON CONTROLS	MP918B1089	FUNCTIONAL	
D3153-3	JOHNSON CONTROLS	MP918B1048	FUNCTIONAL	
M556-14	ROBERTSHAW	MP920B1002 with 14004345-001	FUNCTIONAL	
M556-51	ROBERTSHAW	MP920B1002	FUNCTIONAL	
M572-2311	ROBERTSHAW	MP909A1041	FUNCTIONAL	
M572-3308	ROBERTSHAW	MP909D1227	FUNCTIONAL	
M572-5311	ROBERTSHAW	MP909D1219	FUNCTIONAL	
M572-6308	ROBERTSHAW	MP913A1660	FUNCTIONAL	
M572-8311	ROBERTSHAW	MP909D1201	FUNCTIONAL	
M573-2108	ROBERTSHAW	MP909E1018	FUNCTIONAL	
M573-2111	ROBERTSHAW	MP909E1018	FUNCTIONAL	
M573-3108	ROBERTSHAW	MP909E1034	FUNCTIONAL	
M573-5111	ROBERTSHAW	MP909E1174	FUNCTIONAL	External Only
M573-8111	ROBERTSHAW	MP909E1083	FUNCTIONAL	For unitary applications, consult technical support.
M574-1211	ROBERTSHAW	MP909H1331 or MP918A1024	FUNCTIONAL	External Only
M583-0520	ROBERTSHAW	MP516A1087	FUNCTIONAL	For unitary applications, consult technical support.
M584	ROBERTSHAW	MP516A1087	FUNCTIONAL	
MK3101	BARBER COLMAN	MP909E1083 or MP918B1063	FUNCTIONAL	
MK3111	BARBER COLMAN	MP909E1034 or MP918B1048	FUNCTIONAL	Internal normally closed only
MK3121	BARBER COLMAN	MP909E1174 or MP918B1097	FUNCTIONAL	Internal normally closed only
MK3141	BARBER COLMAN	MP909E1018 or MP918B1006	FUNCTIONAL	
MK3201	BARBER COLMAN	MP909E1083 or MP918B1063	FUNCTIONAL	
MK3211	BARBER COLMAN	MP909E1034 or MP918B1048	FUNCTIONAL	External Only
MK3221	BARBER COLMAN	MP909E1174 or MP918B1063	FUNCTIONAL	External Only
MK4-3101	BARBER COLMAN	MP909H1331	FUNCTIONAL	For unitary applications, consult technical support.
MK4-3111	BARBER COLMAN	MP909H1331	FUNCTIONAL	
MK4-3121	BARBER COLMAN	MP909H1331	FUNCTIONAL	Internal normally closed only
MK4-3141	BARBER COLMAN	MP909H1331	FUNCTIONAL	Internal normally closed only
MK4-3801	BARBER COLMAN	MP909H1331	FUNCTIONAL	
MK4-3811	BARBER COLMAN	MP909H1331	FUNCTIONAL	
MK4-3821	BARBER COLMAN	MP909H1331	FUNCTIONAL	For unitary applications, consult technical support.
MK4-3841	BARBER COLMAN	MP909H1331	FUNCTIONAL	
MK4401	BARBER COLMAN	MP516A1095	FUNCTIONAL	
MK4411	BARBER COLMAN	MP516A1103	FUNCTIONAL	
MK4421	BARBER COLMAN	MP909E1158	FUNCTIONAL	
MK4451	BARBER COLMAN	MP516A1087	FUNCTIONAL	
MK4461	BARBER COLMAN	MP516A1087	FUNCTIONAL	
MK4-7101	BARBER COLMAN	MP918A1024	FUNCTIONAL	
MK4-7121	BARBER COLMAN	MP918A1024	FUNCTIONAL	
MK7101	BARBER COLMAN	MP918B1063	FUNCTIONAL	
MK7121	BARBER COLMAN	MP918B1089	FUNCTIONAL	
MP904A1145	HONEYWELL	MP918A1008	FUNCTIONAL	External Only, 3 psi positioner span
MP904A1145	HONEYWELL	MP918A1016	FUNCTIONAL	External Only, 5 psi positioner span
MP904A1145	HONEYWELL	MP918A1024	FUNCTIONAL	External Only, 10 psi positioner span
MP904A1145	HONEYWELL	MP918A1032	FUNCTIONAL	Internal normally close only, 3 psi positioner span
MP904A1145	HONEYWELL	MP918A1040	FUNCTIONAL	Internal normally close only, 5 psi positioner span
MP904A1145	HONEYWELL	MP918A1057	FUNCTIONAL	Internal normally close only, 10 psi positioner span
MP904A1152	HONEYWELL	MP917A1065	FUNCTIONAL	3 psi positioner span
MP904A1152	HONEYWELL	MP918A1073	FUNCTIONAL	5 psi positioner span
MP904A1152	HONEYWELL	MP918A1081	FUNCTIONAL	10 psi positioner span
MP904A1186	HONEYWELL	MP918A1099	FUNCTIONAL	
MP904B1028	HONEYWELL	MP918B1006	FUNCTIONAL	External Only
MP904B1028	HONEYWELL	MP918B1014	FUNCTIONAL	Internal normally closed only
MP904B1093	HONEYWELL	MP918B1063	FUNCTIONAL	External Only
MP904B1093	HONEYWELL	MP918B1071	FUNCTIONAL	Internal normally closed only
MP904B1101	HONEYWELL	MP918B1097	FUNCTIONAL	Internal normally closed only
MP904B1101	HONEYWELL	MP918B1089	FUNCTIONAL	External Only
MP904B1119	HONEYWELL	MP918B1014	FUNCTIONAL	
MP904B1127	HONEYWELL	MP918B1022	FUNCTIONAL	
MP904B1135	HONEYWELL	MP918B1105	FUNCTIONAL	
MP904B1150	HONEYWELL	MP918B1030	FUNCTIONAL	
MP904C1026	HONEYWELL	MP918A1024	FUNCTIONAL	
MP904C1328	HONEYWELL	MP918B1006	FUNCTIONAL	
MP904C1377	HONEYWELL	MP918B1030	FUNCTIONAL	
MP909A1041	MIRCOSWITCH	MP909D1227 with 14002850-001 with 312867H	FUNCTIONAL	
MP909A1132	HONEYWELL	MP909A1652	FUNCTIONAL	
MP909A1637	MIRCOSWITCH	MP909D1227 with 14002850-001 with 312867H	FUNCTIONAL	

Pneumatics

ITEM NUMBER	MANUFACTURER	HONEYWELL MODEL	TYPE OF REPLACEMENT	REMARKS
MP909A1645	HONEYWELL	MP909D1227 with 14002850-001 with 312867H with 14002061-001	FUNCTIONAL	
MP909A1652	MIRCOSWITCH	MP909D1201 with 14002850-001 with 312867H	FUNCTIONAL	
MP909A1660	MIRCOSWITCH	MP909D1219 with 14002850-001 with 312867H	FUNCTIONAL	
MP909A1744		MP909E1232	FUNCTIONAL	
MP909C1021	HONEYWELL	MP918B1063	FUNCTIONAL	For unitary applications, consult technical support.
MP909C1047	HONEYWELL	MP918B1048	FUNCTIONAL	
MP909C1054	HONEYWELL	MP918B1006	FUNCTIONAL	External Only
MP909C1054	HONEYWELL	MP918B1014	FUNCTIONAL	Internal normally closed only
MP909C1161	HONEYWELL	MP918B1063	FUNCTIONAL	External Only
MP909C1161	HONEYWELL	MP918B1071	FUNCTIONAL	Internal normally closed only
MP909C1179	HONEYWELL	MP918B1097	FUNCTIONAL	Internal normally closed only
MP909C1179	HONEYWELL	MP918B1089	FUNCTIONAL	External Only
MP909C1187	HONEYWELL	MP918B1113	FUNCTIONAL	For unitary applications, consult technical support.
MP909C1286	HONEYWELL	MP918B1048	FUNCTIONAL	
MP909C1294	HONEYWELL	MP918B1022	FUNCTIONAL	
MP909C1310	HONEYWELL	MP918B1063	FUNCTIONAL	For unitary applications, consult technical support.
MP909C1336	HONEYWELL	MP918B1063	FUNCTIONAL	
MP909C1344	HONEYWELL	MP918B1089	FUNCTIONAL	For unitary applications, consult technical support.
MP909D1268	MIRCOSWITCH	MP909D1201 with 14003640-001	DIRECT	
MP909D1292	MIRCOSWITCH	MP909D1227 with 315439/00062	FUNCTIONAL	
MP909D1300	HONEYWELL	MP909D1201	FUNCTIONAL	
MP909D1359	MIRCOSWITCH	MP909D1201 with 14003640-001 with 315781	FUNCTIONAL	
MP909E1265	HONEYWELL	MP909E1232	FUNCTIONAL	
MP909E1497	MIRCOSWITCH	MP909D1201 with 14003640-001 with 315781	FUNCTIONAL	
MP909E1505	HONEYWELL	MP909E1034	FUNCTIONAL	
MP909H1459	HONEYWELL	MP909H1392	FUNCTIONAL	
MP913A1045	HONEYWELL	MP913A1037	FUNCTIONAL	
MP918A1115	HONEYWELL	MP918A1024	FUNCTIONAL	
MP918A1123	HONEYWELL	MP918A1057	FUNCTIONAL	
MP918A115	HONEYWELL	MP918A1024	FUNCTIONAL	
MP918B1220	HONEYWELL	MP918B1063	FUNCTIONAL	
MP920A1004	HONEYWELL	MP920B1002 with 14004345-001	DIRECT	
MP953D1222	HONEYWELL	MP953D1131	FUNCTIONAL	
MP953D1255	HONEYWELL	MP953D1172	FUNCTIONAL	
MP953E1392	MIRCOSWITCH	MP953E1400 with 14004212-001	DIRECT	
PM331	POWERS/LANDIS & GYR	MP920B1002	FUNCTIONAL	
PM331-4X3H	POWERS/LANDIS & GYR	MP516A1087	FUNCTIONAL	
PM331LC	POWERS/LANDIS & GYR	MP920B1002 with 14004345-001	FUNCTIONAL	
2567-016	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2567-020	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2567-024	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2567-028	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-005	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-010	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-015	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-020	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-025	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-030	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-035	ROBERTSHAW	MP953E1327	FUNCTIONAL	
2568-040	ROBERTSHAW	MP953E1327	FUNCTIONAL	
MP953E1392	MIRCOSWITCH	MP953E1400	DIRECT	
2567-004	ROBERTSHAW	MP953F1119	FUNCTIONAL	
2567-008	ROBERTSHAW	MP953F1119	FUNCTIONAL	
2567-032	ROBERTSHAW	MP953F1119	FUNCTIONAL	
2567-036	ROBERTSHAW	MP953F1119	FUNCTIONAL	
2566-102	ROBERTSHAW	MP958C1000	FUNCTIONAL	

BARBER COLMAN - TAC	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
MA-12313	None					24	25	75-180°	28		spst	M8415A1004
MA-12323	None					24	25	75-180°	28	2	spst	M8415A1004
MA-305	None					24	16	180°	20		spst	M836A1042
MA-305-500	None					24	16	180°	20	1	spst	M836A1042
MA-318	M8185D1006				160°	24	60	180°	20		spst	M8185D1006
MA-318-500	M8185D1006		220736A		160°	24	60	180°	20	1	spst	None
MA-405	None					120	16	180°	20		spst	M436A1116
MA-405-500	None					120	16	180°	20	1	spst	M436A1116
MA-406	None					208	16	180°	20		spst	M836A1042
MA-406-500	None					208	16	180°	20	1	spst	M836A1042
MA-407	None					240	16	180°	20		spst	M436A1124
MA-407-500	None					240	16	180°	20	1	spst	M436A1124
MA-416	M8185D1006	50017460-001			160°	208	60	180°	20		spst	M4185B1058
MA-416-500	M8185D1006	50017460-001	220736A		160°	208	60	180°	20	1	spst	M4185B1058
MA-418	M8185D1006	50017460-003			160°	120	60	180°	20		spst	M4185A1001
MA-418-500	M8185D1006	50017460-003	220736A		160°	120	60	180°	20	1	spst	M4185B1009
MA-419	M8185D1006	50017460-001			160°	240	60	180°	20		spst	M4185B1058
MA-419-500	M8185D1006	50017460-001	220736A		160°	240	60	180°	20	1	spst	M4185B1058
MA-5330	None					120	20	2			spst	None
MA-5333	None					24	20	2			spst	None
MA5-419	M8185D1006	50017460-001			160°	240	60	170°	20		spst	M4185B1058
MA5-419-500	M8185D1006	50017460-001	220736A		160°	240	60	170°	20	1	spst	M4185B1058
MC-351	M6194D1017		220736A		160°	24	220	180°	70	1	spdt	None
MC-421	M6184D1035	50017460-003	220736A		160°	120	175	180°	20	1	spdt	None
MC-431	M6194D1017	50017460-001	220736A		160°	120	220	180°	30	1	spdt	None
MC-4311	M6194D1017	50017460-001	220736A		160°	240	220	180°	30	1	spdt	None
MC5-4311	M6194D1017	50017460-001	220736B	ES-650	160°	120	220	180°	36	1	spdt	None
MC-9610	None					120	1100	180°	65	1	spdt	None
MC-9810	None					120	1300	180°	115	1	spdt	None
ME-12313	None					24	25	110°	28 (90°)		3-position	M8405A1006
ME-12313-102	None					24	25	110°	28 (90°)	2	3 position	M8405A1006
MP-2110	None					120	50	180°	25	1	CP-8000	None
MP-2113-500	M6184D1035		220736A		160°	24	50	180°	25	1	spdt	M6184D1001 + Q607A
MP-2130-500	M6184D1035	50017460-003	220736A		90°	120	50	90°	13	1	spdt	M6184D1001 + Q607A
MP-2150-500	M6184D1035	50017460-003	220736A		160°	120	50	180°	25	1	spdt	M6184A1023 + Q607A
MP-2151-500	M6184D1035	50017460-001	220736A		160°	240	50	180°	30	1	spdt	None
MP-371	M6294D1008-S		220736A		160°	24	50	180°	90	1	spdt	None
MP-381	M6194D1017		220736A		160°	24	220	180°	130	1	spdt	None
MP-481	M9194D1003	50017460-003	220736A	Q7230A	160°	120	220	180°	130	1	2-15 Vdc	None
MP-483-600	M6294D1008-S	50017460-003	220736A		90°	120	220	90°	65	1	spdt	M6294D1008-S
MP-485	M6194D1017	50017460-003	220736A		160°	120	220	180°	130	1	spdt	None
MP-4851	M6294D1008-S	50017460-001	220736A		160°	240	220	180°	130	1	CP-8000	None
MP-486	M6294D1008-S	50017460-003	220736A		160°	120	220	180°	130-1300	1	spdt	None
MP-9710	None					120	800	180°	135	1	Proportional	None
MU-12313	None					24	25	90°	28		Economizer	M7415A1006

Competitive Modutrol Motor

PENN JOHNSON	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M110AAB-1	M8185D1006	50017460-003	220736A		ADJ	120	25	45-270°	60	1		None
M110AGA-1	M8185D1006				ADJ	24	25	45-270°	60			None
M110AGB-1	M8185D1006		220736A		ADJ	24	25	45-270°	60	1		None
M110GGA-1	M9185D1004		220738A	Q7230A								None
M110JGA-1	M9185D1004				ADJ	24	25	65-270°	60			M9184D1004 + 220738A
M110JGB-1	M9185D1004		220736A		ADJ	24	25	65-270°	60			M9184D1004 + 220738A
M110QGA-1	None											None
M120AAA-1	M6184D1035	50017460-003			ADJ							None
M120AAB-1	M8185D1006	50017460-003	220736A		ADJ							None
M120AAC-1	M6184D1035	50017460-003	220736B		ADJ							None
M120AGA-1	M6184D1035				ADJ							None
M120GGA-1	M9164D1009			Q7230A	ADJ							None
M120JAA-1	M9164D1009	50017460-003			ADJ	120	35	65-270°	60			M9164D1009
M120JAC-1	M9164D1009		220736B		ADJ	24	35	65-270°	60	2		M9164C1068
M120JGA-1	M9164D1009				ADJ	24	35	65-270°	60			M9164A1005
M120QGA-1	None											None
M130AGA-1	M8185D1006				ADJ	24	50	45-270°	60			None
M130AGB-1	M8185D1006		220736A		ADJ	24	50	45-270°	60	1		None
M130GGA-1	M9185D1004				ADJ	24	50	65-270°	60			M7285Q1008
M130JGA-1	M9185D1004				ADJ	24	50	65-270°	60			M9185A1018
M130JGB-1	M9185D1004		220736A		ADJ	24	50	65-270°	60	1		M9185E1019
M130QGA-1	None											None
M140AAA-1	M6184D1035				ADJ							None
M140AGA-1	M6184D1035				ADJ							None
M140GGA-1	M9174D1007			Q7230A	ADJ							None
M140JAA-1	M9174D1007	50017460-003			ADJ	120	70	65-270°	60			M9174D1007
M140JGA-1	M9174D1007				ADJ	24	70	65-270°	60			M9174D1007
M150AGA-1	M6184D1035				ADJ	24	150	65-270°	60			M6184D1035
M150AGB-1	M6184D1035		220736A		ADJ	24	150	65-270°	60	1		None
M150GGA-1	M9184D1021		220738A	Q7230A	ADJ							None
M150JGA-1	M9184D1021				ADJ	24	150	65-270°	60			M9184A1019
M150JGB-1	M9184D1021		220736A		ADJ	24	150	65-270°	60	1		M9184F1034
M150JGC-1	M9184D1021		220736B		ADJ	24	150	65-270°	60	2		M9184F1034
M150QGA-1	None					24	150	65-270°	60			M7284Q1009
M40AAA-1	M9164D1009	50017460-003			90°	120	35	90°	34			M9164A1005
M40AAC-1	M9164D1009	50017460-003	220736B		90°	120	35	90°	34	2		M9164C1068
M40AGA-1	M6184D1035				90°	24	35	90°	34			M6184A1015
M40AGC-1	M9164D1009		220736B		90°	24	35	90°	34	2		None
M80AAA-3	M6284D1000-S											M6284F1013-S
M80AAB-1	M6284D1000-S		220736B									M6284F1013-S
M80ACA-1	M6285A1005-S											M6285A1005-S
M80ADA-1	M6285A1005-S											M6285A1005-S
M80BAA-1	M9184D1021											M9184A1019
M80BAA-4	None											M9184D1005
M80BCA-1	M9185D1004											M9185D1004
M80BDA-1	M9185D1004											M9185D1004
M80BEA-1	M9185D1004											M9185A1018
M80FAA-2	M9184D1021											M9184A1019
M80FCA-2	M9185D1004											M9185D1004
M80FDA-1	M9185D1004											M9185D1004
M80FEA-1	M9185D1004											M9185A1018
M80FFA-1	M9185D1004											M9185A1018
M80HAB-1	M9184D1021											M9184F1034
M80HAC-1	M9184D1021											M9184F1034
M80JAA–2	M9184D1021				ADJ	24	150	65-240°	60			M9184A1019
M80JAB–1	M9184D1021		220736A		ADJ	24	150	65-240°	60	1		M9184F1034
M80JAC–1	None					24	150	65-240°	60	2		M9484E1017
M80JCA–2	M9185D1004				ADJ	24	50	65-180°	60			M9185A1018
M80JCB–1	M9185D1004		220736A		ADJ	24	50	65-180°	60	1		M9185E1019
M80JDA-1	None											None
M80JFA-1	None											None
M81AAA–12	M6184D1035				ADJ	24	150	65-270°	60			M6184F1014
M81AAA–13	M6184D1035				ADJ	24	80	65-270°	30			M6184D1001
M81AAB–5	M6184D1035		220736A		ADJ	24	150	65-270°	60	1		M6184F1014
M81AAC-1	M6184D1035											M6184F1014
M81ACA-3	M8185D1006				160°	24	50	160°	60			M8185D1006

PENN JOHNSON	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M81ACB-1	M8185D1006		220736A		160°	24	50	160°	60	1		None
M81ADA-2	M8185D1006	50017460-001			160°	MULTI	75	160°	60			M4185B1058
M81AEA-2	M8185D1006	50017460-001			160°	MULTI	75	160°	60			M4185B1009
M81AFA-2	M8185D1006				160°	24	50	160°	60			None
M81AFB-1	M8185D1006	50017460-001										M4185B1058
WHITE RODGERS	**Model Number**	**Required Transformer**	**Required Aux. Switch**	**Required Accessories**	**Stroke Setting**	**Voltage (Vac)**	**Torque (lb-in.)**	**Stroke (degrees)**	**Timing (sec)**	**Aux Sw**	**Control Signal**	**Functional Replacement**
3402–7	None					24	25	110°				M8415A1004
3402A–7	None					120	25	110°				None
3403–4	None					24	25	110°				M8405A1006
3405–2	None					24	20	90°				M836A1042
3405–3	None					24	25	90°				M836A1042
3405A–2	None					120	25	90°				M436A1116
3405–11	None					24	25	90°		1		M836A1042
3405A–11	None					120	25	90°		1		M436A1116
3405–14	None					24	25	90°		1		M836A1042
3420–4	M9185D1004		220738A			24	25	90°				M9185D1004 W/220738A
3420A–4	M9185D1004	50017460-003	220738A			120	25	90°				M9185D1004 W/220738A
3430–7	None					24	25	90°				M7415A1006
3430-18	None					24	25	90°	25			None
3430-21	None					24	25	90°	25			None
3440–4	M9184D1021					24	100	160°	30			M9184A1019

Competitive Modutrol Motor

SIEMENS	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
SQM50.261R1G3						110	90		8		4-20mA	M7284C1000
SQM50.261R1Z3						110	90		8		all	M9184C1031+ Q7230A1005+ 50017460-003
SQM50.264R1G						110	90		8		4-20mA	M7284C1000
SQM50.264R1G4						110	90		8		4-20mA	M7284C1000
SQM50.264R1Z3						110	90		8		all	M9184C1031+ Q7230A1005+ 50017460-003
SQM50.361R1G						110	140		12		4-20mA	M7284C1000
SQM60.361r1z3						110	140		12		all	M9184C1031+ Q7230A1005+ 50017460-003
SQM50.364R1G						110	140		12		4-20mA	M7284C1000
SQM50.364R1Z3						110	140		12		all	M9184C1031+ Q7230A1005+ 50017460-003
SQM50.461R1G3						110	140		25		4-20mA	M7284C1000
SQM50.461R1H3						110	140		25		135 ohm	M9184C1031+ 50017460-003
SQM50.461R1Z						110	140		25		all	M9184C1031+ Q7230A1005+ 50017460-003
SQM50.464R8G						24	140		25		4-20mA	M7284C1000+ 50017460-001
SQM50.464R1G						110	140		25		4-20mA	M7284C1000
SQM50.464R1H3						110	140		25		135 ohm	M9184C1031+ 50017460-003
SQM50.464R8H3						24	140		25		135 ohm	M9184C1031
SQM50.464R1Z3						110	140		25		all	M9184C1031+ Q7230A1005+ 50017460-003
SQM50.464R2Z3						220	140		25		all	M9184C1031+ Q7230A1005+ 50017460-001
SQM50.464R8Z3						24	140		25		all	M9184C1031+ Q7230A1005
SQM53.461R1Z3						110	200		25		all	M9194D1003+ 220736+ Q7230A1005+ 50017460-003
SQM53.464R1G						110	200		25		4-20mA	M7294A1010+ 220736B
SQM53.464R1Z3						110	200		25		all	M9194D1003+ 220736B+ Q7230A1005+ 50017460-003
SQM53.464R2Z3						220	200		25		all	M9194D1003+ 220736B+ Q7230A1005+ 50017460-001
SQM56.564R1G						110	310		37		4-20mA	M7294A1010+ 220736B
SQM56.564R1H4						110	310		37		135 ohm	M9194D1003+ 220736B+ 50017460-003
SQM56.564R1Z3						110	310		37		all	M9194D1003+ 220736B+ Q7230A1005+ 50017460-003
SQM56.664R1G3						110	400		50		4-20mA	M7294A1010+ 220736B
SQM56.664R2G3R						220	400		50		4-20mA	M7294A1010+ 220736B+ 50017460-001
SQM56.664R1H3						110	400		50		135 ohm	M9194D1003+ 220736B+ 50017460-003
SQM56.664R1Z3						110	400		50		all	M9194D1003+ 220736B+ Q7230A1005+ 50017460-001
SQM56.667R1G						110	400		50		4-20mA	M7294A1010+ 220736B
SQM56.667R1Z3						110	400		50		all	M9194D1003+ 220736B+ Q7230A1005+ 50017460-001

