Quality People. Building Solutions.

Comfort Systems USA (Arkansas), Inc.
P.O. Box 16620
Little Rock, AR 72231
Phone 501-834-3320
Fax 501-834-5416

Date: 5/17/2024
Return Request: 5/27/2024
Project: CALS Main Library Renovations
Supplier: JCI
Manufacturer: Various
Submittal: Controls
Submittal Number: 23 09 00-01
Drawing # and Installation: Mechanical Drawings

ARCHITECT
Polk Stanley Wilcox
801 South Spring St.
Little Rock, AR 72201
501-378-0878

ENGINEER
Bernhard
1 Allied Drive, Bldg. 2, Suite 2600
Little Rock, AR 72202
501-666-6776

GENERAL CONTRACTOR
CDI
3000 Cantrell Rd.
Little Rock, AR 72202
501-5666-4300

MECHANICAL SUBCONTRACTOR
Comfort Systems USA (Arkansas), Inc.
9924 Landers Rd.
N. Little Rock, AR 72117
501-834-3320

Notes:

CSUSA PROJECT NO.
23-8016
dpierce@comfortar.com

14-1201-5 Rev. Z

VG1000 Series Forged Brass Ball Valves

Installation Guide

Part No. 14-1201-5, Rev. Z
Issued January 2020

Applications

The VG1000 Series Ball Valves are designed to regulate the flow of hot or chilled water (and for some models, low pressure steam) in response to the demand of a controller in HVAC systems.

IMPORTANT: Use the VG1000 Series Valves as an operating control. Where failure or malfunction of the VG1000 Series Valve could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the VG1000 Series Valve.

Installation

Install VG1000 Series Ball Valves with the actuator at or above the centerline of the horizontal piping, as shown in Figure 1.

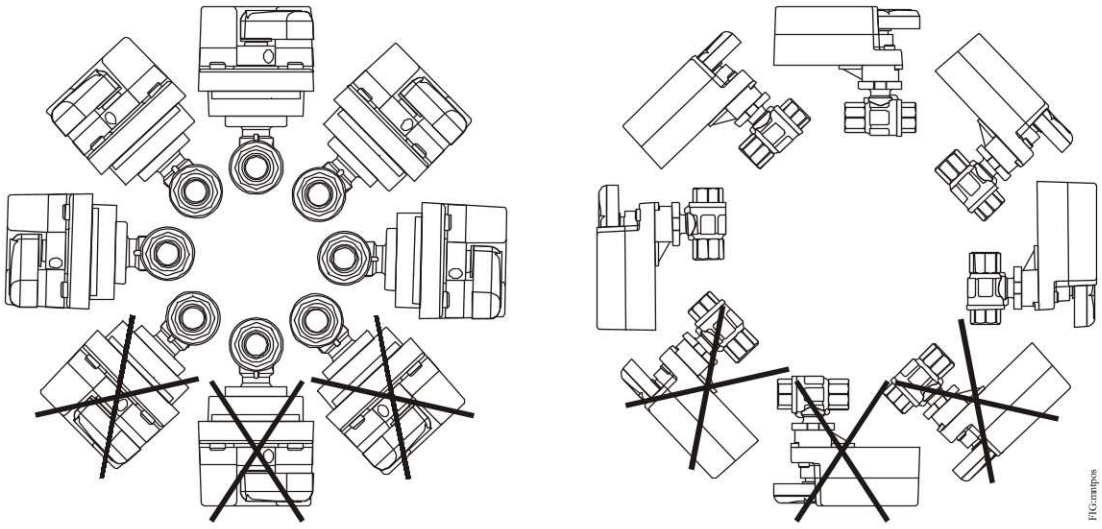
IMPORTANT: In steam applications, install the valve with the stem horizontal to the piping. Failure to follow these guidelines may shorten the life of the actuator.

To minimize heat transfer in steam applications, wrap the valve and piping with insulation. Allow sufficient clearance to remove the actuator (as illustrated in the dimension drawings, Figure 6 through Figure 11).

When mounting the actuator in the field (before installation), use an adjustable wrench to manually rotate the valve stem several times. This rotation breaks the torque that may have built up during long-term storage.

For the valve to move in the proper direction, wire the input lines to the electric actuator correctly.

Figure 1: Mounting Positions for Chilled Water and Condensing Atmosphere Applications



IMPORTANT: Take care to prevent foreign material such as weld slag, thread burrs, metal chips, and scale from entering the piping system. This debris can damage or severely impede the operation of the valve by embedding itself in the seats, scoring the valve, and ultimately resulting in seat leakage. If the debris becomes embedded in the seats, subsequent flushing and filtering of the piping system with the valve installed does not remedy the problem.

For more detailed installation information about the specific equipment used, refer to the appropriate document from the following list:

- *VA9104-xGA-2S Series Electric Non-Spring Return Valve Actuators Installation Instructions (Part No. 14-1336-15)*
- *VA9104-xGA-3S Series Electric Non-Spring Return Valve Actuators Installation Instructions (Part No. 14-1336-23)*
- *M9102-AGA-2S and M9104-xGA-2S Series Electric Non-Spring Return Actuators Installation Instructions (Part No. 34-636-1220)*
- *M9102-AGA-3S and M9104-xGA-3S Series Electric Non-Spring Return Actuators Installation Instructions (Part No. 34-636-1433)*
- *VA9300 Series Electric Non-Spring Return Valve Actuators Installation Instructions (Part No. 34-636-2421)*
- *VA9203-AGx-2Z Series On/Off and Floating Point Electric Spring Return Valve Actuators Installation Instructions (Part No. 14-1380-8)*
- *VA9203-Bxx-2 Series On/Off Spring Return Valve Actuators Installation Instructions (Part No. 14-1380-16)*
- *VA9203-GGx-2Z Series Proportional Spring Return Valve Actuators Installation Instructions (Part No. 14-1380-24)*
- *VA9208-AGx-x Series On/Off and Floating Point Electric Spring Return Valve Actuators Installation Instructions (Part No. 14-1379-5)*
- *VA9208-Bxx-x Series On/Off Spring Return Valve Actuators Installation Instructions (Part No. 14-1379-13)*
- *VA9208-GGx-x Series Proportional Spring Return Valve Actuators Installation Instructions (Part No. 14-1379-21)*
- *M9000-560 Ball Valve Linkage Kit and M9000-561 Thermal Barrier Installation Instructions (Part No. 34-636-2227)*
- *M9000-342 Series Weather Shield Enclosures Installation Instructions (Part No. 34-636-2499)*
- *M9000-551 Ball Valve Linkage Kit Installation Instructions (Part No. 34-636-1816)*

Note: To avoid excessive wear or drive time on the motor for VA9104 and M9104 models, use a controller or software that provides a time-out function to remove the signal at the end of rotation (stall). The IGx and GGx models have an auto shutoff to avoid excessive wear or drive time on the motor.

On models with the flow-characterizing disk, the disk is located in Port A. Port A must be the inlet. On three-way models, use Port A as the coil inlet and Port B as the bypass inlet.

VG1841 and VG1845 Series Three-Way Ball Valves have a different port configuration from VG1644 Series Three-Way valves. See Figure 2, Figure 3, and Figure 4 for details.

Figure 2: VG1841 or VG1845 Series Three-Way Ball Valve (Port A Connected to Port C)

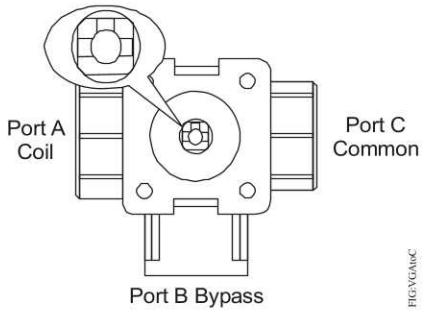


Figure 3: VG1841 or VG1845 Series Three-Way Ball Valve (Port B Connected to Port C)

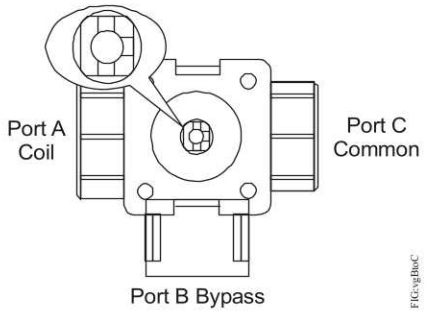
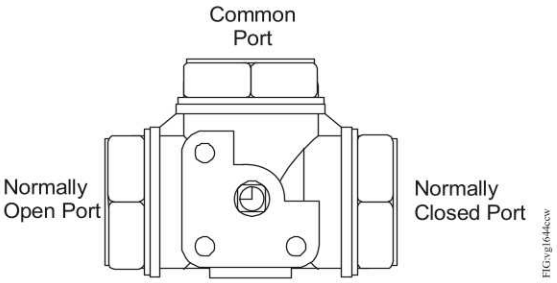


Figure 4: Top View of VG1644 Series Three-Way Ball Valve (Actuator Fully



IMPORTANT: Protect the actuator from dripping water, condensation, and other moisture. Water or moisture could result in an electrical short, which may damage or affect the operation of the actuator.

IMPORTANT: Do not cover the actuator with thermal insulating material. High ambient temperatures may damage the actuator, and a hot water pipe, steam pipe, or other heat source may overheat it.

Contact your local Johnson Controls® representative for compatibility concerns before using VG1000 Series Ball Valves to control the flow of fluids other than those outlined in the *Technical Specifications* table in this document.

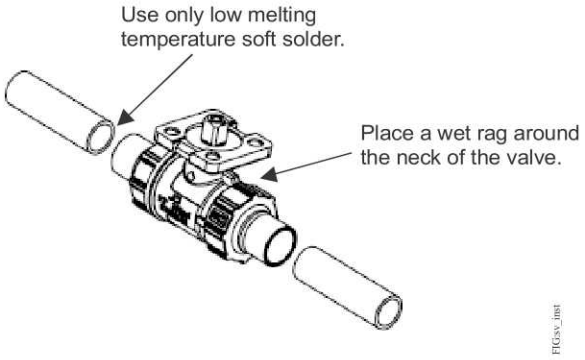
Press Valve Installation

VG1000 press end connection valves are installed using RIDGID® press tools. Always refer to the operator's manual supplied with the RIDGID press tool that is used to make the valve end connections. The manual should provide proper instructions for the safe operation of the tool, proper crimping procedures, and methods of inspecting the finished connection. If you use a battery-operated press tool, ensure its proper operation by fully charging the unit. To avoid damage to the integral O-ring, never use sealant or pipe dope with a press connection. Always inspect the end connections of the valve before making the connection. The end connection should not be deformed, and the internal, integral O-ring must be in place for a proper seal.

Sweat Valve Installation

When soft soldering sweat ball valves, be sure to use a low temperature solder with a melting point that does not exceed 450°F (232°C). For lead-free RoHS compliance, a 96.5% tin/3.5% silver solder is recommended. Never install the actuator on the valve until you have completed the soldering operation and the valve body has cooled. Before soldering, minimize the risk of damage to the ball seals by positioning the ball so that Port A is fully open. When soldering, always apply a wet rag around the valve's neck and cover as much of the valve body with the rag as possible. Direct the tip of the flame away from the valve and always heat the copper tubing directly, but never the valve body. Solder Port A first, then the remaining ports. These steps provide maximum protection to the internal valve components. See Figure 5 for details.

Figure 5: Sweat Valve Installation



See Figure 6 for dimension drawings of the Non-Spring Return VA9104 Series Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves. See Table 1 and Table 2 for specific model linkage dimensions.

Figure 6: VA9104 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with NPT End Connections Dimensions, in. (mm)

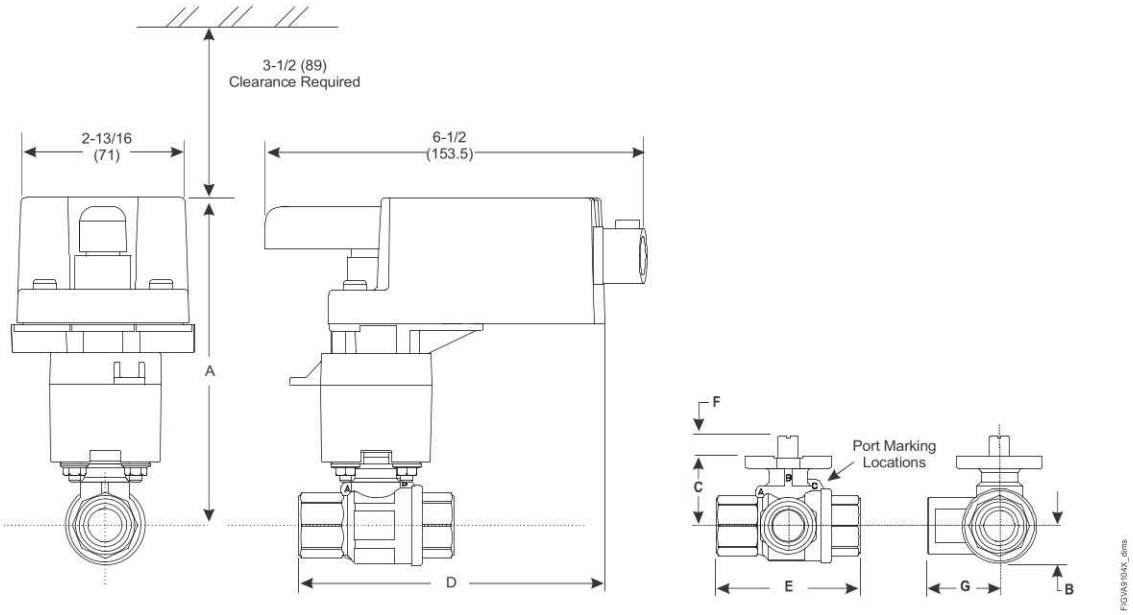


Table 1: VA9104 or M9104 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-551 Linkage Dimensions, in. (mm)

Valve Size, in. (DN)[1]	A (Without Thermal Barrier)	A (With Thermal Barrier)	B	C	D	E	F	G
1/2 (DN15)	3-7/8 (98)	5-11/32 (135)	21/32 (17)	1-7/32 (31)	5-7/64 (129)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	3-7/8 (98)	5-11/32 (135)	21/32 (17)	1-7/32 (31)	5-7/32 (133)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	3-11/16 (100)	5-27/64 (137)	3/4 (19)	1-19/64 (33)	5-9/16 (141)	3-13/32 (87)	11/32 (9)	1-11/16 (43)

1. Port A must always be connected to the coil.

Table 2: VA9104 Actuated VG1275 and VG1875 Series Ball Valve with Sweat End Connections and VA9104 Actuated VG1295 and VG1895 Series Ball Valves with Press End Connections Dimensions, in. (mm)

Valve Size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	3-7/8 (98)	21/32 (17)	1-7/32 (31)	5-45/64 (145)	3-25/32 (96)	11/32 (9)	2-13/16 (55)
3/4 (DN20)	3-7/8 (98)	21/32 (17)	1-7/32 (31)	5-57/64 (150)	4-3/32 (104)	11/32 (9)	2-15/32 (62)
1 (DN25)	3-15/16 (100)	3/4 (19)	1-19/64 (33)	6-1/8 (156)	4-21/32 (118)	11/32 (9)	2-27/32 (72)

1. Port A must always be connected to the coil.

See Figure 7 for dimension drawings of the Spring Return VA9203 Series Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves. See Table 3 and Table 4 for specific model linkage dimensions.

Figure 7: Spring Return VA9203 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Installed Dimensions, in. (mm)

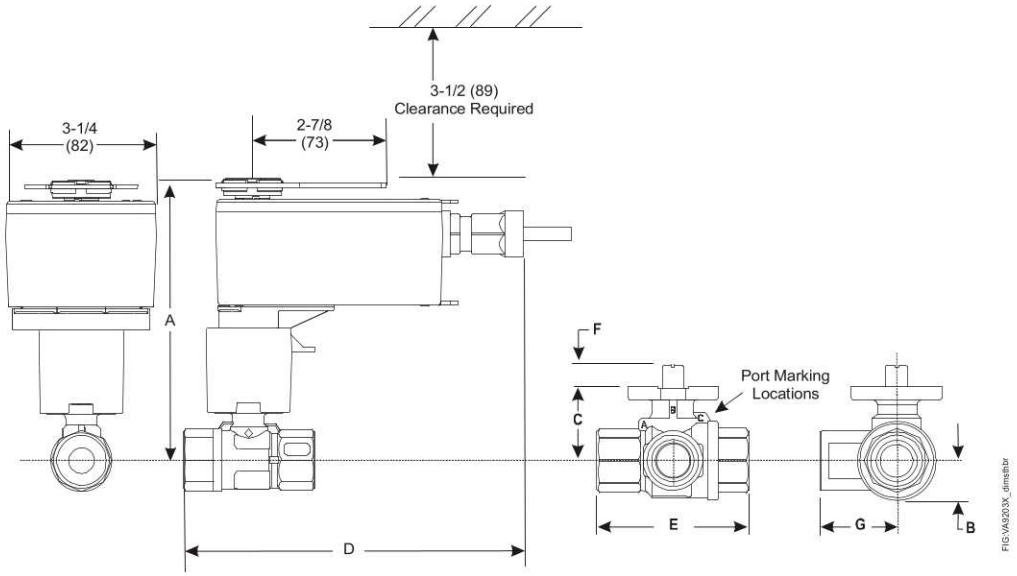


Table 3: VA9203 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with NPT End Connections Dimensions, in. (mm)

Valve Size, in. (DN)[1]	A (Without Thermal Barrier)	A (With Thermal Barrier)	B	C	D	E	F	G
1/2 (DN15)	4-1/4 (108)	6 (152)	21/32 (17)	1-7/32 (31)	6-23/32 (171)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	4-1/4 (108)	6 (152)	21/32 (17)	1-7/32 (31)	6-7/8 (175)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	4-9/32 (109)	6-1/16 (154)	3/4 (19)	1-19/64 (33)	7-7/64 (181)	3-13/32 (87)	11/32 (9)	1-45/64 (43)

1. Port A must always be connected to the coil.

Table 4: VA9203 Actuated VG1271, VG1275, VG1871, and VG1875 Series Sweat Ball Valve and VA9203 Actuated VG1291, VG1295, VG1891, and VG1895 Series Press Ball Valve Dimensions, in. (mm)

Valve Size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	4-5/8 (117)	21/32 (17)	1-7/32 (31)	7-13/64 (183)	3-25/32 (96)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	4-5/8 (117)	21/32 (17)	1-7/32 (31)	7-3/4 (197)	4-3/32 (104)	11/32 (9)	1-13/32 (36)
1 (DN25)	4-11/16 (119)	3/4 (19)	1-19/64 (33)	8-3/16 (208)	4-41/64 (118)	11/32 (9)	1-45/64 (43)

1. Port A must always be connected to the coil.

See Figure 8 for dimensions of the Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier. See Table 5 for specific model linkage dimensions.

Figure 8: Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Dimensions, in. (mm)

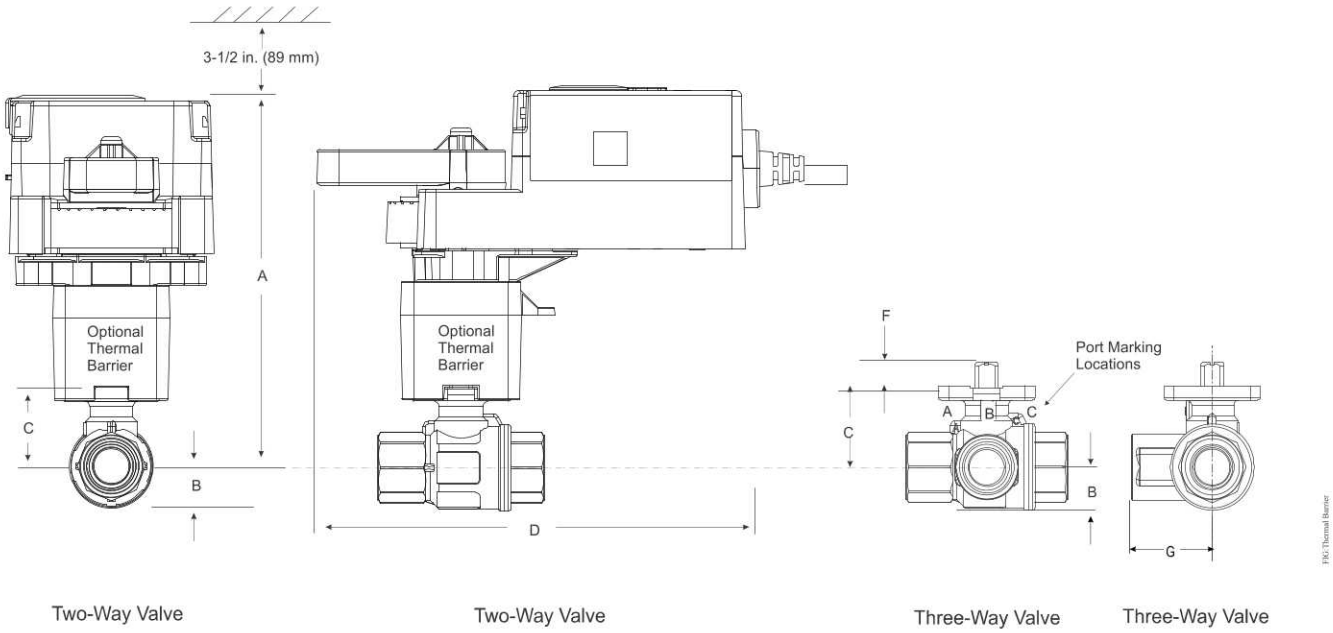


Table 5: VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Dimensions, in. (mm)

Valve Size, in. (DN)	A (With Thermal Barrier)	A (Without Thermal Barrier)	B	C	D	E	F	G
1/2 (DN15)	5-3/4 (146)	4-3/8 (111)	21/32 (17)	1-7/32 (31)	6-13/32 (163)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	5-3/4 (146)	4-3/8 (111)	21/32 (17)	1-7/32 (31)	6-13/32 (163)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	5-13/16 (148)	4-7/16 (113)	3/4 (19)	1-5/16 (33)	6-13/32 (163)	3-13/32 (87)	11/32 (9)	1-45/64 (43)
1-1/4 (DN32)	6-1/4 (159)	4-7/8 (124)	1-1/32 (26)	1-23/32 (44)	6-13/32 (163)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	6-13/32 (163)	5-1/32 (128)	1-1/8 (29)	1-7/8 (48)	6-13/32 (163)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	6-5/8 (168)	5-1/4 (133)	1-15/32 (37)	2-1/16 (53)	6-13/32 (163)	4-27/32 (123)	11/32 (9)	2-27/64 (62)

See Figure 9 for dimensions of the Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier and M9300-2 Switch Kit. See Table 6 for specific model linkage dimensions.

