

HVAC CONTROL PRODUCTS – NORTH AMERICA

VG1000 Series Ball Valve Selection Guide





Creating a more comfortable, safe and sustainable world.

How to build factory assembly codes using this guide

					Actuator Type														
					Non-Spring Return				Spring Return Port A Open ²				Spring Return						
					M9124				M9220										
					On / Off and Floating Point		0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)		On / Off and Floating Point		120V On / Off		24V On / Off		0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)		On / Off and Floating Point		
<ul style="list-style-type: none"> ASME Class 150 Flange Connections High Fluid Temperature Range Stainless Steel Trim Close Off Pressure <ul style="list-style-type: none"> 2-Way = 100 PSID 3-Way = 50 PSID Fluid Temperature Limits: <ul style="list-style-type: none"> -22 to 284°F (-30 to 140°C) 					Control Input														
Actuator Options					1 SPDT, 5.0(2.9) A @ 240 V														
					Auxiliary Switches: 2 SPDT, 5.0(2.9) A @ 240 V														
					2 SPDT, 3.0(1.5) A @ 24 VAC														
Inch		DN (mm)	Cv ³	2-Way ANSI Flange	3-Way ANSI Flange														
2 1/2	65	47 (29)		VG12A5GS	VG18A5GS														
		74 (47)		VG12A5GT	VG18A5GT														
		117 (74)		VG12A5GU	VG18A5GU														
3	80	74 (47)		VG12A5HT	VG18A5HT														
		117 (74)		VG12A5HU	VG18A5HU														
		176 (88)		VG12A5HV	VG18A5HV														
		211 (105)		VG12A5HW	VG18A5HW														
4	100	117 (74)		VG12A5JU	VG18A5JU														
		176 (88)		VG12A5JV	VG18A5JV														

MOTORIZED VALVE ASSEMBLY CODE = VALVE CODE + FACTORY ASSEMBLY CODE
 Example: VG18A5HU+92NGGA

Position Feedback: 0(2) to 10 VDC

Note: Full chart not represented here

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Superior Wear Resistance
 Low Operating Torque
 Double Protection Against Stem Leaks
 PTFE Stem Centering Bushing
 15 to 20 Year Life
 Tested > 200,000 Cycles in Iron Oxide Contaminated Water

WHY SELECT JOHNSON CONTROLS VG1000 SERIES BALL VALVES?

- Most Complete Ball Valve Product Line in the HVAC Industry
- High pressure ratings
- Rangeability > 500 to 1
- Equal Percentage Flow Characteristics
- Choice of Chrome Plated Brass or Stainless Steel Trim
- Simplified Actuator Selection
- 15% Graphite Filled PTFE Ball Seats, Dual EPDM Stem Seals
- Compact Size – Direct Mounted Actuators
- Lower Cost than Globe Valve Solutions
- Six-Sigma Quality Program – Industry Leading Test Programs
- Backed by Johnson Controls – Industry Leading 5 yr. Warranty

Factory Assembled Motorized Valve Assemblies

- Standard Fluid Temperature Range
- NPT Threaded

Actuator Type¹

				Non-Spring Return												Spring Return Port A Open				Spring Return Port A Closed											
				VA9104			M9106			M9109			VA9203		VA9208		VA9203		VA9208												
				Floating Point without Timeout	On / Off and Floating Point	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	Floating Point without Timeout	On / Off and Floating Point	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	Floating Point without Timeout	On / Off and Floating Point	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	On / Off and Floating Point	85 to 264V On / Off	24V On / Off	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	On / Off and Floating Point	120V On / Off	24V On / Off	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	On / Off and Floating Point	120V On / Off	24V On / Off	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)							
<ul style="list-style-type: none"> • NPT Threaded • Standard Fluid Temperature Range • Brass or Stainless Steel Trim • 200 PSID Close Off Pressure • Fluid Temperature Limits: Brass Trim: 23 to 203°F (-5 to 95°C) Stainless Steel Trim: -22 to 212°F (-30 to 100°C) 				1 SPDT, 5.0(2.9) A @ 240 V Auxiliary Switches: 2 SPDT, 5.0(2.9) A @ 240 V 2 SPDT, 3.0(1.5) A @ 24 VAC Electrical Screw Terminals Connections: 120 in. Plenum Cable																											
Inch	DN (mm)	Cv ²	Brass Trim		Stainless Steel Trim																										
			2-Way	3-Way	2-Way	3-Way																									
1/2	15	1.2 (0.7)	VG1241AD	VG1841AD	VG1245AD	VG1845AD																									
		1.9 (1.2)	VG1241AE	VG1841AE	VG1245AE	VG1845AE																									
		2.9 (1.9)	VG1241AF	VG1841AF	VG1245AF	VG1845AF																									
		4.7 (2.9)	VG1241AG	VG1841AG	VG1245AG	VG1845AG																									
		7.4 (4.7)	VG1241AL	VG1841AL	VG1245AL	VG1845AL																									
		11.7 (5.8)	VG1241AN	VG1841AN	VG1245AN	VG1845AN																									
	3/4	20	4.7 (2.9)	VG1241BG	VG1841BG	VG1245BG	VG1845BG																								
			7.4 (4.7)	VG1241BL	VG1841BL	VG1245BL	VG1845BL																								
			11.7 (5.8)	VG1241BN	VG1841BN	VG1245BN	VG1845BN																								
	1	25	7.4 (4.7)	VG1241CL	VG1841CL	VG1245CL	VG1845CL																								
			11.7 (7.4)	VG1241CN	VG1841CN	VG1245CN	VG1845CN																								
			18.7 (9.4)	VG1241CP	VG1841CP	VG1245CP	VG1845CP																								
1 1/4	32	11.7 (7.4)	VG1241DN	VG1841DN	VG1245DN	VG1845DN																									
		18.7 (11.7)	VG1241DP	VG1841DP	VG1245DP	VG1845DP																									
		29.2 (14.6)	VG1241DR	VG1841DR	VG1245DR	VG1845DR																									
1 1/2	40	18.7 (11.7)	VG1241EP	VG1841EP	VG1245EP	VG1845EP																									
		29.2 (18.7)	VG1241ER	VG1841ER	VG1245ER	VG1845ER																									
		46.8 (23.4)	VG1241ES	VG1841ES	VG1245ES	VG1845ES																									
2	50	29.2 (18.7)	VG1241FR	VG1841FR	VG1245FR	VG1845FR																									
		46.8 (29.2)	VG1241FS	VG1841FS	VG1245FS	VG1845FS																									
		73.7 (36.8)	VG1241FT	VG1841FT	VG1245FT	VG1845FT																									
MOTORIZED VALVE ASSEMBLY CODE³ = VALVE CODE + FACTORY ASSEMBLY CODE Example: VG1241AD+9T4AGA							+9T4AGA +9A4AGA +9T4IGA +9A4IGA +9T4GGA +9A4GGA +906AGA +906AGC +906IGA +906IGC +906GGA +906GGC +909AGA +909AGC +909GGA +909GGC +923AGA +923AGB +923BUA +923BUB +923BGA +923BGB +923GGA +923GGB +928AGA +938AGC +938BAA +938BAC +938BGA +938BGC +928GGA +938GGC +943AGA +943AGB +943BUA +943BUB +943BGA +943BGB +943GGA +943GGB +948AGA +958AGC +958BAA +958BAC +958BGA +958BGC +948GGA +958GGC																								
Position Feedback:																															
0(2) to 10 VDC Position Feedback																															
Power Requirements:																															
24 VAC +25%/-20%, Class 2, SELV																															
24 VAC +25%/-15%, Class 2, SELV																															
24 VAC +/- 20%, VDC +/- 10%																															
24 VAC +/- 25%, VDC +/- 10%																															
120 VAC +10%/-15% at 60 Hz																															
85 to 264 VAC at 50/60 Hz																															
Electrical Connections:																															
120 in. (3.05 m) 19 AWG Plenum Cable																															
1/4 in. Spade Terminals																															
48 in. (1.2 m) 18 AWG Appliance Cable																															
Weather Shield Options (For Field Assembly Only)																															
M9000-341																															
▲ Requires M9108 Actuator! See page 11																															