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M204A1001	None					24	37	180	15		Series 20	M6184D1001
M204A1019	M6184D1035				160°	24	54	180	30		Series 20	M6184D1001
M204A1027	None					24	54	30	54		Series 20	None
M204A1035	M6184D1035				160°	24	108	180	60		Series 20	M6184D1035
M204A1043	None					24	108	180	60		Series 20	None
M204A1050	M6184D1035				160°	24	108	180	240		Series 20	M6194D1017
M204A1068	M6184D1035				160°	24	108	180	60		Series 20	M6184D1035
M204B1000	M6184D1035				160°	24	108	180	60		Series 20	M6184D1035
M405A1004	None					120	94	60	25		Series 40	None
M405A1020	None					240	94	60	25		Series 40	None
M405B1003	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185B1009
M405B1011	M8185D1006	50017460-001			160°	208	50	160	60		Series 40	M4185B1058
M405B1029	M8185D1006	50017460-001			160°	240	50	160	60		Series 40	M4185B1058
M405B1037	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185A1001
M405B1045	M8185D1006	50017460-001			160°	220	50	160	60		Series 40	None
M405B1052	M8185D1006	50017460-003			90°	120	50	60	60		Series 40	M4185B1058
M405B1086	M8185D1006	50017460-001			90°	220	50	60	60		Series 40	None
M405B1094	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185A1001
M405B1102	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185A1001
M405C1002	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185A1001
M405C1010	M8185D1006	50017460-001			160°	208	50	160	60		Series 40	M4185B1058
M405C1028	M8185D1006	50017460-001			160°	220	50	160	60		Series 40	None
M405C1036	M8185D1006	50017460-003			90°	120	50	90	30		Series 40	M4185B1058
M405C1044	M8185D1006	50017460-001			90°	208	50	90	30		Series 40	M4185B1058
M405C1051	M8185D1006	50017460-001			90°	240	50	90	30		Series 40	M4185B1058
M405C1069	M8185D1006	50017460-001			160°	240	50	160	60		Series 40	M4185B1058
M405D1001	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185B1009
M405D1019	M8185D1006	50017460-001			160°	208	50	160	60		Series 40	None
M405D1027	M8185D1006	50017460-001			160°	240	50	160	60		Series 40	None
M405D1035	M8185D1006	50017460-001			160°	220	27	160	60		Series 40	None
M445A1000	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445A1018	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445A1026	M8185D1006	50017460-001	220736A		160°	208	50	160	60	1	Series 40	M4185B1058
M445A1034	M8185D1006	50017460-001	220736A		160°	208	50	160	60	1	Series 40	M4185B1058
M445A1042	M8185D1006	50017460-001	220736A		160°	208/240	50	160	60	1	Series 40	M4185B1058
M445A1059	M8185D1006	50017460-001	220736A		160°	240	50	160	60	1	Series 40	M4185B1058
M445A1067	M8185D1006	50017460-001	220736A		160°	220	50	160	60	1	Series 40	None
M445A1075	M8185D1006	50017460-003	220736A		90°	120	50	60	25	1	Series 40	M4185B1058
M445A1091	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445A1109	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445A1117	M8185D1006	50017460-003	220736A		90°	120	50	90	30	1	Series 40	M4185B1058
M445A1125	M8185D1006	50017460-003	220736A		90°	120	50	90	15	1	Series 40	M4185B1058
M445A4004	M8185D1006	50017460-003	220736A		ADJ	120	50	90/160	30/60	1	Series 40	None
M445C1008	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445C1016	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445C1024	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 40	M4185B1009
M445D1007	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185A1001
M445D1015	M8185D1006	50017460-003			90°	120	50	90	30		Series 40	M4185B1058
M445D1023	M8185D1006	50017460-001			160°	220	50	160	60		Series 40	None
M445D1031	M8185D1006	50017460-001			160°	240	50	160	60		Series 40	M4185B1058
M445D1049	M8185D1006	50017460-003			160°	120	50	180	67		Series 40	M4185A1001
M445D1056	M8185D1006	50017460-003			160°	120	50	160	60		Series 40	M4185A1001
M465A1008	M8185D1006	50017460-003			160°	120	25	160	40		Series 40	M4185B1009
M465B1007	M8185D1006	50017460-003	220736B		160°	120	50	160	60	2	Series 40	M4185A1001
M604A1002	M6184D1035	50017460-003				120	75	360	30		Series 61	M6184A1023
M604A1028	M6184D1035	50017460-001				240	40	360	60		Series 61	None
M604A1036	M6184D1035	50017460-001				208	54	360	30		Series 61	None
M604A1051	None					240	40	180	15		Series 61	None
M604A1069	M6184D1035	50017460-003				120	40	360	60		Series 61	None
M604A1077	M6184D1035	50017460-003				120	75	360	15		Series 61	None
M604B1001	M6184D1035	50017460-003			160°	120	37	180	15		Series 61	M6184A1023
M604B1019	M6184D1035	50017460-001			160°	240	37	180	30		Series 61	None
M604B1027	M6184D1035	50017460-003			160°	120	75	180	30		Series 61	M6184A1023
M604B1035	M6184D1035	50017460-001			160°	208	54	180	30		Series 61	None
M604B1043	M6184D1035	50017460-001			160°	240	75	180	30		Series 61	None
M604B1050	None					120	54	180	30		Series 61	None
M604B1068	M6184D1035	50017460-003			160°	120	54	180	30		Series 61	M6184A1023
M604B1076	M6184D1035	50017460-001			160°	220	54	180	30		Series 61	None
M604C1059	None					24	108	160	60		Series 61	None

Modutrol I, II, III to Modutrol IV

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M604C1083	None					24	150	160	120		Series 61	None
M604D1009	M6184D1035	50017460-001			160°	220	85	180	60		Series 61	None
M604D1017	M6184D1035	50017460-001			160°	220	85	180	60		Series 61	None
M604E1008	M6184D1035		220736A		ADJ	24	150	90/160	30/60	1	Series 61	M6184F1014
M604E1016	M6184D1035		220736A		ADJ	24	150	90/160	30/60	1	Series 61	M6184F1014
M604E1024	M6184D1035		220736A		ADJ	24	150	90/160	30/60	1	Series 61	M6184F1014
M634A1009	M6184D1035				160°	24	35	160	60		Series 61	M6184D1035
M634B1008	M6184D1035	50017460-003			160°	120	35	160	60		Series 61	None
M634B1016	M6184D1035	50017460-001			160°	240	35	160	60		Series 61	None
M634C1007	M6184D1035		220736B		160°	24	35	160	60	2	Series 61	M6184F1014
M634C1015	M6184D1035	50017460-003	220736B		160°	120	35	160	60	2	Series 61	M6184F1014
M634C1023	M6184D1035	50017460-001	220736B		160°	240	35	160	60	2	Series 61	M6184F1014
M634C1031	M6184D1035	50017460-001	220736B		160°	220	35	160	60	2	Series 61	M6184F1014
M634C1049	M6184D1035	50017460-003	220736B		160°	120	35	160	60	2	Series 61	M6184F1014
M634C1056	M6184D1035		220736B		160°	24	35	160	60	2	Series 61	M6184F1014
M634C1064	M6184D1035	50017460-001	220736B		160°	220	35	160	60	2	Series 61	M6184F1014
M634C1072	M6184D1035	50017460-003	220736B		160°	120	35	160	60	2	Series 61	M6184F1014
M634C1080	M6184D1035	50017460-001	220736B		160°	220	35	160	60	2	Series 61	M6184F1014
M634C1098	M6184D1035	50017460-001	220736B		160°	220	35	160	60	2	Series 61	M6184F1014
M644A1008	M6184D1035				160°	24	150	160	60		Series 61	M6184D1035
M644A1016	M6184D1035				160°	24	150	160	60		Series 61	M6184D1035
M644A1024	M6184D1035				90°	24	150	90	30		Series 61	M6184A1015
M644A1032	None					24	37	160	15		Series 61	None
M644A1107	None					24	37	335	15		Series 61	None
M644A1115	None					24	37	335	30		Series 61	None
M644A1149	M6184D1035	50017460-001			160°	220	150	160	60		Series 61	None
M644A1180	M6184D1035				160°	24	150	160	60		Series 61	M6184D1035
M644B1007	M6184D1035	50017460-003			160°	120	75	160	30		Series 61	None
M644B1015	None					120	37	160	15		Series 61	None
M644B1031	M6184D1035	50017460-003			90°	120	150	90	120		Series 61	None
M644B1049	M6184D1035	50017460-003			160°	120	75	160	30		Series 61	M6184A1023
M644B1056	M6194D1017	50017460-003			90°	120	150	90	120		Series 61	None
M644C1006	M6184D1035				ADJ	24	75	90/160	15/30		Series 61	M6184D1001
M644C1014	M6194D1017				ADJ	24	150	90/160	120/240		Series 61	M6194D1017
M644C1022	M6184D1035	50017460-003			ADJ	120	150	90/160	120/240		Series 61	None
M644C1030	M6194D1017				ADJ	24	150	90/160	120/240		Series 61	M6194D1017
M644C1055	M6194D1017				ADJ	24	300	90/160	120/240		Series 61	M6194D1017
M644C1063	M6184D1035	50017460-003			ADJ	120	150	90/160	120/240		Series 61	None
M644C1071	M6194D1017				ADJ	24	300	90/160	120/240		Series 61	None
M644C4000	M6194D1017				ADJ	24	150	90/160	120/240		Series 61	M6194D1017
M644D1005	M6184D1035		220736B		ADJ	24	150	90/160	30/60	2	Series 61	M6184F1014
M644D1013	M6184D1035		220736B		ADJ	24	150	90/160	30/60	2	Series 61	M6184F1014
M644D1021	M6184D1035		220736B		ADJ	24	150	90/160	30/60	2	Series 61	M6184F1014
M644D1039	M6184D1035		220736B		ADJ	24	150	90/160	30/60	2	Series 61	M6184F1014
M644D1047	M6194D1017		220736B		ADJ	24	300	90/160	120/240	2	Series 61	None
M644E1004	M6184D1035		220736A		ADJ	24	150	90/160	30/60	1	Series 61	M6184F1014
M644E1012	M6194D1017		220736A		90°	24	150	90	60	1	Series 61	M6194B1011
M644E1020	M6184D1035	50017460-003	220736A		ADJ	120	75	90/160	15/30	1	Series 61	None
M644E1038	M6184D1035		220736A		ADJ	24	75	90/160	15/30	1	Series 61	M6184D1001
M644E1053	M6194D1017		220736A		ADJ	24	300	90/160	120/240	1	Series 61	M6194E1006
M644F1003	M6184D1035	50017460-003			160°	120	75	180	30		Series 61	M6184D1001
M644L1006	M6194D1017	50017460-003	220736A		90°	120	150	90	120	1	Series 61	None
M644L1014	M6184D1035	50017460-003	220736A		90°	120	150	90	30	1	Series 61	M6184F1014
M644L1022	M6194D1017	50017460-003	220736A		90°	120	150	90	120	1	Series 61	None
M644L1030	M6194D1017	50017460-003	220736A		90°	120	150	90	120	1	Series 61	None
M734A1007	None					120	35	90	30		W936	None
M734A1015	None					120	35	90	30		W936	None
M734A1023	None					120	35	90	30		W936	None
M734B1006	None					120	35	90	28		W936	None
M734B1014	None					240	35	90	28		W936	None
M734B1022	None					24	35	90	28		W936	None
M734B1030	None					240	35	160	50		W936	None
M734B1048	None					120	35	160	50		W936	None
M734C1005	None					120	35	90	28		W936	None
M734C1013	None					120	35	90	28		W936	None
M734C1021	None					120	35	90	28		W936	None
M734D1004	M9164D1009	50017460-003		Q7330A1004	160°	120	35	160	50		W936	None
M734D1012	M9164D1009	50017460-003		Q7330A1004	90°	120	35	90	28		W936	None
M734D1020	M9164D1009	50017460-001		Q7330A1004	160°	240	35	160	50		W936	None

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M734D1038	M9164D1009			Q7330A1004	160°	24	35	160	50		W936	None
M734D1046	M9164D1009		220736A	Q7330A1004	90°	24	35	90	28	1	W936	None
M734D1053	M9164D1009		220736A	Q7330A1004	160°	24	35	160	50	1	W936	None
M734E ALL	M9164D1009			Q7330A1004			35				W936	None
M734F ALL	M9164D1009			Q7330A1004			75				W936	None
M734G ALL	M9164D1009			Q7330A1004			75				W936	None
M734H1000	M9164D1009	50017460-003		Q7130A1006	90°	120	35	90	28		10.5-13.5 Vdc	M7164G1030
M734H1018	M9164D1009	50017460-003		Q7130A1006	90°	120	35	90	28		4 - 7 Vdc	None
M734H1026	M9164D1009			Q7130A1006	160°	24	35	160	50		4 - 7 Vdc	None
M734H1034	M9164D1009			Q7130A1006	90°	24	35	90	30		10.5-13.5 Vdc	M7164G1030
M734J1007	M9164D1009	50017460-003		Q7130A1006	160°	120	35	160	50		6 - 9 Vdc	None
M734J1015	M9164D1009			Q7130A1006	160°	24	35	160	50		4 - 7 Vdc	None
M734J1023	M9164D1009			Q7130A1006	90°	24	35	90	30		10.5-13.5 Vdc	M7164A1017
M734J1031	M9164D1009	50017460-003		Q7130A1006	90°	120	35	90	30		10.5-13.5 Vdc	None
M734J1049	M9164D1009			Q7130A1006	160°	24	35	160	50		10.5-13.5 Vdc	None
M734J1056	M9164D1009			Q7130A1006	90°	24	35	90	30		10.5-13.5 Vdc	M7164A1017
M734J1064	M9164D1009	50017460-003		Q7130A1006	90°	120	35	90	30		6 - 9 Vdc	None
M734J1072	M9164D1009	50017460-003	220736A	Q7130A1006	160°	120	35	160	50	1	4 - 7 Vdc	None
M734K1006	None					120	35	160	50		4 - 7 Vdc, 3W, 11 Vdc out	None
M734K1014	None					24	35	160	50			
M741B1001	None					24	150	90	30		BRCS	None
M741B1019	None					24	150	90	30		BRCS	M7484A1010
M744A1006	M9184D1021			Q7330A1004	160°	24	150	160	60		W936	None
M744A1014	M9184D1021			Q7330A1004	90°	24	150	90	30		W936	None
M744A1022	M9184D1021	50017460-003		Q7330A1004	90°	120	150	90	30		W936	None
M744B ALL	None					24	150				W936	None
M744D1003	M9184D1021			Q7130A1006	160°	24	150	160	60		4 - 7 Vdc	None
M744D1011	M9184D1021			Q7130A1006	160°	24	150	160	60		4 - 7 Vdc	None
M744D1029	None					24	150	90	30		0.8 - 3.3 Vdc	None
M744D1037	None					24	150	90	120		0.8 - 3.3 Vdc	None
M744D1045	None					120	150	90	30		0.8 - 3.3 Vdc	None
M744E1002	None					24	50	160	60		2 - 10 Vdc	None
M744F1001	M9184D1021			Q7330A1004	160°	24	150	160	60		W936	None
M744G1000	None					24	150	160	60		4 - 7 Vdc, 3W, 11 Vdc out	None
M744J1006	None					24	150	90	30		0 - 2.5 Vdc	None
M744S1005	M9184D1021	50017460-003		Q7230A1005	90°	120	150	90	30		4 - 20 mA	M7284A1004
M744S1013	M9184D1021	50017460-003		Q7230A1005	160°	120	150	160	60		4 - 20 mA	M7284A1012
M744T1004	M9184D1021	50017460-003	220736B	Q7230A1005	90°	120	150	90	30	2	4 - 20 mA	M7284C1000
M744T1012	M9184D1021	50017460-003	220736B	Q7230A1005	160°	120	150	160	60	2	4 - 20 mA	M7284C1000
M744Y1009	M9184D1021	50017460-003	220736B	Q7230A1005	90°	120	150	90	30	2	4 - 20 mA	M7284Q1009
M744Y1017	M9184D1021	50017460-003	220736B	Q7230A1005	160°	120	150	160	60	2	4 - 20 mA	M7284Q1009
M745A1003	M9185D1004			Q7330A1004	90°	24	50	90	30		W936	None
M745A1011	M9185D1004			Q7330A1004	160°	24	50	160	60		W936	None
M745A1029	M9185D1004	50017460-003		Q7330A1004	160°	120	50	160	60		W936	None
M745B1002	M9185D1004			Q7330A1004	160°	24	50	160	60		W936	None
M745C1001	M9185D1004			Q7330A1004	160°	24	50	160	60		W936	None
M745D ALL	None					24	50	160	60			None
M745E1009	None					24	50	160	60		W936	M9185D1004 +Q7330A1006
M745F1008	None					24	50	160	60			None
M745G1007	M9185D1004			Q7130A1006	160°	24	50	160	60		4 - 7 Vdc	M9185D1004 + Q7130A1006
M745H1006	M9185D1004			Q7630A1001	160°	24	50	160	60		14 - 17 Vdc	None
M745J1003	None					24	50	160	60		4 - 7 Vdc, 3W, 11 Vdc out	None
M745K1002	M9185D1004			Q7630A1001	90°	24	50	90	35		14 - 17 Vdc	None
M745L1001	M9185D1004			Q7630A1001	90°	24	50	90	35		14 - 17 Vdc	None
M745L1019	M9185D1004	50017460-003		Q7630A1001	160°	120	50	160	60		14 - 17 Vdc	None
M745L1027	M9185D1004			Q7630A1001	160°	24	50	160	60		14 - 17 Vdc	None
M745L1035	M9185D1004			Q7630A1001	90°	24	50	90	35		14 - 17 Vdc	None
M745L1043	M9185D1004			Q7630A1001	90°	24	50	90	35		14 - 17 Vdc	None

Modutrol I, II, III to Modutrol IV

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M745M1000	M9185D1004			Q7130A1006	160°	24	50	160	60		6 - 9 Vdc	None
M745M1018	M9185D1004			Q7130A1006	90°	24	50	90	35		10.5-13.5 Vdc	None
M745M1026	M9185D1004			Q7130A1006	160°	24	50	160	60		4 - 7 Vdc	None
M745M1034	M9185D1004			Q7130A1006	160°	24	50	160	60		4 - 7 Vdc	None
M745M1042	M9185D1004			Q7130A1006	160°	24	50	160	60		4 - 7 Vdc	None
M745N1009	M9185D1004			Q7130A1006	90°	24	50	90	35		10.5-13.5 Vdc	None
M745N1017	M9185D1004			Q7130A1006	160°	24	50	160	60		10.5-13.5 Vdc	None
M745N1025	M9185D1004			Q7130A1006	160°	24	50	160	60		6 - 9 Vdc	None
M745P1007	M9185D1004			Q7130A1006	160°	24	50	160	60		4 - 7 Vdc	M9185D1004 + Q7130A1006
M745P1015	M9185D1004			Q7130A1006	90°	24	50	90	35		10.5-13.5 Vdc	None
M745Q1006	None					24	50	90	35			None
M745S1002	M9185D1004	50017460-003		Q7230A1005	90°	120	50	90	30		4 - 20 mA	M7285A1003
M745S1010	M9185D1004	50017460-003		Q7230A1005	160°	120	50	160	60		4 - 20 mA	M7285A1003
M745T1001	M9185D1004	50017460-003	220736B	Q7230A1005	90°	120	50	90	30	2	4 - 20 mA	M7285C1009
M745T1019	M9185D1004	50017460-003	220736B	Q7230A1005	160°	120	50	160	60	2	4 - 20 mA	M7285C1009
M745Y1006	M9185D1004	50017460-003	220736B	Q7230A1005	90°	120	50	90	30	2	4 - 20 mA	M7285Q1008
M745Y1014	M9185D1004	50017460-003	220736B	Q7230A1005	160°	120	50	160	60	2	4 - 20 mA	M7285Q1008
M765A1001	M9185D1004			Q7330A1004	160°	24	25	160	40		W936	None
M765A1019	M9185D1004			Q7330A1004	90°	24	25	90	25		W936	None
M765K1000	M9185D1004			Q7630A1001	90°	24	25	90	25		14 - 17 Vdc	None
M765L1009	M9185D1004			Q7630A1001	160°	24	25	160	40		14 - 17 Vdc	None
M765L1017	M9185D1004			Q7630A1001	90°	24	25	90	25		14 - 17 Vdc	None
M765L1025	M9185D1004	50017460-003		Q7630A1001	90°	120	25	90	25		14 - 17 Vdc	None
M765N1007	M9185D1004			Q7130A1006	90°	24	25	90	25		10.5-13.5 Vdc	None
M765N1015	M9185D1004			Q7130A1006	160°	24	25	160	40		10.5-13.5 Vdc	None
M765P1005	None					24	25	90	25		3.5 - 6.5 Vdc	None
M765P1013	None					24	25	90	25		3.5 - 6.5 Vdc	None
M765Q1004	None					24	25	90	25		0 - 1 mA	None
M805B1004	M8185D1006				160°	24	50	160	60		Series 80	M8185D1006
M805B1012	None					24	27	160	120		Series 80	None
M805B1020	M8185D1006				160°	24	50	160	60		Series 80	M8185D1006
M805B1038	M8185D1006		220736A		160°	24	50	160	60	1	Series 80	None
M805C1003	M8185D1006				160°	24	50	160	60		Series 80	M8185D1006
M805D1002	M8185D1006				160°	24	50	160	60		Series 80	M4185B1009
M845A1001	M8185D1006		220736A		160°	24	50	160	60	1	Series 80	None
M845A1027	M8185D1006	50017460-001	220736A		160°	MULTI	50	160	60	1	Series 80	M4185B1058
M845A1035	M8185D1006	50017460-001	220736A		90°	MULTI	50	90	30	1	Series 80	M4185B1058
M845A1050	None					24	50	160	60	1	Series 80	None
M845A1068	None					24	50	160	60	1	Series 80	None
M845A4005	M8185D1006	50017460-001	220736A		ADJ	MULTI	50	90/160	30/60	1	Series 80	None
M845B1000	M8185D1006		220736A		160°	24	50	160	60	1	Series 80	None
M845B1018	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 80	M4185B1058
M845B1026	M8185D1006	50017460-001	220736A		160°	220	50	160	60	1	Series 80	None
M845C1009	M8185D1006				160°	24	50	160	60		Series 80	M8185D1006
M845D1008	M8185D1006				160°	24	50	160	60		Series 80	None
M845D1016	M8185D1006	50017460-003			160°	120	50	160	60		Series 80	M4185B1058
M845D1024	M8185D1006				160°	24	50	160	60		Series 80	None
M845E1007	M8185D1006	50017460-003	220736A		160°	120	50	160	60	1	Series 80	M4185B1009
M845E4001	M8185D1006	50017460-003	220736A		ADJ	24/120	50	90/160	30/60	1	Series 80	M4185B1009
M865A1009	M8185D1006				160°	24	25	160	40		Series 80	None
M865B1008	M8185D1006		220736A		160°	24	25	160	40	1	Series 80	None
M904A1006	M9184D1021				160°	24	108	160	60		135 ohm	M9184A1019
M904E1002	M9184D1021				160°	24	108	160	60		135 ohm	M9184A1019
M904E1010	None					24	108	160	60		135 ohm	None
M904E1028	None					24	108	160	60		135 ohm	None
M904E1036	M9184D1021			Q181A1004	160°	24	108	180	60		135 ohm	M9184A1019
M904E1051	M9184D1021				90	24	108	90	30		135 ohm	None
M904E1085	M9184D1021				90	24	108	90	30		135 ohm	None
M904E1119	M9194D1003				160	24	108	240	90		135 ohm	None
M904E1150	M9184D1021			Q181A1004	160°	24	108	160	240		135 ohm	M9194D1003
M904E1176	M9184D1021			Q181A1004	160°	24	108	180	240		135 ohm	M9194D1003
M904E1218	None					24	108	160	240		135 ohm	None
M904E1226	None					24	14	160	7.5		135 ohm	None
M904E1234	None					24	38	180	15		135 ohm	None