Figure 9: Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier and M9300-2 Switch Kit Dimensions, in. (mm)

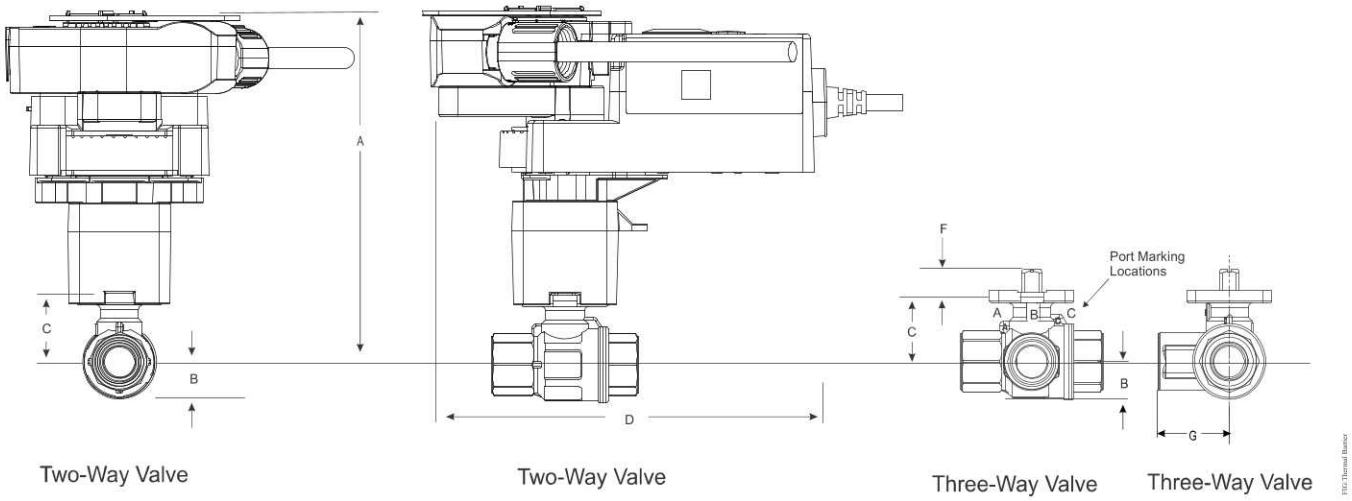


Table 6: VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier and M9300-2 Switch Kit Dimensions, in. (mm)

Valve Size, in. (DN)	A (With Thermal Barrier)	A (Without Thermal Barrier)	B	C	D	E	F	G
1/2 (DN15)	6-3/25 (155.7)	4-3/4 (120.7)	21/32 (17)	1-7/32 (31)	6-21/32 (169)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	6-3/25 (155.7)	4-3/4 (120.7)	21/32 (17)	1-7/32 (31)	6-21/32 (169)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	6-1/5 (157.7)	4-21/25 (122.7)	3/4 (19)	1-5/16 (33)	6-21/32 (169)	3-13/32 (87)	11/32 (9)	1-45/64 (43)
1-1/4 (DN32)	6-16/25 (168.7)	5-1/4 (133.7)	1-1/32 (26)	1-23/32 (44)	6-21/32 (169)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	6-4/5 (172.7)	5-3/7 (137.7)	1-1/8 (29)	1-7/8 (48)	6-21/32 (169)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	6 (177.2)	5-5/8 (142.7)	1-15/32 (37)	2-1/16 (53)	6-21/32 (169)	4-27/32 (123)	11/32 (9)	2-27/64 (62)

See Figure 10 for dimension drawings of the Spring Return VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves with M9000-561 Thermal Barrier. See Table 7 for specific model linkage dimensions.

Figure 10: Spring Return VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Installed Dimensions, in. (mm)

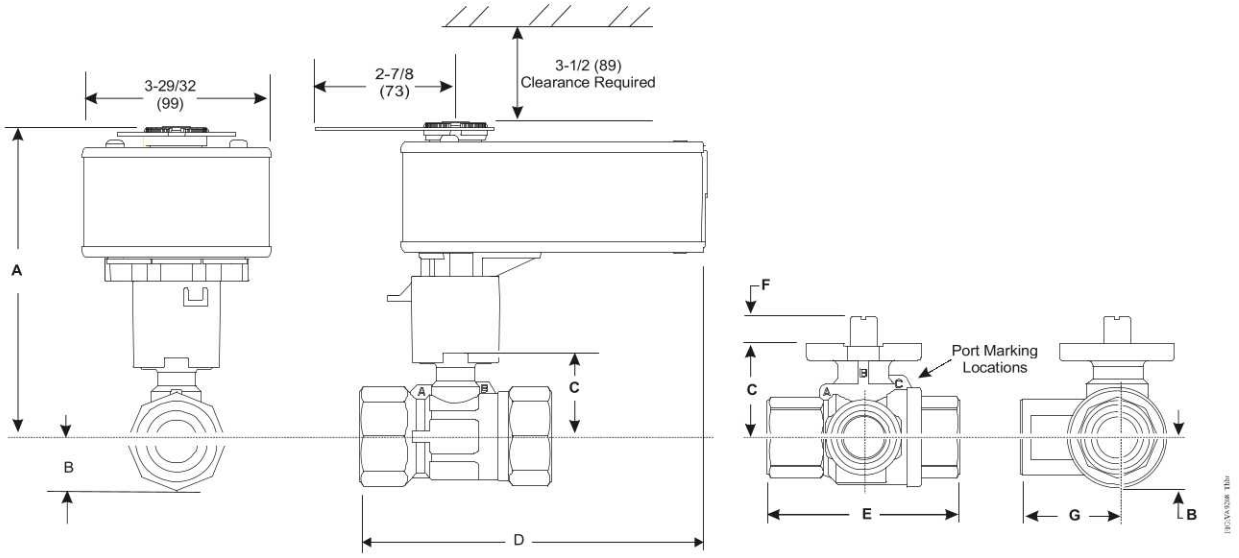


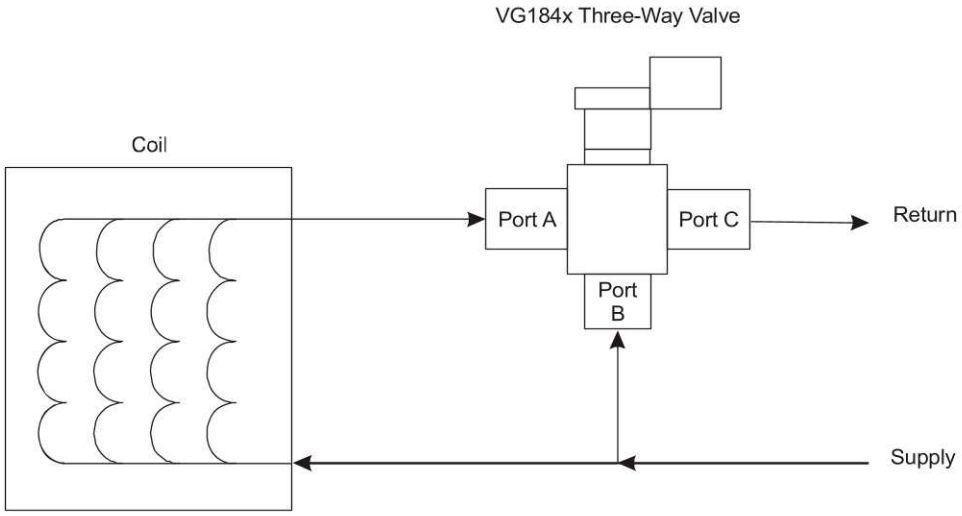
Table 7: VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Installed Dimensions, in. (mm)

Valve Size in. (DN)[1]	Valve Style	A (With Thermal Barrier)	A (Without Thermal Barrier)	B	C	D	E	F	G
1-1/4 (DN32)	All	9-17/64 (235)	7-11/16 (195)	1-1/32 (26)	1-23/32 (44)	7-1/4 (184)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	All	9-15/16 (240)	7-7/8 (200)	1-9/64 (29)	1-57/64 (48)	7-7/16 (189)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	2-way	9-31/32 (244)	8-1/32 (204)	1-15/32 (37)	2-1/8 (54)	7-11/16 (195)	4-27/32 (123)	11/32 (9)	N/A
	3-way					7-7/8 (200)			2-27/64 (62)

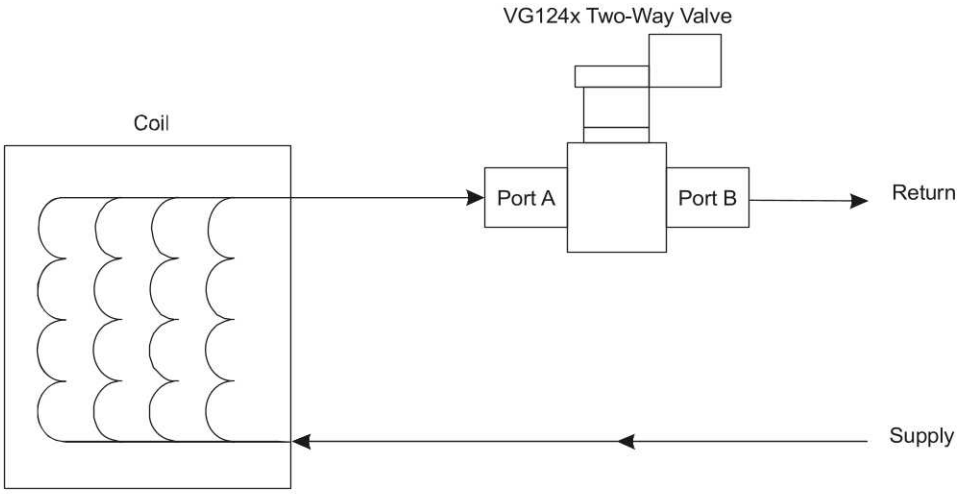
1. Port A must always be connected to the coil.

Piping

Figure 11: Typical VG1000 Piping



Typical Three-Way Ball Valve Application



Typical Two-Way Ball Valve Application

FIG-VG1000_typ4p

Note: Mount the valve downstream from the coil to minimize heat transfer to the actuator.

Wiring

Be sure to wire the input lines to the electric actuator correctly for the valve to move in the proper direction.

IMPORTANT: Use copper conductors only. Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the actuator's electrical ratings.

⚠ WARNING

Risk of Electric Shock.
Disconnect the power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

⚠ ADVERTISSEMENT

Risque de décharge électrique.
Débrancher l'alimentation avant de réaliser tout branchement électrique. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

WARNING: BRASS AND BRONZE MAY CONTAIN LEAD
To fulfill our obligations towards Article 33, in accordance to the European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list:

- Lead

⚠ WARNING This product is made of copper alloy, which contains lead. The product is therefore not to be used on drinking water.

⚠ WARNING This product can expose you to chemicals including lead, which is known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

Troubleshooting

Servicing the Actuator or Piping System

When servicing the electric actuator or the piping system:

- disconnect the power supply to the actuator
- relieve the pressure in the piping system

IMPORTANT: Do not attempt to manually rotate the drive shaft while the actuator is installed without first releasing the actuator gears. Manually rotating the drive shaft without releasing the actuator gears may result in permanent damage to the actuator.

Repair Information

If the VG1000 Series Forged Brass Ball Valve fails to operate within its specifications, replace the unit. For a replacement valve, contact the nearest Johnson Controls® representative.

Technical Specifications

VG1000 Series Forged Brass Ball Valves (Part 1 of 2)

Service[1]		Hot Water, Chilled Water, 50/50 Glycol Solutions, and 15 psig (103 kPa) Saturated Steam for HVAC Systems
Fluid Temperature Limits	Water	**VG12x1 and VG18x1 Series:** 23 to 203°F (-5 to 95°C) **VG12x5 and VG18x5 Series:** -22 to 284°F (-30 to 140°C)
	Steam	**VG12x1 Series:** Not Rated for Steam Service **VG12x5 Series:** 15 psig (103 kPa) at 250°F (121°C)
Maximum Fluid Temperature Limits	212°F (100°C)	VA9104
		VA9300
		VA9203
		VA9208
	284°F (140°C)	VA9104 with M9000-561 Thermal Barrier
		VA9300 with M9000-561 Thermal Barrier
		VA9203 with M9000-561 Thermal Barrier
		VA9208 with M9000-561 Thermal Barrier
Valve Body Pressure/ Temperature Rating	Water	**VG1241, VG1245, VG1841, and VG1845 Series:** 580 psig (4,000 kPa) at 203°F (95°C) (PN40) 464 psig (3,196 kPa) at 284°F (140°C) (PN40)
		VG1275 and VG1875 Series: 300 psig (2,067 kPa)
		VG1295 and VG1895 Series: 300 psig (2,067 kPa)
	Steam	15 psig (103 kPa) Saturated Steam
Maximum Closeoff Pressure		200 psig (1,378 kPa)
Maximum Recommended Operating Pressure Drop		50 psig (340 kPa)
Flow Characteristics	Two-Way	Equal Percentage
	Three-Way	Equal Percentage Flow Characteristics of In-line Port A (Coil) and Linear Flow Characteristics of Angle Port B (Bypass)
Rangeability[2]		Greater than 500:1
Minimum Ambient Operating Temperature	-4°F (-20°C)	VA9104 and M9104 Series Non-Spring Return Actuators
	-22°F (-30°C)	VA9203 Series Spring Return Actuators VA9300 Series Non-Spring Return Actuators
	-40°F (-40°C)	VA9208 Series Spring Return Actuators
Maximum Ambient Operating Temperature[3]	140°F (60°C)	VA9104 and VA9300 Series Non-Spring Return Actuators VA9203 and VA9208 Series Spring Return Actuators
Leakage		0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4 (Two- and Three-Way Control Port) 1% of Maximum Flow for Three-Way Bypass Port
End Connections		National Pipe Thread (NPT): 1/2 to 2 in. (DN15 to DN50) Sweat: 1/2 to 1 in. (DN15 to DN25) Use a low melting point solder. Press (ProPress compatible): 1/2 to 1 in. (DN15 to DN25) Press end connections are designed to work with RIDGID pressing tools.

VG1000 Series Forged Brass Ball Valves (Part 2 of 2)

Materials	Body	Forged Brass
	Ball	VG12x1 and VG18x1 Series: Chrome Plated Brass VG12x5 and VG18x5 Series: 300 Series Stainless Steel
	Blowout-Proof Stem	VG12x1 and VG18x1 Series: Nickel Plated Brass VG12x5 and VG18x5 Series: 300 Series Stainless Steel
	Seats	Graphite-Reinforced PTFE with Ethylene Propylene Diene Monomer (EPDM) O-Ring Backing
	Stem Seals	EPDM Double O-Rings
	Characterizing Disk	Amodel AS-1145HS Polyphthalamide Resin
Compliance CRN		For NPT threaded valves with Stainless Steel Ball (VG1x45...): 0C16910.5C

1. Proper water treatment is recommended; refer to the VDI 2035 Guideline.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.
3. In steam applications, install the valve with the stem horizontal to the piping and wrap the valve and piping with insulation.

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Part Name 零件名	Hazardous substance 有害物质					
	Pb 铅	Hg 汞	Cd 镉	Cr 六价铬	PBB 多溴联苯	PBDE 多溴二苯醚
Body parts 阀体	X	O	O	O	O	O
Trim parts 阀芯/阀杆	O	O	O	O	O	O
Plastic parts 塑料件	O	O	O	O	O	O

O: Identify that this hazardous substance is below specified limits as described in SJ/T 11363-2006.
O：确定该有害物质低于SJ/T 11363-2006中规定的限值。
X: Identify that this hazardous substance is above specified limits as described in SJ/T 11363-2006.
X：确认该有害物质高于SJ/T 11363-2006中规定的限值。

The Environmentally Friendly Used Period (EFUP) for all enclosed products and their parts is per the symbol shown here, unless otherwise marked. The Environmentally Friendly User Period is valid only when the product is operated under the conditions defined in the product bulletin.

除非另有标记，所有产品及其零件的环保使用期限（EFUP）均符合此处所示符号。仅当产品在产品公告中规定的条件下运行时，环保使用期限才有效。

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Patents

Patents: http://jcipat.com

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 - CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

Contact information

Contact your local branch office: www.johnsoncontrols.com/locations

Contact Johnson Controls: www.johnsoncontrols.com/contact-us

Building Technologies & Solutions

Headquarters: Milwaukee, Wisconsin, USA

Branch Offices: Principal Cities World-wide

Metasys CG, CV Equipment Controllers and XPM Expansion Modules Product Bulletin

LIT-12013105
13.0
2023-09-20

Overview

The Metasys General Purpose Application Controllers (CGs), VAV Box Controllers (CVs), and Input/Output Expansion Modules (XPMs) are a new, modernized family of equipment controllers which integrate in the web-based Metasys system.

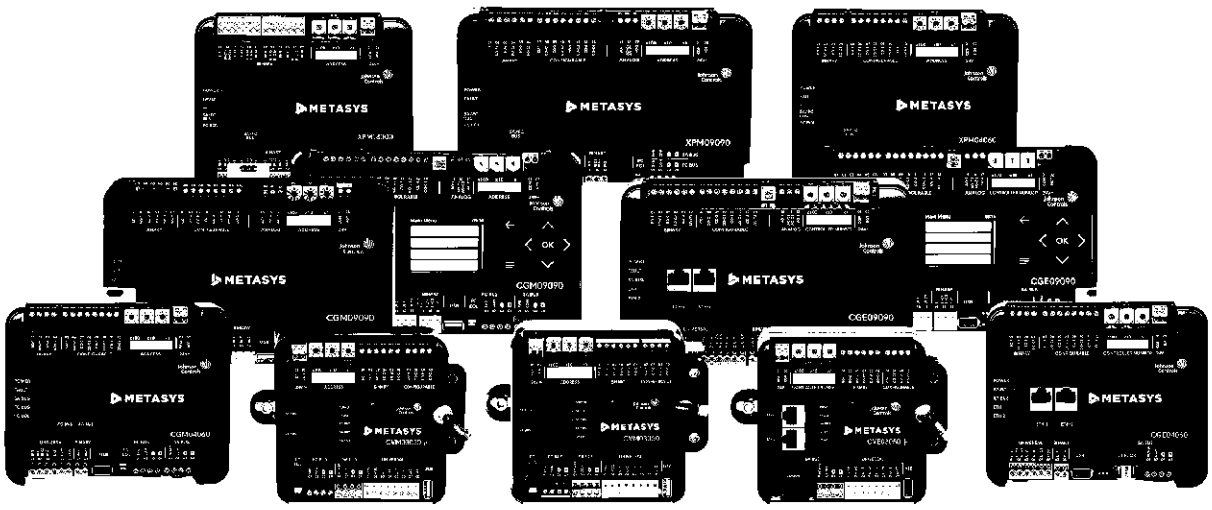
CG and CV Series Equipment Controllers

The CG series general purpose application controllers are well-suited for controlling a wide variety of facility and HVAC equipment, including fan coils, air handling units, packaged HVAC equipment, and central plant equipment. CG series controllers run pre-engineered and user-programmed applications. Some models feature an integral color display with a navigation keypad that enables enhanced local monitoring of controlled field equipment.

The CV series equipment controllers which include the CVM and CVE models, are designed for variable air volume (VAV) box applications. These controllers are fully programmable, but also feature a set of preloaded applications allowing these controllers to be made fully operational by selecting the appropriate VAV box application using the Mobile Access Portal (MAP) Gateway. CV series controllers feature an integral damper actuator, and a digital Differential Pressure Transducer (DPT) sensor. Certain models also feature an integral potentiometer to sense actual VAV box damper position. CG series and CV series controllers include an integral real-time clock, which enables the controllers to monitor and control schedules, calendars, and trends, and operate for extended periods of time as stand-alone controllers when offline from the Metasys system network.

These controllers feature an advanced design that provides optimum performance and easy access to power, network, and field terminations. These controllers are designed to install easily and communicate through standard RS485 BACnet® MS/TP, BACnet Secure Connect (BACnet/SC), or BACnet/IP protocols, which enables you to build a variety of equipment controller network applications, ranging from simple fan coil, heat pump, or VAV control applications to advanced central plant management and stand-alone applications. CGM and CVM controllers are switchable to N2 communications. Controllers running in N2 mode can be used to maintain or modernize sites with installed legacy Johnson Controls® controllers.

Figure 1: Metasys CG and CV Series Equipment Controllers and XPM Expansion Modules



XPM Series Expansion Modules

The M4-XPM series I/O expansion modules can serve in one of two capacities depending on where they are installed in the Metasys system. When installed on the Sensor/Actuator (SA) Bus of a Metasys equipment controller, an XPM expands the input and output interfaces that you can use with that equipment controller. When installed on the Field Controller (FC) Bus of a Metasys network engine, you can use an XPM as I/O point multiplexors to support monitoring and control from a Metasys network engine. The point multiplexor can also be useful for sharing points between other equipment controllers on the FC Bus using peer-to-peer connectivity.

Features and benefits

Sleek and modern packaging and styling

Provides a modern, aesthetically pleasing industrial design.

Standard hardware and software platform

Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows. Also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.

High memory capacity and fast processing power

Provides application engineers with the horsepower to meet sophisticated control requirements.

Auto-Tuned Control Loops

Proportional Adaptive Control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) delivers continuous control loop tuning, which reduces commissioning time, eliminates change-of-season re-commissioning, and reduces wear and tear on actuators.

Standard BACnet protocol

Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.

Models to support BACnet/SC and BACnet/IP communications

BACnet/IP and BACnet/SC use Ethernet cabling for higher speed communication and improved bandwidth. BACnet/SC is a new protocol that provides a secure method of communication on IP networks. It uses standards widely accepted by the IT community, eliminating many concerns of the IT community.

Models to support wired BACnet MS/TP, ZFR wireless, and N2 with streamlined workflow

CGM and CVM controllers can support multiple communication protocols without the need to purchase a special model per protocol and without extra manual setup. If an application configured for N2 communication is loaded on the controller, it automatically communicates through N2. Controllers otherwise default to MS/TP communication. If a ZFR Pro Wireless Field Bus Router is connected to the controller when the controller is initially powered on, it automatically enters wireless mode.