NPT THREADED, STANDARD FLUID TEMPERATURE RANGE



Ball Valves with VA9104 Series Actuators

Ball Valves with M9106(9) Series Actuators

Ball Valves with VA9203 Series Actuators

Ball Valves with VA9208 Series Actuators

Motorized Ball Valve Assembly with Weather Shield (field assembly)

Actuator Options
Valve Type
Additional Actuator and Accessory Reference Information

Factory Assembled Valve + Actuator Combinations Matrix

1 VA9xxx Series Actuators are direct mount actuators, M9106 and M9109 valve/actuator assemblies include the M9000-520 linkage
 2 For 3-Way valves, the first Cv listed is for Port A (Coil). The second Cv listed in parenthesis is for Port B (Bypass).
 3 For ball valve and actuator factory assemblies combine valve code number and actuator valve assembly code.
 Example: VG1241AD+9T4AGA is 1/2 inch two-way ball valve, 1.2 Cv, NPT end connections, plated brass trim with VA9104 Series non-spring return electric actuator with 24 VAC floating point control without time out with screw terminal electrical connections.

Factory Assembled Motorized Valve Assemblies

- High Fluid Temperature Range
- NPT Threaded



Actuator Options
Valve Type
Additional Actuator and Accessory Reference Information

				Actuator Type ¹																																																
				Non-Spring Return						Spring Return Port A Open				Spring Return Port A Closed																																						
				VA9104		M9106		M9109		VA9203		VA9208		VA9203		VA9208																																				
				Control Input																																																
				Floating Point without Timeout	On / Off and Floating Point	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	Floating Point without Timeout	On / Off and Floating Point	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	Floating Point without Timeout	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	On / Off and Floating Point	120V On / Off	24V On / Off	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	On / Off and Floating Point	85 to 264V On / Off	24V On / Off	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)	On / Off and Floating Point	120V On / Off	24V On / Off	0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)																													
<ul style="list-style-type: none"> • NPT Threaded • High Fluid Temperature Range • Stainless Steel Trim • 200 PSID Close Off Pressure • Fluid Temperature Limits: -22 to 284°F (-30 to 140°C) 				1 SPDT, 5.0(2.9) A @ 240 V																																																
Auxiliary Switches:				2 SPDT, 5.0(2.9) A @ 240 V																																																
				2 SPDT, 3.0(1.5) A @ 24 VAC																																																
Electrical				Screw Terminals																																																
Connections:				120 in. Plenum Cable																																																
Inch	DN (mm)	Cv ²	Stainless Steel Trim																																																	
			2-Way	3-Way																																																
1/2	15	1.2 (0.7)	VG1245AD	VG1845AD																																																
		1.9 (1.2)	VG1245AE	VG1845AE																																																
		2.9 (1.9)	VG1245AF	VG1845AF																																																
		4.7 (2.9)	VG1245AG	VG1845AG																																																
		7.4 (4.7)	VG1245AL	VG1845AL																																																
3/4	20	11.7 (5.8)	VG1245AN	VG1845AN																																																
		4.7 (2.9)	VG1245BG	VG1845BG																																																
		7.4 (4.7)	VG1245BL	VG1845BL																																																
1	25	11.7 (5.8)	VG1245BN	VG1845BN																																																
		7.4 (4.7)	VG1245CL	VG1845CL																																																
		11.7 (7.4)	VG1245CN	VG1845CN																																																
1 1/4	32	18.7 (9.4)	VG1245CP	VG1845CP																																																
		11.7 (7.4)	VG1245DN	VG1845DN																																																
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2	50	46.8 (23.4)	VG1245ES	VG1845ES																																																
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		73.7 (36.8)	VG1245FT	VG1845FT																																																
MOTORIZED VALVE ASSEMBLY CODE³ = VALVE CODE + FACTORY ASSEMBLY CODE Example: VG1245ADH9T4AGA					H9T4AGA	H9A4AGA	H9T4IGA	H9A4IGA	H9T4GGA	H9A4GGA	+906AGA	+906AGC	+908IGA	+908IGC	+906GGA	+906GGC	+909AGA	+909AGC	+909GGA	+909GGC	H923AGA	H923AGB	H923BUA	H923BUB	H923BGA	H923BGB	H923GGA	H923GGB	H928AGA	H938AGC	H938BAA	H938BAC	H938BGA	H938BGC	H928GGA	H938GGC	H943AGA	H943AGB	H943BUA	H943BUB	H943BGA	H943BGB	H943GGA	H943GGB	H948AGA	H958AGC	H958BAA	H958BAC	H958BGA	H958BGC	H948GGA	H958GGC
Position Feedback:																																																				
0(2) to 10 VDC Position Feedback																																																				
Power Requirements:																																																				
24 VAC +25%/-20%, Class 2, SELV																																																				
24 VAC +25%/-15%, Class 2, SELV																																																				
24 VAC +/- 20%, VDC +/- 10%																																																				
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Electrical Connections:																																																				
120 in. (3.05 m) 19 AWG Plenum Cable																																																				
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Weather Shield Options (For Field Assembly Only)																																																				
M9000-341																																																				
▲ Requires M9108 Actuator! See page 11																																																				