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M904E1242	None					24	38	180	15		135 ohm	None
M904E1267	M9184D1021			Q181A1004	160°	24	54	160	30		135 ohm	M9184D1005
M904E1358	M9184D1021			Q181A1004	160°	24	150	180	60		135 ohm	M9184A1019
M904E1366	M9184D1021				90	24	150	90	30		135 ohm	M9184D1021
M904E1374	None					24	150	160	60		135 ohm	None
M904F1001	None					24	37	160	15		Series 62	None
M904F1019	None					24	75	160	30		Series 62	None
M904F1027	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M904F1035	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M904F1043	M6284D1000-S				90°	24	150	90	30		Series 62	M6284F1013-S
M904F1050	M6284D1000-S				160°	24	150	160	240		Series 62	None
M904G1000	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M905E1009	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1025	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1058	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1066	M9185D1004			Q181A1004	90°	24	50	90	30		135 ohm	M9185A1018
M905E1074	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1082	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1108	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1116	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905E1124	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M905F1008	M9185D1004				160°	24	56	160	60		135 ohm	M9185A1018
M905F1016	None					24	27	160	120		135 ohm	None
M905F1024	M9185D1004				160°	24	27	160	60		135 ohm	M9185A1018
M905F1032	M9185D1004				160°	24	56	160	60		135 ohm	M9185A1018
M905G1007	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M905G1015	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M905G1023	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M905H1006	M6285A1005-S				160°	24	27	160	60		Series 62	M6285A1005-S + Q209/S963
M905H1014	M6285A1005-S				160°	24	50	160	60		Series 62	
M905J1003	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M905K1002	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M905K1010	None					24	27	160	120		Series 62	None
M905L1001	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M905L1019	None					24	27	160	120		Series 62	None
M905N1009	M9185D1004				160°	24	50	160	60		135 ohm	M9185C1006
M905N1017	M6285A1005-S				160°	24	50	160	60		135 ohm	M9185C1006
M905N1025	M6285A1005-S				160°	24	50	160	60		135 ohm	M9185C1006
M905P1007	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M905P1015	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M931A1009	None					24	108	90	30		135 ohm	M9484D1010
M931A1017	None					24	108	90	60		135 ohm	None
M931A1025	None					24	150	160	60		135 ohm	M9484D1010
M931A1033	None					24	37	160	15		135 ohm	None
M931A1041	None					24	54	90	15		135 ohm	M9484D1010
M931A1058	None					24	75	160	30		135 ohm	M9484D1010
M931A1066	None					24	108	90	30		135 ohm	M9484D1010
M931A1074	None					24	108	160	60		135 ohm	M9484D1010
M931A1082	None					24	108	90	60		135 ohm	None
M931A1090	None					24	150	160	240		135 ohm	None
M931A1108	None					24	150	90	60		135 ohm	None
M931A1116	None					24	150	90	30		135 ohm	M9484D1010
M931A1124	None					24	108	90/160	30/60		135 ohm	M9494D1000
M931A1132	None					24	108	90/160	60/120		135 ohm	M9484D1010
M931A1140	None					24	150	90/160	30/60		135 ohm	M9484D1010
M931A1157	None					24	37	90/160	7.5/15		135 ohm	None
M931A1165	None					24	76	90/160	15/30		135 ohm	M9484D1010
M931A1173	None					24	108	90/160	30/60		135 ohm	M9484D1010
M931A1181	None					24	108	90/160	120/240		135 ohm	None
M931A1199	None					24	54	90/160	30/60		135 ohm	M9484D1010
M931A1207	None					24	150	160	60		135 ohm	M9484D1010
M931A1215	None					24	108	90/160	30/60	1	135 ohm	M9484E1017
M931A1223	None					24	108	90/160	60/120	1	135 ohm	None
M931A1231	None					24	108	90/160	30/60	1	135 ohm	M9484E1017
M931A1249	None					24	27	90/160	7.5/15	1	135 ohm	None
M931A1256	None					24	54	90/160	15/30	1	135 ohm	M9484E1009
M931A1264	None					24	108	90/160	30/60	1	135 ohm	M9484E1017
M931A1272	None					24	108	90/160	120/240	1	135 ohm	None
M931A1280	None					24	150	90/160	30/60	1	135 ohm	M9484E1033

Modutrol I, II, III to Modutrol IV

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M931A1298	None					24	150	90	60		135 ohm	None
M931A1306	None					24	108	90/160	30/60		135 ohm	M9484D1010
M931A1314	None					24	108	90/160	60/120		135 ohm	M9494D1000
M931A1322	None					24	108	90/160	30/60		135 ohm	M9484D1010
M931A1330	None					24	150	160	60		135 ohm	None
M931B1008	None					24	108	90	30		Series 62	M6284F1013-S
M931B1016	None					24	150	90/160	30/60		Series 62	M6284F1013-S
M931B1024	None					24	150	160	60		Series 62	M6284D1000-S
M931B1032	None					24	150	160	30		Series 62	None
M931B1040	None					24	150	160	60		Series 62	M6284D1000-S
M931B1057	None					24	150	90	60		Series 62	None
M931C1007	None					24	108	90/160	30/60	1	135 ohm	M9484E1017
M931C1015	None					24	150	90/160	60/120	1	135 ohm	None
M931C1023	None					24	150	90/160	30/60	1	135 ohm	M9484E1017
M931C1031	None					24	37	90/160	7.5/15	1	135 ohm	None
M931C1049	None					24	75	90/160	15/30	1	135 ohm	M9484E1009
M931C1056	None					24	150	90/160	120/240	1	135 ohm	None
M931C1064	None					24	150	90/160	30/60	1	135 ohm	M9484E1017
M931C1072	None					24	150	90/160	30/60	1	135 ohm	M9484E1033
M931D1006	None					24	150	160	60	1	135 ohm	M6284F1013-S
M931D1014	None					24	150	90	30	1	135 ohm	M6284F1013-S
M934A1003	M9164D1009	50017460-001			160°	240	35	160	60		135 ohm	None
M934A1011	M9164D1009	50017460-003			160°	120	35	160	60		135 ohm	None
M934A1029	M9164D1009				160°	24	35	160	60		135 ohm	M9164A1005
M934A1037	M9164D1009	50017460-001			160°	220	35	160	60		135 ohm	M9164A1088
M934A1045	M9164D1009		220736B		160°	24	35	160	60	2	135 ohm	M9164C1068
M934A1052	M9164D1009	50017460-003	220736B		160°	120	35	160	60	2	135 ohm	M9164C1068
M934A1060	M9164D1009	50017460-001	220736B		160°	240	35	160	60	2	135 ohm	None
M934A1078	M9164D1009	50017460-001	220736B		160°	220	35	160	60	2	135 ohm	None
M934A1086	M9164D1009	50017460-003			160°	120	35	160	60		135 ohm	M9164A1005
M934A1094	M9164D1009	50017460-003	220736B		160°	120	35	160	60	2	135 ohm	M9164C1068
M934A1102	M9164D1009	50017460-001			90°	240	35	90	35		135 ohm	None
M934A1128	M9164D1009	50017460-003	220736B		90°	120	35	90	35	2	135 ohm	M9164C1068
M934A1136	M9164D1009	50017460-003			90°	120	35	90	35		135 ohm	M9164A1005
M934A1144	M9164D1009				90°	24	35	90	35		135 ohm	None
M934A1169	M9164D1009				160°	24	35	160	60		135 ohm	M9164A1005
M934A1193	M9164D1009		220736B		160°	24	35	160	60	2	135 ohm	M9164C1068
M934A1201	M9164D1009	50017460-001			160°	240	35	160	60		135 ohm	M9164A1013
M934A1219	M9164D1009	50017460-003			160°	120	35	160	60		135 ohm	M9164A1005
M934A1227	M9164D1009				160°	24	35	160	60		135 ohm	M9164D1009
M934A1235	M9164D1009	50017460-001			160°	220	35	160	60		135 ohm	M9164A1088
M934A1243	M9164D1009		220736B		160°	24	35	160	60	2	135 ohm	M9164C1068
M934A1250	M9164D1009	50017460-003	220736B		160°	120	35	160	60	2	135 ohm	M9164C1068
M934A1268	M9164D1009	50017460-001	220736B		160°	240	35	160	60	2	135 ohm	None
M934A1276	M9164D1009	50017460-001	220736B		160°	220	35	160	60	2	135 ohm	None
M934A1284	M9164D1009	50017460-003			160°	120	35	160	60		135 ohm	M9164A1005
M934A1292	M9164D1009	50017460-003	220736B		160°	120	35	160	60	2	135 ohm	M9164C1068
M934A1300	M9164D1009	50017460-001			90°	240	35	90	30		135 ohm	None
M934A1318	M9164D1009	50017460-003	220736B		90°	120	35	90	30	2	135 ohm	M9164C1068
M934A1326	M9164D1009	50017460-003			90°	120	35	90	30		135 ohm	M9164A1005
M934A1334	M9164D1009				90°	24	35	90	30		135 ohm	None
M934A1342	M9164D1009				160°	24	35	160	60		135 ohm	M9164A1005
M934A1359	M9164D1009		220736B		160°	24	35	160	60	2	135 ohm	M9164C1068
M934A1367	M9164D1009	50017460-003		Q209E	160°	120	35	160	60		135 ohm	None
M934A1375	M9164D1009	50017460-001			160°	240	35	160	60		135 ohm	None
M934A1383	M9164D1009	50017460-001			160°	240	35	160	60		135 ohm	M9164A1013
M934A1391	M9164D1009	50017460-003			90°	120	35	90	35		135 ohm	M9164A1005
M934A1409	M9164D1009				90°	24	35	90	35		135 ohm	None
M934A1425	M9164D1009				160°	24	35	160	60		135 ohm	M9164A1005
M934A1433	M9164D1009	50017460-001	220736B		160°	240	35	160	60	2	135 ohm	None
M934A1441	M9164D1009	50017460-003			160°	120	35	160	60		135 ohm	M9164A1005
M934A1458	M9164D1009				90°	24	35	90	35		135 ohm	None
M934A1466	M9164D1009				90°	24	35	90	35		135 ohm	None
M934A1474	M9164D1009		220736B		160°	24	35	160	60	2	135 ohm	M9164C1068
M934A1482	M9164D1009	50017460-003	220736B		160°	120	35	160	60	2	135 ohm	M9164C1068
M934A1490	M9164D1009			Q209E	160°	24	35	160	60		135 ohm	None
M934A1508	M9164D1009	50017460-001			160°	240	35	160	60		135 ohm	None
M934A1516	M9164D1009	50017460-003	220736A		90°	120	35	90	35	1	135 ohm	M9164C1068
M934A1524	M9164D1009				160°	24	35	160	60		135 ohm	M9164A1005
M934A1532	M9164D1009	50017460-001			90°	240	35	90	35		135 ohm	None

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M934A1540	M9164D1009	50017460-003			90°	120	35	90	35		135 ohm	M9164A1005
M934A1557	M9164D1009	50017460-001			160°	208/240	35	160	60		135 ohm	None
M934A1565	M9164D1009	50017460-003	220736A		90°	120	35	90	35	1	135 ohm	M9164C1068
M934A1573	M9164D1009	50017460-003			160°	120	35	160	60		135 ohm	M9164A1005
M934A1599	M9164D1009			Q209E	160°	24	35	160	60		135 ohm	None
M934B1036	M6284D1000-S				90°	24	35	90	35		Series 62	M6284F1013-S
M934C1001	M9164D1009	50017460-003		Q181A1004	90°	120	35	90	35		135 ohm	M9164A1005 +Q181A1004
M934D1000	M9174D1007	50017460-003	220736A		160°	120	75	160	60	1	135 ohm	M9174B1043
M934D1018	M9174D1007	50017460-003	220736B		160°	120	75	160	60	2	135 ohm	M9174C1033
M934D1026	M9174D1007	50017460-003	220736A		90°	120	75	90	35	1	135 ohm	M9174B1027 + 220738A
M934D1034	M9174D1007	50017460-003	220736B		90°	120	75	90	35	2	135 ohm	M9174C1025
M934D1042	M9174D1007	50017460-003	220736B		90°	120	75	90	35	2	135 ohm	None
M934D1059	M9174D1007	50017460-003	220736A		90°	120	75	90	35	1	135 ohm	None
M934E1009	M9174D1007				160°	24	75	160	60		135 ohm	M9174B1043
M934E1017	M9174D1007	50017460-003			160°	120	75	160	60		135 ohm	M9174B1043
M934E1025	M9174D1007	50017460-003			90°	120	75	90	35		135 ohm	M9174B1043
M941A1008	None					24	75	90/160	15/30		135 ohm	M9484D1010
M941A1016	None					24	150	90/160	30/60		135 ohm	M9484D1010
M941A1024	None					24	150	90/160	60/120		135 ohm	M9484D1010
M941A1032	None					24	150	90/160	30/60		135 ohm	M9484D1010
M941A1040	None					24	37	90/160	7.5/15		135 ohm	None
M941A1057	None					24	75	90/160	15/30		135 ohm	M9484D1010
M941A1065	None					24	75	90/160	15/30		135 ohm	M9484D1010
M941A1073	None					24	150	90/160	30/60		135 ohm	M9484D1010
M941A1081	None					24	150	90/160	30/60		135 ohm	M9484D1010
M941A1099	None					24	150	90/160	60/120		135 ohm	M9494D1000
M941A1107	None					24	37	90/160	7.5/15		135 ohm	None
M941A4002	None					24	150	90/160	30/60		135 ohm	M9484D1010
M941B1007	None					24	150	90/160	30/60		Series 62	M6284F1013-S
M941B1015	M6284D1000-S					24	50	90/160	30/60		Series 62	None
M941C1006	None					24	75	90/160	15/30	1	135 ohm	M9484E1009
M941C1014	None					24	150	90/160	30/60	1	135 ohm	M9484E1017
M941C1022	None					24	150	90/160	30/60	1	135 ohm	M9484E1033
M941C1030	None					24	150	90/160	30/60	1	135 ohm	M9484E1033
M941C1048	None					24	150	90/160	30/60	1	135 ohm	M9484E1033
M941C1055	None					24	150	90/160	30/60	1	135 ohm	M9484E1033
M941C1063	None					24	150	90/160	30/60	1	135 ohm	M9484E1033
M941C1089	None					24	150	90/160	30/60	1	135 ohm	None
M941C4000	None					24	150	90/160	30/60	1	135 ohm	M9484E1017 + 220741A
M941C4018	None					24	150	90/160	30/60	1	135 ohm	M9484E1017 + 220741A
M941D1005	None					24	150	90/160	30/60	2	135 ohm	M9484F1007
M941D1013	None					24	150	90/160	30/60	2	135 ohm	M9484F1007
M941D1021	None					24	75	90/160	15/30	2	135 ohm	M9484F1023
M941D1039	None					24	150	90/160	30/60	2	135 ohm	M9484F1031
M941D1047	None					24	150	90/160	30/60	2	135 ohm	M9484F1049
M941D1054	None					24	150	90/160	30/60	2	135 ohm	M9484F1031
M941D1062	None					24	150	90/160	30/60	2	135 ohm	M9484F1031
M941D1070	None					24	150	90/160	30/60	2	135 ohm	M9484F1007
M941D1112	None					120	300	90/160	60/120	2	135 ohm	None
M941D4009	None					24	150	90/160	30/60	2	135 ohm	M9484F4001
M941D4017	None					24	75	90/160	15/30	2	135 ohm	M9484F4019
M941E1012	None					24	75	160	30		135 ohm	M9484D1010
M941E1038	None					24	150	160	60		135 ohm	M9484D1010
M941E1046	None					24	150	160	60		135 ohm	M9484D1010
M941E1053	None					24	150	90	60		135 ohm	None
M941E1061	None					24	75	90	60		135 ohm	None
M943A1004	None					24	40	240	90	2	135 ohm	None
M944A1002	M9184D1021				160°	24	150	160	60		135 ohm	M9184A1019
M944A1010	M9184D1021				160°	24	150	160	60		135 ohm	M9184A1019
M944A1028	M9184D1021				90°	24	150	90	30		135 ohm	M9184D1021
M944A1036	None					24	37	160	15		135 ohm	None
M944A1044	None					24	37	310	15		135 ohm	None
M944A1051	M9184D1021				90°	24	75	90	30		135 ohm	m9184F1034
M944A1069	M9184D1021	50017460-003			90°	120	75	90	30		135 ohm	m9184F1034
M944A1119	None					24	37	335	15		135 ohm	None
M944A1127	None					24	75	335	30		135 ohm	None

Modutrol I, II, III to Modutrol IV

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M944A1150	M9184D1021				160°	24	150	160	120		135 ohm	M9194D1003
M944A1168	M9184D1021				160°	24	150	160	60		135 ohm	M9184A1019
M944A1176	M9184D1021				160°	24	150	160	60		135 ohm	M9184A1019
M944A1192	M9184D1021				90°	24	75	90	30		135 ohm	m9184F1034
M944B1001	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944B1019	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944B1027	None					24	37	160	15		Series 62	None
M944B1035	M6284D1000-S				160°	24	150	160	240		Series 62	None
M944B1043	M6284D1000-S				90°	24	75	90	30		Series 62	M6284A1055-S
M944B1167	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944B1175	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944B1183	M6284D1000-S				160°	24	37	160	15		Series 62	M6284D1000-S
M944B1191	M6294D1008-S				160°	24	300	160	240		Series 62	None
M944B1209	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944B1241	M6294D1008-S		220736A		160°	24	150	160	240	1	Series 62	None
M944B4005	M6284D1000-S				ADJ	24	75	90/160	15/30		Series 62	M6284D1000-S
M944C1000	M9184D1021				ADJ	24	75	90/160	15/30		135 ohm	M9184D1005
M944C1018	M9194D1003				ADJ	24	300	90/160	120/240		135 ohm	M9194D1003
M944C1042	M9184D1021				ADJ	24	150	90/160	30/60		135 ohm	M9184D1021
M944C1059	M9194D1003		220736A		ADJ	24	300	90/160	120/240	1	135 ohm	M9194E1000
M944C4004	M9184D1021				ADJ	24	150	90/160	30/60		135 ohm	M9184D1021
M944C4012	M9184D1021				ADJ	24	150	90/160	120/240		135 ohm	M9194D1003
M944D1009	M9184D1021		220736B		ADJ	24	150	90/160	30/60	2	135 ohm	m9184F1034
M944D1017	M9184D1021		220736B		ADJ	24	150	90/160	30/60	2	135 ohm	m9184F1034
M944E1008	M6284D1000-S		220736B		ADJ	24	75	90/160	15/30	2	Series 62	None
M944E1016	M6284D1000-S		220736B		ADJ	24	150	90/160	30/60	2	Series 62	M6284F1013-S
M944E1024	M6284D1000-S		220736B		ADJ	24	150	90/160	30/60	2	Series 62	M6284F1013-S
M944E1032	M6284D1000-S		220736B		ADJ	24	75	90/160	15/30	2	Series 62	None
M944E1040	M6284D1000-S		220736B		ADJ	24	150	90/160	30/60	2	Series 62	M6284F1013-S
M944E1057	M6284D1000-S		220736B		ADJ	24	150	90/160	30/60	2	Series 62	M6284F1013-S
M944E1081	M6284D1000-S		220736B		90°	24	75	90	30	2	Series 62	M6284F1013-S
M944E1099	M6284D1000-S		220736B		90°	24	150	90	30	2	Series 62	M6284F1013-S
M944F1007	M9184D1021				160°	24	150	160	60		135 ohm	M9184A1019
M944G1006	M9184D1021		220736B		160°	24	150	160	60	2	Series 62	m9184F1034
M944G1014	M9184D1021		220736B		160°	24	150	160	60	2	Series 62	m9184F1034
M944G1022	M6284D1000-S	50017460-003			160°	120	150	160	60		Series 62	M6284A1055-S
M944G1030	M6284D1000-S	50017460-003			90°	120	150	90	30		Series 62	M6284A1055-S
M944G1048	M6284D1000-S	50017460-003			160°	120	150	160	60		Series 62	M6284A1055-S
M944G1055	M6284D1000-S	50017460-003			160°	120	150	160	240		Series 62	None
M944G1063	M6284D1000-S	50017460-003			160°	120	150	160	60		Series 62	M6284A1055-S
M944G1071	M6284D1000-S	50017460-003			90°	120	150	90	30		Series 62	M6284A1055-S
M944G1089	M6284D1000-S	50017460-003			160°	120	150	160	60		Series 62	M6284A1055-S
M944G1097	M6284D1000-S	50017460-003			90°	120	150	90	30		Series 62	M6284A1055-S
M944G1105	M6294D1008-S	50017460-003			160°	120	300	160	240		Series 62	None
M944G1121	M6294D1008-S	50017460-003	220736A		160°	120	300	160	240	1	Series 62	None
M944H1013	M6284D1000-S	50017460-003	220736A		160°	120	150	160	60	1	Series 62	M6284F1013-S
M944H1021	M6284D1000-S	50017460-003	220736A		160°	120	150	160	60	1	Series 62	M6284F1013-S
M944H1039	M6284D1000-S	50017460-003	220736A		160°	120	150	160	60	1	Series 62	M6284F1013-S + 50017460-003
M944H1047	M6284D1000-S	50017460-003	220736A		160°	120	150	160	60	1	Series 62	M6284F1013-S + 50017460-003
M944H1062	M6294D1008-S	50017460-003	220736A		160°	120	150	160	240	1	Series 62	None
M944J1002	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944J1051	M6284D1000-S				160°	24	150	160	60		Series 62	M6284D1000-S
M944K1001	M6284D1000-S	50017460-003	220736B		160°	120	150	160	60	2	Series 62	M6284F1013-S
M944K1019	M6284D1000-S	50017460-003	220736B		160°	120	150	160	60	2	Series 62	M6284F1013-S
M944L1018	M9184D1021	50017460-003			ADJ	120	150	90/160	120/240		135 ohm	None
M944N1024	M9184D1021		220736A		160°	24	75	160	30	1	135 ohm	M6184D1001 +Q607A1050
M944N1032	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M944N1040	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M944N1057	M9184D1021		220736A		160°	24	150	160	60	1	135 ohm	M9184F1034
M944N1065	M9184D1021		220736A		160°	24	75	160	30	1	135 ohm	M6184D1001
M944N1073	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M944N1081	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M944P1014	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184F1034
M944P1022	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184F1034
M944P1030	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184F1034
M944P1048	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184F1034
M944R1012	M6294D1008-S	50017460-003	220736A		160°	120	150	160	120	1	Series 62	None

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M944R1020	M6294D1008-S	50017460-003	220736B		160°	120	150	160	120	2	Series 62	None
M944S1001	M6284D1000-S	50017460-003	220736B		ADJ	120	75	90/160	15/30	2	Series 62	None
M944S1019	M6284D1000-S	50017460-003	220736B		ADJ	120	150	90/160	30/60	2	Series 62	M6284F1013-S
M944S1027	M6284D1000-S	50017460-003	220736B		ADJ	120	150	90/160	30/60	2	Series 62	M6284F1013-S
M945A1009	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945A1017	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945A1025	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945A1033	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945A1066	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945A1074	M9185D1004				90°	24	50	90	35		135 ohm	M9185A1018
M945A1082	M9185D1004				90°	24	50	90	35		135 ohm	M9185A1018
M945A1090	M9185D1004				160°	24	50	160	60		135 ohm	M9185D1004
M945A1108	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945A1116	M9185D1004				90°	24	50	90	35		135 ohm	M9185A1018
M945A1124	M9185D1004				90°	24	50	90	35		135 ohm	M9185A1018
M945A1157	M9185D1004				ADJ	24	50	90/160	30/60		135 ohm	M9185D1004
M945A4003	M9185D1004				ADJ	24	50	90/160	30/60		135 ohm	M9185D1004
M945AA1007	M9185D1004		220736B		90°	24	50	90	60	2		None
M945AB1005	M9185D1004		220736A		90°	24	50	90	60	1		None
M945AB1013	M9185D1004		220736A		90°	24	50	90	60	1		None
M945AD1001	M6285A1005-S				90°	24	25	90	60		Series 62	None
M945B1057	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M945B1065	M6285A1005-S				90°	24	50	90	30		Series 62	M6285A1005-S
M945B1073	None					24	50	90	30		Series 62	None
M945B1081	None					24	50	160	60		Series 62	None
M945B1115	M6285A1005-S	50017460-003			90°	120	50	90	30		Series 62	None
M945B4002	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M945C1007	M6285A1005-S		220736B		160°	24	50	160	60	2	Series 62	M6285C1001-S
M945C1015	M6285A1005-S		220736B		160°	24	50	160	60	2	Series 62	M6285C1001-S
M945C1031	M6285A1005-S		220736A		90°	24	50	90	30	1	Series 62	None
M945D1006	M9185D1004		220736B		160°	24	50	160	60	2	135 ohm	M9185C1006
M945D1030	None					24	50	160	60	2	135 ohm	None
M945D1048	None					24	50	160	60	2	135 ohm	None
M945E1005	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M945E1013	M9185D1004			Q181A1004	160°	24	50	160	60		135 ohm	M9185A1018
M945F1004	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945F1038	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945F1046	M9185D1004	50017460-001			160°	208	50	160	60		135 ohm	None
M945F1053	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945F4008	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945G1003	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M945G1037	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M945G1045	None					24	50	160	60		Series 62	None
M945G1052	None					220	50	160	60		Series 62	None
M945H1002	M9185D1004		220736B		160°	24	50	160	60	2	135 ohm	M9185C1006
M945H1010	M9185D1004		220736B		160°	24	50	160	60	2	135 ohm	M9185C1006
M945J1009	M9185D1004		220736A		160°	24	50	160	60	1	135 ohm	M9185C1006
M945J1017	M9185D1004		220736A		160°	24	50	160	60	1	135 ohm	M9185C1006
M945J1025	M9185D1004		220736B		160°	24	50	160	60	2	135 ohm	M9185C1006
M945J1033	M9185D1004	50017460-003	220736B		160°	120	50	160	60	2	135 ohm	None
M945K1008	M6285A1005-S		220736B		160°	24	50	160	60	2	Series 62	M6285C1001-S
M945K1016	M6285A1005-S		220736B		160°	24	50	160	60	2	Series 62	M6285C1001-S
M945L1007	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M945L1015	M6285A1005-S				160°	24	50	160	60		Series 62	M6285A1005-S
M945M1006	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945M1022	M9185D1004	50017460-001			160°	208/240	50	160	60		135 ohm	None
M945M1030	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945M1048	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M945Y1002	M6285A1005-S			Q181A1004	160°	24	50	160	60		Series 62	M6285A1005-S
M945Y1010	None					24	50	90	60		135 ohm	None
M945Z1001	M9185D1004		220736B		160°	24	50	160	60	2	135 ohm	M9185A1018
M945Z1019	M9185D1004	50017460-001			160°	208/240	50	160	60		135 ohm	None
M954A1001	M9184D1021				ADJ	24	150	90/160	30/60		135 ohm	M9184D1021
M954A1019	M9184D1021				ADJ	24	150	90/160	30/60		135 ohm	M9184D1021
M954A1027	M9184D1021				ADJ	24	150	90/160	30/60		135 ohm	M9184D1021
M954A1035	M9184D1021				ADJ	24	150	90/160	30/60		135 ohm	M9184D1021
M954B1000	M9184D1021		220736B		160°	24	150	160	60	2	135 ohm	M9184F1034
M954B1018	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184C1031
M954B1026	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184C1031
M954B1034	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184C1031