BACnet Testing Laboratories (BTL) listed and certified

Ensures openness and interoperability with other BTL-listed devices. BTL is a third-party agency, which validates that BAS vendor products meet the BACnet industry-standard protocol.

BACnet automatic discovery

Supports easy controller integration into a Metasys BAS.

Device Security

Ensures device integrity while the system is rebooting and during normal operation. Embedded software in the CGE and CVE controllers provides secure boot operation, firmware protection, secure communications, and secure firmware updates comply with cyber security best practices.

FIPS 140-2 Level 1 compliance using FIPS validated components

CGE and CVE controllers are FIPS 140-2 Level 1 compliant using FIPS validated components. FIPS 140-2 is a U.S. government cyber security standard used to approve cryptographic modules and algorithms used for encryption. Assures operators that Metasys uses leading cyber security techniques to help prevent unauthorized access to systems and data.

Wireless ZFR Pro support

Wireless ZFR Pro support provides a wireless alternative to hard-wired MS/TP networking, offering application flexibility and mobility with minimal disruption to building occupants, and also simplifies and speeds up replacements.

Integral real-time clock

An integral real-time clock, which enables the controllers to monitor and control schedules, calendars, and trends, and operate for extended periods of time as stand-alone controllers when offline from the Metasys system network.

Pluggable screw terminal blocks

Pluggable input/output wiring terminal blocks provide electrical installers and field technicians the ability to quickly and easily install and service a controller without the need to disconnect and reconnect the input/output wiring.

Rotary switches for controller address/controller number

Easy-to-use rotary switches set the MS/TP address or controller number in decimal format.

Universal Inputs and Configurable Outputs

Allows multiple signal options to provide input/output flexibility.

End-of-Line (EOL) switch in MS/TP devices

Enables equipment controllers and I/O expansion modules to be terminating devices on the communications bus.

Default configuration for equipment controller Input/Output wiring validation

Enables validation of the input and output terminals' wiring without having to download an application file.

Background transfer coupled with enable/disable logic options in Controller Configuration Tool (CCT) and System Configuration Tool (SCT)

Saves field technicians' time, enables productivity and minimizes equipment disruption, since the controllers are operating while file updates take place in the background and you can leave the application disabled until the system is ready to run.

SA Bus commissioning improvements

Saves field technicians' time when commissioning SA Bus devices by enabling an equipment controller to transfer and apply firmware files to all the SA Bus devices (XPM, IOM, NS8000) connected to it.

Small, convenient package size

Facilitates quick field installation and efficient use of space without compromising control performance

Models with onboard display and navigation keypad

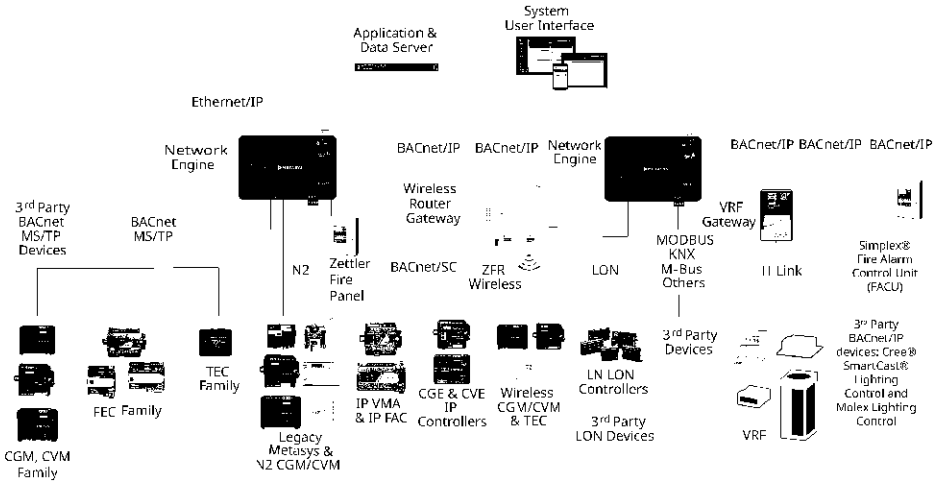
Provides an intuitive local interface for users to monitor point values and status, view alarms, view trends, override outputs, and adjust setpoints and parameters. The easy-to-use display provides the ability to quickly troubleshoot issues and restore control while being near the associated mechanical equipment.

Local Controller Display and the Mobile Access Portal (MAP) Gateway Support

Enable monitoring and commanding of I/O and configuration parameters.

Network diagram with equipment controllers

Figure 2: Metasys System with Equipment Controllers



Integration to the Metasys system supervisory devices

The CG and CV series equipment controllers are designed to integrate seamlessly into the Metasys system by connecting to, communicating with, and being supervised by Metasys network engines (including SNE, SNC, NAE, NIE, and NCE series network engines). This seamless integration of equipment controllers with Metasys network engines delivers coordinated, system-wide control and enables building operators to monitor and adjust equipment controllers from the Metasys system UI.

In addition, service personnel can view equipment controller information locally through an optional local controller display (M4-DLK0350-0 or MS-DIS1710-0) available for equipment controllers, or through the optional MAP Gateway.

Communications protocols

The CG and CV series controllers communicate using multiple communication protocols depending on the model and configuration. The CGE and CVE controllers communicate using BACnet/SC or BACnet/IP communication protocols. The CGM and CVM controllers communicate using BACnet MS/TP, N2, or ZFR wireless.

If you load an application configured for N2 communication on a CGM controller, it automatically communicates through N2. Controllers otherwise default to MS/TP communication. If you connect a ZFR Pro Wireless Field Bus Router to the CGM controller when the controller is initially powered on, it automatically enters wireless mode. This enables the same controller to support multiple communication protocols without the need to purchase a special model for each protocol, and without extra manual setup. Equipment controllers in BACnet/SC, BACnet/IP, or BACnet MS/TP communication mode are BACnet network-compliant devices.

The XPM expansion modules communicate using BACnet MS/TP, or wireless Zigbee® using a ZFR Pro Wireless Field Bus Router (on the FC Bus only). By default, the XPM expansion modules communicate using the BACnet MS/TP protocol.

The BACnet MS/TP protocol is a standard for ANSI, ASHRAE, and the International Standards Organization (ISO) for building controls.

You can use the CGM and CVM controllers as functional replacements for legacy N2 controllers. The N2-capable MS/TP equipment controller models provide a cost-effective upgrade and modernization path for customers with existing N2 controllers.

You can also install the CGM and CVM controllers in a wireless application using a ZFR Pro Wireless Field Bus Router, see Related products.

Hardware and installation

Metasys equipment controllers and expansion modules are encased in a durable plastic housing. The plastic housing may eliminate the need for a separate enclosure for plenum-rated construction. Check specific controller documentation and regional, national, and local code requirements for appropriate applications.

Metasys CG, CV family devices feature bright, color-coded LEDs, visible on the controller cover, that indicate the supply power, communications bus, and EOL switch status, as well as a variety of fault conditions to aid troubleshooting the controller and bus.

The equipment controllers ship with a default configuration that can assist in validating the wiring of the input and output terminals before you download an application file. When the controller is powered on in this configuration, the Fault LED will flash in a pattern of two quick blinks and then a long pause.

CG, CV family devices feature removable, color-coded, keyed, and labeled terminal block plugs for the input and output, supply power, and communications bus terminations.

CG, CV family devices feature rotary switches that allow you to set a valid and unique device address or controller number for each device on the bus. A blank space is included on the cover for recording the device address.

Integral mounting clips and a DIN rail track on the back plate of the CGM controllers and XPM devices allow you to easily mount the device either on a horizontal section of 35 mm DIN rail, or screw mount on a flat surface with three integral mounting clips on the device.

An integral EOL switch on MS/TP devices allows you to enable the device as a bus terminating device, which when properly configured, reduces reflected noise on the bus and improves bus communication.

Some CG series models feature an onboard display and navigation keypad that provides an intuitive local interface for users to monitor point values and status, view alarms, view trends, override outputs, and adjust setpoints and parameters. You can use the display to quickly troubleshoot issues and restore control while being near the associated mechanical equipment. You can adjust the brightness of the screen for readability in low-light environments. For equipment controllers that do not feature an onboard display, a remote mountable DLK0350 Local Controller Display model or the MAP Gateway are available that connect directly to the SA Bus port of the equipment controller. For more information, refer to the *M4-DLK Local Controller Display Product Bulletin (LIT-12014001)* and the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)*.

CG and CV Series Controllers

CG series model information

Table 1: CG series information including point type counts

CG series information	**Description**		
Communication protocol	**CGM09090-0/0H and CGM04060-0:** BACnet MS/TP, N2, or Zigbee Wireless (using add-on modules) **CGE09090-0/0H and CGE04060-0:** BACnet/SC or BACnet/IP		
Supported network engines	**CGM09090-0/0H and CGM04060-0:** All network engine model types **CGE09090-0/0H and CGE04060-0:** All network engine model types at R9.0 or later. Refer to the *Network Engines Product Bulletin (LIT-12012138)* and the *M4-SNE/M4-SNC Product Bulletin (LIT-12013296)* for details.		
Modular jacks	**CGM09090-0/0H and CGM04060-0:** FC and SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks **CGE09090-0/0H and CGE04060-0:** RJ-12 6-Pin Sensor Port		
Point types	**Signals accepted**	**M4-CGM09090-0/0H M4-CGE09090-0/0H**	**M4-CGM04060-0 M4-CGE04060-0**
Universal Input (UI)	15 VDC Power Source (Provide 100mA total current) Analog Input - Voltage Mode (0–10 VDC) Analog Input - Current Mode (4–20 mA) Analog Input - Resistive Mode (0–600k ohm), RTD (1k Nickel [Johnson Controls sensor], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input - Dry Contact Maintained Mode Universal Input Common	7	3

Table 1: CG series information including point type counts

CG series information	Description		
Binary Input (BI)	Binary Input - Dry Contact Maintained Mode Binary Input - Pulse Counter/Accumulator Mode Binary Input Common	2	1
Binary Output (BO)	Binary Output - 24 VAC Triac (External Power Source) Binary Output Common	3	2
Configurable Output (CO)	Analog Output - Voltage Mode (0–10 VDC) Binary Output - 24 VAC Triac Analog Output Signal Common Binary Output Signal Common	4	4
Analog Output (AO)	Analog Output - Voltage Mode (0–10 VDC) Analog Output - Current Mode (4–20 mA) Analog Output Signal Common	2	0
SA Bus	Supports up to 10 total wired SA Bus devices, including the XPM and IOM series expansion I/O modules.		
	Supports up to four NS Series Network Sensors.		
WRZ sensors	Supports up to nine WRZ sensors when using the ZFR or ZFR Pro Series wireless router configuration.		
	Supports up to five WRZ sensors when using the one-to-one WRZ-78xx wireless configuration.		

ⓘ **Note:** The models that end in **H** feature a built-in display.

Panel and sub-panel assembly options

CG series controllers and XPM expansion modules are optionally available in pre-wired panels and sub-panel assemblies. The panelized options provide all of the controllers necessary for a complete application solution, including a pre-wired power source and a latching or lockable door.

For more information about panel and sub-panel assembly options, refer to *M4-CGM/XPM Equipment Controller Standard Control Panel Assembly Catalog Page (LIT-1901089)*.

CV series features

In addition to the features listed in Features and benefits, CV series equipment controllers provide the following benefits:

An integrated damper actuator and digital Differential Pressure Transducer (DPT) sensor

Reduces installation time

Fast response actuator

Drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time

Preloaded, selectable applications

The CV series VAV box controller is shipped with a factory-installed library of the most popular VAV box control applications. You can make this controller fully operational by using the MAP Gateway to select the appropriate VAV box application, thereby, saving field technicians' time by eliminating the provisioning workflow.

Optional integrated feedback potentiometer

Users and field technicians of a VAV box damper can get reassurance on the damper's actual position, can confirm and troubleshoot VAV controller operations, confirm actuator is at the correct position, and track damper position.

CV installation

Field mounting the CV series controllers is straightforward. These controllers require minimal wiring and are mounted to the VAV box using a single sheet metal screw and a single set screw to lock the actuator to the damper shaft. The set screw has a self-locking cup point end to resist loosening due to vibration.

The actuator coupling is serrated, providing additional damper shaft grip and minimizing shaft slippage during operation. The coupling accommodates shafts from 10 mm (3/8 in.) square and up to 13 mm (1/2 in.) diameter round. A gear release lever allows easy resetting of the damper to fully open or fully closed.

The housing dimensions of the CV series controllers meet industry mounting requirements and make the controllers easy to handle.

The controller device address can be unique for each controller using the rotary switches that are accessible through the controller housing.

For more information about installing CV controllers, refer to *CV Series VAV Box Controllers Installation Guide (Part No. 24-10143-01590)*

CV series model information

Table 2: CV series information including point type counts

		M4-CVM03050-0	M4-CVM03050-0P	M4-CVE03050-0P
Communication protocols	**CVM models:** BACnet MS/TP, N2, or Zigbee Wireless using add-on modules **CVE models:** BACnet/SC or BACnet/IP			
Modular jacks	**CVM models:** FC and SA Bus modular ports: RJ-12 6-pin modular jacks **CVE models:** RJ-12 6-pin sensor port			
Point types	**Signals accepted:**			
Universal Input (UI)	15 VDC Power Source (Provides 35mA total current source) Analog Input - Voltage Mode (0–10 VDC) Analog Input - Resistive Mode (0–600k ohm), RTD (1k Nickel [Johnson Controls sensor], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input - Dry Contact Maintained Mode	3	3	3
Configurable Output (CO)	Analog Output - Voltage Mode (0–10 VDC) Binary Output - 24 VAC Triac Analog Output Signal Common Binary Output Signal Common	2	2	2
Binary Output (BO)	Binary Output - 24 VAC Triac	3	3	3
Integrated actuator	Internal	1	1	1
Differential pressure transducer	Internal	1	1	1
Integrated feedback potentiometer	Internal	No	Yes	Yes
SA Bus	Supports up to 10 total wired SA Bus devices, including the XPM and IOM series I/O expansion modules and up to 4 NS series network sensors.			
WRZ sensors	Support up to 9 WRZ sensors when using the ZFR Pro Series wireless router configuration			
	Support up to 5 WRZ sensors when using the one-to-one WRZ-7860 wireless configuration			

XPM Expansion Modules

Compatibility

You can connect XPM series expansion modules to the SA Bus of the following equipment controller device types:

- CG series General Purpose Application Equipment Controllers
- CV series VAV Box Controllers
- CCM Critical Environment Controller
- FAC series Advanced Application Field Equipment Controllers
- FEC series Field Equipment Controllers
- VMA16, VMA17, VMA18, and VMA19 series VAV Box Controllers
- SNC series Network Control Engines
- NCE series Network Control Engines

ⓘ **Note:** XPM series expansion modules may coexist on the SA Bus with IOM series input/output expansion modules.

You can connect XPM series expansion modules to the FC bus of the following network engine types:

- SNE series Network Engines
- SNC series Network Control Engines
- NAE35, NIE39, NAE45, NAE49, NAE55, and NAE59 series Network Automation and Integration Engines
- NCE25 and NIE29 series Network Control Engines

ⓘ **Note:** XPM series modules may coexist on the FC Bus with IOM series input/output expansion modules.

XPM series model information

Table 3: XPM series information including point type counts

		M4-XPM04060-0	M4-XPM09090-0	M4-XPM18000-0
Communication protocols	BACnet MS/TP			
Modular jacks	SA/FC Bus Port: RJ-12 6-Pin Modular Jack			
Point types	Signals accepted	Number of points		

Table 3: XPM series information including point type counts

		M4-XPM04060-0	M4-XPM09090-0	M4-XPM18000-0
Universal Input (UI)	15 VDC Power Source (Provide 100mA total current) Analog Input - Voltage Mode (0–10 VDC) Analog Input - Current Mode (4–20 mA) Analog Input - Resistive Mode (0–600k ohm), RTD (1k Nickel [Johnson Controls sensor], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode Universal Input Common	3	7	0
Binary Input (BI)	Binary Input, Dry Contact Maintained Mode Binary Input - Pulse Counter/Accumulator Mode Binary Input Common	1	2	18
Configurable Output (CO)	Analog Output - Voltage Mode (0–10 VDC) Binary Output 24 VAC Triac Analog Output Signal Common Binary Output Signal Common	4	4	0
Analog Output (AO)	Analog Output - Voltage Mode (0–10 VDC) Analog Output - Current Mode (4–20 mA) Analog Output Signal Common	0	2	0
Binary Output (BO)	Binary Output - 24 VAC Triac (External Power Source) Binary Output Common	2	3	0

Related products

For information about the Metasys system and related products, refer to *Metasys System Product Bulletin (LIT-1201526)*.

Controller Configuration Tool (CCT)

The CCT is used in conjunction with the Metasys system to configure, simulate, and commission equipment controllers.

For information about using CCT for configuration, simulation, and commissioning of the equipment controllers, refer to *Controller Configuration Tool (CCT) Catalog Page (LIT-1900386)*.

Mobile Access Protocol (MAP) Gateway

The MAP Gateway is a pocket-sized web server that provides a wireless mobile user interface to SMART Equipment and Johnson Controls branded equipment controllers and thermostats.

For more information on the MAP Gateway, refer to the *Mobile Access Portal Gateway Product Bulletin (LIT-12011884)*.

Connected Workflow Wireless MS/TP Converter (CWCVT)

The CWCVT is a Communications converter that provides a temporary wireless connection between a host device and equipment controllers that support the BACnet MS/TP protocol.

For more information on the CWCVT, refer to the *CWCVT Wireless MS/TP Converter Catalog Page (LIT-1901198)*.

Handheld VAV Balancing Tool

The Handheld VAV Balancing Tool lets you set the parameters for VAV applications that reside on CV series equipment controllers.

For more information on the Handheld VAV Balancing Tool, refer to the *Handheld VAV Balancing Tool Catalog Page (LIT-1090348)*.

Network Sensors

The NS Series Network Sensor offering includes NS Series Network Zone Sensors and NS Series Network Discharge Air Sensors. The NS Series Network Zone Sensors are designed to function directly with the Metasys equipment controllers.

For more product application information, ordering information, and technical specifications, refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574).*

WNC1830/ZFR183x Pro Series Wireless Field Bus System

The WRG1830/ZFR183x Pro (ZFR Pro) Series Wireless Field Bus System provides a wireless platform for BACnet MS/TP controllers using BACnet protocol over 2.4 GHz wireless ISM band. For more information, refer to the *WRG1830/ZFR183x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12013553).*

Ordering information

Table 4: Ordering information

Product code number	Description
M4-CGM09090-0	18-point General Purpose Application MS/TP Controller Includes: MS/TP and N2 communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input
M4-CGM09090-0H	18-point General Purpose Application MS/TP Controller Includes: MS/TP and N2 communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input; Integral 2.4 inch color display and navigation keypad
M4-CGM04060-0	10-point General Purpose Application MS/TP Controller Includes: MS/TP and N2 communication; 10 points (3 UI, 1 BI, 4 CO, 2 BO); real-time clock; 24 VAC input
M4-CGE09090-0	18-point General Purpose Application Ethernet Controller Includes: BACnet/SC and BACnet/IP communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 24 VAC input
M4-CGE09090-0H	18-point General Purpose Application Ethernet Controller Includes: BACnet/SC and BACnet/IP communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO)}; real-time clock; 24 VAC input; Integral 2.4 inch color display and navigation keypad
M4-CGE04060-0	10-point General Purpose Application Ethernet Controller Includes: BACnet/SC and BACnet/IP communication; 10 points (3 UI, 1 BI, 4 CO, 2 BO); real-time clock; 24 VAC input
M4-CVM03050-0	VAV Box Controller with Integrated Actuator and Digital Differential Pressure Transducer (DPT) Sensor Includes MS/TP and N2 communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 24 VAC input.
M4-CVM03050-0P	VAV Box Controller with Integrated Actuator, Position Feedback, and DPT Sensor Includes MS/TP and N2 communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 24 VAC input
M4-CVE03050-0P	VAV Box Controller with Integrated Actuator, Position Feedback, and DPT Sensor Includes BACnet/SC and BACnet/IP communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 24 VAC input.
M4-XPM04060-0	10-point Input/Output Expansion Module Includes: MS/TP communication; 10 points (3 UI, 1 BI, 4 CO, 2 BO); 24VAC input
M4-XPM09090-0	18-point Input/Output Expansion Module Includes: MS/TP communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); 24VAC input
M4-XPM18000-0	18-point Input Expansion Module Includes: MS/TP communication; 18 points (18 BI); 24VAC input

ⓘ **Note:** M4-CG series models, the M4-CVM03050-0P, the M4-CVE03050-0P, and the M4-XPM series models that comply with Buy American Act requirements are also available. To order the model that complies with the Buy American Act requirements, add a G to the end of the product code. For example, M4-CVM03050-0PG.