Factory Assembled Valve + Actuator Combinations Matrix

¹ VA9xxx Series Actuators are direct mount actuators, M9106 and M9109 valve/actuator assemblies include the M9000-520 linkage
² For 3-Way valves, the first Cv listed is for Port A (Coil). The second Cv listed in parenthesis is for Port B (Bypass)
³ For Ball valve and actuator factory assemblies combine valve code number and actuator valve assembly code.
 Example: VG1245ADH9T4AGA is 1/2 inch two-way ball valve, 1.2 Cv, NPT end connections, Stainless Steel trim with VA9104 Series non-spring return electric actuator with 24 VAC floating point control without time out with screw terminal electrical connections.

Factory Assembled Motorized Valve Assemblies

- Standard Fluid Temperature Range
- Sweat and Press Connected



Ball Valves with VA9104 Series Actuators

Ball Valves with VA9203 Series Actuators

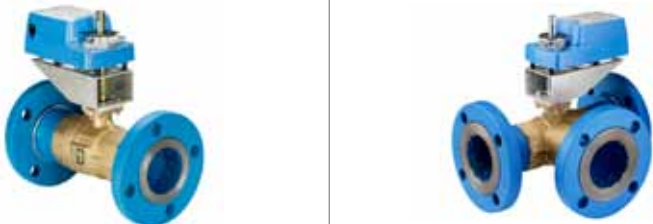
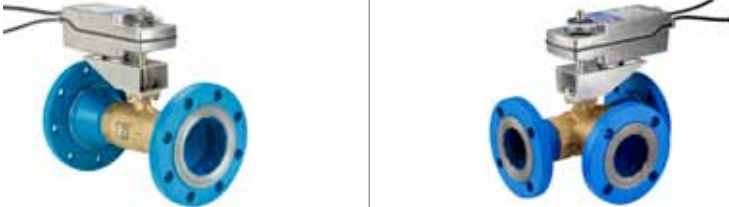
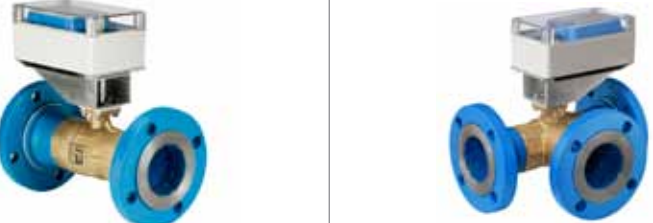

Motorized Ball Valve Assembly with Weather Shield (field assembly)

		Actuator Type ¹																						
		Non-Spring Return						Spring Return Port A Open				Spring Return Port A Closed												
		VA9104						VA9203				VA9203												
		Floating Point without Timeout		On / Off and Floating Point		0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)		On / Off and Floating Point		120V On / Off		24V On / Off		0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)		On / Off and Floating Point		120V On / Off		24V On / Off		0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)		
Actuator Options		1 SPDT, 5.0(2.9) A @ 240 V																						
		Auxiliary Switches: 2 SPDT, 5.0(2.9) A @ 240 V																						
Valve Type		2 SPDT, 3.0(1.5) A @ 24 VAC																						
		Electrical Screw Terminals																						
Additional Actuator and Accessory Reference Information		Connections: 120 in. Plenum Cable																						
		M9000-341																						
Inch	DN (mm)	Cv ²	Sweat Connections			Press Connections																		
			2-Way	3-Way		2-Way	3-Way																	
1/2	15	1.2 (0.7)	VG1275AD	VG1875AD	VG1295AD	VG1895AD																		
		1.9 (1.2)	VG1275AE	VG1875AE	VG1295AE	VG1895AE																		
		2.9 (1.9)	VG1275AF	VG1875AF	VG1295AF	VG1895AF																		
		4.7 (2.9)	VG1275AG	VG1875AG	VG1295AG	VG1895AG																		
		7.4 (4.7)	VG1275AL	VG1875AL	VG1295AL	VG1895AL																		
3/4	20	11.7 (5.8)	VG1275AN	VG1875AN	VG1295AN	VG1895AN																		
		4.7 (2.9)	VG1275BG	VG1875BG	VG1295BG	VG1895BG																		
		7.4 (4.7)	VG1275BL	VG1875BL	VG1295BL	VG1895BL																		
1	25	11.7 (5.8)	VG1275BN	VG1875BN	VG1295BN	VG1895BN																		
		7.4 (4.7)	VG1275CL	VG1875CL	VG1295CL	VG1895CL																		
		11.7 (7.4)	VG1275CN	VG1875CN	VG1295CN	VG1895CN																		
		18.7 (9.4)	VG1275CP	VG1875CP	VG1295CP	VG1895CP																		
MOTORIZED VALVE ASSEMBLY CODE³ = VALVE CODE + FACTORY ASSEMBLY CODE Example: VG1895AD+9T4AGA																								
Position Feedback:																								
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M9000-341																								

1 VA9xxx Series Actuators are direct mount actuators, M9106 and M9109 valve/actuator assemblies include the M9000-520 linkage
 2 For 3-Way valves, the first Cv listed is for Port A (Coil). The second Cv listed in parenthesis is for Port B (Bypass)
 3 For ball valve and actuator factory assemblies combine valve code number and actuator valve assembly code.
 Example: VG1895AD+9T4AGA is 1/2 inch three-way ball valve, 1.2 Cv, Press end connections, stainless steel trim with non-spring return electric actuator with 24 VAC floating point control without time out with screw terminal electrical connections.