Modutrol I, II, III to Modutrol IV

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Stroke Setting	Voltage (Vac)	Torque (lb-in.)	Stroke (degrees)	Timing (sec)	Aux Sw	Control Signal	Functional Replacement
M954B1042	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	M9184C1031
M954B1059	M9184D1021	50017460-003	220736B		160°	120	75	160	30	2	135 ohm	M9184D1005
M954B1067	M9184D1021		220736B		160°	24	150	160	60	2	135 ohm	M9184F1034
M954B1075	M9184D1021		220736B		90°	24	150	90	30	2	135 ohm	None
M954C1009	M9184D1021		220736A		160°	24	75	160	30	1	135 ohm	M9184D1005
M954C1017	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M954C1025	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M954C1033	M9184D1021		220736A		160°	24	150	160	60	1	135 ohm	M9184F1034
M954C1041	M9184D1021		220736A		160°	24	75	160	30	1	135 ohm	M9184D1005
M954C1058	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M954C1066	M9184D1021		220736A		90°	24	150	90	30	1	135 ohm	M9184F1034
M954C1074	M9184D1021		220736A		160°	24	150	160	60	1	135 ohm	M9184F1034
M954C1082	M9184D1021		220736A		90°	24	75	90	30	1	135 ohm	M9184F1034
M954C4003	M9184D1021		220736A		ADJ	24	150	90/160	30/60	1	135 ohm	None
M954D1008	M9184D1021		220736B		ADJ	24	150	90/160	30/60	2	135 ohm	M9184F1034
M954D1016	M9184D1021		220736B		ADJ	24	150	90/160	30/60	2	135 ohm	M9184F1034
M954G1052	None					220	50	160	60		Series 62	None
M955A1008	M9185D1004				ADJ	24	50	90/160	30/60		135 ohm	M9185D1004
M955A1016	M9185D1004				ADJ	24	50	90/160	30/60		135 ohm	M9185D1004
M955A1024	M9185D1004				ADJ	24	50	90/160	30/60		135 ohm	M9185D1004
M955A1032	M9185D1004				ADJ	24	50	90/160	30/60		135 ohm	M9185D1004
M955B1007	M9185D1004		220736B		ADJ	24	50	90/160	30/60	2	135 ohm	M9185E1019 +Q607A1050
M955C1006	M9185D1004		220736A		ADJ	24	50	90/160	30/60	1	135 ohm	M9185E1019
M955C1014	M9185D1004		220736A		ADJ	24	50	90/160	30/60	1	135 ohm	M9185E1019
M955C4000	M9185D1004		220736A		ADJ	24	50	90/160	30/60	1	135 ohm	M9185E1019
M955D1005	M9185D1004				160°	24	50	160	60		135 ohm	M9185A1018
M955D1013	M9185D1004				90°	24	50	90	30		135 ohm	M9185A1018
M955D1039	M9185D1004	50017460-003			90°	120	50	90	30		135 ohm	None
M955D1047	M9185D1004				90°	24	50	90	30		135 ohm	M9185A1018
M955D1054	M9185D1004				90°	24	50	90	30		135 ohm	M9184D1021
M955E1004	M9185D1004	50017460-003	220736A		90°	120	50	90	30	1	135 ohm	None
M955E1012	M9185D1014	50017460-003	220736A	Q209E	90°	120	50	90	30	1	135 ohm	None
M965A1007	M9185D1004				160°	24	25	160	40		135 ohm	M9185D1004
M965A1015	M9185D1004				160°	24	25	160	40		135 ohm	M9185D1004
M965A1023	M9185D1004	50017460-003			160°	120	25	160	40		135 ohm	None
M965A1031	M9185D1004	50017460-003			90°	120	25	90	23		135 ohm	None
M965A1049	M9185D1004	50017460-003			90°	120	25	90	23		135 ohm	M9185D1004
M965A1064	M9185D1004				90°	24	25	90	23		135 ohm	M9185D1004
M965A1072	M9185D1004				90°	24	25	90	23		135 ohm	M9185D1004
M965B1006	M9185D1004		220736B		160°	24	25	160	40	2	135 ohm	None
M965B1014	M9185D1004	50017460-001	220736B		90°	240	25	90	23	2	135 ohm	None
M965B1022	M9185D1004		220736A		90°	24	25	90	23	1	135 ohm	None
M965B1030	M9185D1004		220736B		160°	24	25	160	40	2	135 ohm	None
M975A1006	M9185D1004				160°	24	25	160	40		135 ohm	M9185D1004
M975A1014	M9185D1004				90°	24	25	90	23		135 ohm	M9185D1004
M975A1022	M9185D1004	50017460-003			160°	120	25	160	40		135 ohm	M9185D1004
M975A1030	M9185D1004	50017460-003		Q209E	90°	120	25	90	23		135 ohm	None
M975A1055	M9185D1004	50017460-003		Q209E	160°	120	25	160	40		135 ohm	None
M975A1071	M9185D1004				160°	24	25	160	40		135 ohm	M9185D1004
M975A1089	M9185D1004				160°	24	25	160	40		135 ohm	M9185D1004
M975A1097	M9185D1004	50017460-003			160°	120	25	160	40		135 ohm	M9185D1004
M975B1005	M9185D1004		220736B		160°	24	25	160	40	2	135 ohm	None
M975B1013	M9185D1004	50017460-001	220736B		160°	240	25	160	40	2	135 ohm	None
M975B1021	M9185D1004	50017460-003	220736A	Q209E	90°	120	25	90	23	1	135 ohm	None
M975B1039	M9185D1004	50017460-003	220736B	Q209E	160°	120	25	160	40	2	135 ohm	None
M975B1047	M9185D1004	50017460-003	220736B		90°	120	25	90	23	2	135 ohm	None
M975B1062	M9185D1004	50017460-003	220736B		90°	120	25	90	23	2	135 ohm	None

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M4172A1006	M8185D1006	50017460-003			60		M4185A1001	
M4172B1004	M4185B1058				60	1	M4185B1009	
M4175D1015	M4185B1058				30/60		None	
M4175E1012	M8185D1006	50017460-003	220736A		30/60	1	None	
M4182A1004	M8185D1006	50017460-003			60		M4185A1001	
M4182B1002	M8185D1006	50017460-003	220736A		60	1	M4185B1009	
M4182B1010	M8185D1006	50017460-001	220736A		60	1	M4185B1017	
M4182B1028	M8185D1006	50017460-001	220736A		60	1	None	
M4182B1036	M4185B1009				30	1	M4185B1058	
M4182B1044	M8185D1006	50017460-001	220736A		30	1	M4185B1058	
M4182B1051	M8185D1006	50017460-003	220736A	4074ERU	30	1	M4185B1058	With weatherproof kit; Requires 4074ERU
M4182B1069	M8185D1006	50017460-003	220736A	4074ERU	60	1	M4185B1009	
M4185A1001	N/A				60		N/A	
M4185A1019	M8185D1006	50017460-003			67		None	
M4185A1027	M8185D1006	50017460-003			60		M4185A1001	
M4185B1009	N/A				60	1	N/A	
M4185B1017	M4185B1058				60	1	M4185B1017	
M4185B1025	M8185D1006	50017460-001	220736A		60	1	None	
M4185B1033	M8185D1006	50017460-003	220736A		60	1	M4185B1009	
M4185B1041	M8185D1006	50017460-001	220736A		60	1	M4185B1017	
M4185B1058	N/A				30	1	N/A	
M4185B1066	M8185D1006	50017460-003	220736A		30	1	M4185B1058	
M4185B1074	M8185D1006	50017460-001	220736A		60	1	None	
M4185C1007	N/A				30	2	None	
M4185D1013	M8185D1006	50017460-003			30		None	
M4185E1010	M8185D1006	50017460-003	220736A		30	1	None	
M4185E4006	N/A				30/60	1	None	Canada TRADELINE
M4185E4014	N/A				30/60	1	None	Canada TRADELINE
M4186H1005	M8185D1006	50017460-003	220736A		60	1	M4185B1009	Use auxiliary shaft
M4186H4009	M8185D1006	50017460-003	220736A		60	1	None	Canada, use auxiliary shaft
M4186L4000	M8185D1006	50017460-003	220736A		30/60	1	None	
M6161A1004	M6184A1023				30		M6184A1015	
M6161B1002	M6184D1035	50017460-003	220736A		30	1	None	
M6174A1009	M6184D1035				60		None	Includes aux. switch cams
M6174D1003	M6184D1035	50017460-003			30/60		M6184D1035	
M6181A1000	M6184D1035				60		None	Less junction box
M6181A1018	M6184A1015				60		None	
M6181A1026	M6184D1035				30		M6184A1015	
M6181A1034	M6184A1023				30		M6184A1023	
M6181A1042	M6184D1035	50017460-003			60		None	
M6181A1059	M6184D1035				60		None	Carrier
M6181D1004	M6184D1035				15/30		M6184D1001	
M6181F1009	M6184D1035		220736B		30/60	2	M6184F1014	
M6181F1017	M6184D1035	50017460-001	220736B		30/60	2	M6184F1014	Replacement requires 50017460-001
M6182D1003	None				15/60		None	Carrier
M6182D1011	None				Select		None	
M6182F1008	None				15/60	2	None	
M6182F1016	M6285A1005-S				30/60	2	None	With weatherproof kit
M6184A1007	M6184D1035				60		None	
M6184A1015	N/A				30		N/A	
M6184A1023	N/A				30		N/A	
M6184A1031	M6184D1035				60		None	Carrier
M6184A1049	M6184D1035	50017460-003			30		M6184A1023	
M6184A1056	M6184D1035				30		None	Trane
M6184B1005	M6184D1035	50017460-003	220736A		120	1	None	
M6184B1013	N/A				120	1	None	Trane
M6184B1021	M6184D1035		220736A		60	1	M6184F1014	
M6184D1001	N/A				15/30		N/A	
M6184D1035	N/A				30/60		N/A	TRADELINE
M6184D1050	M6184D1035				15/30		M6184D1001	
M6184D1068	N/A				120/240		N/A	
M6184D1076	M6184D1035				30/60		None	Trane
M6184F1006	M6184D1035		220736B		30/60	2	M6184F1014	
M6184F1014	N/A				30/60	2	N/A	
M6185D1000	M6285A1005-S				30/60		None	
M6191A1008	M6194D1017	50017460-003			120		None	
M6191B1006	M6194D1017		220736A		60	1	M6194B1011	
M6191D1002	M6284D1008-S				120/240		M6194D1017	
M6191D1010	M6194D1017	50017460-003			120/240		None	York
M6194A1005	N/A				120		None	OEM

Modutrol IV Motor Series 1 to Series 2

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M6194A1021	M6194D1017				120		None	With aux. switch cams
M6194B1003	M6194D1017		220736A		60	1	M6194B1011	
M6194B1011	N/A		220736A		60	1	N/A	
M6194B1029	N/A				120	1	N/A	Requires 50017460-003 - Trane
M6194B1037	M6194D1017	50017460-003	220736A		120	1	None	Trane
M6194B1045	M6194D1017	50017460-003	220736A		120	1	M6194E1006	Requires 50017460-003
M6194D1017	N/A				120/240		N/A	TRADELINE
M6194D1025	M6194D1017				120/240		None	Lennox
M6194D1033	M6194D1017				120/240		None	York
M6194D1041	M6194D1017			220741A2-61	120/240		None	Japan, includes 220741A
M6194D4003	N/A				120/240		N/A	Canada TRADELINE
M6194E1006	N/A		220736A		120/240	1	N/A	
M6194E1014	M6194D1017		220736A	4074ERU	120/240	1	M6194E1006 + 4074ERU	Includes weatherproof kit
M6194F1004	M6194D1017		220736B		120/240	2	None	
M6281A1009	M6284D1000-S				60		M6284A1055-S	
M6281F1008	M6284D1000-S		220736B		30/60	2	M6284F1013-S	
M6281F1016	M6284F1062-S	50017460-003	220736B		30/60	2	M6284F1013-S	Requires 50017460-003
M6282A1008	M6285A1005-S				60		M6285A1005-S	
M6282A1016	M6285A1005-S	50017460-003			30		None	Trane
M6282A1024	M6285A1005-S				60		None	
M6282A1032	M6285A1005-S	50017460-003			60		None	
M6282B1006	M6285A1005-S		220736A		30	1	None	
M6282E1009	M6282A1009-F				15/60	1	None	Carrier
M6284A1006	M6284D1000-S				60		M6284A1055-S	
M6284A1014	M6284D1000-S	50017460-003			60		M6284A1055-S	
M6284A1022	M6284D1000-S	50017460-003			30		M6284A1055	
M6284A1030	M6284A1030-S				60		None	Japan, includes 220741A
M6284A1048	M6284A1055-S				60		M6284A1055-S	
M6284A1055	M6284A1055-S				30		M6284A1055-S	
M6284A1063	M6284D1000-S	50017460-003		220741A2-62	60		M6284A1055-S + 4074ERU	Includes 220741A
M6284A1071	M6284A1071-S				30		M6284A1071-S	
M6284A1089	M6284A1089-S				15		M6284A1089-S	
M6284A1097	M6284A1097-S				30		M6284A1097-S	
M6284B1004	M6284B1004-S				240	1	None	Trane
M6284C1002	M6284D1000-S		220736B		30	2	M6284F1013-S	
M6284C1010	M6284C1010-S				30	2	None	Includes 220741A
M6284C1028	M6284C1028-S				30	2	None	Japan, includes 220741A
M6284C1036	M6284D1000-S	50017460-003	220736B	4074ERU	60	2	None	Includes weatherproof kit
M6284C1044	M6284C1044-S				30	2	None	
M6284D1000	M6284D1000-S				30/60		M6284D1000-S	TRADELINE
M6284D1026	M6284D1026-S				30/60		None	Includes 220741A
M6284D4004	M6284D4004-S				30/60		N/A	Canada TRADELINE
M6284F1005	M6284D1000-S		220736B		30/60	2	M6284F1013-S	
M6284F1013	M6284F1013-S		220736B		30/60	2	N/A	
M6284F1021	M6284D1000-S	50017460-003	220736B		30/60	2	M6284F1013-S	Requires 50017460-003
M6284F1039	M6284F1039-S				30/60	2	N/A	Japan, includes 220741A
M6284F1047	M6284D1000-S	50017460-003	220736B		30/60	2	M6284F1013-S	Requires 50017460-003
M6284F1054	M6284F1062-S				30/60	2	None	
M6285A1005	M6285A1005-S				60		N/A	TRADELINE
M6285A1013	M6285A1005-S				30		N/A	
M6285A1021	M6285A1005-S	50017460-003			30		None	
M6285A1039	M6285A1039-S				60		None	Trane
M6285A1047	M6285A1047-S				60		None	Japan, includes 220741A
M6285A1054	M6285A1054-S				60		None	Snyder General
M6285A4009	M6285A4009-S				60		M6285A4009-S	Canada TRADELINE
M6285B1003	M6285A1005-S		220736A		30	1	None	
M6285C1001	M6285C1001-S				60	2	M6285C1001-S	
M6286G1001	M6285A1005-S				60		M6285A1005-S	Use auxiliary shaft
M6286G1019	M6285A1005-S	50017460-001			60		None	
M6286G1027	M6285A1005-S			220741A2-62	60		M6285A1005-S + 4074ERU	Japan, includes 220741A, use auxiliary shaft
M6294A1004	M6294D1008-S	50017460-003			240		None	
M6294B1002	M6294D1008-S		220736A		240	1	None	
M6294B1010	M6294D1008-S	50017460-003	220736A		240	1	None	
M6294B1028	M6294D1008-S	50017460-003	220736A		240	1	None	Trane
M6294B1036	M6294B1036-S				120	1	None	
M6294C1000	M6294D1008-S	50017460-003	220736B	220741A	60	2	None	Includes 220741A
M6294D1008	M6294D1008-S				120/240		M6294D1008-S	

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M7161A1002	M9164D1009	50017460-003		Q7130A1006	30		None	
M7161B1000	M9164D1009	50017460-003	220736A	Q7130A1006	60	1	None	
M7161B1018	M9164D1009	50017460-003	220736A	Q7130A1006	60	1	None	Trane
M7161G1009	M9164D1009	50017460-003		Q7130A1006	30		M7164G1030	
M7161G1017	M9164D1021	50017460-003		Q7130A1006	30		None	
M7161G1025	M9164D1009			Q7130A1006	60		None	
M7164A1009	M9164D1009			Q7130A1006	60		None	
M7164A1017	N/A				30		N/A	
M7164A1025	M9164D1009			Q7130A1006	30		None	Lennox
M7164A1033	M9164D1009			Q7130A1006	60		None	
M7164A1041	M9164D1009			Q7130A1006	60		None	
M7164A1058	M9164D1009	50017460-001		Q7130A1006	30		M7164A1017	
M7164B1007	M9164D1009	50017460-003	220736A	Q7130A1006	60	1	None	
M7164G1006	M9164D1009	50017460-003		Q7130A1006	30		M7164G1030	
M7164G1014	M9164D1009	50017460-003		Q7130A1006	30		None	
M7164G1022	M9164D1009			Q7130A1006	60		None	
M7164G1030	N/A				30		N/A	
M7183G1003	M9185D1004			Q7130A1006	60		N/A	Use auxiliary shaft
M7184A1005	M9184D1021			Q7130A1006	60		None	
M7184A1013	None				30		None	
M7184A1021	None				30		None	
M7185A1004	M9185D1004			Q7130A1006	60		N/A	
M7186G1000	M9185D1004			Q7130A1006	60		N/A	Use auxiliary shaft
M7261A1001	N/A				60		N/A	Trane
M7272A1008	M9185D1004	50017460-003		Q7230A1005	30		None	
M7274A1006	M9174D1007			Q7230A1005	60		N/A	
M7274G1003	M9174D1007			Q7230A1005	60		N/A	
M7281A1007	M7284A1004				30		M7284A1004	Includes 220741A
M7281C1003	M9184D1021	50017460-003	220736B	Q7230A1005	30	2	M7284C1000	
M7281C1011	M9184D1021	50017460-003	220736B	Q7230A1005	60	2	M7284C1018	
M7281Q1002	M7284Q1009				30	2	M7284Q1009	Includes 203709D
M7282A1006	M9185D1004	50017460-003		Q7230A1005	30		M7285A1003	Includes 220741A
M7282A1014	N/A				30		N/A	Trane
M7282A1022	N/A				30		N/A	Trane, with wiring harness
M7282B1004	M9185D1004	50017460-003	220736A	Q7230A1005	30	1	None	Trane
M7282B1012	N/A				30	1	N/A	
M7282C1002	M9185D1004	50017460-003	220736B	Q7230A1005	30	2	None	
M7282D1000	N/A				15/60		N/A	Carrier, with 205118A
M7282D1018	M7282D1000	50017460-001			15/60		None	Carrier
M7282F1005	M7282D1000		220736B		15/60	2	None	Carrier, 205118A and crank arm
M7284A1004	N/A				30		N/A	Includes 220741A
M7284A1012	N/A				60		N/A	
M7284A1020	M9184D1021	50017460-003		Q7230A1005	60		M7284A1012	
M7284A1038	N/A				15		N/A	
M7284A1046	M7284A1004				30		M7284A1004	
M7284A1053	N/A				30		N/A	Trane
M7284A1061	M9184D1021	50017460-003		Q7230A1005	60		None	
M7284A1079	N/A				60		N/A	
M7284A1087	N/A				30		N/A	Trane
M7284C1000	N/A				30	2	N/A	Includes 220741A2-72
M7284C1018	M7284C1000				60	2	N/A	
M7284C1026	M9184D1021	50017460-003	220736B	Q7230A1005	30	2	M7284C1000	includes 220741A2-72
M7284C1034	M9184D1021	50017460-003	220736B	Q7230A1005	60	2	M7284C1018	includes 220741A2-72
M7284C1042	M9184D1021		220736B	Q7230A1005	30	2	None	International, incl.220741A
M7284C1059	M7284C1083				30	2	None	Enhanced
M7284C1067	M7284C1091				30	2	None	
M7284G1001	M9184D1021			Q7230A1005	60		M7284A1079	
M7284Q1009	N/A				30	2	N/A	Includes 203709D
M7284Q1017	M7284Q1009				60	2	None	
M7284Q1025	M7284Q1009				30		None	International, incl.203709D
M7284Q1033	M7284Q1082				30	2	None	Enhanced
M7284Q1041	M7284Q1090				60	2	None	
M7285A1003	N/A				30		N/A	Includes 220741A
M7285A1011	M7285A1003				60		None	
M7285A1029	M9185D1004			Q7230A1005	60		None	
M7285A1037	M9185D1004			Q7230A1005	60		None	
M7285A1045	N/A				60		N/A	
M7285A1052	M9185D1004			Q7230A1005	30		None	
M7285B1001	M9185D1004		220736A	Q7230A1005	30	1	None	Trane
M7285C1009	N/A				30	2	N/A	Includes 220741A