ⓘ **Note:** The following CV models are also available in bulk pack models: M4-CVM03050-0D, M4-CVM03050-0PD,M4-CVE03050-0PD

Table 5: Accessories (order separately)

Product code number	Description
IOM Series Expansion Modules	Refer to the *Metasys System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for a complete list of available Expansion Modules.
TL-CCT-0	License enabling Controller Configuration Tool (CCT) software for one user
MS-FCP-0	License enabling Metasys Equipment Controller Firmware Package Files required for CCT
TL-CWCVT-0	Communications converter that provides a temporary wireless connection between a host device and equipment controllers that support the BACnet MS/TP protocol.
M4-DLK0350-0	Local Controller Display, 3.5 in. (89 mm) color display with navigation keypad.
NS-ATV7003-0	Handheld VAV Balancing Tool
NS Series Network Sensors	Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
AS-CBLTSTAT-0	Cable adapter for connection to 8-pin TE-6700 Series sensors
NS-WALLPLATE-0	Network Sensor Wall Plate
WRZ Series Wireless Room Sensors	Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for specific sensor model descriptions.
WRZ-7860-0	Refer to the *WRZ-7860 Receiver for One-to-One Wireless Room Sensing Product Bulletin (LIT-12011640)* for a list of available products.
WRZ-SST-120	Refer to the *WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (LIT-24-10563-55)* for usage instructions.
ZFR-HPSST-0	Wireless System Survey Tool. For use with the higher power WRG1830/ZFR183x System and lower power WRZ Sensors (10 mW). Refer to the *High Power Wireless Sensing System Tool Installation Instructions (LIT-24-11461-00012)* for usage instructions.
WRG1830/ZFR183x Pro Series Wireless Field Bus System	For more information on products needed for wireless field bus installations and for a list of available products, refer to the *WRG1830/ZFR183x Pro Series Wireless Field Bus System Catalog Page (LIT-1901153)*.
ZFR-USBHA-0	ZFR USB Dongle provides a wireless connection through CCT to allow wireless commissioning of the wirelessly enabled CGM and CVM controllers. It also allows use of the ZFR Checkout Tool (ZCT) in CCT. ⓘ **Note:** The ZFR-USBHA-0 is not compatible with the WRG1830/ZFR183x Pro Series. ⓘ **Note:** The ZFR-USBHA-0 replaces the IA OEM DAUBI_2400 ZFR USB dongle. For additional information about the ZFR-USBHA-0 ZFR dongle, refer to the *ZCT Checkout Tool Help LIT-12012292* or the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356)*.
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 72.2 cm (30 in.), Primary Leads and 76.2 cm (30 in.) Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 20.32 cm (8 in.), Primary Leads and 76.2 cm (30 in.) Secondary Leads, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 20.32 cm (8 in.), Primary Leads and Secondary Screw Terminals, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 20.32 cm (8 in.), Primary Leads and Secondary Screw Terminals, Class 2
MS-FIT100-0	The Field Inspection Tool or (FIT) is a portable handheld device with a user interface that is used to test and troubleshoot the BACnet protocol MS/TP RS-485 communications bus that connects supervisory controllers and equipment controllers to field point interfaces. You can use the FIT to check out the wiring of the MS/TP RS-485 bus as well as verify proper communications of supervisory controllers and equipment controllers connected to the bus. You can use the FIT on both the FC Bus and SA Bus.
TL-BRTRP-0	Portable BACnet/IP to MS/TP Router
ACC-TBKPWFCSA-0	Power, FC Bus, and SA Bus terminal block replacement kit for SNC, CG, CV, CCM, and XPM products. Kit includes 5 of each terminal block type. 15 terminal blocks in total.
ACC-TBKINOUT-0	Input and Output terminal block replacement kit for SNC, CG, CV, CCM, and XPM products. Kit includes 5 of each 2, 3, and 4 position Input and Output terminal blocks. 30 terminal blocks in total.

Table 5: Accessories (order separately)

Product code number	Description
ACC-CVDPT-0R	Replacement DPT sensor with barbed fittings for CV series VAV controllers with Rev B boards, with date code starting from RY12106 to present.
M4-CVACT-0R	Actuator Assembly Replacement Kit for M4-CV series controllers.

CG series technical specifications

Table 6: Technical specifications for CG series controllers

Specification	Description
Power requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power consumption	**M4-CGM models:** 14 VA maximum[1] **M4-CGE models:** 15 VA maximum ⓘ **Note:** The USB feature is not currently supported.
Power source	+15 VDC power source terminals provide 100 mA total current. **M4-CGM09090, M4-CGE09090:** Two +15VDC power sources terminal located in Universal IN terminals for active (3-wire) input devices **M4-CGM04060, M4-CGE04060:** One +15VDC power sources terminal located in Universal IN terminals for active (3-wire) input devices
Ambient conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 10 to 90% RH noncondensing **Storage:** -40°C to 80°C (-40°F to 176°F); 5 to 95% RH noncondensing
Supported network engines	**M4-CGM models:** All network engine model types **M4-CGE models:** All network engine model types at R9.0 or later.
Communications protocol	**M4-CGM models:** BACnet MS/TP, N2, ZFR Wireless also supported (at FC Bus and for Sensors) with additional hardware. **M4-CGE models:** BACnet/IP or BACnet/SC
Device addressing for BACnet MS/TP	Decimal address set using three rotary switches: valid controller device addresses 4-127
Device addressing for N2	Decimal address set using three rotary switches: valid controller device addresses 1-253
Controller number for Ethernet controllers	Three rotary switches to assign a unique number for each controller to physically identify the controller and relate it to the building drawings; valid controller numbers 0-999
Communications bus	**M4-CGM models** BACnet MS/TP (default); N2 3-wire FC Bus between the supervisory controller and equipment controllers **M4-CGE models** BACnet/IP (default); BACnet/SC Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector **All M4-CG models** 4-wire SA Bus between equipment controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power, from equipment controller, to bus devices.
Processor	RX64M Renesas® 32-Bit microcontroller
Memory	16 MB flash memory and 8 MB SDRAM
Real-time clock backup power supply	Super capacitor maintains power to the onboard real-time clock for a minimum of 72 hours when supply power to the controller is disconnected.
Input and Output capabilities	**M4-CGM09090, M4-CGE09090** 7 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 4 - Configurable Outputs: Defined as 0-10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA 3 - Binary Outputs: Defined as 24 VAC Triac (external power source only) **M4-CGM04060, M4-CGE04060** 3 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact 1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 4 - Configurable Outputs: Defined as 0-10 VDC or 24 VAC Triac BO 2 - Binary Outputs: Defined as 24 VAC Triac (external power source only)

Table 6: Technical specifications for CG series controllers

Specification	Description
Universal Input (UI) resolution/ Analog Output (AO) accuracy	**Input:** 24-bit Analog to Digital converter **Output:** +/- 200 mV accuracy in 0–10 VDC applications
Terminations	**Input/Output:** Pluggable Screw Terminal Blocks **FC Bus, SA Bus, and Supply Power:** 4-Wire and 2-Wire Pluggable Screw Terminal Blocks **FC and SA Bus Modular Ports:** RJ-12 6-Pin Modular Jacks ⓘ **Note:** The FC Bus Terminal and FC Bus Port are only available on the CGM models
Mounting	Horizontal on single 35 mm DIN rail mount (recommended), or screw mount on flat surface with three integral mounting clips on controller
Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; Self-extinguishing Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**M4-CGM09090, M4-CGE09090:** 150 mm x 190 mm x 44.5 mm (5-7/8 in. x 7-1/2 in. x 1-3/4 in.) including terminals and mounting clips. **M4-CGM04060, M4-CGE04060:** 150 mm x 152 mm x 44.5 mm (5-7/8 in. x 6 in. x 1-3/4 in.) including terminals and mounting clips ⓘ **Note:** Mounting space requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**M4-CGM04060,M4-CGE04060:** 0.29 kg (0.64 lb) **M4-CGM09090,M4-CGE09090:** 0.4 kg (0.89 lb) **M4-CGM09090-0H,M4-CGE09090-0H:** 0.47 kg (1.04 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7 CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	**Australia and New Zealand:** RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 18 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on ANSI/ASHRAE 135-2020
UK CA	**United Kingdom:** Johnson Controls declares that this product is in compliance with Electromagnetic Compatibility Regulations, The Electrical Equipment (Safety) Regulations, and Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations.

1 The VA rating does **not** include any power supplied to the peripheral devices connected to Configurable Outputs (COs) or Binary Outputs (BOs), which can consume up to 12 VA for each CO or BO; for a possible total consumption of an additional 84 VA (maximum).

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

CV series technical specifications

Table 7: Technical specification for CV Series Controllers

Specification	Description
Power requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power consumption	10 VA typical, 14 VA maximum[1] ⓘ **Note:** The USB feature is not currently supported.
Power source	+15 VDC power source terminals provide 35 mA total current. Quantity 1 located in Universal IN terminals - for active (3-wire) input devices
Ambient conditions	**Operating:** 0°C to 50°C (32°F to 122°F) **Storage:** -40°C to 70°C (-40°F to 158°F)
Network engines	**M4-CVM models:** All network engine model types **M4-CVE03050-0P:** All network engine model types at R9.0 or later.
Communications protocol	**M4-CVM models:** BACnet MS/TP, N2, Zigbee Wireless also supported (at FC Bus and for Sensors) with additional hardware. **M4-CVE03050-0P:** BACnet/SC or BACnet/IP
Device addressing for BACnet MS/TP	Decimal address set using the three rotary switches: valid controller device addresses 4-127
Controller number for Ethernet controller	3 rotary switches to assign a unique number for each controller to physically identify the controller and relate it to the building drawings; valid controller numbers 0-999
Device addressing for N2	Decimal address set using the three rotary switches: valid controller device addresses 1-253
Communications bus	**M4-CVM models:** BACnet MS/TP (default), N2. CV Series controllers support wireless functionality for the FC bus and for sensors with additional hardware. 3-wire FC Bus between the supervisory controller and equipment controllers ⓘ **Note:** For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).* **M4-CVE03050-0P:** BACnet/IP (default); BACnet/SC Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector **All CV series models:** 4-wire SA Bus between equipment controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from equipment controller) to bus devices
Processor	RX64M 32-bit Renesas microcontroller
Memory	16MB Flash Memory and 8MB SDRAM
Real-time clock backup power supply	Super capacitor maintains power to the onboard real-time clock for a minimum of 72 hours when supply power to the controller is disconnected.
Input and output capabilities	**3 - Universal Inputs**: Defined as 0–10 VDC, 0–600k ohms, or Binary Dry Contact **2 - Configurable Outputs:** Defined as 0-10 VDC or 24 VAC Triac BO **3 - Binary Outputs:** Defined as 24 VAC Triac (internal power)
Universal Input (UI) Resolution/ Configurable Output (CO) accuracy	**UI Analog Input Mode:** 15-bit resolution on UIs **CO Analog Output Mode:** 0–10 VDC ± 200 mV
Air pressure differential sensor	Range: -2 in. to 2 in. H2O **Performance Characteristics:** Typical accuracy at ambient operating conditions: +/- 0.5 % in. Water column full scale Typical accuracy at zero (null) pressure is +/- 0.0006 in. Water column
Actuator rating	4 N·m (35 lb·in) minimum shaft length = 44 mm (1-3/4 in.) (if provided)

Table 7: Technical specification for CV Series Controllers

Specification	Description
Terminations	**Inputs/Outputs**: Pluggable Screw Terminal **FC Bus, SA Bus, and Supply Power**: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks **FC and SA Bus Modular Ports**: RJ-12 6-Pin Modular Jacks ⓘ **Note:** The FC Bus Terminal and FC Bus Port are only available on the CVM models
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw
Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; Self-extinguishing **Protection Class:** IP20 (IEC529)
Dimensions **(height x width x depth)**	165 mm x 125 mm x 73 mm (6.5 in. x 4.92 in. x 2.9 in.) **Center of Output Hub to Center of Captive Spacer:** 135 mm (5-5/16 in.)
Weight	0.69 kg (1.52 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment. FCC Compliant to CFR47, Part 15, Subpart B, Class A. Suitable for Use in Other Environmental Air Space (Plenums) in Accordance with Section 300.22(C) of the National Electrical Code.
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment. Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant.
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 18 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on ANSI/ASHRAE 135-2020
UK CA	**United Kingdom:** Johnson Controls declares that this product is in compliance with Electromagnetic Compatibility Regulations, the Electrical Equipment (Safety) Regulations, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations.

1 The VA rating does not include any power supplied to the peripheral devices connected to Configurable Outputs (COs) or Binary Outputs (BOs), which can consume up to 12 VA for each CO or BO, for a possible total consumption of an additional 60 VA (maximum).

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

XPM Expansion Modules technical specifications

Table 8: Technical specifications

Specification	Description
Power requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power consumption	14 VA maximum ⓘ **Note:** The VA rating does not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO; for a possible total consumption of an additional 84 VA (maximum).

Table 8: Technical specifications

Specification	Description
Power source	+15 VDC power source terminals provide 100 mA total current. ⓘ **Note:** Only present on XPM09090 and XPM04060 models. • **M4-XPM09090-0:** Quantity 2-located in Universal Input terminals for active (3-wire) input devices. • **M4-XPM04060-0:** Quantity 1-located in Universal Input terminals for active (3-wire) input devices.
Ambient conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 10% to 90% RH noncondensing **Storage:** -40°C to 80°C (-40°F to 176°F); 5% to 95% RH noncondensing
Communications protocol	BACnet MS/TP; Zigbee Wireless also supported (at FC Bus and for Sensors) with additional hardware. XPM expansion modules support Zigbee wireless functionality for the FC bus and for sensors with additional hardware.
Device addressing for BACnet MS/TP	Decimal address set using the three rotary switches; valid controller device addresses 4-127
Communications bus	RS-485 3-wire FC Bus between the supervisory controller and expansion modules 4-wire SA Bus between equipment controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from equipment controller) to bus devices.
Processor	RX64M Renesas® 32-Bit microcontroller
Memory	16 MB flash memory and 8 MB SDRAM
Input and output capabilities	**Universal Inputs:** Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact **Binary Inputs:** Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode **Configurable Outputs:** Defined as 0-10 VDC or 24 VAC @500mA Triac BO **Analog Outputs:** Defined as 0–10 VDC or 4–20 mA **Binary Outputs:** Defined as 24 @500mA VAC Triac (external power source only)
Universal Input (UI) Resolution / Analog Output (AO) Accuracy	**Input:** 24-bit Analog to Digital converter **Output:** +/- 200 mV accuracy in 0–10 VDC applications
Terminations	**Input/Output:** Pluggable Screw Terminal Blocks **SA/FC Bus and Supply Power:** 4-Wire and 2-Wire Pluggable Screw Terminal Blocks **SA/FC Bus Port:** RJ-12 6-Pin Modular Jack
Mounting	Horizontal on single 35 mm DIN rail mount (recommended), or screw mount on flat surface with three integral mounting clips on controller
Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; Self-extinguishing Protection Class: IP20 (IEC529)
Dimensions (height x width x depth)	**XPM09090-0:** 150 mm x 190 mm x 44.5 mm (5-7/8 in. x 7-1/2 in. x 1-3/4 in.) including terminals and mounting clips **XPM04060-0 and XPM18000-0:** 150 mm x 152 mm x 44.5 mm (5-7/8 in. x 6 in. x 1-3/4 in.) including terminals and mounting clips ⓘ **Note:** Mounting space requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**XPM09090-0:** 0.5 kg (1.1 lb) **XPM04060-0 and XPM18000-0:** 0.29 kg (0.64 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7 CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003

Table 8: Technical specifications

Specification	Description
CE	**Europe:** Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 18 Listed and Certified BACnet Smart Actuator (B-SA), based on ANSI/ASHRAE 135-2020
UK CA	**United Kingdom:** Johnson Controls declares that this product is in compliance with Electromagnetic Compatibility Regulations, The Electrical Equipment (Safety) Regulations, and Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations.

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Compliance for CG Series and CV Series Controllers

North American emissions compliance

United States

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the users will be required to correct the interference at their own expense.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Industry Canada Statement(s)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage, et
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Repair information

If a controller, network sensor, or any related product fails to operate within its specifications, replace the product. For replacement products, contact the nearest Johnson Controls representative.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Patents

Patents: https://jcipat.com

Single point of contact

APAC	EU	UK	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS TYCO PARK GRIMSHAW LANE MANCHESTER M40 2WL UNITED KINGDOM	JOHNSON CONTROLS 5757 N GREEN BAY AVE. GLENDALE, WI 53209 USA

Vertical Wallbox-Mounted or Surface-Mounted NS Series Network Sensors Product Bulletin

LIT-12013113

2023-07-20

Overview

Figure 1: LCD full color graphical display, LCD fixed segment display, Warmer/Cooler interface, No display

The NS Series Network Sensors function directly with Metasys® system Field Equipment Controllers (FECs), Metasys Network and Control Engines (NCEs), Advanced Application Field Equipment Controller (FACs), Metasys VAV Box Equipment Controllers (CVM), General Purpose Application Controllers (CGM), VAV Modular Assembly (VMA16) Controllers, and Facility Explorer™ FX-PC Series Programmable Controllers (FX-PCGs, FX-PCVs, and FXPCXs). The sensors are also compatible with Verasys® and Johnson Controls® Smart Equipment.

The NS Series Network Sensors monitor zone temperature, relative humidity (RH), carbon dioxide (CO_2), motion, and local temperature setpoint adjustments. The sensor transmits this data to a controller on the Sensor/Actuator (SA) bus.

Some NS Series Network Sensors models include an onboard passive infrared (PIR) occupancy sensor that detects motion to determine if a space is occupied. This feature maximizes up to 30% energy savings in high-energy usage environments such as schools, dormitories, offices, hospitals, and hotels by adjusting the temperature of the space based on the occupancy status. In addition, the PIR occupancy sensor facilitates trending of floor space usage in these environments.

Display models of the NS Series Network Sensors are available with a backlit LCD fixed segment display or a full color graphical LCD interface. These models allow the user to view zone temperature, RH, CO_2, and adjust the zone temperature setpoint and fan speed. Graphical models provide a summary of sensor values at the base of the display. Fixed segment models have the capability to set the default display to temperature, RH, or temperature setpoint.

The user can also choose between degrees Fahrenheit (F) and degrees Celsius (C). To prevent tampering with the sensor, display models also include a screen lockout feature. The graphical display allows the user to choose between a light or dark color theme and to set the sleep mode to dim or turn off.

Some models also have a Warmer/Cooler interface to adjust the zone temperature. Instead of a display, these models have two cap touch buttons with seven LED lights that represent the current setpoint. The display models include the following fan speeds: automatic, off, low, medium, or high.

Interaction with the sensor sets the occupancy override function to signal to the controller that the zone is occupied and to override the scheduled mode. The LCD full color graphical models use the graphical user interface to set a unique BACnet® address for applications that require multiple sensors. Other models have DIP switches to set a unique address for applications that require multiple sensors. All models ship standard with modular phone jacks and screw terminals to terminate the wiring connecting the sensors to the controller.

ⓘ **Note:** To connect the NS Series Network Sensor to the same SA bus segment, use only one of the two connection methods, either the modular phone jack or the screw terminals.

Each network sensor includes a SA bus access port, allowing for accessories to connect to the SA bus. Through this connector, the user can use accessories to service or commission the connected controller or gain access to any other controller on the same field controller (FC) bus.

ⓘ **Note:** Device programming for the NS8000 sensor connected to the controller does not include balancing functionality and features.

The NS Series Network Sensors can be surface mounted or vertical wallbox mounted to meet the requirements of the specific application. All display models are optimized for the California Energy Code (Title 24). To suit specific architectural and interior design needs, the models come with either black or white enclosures.

Modern enclosures in black or white design themes are available in the following styles:

- **LCD fixed segment display** and **LCD full color graphical display**: View zone temperature, RH, CO2 , occupancy status, and adjust the zone temperature setpoint and fan speed. These models have the capability to set the default display to temperature, RH or temperature setpoint. On these display models, you can also choose between degrees Fahrenheit (F) and degrees Celsius (C).
- **Warmer/Cooler interface**: This interface incorporates cap touch buttons with seven LED lights that represent the current setpoint status.
- **No display**: The NS Series Network Sensors are available in high gloss black or white with or without the Johnson Controls logo.
- All sensors are serialized for quality and warranty purposes. Based on the serial number, the user can obtain factory calibration certificates.

ⓘ **Note:** : The LCD full color graphical models are only available in white. See Table through Table for ordering information.

Features and benefits

Features	Benefits
BACnet® MS/TP protocol communication	Provides compatibility with Metasys system field controllers, Facility Explorer programmable controllers as well as Verasys and Johnson Controls Smart Equipment in a proven communication network.
Single and multifunctional sensors	Choose temperature, RH, CO_2, and occupancy sensing depending on HVAC needs.
Large backlit fixed segment display available on some models	Provides real-time status of the environment with backlighting activated during user interaction.
Simple temperature setpoint adjustment or Warmer/ Cooler mode available on display models	Configure simple setpoint adjustment or Warmer/Cooler mode.
Onboard occupancy sensor available on PIR models	Maximizes up to 30% energy savings in high-energy usage environments, and facilitates trending of floor space usage.
Temporary occupancy included on all display and Warmer/Cooler models	Provides a timed override command, which initiates a temporary occupancy state.
Field-selectable default display setting on display models	Toggle between temperature, RH or temperature setpoint on the display, and set the required default for continuous viewing.
Fahrenheit/Celsius (°F/°C) selectable on display models	Display temperature in degrees Fahrenheit or degrees Celsius.
All display models meet California Energy Code (Title 24)	Displays the required State of California Title 24 economizer fault conditions.
All display models include a screen lockout	Prevents sensor tampering.
Serialized sensors and calibration certificates	Obtain factory calibration certificates for all models.

Ordering information

See Table 1 through Table 6 for the various NS Series Network Sensor models available. See Table 7 for accessories.

ⓘ **Note:** Product codes marked with an asterisk are made in America to meet the Buy American Standard.

➤ **Important:** The NS Series Network Sensor is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the network sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the network sensor.

ⓘ **Note:** Keep the Metasys system software up to date as some NS Series Network Sensor features are not supported in previous releases of Metasys, Facility Explorer, Verasys, or Johnson Controls Smart Equipment system software.

Repair information

If the NS Series Network Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls representative.