Factory Assembled Motorized Valve Assemblies

- High Fluid Temperature Range
- ASME Class 150 Flange Connected

			Actuator Type																																																																																																																																																																						
			Non-Spring Return				Spring Return Port A Open				Spring Return Port A Closed																																																																																																																																																														
			M9124 ¹				M9220 ²				M9220 ²																																																																																																																																																														
			On / Off and Floating Point 0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)				On / Off and Floating Point 120V On / Off 24V On / Off 0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)				On / Off and Floating Point 120V On / Off 24V On / Off 0 (2) to 10 VDC 0 (4) to 20 mA (w/500 ohm resistor)																																																																																																																																																														
 <p>M9124 Actuator Installed on 2 1/2 thru 4 inch. ASME Flanged Ball Valves using M9000-518 Linkage</p>			1 SPDT, 5.0(2.9) A @ 240 V Auxiliary Switches: 2 SPDT, 5.0(2.9) A @ 240 V 2 SPDT, 3.0(1.5) A @ 24 VAC																																																																																																																																																																						
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 <p>Field Assembled M9220 Actuator, M9000-519 Linkage and M9000-340 Weather Shield on Flanged Ball Valve (field assembly)</p>			Electrical Connections: Screw Terminals 48 in. (1.2 m) 19 AWG Plenum Cable 120 in. (3.05 m) 19 AWG Plenum Cable 1/4 in. Spade Terminals 48 in. (1.2 m) 18 AWG Appliance Cable																																																																																																																																																																						
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1 The M9124 assemblies include the M9000-518 Linkage
 2 The M9220 assemblies include the M9000-519 Linkage
 3 For 3-Way valves, the first Cv listed is for Port A (Coil). The second Cv listed in parenthesis is for Port B (Bypass)
 4 For Ball Valve and actuator factory assemblies combine valve code number and actuator valve assembly code.
 Example: VG18A5HU+92NGGA is a 3 inch, 3-Way ball valve, 117 Cv thru Port A and 74 Cv thru Port B, ASME Class 150 flanged end connections, stainless steel trim with M9220 spring return actuator, with 0(2) to 10 VDC or 0(4) to 20ma proportional control with 48 in. (1.2m) 18 AWG Appliance Cable, assembled for spring return port "A" open.

Special Configurations:
Field Assembled
Weather Applications



Field Assembled M9108
Actuator, M9000-516
Linkage and M9000-330
Weather Shield on NPT
Threaded Ball Valve

Actuator Type							Control Input			
Non-Spring Return Electric Actuators							Non-Spring Return			
<ul style="list-style-type: none"> NPT Connections Standard or High Fluid Temperature Range Brass or Stainless Steel Trim 200 PSID Close Off Pressure Fluid Temperature Limits: Brass Trim: 23 to 203°F (-5 to 95°C) Stainless Steel Trim: -22 to 284°F (-30 to 140°C) 							M9108			
Actuator Options							On / Off and Floating Point			
1 SPDT, 5.0(2.9) A @ 240 V							0 (2) to 10 VDC			
Auxiliary Switches: 2 SPDT, 5.0(2.9) A @ 240 V							0.4 to 20 mA			
2 SPDT, 3.0(1.5) A @ 24 VAC							(w/500 ohm resistor)			
Valve Type	Inch	DN (mm)	Cv ¹	2-Way Brass Trim	3-Way Brass Trim	2-Way Stainless Steel Trim	3-Way Stainless Steel Trim	Actuator Type		
	1/2	15	1.2 (0.7)	VG1241AD	VG1841AD	VG1245AD	VG1845AD	■	■	■
			1.9 (1.2)	VG1241AE	VG1841AE	VG1245AE	VG1845AE	■	■	■
2.9 (1.9)	VG1241AF		VG1841AF	VG1245AF	VG1845AF	■	■	■		
4.7 (2.9)	VG1241AG		VG1841AG	VG1245AG	VG1845AG	■	■	■		
7.4 (4.7)	VG1241AL		VG1841AL	VG1245AL	VG1845AL	■	■	■		
11.7 (5.8)	VG1241AN		VG1841AN	VG1245AN	VG1845AN	■	■	■		
3/4	20	4.7 (2.9)	VG1241BG	VG1841BG	VG1245BG	VG1845BG	■	■	■	
		7.4 (4.7)	VG1241BL	VG1841BL	VG1245BL	VG1845BL	■	■	■	
		11.7 (5.8)	VG1241BN	VG1841BN	VG1245BN	VG1845BN	■	■	■	
1	25	7.4 (4.7)	VG1241CL	VG1841CL	VG1245CL	VG1845CL	■	■	■	
		11.7 (7.4)	VG1241CN	VG1841CN	VG1245CN	VG1845CN	■	■	■	
		18.7 (9.4)	VG1241CP	VG1841CP	VG1245CP	VG1845CP	■	■	■	
1 1/4	32	11.7 (7.4)	VG1241DN	VG1841DN	VG1245DN	VG1845DN	■	■	■	
		18.7 (11.7)	VG1241DP	VG1841DP	VG1245DP	VG1845DP	■	■	■	
		29.2 (14.6)	VG1241DR	VG1841DR	VG1245DR	VG1845DR	■	■	■	
1 1/2	40	18.7 (11.7)	VG1241EP	VG1841EP	VG1245EP	VG1845EP	■	■	■	
		29.2 (18.7)	VG1241ER	VG1841ER	VG1245ER	VG1845ER	■	■	■	
		46.8 (23.4)	VG1241ES	VG1841ES	VG1245ES	VG1845ES	■	■	■	
2	50	29.2 (18.7)	VG1241FR	VG1841FR	VG1245FR	VG1845FR	■	■	■	
		46.8 (29.2)	VG1241FS	VG1841FS	VG1245FS	VG1845FS	■	■	■	
		73.7 (36.8)	VG1241FT	VG1841FT	VG1245FT	VG1845FT	■	■	■	
VALVE CODE							ACTUATOR CODE (For Field Assembly)			
							M9108-AGA-2	M9108-AGC-2	M9108-GGA-2	M9108-GGC-2
Additional Actuator and Accessory Reference Information										
Position Feedback: 0(2) to 10 VDC Position Feedback										
Power Requirements: 24 VAC +25%/-20%, Class 2, SELV										
24 VAC +25%/-15%, VDC +/- 10%										
24 VAC +/- 20%, VDC +/- 10%										
24 VAC +/- 25%, VDC +/- 10%										
120 VAC +10%/-15% at 60 Hz										
85 to 264 VAC at 50/60 Hz										
Electrical Connections:										
Screw Terminals										
48 in. (1.2 m) 19 AWG Plenum Cable										
120 in. (3.05 m) 19 AWG Plenum Cable										
1/4 in. Spade Terminals										
48 in. (1.2 m) 18 AWG Appliance Cable										
Weather Shield Options (For Field Assembly Only)										
M9000-330 Weather Shield + M9000-516 Linkage										