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OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M7285C1017	M7284C1009				60	2	None	
M7285C1025	M9185D1004		220736B	Q7230A1005	60	2	None	
M7285C1033	M9185D1004		220736B	Q7230A1005	60	2	None	
M7285Q1008	N/A				30	2	N/A	Includes 203709D
M7285Q1016	M7285Q1008				60	2	N/A	
M7286G1009	N/A				60		N/A	
M7294A1002	M9194D1003	50017460-003		Q7230A1005	60		M7294Q1007	Includes 220741A
M7294A1010	N/A				120		N/A	
M7294G1009	M7294A1010				120		None	
M7294Q1007	N/A				60	2	N/A	Includes 203709D
M7361A1000	M9164D1009	50017460-003		Q7330A1004	30		None	
M7361A1018	None				60		None	Liebert, with 203709B
M7364A1007	M9164D1009	50017460-003		Q7330A1004	60		None	
M7364A1015	M9164D1009	50017460-003		Q7330A1004	30		None	
M7364A1023	M9164D1009			Q7330A1004	60		None	
M7364A1031	M9164A1070	50017460-001		Q7330A1004	60		None	Liebert
M7381A1006	None				60		None	Liebert, with 203709B board
M7382A1005	None				60		None	Liebert
M7384A1003	M9184D1021			Q7330A1004	60		None	
M7384A1011	M9184D1021			Q7330A1004	30		None	
M7384A1029	None				60		None	Liebert
M7385A1002	M9185D1004			Q7330A1004	30		None	
M7385A1010	M9185D1004	50017460-003		Q7330A1004	60		None	Includes isolation transformer
M7385A1028	M9185D1004	50017460-003		Q7330A1004	60		None	
M7385A1036	M9185D1004			Q7330A1004	60		None	
M7385A1044	M9185A1018	50017460-001		Q7330A1004	60		None	Liebert
M7484A1002	None				30		None	Cleaver Brooks
M7484A1010	None				30		None	
M7675A1001	M9185D1004			Q7630A1001	60		None	
M7675A1019	M9185D1004	50017460-003		Q7630A1001	30		None	Trane
M7675G1008	M9185D1004			Q7630A1001	60		None	
M7682A1010	M9185D1004			Q7630A1001	60		None	Includes Q209F1001
M7685A1009	M9185D1004			Q7630A1001	60		None	
M7685A1017	M9185D1004			Q7630A1001	30		None	
M7685A1025	M9185D1004			Q7630A1001	30		None	
M7685A1033	M9185D1004	50017460-003		Q7630A1001	60		None	York
M7685A1041	M9185D1004			Q7630A1001	30		None	Lennox
M7685G1006	M9185D1004			Q7630A1001	30		None	
M7964A1001	None				30		None	
M7964B1009	None				30		None	Nesbitt ITT
M7964B1017	None				60		None	
M7964C1007	None				30		None	
M7964C1015	None				30		None	
M7964D1005	None				60		None	
M7964D1013	None				60		None	
M7975E1009	None				30		None	
M7975E1017	None				30		None	
M7983G1005	None				60		None	IBM
M7984D1001	None				60		None	Includes 220741A
M7984N1008	None				30		None	
M7985D1000	None				60		None	
M8175B1002	M8185D1006		220736A		60	1	None	
M8182A1005	M8185D1006				60		M8185A1002	
M8182B1003	M8185D1006		220736A		60	1	None	
M8182B1011	M8185D1006		220736A	4074ERU	60	1	None	Includes weatherproof kit
M8185A1002	M8185D1006				60		M8185A1002	
M8185A1010	M8185D1006				60		M8185D1006	
M8185A1028	None				60		None	
M8185B1000	M8185D1006		220736A		60	1	None	
M8185B1018	M8185D1006				60	1	M8185D1006	
M8185B1026	None				60	1	None	
M8185B1034	M8185D1006		220736A		60	1	None	
M8185D1006	N/A				30/60		N/A	TRADELINE
M8186G1008	M8185D1006				60		None	Includes aux. switch cams, use aux. shaft
M9161A1008	M9164D1009	50017460-003			60		M9164A1005	
M9161A1016	M9164D1009				60		M9164A1005	Wire to 24 Vac
M9161A1024	M9164A1005				30		None	
M9161A1032	M9164A1005				60		None	Carrier
M9161A1040	M9164D1009	50017460-003		4074ERU	30		M9164A1005 + 4074ERU	Includes weatherproof kit

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M9161C1004	M9164C1001		220736B		60	2	M9164C1068	Wire to 24 Vac
M9161C1012	M9164C1068				30	2	None	
M9161V1009	N/A				60		N/A	Carrier
M9164A1005	N/A				30		N/A	
M9164A1013	N/A				60		N/A	
M9164A1021	M9164A1005				60		M9164A1005	
M9164A1039	M9164D1009	50017460-003			60		M9164A1005	
M9164A1047	M9164D1009	50017460-001			60		M9164A1013	
M9164A1054	M9164D1009	50017460-003			30		M9164A1005	
M9164A1062	M9164D1009				30		M9164A1005	Wire to 24 Vac
M9164A1070	N/A				60		N/A	
M9164A1088	M9164A1013				60		None	
M9164A1096	M9164D1009	50017460-003			60		M9164A1005	
M9164A1104	M9164D1009	50017460-003			60		None	Carrier
M9164A1112	M9164D1009	50017460-001			30		None	York
M9164A1120	M9164D1009				30		M9164A1005	Wire to 24 Vac
M9164A1138	M9164D1009	50017460-003			60		None	Carrier
M9164B1003	M9164D1009	50017460-003	220736A		30	1	M9164C1068	
M9164C1001	N/A				60	2	N/A	Wire to 24 Vac
M9164C1019	M9164D1009	50017460-003	220736B		60	2	M9164C1068	
M9164C1027	M9164D1009	50017460-001	220736B		60	2	None	
M9164C1035	M9164D1009	50017460-003	220736B		30	2	M9164C1068	
M9164C1043	M9164D1009	50017460-003	220736B		60	2	M9164C1068	
M9164C1050	M9164C1068				60	2		
M9164C1068	N/A				30	2	N/A	
M9164D1009	N/A				30/60		N/A	TRADELINE
M9164V1006	N/A				60		N/A	Carrier
M9164V1014	M9164D1009				60		None	
M9164V1022	M9164D1009			Q209E1010	60		None	Carrier, with Q209E, crank arm
M9171A1006	M9174B1027	50017460-003			60		M9174B1027	
M9171B1004	M9184D1021	50017460-003	220736A		60	1	M9174B1027	
M9171B1012	M9174D1007	50017460-003	220736A		30	1	M9174B1027	
M9171B1020	None				30	1	None	Cleaver Brooks
M9171C1002	M9174C1025		22036B		30	2	M9174C1025	
M9171C1010	M9174D1007	50017460-003	220736B		30	2	9174C1041	Cleaver Brooks
M9172A1005	M9185D1004				60		None	
M9172A1013	M9185D1004				60		None	
M9172A1021	M9185D1004				60		None	Carrier
M9172C1001	M9185D1004		220736B		60	2	None	Reznor
M9172W1004	M9185D1004	50017460-003	220736A	Q209E1010	30	1	None	Trane, with Q209E1010
M9172W1012	N/A				60	1	N/A	Carrier
M9174B1001	M9174D1007	50017460-003	220736A		60	1	M9174B1027	
M9174B1019	M9174D1007	50017460-003	220736A		30	1	M9174B1027	Requires 220738A
M9174B1027	N/A				30	1	N/A	
M9174B1035	M9184D1021	50017460-003	220736A		30	1	None	Cleaver Brooks
M9174B1043	M9174B1027				60	1	M9174B1027	
M9174C1009	M9174D1007	50017460-003	220736B		60	2	M9174C1033	
M9174C1017	M9174D1007	50017460-003	220736B		30	2	M9174C1025	
M9174C1025	N/A				30	2	N/A	
M9174C1033	N/A				60	2	N/A	
M9174C1041	N/A				30	2	None	Cleaver Brooks
M9174D1007	N/A				30/60		N/A	TRADELINE
M9175A1002	M9185D1004				60		None	
M9175A1010	M9185A1018			221455A	30		None	Includes crank arm
M9175A1028	M9185D1004				60		None	
M9175A1036	M9185D1004	50017460-003			30		None	York
M9175A1044	M9185D1004	50017460-003			30		None	
M9175A1051	M9185A1018				30		None	
M9175A1069	M9185D1004				60		None	Carrier
M9175A1077	M9185D1004				30		None	Trane
M9175B1000	N/A				30	1	N/A	
M9175C1008	M9185D1004	50017460-003	220736A		30	2	None	Reznor
M9175D1006	M9185A1018	50017460-003			30/60		M9185D1004	Requires 50017460-003
M9175D1014	M9185D1004				30/60		M9185D1004	TRADELINE
M9175V1003	M9185D1004	50017460-003			30		None	Trane
M9175V1011	None				60		None	Carrier, leadwires
M9175W1001	M9185D1004	50017460-003	220736A		60	1	None	Carrier
M9175W1019	M9185D1004	50017460-003	220736A		30	1	None	Trane
M9175Y1007	M9185D1004	50017460-003	220736B		30	2	None	
M9181A1004	M9184D1021				60		M9184A1019	

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OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M9181A1012	M9184A1019				60		None	
M9181A1020	M9184D1021				60		M9184A1019	
M9181A1038	M9184D1021				30		M9184A1035	
M9181B1002	M9184D1021		220736A		30	1	M9184C1031	
M9181B1010	M9184D1021		220736A		60	1	None	
M9181B1028	None				30	1	None	Cleaver Brooks
M9181C1000	None				30	2	None	
M9181D1008	M9184D1021				15/30		M9184D1005	
M9181D1016	N/A				120/240		N/A	Trane
M9181D1024	None				60/120/240		None	Special Timing
M9182A1003	M9185D1004				60		M9185A1018	Less junction box
M9182A1011	N/A				60		N/A	
M9182A1029	M9185A1018				30		None	
M9182A1037	M9185D1004	50017460-003			30		None	Trane
M9182A1045	M9185D1004				60		M9185A1018	
M9182A1052	M9185D1004			4074ERU	60		M9185A1018 + 4074ERU	Includes weatherproof kit
M9182A1060	M9185D1004	50017460-003			30		None	York
M9182C1009	M9185C1006				60	2	None	
M9182C1017	M9185D1004		220736B		30	2	None	
M9182D1007	M9185D1004				30/60		M9185D1004	Less junction box
M9182D1015	M9185D1004				30/60		M9185D1004	
M9182D1023	N/A				60/120/240		N/A	Special Timing
M9182D1031	M9185D1004	50017460-001		Q209E1010	30/60		None	Includes Q209E
M9182D4001	M9185D4008				30/60		M9185D1004	Canada
M9182W1002	M9185D1004	50017460-003	220736A	Q209E1010	30	1	None	Trane, includes Q209E
M9183G1009	M9185D1004				60		M9185A1018	Use auxiliary shaft
M9184A1001	M9184D1021				60		M9184A1019	
M9184A1019	N/A				60		N/A	
M9184A1027	M9184D1021				30		M9184A1035	
M9184A1035	M9184D1021				30		M9184A1019	
M9184A1043	M9184D1021			220741A2-90	60		M9184A1019	Japan; replacement requires 220741A
M9184B1009	N/A				30	1	N/A	Cleaver Brooks
M9184B1017	N/A				30	1	N/A	
M9184B1025	N/A				30	1	N/A	Cleaver Brooks
M9184B1033	M9184D1021		220736A		60	1	M9184F1034	With tapped shaft
M9184B1041	M9184D1021		220736A	4074ERU	30	1	M9184C1031	Includes weatherproof kit
M9184C1007	M9184D1021		220736B		30	2	M9184C1031	With tapped shaft
M9184C1015	M9184D1021		220736B		60	2	None	
M9184C1023	N/A				30	2	N/A	Cleaver Brooks
M9184C1031	N/A				30	2	N/A	With tapped shaft
M9184C1049	N/A				30	2	N/A	Cleaver Brooks
M9184D1005	N/A				15/30		N/A	
M9184D1013	M9184D1021				30/60		none	TRADELINE
M9184D1021	N/A				30/60		N/A	TRADELINE, with tapped shaft
M9184D1039	M9184D1021			220741A2-90	15/30		M9184D1005	Japan; replacement requires 220741A
M9184D1047	M9184D1021				15/30		M9184D1005	
M9184D1054	M9194D1003				120/240		None	
M9184D1062	M9184D1021				30/60		M9184D1021	
M9184D4009	N/A				30/60		N/A	Canada, TRADELINE
M9184E4006	N/A		220736A		30/60	1	None	Canada, TRADELINE, tapped shaft
M9184F1000	M9184F1034				30/60	2	None	
M9184F1018	M9184D1021		220736B		30/60	2	M9184F1034	With tapped shaft
M9184F1026	M9184D1021		220736B	220741A2-90	30/60	2	M9184F1034	Requires 220741A
M9184F1034	N/A		220736B		30/60	2	N/A	With tapped shaft
M9185A1000	M9185D1004				60		M9185A1018	
M9185A1018	N/A				60		N/A	
M9185A1026	M9185A1018				30		None	
M9185A1034	M9185D1004				60		M9185A1018	
M9185A1042	M9185D1004	50017460-003			30		M9185A1026	Requires 50017460-003
M9185A1059	M9185D1004				30		None	Lennox
M9185A1067	M9185D1004				30		None	York
M9185A1075	N/A			220741A	60		N/A	Requires 220741A
M9185A1083	M9185D1004				60		M9185A1018	
M9185A1091	M9185D1004				30		M9185A1018	Less junction box
M9185B1008	M9185D1004	50017460-003	220736A		30	1	None	
M9185C1006	N/A		220736B		60	2	N/A	
M9185C1014	M9185D1004		220736B		60	2	None	
M9185C1022	M9185D1004		220736B		60	2	None	
M9185D1004	N/A				30/60		N/A	TRADELINE

OS # to be Replaced	Model Number	Required Transformer	Required Aux. Switch	Required Accessories	Timing (sec)	Aux Sw	Functional Replacement	TRADELINE Comments
M9185D1012	M9185D1004				30/60		M9185D1004	
M9185D4008	N/A				30/60		N/A	Canada, TRADELINE
M9185E1001	M9185D1004		220736A		30/60	1	M9185E1019	
M9185E1019	N/A				30/60	1	N/A	
M9185E4005	N/A		220736A		30/60	1	N/A	Canada, TRADELINE, tapped shaft
M9185F1009	None				30/60	2	None	Carrier (W957G1006)
M9185W1017	M9185D1004	50017460-003	220736A	Q209E1010	30	1	None	Trane, with Q209E
M9186G1006	M9185A1018				60		None	Use auxiliary shaft
M9186G1014	M9185D1004			220741A2-90	60		M9185A1018	Japan, use auxiliary shaft
M9186G4000	M9185E4005				60		None	Canada, use auxiliary shaft
M9191D1006	M9194D1003				120/240		M9194D1003	
M9191F1001	N/A		220736B		120/240	2	N/A	
M9194C1005	N/A				60	2	N/A	
M9194D1003	N/A				120/240		N/A	TRADELINE
M9194D4007	M9194D1003				120/240		None	Canada, TRADELINE
M9194E1000	N/A				120/240	1	N/A	
M9481D1005	M9484F1007				30/60		M9484D1010	
M9481E1002	M9484F1007				30/60	1	M9484E1017	
M9481F1000	M9484F1007				30/60	2	None	
M9484D1002	None				15/30		M9484D1010	
M9484D1010	N/A				30/60		N/A	With tapped shaft
M9484D1028	none				30/60		M9484D1010	
M9484D1036	None				15/30		M9484E1009	
M9484D1044	None				30/60		M9484D1010	With tapped shaft
M9484D1051	None				30/60		M9484D1010	
M9484D4006	N/A				30/60		N/A	Canada, tapped shaft, 220741A
M9484E1009	N/A				15/30	1	N/A	With tapped shaft
M9484E1017	N/A				30/60	1	N/A	
M9484E1025	None				30/60	1	M9484E1033	
M9484E1033	N/A				30/60	1	N/A	
M9484E1041	None				30/60	1	M9484E1033	With 221455A
M9484E1058	None				30/60	1	M9484E1033	
M9484E1066	None				30/60	1	M9484E1033	
M9484E1074	None				30/60	1	M9484E1033	
M9484E1082	None				30/60	1	M9484E1017	With tapped shaft
M9484E1090	None				30/60	1	M9484E1017	
M9484E1116	None				15/30	1	M9484E1009	
M9484E4003	N/A				30/60	1	N/A	Canada, tapped shaft, 220741A
M9484F1007	N/A				30/60	2	N/A	
M9484F1015	None				30/60	2	M9484F1007	
M9484F1023	N/A				15/30	2	N/A	With tapped shaft
M9484F1031	N/A				30/60	2	N/A	
M9484F1049	N/A				30/60	2	N/A	
M9484F1056	None				15/30	2	M9484F1023	With tapped shaft
M9484F1064	None				30/60	2	M9484F1031	
M9484F1072	None				30/60	2	M9484F1007	
M9484F4001	N/A				30/60	2	N/A	Canada, tapped shaft, 220741A
M9484F4019	N/A				15/30	2	N/A	
M9491D1003	None				60/120		M9494D1000	
M9494D1000	N/A				60/120		N/A	

Notes

Section 8: Appendices

Appendix A:

Technology Comparison of Control Ball and Globe Valves

Appendix B:

Appendix C:

Appendix A: Valve Selection and Sizing

Introduction

This section provides information on valve selection and sizing. Valves must be selected for ability to meet temperature, pressure, flow control characteristic, and piping connection requirements of the hydronic system. Valve sizing is critical to ensure support for heating and cooling loads with adequate valve capacity, yet able to control system flow to provide stable building conditions efficiently.

Definitions

Valve Components

Actuator: The part of an automatic control valve that moves the stem based on an electric, electronic, or pneumatic signal from a controller. The actuator and valve can be two separate devices or together they can be one device.

Body: The valve casting through which the controlled fluid flows (Fig. 1).

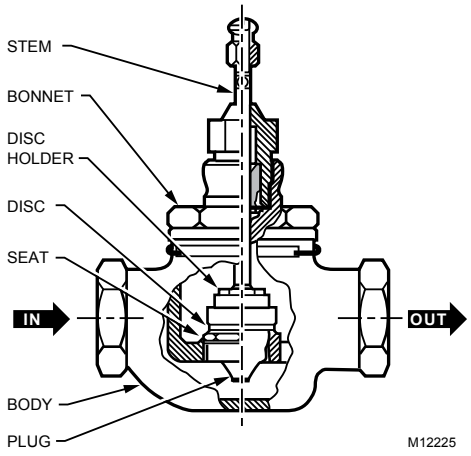


Fig. 1. Globe Valve Components.

Bonnet: The part that screws to the top of the valve body and contains the packing that seals and guides the valve stem.

Disc: The part of the valve assembly that contacts the valve seat to close off flow of the controlled fluid. Some valve assemblies are built so the disc is replaceable. Replaceable discs are usually made of a composition material softer than metal. "Metal trim" valves use precisely-machined metal plugs and seats operated by high force actuators instead of a disk.

Plug: The part that varies the opening for the fluid to flow through the valve body. The following describes the three most common types of plugs:

- A contoured plug has a shaped end that is usually end-guided at the top or bottom (or both) of the valve body. The shaped end controls fluid flow through the valve with respect to stem travel.
- A V-port plug has a cylinder, called a skirt, that rides up and down in the valve seat ring. The skirt guides the plug and varies the flow area with respect to stem travel via its shaped openings.
- A quick-opening plug is flat and is either end-guided or guided by wings riding in the valve seat ring. The flat plug provides maximum flow soon after it lifts from the valve seat.

Port: The opening in the valve seat.

Seat: The stationary part of the valve body that has a raised lip to contact the valve disc when closing off flow of the controlled fluid.

Stem: The shaft that runs through the valve bonnet and connects an actuator to the valve plug.

Trim: All parts of the valve that contact the controlled fluid. Trim includes the stem, packing, plug, disc, and seat; it does not include the valve body.

Valve Flow Characteristics

Direction of Flow: The correct flow of the controlled fluid through the valve is usually indicated on the valve body. If the fluid flow through the valve is incorrect, the disc can slam into the seat as it approaches the closed position. The result is poor control, excessive valve wear, and noisy operation. In addition, the actuator must work harder to reopen the closed valve since it must overcome the pressure exerted by the fluid on top of the disc rather than have the fluid assist in opening the valve by exerting pressure under the disc. Gate and butterfly valves may offer bi-directional flow.

Equal percentage: A valve which changes flow by an equal percentage (regardless of flow rate) for similar movements in stem travel (at any point in the flow range).

Linear: A valve which provides a flow-to-lift relationship that is directly proportional. It provides equal flow changes for equal lift changes, regardless of percentage of valve opening.

Quick-opening: A valve which provides maximum possible flow as soon as the stem lifts the disc from the valve seat.

Valve flow characteristic: The relationship between the stem travel of a valve, expressed in percent of travel, and the fluid flow through the valve, expressed in percent of full flow.

Valve Flow Terms

Rangeability: The ratio of maximum flow to minimum controllable flow. Approximate rangeability ratios are 50 to 1 for V-port globe valves and 30 to 1 for contoured plug valves.

EXAMPLE:

A valve with a total flow capacity of 100 gpm full open and a rangeability of 30 to 1, can accurately controls flow accurately as low as 3 gpm.

Tight shut-off/close-off: A valve condition in which virtually no leakage of the controlled fluid occurs in the closed position. Generally, only single-seated valves provide tight shut-off. Double-seated valves typically have a one to three percent leakage in the closed position.

Turndown: The ratio of maximum flow to minimum controllable flow of a valve installed in a system. Turndown is equal to or less than rangeability.

EXAMPLE:

For the valve in the rangeability example, if the system requires a 66 gpm maximum flow through the valve and since the minimum accurately controllable flow is 3 gpm, the turndown is 22.

Valve Ratings

Flow coefficient (capacity index): Used to state the flow capacity of a control valve for specified conditions. In the control valve industry currently one of three flow coefficients is used depending upon the location and system of units; British Av, European k_{vs}, or United States C_v . The flow coefficients have the following relationships:

$A_V = 0.0000278\ k_{vs}$

$A_V = 0.0000240\ C_v$

$k_{vs} = 0.865\ C_v$

The flow coefficient Av is in cubic meters per second and can be determined from the formula:

$$A_V = Q\sqrt{\frac{\rho}{\Delta p}}$$

Where:

Q = volumetric flow in cubic meters per second.

ρ = fluid density in kilograms per cubic meter.

Δp = static pressure loss across the valve in pascals.

The flow coefficient k_{vs} is water flow in cubic meters per hour with a static pressure loss across the valve of 10^5 pascals (1 bar) within the temperature range of 5 to 40°C and can be determined from the formula:

$$k_{VS} = Q\sqrt{\frac{\Delta\rho k_{VS}}{\Delta\rho} \bullet \frac{\rho}{\rho_W}}$$

Where:

Q = volumetric flow in cubic meters per hour.

ρ = fluid density in kilograms per cubic meter.

ρ_w = density of water in kilograms per cubic meter.

$\Delta p\ k_{vs}$ = static pressure loss of 10^5 pascals.

Δp = static pressure loss across the valve in pascals.

The flow coefficient C_v is water flow in gallons per minute with a pressure loss across the valve of one pound per square inch within the temperature range of 40 to 100F and can be determined for other conditions from the formula:

$$C_V = Q\sqrt{\frac{1}{\Delta\rho} \bullet \frac{\rho}{\rho_W}}$$

Where:

Q = volumetric flow in US gallons per minute.

ρ = fluid density in pounds per cubic foot.

ρ_w = density of water in pounds per cubic foot within the temperature range of 40 to 100F

Δp = static pressure loss across the valve in pounds per square inch.

Close-off rating: The maximum pressure drop that a valve can withstand without leakage while in the full closed position. The close-off rating is a function of actuator power to hold the valve closed against pressure drop, by structural parts such as the stem can be the limiting factor. The construction of gate-style valves, such as ball valves, often allows them to hold back high head pressures in the closed position, although the actuator may not be powerful enough to operate the valve against such forces.

EXAMPLE:

A valve with a close-off rating of 10 psi could have 40 psi upstream pressure and 30 psi downstream pressure. Note that in applications where failure of the valve to close is hazardous, the maximum upstream pressure must not exceed the valve close-off rating, regardless of the downstream pressure.

The valve close-off rating is independent of the actual valve body rating. See definition of BODY RATING (ACTUAL).

Appendix A: Valve Selection and Sizing

Close-off rating of three-way valves: The maximum pressure difference between either of the two inlet ports and the outlet port for mixing valves, or the pressure difference between the inlet port and either of the two outlet ports for diverting valves.

Pressure drop: The difference in upstream and downstream pressures of the fluid flowing through the valve.

Pressure drop (critical): The flow of a gaseous controlled fluid through the valve increases as the pressures drop increases until reaching a critical point. This is the critical pressure drop.

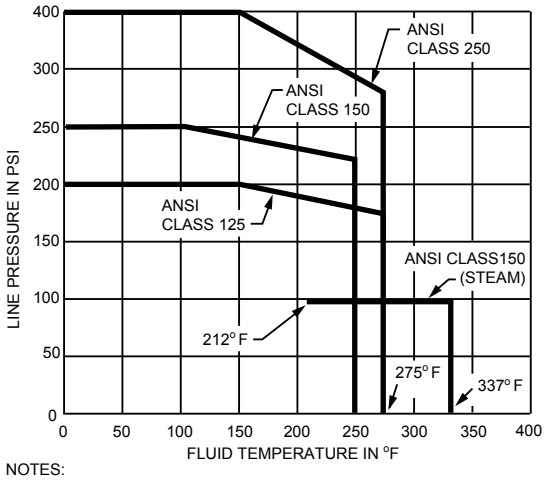
Any increase in pressure drop beyond the critical pressure drop is dissipated as noise and cavitation rather than increasing flow. The noise and cavitation can destroy the valve and adjacent piping components.

Body rating (nominal): The theoretical pressure rating, expressed in psi, of the valve body exclusive of packing, disc, etc. The nominal rating is often cast on the valve body and provides a way to classify the valve by pressure. A valve of specified body material and nominal body rating often has characteristics such as pressure-temperature ratings, wall thickness, and end connections which are determined by a society such as ANSI (American National Standards Institute). Figure 2 shows ANSI pressure-temperature ratings for valves. Note that the nominal body rating is not the same as the actual body rating.