Selection charts

Table 1: NS Series Network Sensor ordering information: temperature, humidity and CO_2 models (3% RH)

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BHC040-0	No display	Yes	White	No
NSB8BHC041-0		No	White	No
NSB8BHC042-0		Yes	Black	No
NSB8BHC043-0		No	Black	No
NSB8MHC040-0		Yes	White	Yes
NSB8MHC041-0		No	White	Yes
NSB8MHC042-0		Yes	Black	Yes
NSB8MHC043-0		No	Black	Yes
NSB8BHC040-0G*		Yes	White	No
NSB8MHC040-0G*		Yes	White	Yes
NSB8BHC240-0	Fixed segment display	Yes	White	No
NSB8BHC241-0		No	White	No
NSB8BHC242-0		Yes	Black	No
NSB8BHC243-0		No	Black	No
NSB8MHC240-0		Yes	White	Yes
NSB8MHC241-0		No	White	Yes
NSB8MHC242-0		Yes	Black	Yes
NSB8MHC243-0		No	Black	Yes
NSB8BHC240-0G*		Yes	White	No
NSB8MHC240-0G*		Yes	White	Yes
NSB8BHC140-0	Warmer/Cooler interface	Yes	White	No
NSB8BHC141-0		No	White	No
NSB8BHC340-0	Graphical user interface	Yes	White	No
NSB8BHC341-0		No	White	

Table 2: NS Series Network Sensor ordering information: temperature and humidity models (3% RH)

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BHN240-0	Fixed segment display	Yes	White	No
NSB8BHN241-0		No	White	No
NSB8BHN242-0		Yes	Black	No
NSB8BHN243-0		No	Black	No
NSB8MHN240-0		Yes	White	Yes
NSB8MHN241-0		No	White	Yes
NSB8MHN242-0		Yes	Black	Yes
NSB8MHN243-0		No	Black	Yes
NSB8BHN240-0G*		Yes	White	No

Table 2: NS Series Network Sensor ordering information: temperature and humidity models (3% RH)

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BHN040-0	No display	Yes	White	No
NSB8BHN041-0		No	White	No
NSB8BHN042-0		Yes	Black	No
NSB8BHN043-0		No	Black	No
NSB8MHN040-0		Yes	White	Yes
NSB8MHN041-0		No	White	Yes
NSB8MHN042-0		Yes	Black	Yes
NSB8MHN043-0		No	Black	Yes
NSB8BHN040-0G*		Yes	White	No
NSB8BHN140-0	Warmer/Cooler interface	Yes	White	No
NSB8BHN141-0		No	White	No
NSB8BHN142-0		Yes	Black	No
NSB8BHN143-0		No	Black	No
NSB8BHN140-0G*		Yes	White	No
NSB8BHN340-0	Graphical user interface	Yes	White	No
NSB8BHN341-0		No	White	No

Table 3: NS Series Network Sensor ordering information: temperature and CO_2 models

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BTC040-0	No display	Yes	White	No
NSB8BTC041-0		No	White	No
NSB8BTC042-0		Yes	Black	No
NSB8BTC043-0		No	Black	No
NSB8MTC040-0		Yes	White	Yes
NSB8MTC041-0		No	White	Yes
NSB8MTC042-0		Yes	Black	Yes
NSB8MTC043-0		No	Black	Yes
NSB8BTC040-0G*		Yes	White	No
NSB8MTN040-0G*		Yes	White	Yes
NSB8BTC240-0	Fixed segment display	Yes	White	No
NSB8BTC241-0		No	White	No
NSB8BTC242-0		Yes	Black	No
NSB8BTC243-0		No	Black	No
NSB8MTC240-0		Yes	White	Yes
NSB8MTC241-0		No	White	Yes
NSB8MTC242-0		Yes	Black	Yes
NSB8MTC243-0		No	Black	Yes
NSB8BTC240-0G*		Yes	White	No
NSB8BTC340-0	Graphical user interface	Yes	White	No
NSB8BTC341-0		No	White	No

Table 4: NS Series Network Sensor ordering information: temperature only models

Product code number	Display and interface information	Johnson Controls logo	Color	PIR occupancy sensor
NSB8BTN240-0	Fixed segment display	Yes	White	No
NSB8BTN241-0		No	White	No
NSB8BTN242-0		Yes	Black	No
NSB8BTN243-0		No	Black	No
NSB8MTN240-0		Yes	White	Yes
NSB8MTN241-0		No	White	Yes
NSB8MTN242-0		Yes	Black	Yes
NSB8MTN243-0		No	Black	Yes
NSB8BTN240-0G*		Yes	White	No
NSB8MTN240-0G*		Yes	White	Yes
NSB8BTN040-0	No display	Yes	White	No
NSB8BTN041-0		No	White	No
NSB8BTN042-0		Yes	Black	No
NSB8BTN043-0		No	Black	No
NSB8MTN040-0		Yes	White	Yes
NSB8MTN041-0		No	White	Yes
NSB8MTN042-0		Yes	Black	Yes
NSB8MTN043-0		No	Black	Yes
NSB8BTN040-0G*		Yes	White	No
NSB8BTN140-0	Warmer/Cooler interface	Yes	White	No
NSB8BTN141-0		No	White	No
NSB8BTN142-0		Yes	Black	No
NSB8BTN143-0		No	Black	No
NSB8BTN140-0G*		Yes	White	No
NSB8BTN340-0	Graphical user interface	Yes	White	No
NSB8BTN341-0		No	White	No

Table 5: NS Series Network Sensor ordering information: CO_2 only models without display

Product code number	Johnson Controls logo	Color
NSB8BNC040-0	Yes	White
NSB8BNC041-0	No	White
NSB8BNC042-0	Yes	Black
NSB8BNC043-0	No	Black
NSB8BNC040-0G*	Yes	White

Table 6: NS Series Network Sensor ordering information: temperature and humidity models (2% RH)

Product code number	Display and interface information	Johnson Controls logo	Color
NSB8BPN240-0	Fixed segment display	Yes	White
NSB8BPN241-0		No	White
NSB8BPN242-0		Yes	Black
NSB8BPN243-0		No	Black
NSB8BPN240-0G*		Yes	White

Table 7: Accessories

Product code number	Description
NS-WALLPLATE-0	Wall plates fit seamlessly around the NS8000 Sensor models and enable you to mount a sensor where a larger one was previously mounted.

NS Sensors with fault code capability error codes

The fault indication comes through the network sensor bus when a network sensor is used in the zone. The LCD indicates the code number for all the required state of California Title 24 economizer fault conditions.

Table 8: Fault code capability error codes

Display text	California Title 24 economizer fault condition	Possible problem
E00	Air temperature sensor failure/fault	Problem with one of the air temperature sensors. Check outdoor air, return air, or supply air sensors.
E01	Not economizing when it should	The economizer is not using outdoor air when it should.
E02	Economizing when it should not	The economizer is allowing outdoor air inside when the conditions are not suitable for economizer operation.
E03	Damper not modulating	The economizer damper is not able to modulate properly. Check damper, linkage to actuator, or the actuator.
E04	Excess outdoor air	The economizer is allowing excess outdoor air inside.

Technical specifications

Table 9: Vertical Wallbox-Mounted or Surface-Mounted NS Series Network Sensors technical specifications

Description			Specification
Supply voltage			9.8 VDC to 16.5 VDC; 15 VDC nominal (from SA bus)
Current consumption	Base current draw (graphical models)	Screen off	18 mA maximum (non-transmitting)
		Screen on	45 mA maximum
	Base current draw (other models)		3 mA maximum (non-transmitting)
	CO_2 models	LCD graphical	13 mA maximum additional current (during measurement)
		Other models	15 mA maximum additional current (during measurement)
	Fixed segment display models - backlight on		10 mA additional current
	Warmer/Cooler models - LEDs on		8 mA additional current
	ⓘ **Note:** SA bus applications are limited to a power load of 210 mA. The best practice when configuring an SA bus is to limit the total available operating power consumption to 120 mA or less. This power level allows you to connect a BTCVT Wireless Commissioning Converter temporarily or a DIS1710 Local Controller Display to the bus for commissioning, adjusting, and monitoring.		
Terminations			Modular jack and screw terminal block
Network sensor addressing	LCD graphical display models		Configurable through graphical user interface
	Other models		DIP switch set from 199 to 206; factory set at 199
Wire size	Modular jack models		24 AWG or 26 AWG (0.5 mm or 0.4 mm diameter); three twisted pair (six conductors)
	Screw terminal block models		18 AWG to 22 AWG (1 mm to 0.6 mm diameter); 22 AWG (0.6 mm diameter)
Communication rate			Auto-detect: 9.6 kbps, 19.2 kbps, 38.4 kbps, or 76.8 kbps
Temperature measurement range			32°F/0°C to 104°F/40°C
Temperature sensor type			Digital temperature sensor
Humidity sensor type			Thin film capacitive sensor
Ambient Conditions	Operating		32°F to 122°F (0°C to 50°C); 10% RH to 90% RH, noncondensing; 85°F (29°C) maximum dew point
	Storage	Display models	-40°F to 122°F (-40°C to 50°C); 5% RH to 95% RH, noncondensing
		Non-display models	-40°F to 185°F (-40°C to 70°C); 5% RH to 95% RH, noncondensing
Temperature resolution			±0.5°F/±0.5°C
Temperature accuracy	NS Series Network Zone Sensor		±1°F/±0.6°C
	Temperature element only		±0.36°F/±0.2°C at 70°F/21°C
Humidity element accuracy	NSB8BPN24x-0 models		±2% RH for 20% to 80% RH at 50°F to 95°F (10°C to 35°C)±4% RH for 10% to 20% and 80% to 90% RH at 50°F to 95°F (10°C to 35°C)
	NSB8BHxxxx-0 models		±3% RH for 20% to 80% RH at 50°F to 95°F (10°C to 35°C)±6% RH for 10% to 20% and 80% to 90% RH at 50°F to 95°F (10°C to 35°C)
CO_2 measurement range	0 ppm to 2000 ppm		
CO_2 sensor accuracy	Accuracy		±30 ppm ±3% of CO_2 reading at 77°F (25°C) and 978 hPa (1,000 ft/300m)
	Temperature dependence		±1.4 ppm/°F (± 2.5 ppm/°C)
	Pressure dependence		Refer to the *NS8000 Series Network Sensors Installation Guide (24-11256-00007)* for CO_2 altitude compensation.
CO_2 sensor operation range			32°F to 122°F (0°C to 50°C)

Table 9: Vertical Wallbox-Mounted or Surface-Mounted NS Series Network Sensors technical specifications

Description		Specification
Time constant		10 minutes nominal at 10 fpm airflow
Default temperature setpoint adjustment range		50°F/10°C to 86°F/30°C in 0.5° increments
CO_2 sensor lifespan		10 years under standard operating conditions
LCD lifespan for graphical display models		Screen timeout set to off > 10 years
		Screen timeout set to dim At least 6 years
PIR occupancy sensor motion detection		Minimum 94 angular degrees up to a distance of 26 ft (8m); Based on clear line of sight
Compliance	United States	UL Listed, File E107041, CCN PAZX,Under UL 60730-1, Energy Management Equipment
		FCC Compliant to CFR 47, Part 15, Subpart B, Class B
	Canada	cUL Listed, File E107041, CCN PAZX7,Under CAN/CSA E60730-1, Signal Equipment
		Industry Canada, ICES-003
CE	Europe	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant
	China	RoHS2
Dimensions (H x W x D)		3.4 in. x 5 in. x 1.1 in. (85.3 mm x 127.55 mm x 26.8 mm)
Shipping weight		0.4 lb/0.18 kg

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable end-user license, open-source software information, and other terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

Patents

Patents: https://jcipat.com

Single point of contact

APAC	EU	UK	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS TYCO PARK GRIMSHAW LANE MANCHESTER M40 2WL UNITED KINGDOM	JOHNSON CONTROLS 5757 N GREEN BAY AVE. GLENDALE, WI 53209 USA

Contact information

Contact your local Johnson Controls representative: www.johnsoncontrols.com/locations
Contact Johnson Controls: www.johnsoncontrols.com/contact-us

TE-6300 Series Temperature Sensors

Product Bulletin

Code No. LIT-216320
Issued February 2017

Introduction

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and VAV Modular Assembly (VMA) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

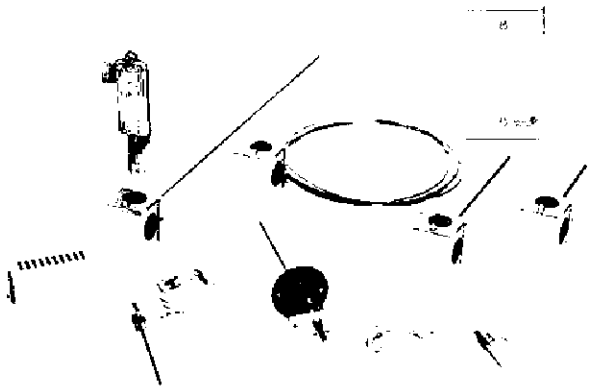
- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Features and Benefits

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and to reduce both commissioning time and cost.

- **Full Line of Versatile Sensors**—Supports all your temperature sensing needs from a single supplier: wall-mount, outdoor-air, duct, duct-averaging, strap-mount, well-insertion, and flange-mount duct-probe.
- **Single Assembly Ordering**—Simplifies ordering; provides a complete assembly in one box.
- **Models Featuring an Integral National Pipe Thread (NPT) Adaptor**—Increase sensor connection strength, which eliminates the need for a special adaptor.

Figure 1: TE-6300 Series Temperature Sensors



- **Models with a Stainless Steel Sensor Probe**—Protect the sensor while increasing corrosion resistance.
- **Metal Enclosure (TE-63xxE, TE-63xxM, and TE-63xxV Models)**—Meets plenum requirements.
- **Models Featuring a Retainer for the Sensor Holder**—Allow you to lock the sensor holder into the conduit box.
- **Brushed Stainless Steel Mounting Plate**—Offers a durable, aesthetically pleasing design.
- **Low Profile Flush Mount Design (TE-63xxF Models)**—Provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more.

Product Overview

IMPORTANT: The TE-6300 Series Temperature Sensors are intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the temperature sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the temperature sensor.

IMPORTANT : Le TE-6300 Series Temperature Sensors est destiné à transmettre des données entrantes à un équipement dans des conditions normales de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du temperature sensor risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du temperature sensor.

All TE-6300 Series Temperature Sensors are two-wire, passive, resistance-output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) internal thread insulated quick-connect terminations on leads

TE-63xxE Models

The TE-63xxE (economizer mount) models:

- provide a stainless steel mounting flange
- include two hex-head self-drilling screws for mounting
- meet UL 1995 plenum use requirements

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- thermally isolate sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG (0.6 mm diameter) lead wires with low voltage installation

TE-63xxM Models

The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct-averaging models
- offer either a direct-mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series Thermowells (well models; order the thermowell separately)
- provide optional well sensor holders (order separately) to mount duct models in thermowells
- meet UL 1995 plenum use requirements
- offer an optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with 1/2-14 internal NPT for connecting to conduit
- provide aluminum mounting plate and 1/2-14 internal NPT hub mounting options for the duct and duct-averaging models
- use the 1/2-14 internal NPT to mount the outdoor air models directly to rigid conduit
- include sensor holders to mount duct models in thermowells (order thermowell separately)
- offer an optional accessory metal cover and gasket kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements
- include a replaceable sensing probe on duct-probe, outdoor-air, and well-insertion models

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (strap-mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) in diameter
- come equipped with a 10 ft (3 m) plenum-rated cable
- meet UL 1995 plenum use requirements
- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) in diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) internal thread insulated quick-connect terminations on leads
- meet UL 1995 plenum use requirements

Additional Product Information

See Figure 2 for nickel and platinum sensor Resistance/Temperature (R/T) response characteristics. See Table 1 for all sensor Temperature/Resistance values.

Note: Figure 2 shows 1k ohm platinum sensor characteristics. For 100 ohm platinum sensor characteristics, divide the resistance value by 10.

See Figure 3 for 2.2k and 10k ohm thermistor sensor R/T response characteristics.

Figure 2: Nickel and Platinum Temperature Response

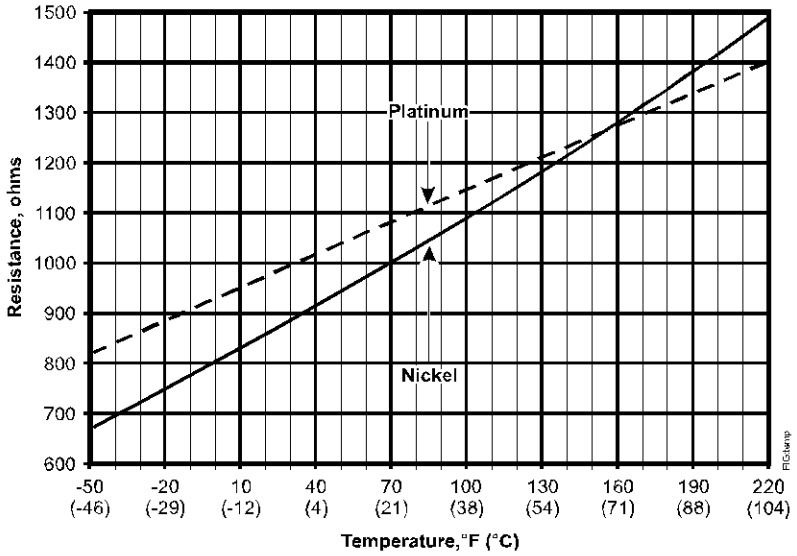


Figure 3: Thermistor Temperature Response

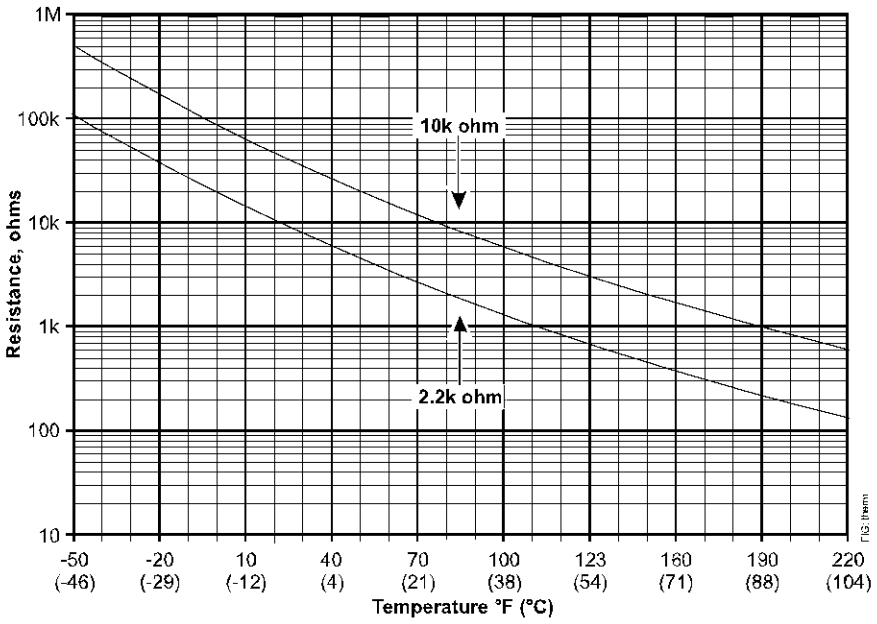


Table 1: Nominal Values for: Nickel (Ni), Platinum (Pt)[1], and Thermistor Sensors

Temperature		Resistance (ohms)			
°F	°C	1k Ni	1k Pt[1]	Thermistor	
				2.2k	10k
-50	-46	674	821	109,905	489,981
-40	-40	699	843	75,487	366,185
-30	-34	725	865	52,584	233,990
-20	-29	751	887	37,123	165,085
-10	-23	777	908	26,544	117,978
0	-18	803	930	19,210	85,349
10	-12	830	952	14,063	62,464
20	-7	858	974	10,408	46,221
30	-1	885	996	7,783	34,562
40	4	914	1,017	5,879	26,103
50	10	942	1,039	4,482	19,903
60	16	971	1,061	3,449	15,313
70	21	1,000	1,082	2,676	11,883
80	27	1,030	1,104	2,094	9,298
90	32	1,060	1,125	1,651	7,333
100	38	1,090	1,147	1,312	5,827
110	43	1,121	1,168	1,050	4,663
120	49	1,152	1,190	846	3,757
130	54	1,184	1,211	686	3,048
140	60	1,216	1,232	560	2,488
150	66	1,248	1,254	460	2,043
160	71	1,281	1,275	380	1,687
170	77	1,314	1,296	315	1,401
180	82	1,348	1,317	263	1,170
190	88	1,382	1,339	221	982
200	93	1,417	1,360	186	828
210	99	1,452	1,381	158	701
220	104	1,487	1,402	134	597

1. For 100 ohm platinum sensors, divide resistance values by 10.

Applications

Averaging Sensing

Series-parallel wiring arrangements of four (2 x 2), nine (3 x 3), sixteen (4 x 4), or more sensors provide an average temperature reading in an area or large duct when one sensor cannot provide a representative reading. (See Figure 4.)

A series-parallel arrangement requires the same number of parallel-connected sensors as there are series-connected sensors. For example:

- with four sensors, connect two parallel legs with two sensors in series in each leg
- with nine sensors, connect three parallel legs with three sensors in series in each leg

All sensors in a series-parallel network must be of the same sensor type and value. For example, use all 100 ohm platinum or all 1k ohm nickel sensors.

Figure 4: Nine-Sensor Series-Parallel Wiring

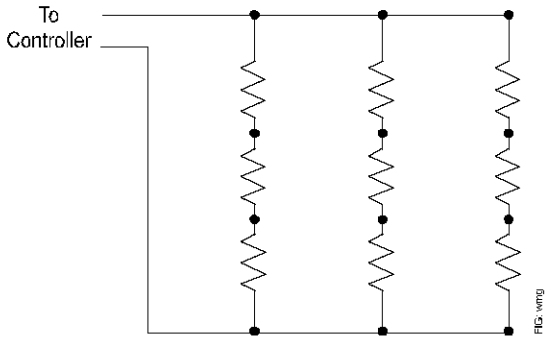
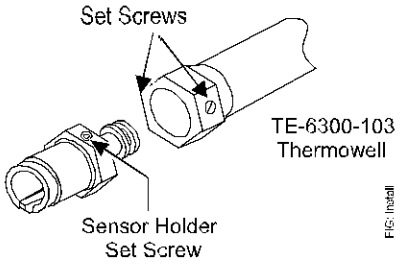


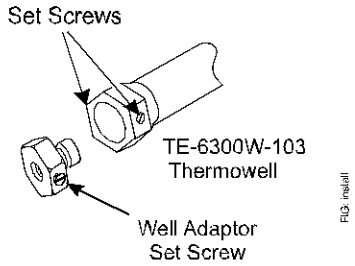
Figure 5 through Figure 8 illustrate installation of sensor holders and well adaptors.