Valid Field Assembly Combinations
VG1000 Series Ball Valves, M(VA)9000 Series Actuators, Linkage Kits, Weather Shields

Valve Size in. (mm)	NPT End Connection	Sweat End Connection	Press End Connection	Actuator Base Code Number ¹	Linkage Kit Code Number	Weather Shield Code Number
1/2 (DN15)	VG1241Ax VG1245Ax VG1841Ax VG1845Ax	VG1275Ax VG1875Ax	VG1295Ax VG1895Ax	VA9104 ²	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9104 ²	M9000-551 (Fluid Temperatures ≤212°F) M9000-551 and M9000-561 (Fluid Temperatures >212°F)	
				M9106 ²	M9000-520	
				M9108	M9000-516	M9000-330
				VA9203	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9203	M9000-560 (Fluid Temperatures ≤212°F) M9000-560 and M9000-561 (Fluid Temperatures >212°F)	
3/4 (DN20)	VG1241Bx VG1245Bx VG1841Bx VG1845Bx	VG1275Bx VG1875Bx	VG1295Bx VG1895Bx	VA9104 ²	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9104 ²	M9000-551 (Fluid Temperatures ≤212°F) M9000-551 and M9000-561 (Fluid Temperatures >212°F)	
				M9106 ²	M9000-520	
				M9108	M9000-516	M9000-330
				VA9203	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9203	M9000-560 (Fluid Temperatures ≤212°F) M9000-560 and M9000-561 (Fluid Temperatures >212°F)	
1 (DN25)	VG1241Cx VG1245Cx VG1841Cx VG1845Cx	VG1275Cx VG1875Cx	VG1295Cx VG1895Cx	VA9104 ²	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9104 ²	M9000-551 (Fluid Temperatures ≤212°F) M9000-551 and M9000-561 (Fluid Temperatures >212°F)	
				M9106 ²	M9000-520	
				M9108	M9000-516	M9000-330
				VA9203	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9203	M9000-560 (Fluid Temperatures ≤212°F) M9000-560 and M9000-561 (Fluid Temperatures >212°F)	
1 1/4 (DN32)	VG1241Dx VG1245Dx VG1841Dx VG1845Dx			M9106 ²	M9000-520	
				M9108	M9000-516	M9000-330
				VA9208	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9208	M9000-560 (Fluid Temperatures ≤212°F) M9000-560 and M9000-561 (Fluid Temperatures >212°F)	
1 1/2 (DN40)	VG1241Ex VG1245Ex VG1841Ex VG1845Ex			M9106 ²	M9000-520	
				M9108	M9000-516	M9000-330
				VA9208	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9208	M9000-560 (Fluid Temperatures ≤212°F) M9000-560 and M9000-561 (Fluid Temperatures >212°F)	
2 (DN50)	VG1241Fx VG1245Fx VG1841Fx VG1845Fx			M9109 ²	M9000-520	
				M9108	M9000-516	M9000-330
				VA9208	Non-required (Fluid Temperatures ≤212°F) M9000-561 (Fluid Temperatures >212°F)	M9000-341 (When using Weather Shield M9000-561 Thermal Barrier is not needed)
				M9208	M9000-560 (Fluid Temperatures ≤212°F) M9000-560 and M9000-561 (Fluid Temperatures >212°F)	
Flanged Ball Valves, ASME Class 150 Flange						
2 1/2 (DN65)	VG12A5Gx VG18A5Gx			M9124	M9000-518	M9000-330
				M9220	M9000-519	M9000-340
3 (DN80)	VG12A5Hx VG18A5Hx			M9124	M9000-518	M9000-330
				M9220	M9000-519	M9000-340
4 (DN100)	VG12A5Jx VG18A5Jx			M9124	M9000-518	M9000-330
				M9220	M9000-519	M9000-340

¹ The VA9104, M9104, M9106, M9108, M9109 and M9124 are non-spring return models. The VA9203, VA9208 and M9220 are spring return models.
² To avoid excessive wear or drive time on the motor for VA9104, M9104, M9106 and M9109 AGx models, use a controller and/or software that provides a timeout function to remove the signal at the end of rotation (stall). The IGx and Gx models have an auto shutoff to avoid excessive wear or drive time on the motor

VG1000 Series Ball Valve Accessories

	Code Number	Description	Qty
Ball Valve Linkages			
	M9000-551	VG1000 Ball Valve linkage (for use with M9104 Series actuators only)	1
	M9000-520	VG1000 Ball Valve linkage (for use with M9106, M9109 and M9206 Series actuators only)	1
	M9000-560	Ball Valve Linkage Kit for applying M9203, and M9208 Series Electric Actuators to VG1000 Series Valves	1
	M9000-561	Thermal Barrier Kit for M9000-560 Ball Valve Linkage. Extends M(VA)9104, M(VA)9203, and M(VA)9208 Series Electric Spring Return Actuators applications to include low pressure steam	1
	M9000-516	Ball Valve Linkage for Non-Spring Return, 1/2 to 2 in. VG1000 valves with 9 mm square stem	1
	M9000-518	Ball Valve Linkage for Non-Spring Return, 2 1/2 to 4 in. VG1000 flanged valves with 11 mm square stem	1
	M9000-519	Ball Valve Linkage for Spring Return, 2 1/2 to 4 in. VG1000 flanged Valves with 11 mm square stem	1

VG1000 Series Ball Valve Accessories

	Code Number	Description	Qty
Weather Shields for Ball Valves			
	M9000-341	Weather Shield Kit for VG1000 Series Ball Valve application of M(VA)9104, M(VA)9203, and M(VA)9208 Series Electric Spring Return Actuators	1
	M9000-330	NEMA 3R Weather Shield for VG1000 Series Non-Spring Return Ball Valves with M9000-516 or M9000-518 Linkage	1
	M9000-340	NEMA 3R Weather Shield for VG1000 Series Spring Ball Valves with M9000-517 or M9000-519 Linkage	1
Miscellaneous			
	M9000-155	Manual Handle for M9108[16][24][32] Series Actuators	1
	M9200-100	Threaded Conduit Adapters for 1/2 in. electrician's fittings (For use with M(VA)9208, M(VA)9210, and M(VA)9220 Series Actuators)	5
	M9000-607	Position Indicator for VG1000 Series Ball Valve Applications (For use with VA9203 and VA9208 Series Actuators)	5
	M9000-200	Commissioning Tool that provides a control signal to drive 24V On/Off, Floating, Proportional, and/or Resistive Electric Actuators	1

Sizing Water Valves

Two-Position Applications: The valve is normally sized with the largest Cv available.