Body rating (actual): The correlation between safe, permissible flowing fluid pressure and flowing fluid temperature of the valve body (exclusive of the packing, disc, etc.). The nominal valve body rating is the permissible pressure at a specific temperature.

EXAMPLE:

From Figure 2, a valve with an ANSI rating of 150 psi (ANSI Class 150) has an actual rating of 225 psi at 250F.



NOTES:
1. FOR HIGH FLUID TEMPERATURES, THE VALVE AND/OR PIPING SHOULD BE INSULATED TO PREVENT AMBIENT TEMPERATURES FROM EXCEEDING ACTURATOR RATINGS.

M12224

Fig. 2. Sample ANSI Pressure-Temperature Ratings for Valves.

Maximum pressure and temperature: The maximum pressure and temperature limitations of fluid flow that a valve can withstand. These ratings may be due to valve packing, body, or disc material or actuator limitations. The actual valve body ratings are exclusively for the valve body and the maximum pressure and temperature ratings are for the complete valve (body and trim). Note that the maximum pressure and temperature ratings may be less that the actual valve body ratings.

EXAMPLE:

The body of a valve, exclusive of packing, disc, etc., has a pressure and temperature rating of 125 psi at 335F. If the valve contains a composition disc that can withstand a temperature of only 240F, then the temperature limit of the disc becomes the maximum temperature rating for the valve.

Valve Types

Ball valve: A ball valve has a precision ball between two seats with a body (Fig. 3). Ball valves have several port sizes for a give body size and go from closed to open with a 90 degree turn of the stem. They are available in both two-way and three-way configurations. For HVAC applications, ball valve construction includes brass and cast iron bodies; stainless steel, chrome plated brass, and cast iron balls; resilient seats with various temperature ratings. Ball valves provide tight shut-off, while full port models have low flow resistance, and models with flow characterizing inserts can be selected for modulating applications.

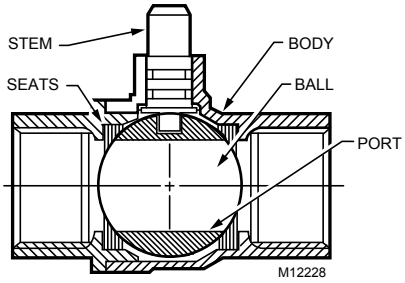


Fig. 3. Ball Valve.

Butterfly valve: A valve with cylindrical bod, a shaft, and a rotating disc (Fig. 4). The disc rotates 90 degrees from open to closed. The disc seats against a resilient body liner or spring-loaded metal seat and may be manufactured for tight shut-off or made smaller for reduced operating torque at lower close-off. Butterfly valves have limited rangeability for modulating applications so are used mainly for two-way operation. For three-way applications, two butterfly valves are assembled to a pipe tee with linkage for simultaneous operation.

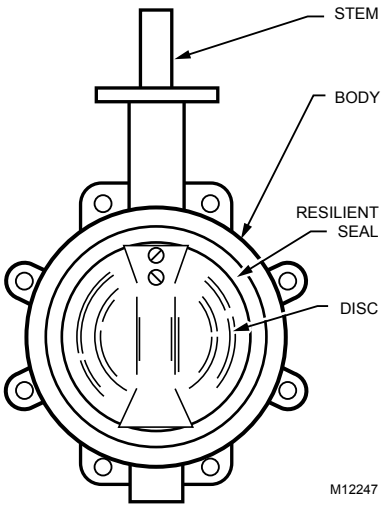


Fig. 4. Butterfly Valve.

Double-seated valve: A valve with two seats, plugs, and discs. Double-seated valves are suitable for applications where fluid pressure is too high to permit a single seated valve to close. The discs in a double-seated valve are arranged so that in the closed position there is minimal fluid pressure forcing the stem toward the open or closed position; the pressure on the discs is essentially balanced. For a valve of given size and port area, the double-seated valve requires less force to operate than the single-seated valve so the double seated valve can use a smaller actuator than a single seated.

Also, double-seated valves often have a larger port area for a given pipe size. A limitation of double-seated valves is that they do not provide tight shut-off. Since both discs rigidly connect together and changes in fluid temperature can cause either the disc or the valve body to expand or contract, one disc may seat before the other and prevent the other disc from seating tightly.

Flanged-end connections: A valve that connects to a pipe by bolting a flange on the valve to a flange screwed onto the pipe. Flanged connections are typically used on large valves only.

Gate valve: A valve that controls flow using a gating mechanism, usually a plate, that moves across the valve seat instead of pushing against the flow. The actuator works against the friction of the seals rather than directly against the force of the water. Gate valves are inherently self-sealing and are often capable of high close-off pressures without an actuator. Ball valves are a type of gate valve.

Globe valve: A valve which controls flow by moving a circular disk against or away from a seat. When used in throttling control a contoured plug (throttling plug) extends from the center of circular disk through the center of the seat for precise control (Fig. 1).

Pressure-balanced valve: A globe valve with a sealed pressure chamber built into the plug, which equalizes head pressure across the seat and allows most of the actuator force to be used to close off the flow, resulting in very high close-off ratings with very low seat leakage.

Reduced-port valve: A valve with a capacity less than the maximum for the valve body. Ball, butterfly, and smaller globe valves are available with reduced ports to allow correct sizing for good control.

Single-seated valve: A valve with one seat, plug, and disc. Single-seated valves are suitable for applications requiring tight shut-off. Since a single-seated valve has nothing to balance the force of the fluid pressure exerted on the plug, it requires more closing force than a double-seated valve of the same size and therefore requires more actuator force than a double-seated valve.

Threaded-end connection: A valve with threaded pipe connections. Valve threads are usually tapered female, to National Pipe Thread standards, but male connections are available for special applications. Some valves have an integral union for easier installation.

Three-way valve: A valve with three ports. The internal design of a three-way valve classifies it as a mixing or diverting valve. Three-way valves control liquid in modulating or two-position applications and do not provide tight shut-off.

Two-way valve: A valve with one inlet port and one outlet port. Two-way valves control water or steam in two-position or modulating applications and provide tight shut-off in both straight through and angle patterns.

Valve Material and Media

Valves with bronze or cast iron bodies having brass or stainless steel trim perform satisfactorily in HVAC hydronic systems when the water is treated properly. Failure of valves in these systems may be an indication of inadequate water treatment. The untreated water may contain dissolved minerals (e.g., calcium, magnesium, or iron compounds) or gases (e.g., carbon dioxide, oxygen, or ammonia). Inadequate treatment results in corrosion of the system. Depending on the material of the valve, the color of the corrosion may indicate the substance causing the failure (Table 1).

Table 1. Corrosive Elements in Hydronic Systems.

Brass or Bronze Component	
Corrosive Substance	**Corrosion Color**
Chloride	Light Blue-Green
Ammonia	Blue or Dark Blue
Carbonates	Dark Blue-Green
Magnesium or Calcium	White
Oxides	Black (water)
Sulphide (Hydrogen)	Black (Gas)
Iron	Rust
Iron or Steel Component	
Corrosive Substance	**Corrosion Color**
Magnesium or Calcium	White
Iron	Rust

Petroleum products from sources such as cutting oils, solder flux, etc. can cause some rubber compounds to swell and interfere with moving parts.

Chloramines, chemical compounds of ammonia and chlorine used to treat municipal drinking water, are reported to attack some rubber compounds commonly used in closed loop hydronic systems.

Particulate present in the system can interfere with, and sometimes damage moving parts. Examples include: rust (Fe_2O_3), magnetite (Fe_3O_4), sand (quartz granules), silt from municipal water, iron filings from pipe threads, and scale precipitated from hard water. Rust, in particular, is highly abrasive and can rapidly wear out stem seals, causing leaks.

To prevent damage to valves and pumps, a complete flushing of the system during commissioning, including the existing structure when building an addition, may be required to remove physical particulate. Additional components may also be needed, such as in-line Y-strainers for large objects such as stones or solder blobs and mechanical filtration, such as a 50 micron 10% side-stream filter piped in parallel with the system pumps.

Glycol solutions may be used to prevent hydronic systems freezing. Glycol solutions should be formulated for HVAC systems. Some available glycol solutions formulated for other uses contain additives that are injurious to some system seals. In addition, hydronic seals react differently to water and glycol such that when a new system is started up with water or glycol the seals are effective. The hydronic seals are likely to leak if the system is later restarted with media changed from to water to glycol or glycol to water. To prevent leakage part of the process of media changeover should include replacing seals such as, pump and valve packing. Glycol mixtures are usually limited to 50% concentration. At 60% concentration, glycol mixtures have their minimum freezing temperature, but can have unstable phase changes which may severely damage a system.

Valve Selection

Proper valve selection matches a valve to the control and hydronic system physical requirements. First consider the application requirements and then consider the valve characteristics necessary to meet those requirements. The following questions provide a guide to correct valve selection.

— What is the piping arrangement and size?

The piping arrangement indicates whether a two-way or three-way mixing or diverting valve is needed. The piping size gives some indication of whether the valve requires a screwed end or a flanged end connection.

— Does the application require two-position control or proportional control? Does the application require a normally open or normally closed valve? Should the actuator be direct acting or reverse acting?

In its state of rest, the valve is normally open or closed depending on the load being controlled, the fluid being controlled, and the system configuration.

For chilled water coils, it is usually preferable to close the valve on fan shutdown to prevent excessive condensation around the duct and coil, and to save pumping energy. This may be accomplished with either normally closed valves or a variety of other control schemes. Lower cost and more powerful normally open valve assemblies may be used with the close-on-shutdown feature and allow, in the case of pneumatic systems, the capability to provide heating or cooling in the event of air compressor failure.

Converter control valves should be normally closed and outdoor air preheat valves should be normally open.

— Is tight shut-off necessary? What differential pressure does the valve have to close against? How much actuator close-off force is required?

Valves should never be allowed to "dead head" a pump unless the pumps are controlled by variable speed drive systems capable of detecting such conditions and shutting down the pumps.

Single-seated valves provide tight shut-off, while double-seated valves do not. Double seated valves are acceptable for use in pressure bypass or in-line throttling applications.

The design and flow capacity of a valve determine who much actuator force is required for a given close-off. Therefore, the valve must first be sized, then, the valve and actuator selected to provide the required close-off.

— What type of medium is being controlled? What are the temperature and pressure ranges of the medium?

Valves must be compatible with system media composition, maximum and minimum temperature, and maximum pressure. The temperature and pressure of the medium being controlled should not exceed the maximum temperature and pressure ratings of the valve.

For applications such as chlorinated water or brine, select valve materials to avoid corrosion.

— What is the pressure drop across the valve? Is the pressure drop high enough?

The full open pressure drop across the valve must be high enough to allow the valve to exercise control over its portion of the hydronic system. However, the full open pressure drop must not exceed the valves rating for quiet service and normal life. Closed pressure drop must not exceed valve and actuator close-off rating.

Globe Valve

Globe valves are popular for HVAC applications. They are available in pipe sizes from 1/2 in. to 12 in. and in a large variety of capacities, flow characteristics, and temperature and pressure capabilities. They provide wide rangeability and tight shutoff for excellent control over a broad range of conditions. Globe valves are made in two-way, straight or angle configurations and three-way mixing and diverting designs. Globe valves close against the flow and have arrows on the body indicating correct flow direction. Incorrect piping can result in stem oscillations, noise, and high wear.

A two-way globe valve has one inlet port and one outlet port (Fig. 5) in either a straight through or angle pattern. The valve can be either push-down-to-close or push-down-to-open.

Pneumatic and electric actuators with linear motion to operate globe valves are available for operation with many control signals.

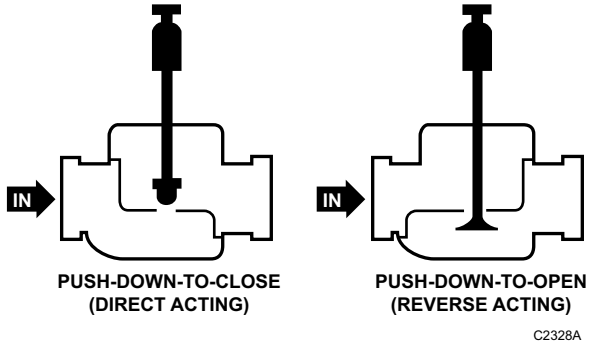


Fig. 5. Two-Way Globe Valves.

Ball Valve

Ball valves are available for two-position applications either manual (hand) or power operated or for modulating applications with direct coupled electric actuators. Ball valves are relatively low cost, provide tight close off, and are available in two-way and three-way configurations. As with all other valves, ball valves must be properly sized to provide good flow control.

When used in modulating service, ball valves must be specifically designed for modulating service as compared to two-position service. Packing must provide leak-free sealing through thousands of cycles to ensure trouble-free HVAC service. The ball, stem and seals should be made of materials that minimizes sticking and breakaway torque to achieve smooth operation.

Two-way ball valves have equal percentage flow control characteristics and flow in full-port models can be in either direction.

Three-way ball valves can be used in either mixing or diverting service. Full port models have linear flow control characteristics for constant total flow. A popular option with 3-way valves is a 20% flow capacity reduction in the B port to equalize pressure losses in a coil-bypass application.

Butterfly Valve

Butterfly valves (Fig. 6) control the flow of hot, chilled, or condenser water in two-position or proportional applications. Butterfly valves are available in two-way or three-way configurations. Tight shutoff may be achieved by proper selection of actuator force and body lining. The three-way valve can be used in mixing or diverting applications with the flow in any direction. The three-way valve consists of two butterfly valves that mount on a flanged cast iron tee and are linked to an actuator which opens one valve as it closes the other. Minimum combined capacity of both valves occurs at the half-open position.

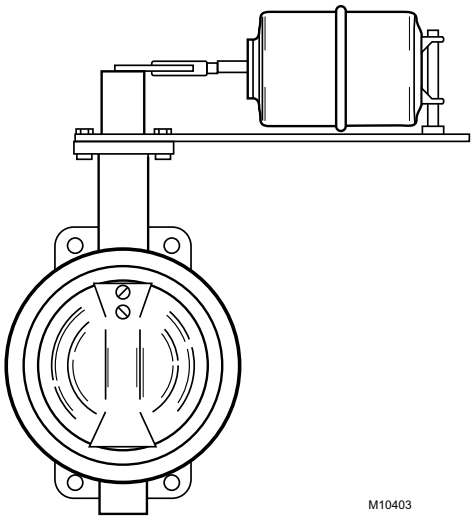


Fig. 6. Butterfly Valve.

When butterfly valves are used for proportional control, they must be applied using conservative pressure drop criteria. If the pressure drop approaches the critical pressure drop, unbalanced forces on the disc can cause oscillations, poor control, and/or damage to the linkage and actuator, even though the critical flow point is not reached. Modulating control is usually limited to a range of 15 to 65 degrees of disk rotation.

Butterfly valves are usually found in larger pipe sizes. For example, two butterfly valves could be piped in a mixing application to control the temperature of the water going back to the condenser. The valves proportion the amount of tower water and condenser water return that is flowing in the condenser water supply line.

Two-way Valve

Two-way valves are available as globe, ball, or butterfly valves. The combination of valve body and actuator (called valve assembly) determines the valve stem position. Two-way valves control steam or water in two-position or proportional applications (Fig. 7). They provide tight shutoff and are available with quick-opening, linear, or equal percentage flow characteristics. Control valves are typically installed on the supply side of convectors and radiators, and the return side of small-bore water coils used in fan-forced equipment.

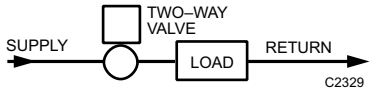


Fig. 7. Two-Way Valve Application.

Ideally, a control system has a linear response over its entire operating range. The sensitivity of the control to a change in temperature is then constant throughout the entire control range. For example, a small increase in temperature provides a small increase in cooling. A nonlinear system has varying sensitivity. For example, a small increase in temperature can provide a large increase in cooling in one part of the operating range and a small increase in another part of the operating range. To achieve linear control, the combined system performance of the actuator, control valve, and load must be linear. If the system is linear, a linear control valve is appropriate (Fig. 8). If the system is not linear, a nonlinear control valve, such as an equal percentage valve, is appropriate to balance the system so that resultant performance is linear.

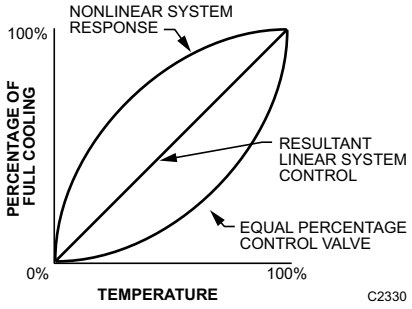


Fig. 8. Linear vs. Nonlinear System Control.

QUICK-OPENING VALVE

A quick-opening two-way valve includes only a disc guide and a flat or quick-opening plug. This type of valve is used for two position control of steam. The pressure drop for a quick opening two-way valve should be 10 to 20 percent of the piping system pressure differential, leaving the other 80 to 90 percent for the load and piping connections.Figure 9 shows the relationship of flow versus stem travel for a quick-opening valve. To achieve 90 percent flow, the stem must open only 20 percent. Linear or equal percentage valves can be used in lieu of quick-opening valves in two-position control applications as the only significant positions are full open and full closed.

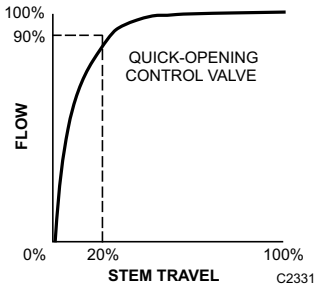


Fig. 9. Flow vs. Stem Travel Characteristic of a Quick-Opening Valve.

Linear Valve

A linear valve may include a V-port plug or a contoured plug. This type of valve is used for proportional control of steam or chilled water, or in applications that do not have wide load variations. Typically in steam or chilled water applications, changes in flow through the load (e.g., heat exchanger, coil) cause proportional changes in heat output. For example, Figure 10 shows the relationships between heat output, flow, and stem travel given a steam heat exchanger and a linear valve as follows:

— Graph A shows the linear relationship between heat output and flow for the steam heat exchanger. Changes in heat output vary directly with changes in the fluid flow.

— Graph B shows the linear relationship between flow and stem travel for the linear control valve. Changes in stem travel vary directly with changes in the fluid flow.

NOTE: As a linear valve just starts to open, a minimum flow occurs due to clearances required to prevent sticking of the valve. Some valves have a modified linear characteristic to reduce this minimum controllable flow. This modified characteristic is similar to an equal percentage valve characteristic for the first 5 to 10 percent of stem lift and then follows a linear valve characteristic for the remainder of the stem travel.

— Graph C shows the linear relationship between heat output and stem travel for the combined heat exchanger and linear valve. Changes in heat output are directly proportional to changes in the stem travel.

Thus a linear valve is used in linear applications to provide linear control.

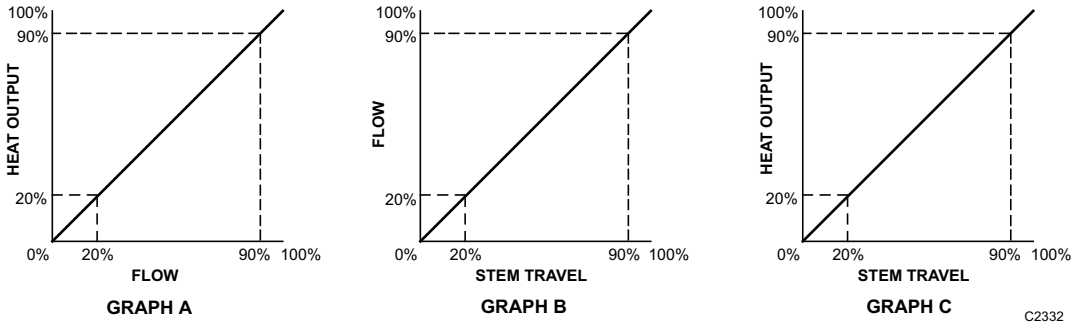


Fig. 10. Heat Output, Flow, and Stem Travel Characteristics of a Linear Valve.

EQUAL PERCENTAGE VALVE

An equal percentage valve includes a contoured plug or contoured V-port shaped so that similar movements in stem travel at any point in the flow range change the existing flow an equal percentage, regardless of flow rate. In mathematical terms, this is an exponential response.

EXAMPLE:

When a valve with the stem at 30 percent of its total lift and existing flow of 3.9 gpm (Table 2) opens an additional 10 percent of its full travel, the flow measures 6.2 gpm or increases 60 percent. If the valve opens an additional 10 percent so the stem is at 50 percent of its full travel, the flow increases another 60 percent and is 9.9 gpm.

Table 2. Stem Position vs. Flow for Equal Percentage Valve.

Stem		Flow	
Change	**Position**	**Rate**	**Change**
—	30% open	3.9 gpm	—
10% increase	40% open	6.2 gpm	60% increase
10% increase	50% open	9.9 gpm	60% increase

An equal percentage valve is used for proportional control in hot water applications and is useful in control applications where wide load variations can occur. Typically in hot water applications, large reductions in flow through the load (e.g., coil) cause small reductions in heat output. An equal percentage valve is used in these applications to achieve linear control. For example, Figure 11 shows the heat output, flow, and stem travel relationships for a hot water coil, with 200F, entering water and 50F entering air and an equal percentage valve, as follows:

— Graph A shows the nonlinear relationship between heat output and flow for the hot water coil. A 50 percent reduction in flow causes a 10 percent reduction in heat output. To reduce the heat output by 50 percent, the flow must decrease 90 percent.

— Graph B shows the nonlinear relationship between flow and stem travel for the equal percentage control valve. To reduce the flow 50 percent, the stem must close 10 percent. If the stem closes 50 percent, the flow reduces 90 percent.

— Graph C shows the relationship between heat output and stem travel for the combined coil and equal percentage valve. The combined relationship is close to linear. A 10 percent reduction in heat output requires the stem to close 10 percent, a 50 percent reduction in heat output requires the stem to close 50 percent, and a 90 percent reduction in heat output requires the stem to close 90 percent.

The equal percentage valve compensates for the characteristics of a hot water application to provide a control that is close to linear.

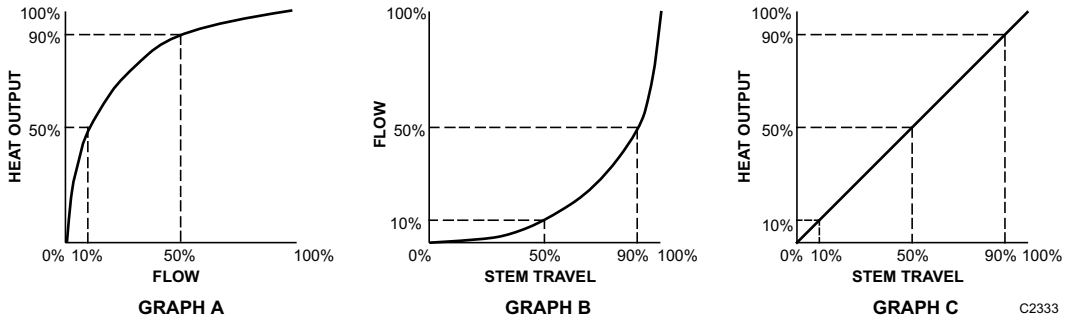


Fig. 11. Heat Output, Flow, and Stem Travel Characteristics of an Equal Percentage Valve.

Three-way Valves

Three-way valves (Fig. 12) control the flow of liquids in mixing or diverting valve applications (Fig. 13). The internal design of a three-way globe valve enables it to seat against the flow of liquid in the different applications. An arrow cast on the valve body indicates the proper direction of liquid flow. It is important to connect three-way valve piping correctly or oscillations, noise, and excessive valve wear can result. Three-way valves are typically have linear flow characteristics, although, some are equal percentage for flow through the coil with linear flow characteristics for flow through the coil bypass. Ball valves are also available in a three-way configuration, while two butterfly valves can be made to act as a three-way valve.

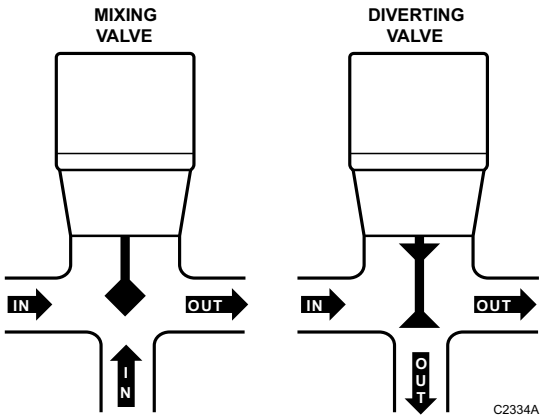


Fig. 12. Three-Way Valves.