Figure 5: Installing the TE-63xAP-1 Sensor Holder



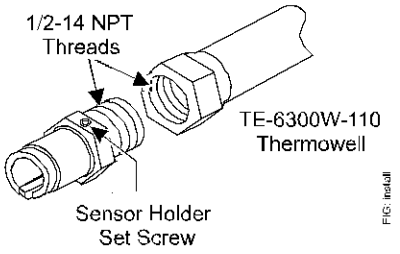
- sensor model TE-63xAP-1
- threadless sensor holder/well adaptor
- 6 in. (150 mm) probe

Figure 6: Installing the TE-63xAM-1 Well Adaptor



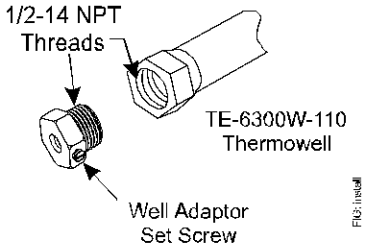
- sensor model TE-63xAM-1
- threadless well adaptor
- 6 in. (150 mm) probe

Figure 7: Installing the TE-63x2P-1 Sensor Holder



- sensor model TE-63x2P-1
- 1/2-14 NPT threaded sensor holder/well adaptor
- 8 in. (200 mm) probe

Figure 8: Installing the TE-63x2M-1 Well Adaptor



- sensor model TE-63x2M-1
- 1/2-14 NPT threaded well adaptor
- 8 in. (200 mm) probe

Table 2: TE-6300 Series Temperature Sensor Applications (Part 1 of 2)

Application	Nominal Probe Length, in. (mm)	Sensor Type	Application Notes
Duct Probe	2 (51) 4 (102) 6 (152) 8 (203) 12 (305) 18 (457)	1k ohm thin-film nickel 1k ohm thin-film platinum 2.2k ohm thermistor 10k ohm thermistor type II	• Ideal in freezer lockers or for mounting outside of the sensed area. • Available with plastic enclosure, metal enclosure, flange mount, or with mounting bracket for adjustable length. • Use TE-63xxE, TE-63xxM, or TE-63xxV models for plenum applications. • Use TE-6300-613 Accessory Kit with TE-63xxM models to meet IMC requirements. • Use TE-6001-13 Metal Cover and Gasket Kit with TE-63xxP models to meet UL 1995 plenum requirements. • Order an optional TE-63xxP model accessory: 12 in. (300 mm) probe.
Duct-Averaging Element	8 ft (2.4 m) 10 ft (3 m) 17 ft (5.2 m) 20 ft (6.1 m)	1k ohm nickel wire 100 ohm platinum equivalent wire 1k ohm platinum equivalent wire	• Use to sense duct temperature where stratification can occur, such as mixed air ducts. • Duct-averaging models come in three styles: plastic enclosure, metal enclosure, or flange mount. • Use about 1 ft (0.3 m) of sensor per sq ft (0.09 m^2) of duct cross section. • Use a series-parallel sensor network to cover larger ducts. • Use a TE-6001-8 Element Holder (recommended) when installing an averaging sensor in a duct. • Use TE-63xxM or TE-63xxV models for plenum-rated applications. • Use TE-6300-613 kit with TE-63xxM models to meet IMC requirements. • Use the TE-6001-13 Metal Cover and Gasket Kit with TE-63xxP models to meet UL 1995 plenum requirements.
Outdoor Air	3 (76)	1k ohm thin-film nickel 1k ohm thin-film platinum 2.2k ohm thermistor 10k ohm thermistor, type II	• Use to sense outside ambient temperature to determine efficient heating and cooling strategies. • Mount the sensor out of direct sunlight and away from exhaust vents or equipment that can cause inaccurate temperature sensing.
Strap-Mount	3 (76)	1k ohm thin-film nickel 1k ohm thin-film platinum 10k ohm thermistor, type II	• Clamp the probe directly to a pipe or the device to be sensed. • Mount the probe away from fans or radiant heat that can affect measurement of the sensed device. • Use for plenum applications. • Order an accessory mounting kit or use readily available hardware for pipe up to 11 in. (280 mm) in diameter.
Wall Mount	N/A	1k ohm thin-film nickel 1k ohm thin-film platinum 2.2k ohm thermistor	• Use to sense room or space temperature. • Order an accessory cover with a thermometer or to match the style of existing installations. • Mount the sensor on an inside wall, out of direct sunlight and away from radiant heat.
Wall Plate Flush Mount	N/A	Flush mount 1k ohm nickel sensor Flush mount 1k ohm platinum sensor Flush mount 10k ohm NTC sensor	• Do not install the flush mount sensor in temperatures beyond 0 to 40°C. • Use copper conductors only. Refer to installation diagrams for recommended wiring lengths.

Table 2: TE-6300 Series Temperature Sensor Applications (Part 2 of 2)

Application	Nominal Probe Length, in. (mm)	Sensor Type	Application Notes
Well Insertion Probe	6 (152) 8 (203)	**TE-63xxM** 1k ohm thin-film nickel 1k ohm thin-film platinum 2.2k ohm thermistor 10k ohm thermistor type II	• Metal enclosure. • Mount the thermowell at an angle so condensation runs out of the well. If not possible, seal the well adaptor and wiring end of the sensor probe with (room temperature vulcanization) RTV silicone sealant. • Use TE-63xxM models to meet UL 1995 plenum use applications. • No separate well adaptor to order when using recommended thermowell and sensor model combinations. • Threaded sensor holder has 1/2-14 NPT threads; threadless holder accommodates set screw-type wells. • Order TE-63x2M-1, which includes a 1/2-14 NPT adaptor for TE-6300W-110, or retrofit applications of WZ-1000-2 and WZ-1000-4 Thermowells. • Order TE-63xAM-2 for use with direct-mount thermowells TE-6300W-101 and TE-6300W-102. • Order TE-63xAM-1, which includes a threadless adaptor for retrofit applications of TE-6300W-103 and WZ-1000-5 Thermowells. • Order compatible thermowells using Table 4 and Table 5.
		TE-63xxP 1k ohm thin-film nickel 1k ohm thin-film platinum 2.2k ohm thermistor	• Plastic enclosure. • Mount the thermowell at an angle so condensation runs out of the well. If not possible, seal the sensor holder and the wiring end of the sensor probe with RTV silicone sealant. • Use TE-6001-13 Metal Cover and Gasket Kit with TE-63xxP models to meet UL 1995 plenum requirements. • Use the accessory 12 in. (305 mm) probe with the TE-63xxP Sensor in longer wells. • No separate well adaptor to order when using recommended thermowell and sensor model combinations. • Threaded sensor holder has 1/2-14 NPT threads; threadless holder accommodates set screw-type wells. • Order TE-63x2P-1, which includes a 1/2-14 NPT adaptor for TE-6300W-110, or retrofit applications of WZ-1000-2 and WZ-1000-4 Thermowells. • Order TE-63xAP-1, which includes a threadless adaptor for TE-6300W-103 or retrofit applications of WZ-1000-5 Thermowells. • Order compatible thermowells using Table 4 and Table 6.

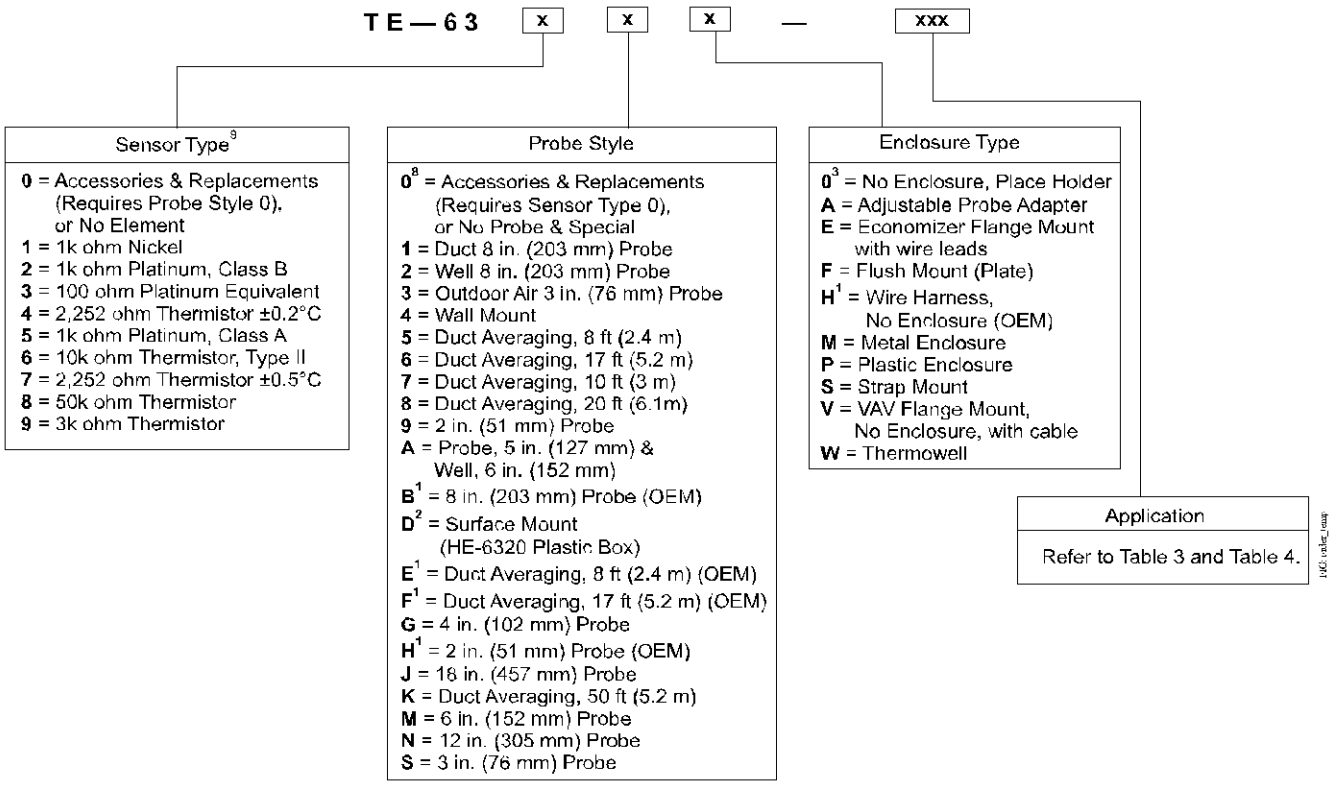
Ordering Information

To order a TE-6300 Series Temperature Sensor, contact the nearest Johnson Controls representative. Specify the desired sensor product code number from Table 3 and accessories from Table 4, depending on the model.

Note: Use the TE-63xxE, TE-63xxM, or TE-63xxV model to meet plenum requirements where UL1995 rating is accepted, or replace the existing plastic cover on the TE-63xxP models with the TE-6001-13 Metal Cover and Gasket Kit.

Use the TE-63xxM model and a TE-6300-613 Accessory Kit to replace the plastic bushing to meet International Mechanical Code (IMC) requirements.

Figure 9: Ordering Template



Note: Not all possible combinations are available. See Table 3 for available models.

Table 3: Product Ordering (Part 1 of 2)

Sensor	Mounting Style	Probe Length, in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable	8 (203)	TE-6311A-1
	Averaging[1]	8 ft (2.4 m)	TE-6315M-1
			TE-6315P-1
			TE-6315V-2
		17 ft (5.2 m)	TE-6316M-1
			TE-6316P-1
			TE-6316V-2
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange (VAV)	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-0
			TE-6310F-1
	Outdoor air	3 (76)	TE-6313P-1
	Strap-mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-1[3]
			TE-631AM-2
			TE-631AP-1
		8 (203)	TE-6312M-1
			TE-6312P-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351A-1
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange (VAV)	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-0
			TE-6350F-1
	Outdoor air	3 (76)	TE-6353P-1
	Strap-mount	3 (76)	TE-635S-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-1[3]
			TE-635AM-2
			TE-635AP-1
		8 (203)	TE-6352M-1
			TE-6352P-1

Table 3: Product Ordering (Part 2 of 2)

Sensor	Mounting Style	Probe Length, in. (mm)	Product Code Number
Platinum Equivalent	1k ohm averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm averaging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange (VAV)	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	6 (152)	TE-634AM-2
		8 (203)	TE-6342M-1
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange (VAV)	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flange (economizer)	2 (51)	TE-6369E-2
		6 (152)	TE-636ME-2
		8 (203)	TE-6361E-2
		12 (305)	TE-636NE-2
	Flush	N/A	TE-6360F-0
			TE-6360F-1
	Outdoor air	3 (76)	TE-6363P-1
	Strap-mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-1[3]
			TE-636AM-2
		8 (203)	TE-6362M-1

1. Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2. Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.
3. TE-631AM-1, TE-635AM-1, and TE-636AM-1 include TE-6300-612 Threadless Brass Sensor Holder/Well Adaptor for retrofit to TE-6300W-103 or WZ-1000-5 Thermowells.

Table 4: Optional Accessories and Replacement Parts[1]

Product Code Number	Description
F-1000-182	Thermal conductive grease for element wells (8 oz. [0.23 kg])
T-4000-119	Allen head tool for wall mount cover screws (order in multiples of 30)
TE-1800-9600	Mounting hardware for mounting the wall-mount unit to a wall box
TE-6001-8	Averaging sensor mounting bracket (order in multiples of ten)
TE-6001-13	Metal cover and gasket kit (order in multiples of five)
TE-6300-101	12 in. (305 mm) 1k ohm nickel probe (cut to an appropriate length)[2]
TE-6300-103	1/2-14 NPT plastic sensor holder without retainer (order in multiples of ten)
TE-6300-105	12 in. (305 mm) 1k ohm platinum Class A probe (cut to an appropriate length)[2]
TE-6300-601	8 in. (203 mm) 1k ohm nickel probe
TE-6300-603	3 in. (76 mm) 1k ohm nickel probe
TE-6300-605	1/2-14 NPT threaded plastic sensor holder/well adaptor with retainer (order in multiples of ten)
TE-6300-606	8 in. (203 mm) 2.2k ohm thermistor probe
TE-6300-607	3 in. (76 mm) 2.2k ohm thermistor probe
TE-6300-611	1/2-14 NPT threaded brass sensor holder/well adaptor (order in multiples of ten)
TE-6300-612	Threadless brass sensor holder/well adaptor (order in multiples of ten)
TE-6300-613	IMC kit with metal plugs and clamp connector (order in multiples of ten)
TE-6300-614	Cable tie mounting kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) bundle diameter (order in multiples of ten)
TE-6300-615	Cable tie mounting kit, 11 in. (280 mm) maximum bundle diameter
TE-6300-616	8 in. (203 mm) 1k ohm platinum Class A probe
TE-6300-617	3 in. (76 mm) 1k ohm platinum Class A probe
TQ-6000-1	4 to 20 mA output transmitter for use with the 100 ohm platinum sensor
TE-6300W-101[3]	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe model TE-63xAM-2
TE-6300W-102[3]	Thermowell, stainless steel, 2.38 in. (60.5 mm) immersion depth, without thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe model TE-63xAM-2
TE-6300W-103	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, threadless adaptor required, for use with 6 in. (150 mm) probe models TE-63xAM-1 (adaptor included) and TE-63xAP-1 (adaptor included)
TE-6300W-110	Thermowell, stainless steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe models TE-63x2M-1 (adaptor included) and TE-63x2P-1 (adaptor included)

1. For accessory usage, see Table 5, Table 6, and Table 7.
2. Cut 12 in. (305 mm) probes to a minimum of 3 in. (76 mm).
3. Direct-mount thermowells TE-6300W-101 and TE-6300W-102 can be used only with the TE-6300M Sensors.

Table 5: Typical Accessory and Replacement Part Usage for TE-6300M Models

Product Code Number	Description	TE-6311M-1	TE-6312M-1	TE-6315M-1	TE-6316M-1	TE-631AM-1	TE-631AM-2	TE-631GM-1	TE-631JM-1	TE-6351M-1	TE-6352M-1	TE-635AM-2	TE-635GM-1	TE-635JM-1	TE-6361M-1	TE-6362M-1	TE-636AM-2	TE-636GM-1	TE-636JM-1	TE-634AM-2
TE-6001-8	Averaging sensor mounting bracket			X	X															
TE-6300-611	1/2-14 NPT threaded brass sensor holder/well adaptor, for use with TE-6300W-110 (replacement part, included with TE-63x2M-1)		X								X					X				
TE-6300-612	Threadless brass sensor holder/well adaptor, for use with TE-6300W-103 (included with TE-631AM-1)					X	X					X					X			X
TE-6300-613	IMC kit with metal plugs and clamp connector	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TE-6300W-101	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe						X					X					X			X
TE-6300W-102	Thermowell, stainless steel, 2.38 in. (60.5 mm) immersion depth, without thermal grease, direct mount, no adaptor required, for use with 6 in. (150 mm) probe						X					X					X			X
TE-6300W-103	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, threadless adaptor required, for use with 6 in. (150 mm) probe (TE-631AM-1 includes adaptor)					X														
TE-6300W-110	Thermowell, stainless steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe (TE-63x2M-1 includes adaptor)		X								X					X				

Table 6: Typical Accessory and Replacement Part Usage for TE-6300P Models

Product Code Number	Description	TE-6311P-1	TE-6312P-1	TE-6313P-1	TE-6314P-1	TE-6315P-1	TE-6316P-1	TE-631AP-1	TE-6324P-1	TE-6327P-1	TE-6328P-1	TE-6337P-1	TE-6338P-1	TE-6341P-1	TE-6343P-1	TE-6344P-1	TE-6351P-1	TE-6352P-1	TE-6353P-1	TE-635AP-1	TE-6361P-1	TE-6363P-1
T-4000-119	Allen head tool				X				X							X						
TE-1800-9600	Mounting hardware				X				X							X						
TE-6001-8	Averaging sensor mounting bracket					X	X			X	X	X	X									
TE-6001-13	Metal cover and gasket kit	X	X	X		X	X	X		X	X	X	X	X	X		X	X	X	X	X	X
TE-6300-101	12 in. (305 mm) 1k ohm nickel probe	X																				
TE-6300-105	12 in. (305 mm) 1k ohm platinum Class A probe																X					
TE-6300-601	8 in. (203 mm) 1k ohm nickel probe	X																				
TE-6300-603	3 in. (76 mm) 1k ohm nickel probe			X																		
TE-6300-605	1/2-14 NPT threaded plastic sensor holder/ well adaptor with retainer, for use with TE-6300W-110 (replacement part, included with TE-63xxP-1)	X	X			X	X			X	X	X	X	X			X	X			X	
TE-6300-606	8 in. (203 mm) 2.2k ohm thermistor probe													X								
TE-6300-607	3 in. (76 mm) 2.2k ohm thermistor probe														X							
TE-6300-616	8 in. (203 mm) 1k ohm platinum Class A probe																X					
TE-6300-617	3 in. (76 mm) 1k ohm platinum Class A probe																		X			
TQ-6000-1	4 to 20 mA output transmitter											X	X									
Thermowells																						
F-1000-182	Thermal conductive grease (8 oz. [0.23 kg])		X					X										X		X		
TE-6300W-103	Thermowell, brass with copper bulb, 2.38 in. (60.5 mm) immersion depth, with thermal grease, threadless adaptor required, for use with 6 in. (150 mm) probe (TE-63xAP-1 includes adaptor)							X												X		
TE-6300W-110	Thermowell, stainless steel, 4.50 in. (114.3 mm) immersion depth, without thermal grease, 1/2-14 NPT adaptor required, for use with 8 in. (200 mm) probe (TE-63x2P-1 includes adaptor)		X															X				

Table 7: Typical Accessory and Replacement Part Usage for TE-63xS Models

Product Code Number	Description
F-1000-182	Thermal conductive grease for element wells (8 oz. [0.23 kg])
TE-6300-614	Cable tie mounting kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) bundle diameter (order in multiples of ten)
TE-6300-615	Cable tie mounting kit, 11 in. (280 mm) maximum bundle diameter

Table 8: T-4000 Covers Available for the Wall-Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer, with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]				Brushed aluminum/beige
T-4000-2139	X			
T-4000-2140	X		X	
T-4000-2144		X		
T-4000-2639	X			Brown and gold/beige
T-4000-2640	X		X	
T-4000-2644		X		
T-4000-3139	X			Brushed aluminum/white
T-4000-3140	X		X	
T-4000-3144		X		

1. Without Johnson Controls logo

.

Repair Information

If the TE-6300 Series Temperature Sensor fails to operate within its specifications, replace the unit. For a replacement temperature sensor, see Table 3 and contact the nearest Johnson Controls representative. For a replacement sensor probe for TE-63xxP duct, well, and outdoor-air models, see Table 4.