Modulating Applications: The valve should be sized to produce the required Cv with a pressure drop of one to two times the pressure drop across the coil at rated flow.

Example: Coil requires 14 gpm at 5 psi pressure drop. The valve should be selected to provide 14 gpm with a pressure drop across the valve between 5 and 10 psi (one to two times the pressure drop across the coil at the required flow).

Solution: From the table below a 1/2 in., 4.7 Cv valve will provide 14.1 gpm flow at a pressure drop across the valve of 9 psi. This valve should be selected as the valve will provide the needed flow with a pressure drop between one and two times the pressure drop across the coil at the required flow.

VG1000 Ball Valves 1/2 through 2 inch

FLOW RATE IN GPM (GALLONS PER MINUTE)										
Cv	1.2	1.9	2.9	4.7	7.4	11.7	18.7	29.2	46.8	73.7
Pressure Drop (PSI)										
1	1.2	1.9	2.9	4.7	7.4	11.7	18.7	29.2	46.8	73.7
2	1.7	2.7	4.1	6.6	10.5	16.5	26.4	41.3	66.2	104.2
3	2.1	3.3	5.0	8.1	12.8	20.3	32.4	50.6	81.1	127.7
4	2.4	3.8	5.8	9.4	14.8	23.4	37.4	58.4	93.6	147.4
5	2.7	4.2	6.5	10.5	16.5	26.2	41.8	65.3	104.6	164.8
6	2.9	4.7	7.1	11.5	18.1	28.7	45.8	71.5	114.6	180.5
7	3.2	5.0	7.7	12.4	19.6	31.0	49.5	77.3	123.8	195.0
8	3.4	5.4	8.2	13.3	20.9	33.1	52.9	82.6	132.4	208.5
9	3.6	5.7	8.7	14.1	22.2	35.1	56.1	87.6	140.4	221.1
10	3.8	6.0	9.2	14.9	23.4	37.0	59.1	92.3	148.0	233.1
11	4.0	6.3	9.6	15.6	24.5	38.8	62.0	96.8	155.2	244.4
12	4.2	6.6	10.0	16.3	25.6	40.5	64.8	101.2	162.1	255.3
13	4.3	6.9	10.5	16.9	26.7	42.2	67.4	105.3	168.7	265.7
14	4.5	7.1	10.9	17.6	27.7	43.8	70.0	109.3	175.1	275.8
15	4.6	7.4	11.2	18.2	28.7	45.3	72.4	113.1	181.3	285.4
16	4.8	7.6	11.6	18.8	29.6	46.8	74.8	116.8	187.2	294.8
17	4.9	7.8	12.0	19.4	30.5	48.2	77.1	120.4	193.0	303.9
18	5.1	8.1	12.3	19.9	31.4	49.6	79.3	123.9	198.6	312.7
19	5.2	8.3	12.6	20.5	32.3	51.0	81.5	127.3	204.0	321.3
20	5.4	8.5	13.0	21.0	33.1	52.3	83.6	130.6	209.3	329.6
21	5.5	8.7	13.3	21.5	33.9	53.6	85.7	133.8	214.5	337.7
22	5.6	8.9	13.6	22.0	34.7	54.9	87.7	137.0	219.5	345.7
23	5.8	9.1	13.9	22.5	35.5	56.1	89.7	140.0	224.4	353.5
24	5.9	9.3	14.2	23.0	36.3	57.3	91.6	143.1	229.3	361.1
25	6.0	9.5	14.5	23.5	37.0	58.5	93.5	146.0	234.0	368.5
26	6.1	9.7	14.8	24.0	37.7	59.7	95.4	148.9	238.6	375.8
27	6.2	9.9	15.1	24.4	38.5	60.8	97.2	151.7	243.2	383.0
28	6.3	10.1	15.3	24.9	39.2	61.9	99.0	154.5	247.6	390.0
29	6.5	10.2	15.6	25.3	39.9	63.0	100.7	157.2	252.0	396.9
30	6.6	10.4	15.9	25.7	40.5	64.1	102.4	159.9	256.3	403.7

Sizing Water Valves

Two-Position Applications: The valve is normally sized with the largest Cv available.

Modulating Applications: The valve should be sized to produce the required Cv with a pressure drop of one to two times the pressure drop across the coil at rated flow.

Example: Coil requires 180 gpm at 4 psi pressure drop. The valve should be selected to provide 180 gpm with a pressure drop across the valve between 4 and 8 psi (one to two times the pressure drop across the coil at the required flow).

Solution: From the table below a 7/4 Cv valve will provide 181 gpm flow at a pressure drop across the valve of 6 psi. This valve should be selected as the valve will provide the needed flow with a pressure drop between one and two times the pressure drop across the coil at the required flow.

VG1000 Ball Valves 2-1/2 through 4 inch

FLOW RATE IN GPM (GALLONS PER MINUTE)					
Cv	47	74	117	176	211
Pressure Drop (PSI)					
1	47	74	117	176	211
2	66	105	165	249	298
3	81	128	203	305	365
4	94	148	234	352	422
5	105	165	262	394	472
6	115	181	287	431	517
7	124	196	310	466	558
8	133	209	331	498	597
9	141	222	351	528	633
10	149	234	370	557	667
11	156	245	388	584	700
12	163	256	405	610	731
13	169	267	422	635	761
14	176	277	438	659	789
15	182	287	453	682	817
16	188	296	468	704	844
17	194	305	482	726	870
18	199	314	496	747	895
19	205	323	510	767	920
20	210	331	523	787	944
21	215	339	536	807	967
22	220	347	549	826	990
23	225	355	561	844	1012
24	230	363	573	862	1034
25	235	370	585	880	1055
26	240	377	597	897	1076
27	244	385	608	915	1096
28	249	392	619	931	1117
29	253	399	630	948	1136
30	257	405	641	964	1156

Sizing Steam Valves

Two-Position Applications: The valve is normally sized to be the same as the pipe using the largest Cv available for a given pipe size.