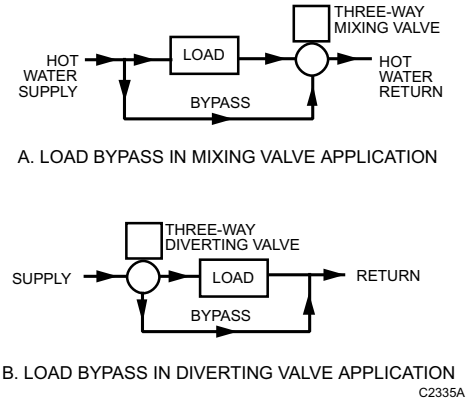


Fig. 13. Three-Way Valve Applications.

MIXING VALVE

A mixing valve provides two inlet ports and one common outlet port. The valve receives liquids to be mixed from the inlet ports and discharges the liquid through the outlet port (Fig. 12). The position of the valve disc determines the mixing proportions of the liquids from the inlet ports.

The close-off pressure in a mixing valve equals the maximum value of the greater inlet pressure minus the minimum value of the downstream pressure.

EXAMPLE:

A mixing valve application has a maximum pressure of 25 psi on one inlet port, maximum pressure of 20 psi on the other inlet port, and minimum downstream pressure of 10 psi on the outlet port. The close-off pressure is 25 psi – 10 psi = 15 psi. The application requires a mixing valve with at least a 15 psi close-off rating. The actuator selected must have a high enough force to operate satisfactorily.

In globe mixing valve applications, the force exerted on the valve disc due to unbalanced pressure at the inlets usually remains in the same direction. In cases where there is a reversal of force, the force changes direction and holds the valve disc off the seat, cushioning it as it closes. If the pressure difference for the system is greater than the pressure ratings of available globe mixing valves, use a ball mixing valve or two butterfly valves in a tee configuration.

Globe mixing valves are not suitable for modulating diverting valve applications. If a mixing valve is piped for modulating diverting service, the inlet pressure slams the disc against the seat when it nears the closed position. This results in loss of control, oscillations, and excessive valve wear and noise. Mixing valves are acceptable using about 80 percent of the close-off rating, but not recommended, in two-position diverting valve applications.

DIVERTING VALVE

A globe diverting valve provides one common inlet port and two outlet ports. The diverting valve uses two V-port plugs which seat in opposite directions and against the common inlet flow. The valve receives a liquid from one inlet port and discharges the liquids through the outlet ports (Fig. 12) depending on the position of the valve disc. If the valve disc is against the bottom seat (stem up), all the liquid discharges through the side outlet port. If the valve disc is against the top seat (stem down), all the liquid discharges through the bottom outlet port.

The close-off pressure in a diverting valve equals the maximum value of the inlet pressure minus the minimum value of the downstream pressure.

Globe diverting valves must not be used for mixing service. As with mixing valves used for diverting service, media pressure drop across the valve can cause it to slam shut with resulting loss of control.

EXAMPLE:

A diverting valve application has 20 psi maximum on the inlet port, one outlet port discharging to the atmosphere, and the other outlet port connecting to a tank under 10 psi constant pressure. The pressure difference between the inlet and the first outlet port is 20 psi and between the inlet and second outlet port is 10 psi. The application requires a diverting valve with at least 20 psi close-off rating.

Valve Sizing

Every valve has a capacity index or flow coefficient (C_v). Typically determined for the globe and ball valves at full open and about 60 degrees open for butterfly valves. C_v is the quantity of water in gpm at 60F that flows through a valve with a pressure differential of 1 psi. Sizing a valve requires knowing the medium (liquid or gas) and the required pressure differential to calculate the required C_v. When the required C_v is not available in a standard valve, select the next closest and calculate the resulting valve pressure differential at the required flow to verify to verify acceptable performance.

After determination of the valve C_v, calculation of the flow of any medium through that valve can be found if the characteristics of the medium and the pressure drop across the valve are known.

Water Valves

Determine the capacity index (C_v) for a valve used in a water application, using the formula:

$$C_V = \frac{Q\sqrt{G}}{\sqrt{h}}$$

Where:

Q = Flow of fluid in gallons per minute required to pass through the valve.

G = Specific gravity of the fluid (water = 1).

h = Pressure drop in psi. See Figures 14 and 15 for glycol solution correction values.

NOTE: The calculated C_v will rarely match the C_v of an available valve. For most accurate proportional control, select the valve with the next lower C_v value, and increase the pressure drop across the control valve to achieve the required flow through the coil by reducing the setting of the balancing valve. Otherwise, turndown ratio will be reduced, proportionally.

For example, if the calculated C_v is 87, and the two closest C_v values are 63 and 100, the best choice for control precision would be the valve with a C_v of 63, and increase pressure drop across the valve by 90%.

If increased pressure drop is not possible, use the valve with C_v of 100, and accept a 13% reduction in valve rangeability.

For two-position control, always chose the largest C_v greater than the coil with acceptable close-off pressure rating.

Determining the C_v of a water valve requires knowing the quantity of water (gpm) through the valve and the pressure drop (h) across the valve. If the fluid is a glycol solution, use the pressure drop multipliers from either Figure 14 or 15. See the sections on QUANTITY OF WATER and WATER VALVE PRESSURE DROP. Then select the appropriate valve based on C_v, temperature range, action, body ratings, etc., per VALVE SELECTION guidelines.

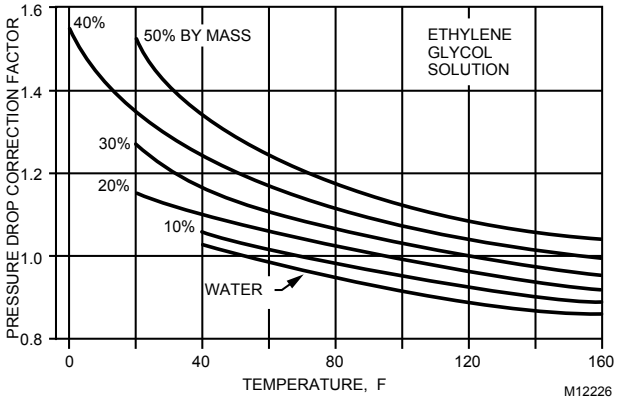


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Fig. 14. Pressure Drop Correction for Ethylene Glycol Solutions

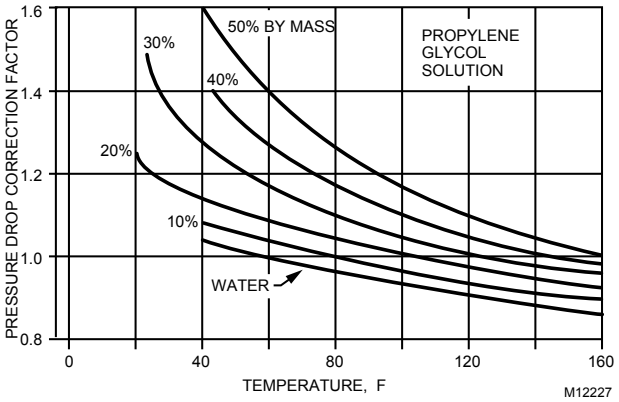

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Fig. 15. Pressure Drop Correction for Propylene Glycol Solutions.

Quantity of Water

To find the quantity of water (Q) in gallons per minute use one of the following formulas:

1. When Btu/hr is known:

$$Q = \frac{Btu/hr}{K \times TD_W}$$

Where:

Btu/hr= Heat output.

K = Value from Table 3; based on temperature of water entering the coil. The value is in pounds per gallon x 60 minutes per hour.

TD_W = Temperature difference of water entering and leaving the coil.

Table 3. Water Flow Formula Table

Water		Water	
Temp F	**K**	**Temp F**	**K**
40	502	200	484
60	500	225	483
80	498	250	479
100	496	275	478
120	495	300	473
150	490	350	470
180	487	400	465

2. For hot water coil valves:

$$Q = \frac{cfm \times 1.08 \times TD_a}{K \times TD_w}$$

Where:

cfm = Airflow through the coil.

1.08 = A scaling constant. See Note.

TD_a = Temperature difference of air entering and leaving the coil.

K = Value from Table 3; based on temperature of water entering the coil (pounds per gallon x 60 minutes per hour).

TD_w = Temperature difference of water entering and leaving the coil.

NOTE: The scaling constant 1.08 is derived as follows:

$$1.08 = \frac{0.24 BTU}{lbair F} \times \frac{60 min}{1 hr} \times \frac{1 lbair}{13.35 ft^3}$$

Where:

$\frac{1 lbair}{13.35 ft^3}$ = the specific volume of air at standard conditions of temperature and atmospheric pressure.

Simplifying the equation:

$$1.08 = \frac{14,40 Btumin}{Fhr 13.35 ft^3}$$

To find the scaling constant for air conditions other than standard, divide 14.40 Btu by specific volume of air at those conditions.

3. For fan system chilled water coil valves:

$$Q = \frac{cfm \times Btu/lb}{113 \times TD_w}$$

Where:

cfm = Airflow through the coil.

Btu/lb = Heat per pound of dry air removed. Includes both sensible and latent heat.

113 = A scaling constant.

TD_w = Temperature difference of water entering and leaving the coil.

WATER VALVE PRESSURE DROP

To determine valve pressure drop:

1. For two-way valves consider the following guidelines for valve pressure drop:

a. Include the pressure drop in the design of the water circulating system.

— In systems with two-way valves only, it is often necessary to provide a pump relief bypass or some other means of differential pressure control to limit valve pressure drops to the valve capabilities. For control stability at light loads, pressure drop across the fully closed valve should not exceed triple the pressure drop used for sizing the valve.

— To avoid high pressure drops near the pump, reverse returns are recommended in large systems.

b. The pressure drop across an open valve should be about half of the pressure difference between system supply and return, enough so that the valve, not the friction through the coil or radiator, controls the volume of water flow or the valve pressure drop should be equal to or greater than the pressure drop through the coil or radiator, plus the pipe and fittings connecting them to the supply and return mains.

c. Verify allowable full open and full closed pressure drops for all proportional and two-position water valves with appropriate manufacturer literature.

d. Make an analysis of the system at maximum and minimum rates of flow to determine whether or not the pressure difference between the supply and return mains stays within the limits that are acceptable from the stand point of control stability and close-off rating.

2. For two- and three-way valves consider the following guidelines for valve pressure drop:

a. In load bypass applications (Fig. 13) such as radiators, coils, and air conditioning units, the pressure drop should be 50 to 70 percent of the minimum difference between the supply and return main pressure at design operating conditions.

b. A manual balancing valve may be installed in the bypass to equalize the load drop and the bypass drop.

3. When selecting pressure drops for three-way mixing valves in boiler bypass applications (Fig. 13), consider the following:

a. Determine the design pressure drop through the boiler including all of the piping, valves, and fittings from the bypass connection through the boiler and up to the three-way valve input.

b. The valve pressure drop should be equal to or greater than the drop through the boiler and the fittings. If the valve drop is much smaller than the boiler pressure drop at design, effective control is obtained only when the disc is near one of the two seats. The mid-portion of the valve lift will be relatively ineffective.

c. A manual balancing valve may be installed in the boiler bypass to equalize the boiler drop and the bypass drop.

WATER VALVE SIZING EXAMPLES

EXAMPLE 1:

A two-way linear valve is needed to control flow of 45F chilled water to a cooling coil. The coil manufacturer has specified an eight-row coil having a water flow pressure drop of 3.16 psi. Further, specifications say that the coil will produce 55F leaving air with a water flow of 14.6 gpm. Supply main is maintained at 40 psig, return is at 30 psig. Select required capacity index (C_V) of the valve.

Use the water valve C_V formula to determine capacity index for Valve V1 as follows:

$$C_V = \frac{Q\sqrt{G}}{\sqrt{h}}$$

Where:

Q = Flow of fluid in gallons per minute required is 14.6 gpm.

G = Specific gravity of water is 1.

h = Pressure drop across the valve. The difference between the supply and return is 10 psi. 50% to 70% x 10 psi = 5 to 7 psi. Use 6 psi for the correct valve pressure drop. Note that 6 psi is also greater than the coil pressure drop of 3.16 psi.

Substituting:

$$C_V = \frac{14.6\sqrt{1}}{\sqrt{6}} = 6$$

Select a linear valve providing close control with a capacity index of 6 and meeting the required pressure and temperature ratings.

EXAMPLE 2:

A bypass valve is required to prevent flow through the chiller from dropping below 90 percent of design flow. When sizing valves for pump or chiller bypass applications (Fig. 16), system conditions that cause the valve to open or close completely must be considered before a pressure drop can be selected.

Assume the following:

System flow at design, 1000 gpm
Pump head at design, 48 ft
Pump head at 90 percent flow, 50 ft
Pressure across mains at AHU 1 at design flow, 28 ft
Chiller pressure drop, 12 ft
Chiller piping loop design pressure drop, 8 ft

With full system flow, Valve V5 is closed. Pressure drop across V5 equals the pump head minus the friction drops to V5. Pressure drop across Valve V5 is then 48 ft – 12 ft (chiller drop) – 4 ft (supply drop) – 4 ft (return drop) or 28 ft.

With system flow at 90 percent, the pump head rises to 50 ft, while the friction drops fall to the lower values shown in Figure 16. For additional information on chiller bypass operation see Chiller, Boiler, and Distribution System Applications section. Pressure drop across V5 equals the pump head minus the friction drops to V5. Pressure drop across Valve V5 is then 50 ft – 9.6 ft (chiller drop) – 3.2 ft (supply drop) – 3.2 ft (return drop) or 34 ft. Converting ft to psi, 34 ft x 0.4335 psi/ft = 14.7 psi.

Substituting the flow of water, specific gravity of water, and pressure drop in the C_V formula shows that the Valve V5 should have a C_V of 235.

$$C_V = \frac{900\sqrt{1}}{\sqrt{14.7}} = 235$$

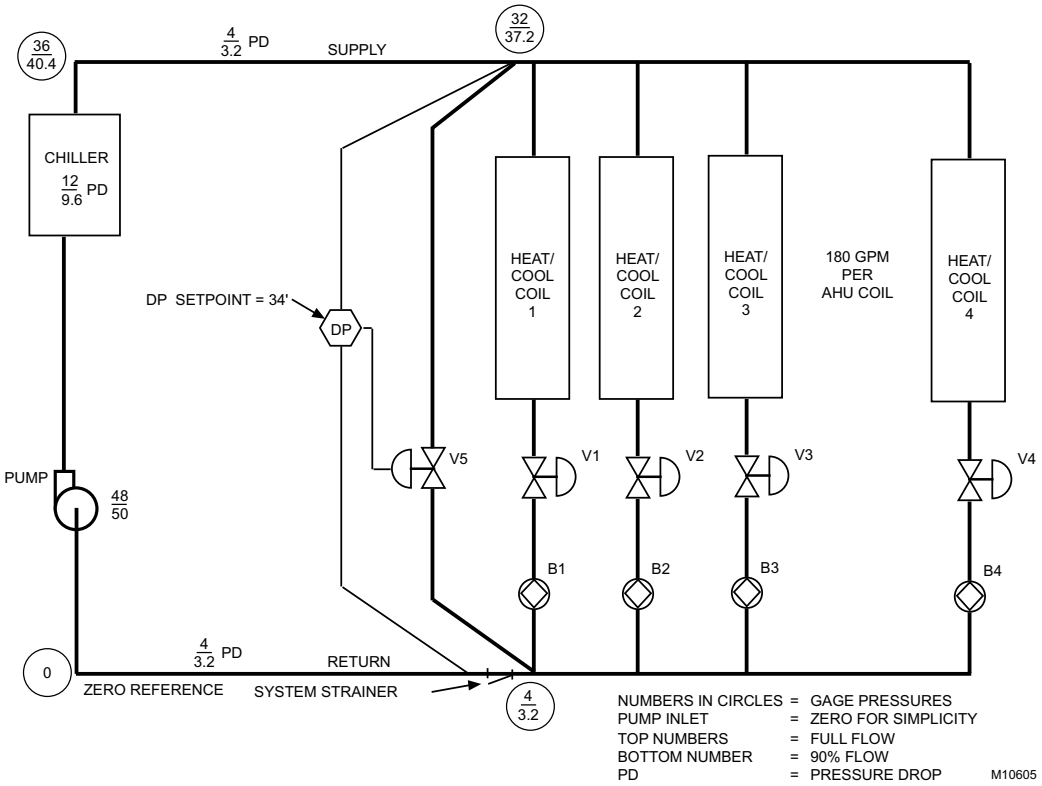

Fig. 16. Chiller Bypass Application.

EXAMPLE 3:

Sizing water valves for heating coils is especially critical. In Figure 17, a valve with a C_V of 12 will have 30 percent of the available pressure drop when full open, while a valve with a C_V of 5 will have 70 percent of the available pressure drop. As shown in Figure 18, the valve with 70 percent of the available pressure drop essentially provides the equal percentage water flow control, resulting in linear coil heat transfer and stable temperature control. The valve with only 30 percent of the available pressure drop has a more linear flow control which results in nonlinear coil heat transfer. See EQUAL PERCENTAGE VALVE section for further information.

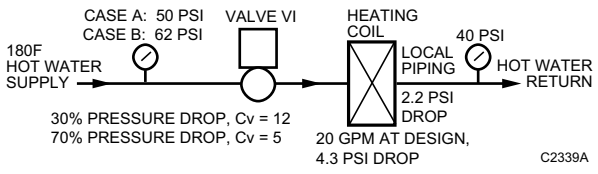

Fig. 17. Equal Percentage Valve Hot Water Application.

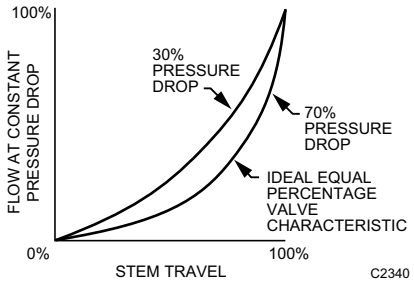

Fig 18. Effect of Pressure Drop in Hot Water Valve Sizing.

EXAMPLE 4:

A three-way mixing valve is needed for a heat exchanger application with a bypass line. Water flow is specified at the rate of 70 gpm. Manufacturer data for the exchanger indicates a pressure drop of 1.41 ft of water through the exchanger coils.

Use the water valve C_v formula to determine capacity index for Valve V1 as follows:

$$C_V = \frac{Q\sqrt{G}}{\sqrt{h}}$$

Where:

Q = Flow of fluid in gallons per minute required to pass through the valve is 70 gpm.

G = Specific gravity of water is 1.

h = Pressure drop across the valve. Plans of the heating system indicate three-inch supply and return mains. From an elbow equivalent table and pipe friction chart found in the ASHRAE Handbook or other reference manuals, the calculated pressure drop through a three-inch tee and the piping from the valve and the tee to the exchanger is 0.09 psi. Heat exchanger pressure drop is 1.41 ft of water or 1.41 ft x 0.433 psi/ft = 0.61 psi. Total pressure drop from bypass connection through the heat exchanger and to the hot-water input of the three-way valve is 0.61 + 0.09 or 0.70 psi.

Since the valve pressure drop (h) should be equal to or greater than the drop through the heat exchanger and fittings, 0.70 psi is used as the valve pressure drop.

For optimum control, a manual balancing valve is installed in the bypass line to equalize the pressure drops in the exchanger and bypass circuits.

$$C_V = \frac{70\sqrt{1}}{\sqrt{0.70}} = 83.6 \text{ or } 84$$

Substituting the flow of water, specific gravity of water, and pressure drop in the C_v formula shows that the valve should have a C_v of 83.6 or 84.

Select a linear valve providing close control with a capacity index of 84 and meeting the required pressure and temperature ratings.

Steam Valves

Calculate the required capacity index (C_v) for a valve used in a steam application, using the formula:

$$C_V = \frac{(1 + 0.00075s)\,Q\sqrt{V}}{63.5\sqrt{h}}$$

Where:

Q = Quantity of steam in pounds per hour required to pass through the valve.

V = Specific volume of steam, in cubic feet per pound, at the average pressure in the valve. For convenience Table 5 at the end of the STEAM VALVES section lists the square root of the specific volume of steam for various steam pressures. Therefore, use the value in this column of the table as is; do not take its square root.

63.5 = A scaling constant.

h = Pressure drop in psi.

s = Superheat in degrees F.

Determining the C_v for a steam valve requires knowing, the quantity of steam (Q) through the valve, the pressure drop (h) across the valve, and the degrees of superheat. See QUANTITY OF STEAM and STEAM VALVE PRESSURE DROP. Then select the appropriate valve based on C_v, temperature range, action, body ratings, etc., per VALVE SELECTION guidelines.

NOTE: When the superheat is 0F, then (1 + 0.00075s) equals 1 and may be ignored.

QUANTITY OF STEAM

To find the quantity of steam (Q) in pounds per hour use one of the following formulas:

1. When Btu/hr (heat output) is known:

$$Q = \frac{Btu/hr}{1000\,Btu/lb steam}$$

Where:

Btu/hr = Heat output.

1000 Btu/lb = A scaling constant representing the approximate heat of vaporization of steam.

2. For sizing steam coil valves:

$$Q = \frac{CFM \times TD_a \times 1.08}{1000\,Btu/lb steam}$$

Where:

cfm = Cubic feet per minute (ft^3/min) of air from the fan.

TDa = Temperature difference of air entering and leaving the coil.

1.08 = A scaling constant. See NOTE.

1000 Btu/lb = A scaling constant representing the approximate heat of vaporization of steam.

NOTE: The scaling constant 1.08 is derived as follows:

$$1.08 = \frac{0.24 BTU}{lbair F} \times \frac{60 min}{1 hr} \times \frac{1 lbair}{13.35 ft^3}$$

Where:

$\frac{1 lbair}{13.35 ft^3}$ = the specific volume of air at standard conditions of temperature and atmospheric pressure.

Simplifying the equation:

$$1.08 = \frac{14.40 Btumin}{Fhr 13.35 ft^3}$$

To find the scaling constant for air conditions other than standard, divide 14.40 Btu by specific volume of air at those conditions.

3. For sizing steam to hot water converter valves:

$$Q = gpm \times TD_w \times 0.49$$

Where:

gpm = Gallons per minute of water flow through converter.

TD_w = Temperature difference of water entering and leaving the converter.

0.49 = A scaling constant. This value is derived as follows:

$$0.49 = \frac{8.33 lbwater}{1 gal} \times \frac{60 min}{1 hr} \times \frac{1 lbsteam}{1000 Btu} \times \frac{1 Btu}{\text{lb water F}}$$

Simplifying the equation:

$$0.49 = \frac{0.49 minlbsteam}{galhrF}$$

4. When sizing steam jet humidifier valves:

$$Q = \frac{(W_1 - W_2) lbmoisture}{lbair} \times \frac{1}{\frac{13.35 ft^3}{lbair}} \times \frac{ft^3}{min} \times \frac{60 min}{hr}$$

Where:

W1 = Humidity ratio entering humidifier, pounds of moisture per pound of dry air.

W2 = Humidity ratio leaving humidifier, pounds of moisture per pound of dry air.

$\frac{13.35 ft^3}{lbair}$ = The specific volume of air at standard conditions of temperature and atmospheric pressure.

$\frac{ft^3}{min}$ = Cubic feet per minute (cfm) of air from the fan.

$\frac{60 min}{hr}$ = A conversion factor.

Simplifying:

$$Q = 4.49 \frac{(W_1 - W_2) lbmoisture}{hr}$$

5. When Equivalent Direct Radiation (EDR) is known:

$$Q = EDR(Total) \times 0.24$$

Where:

EDR (Total)=Radiators are sized according to Equivalent Direct Radiation (EDR). If controlling several pieces of radiation equipment with one valve, add the EDR values for all pieces to obtain the total EDR for the formula.

0.24 = A scaling constant, lb steam/unit EDR. See Table 4.

Table 4. Output of Radiators and Convectors.

Average Radiator of Convector Temperature, Deg F	Cast Iron Radiator Btu/Hr/EDR[a]	Convector, Btu/Hr/EDR[b]
215	240	240
200	209	205
190	187	183
180	167	162
170	148	140
160	129	120
150	111	102
140	93	85
130	76	69
120	60	53
110	45	39
100	31	27
90	18	16

a At Room Termperature
b At 65 F Inlet Air Temperature

STEAM VALVE PRESSURE DROP

Proportional Applications

When specified, use that pressure drop (h) across the valve.

When not specified:

1. Calculate the pressure drop (h) across the valve for good modulating control:

h = 80% x (Pm-Pr)

NOTE: For a zone valve in a system using radiator orifices use:

h = (50 - 75)% x (Pm-Pr)

Where

Pm = Pressure in supply main in psig or psia (gage or absolute pressure).

Pr = Pressure in return in psig or psia. A negative value if a vacuum return.