Technical Specifications

TE-6300 Series Temperature Sensors (Part 1 of 3)

Sensor Reference Resistance	1k ohm nickel	1k ohms at 70°F (21°C)
	1k ohm nickel averaging	
	1k ohm platinum	1k ohms at 32°F (0°C)
	100 ohm platinum averaging	100 ohms at 32°F (0°C)
	1k ohm platinum averaging	1k ohms at 32°F (0°C)
	2.2k ohm thermistor	2,252 ohms at 77°F (25°C)
	10k ohm thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	1k ohm nickel	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm nickel averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm platinum Class A (TE-635xx)	EN 60751 Class A, ± [0.15 + 0.002 * | T °C |], ±0.19C° at 21°C (±0.35F° at 70°F)
	100 ohm platinum Class A	
	1k ohm platinum Class B (TE-632xx)	EN 60751 Class B, ± [0.30 + 0.005 * | T °C |], ±0.41C° at 21°C (±0.73F° at 70°F)
	100 ohm platinum averaging	±1.0F°at 70°F (±0.58C° at 21°C)
	1k ohm platinum averaging	
	2.2k ohm thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient (see Table 1)	1k ohm nickel	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm nickel averaging	
	1k ohm platinum	Approximately 2 ohms/F° (3.9 ohms/C°), 3,850 ppm/K
	100 ohm platinum averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm platinum averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm thermistor	Nonlinear, negative temperature coefficient (NTC)
	10k ohm thermistor	Nonlinear NTC, Johnson Controls Type II
Electrical Connection	TE-63xxE	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxM	
	TE-63xxP	
	TE-63xxF	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided copper wires, low voltage insulation, half-stripped ends
	TE-63xxP nickel averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable, with 2-position plug terminal block for 1/4 in. (6.35 mm) external tab terminals on 0.197 in. (5 mm) centers
	TE-63xxV	

TE-6300 Series Temperature Sensors (Part 2 of 3)

Materials	Probes	Nickel averaging: Nickel averaging adaptor: Platinum averaging probe: All others:	0.094 in. (2.4 mm) outside diameter (O.D.) copper tubing 0.25 in. (6.35 mm) O.D. brass 0.19 in. (4.8 mm) aluminum tubing 0.25 in. (6.35 mm) O.D. stainless steel
	TE-63xxA	Mounting adaptor plate and gland:	thermoplastic
	TE-63xxF	Flush mount:	stainless steel
	TE-63xxM	Enclosure: Well sensor holder:	corrosion-protected steel 0.875 in. (22.2 mm) hex brass
	TE-63xxP	Conduit box and shield: Mounting plate: Sensor holder: Wall mount base plate: Wall mount cover: Wall mount face plate:	rigid thermoplastic aluminum rigid thermoplastic corrosion-protected steel rigid thermoplastic (white) brushed aluminum
	TE-63xxE	Mounting flange:	stainless steel
	TE-63xxV		
Operating Conditions	TE-63xxA		-50 to 140°F (-46 to 60°C)
	TE-63xxF		32 to 104°F (0 to 40°C)
	TE-63xxE		-50 to 220°F (-46 to 104°C)
	TE-63xxM		
	TE-63xxP	Enclosure: Sensor probe:	-50 to 122°F (-46 to 50°C) -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor probe: Wire harness:	-50 to 220°F (-46 to 104°C) -50 to 122°F (-46 to 50°C)
	TE-63xxV		
Shipping Weight	TE-63xxA		0.2 lb (0.09 kg)
	TE-63xxE		
	TE-63xxF		0.25 lb (113.4 kg)
	TE-63xxM	Duct averaging: Duct mount: Well insertion:	0.9 lb (0.41 kg) 0.4 lb (0.18 kg) 0.5 lb (0.23 kg)
	TE-63xxP	Duct averaging: Duct mount: Outdoor air: Wall mount: Well insertion:	0.5 lb (0.23 kg) 0.4 lb (0.18 kg) 0.5 lb (0.23 kg) 0.2 lb (0.09 kg) 0.35 lb (0.16 kg)
	TE-63xS	Strap mount:	0.2 lb (0.09 kg)
	TE-63xxV	Duct averaging: Duct mount:	0.7 lb (0.32 kg) 0.2 lb (0.09 kg)

TE-6300 Series Temperature Sensors (Part 3 of 3)

Dimensions (H x W x D)	TE-63xxA		2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 mm) element
	TE-63xxE	Duct mount:	2.5 x 1.50 in. (57 x 38 mm) plus 2, 6, 8, or 12 in. (51, 152, 203, or 305 mm) element
	TE-63xxF	Flush mount:	4-1/2 x 2-3/4 in. (114 x 70 mm)
	TE-63xxM	Duct averaging:	1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element
		Duct mount:	1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element
		Well insertion:	1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct averaging:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element
		Duct mount:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
		Outdoor air:	5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm)
		Wall mount:	2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm)
		Well insertion:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap mount:	0.25 in. (6.4 mm) diameter x 3.00 in. (76 mm) long
	TE-63xxV	Duct averaging:	2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element
		Duct mount:	2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 mm) element

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Johnson Controls

Building Technologies & Solutions
507 E. Michigan Street, Milwaukee, WI 53202

VG1000 Series Forged Brass Ball Valves

Product Bulletin

Code No. LIT-977132
Issued June 2020

VG1000 Series Ball Valves are designed to regulate the flow of hot or chilled water and, for some models, low pressure steam in response to the demand of a controller in HVAC systems. Available in sizes 1/2 through 2 in. (DN15 through DN50), this family of two- and three-way forged brass valves is factory or field mounted to Johnson Controls® VA9104 and VA9300 Series Non-Spring Return and VA9203 and VA9208 Series Spring Return Electric Actuators for on/off, floating, or proportional control. For sweat and press end connection valves supplied with an actuator, the actuator is not mounted to the valve to allow access to the end connections.

WARNING: BRASS MAY CONTAIN LEAD
To fulfill our obligations towards Article 33, in accordance to the European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list:

- Lead

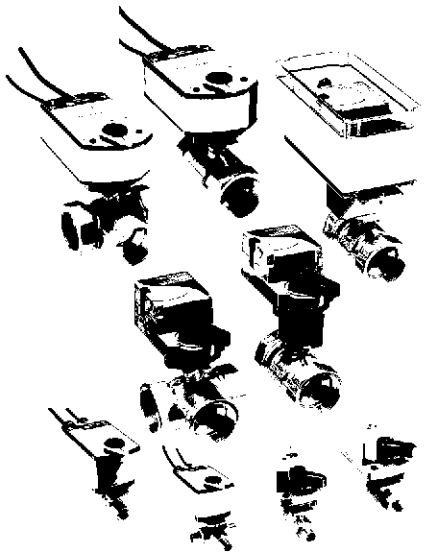


Figure 1: VG1000 Series Ball Valves Shown with Factory-Mounted M9000 Series Electric Actuators

⚠ WARNING This product is made of copper alloy, which contains lead. The product is therefore not to be used on drinking water.

⚠ WARNING This product can expose you to chemicals including lead, which is known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

Table 1: Features and benefits (Part 1 of 2)

Features	Benefits
National Pipe Thread (NPT), sweat, and press end connections	Provide the right valve for a broad range of applications, reduce installation time while reducing the need for adapters, and increase system reliability.
Forged brass body	Provides 580 psig static pressure rating.
Amodel® flow characterizing disk	Maintains equal percentage flow characteristics for best temperature control, available in a wide variety of Cvs to cover a broad range of applications.
200 psi closeoff pressure rating	Provides tight shutoff.
Chrome-plated brass ball and stem assembly standard	Handles both chilled and hot water applications with a fluid temperature range of 23 to 203°F (-5 to 95°C).
300 Series stainless steel ball and stem assembly	Tolerates high temperature water or 15 psi saturated steam with fluid temperatures of -22 to 284°F (-30 to 140°C) or where a higher degree of corrosion protection is desired.
500:1 rangeability	Provides accurate control under all load conditions.
Ethylene Propylene Diene Monomer (EPDM) double O-ring stem seal	Provides a leak-free seal; the packing has been tested and is leak-free after 200,000 cycles in iron-oxide contaminated water.

Table 1: Features and benefits (Part 2 of 2)

Features	Benefits
Graphite-Reinforced Polytetrafluoroethylene (PTFE) seats	Include 15% graphite-reinforced ball seats, providing better wear resistance.
Blowout-proof stem	Protects the user from the risk of injury.
Maintenance-free design	Performs without failure in excess of 200,000 full stroke cycles in iron-oxide contaminated water.
Wide selection of styles for a variety of applications	Offers various valve configurations including two- and three-way full port and reduced port models in chrome-plated brass and stainless steel trim.
Factory-mounted VA9104, VA9203, VA9208, or VA9300 Series Electric Actuators	Reduce installation time, thus reducing overall installation cost.
M9000-551 Linkage Kit available for field mounting to M9104 Series Electric Actuators	Lowers both space requirements and total cost by providing high thermal isolation in a compact size.
M9000-560 Linkage Kit available for field mounting to M9203 or M9208 Series Electric Actuators	Lowers both space requirements and total cost by providing high thermal isolation in a compact size.
M9310-500 Linkage Kit available for field mounting M9300 Series Electric Actuators	Lowers both space requirements and total cost by providing high thermal isolation in a compact size.
M9000-561 Thermal Barrier Kit for VA9104, VA9203, VA9208, and VA9300 Series Electric Actuators	Allows the valve assembly to be used for fluid temperatures up to 284°F (140°C), or 15 psi (105 kPa) saturated steam.
M9000-342 Weather Shield Kit available for field mounting VA9104, VA9203, VA9208, and VA9300 Series Electric Actuators	Protects the electric actuators from corrosion, rain, freezing rain, sleet and snow. Manufactured to National Electrical Manufacturers' Association (NEMA) 4X (IP66/67).

Ordering information

Table 2: Ordering data[1]

V G		Valve Global	
1 2	1 3	Product Family	1 = Forged Brass Ball Valve
	2 4	Body Type and Flow Characteristic	2 = Two-Way, with Equal Percentage Flow Characteristics 8 = Three-Way Mixing, with Equal Percentage Flow Characteristics of In-line Port and Linear Flow Characteristics of Angle-Port
	4 5	End Connection	4 = Threaded - NPT Taper 7 = Sweat (1/2 to 1 in. Sizes) 9 = Press (ProPress® Fitting Compatible, 1/2 to 1 in. Sizes) Press End Connections are designed to work with RIDGID® Pressing Tools.
	1 Trim 6		1 = Chrome-Plated Brass Ball and Nickel-Plated Brass Stem 5 = Stainless Steel Ball and Stem, 300 Series
	A E 7 8	Size and Maximum Cv (Kvs = Cv x 0.857)	
	+	Actuator	+ = Factory-Mounted Actuator
	9	Mounting	(Leave Fields 9 through 15 blank for valve without factory-mounted actuator.) H = High Temperature Linkage (VA9104, VA9203, VA9208, and VA9300 actuators)

Size	Control Disk	Control Port Cv (Kvs)	Bypass Port Cv (Kvs) (Three-Way Only)
AA = 1/2 in. (DN15)	Yes	0.3 (0.2)	0.2 (0.1)
AB = 1/2 in. (DN15)	Yes	0.5 (0.4)	0.3 (0.2)
AC = 1/2 in. (DN15)	Yes	0.8 (0.7)	0.4 (0.3)
AD = 1/2 in. (DN15)	Yes	1.2 (1.0)	0.7 (0.6)
AE = 1/2 in. (DN15)	Yes	1.9 (1.6)	1.2 (1.0)
AF = 1/2 in. (DN15)	Yes	2.9 (2.5)	1.9 (1.6)
AG = 1/2 in. (DN15)	Yes	4.7 (4.0)	2.9 (2.5)
AL = 1/2 in. (DN15)	Yes	7.4 (6.3)	4.7 (4.0)
AN = 1/2 in. (DN15)	No	11.7 (10.0)	5.8 (5.0)
BG = 3/4 in. (DN20)	Yes	4.7 (4.0)	2.9 (2.5)
BL = 3/4 in. (DN20)	Yes	7.4 (6.3)	4.7 (4.0)
BN = 3/4 in. (DN20)	No	11.7 (10.0)	5.8 (5.0)
CL = 1 in. (DN25)	Yes	7.4 (6.3)	4.7 (4.0)
CN = 1 in. (DN25)	Yes	11.7 (10.0)	7.4 (6.3)
CP = 1 in. (DN25)	No	18.7 (16.0)	9.4 (8.0)
DN = 1-1/4 in. (DN32)	Yes	11.7 (10.0)	7.4 (6.3)
DP = 1-1/4 in. (DN32)	Yes	18.7 (16.0)	11.7 (10.0)
DR = 1-1/4 in. (DN32)	No	29.2 (25.0)	14.6 (12.5)
EP = 1-1/2 in. (DN40)	Yes	18.7 (16.0)	11.7 (10.0)
ER = 1-1/2 in. (DN40)	Yes	29.2 (25.0)	18.7 (16.0)
ES = 1-1/2 in. (DN40)	No	46.8 (40.0)	23.4 (20.0)
FR = 2 in. (DN50)	Yes	29.2 (25.0)	18.7 (16.0)
FS = 2 in. (DN50)	Yes	46.8 (40.0)	29.2 (25.0)
FT = 2 in. (DN50)	No	73.7 (63.0)	36.8 (31.5)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 = Field

V	G	1	2	4	1	A	E	+						
Valve								+	Actuator					

Example: Forged brass ball valve, two-way, threaded (NPT), brass trim, equal %, 1/2 in. (DN15) 1.9 Cv.

1. Before retrofitting older valves with VA9104, VA9300, VA9203, or VA9208 actuators, be sure that the valves have a tapped hole in the center of the valve stem and no threads in the flange holes. For retrofitting older valves with unthreaded stems and tapped flange holes, add the M9000-561 thermal barrier on the valve and mount the actuator.

Table 3: Ordering Data – Adding a Factory-Mounted Electric Actuator[1]

V G 1 2 4 1 A E +	Actuator Mounting[2]	+ = Factory-Mounted Actuator H = High Temperature Linkage (VA9104, VA9203, VA9208, and M9300 actuators)
9		(Leave Fields 9 through 15 blank for valve without factory-mounted actuator.)
9	Actuator Series	9 = VA9000 Series Direct Mounting Actuators
10		
1 0	Actuator Series[3].	10 = VA9310-HGA-2 Non-Spring Return
11 12		23 = VA9203-xxx-2(Z) Spring Opens
		28 = VA9208-AGA-2 and VA9208-GGA-2 Spring Opens
		38 = VA9208-xxx-3 Spring Opens (available in AGC, BAA, BAC, BGA, BGC, and GGC)
		43 = VA9203-xxx-2(Z) Spring Closes
		48 = VA9208-AGA-2 and VA9208-GGA-2 Spring Closes
		58 = VA9208-xxx-3 Spring Closes (available in AGC, BAA, BAC, BGA, BGC, and GGC)
		A4 = VA9104-xGA-2S, Non-Spring Return, 120 in. Cable (All 1/2, 3/4, and 1 in. Valves)
		T4 = VA9104-xGA-3S, Non-Spring Return, Screw Terminals (All 1/2, 3/4, and 1 in. Valves)
H	Control Type	A = Floating, AC/DC 24 V Input (VA9104, VA9300, VA9203, and VA9208)
13		B = On/Off (VA9203 and VA9208)
		G = Prop. DC 0 (2) to 10 V or 0 (4) to 20 mA (VA9104, VA9203, and VA9208)
		H = Universal Input for On/Off, Floating and Proportional 0(2) to 10 VDC with Adjustable Span (VA9300)
		I = On/Off Floating with Timeout (VA9104)
G	Supply	A = AC 120 V (VA9208-BAx Only)
14	Voltage	G = 24 VAC (All Models), 24 VAC/VDC (VA9300 Series)
		U = AC 85 to 264 V (VA9203-BUx)
C	Auxiliary Switch	A = No Auxiliary Switch (All models) B = One Auxiliary Switch C = Two Auxiliary Switches
15		

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 = Field

V	G	1	2	4	1	A	E	+	9	1	0	H	G	C
Valve								+	Actuator					

Example: Forged brass ball valve, two-way, threaded (NPT), brass trim, equal %, 1/2 in. (DN15) 1.9 Cv, factory-mounted direct acting VA9310-HGA-2 Actuator, non-spring return, universal input control, 24 VAC/VDC supply (with feedback), and M9300-2 Accessory Kit with two auxiliary switches.

1. Before retrofitting older valves with VA9104, VA9300, VA9203, or VA9208 actuators, be sure that the valves have a tapped hole in the center of the valve stem and no threads in the flange holes. For retrofitting older valves with unthreaded stems and tapped flange holes, add the M9000-561 thermal barrier on the valve and mount the actuator.
2. The high-speed, non-spring return actuators (VA9308-AGA-2Z), the line-voltage, non-spring return actuators (VA9310-AUA-2), and the line-voltage high speed actuators (VA9308-AUA-2Z) are available for mounting in the field; refer to the *VA9300 Series Electric Non-Spring Return Valve Actuators Product Bulletin (LIT-12012265)* for information.
3. Refer to actuator product bulletin for detailed information.

Table 4: Two-way stainless steel trim ball valves, non-spring return, VA9104 series actuators without switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V		
				On/off (floating) without timeout[1]	On/off (floating) with timeout	DC 0 to 10 V proportional
Valve	Size, in.	Cv	Closeoff psi			
Actuators with M3 screw terminals				**VA9104-AGA-3S**	**VA9104-IGA-3S**	**VA9104-GGA-3S**
VG1245AA	1/2	0.3[2]	200	VG1245AA+9T4AGA	-	VG1245AA+9T4GGA
VG1245AB		0.5[2]		VG1245AB+9T4AGA	-	VG1245AB+9T4GGA
VG1245AC		0.8[2]		VG1245AC+9T4AGA	-	VG1245AC+9T4GGA
VG1245AD		1.2[2]		VG1245AD+9T4AGA	VG1245AD+9T4IGA	VG1245AD+9T4GGA
VG1245AE		1.9[2]		VG1245AE+9T4AGA	VG1245AE+9T4IGA	VG1245AE+9T4GGA
VG1245AF		2.9[2]		VG1245AF+9T4AGA	VG1245AF+9T4IGA	VG1245AF+9T4GGA
VG1245AG		4.7[2]		VG1245AG+9T4AGA	VG1245AG+9T4IGA	VG1245AG+9T4GGA
VG1245AL		7.4[2]		VG1245AL+9T4AGA	VG1245AL+9T4IGA	VG1245AL+9T4GGA
VG1245AN		11.7		VG1245AN+9T4AGA	VG1245AN+9T4IGA	VG1245AN+9T4GGA
VG1245BG	3/4	4.7[2]	200	VG1245BG+9T4AGA	VG1245BG+9T4IGA	VG1245BG+9T4GGA
VG1245BL		7.4[2]		VG1245BL+9T4AGA	VG1245BL+9T4IGA	VG1245BL+9T4GGA
VG1245BN		11.7		VG1245BN+9T4AGA	VG1245BN+9T4IGA	VG1245BN+9T4GGA
VG1245CL	1	7.4[2]	200	VG1245CL+9T4AGA	VG1245CL+9T4IGA	VG1245CL+9T4GGA
VG1245CN		11.7[2]		VG1245CN+9T4AGA	VG1245CN+9T4IGA	VG1245CN+9T4GGA
VG1245CP		18.7		VG1245CP+9T4AGA	VG1245CP+9T4IGA	VG1245CP+9T4GGA
Actuators with 120 in. (3.05 m) 19 AWG plenum cable				**VA9104-AGA-2S**	**VA9104-IGA-2S**	**VA9104-GGA-2S**
VG1245AA	1/2	0.3[2]	200	VG1245AA+9A4AGA	-	VG1245AA+9A4GGA
VG1245AB		0.5[2]		VG1245AB+9A4AGA	-	VG1245AB+9A4GGA
VG1245AC		0.8[2]		VG1245AC+9A4AGA	-	VG1245AC+9A4GGA
VG1245AD		1.2[2]		VG1245AD+9A4AGA	VG1245AD+9A4IGA	VG1245AD+9A4GGA
VG1245AE		1.9[2]		VG1245AE+9A4AGA	VG1245AE+9A4IGA	VG1245AE+9A4GGA
VG1245AF		2.9[2]		VG1245AF+9A4AGA	VG1245AF+9A4IGA	VG1245AF+9A4GGA
VG1245AG		4.7[2]		VG1245AG+9A4AGA	VG1245AG+9A4IGA	VG1245AG+9A4GGA
VG1245AL		7.4[2]		VG1245AL+9A4AGA	VG1245AL+9A4IGA	VG1245AL+9A4GGA
VG1245AN		11.7		VG1245AN+9A4AGA	VG1245AN+9A4IGA	VG1245AN+9A4GGA
VG1245BG	3/4	4.7[2]	200	VG1245BG+9A4AGA	VG1245BG+9A4IGA	VG1245BG+9A4GGA
VG1245BL		7.4[2]		VG1245BL+9A4AGA	VG1245BL+9A4IGA	VG1245BL+9A4GGA
VG1245BN		11.7		VG1245BN+9A4AGA	VG1245BN+9A4IGA	VG1245BN+9A4GGA
VG1245CL	1	7.4[2]	200	VG1245CL+9A4AGA	VG1245CL+9A4IGA	VG1245CL+9A4GGA
VG1245CN		11.7[2]		VG1245CN+9A4AGA	VG1245CN+9A4IGA	VG1245CN+9A4GGA
VG1245CP		18.7		VG1245CP+9A4AGA	VG1245CP+9A4IGA	VG1245CP+9A4GGA

1. To avoid excessive wear or drive time on the motor for the AGx models, use a controller or software that provides a timeout function to remove the signal at the end of rotation (stall).
2. Valve has a characterizing disk.

Table 5: Two-way stainless steel trim ball valves, non-spring return, VA9104 series actuators without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V		
				On/off (floating) without timeout[1]	On/off (floating) with timeout	DC 0 to 10 V proportional
Valve	**Size, in.**	**Cv**	**Closeoff psi**			
Actuators with M3 screw terminals with M9000-561 Thermal Barrier installed				**VA9104-AGA-3S**	**VA9104-IGA-3S**	**VA9104-GGA-3S**
VG1245AA	1/2	0.3[2]	200	VG1245AAH9T4AGA	-	VG1245AAH9T4GGA
VG1245AB		0.5[2]		VG1245ABH9T4AGA	-	VG1245ABH9T4GGA
VG1245AC		0.8[2]		VG1245ACH9T4AGA	-	VG1245ACH9T4GGA
VG1245AD		1.2[2]		VG1245ADH9T4AGA	VG1245ADH9T4IGA	VG1245ADH9T4GGA
VG1245AE		1.9[2]		VG1245AEH9T4AGA	VG1245AEH9T4IGA	VG1245AEH9T4GGA
VG1245AF		2.9[2]		VG1245AFH9T4AGA	VG1245AFH9T4IGA	VG1245AFH9T4GGA
VG1245AG		4.7[2]		VG1245AGH9T4AGA	VG1245AGH9T4IGA	VG1245AGH9T4GGA
VG1245AL		7.4[2]		VG1245ALH9T4AGA	VG1245ALH9T4IGA	VG1245ALH9T4GGA
VG1245AN		11.7		VG1245ANH9T4AGA	VG1245ANH9T4IGA	VG1245ANH9T4GGA
VG1245BG	3/4	4.7[2]	200	VG1245BGH9T4AGA	VG1245BGH9T4IGA	VG1245BGH9T4GGA
VG1245BL		7.4[2]		VG1245BLH9T4AGA	VG1245BLH9T4IGA	VG1245BLH9T4GGA
VG1245BN		11.7		VG1245BNH9T4AGA	VG1245BNH9T4IGA	VG1245BNH9T4GGA
VG1245CL	1	7.4[2]	200	VG1245CLH9T4AGA	VG1245CLH9T4IGA	VG1245CLH9T4GGA
VG1245CN		11.7[2]		VG1245CNH9T4AGA	VG1245CNH9T4IGA	VG1245CNH9T4GGA
VG1245CP		18.7		VG1245CPH9T4AGA	VG1245CPH9T4IGA	VG1245CPH9T4GGA
Actuators with 120 in. (3.05 m) 19 AWG plenum cable with M9000-561 Thermal Barrier installed				**VA9104-AGA-2S**	**VA9104-IGA-2S**	**VA9104-GGA-2S**
VG1245AA	1/2	0.3[2]	200	VG1245AAH9A4AGA	-	VG1245AAH9A4GGA
VG1245AB		0.5[2]		VG1245ABH9A4AGA	-	VG1245ABH9A4GGA
VG1245AC		0.8[2]		VG1245ACH9A4AGA	-	VG1245ACH9A4GGA
VG1245AD		1.2[2]		VG1245ADH9A4AGA	VG1245ADH9A4IGA	VG1245ADH9A4GGA
VG1245AE		1.9[2]		VG1245AEH9A4AGA	VG1245AEH9A4IGA	VG1245AEH9A4GGA
VG1245AF		2.9[2]		VG1245AFH9A4AGA	VG1245AFH9A4IGA	VG1245AFH9A4GGA
VG1245AG		4.7[2]		VG1245AGH9A4AGA	VG1245AGH9A4IGA	VG1245AGH9A4GGA
VG1245AL		7.4[2]		VG1245ALH9A4AGA	VG1245ALH9A4IGA	VG1245ALH9A4GGA
VG1245AN		11.7		VG1245ANH9A4AGA	VG1245ANH9A4IGA	VG1245ANH9A4GGA
VG1245BG	3/4	4.7[2]	200	VG1245BGH9A4AGA	VG1245BGH9A4IGA	VG1245BGH9A4GGA
VG1245BL		7.4[2]		VG1245BLH9A4AGA	VG1245BLH9A4IGA	VG1245BLH9A4GGA
VG1245BN		11.7		VG1245BNH9A4AGA	VG1245BNH9A4IGA	VG1245BNH9A4GGA
VG1245CL	1	7.4[2]	200	VG1245CLH9A4AGA	VG1245CLH9A4IGA	VG1245CLH9A4GGA
VG1245CN		11.7[2]		VG1245CNH9A4AGA	VG1245CNH9A4IGA	VG1245CNH9A4GGA
VG1245CP		18.7		VG1245CPH9A4AGA	VG1245CPH9A4IGA	VG1245CPH9A4GGA

1. To avoid excessive wear or drive time on the motor for the AGx models, use a controller or software that provides a timeout function to remove the signal at the end of rotation (stall).
2. Valve has a characterizing disk.