Modulating Applications: Select the valve to meet the BtuH requirements of the coil.

Assumptions:

1. The table assumes an atmospheric return.
2. Minimum coil BtuH calculated assuming a pressure drop across the valve of 50% of supply pressure.
3. Maximum coil BtuH calculated assuming a pressure drop across the valve of 80% of supply pressure.

VG1000 Ball Valves 1/2 through 2 inch

Available Pipe Size NPT	1/2 in.		1/2 in.		1/2 in.		1/2 in. 3/4 in.		1/2 in. 3/4 in. 1 in.	
	1.2		1.9		2.9		4.7		7.4	
Cv	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH
1	10,700	13,600	17,000	21,500	25,900	32,800	42,000	53,200	66,200	83,700
2	15,600	19,800	24,700	31,300	37,800	47,800	61,200	77,400	96,400	121,900
3	19,600	24,800	31,100	39,300	47,500	60,000	76,900	97,300	121,100	153,200
4	23,300	29,500	36,900	46,700	56,300	71,200	91,200	115,400	143,700	181,700
5	26,700	33,700	42,200	53,400	64,400	81,500	104,400	132,100	164,400	208,000
6	29,900	37,900	47,400	59,900	72,300	91,500	117,200	148,300	184,600	233,400
7	33,000	41,800	52,300	66,100	79,800	100,900	129,300	163,600	203,600	257,600
8	36,100	45,600	57,100	72,200	87,200	110,300	141,300	178,700	222,400	281,400
9	39,000	49,400	61,800	78,200	94,300	119,300	152,900	193,300	240,700	304,400
10	42,000	53,100	66,400	84,000	101,400	128,300	164,300	207,900	258,700	327,300
11	44,800	56,700	71,000	89,800	108,300	137,000	175,600	222,100	276,400	349,600
12	47,600	60,300	75,400	95,400	115,100	145,600	186,600	236,000	293,800	371,600
15	56,000	70,900	88,700	112,200	135,400	171,300	219,500	277,600	345,600	437,100

VG1000 Ball Valves 1/2 through 2 inch

Available Pipe Size NPT	1/2 in. 3/4 in. 1 in.		1 in. 1 1/4 in. 1 1/2 in.		1 1/4 in. 1 1/2 in. 2 in.		1 1/2 in. 2 in.		2 in.	
	11.7		18.7		29.2		46.8		73.7	
Cv	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH
1	104,700	132,400	167,300	211,600	261,200	330,400	416,800	527,200	659,200	833,800
2	152,400	192,700	243,500	308,000	380,300	481,000	606,900	767,600	959,800	1,214,100
3	191,500	242,300	306,100	387,200	478,000	604,600	762,800	964,900	1,206,400	1,526,000
4	227,100	287,300	363,000	459,200	566,800	717,000	904,600	1,144,300	1,430,700	1,809,700
5	260,000	328,900	415,600	525,700	648,900	820,800	1,035,600	1,309,900	1,637,800	2,071,700
6	291,800	369,100	466,400	589,900	728,200	921,200	1,162,200	1,470,100	1,838,100	2,325,000
7	322,000	407,300	514,600	650,900	803,500	1,016,400	1,282,400	1,622,100	2,028,100	2,565,400
8	351,700	444,900	562,100	711,000	877,700	1,110,200	1,400,800	1,771,800	2,215,400	2,802,200
9	380,500	481,300	608,200	769,300	949,600	1,201,200	1,515,500	1,917,000	2,396,800	3,031,800
10	409,100	517,500	653,800	827,000	1,021,000	1,291,400	1,629,300	2,061,000	2,576,900	3,259,500
11	437,000	552,800	698,500	883,500	1,090,700	1,379,600	1,740,600	2,201,700	2,752,800	3,482,100
12	464,500	587,500	742,400	939,000	1,159,200	1,466,300	1,850,000	2,340,100	2,925,900	3,700,900
15	546,400	691,100	873,200	1,104,600	1,363,600	1,724,800	2,176,100	2,752,600	3,441,600	4,353,300

Sizing Steam Valves

Two-Position Applications: The valve is normally sized to be the same as the pipe using the largest Cv available for a given pipe size.

Modulating Applications: Select the valve to meet the BtuH requirements of the coil.

Assumptions:

1. The table assumes an atmospheric return.
2. Minimum coil BtuH calculated assuming a pressure drop across the valve of 50% of supply pressure.
3. Maximum coil BtuH calculated assuming a pressure drop across the valve of 80% of supply pressure.

VG1000 Ball Valves 2 1/2 through 4 inch

Available Pipe Size NPT	2 1/2 in.		2 1/2 in. 3 in.		2 1/2 in. 3 in. 4 in.		3 in. 4 in.		3 in.	
	47		74		117		176		211	
Cv	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH	MINIMUM COIL BTUH	MAXIMUM COIL BTUH
1	420,400	531,800	661,900	837,200	1,046,500	1,323,700	1,574,200	1,991,300	1,887,300	2,387,200
2	612,100	774,200	963,700	1,219,000	1,523,700	1,927,300	2,292,000	2,899,200	2,747,800	3,475,800
3	769,400	973,200	1,211,300	1,532,200	1,915,200	2,422,600	2,881,000	3,644,200	3,454,000	4,368,900
4	912,400	1,154,100	1,436,500	1,817,100	2,271,300	2,873,000	3,416,600	4,321,700	4,096,100	5,181,100
5	1,044,500	1,321,200	1,644,500	2,080,100	2,600,100	3,288,800	3,911,200	4,947,300	4,689,000	5,931,200
6	1,172,200	1,482,700	1,845,600	2,334,500	2,918,000	3,691,000	4,389,400	5,552,200	5,262,300	6,656,400
7	1,293,400	1,636,000	2,036,400	2,575,800	3,219,700	4,072,600	4,843,300	6,126,300	5,806,400	7,344,600
8	1,412,800	1,787,000	2,224,400	2,813,600	3,516,900	4,448,600	5,290,400	6,691,900	6,342,500	8,022,700
9	1,528,500	1,933,400	2,406,600	3,044,100	3,805,000	4,813,000	5,723,800	7,240,100	6,862,000	8,679,900
10	1,643,300	2,078,700	2,587,400	3,272,800	4,090,800	5,174,500	6,153,700	7,783,900	7,377,500	9,331,900
11	1,755,500	2,220,600	2,764,000	3,496,200	4,370,100	5,527,800	6,573,900	8,315,400	7,881,200	9,969,000
12	1,865,900	2,360,200	2,937,800	3,716,000	4,644,800	5,875,300	6,987,100	8,838,100	8,376,600	10,595,600
15	2,194,800	2,776,200	3,455,600	4,371,100	5,463,600	6,911,000	8,218,800	10,396,000	9,853,200	12,463,400
20	2,724,500	3,446,300	4,289,700	5,426,100	6,782,400	8,579,100	10,202,500	12,905,300	12,231,500	15,471,700
25	3,245,700	4,105,500	5,110,300	6,464,000	8,079,700	10,220,200	12,154,100	15,373,900	14,571,200	18,431,200