2. Determine the critical pressure drop:

$$h_{critical} = 50\% \times Pma$$

Where:

Pma = Pressure in supply main in psia (absolute pressure)

psia = psig + 14.7

Use the smaller value h or $h_{critical}$ when calculating C_v.

Two-Position Applications

Use line sized valves whenever possible. If the valve size must be reduced, use:

$$h = 20\% \times (Pm-Pr)$$

Where

Pm = Pressure in supply main in psig or psia (gage or absolute pressure).

Pr = Pressure in return in psig or psia. A negative value if a vacuum return.

STEAM VALVE SIZING EXAMPLES

EXAMPLE 1:

A two-way linear valve (V1) is needed to control high-pressure steam flow to a steam-to-water heat exchanger. An industrial-type valve is specified. Steam pressure in the supply main is 80 psig with no superheat, pressure in return is equal to atmospheric pressure, water flow is 82.5 gpm, and the water temperature difference is 20F.

Use the steam valve C_v formula to determine capacity index for Valve V1 as follows:

$$C_V = \frac{(1 + 0.00075s)Q\sqrt{V}}{63.5\sqrt{h}}$$

Where:

Q = The quantity of steam required to pass through the valve is found using the converter valve formula:

$$Q = gpm \times TD_W \times 0.49$$

Where:

gpm = 82.5 gpm water flow through exchanger

TD_W = 20F temperature difference

0.49 = A scaling constant

Substituting this data in the formula:

Q = 808.5 pounds per hour

h = The pressure drop across a valve in a modulating application is:

$$h = 85\% \times (Pm-Pr)$$

Where:

Pm = Upstream pressure in supply main is 80 psig.

Pr = Pressure in return is atmospheric pressure or 0 psig.

Substituting this data in the pressure drop formula:

h = 0.80 x (80 – 0)

= 0.80 x 80

= 64 psi

The critical pressure drop is found using the following formula:

$$h_{critical} = 50\% \times (psig + 14.7\ psi)$$

$h_{critical}$= 0.50 x (80 psig upstream + 14.7 psi)

= 0.50 x 94.7 psi

= 47.4 psi

The critical pressure drop ($h_{critical}$) of 47.4 psi is used in calculating C_v, since it is less than the pressure drop (h) of 64 psi. Always, use the smaller of the two calculated values.

V = Specific volume (V) of steam, in cubic feetper pound at average pressure in valve (P_{avg}):

Pavg = $Pm - \frac{h}{2}$

= $80 - \frac{47.4}{2} = 80 - 23.6 = 56.4 psig$

The specific volume of steam at 56.4 psig is 6.14 and the square root is 2.48.

63.5 = A scaling constant.

Substituting the quantity of steam, specific volume of steam, and pressure drop in the C_v formula shows that the valve should have a C_v of 4.6.

$$C_V = \frac{(1 + 0.00075 \times 0) \times 808.5 \times 2.48}{63.5\sqrt{47.4}}$$

$$= \frac{1745.6}{63.5 \times 6.88} = 4.6$$

NOTE: If P_{avg} is rounded off to the nearest value in Table 5 (60 psi), the calculated C_v is 4.5 a negligible difference.

Select a linear valve providing close control with a capacity index of 4 and meeting the required pressure and temperature ratings.

NOTE: For steam valves downstream from pressure reducing stations, the steam will be superheated in most cases and must be considered.

EXAMPLE 2:
In Figure 19, a linear valve (V1) is needed for accurate flow control of a steam coil that requires 750 pounds per hour of steam. Upstream pressure in the supply main is 5 psig and pressure in the return is 4 in. Hg vacuum minimum.

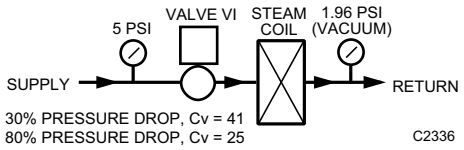

Fig. 19. Linear Valve Steam Application.

Use the steam valve C_V formula to determine capacity index for Valve V1 as follows:

$$C_V = \frac{(1 + 0.00075s)Q\sqrt{V}}{63.5\sqrt{h}}$$

Where:

Q = Quantity of steam required to pass through the valve is 750 pounds per hour.

h = The pressure drop across a valve in a modulating application is found using:

h = 80% x (Pm – Pr)

and:

Pm = Upstream pressure in supply main is 5 psig.

Pr = Pressure in return is 4 in. Hg vacuum.

NOTE: 1 in. Hg = 0.49 psi and 1 psi = 2.04 in. Hg.

Therefore,
4 in. Hg vacuum = –1.96 psig.

h = 0.80 x [5 – (–1.96)]
= 0.80 x 6.96
= 5.6 psi

The critical pressure drop is found using the following formula:

$h_{critical}$ = 50% x (psig + 14.7 psi)

$h_{critical}$ = 0.50 x (5 psig upstream + 14.7 psi)
= 0.50 x 19.7 psia
= 9.9 psi

The pressure drop (h) of 5.6 psi is used in calculating the C_V, since it is less than the critical pressure drop ($h_{critical}$) of 9.9 psi.

V = Specific volume (V) of steam, in cubic feet per pound at average pressure in valve (P_{avg}):

Pavg = $Pm - \frac{h}{2}$

= $5 - \frac{5.6}{2} = 5 - 2.8 = 2.2 psig$

The specific volume of steam at 2.2 psig is 23.54 and the square root is 4.85.

63.5 = A scaling constant.

s = 0

Substituting the quantity of steam, specific volume of steam, and pressure drop in the C_V formula shows that Valve V1 should have a C_V of 24.17 or the next higher available value (e.g., 25).

$$C_V = \frac{(1 + 0.00075 \times 0) \times 750 \times 4.85}{63.5\sqrt{5.6}}$$

$$= \frac{3637.5}{63.5 \times 2.37} = 24.17$$

NOTE: If P_{avg} is rounded off to the nearest value in Table 5 (2 psi), the calculated C_V is 24.30.

Select a linear valve providing close control with a capacity index of 25 and meeting the required pressure and temperature ratings.

EXAMPLE 3:
Figure 20 shows the importance of selecting an 80 percent pressure drop for sizing the steam valve in Example 2. This pressure drop (5.6 psi) approximates the linear valve characteristic. If only 30 percent of the available pressure drop is used (0.30 x 6.96 psi = 2.10 psi or 2 psi), the valve C_V becomes:

$$C_V = \frac{(1 + 0.00075s)Q\sqrt{V}}{63.5\sqrt{h}}$$

$$C_V = \frac{750 \times 4.85}{63.5\sqrt{2}} = 40.5$$

This larger valve (2 psi drop) has a steeper curve that is further away from the desired linear valve characteristic. See LINEAR VALVE under VALVE SELECTION for more information.

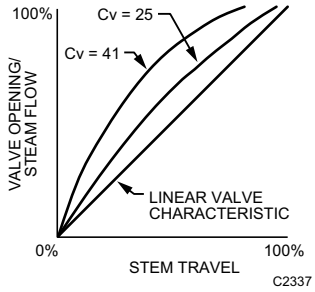

Fig. 20. Effect of Pressure Drop in Steam Valve Sizing.

Table 5. Properties of Saturated Steam.

Vacuum, Inches of Mercury	Boiling Point or Steam Temperature (Deg F)	Specific Volume (V), cu. ft/lb	$\sqrt{V}$ (For valve sizing)	Maximum Allowable Pressure Drop, psi.
29	76.6	706.00	26.57	0.23
25	133.2	145.00	12.04	1.2
20	161.2	75.20	8.672	2.4
15	178.9	51.30	7.162	3.7
14	181.8	48.30	6.950	3.9
12	187.2	43.27	6.576	4.4
10	192.2	39.16	6.257	4.9
8	196.7	35.81	5.984	5.4
6	201.0	32.99	5.744	5.9
4	204.8	30.62	5.533	6.4
2	208.5	28.58	5.345	6.9

Gage Pressure, psig	Boiling Point or Steam Temperature (Deg F)	Specific Volume (V), cu. ft/lb	$\sqrt{V}$ (For valve sizing)	Maximum Allowable Pressure Drop, psi.
0	212.0	26.79	5.175	7.4
1	215.3	25.20	5.020	7.8
2	218.5	23.78	4.876	8.4
3	221.5	22.57	4.751	8.8
4	224.4	21.40	4.626	9.4
5	227.1	20.41	4.518	9.8
6	229.8	19.45	4.410	10.4
7	232.3	18.64	4.317	10.8
8	234.8	17.85	4.225	11.4
9	237.1	17.16	4.142	11.8
10	239.4	16.49	4.061	12.4
11	241.6	15.90	3.987	12.8
12	243.7	15.35	3.918	13.4
15	249.8	13.87	3.724	14.8
20	258.8	12.00	3.464	17.4
25	266.8	10.57	3.251	19.8
30	274.0	9.463	3.076	22.4
35	280.6	8.56	2.93	24.8
40	286.7	7.826	2.797	27.4
45	292.4	7.209	2.685	29.8
50	297.7	6.682	2.585	32.4
55	302.6	6.232	2.496	34.8
60	307.3	5.836	2.416	37.4
65	311.8	5.491	2.343	39.8
70	316.0	5.182	2.276	42.4
75	320.0	4.912	2.216	44.8
80	323.9	4.662	2.159	47.4
85	327.6	4.445	2.108	49.8
90	331.2	4.239	2.059	52.4
95	334.6	4.060	2.015	54.8
100	337.9	3.888	1.972	57.4
110	344.1	3.595	1.896	62.3
120	350.0	3.337	1.827	67.4
130	355.2	3.12	1.766	72.3
140	360.9	2.923	1.710	77.4
150	366.2	2.746	1.657	82.3
160	370.6	2.602	1.613	87.4
170	375.5	2.462	1.569	92.3
180	379.6	2.345	1.531	97.4
190	383.9	2.234	1.495	102.3
200	387.8	2.134	1.461	107.4
225	397.4	1.918	1.385	119.8
250	406.0	1.742	1.320	132.4
275	414.2	1.595	1.263	145.0
300	421.8	1.472	1.213	157.4
350	435.6	1.272	1.128	182.4
400	448.1	1.120	1.058	207.4
450	459.5	0.998	0.999	232.4
500	470.0	0.900	0.949	257.4
550	479.7	0.818	0.904	282.4
600	488.8	0.749	0.865	307.4
650	497.3	0.690	0.831	332.4
700	505.4	0.639	0.799	357.4
800	520.3	0.554	0.744	407.4
900	533.9	0.488	0.699	457.4
1000	546.3	0.435	0.659	507.4

Technology Comparison of Control Ball and Globe Valves

Attribute	Control Ball Valve	Globe Valve	Advantage	Reason
Flow Characteristics	Quadratic (with characterization)	Equal percent to design temp.	Globe	BAS controller expects flow from valve at low signal
	Linear (full port)	Linear		
	Delayed opening / early close-off	Continuous from start		
Rangeability (turn-down ratio)	Fixed minimum flow results in 1. Low TDR at low Cv 2. High TDR at high Cv	50:1 = 2% steps (HON)	Globe	Small sizes are the most common applications and need high TDR
		100:1 (Siemens claim)		
		Maximum 25:1 (JCI)		
Operating Differential Pressure	20 – 25 psid for characterized ports (plate distortion)	20 – 25 psid for quiet operation (cavitation at low flow)	— —	20+ psid is not typical of control valve applications
Close-Off Differential Pressure	High with low Torque actuators (water pressure aids sealing)	Inversely proportional to Cv, and proportional to actuator force	Control Ball	Globe is comparable in small sizes
	Capable of dead-heading pumps*	Pressure balanced is high		PB more expensive
Seat Leakage	ANSI Class IV (< 0.01% Cv) @ A port (Does not apply to B port without seals)	ANSI Class III w/ small metal seats ANSI Class IV with resilient seat and larger metal seated valves	Control Ball	Less leakage reduces energy use with chilled water
Trim (internal construction)	Plated brass ball and stem	Resilient material on metal seat	— —	Long term performance of ball valve in automatic control unknown
		Stainless steel ball and stem Brass plug on brass seat		
	Rubber and Teflon stem O-rings	Stainless steel plug on SS seat		
Steam Ratings	Low pressure (full port only)	Low pressure	Globe	Greater versatility. Equal % flow available with globe
	— —	High pressure		
Cv Ratings	Multiple Cv's per valve size	Multiple Cvs @ 1/2" size	Ball	Lower installed cost with no loss of control capability
Line Size Piping	Line size piping with lower Cv	Reducers often needed > 1/2"	Ball	Lower installed cost with no loss of control capability
Pipe Sizes	1/2" – 3" Threaded	1/2" – 3" Threaded ANSI 150	Globe	Wider applications
	4" – 6" ANSI 125 Flanged	2-1/2" – 6" ANSI 125 and 250 Flanged		
3-Way Body Styles	Combo mixing/diverting	Mixing models	Control Ball	Easier to select. Piping different mixing & diverting
	B port seal required for tight close-off	Diverting models		
Physical Size	Low profile at large sizes	Large profile at large sizes	Control Ball	Depends on application
	Relatively large in 1/2" pipe	Small size in 1/2" pipe	Globe	
Control Inputs	Floating/2-position, modulating	Floating/2-position, modulating	— —	Depends on application
	Some pneumatic actuators available	Large linear pneumatic installed base	Globe	
Fail Safe Operation	N/O or N/C by actuator position	N/O or N/C up to 3"	Control Ball	Globe needs higher power actuators
	Stay-in-place	Stay-in-place		
Valve Serviceability	Requires unions for valve access VBN stems replaceable	In-line serviceable	Globe	B.V. must be removed from piping
CE Preference	Growing with time	Well established	Globe	Familiar technology (habit)
Contractor Preference	Valve comes with actuator	Actuator selection separate	Control Ball	Easier to select
Actuator Selection	Match valve and damper DCAs	Requires linkage for DCAs	Control Ball	Added cost for globe valve

*Pumps require pressure cut-offs or supply-return differential pressure regulators to avoid pump seal damage and potential leakage that can result without flow-through. Unless used in end-of-line-service, control valves do not need to close off against full pump head.

Appendix B: NEMA Standard Classification Code for Enclosures

NEMA 1—General purpose. for indoor protection, where conditions are not unusually severe.

NEMA 2—Drip tight. Designed to exclude falling moisture or dirt. Particularly applicable to cooling rooms, laundries, etc., where condensation is prevalent. For indoor use.

NEMA 3—Weather Resistant (weatherproof). For outdoor use; designed to withstand all normal exposure to natural elements. Controls mounted on pullout racks for easy access. With rain hood and weather seals.

NEMA 4—Watertight. Withstands water pressure from 1 in. hose nozzle, 65 gallons per minute, from distance of not less than 10 ft for five minutes. Suitable for maritime applications, breweries, etc.

NEMA 5—Dust-tight. Equipped with dust-tight gaskets. Suitable for mills and other high-dust atmospheres.

NEMA 6—Submersible. For submerged operation under specified pressures and time.

NEMA 7—Hazardous Locations, National Electrical Code Class 1 (circuit breaks in air).

NEMA 8—Hazardous Locations, National Electrical Code Class 1 (circuit breaks immersed in oil).

NEMA 9—Hazardous Locations, National Electrical Code Class 2.

NEMA 10—Explosion-proof. Meets U.S. Bureau of Mines requirements for explosive atmospheres.

NEMA 11—Acid or Fume Resistant. Provides for immersion of enclosed equipment in oil.

NEMA 12—IIndustrial Use. Excludes oils, dust, moisture, to satisfy individual requirements.

Appendix C: Best Practices for Low Power Control Signal Wiring

Low power analog signals are commonly used for proportional control signal wiring in HVAC applications. Following are a series of best practices for the prevention of corruption of these signals due to electro-magnetic interference ("EMI").

EMI is typically caused by coupling of the electro-magnetic field that surrounds all wires carrying current. It may also be caused by radio frequency sources such as "walkie talkies" using amplitude modulated signals. A strong EM field can induce electrical noise in wires up to 2 V in amplitude. The strongest coupling comes between closely spaced, parallel wires. Inductive and high power motor loads are some of the strongest sources of EMI, along with electronics lighting ballasts, dimmers, and variable frequency motor drives. More potential EMI sources in a building mean that greater attention needs to be paid to effective wiring practices.

All control wiring should consist of twisted pairs of wires, which resist interference better than straight, non-twisted conductors. Stranded conductors offer less resistance to current flow than solid wires, and are more flexible making them easier to install; however, care must be taken to ensure that all the conductors in the wire are properly installed and that "whiskers" do not short out any wiring connections.

Shielded Wiring

Control signals can be protected from EMI using shielded wire. The more continuous the shield, the more effective it is. Braided shield is commonly used for microphone cables because of its superior flexibility. HVAC wiring is fixed, does not require high flexibility during use, and is better served with lower cost cables using continuous foil shielding and a "drain wire".

1. All signal wiring in hospitals should be shielded to prevent the potential for interference with medical equipment such as high power MRI and CT scanners.
2. All 0~10 Vdc control signals should be run in shielded cable. EMI noise can be interpreted as control signaling, depending on the noise suppression circuitry in the controlled equipment.
3. Long runs of wiring from 24 V power supply transformers should be shielded in heavy electrical noise environments to prevent EMI from coupling through the actuator's power supply.
4. In typical commercial buildings, 2~10 Vdc signals do not require shielded wiring.
5. Current flow is much more difficult to induce in wiring than voltage, and current-based control signals usually do not require shielded cable except in heavy industrial applications.
   a. If the terminal equipment only accepts voltage input, install a 500 ohm, ¼ Watt (or larger), 1% resistor across the control input terminals to convert a 4~20 mA(dc) signal to 2~10 Vdc.
   b. If multiple actuators are connected in parallel, install this resistor at the first actuator in the group.
   c. Any standard resistor ("EIA") value between 490 and 510 ohms is acceptable, and can be purchased at retail outlets that sell electronic components.
6. Floating, pulse-width modulated, and two-position actuators use switched 24 Vac control or power signals and so rarely require shielded wiring.

Wiring Techniques

1. No wiring should ever be assumed to be interference-proof. Never strap signal cables to other conductors or conduit, especially line voltage.
2. Never run signal wires in raceways or wiring troughs with other conductors. Keep signal wires at least a yard away from line voltage wiring. Higher voltage wiring requires greater separation.
3. When necessary, cross line voltage conductors with signal wiring at 90° (right angles), to minimize signal coupling.
4. Electromagnetic shielding is a static phenomenon; any current running through the shield will negate any protection the shield may have provided. Only ground (or "earth") a shield drain wire at one point, preferably where the signal will be the weakest, for example: at the actuator.
   a. Do not ground the secondary of the 24 V power supply in the control system. This will create a secondary current path and negate the protection of any shielding.
   b. If there is a burner ignition system, power it with its own transformer and use an interface relay for isolation, if necessary.
   c. Use relays with built-in coil arc suppression, such as a Honeywell R8229.
5. Insulate all exposed shielding and drain wire joins and splices so that they cannot contact electrical ground, especially junction boxes and conduit. Do not use the ground screw of a junction box as a tie point. Use a separate electrical ground wire if required for safety extra-low voltage wiring by local code.
6. Both rigid and flexible conduit are continuously grounded ("bonded") for electrical safety, and cannot function as a signal shield. Where local codes require mechanical protection for all wiring, shielded signal cable may be run inside conduit, following the practices listed above.

Additional References

Most of these wiring techniques were developed to protect the very low-strength signals in audio recording. The 20 mA current loop signal was originally used with teletype ("TWX") equipment communicating over telephone lines and adapted for proportional analog control signaling in industrial process control. Further information and background theory can be found in:

1. Audio Engineering Handbook, edited by Blair K. Benson, McGraw-Hill
2. Handbook for Sound Engineers, by Glen Ballou
3. Standard Handbook of Audio Engineering, by Jerry Whitaker and Blair K. Benson, McGraw-Hill.

Notes

Honeywell

ENVIRONMENTAL AND COMBUSTION CONTROL

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INSTRUCTIONS—INSTALLING OR SERVICING CONTRACTOR OR DEALER

When replacing a Honeywell product under warranty, including those products furnished on original heating and/or cooling equipment, you should rely on your local Honeywell Wholesaler or Distributor for prompt and efficient product replacement service.

A Honeywell Returned Goods Identification Tag (form 87-0030) or an electronic data notification system must be completed and approved by the servicing dealer/contractor prior to submitting the product to the Honeywell Wholesaler or Distributor. (Tags may be obtained from the Wholesaler or Distributor in advance.) No warranty claim for product replacement or credit will be honored by the Wholesaler/Distributor without a completed warranty tag attached or electronic notification.

INSTRUCTIONS—WHOLESALER OR DISTRIBUTOR

The following will apply to the return of any product to Honeywell under this warranty:

Any products which are not variable frequency drives or WEBs and are:

(i) identified with Honeywell's Returned Goods Identification Tag (form 87-0030), or electronic notification system;

(ii) are listed individually with Returned Goods ID Tag numbers and date codes listed on Honeywell's Returned Goods Order (form 71-96024) or a similar form;

(iii) packed separately from other returns and protected from shipping damage;

(iv) have certification by the installer or servicing dealer that the product was removed, due to failure, within the applicable warranty period;

(v) are received transportation pre-paid at:

Honeywell Return Goods
Dock 4 MN10-3860
1885 Douglas Drive
Golden Valley, MN 55422

(vi) and are found by Honeywell's inspection to be defective in workmanship or materials under normal use and service

will be handled in accordance with one of the two following procedures, as specified by the customer making the return.

1. *CREDIT PROCEDURE*. Honeywell will issue credit, at Honeywell's lowest wholesaler net price in effect at the time of the return (as set forth on Honeywell's then current price sheet) or at the actual invoice amount if a copy of that invoice is attached to the packing list. (TRADELINE Replacement Exchange Products will be at Honeywell's lowest replacement exchange net price in effect at the time of such return, as shown on Honeywell's then current price sheet.) Honeywell reserves the right to disallow this credit option in cases of warranty abuse.
2. *REPAIR OR REPLACEMENT PROCEDURE*. Honeywell will, at its option, either repair or replace the product free of charge and return it or its replacement lowest cost transportation prepaid. The replacement will be a functionally equivalent new TRADELINE product. Premium transportation will be used at customer's request and expense.

List Water Solutions products on a separate Return Goods Order form, marked "**Water Solutions**".

All new and unused VBN control ball valves MUST be approved by your Honeywell sales representative before returned.

WEBs return products must be processed through WEBs Customer Care. Defective hardware products under warranty have to be returned to Tridium in Richmond, VA. Security accessories must have prior authorization (From No. 87-0288).

All VFD warranty return products must have prior authorization (Form No. 87-0284) and be returned only to the VFD Service Center in Chattanooga, TN.

The warranty will not be honored if:

(i) product is damaged or missing parts or accessory items including batteries.

(ii) product exhibits evidence of field misapplications.

Final disposition of any warranty claim will be determined solely by Honeywell. If inspection by Honeywell does not disclose any defect covered by the warranty, the product will be returned or scrapped as instructed by the customer and Honeywell's regular service charges will apply. Products returned to the customer may be sent shipping charges collect.

If you have any questions relative to product returns to Honeywell, contact your Customer Care Representative:

Honeywell International Inc.
Customer Care MN10-1461
1985 Douglas Drive
Golden Valley, MN 55422
(763) 954-5720

SPECIAL MESSAGE TO INDUSTRIAL USERS AND BUILDING OWNERS

Thank you for using Honeywell products.

As a user, when you purchase a Honeywell product from this catalog you should expect performance from the product and, if it fails, replacement of the product by the installing dealer.

Typically, you will have purchased a Honeywell product under the following circumstances:

1. To modernize or refurbish your existing commercial and/or process control system.
2. You have purchased new commercial and/or process heating, cooling, air cleaning or humidification equipment that is furnished with Honeywell controls or components (refer to your owner's manual furnished with the equipment).
3. A control has failed on your existing commercial and/or process heating and/or cooling equipment and is replaced by a Honeywell TRADELINE product.

With few exceptions, you utilize the services of a competent plumbing, heating and/or cooling dealer/contractor for new or replacement work performed.

Although our warranty does not extend to you, Honeywell does extend a warranty to your supplier. Your supplier can rely on its local Honeywell Wholesaler/Distributor or Honeywell for prompt replacement.

If you have any questions, need additional information or would like to comment on Honeywell's products or services, please write or phone:

Honeywell International Inc.
Customer Care MN10-1461
1985 Douglas Drive North
Golden Valley, MN 55422-4386
(763) 954-5720

or check your telephone directory (white pages) for one of many Honeywell field sales offices.

Automation and Control Solutions
In the US:
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422-3992

In Canada:
Honeywell Limited
35 Dynamic Drive
Toronto, Ontario M1V 4Z9
customer.honeywell.com

63-9271 PR
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