Key to the Factory Assembly Codes to Actuator and Accessory Mounting Kits

Factory Assembly Code	Actuator and Accessories being Mounted
+9T4AGA	VA9104-AGA-3S
+9A4AGA	VA9104-AGA-2S
+9T4IGA	VA9104-IGA-3S
+9A4IGA	VA9104-IGA-2S
+9T4GGA	VA9104-GGA-3S
+9A4GGA	VA9104-GGA-2S
+906AGA	M9106-AGA-2 with M9000-520 linkage
+906AGC	M9106-AGC-2 with M9000-520 linkage
+906IGA	M9106-IGA-2 with M9000-520 linkage
+906IGC	M9106-IGC-2 with M9000-520 linkage
+906GGA	M9106-GGA-2 with M9000-520 linkage
+906GGC	M9106-GGC-2 with M9000-520 linkage
+909AGA	M9109-AGA-2 with M9000-520 linkage
+909AGC	M9109-AGC-2 with M9000-520 linkage
+909GGA	M9109-GGA-2 with M9000-520 linkage
+909GGC	M9109-GGC-2 with M9000-520 linkage
+923AGA or +943AGA	VA9203-AGA-2Z
+923AGB or +943AGB	VA9203-AGB-2Z
+923BUA or +943BUA	VA9203-BUA-2
+923BUB or +943BUB	VA9203-BUB-2
+923BGA or +943BGA	VA9203-BGA-2
+923BGB or +943BGB	VA9203-BGB-2
+923GGA or +943GGA	VA9203-GGA-2Z
+923GGB or +943GGB	VA9203-GGB-2Z
+928AGA or +948AGA	VA9208-AGA-2
+938AGC or +958AGC	VA9208-AGC-3
+938BAA or +958BAA	VA9208-BAA-3
+938BAC or +958BAC	VA9208-BAC-3
+938BGA or +958BGA	VA9208-BGA-3
+938BGC or +958BGC	VA9208-BGC-3
+928GGA or +948GGA	VA9208-GGA-2
+938GGC or +958GGC	VA9208-GGC-3
H9T4AGA	VA9104-AGA-3S with M9000-561 thermal barrier
H9A4AGA	VA9104-AGA-2S with M9000-561 thermal barrier
H9T4IGA	VA9104-IGA-3S with M9000-561 thermal barrier
H9A4IGA	VA9104-IGA-2S with M9000-561 thermal barrier
H9T4GGA	VA9104-GGA-3S with M9000-561 thermal barrier
H9A4GGA	VA9104-GGA-2S with M9000-561 thermal barrier

Factory Assembly Code	Actuator and Accessories being Mounted
H923AGA or H943AGA	VA9203-AGA-2Z with M9000-561 thermal barrier
H923AGB or H943AGB	VA9203-AGB-2Z with M9000-561 thermal barrier
H923BUA or H943BUA	VA9203-BUA-2 with M9000-561 thermal barrier
H923BUB or H943BUB	VA9203-BUB-2 with M9000-561 thermal barrier
H923BGA or H943BGA	VA9203-BGA-2 with M9000-561 thermal barrier
H923BGB or H943BGB	VA9203-BGB-2 with M9000-561 thermal barrier
H923GGA or H943GGA	VA9203-GGA-2Z with M9000-561 thermal barrier
H923GGB or H943GGB	VA9203-GGB-2Z with M9000-561 thermal barrier
H928AGA or H948AGA	VA9208-AGA-2 with M9000-561 thermal barrier
H938AGC or H958AGC	VA9208-AGC-3 with M9000-561 thermal barrier
H938BAA or H958BAA	VA9208-BAA-3 with M9000-561 thermal barrier
H938BAC or H958BAC	VA9208-BAC-3 with M9000-561 thermal barrier
H938BGA or H958BGA	VA9208-BGA-3 with M9000-561 thermal barrier
H938BGC or H958BGC	VA9208-BGC-3 with M9000-561 thermal barrier
H928GGA or H948GGA	VA9208-GGA-2 with M9000-561 thermal barrier
H938GGC or H958GGC	VA9208-GGC-3 with M9000-561 thermal barrier
+924AGA	M9124 AGA-2 with M9000-518 linkage
+924AGC	M9124 AGC-2 with M9000-518 linkage
+924GGA	M9124 GGA-2 with M9000-518 linkage
+924GGC	M9124 GGC-2 with M9000-518 linkage
+92NAGA or +94NAGA	M9220-AGA-3 with M9000-519 linkage
+92NAGC or +94NAGC	M9220-AGC-3 with M9000-519 linkage
+92NBAA or +94NBAA	M9220-BAA-3 with M9000-519 linkage
+92NBAC or +94NBAC	M9220-BAC-3 with M9000-519 linkage
+92NBGA or +94NBGA	M9220-BGA-3 with M9000-519 linkage
+92NBGC or +94NBGC	M9220-BGC-3 with M9000-519 linkage
+92NGGA or +94NGGA	M9220-GGA-3 with M9000-519 linkage
+92NGGC or +94NGGC	M9220-GGC-3 with M9000-519 linkage

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