Table 6: Two-way stainless steel trim ball valves, non-spring return, VA9300 series actuators without switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC/DC 24 V		
				On/Off	Floating	DC 0(2) to 10 V Proportional
Valve	Size, in.	Cv	Closeoff psi	VA9310-HGA-2		
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+910HGA		
VG1245DP		18.7[1]		VG1245DP+910HGA		
VG1245DR		29.2		VG1245DR+910HGA		
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+910HGA		
VG1245ER		29.2[1]		VG1245ER+910HGA		
VG1245ES		46.8		VG1245ES+910HGA		
VG1245FR	2	29.2[1]	200	VG1245FR+910HGA		
VG1245FS		48.8[1]		VG1245FS+910HGA		
VG1245FT		73.7		VG1245FT+910HGA		

1. Valve has a characterizing disk.

Table 7: Two-way stainless steel trim ball valves, non-spring return VA9300 series electric actuators with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC/DC 24 V		
				On/Off	Floating	DC 0(2) to 10 V Proportional
Valve	Size, in.	Cv	Closeoff psi	VA9310-HGA-2 actuator with M9300-2 Switch Kit[1]		
VG1245AD	1/2	1.2[2]	200	VG1245AD+910HGC		
VG1245AE		1.9[2]		VG1245AE+910HGC		
VG1245AF		2.9[2]		VG1245AF+910HGC		
VG1245AG		4.7[2]		VG1245AG+910HGC		
VG1245AL		7.4[2]		VG1245AL+910HGC		
VG1245AN		11.7		VG1245AN+910HGC		
VG1245BG	3/4	4.7[2]	200	VG1245BG+910HGC		
VG1245BL		7.4[2]		VG1245BL+910HGC		
VG1245BN		11.7		VG1245BN+910HGC		
VG1245CL	1	7.4[2]	200	VG1245CL+910HGC		
VG1245CN		11.7[2]		VG1245CN+910HGC		
VG1245CP		18.7		VG1245CP+910HGC		
VG1245DN	1-1/4	11.7[2]	200	VG1245DN+910HGC		
VG1245DP		18.7[2]		VG1245DP+910HGC		
VG1245DR		29.2		VG1245DR+910HGC		
VG1245EP	1-1/2	18.7[2]	200	VG1245EP+910HGC		
VG1245ER		29.2[2]		VG1245ER+910HGC		
VG1245ES		46.8		VG1245ES+910HGC		
VG1245FR	2	29.2[2]	200	VG1245FR+910HGC		
VG1245FS		46.8[2]		VG1245FS+910HGC		
VG1245FT		73.7		VG1245FT+910HGC		

1. For field mounting order VA9310-HGA-2 and the M9300-2 Switch Kit separately.
2. Valve has a characterizing disk.

Table 8: Two-way stainless steel trim ball valves, non-spring return, VA9300 series actuators without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC/DC 24 V		
				On/Off	Floating	DC 0(2) to 10 V Proportional
Valve	Size, in.	Cv	Closeoff psi	VA9310-HGA-2 with M9000-561 Thermal Barrier		
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH910HGA		
VG1245DP		18.7[1]		VG1245DPH910HGA		
VG1245DR		29.2		VG1245DRH910HGA		
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH910HGA		
VG1245ER		29.2[1]		VG1245ERH910HGA		
VG1245ES		46.8		VG1245ESH910HGA		
VG1245FR	2	29.2[1]	200	VG1245FRH910HGA		
VG1245FS		48.8[1]		VG1245FSH910HGA		
VG1245FT		73.7		VG1245FTH910HGA		

1. Valve has a characterizing disk.

Table 9: Two-way stainless steel trim ball valves, non-spring return VA9300 series electric actuators with switches and optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC/DC 24 V		
				On/Off	Floating	DC 0(2) to 10 V Proportional
Valve	Size, in.	Cv	Closeoff psi	VA9310-HGA-2 actuator with M9300-2 Switch Kit with M9000-561 Thermal Barrier[1]		
VG1245AD	1/2	1.2[2]	200	VG1245ADH910HGC		
VG1245AE		1.9[2]		VG1245AEH910HGC		
VG1245AF		2.9[2]		VG1245AFH910HGC		
VG1245AG		4.7[2]		VG1245AGH910HGC		
VG1245AL		7.4[2]		VG1245ALH910HGC		
VG1245AN		11.7		VG1245ANH910HGC		
VG1245BG	3/4	4.7[2]	200	VG1245BGH910HGC		
VG1245BL		7.4[2]		VG1245BLH910HGC		
VG1245BN		11.7		VG1245BNH910HGC		
VG1245CL	1	7.4[2]	200	VG1245CLH910HGC		
VG1245CN		11.7[2]		VG1245CNH910HGC		
VG1245CP		18.7		VG1245CPH910HGC		
VG1245DN	1-1/4	11.7[2]	200	VG1245DNH910HGC		
VG1245DP		18.7[2]		VG1245DPH910HGC		
VG1245DR		29.2		VG1245DRH910HGC		
VG1245EP	1-1/2	18.7[2]	200	VG1245EPH910HGC		
VG1245ER		29.2[2]		VG1245ERH910HGC		
VG1245ES		46.8		VG1245ESH910HGC		
VG1245FR	2	29.2[2]	200	VG1245FRH910HGC		
VG1245FS		46.8[2]		VG1245FSH910HGC		
VG1245FT		73.7		VG1245FTH0910HGC		

1. For field mounting order VA9310-HGA-2, M9300-2 Switch Kit and M9000-561 Thermal Barrier separately.
2. Valve has a characterizing disk.

Table 10: Two-way stainless steel trim ball valves, spring return valve open - valve normally open, VA9203/ VA9208 series actuators with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/Off	On/Off
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Spring return open — valve normally open — actuators with one switch**			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AA	1/2	0.3[1]	200	VG1245AA+923AGB	VG1245AA+923GGB	VG1245AA+923BGB	-
VG1245AB		0.5[1]		VG1245AB+923AGB	VG1245AB+923GGB	VG1245AB+923BGB	-
VG1245AA		0.8[1]		VG1245AC+923AGB	VG1245AC+923GGB	VG1245AC+923BGB	-
VG1245AD		1.2[1]		VG1245AD+923AGB	VG1245AD+923GGB	VG1245AD+923BGB	VG1245AD+923BUB
VG1245AE		1.9[1]		VG1245AE+923AGB	VG1245AE+923GGB	VG1245AE+923BGB	VG1245AE+923BUB
VG1245AF		2.9[1]		VG1245AF+923AGB	VG1245AF+923GGB	VG1245AF+923BGB	VG1245AF+923BUB
VG1245AG		4.7[1]		VG1245AG+923AGB	VG1245AG+923GGB	VG1245AG+923BGB	VG1245AG+923BUB
VG1245AL		7.4[1]		VG1245AL+923AGB	VG1245AL+923GGB	VG1245AL+923BGB	VG1245AL+923BUB
VG1245AN		11.7		VG1245AN+923AGB	VG1245AN+923GGB	VG1245AN+923BGB	VG1245AN+923BUB
VG1245BG	3/4	4.7[1]	200	VG1245BG+923AGB	VG1245BG+923GGB	VG1245BG+923BGB	VG1245BG+923BUB
VG1245BL		7.4[1]		VG1245BL+923AGB	VG1245BL+923GGB	VG1245BL+923BGB	VG1245BL+923BUB
VG1245BN		11.7		VG1245BN+923AGB	VG1245BN+923GGB	VG1245BN+923BGB	VG1245BN+923BUB
VG1245CL	1	7.4[1]	200	VG1245CL+923AGB	VG1245CL+923GGB	VG1245CL+923BGB	VG1245CL+923BUB
VG1245CN		11.7[1]		VG1245CN+923AGB	VG1245CN+923GGB	VG1245CN+923BGB	VG1245CN+923BUB
VG1245CP		18.7		VG1245CP+923AGB	VG1245CP+923GGB	VG1245CP+923BGB	VG1245CP+923BUB
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Spring return open — valve normally open — actuators with two switches**			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+938AGC	VG1245DN+938GGC	VG1245DN+938BGC	VG1245DN+938BAC
VG1245DP		18.7[1]		VG1245DP+938AGC	VG1245DP+938GGC	VG1245DP+938BGC	VG1245DP+938BAC
VG1245DR		29.2		VG1245DR+938AGC	VG1245DR+938GGC	VG1245DR+938BGC	VG1245DR+938BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+938AGC	VG1245EP+938GGC	VG1245EP+938BGC	VG1245EP+938BAC
VG1245ER		29.2[1]		VG1245ER+938AGC	VG1245ER+938GGC	VG1245ER+938BGC	VG1245ER+938BAC
VG1245ES		46.8		VG1245ES+938AGC	VG1245ES+938GGC	VG1245ES+938BGC	VG1245ES+938BAC
VG1245FR	2	29.2[1]	200	VG1245FR+938AGC	VG1245FR+938GGC	VG1245FR+938BGC	VG1245FR+938BAC
VG1245FS		46.8[1]		VG1245FS+938AGC	VG1245FS+938GGC	VG1245FS+938BGC	VG1245FS+938BAC
VG1245FT		73.7		VG1245FT+938AGC	VG1245FT+938GGC	VG1245FT+938BGC	VG1245FT+938BAC

1. Valve has a characterizing disk.

Table 11: Two-way stainless steel trim ball valves, spring return valve closed - valve normally closed, VA9203/VA9208 series actuators with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv	Closeoff psi	Spring return closed — valve normally closed — actuators with one switch			
				VA9203-AGB-2Z	VA9203-GGB-2Z	VA9203-BGB-2	VA9203-BUB-2
VG1245AA	1/2	0.3[1]	200	VG1245AA+943AGB	VG1245AA+943GGB	VG1245AA+943BGB	-
VG1245AB		0.5[1]		VG1245AB+943AGB	VG1245AB+943GGB	VG1245AB+943BGB	-
VG1245AA		0.8[1]		VG1245AC+943AGB	VG1245AC+943GGB	VG1245AC+943BGB	-
VG1245AD		1.2[1]		VG1245AD+943AGB	VG1245AD+943GGB	VG1245AD+943BGB	VG1245AD+943BUB
VG1245AE		1.9[1]		VG1245AE+943AGB	VG1245AE+943GGB	VG1245AE+943BGB	VG1245AE+943BUB
VG1245AF		2.9[1]		VG1245AF+943AGB	VG1245AF+943GGB	VG1245AF+943BGB	VG1245AF+943BUB
VG1245AG		4.7[1]		VG1245AG+943AGB	VG1245AG+943GGB	VG1245AG+943BGB	VG1245AG+943BUB
VG1245AL		7.4[1]		VG1245AL+943AGB	VG1245AL+943GGB	VG1245AL+943BGB	VG1245AL+943BUB
VG1245AN		11.7		VG1245AN+943AGB	VG1245AN+943GGB	VG1245AN+943BGB	VG1245AN+943BUB
VG1245BG	3/4	4.7[1]	200	VG1245BG+943AGB	VG1245BG+943GGB	VG1245BG+943BGB	VG1245BG+943BUB
VG1245BL		7.4[1]		VG1245BL+943AGB	VG1245BL+943GGB	VG1245BL+943BGB	VG1245BL+943BUB
VG1245BN		11.7		VG1245BN+943AGB	VG1245BN+943GGB	VG1245BN+943BGB	VG1245BN+943BUB
VG1245CL	1	7.4[1]	200	VG1245CL+943AGB	VG1245CL+943GGB	VG1245CL+943BGB	VG1245CL+943BUB
VG1245CN		11.7[1]		VG1245CN+943AGB	VG1245CN+943GGB	VG1245CN+943BGB	VG1245CN+943BUB
VG1245CP		18.7		VG1245CP+943AGB	VG1245CP+943GGB	VG1245CP+943BGB	VG1245CP+943BUB
Valve	Size, in.	Cv	Closeoff psi	Spring return closed — valve normally closed — actuators with two switches			
				VA9208-AGC-3	VA9208-GGC-3	VA9208-BGC-3	VA9208-BAC-3
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+958AGC	VG1245DN+958GGC	VG1245DN+958BGC	VG1245DN+958BAC
VG1245DP		18.7[1]		VG1245DP+958AGC	VG1245DP+958GGC	VG1245DP+958BGC	VG1245DP+958BAC
VG1245DR		29.2		VG1245DR+958AGC	VG1245DR+958GGC	VG1245DR+958BGC	VG1245DR+958BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+958AGC	VG1245EP+958GGC	VG1245EP+958BGC	VG1245EP+958BAC
VG1245ER		29.2[1]		VG1245ER+958AGC	VG1245ER+958GGC	VG1245ER+958BGC	VG1245ER+958BAC
VG1245ES		46.8		VG1245ES+958AGC	VG1245ES+958GGC	VG1245ES+958BGC	VG1245ES+958BAC
VG1245FR	2	29.2[1]	200	VG1245FR+958AGC	VG1245FR+958GGC	VG1245FR+958BGC	VG1245FR+958BAC
VG1245FS		46.8[1]		VG1245FS+958AGC	VG1245FS+958GGC	VG1245FS+958BGC	VG1245FS+958BAC
VG1245FT		73.7		VG1245FT+958AGC	VG1245FT+958GGC	VG1245FT+958BGC	VG1245FT+958BAC

1. Valve has a characterizing disk.

Table 12: Two-way stainless steel trim ball valves, spring return valve open - valve normally open, VA9203/ VA9208 series actuators with switches and optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V Proportional	On/Off	On/Off
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Spring return open — valve normally open — actuators with one switch**			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AA	1/2	0.3[1]	200	VG1245AAH923AGB	VG1245AAH923GGB	VG1245AAH923BGB	-
VG1245AB		0.5[1]		VG1245ABH923AGB	VG1245ABH923GGB	VG1245ABH923BGB	-
VG1245AA		0.8[1]		VG1245ACH923AGB	VG1245ACH923GGB	VG1245ACH923BGB	-
VG1245AD		1.2[1]		VG1245ADH923AGB	VG1245ADH923GGB	VG1245ADH923BGB	VG1245ADH923BUB
VG1245AE		1.9[1]		VG1245AEH923AGB	VG1245AEH923GGB	VG1245AEH923BGB	VG1245AEH923BUB
VG1245AF		2.9[1]		VG1245AFH923AGB	VG1245AFH923GGB	VG1245AFH923BGB	VG1245AFH923BUB
VG1245AG		4.7[1]		VG1245AGH923AGB	VG1245AGH923GGB	VG1245AGH923BGB	VG1245AGH923BUB
VG1245AL		7.4[1]		VG1245ALH923AGB	VG1245ALH923GGB	VG1245ALH923BGB	VG1245ALH923BUB
VG1245AN		11.7		VG1245ANH923AGB	VG1245ANH923GGB	VG1245ANH923BGB	VG1245ANH923BUB
VG1245BG	3/4	4.7[1]	200	VG1245BGH923AGB	VG1245BGH923GGB	VG1245BGH923BGB	VG1245BGH923BUB
VG1245BL		7.4[1]		VG1245BLH923AGB	VG1245BLH923GGB	VG1245BLH923BGB	VG1245BLH923BUB
VG1245BN		11.7		VG1245BNH923AGB	VG1245BNH923GGB	VG1245BNH923BGB	VG1245BNH923BUB
VG1245CL	1	7.4[1]	200	VG1245CLH923AGB	VG1245CLH923GGB	VG1245CLH923BGB	VG1245CLH923BUB
VG1245CN		11.7[1]		VG1245CNH923AGB	VG1245CNH923GGB	VG1245CNH923BGB	VG1245CNH923BUB
VG1245CP		18.7		VG1245CPH923AGB	VG1245CPH923GGB	VG1245CPH923BGB	VG1245CPH923BUB
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Spring return open — valve normally open — actuators with two switches**			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH938AGC	VG1245DNH938GGC	VG1245DNH938BGC	VG1245DNH938BAC
VG1245DP		18.7[1]		VG1245DPH938AGC	VG1245DPH938GGC	VG1245DPH938BGC	VG1245DPH938BAC
VG1245DR		29.2		VG1245DRH938AGC	VG1245DRH938GGC	VG1245DRH938BGC	VG1245DRH938BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH938AGC	VG1245EPH938GGC	VG1245EPH938BGC	VG1245EPH938BAC
VG1245ER		29.2[1]		VG1245ERH938AGC	VG1245ERH938GGC	VG1245ERH938BGC	VG1245ERH938BAC
VG1245ES		46.8		VG1245ESH938AGC	VG1245ESH938GGC	VG1245ESH938BGC	VG1245ESH938BAC
VG1245FR	2	29.2[1]	200	VG1245FRH938AGC	VG1245FRH938GGC	VG1245FRH938BGC	VG1245FRH938BAC
VG1245FS		46.8[1]		VG1245FSH938AGC	VG1245FSH938GGC	VG1245FSH938BGC	VG1245FSH938BAC
VG1245FT		73.7		VG1245FTH938AGC	VG1245FTH938GGC	VG1245FTH938BGC	VG1245FTH938BAC

1. Valve has a characterizing disk.

Table 13: Two-way stainless steel trim ball valves, spring return valve closed - valve normally closed, VA9203/VA9208 series actuators with switches and optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Spring return closed — valve normally closed — actuators with one switch**			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1245AA	1/2	0.3[1]	200	VG1245AAH943AGB	VG1245AAH943GGB	VG1245AAH943BGB	-
VG1245AB		0.5[1]		VG1245ABH943AGB	VG1245ABH943GGB	VG1245ABH943BGB	-
VG1245AA		0.8[1]		VG1245ACH943AGB	VG1245ACH943GGB	VG1245ACH943BGB	-
VG1245AD		1.2[1]		VG1245ADH943AGB	VG1245ADH943GGB	VG1245ADH943BGB	VG1245ADH943BUB
VG1245AE		1.9[1]		VG1245AEH943AGB	VG1245AEH943GGB	VG1245AEH943BGB	VG1245AEH943BUB
VG1245AF		2.9[1]		VG1245AFH943AGB	VG1245AFH943GGB	VG1245AFH943BGB	VG1245AFH943BUB
VG1245AG		4.7[1]		VG1245AGH943AGB	VG1245AGH943GGB	VG1245AGH943BGB	VG1245AGH943BUB
VG1245AL		7.4[1]		VG1245ALH943AGB	VG1245ALH943GGB	VG1245ALH943BGB	VG1245ALH943BUB
VG1245AN		11.7		VG1245ANH943AGB	VG1245ANH943GGB	VG1245ANH943BGB	VG1245ANH943BUB
VG1245BG	3/4	4.7[1]	200	VG1245BGH943AGB	VG1245BGH943GGB	VG1245BGH943BGB	VG1245BGH943BUB
VG1245BL		7.4[1]		VG1245BLH943AGB	VG1245BLH943GGB	VG1245BLH943BGB	VG1245BLH943BUB
VG1245BN		11.7		VG1245BNH943AGB	VG1245BNH943GGB	VG1245BNH943BGB	VG1245BNH943BUB
VG1245CL	1	7.4[1]	200	VG1245CLH943AGB	VG1245CLH943GGB	VG1245CLH943BGB	VG1245CLH943BUB
VG1245CN		11.7[1]		VG1245CNH943AGB	VG1245CNH943GGB	VG1245CNH943BGB	VG1245CNH943BUB
VG1245CP		18.7		VG1245CPH943AGB	VG1245CPH943GGB	VG1245CPH943BGB	VG1245CPH943BUB
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**Spring return closed — valve normally closed — actuators with two switches**			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH958AGC	VG1245DNH958GGC	VG1245DNH958BGC	VG1245DNH958BAC
VG1245DP		18.7[1]		VG1245DPH958AGC	VG1245DPH958GGC	VG1245DPH958BGC	VG1245DPH958BAC
VG1245DR		29.2		VG1245DRH958AGC	VG1245DRH958GGC	VG1245DRH958BGC	VG1245DRH958BAC
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH958AGC	VG1245EPH958GGC	VG1245EPH958BGC	VG1245EPH958BAC
VG1245ER		29.2[1]		VG1245ERH958AGC	VG1245ERH958GGC	VG1245ERH958BGC	VG1245ERH958BAC
VG1245ES		46.8		VG1245ESH958AGC	VG1245ESH958GGC	VG1245ESH958BGC	VG1245ESH958BAC
VG1245FR	2	29.2[1]	200	VG1245FRH958AGC	VG1245FRH958GGC	VG1245FRH958BGC	VG1245FRH958BAC
VG1245FS		46.8[1]		VG1245FSH958AGC	VG1245FSH958GGC	VG1245FSH958BGC	VG1245FSH958BAC
VG1245FT		73.7		VG1245FTH958AGC	VG1245FTH958GGC	VG1245FTH958BGC	VG1245FTH958BAC

1. Valve has a characterizing disk.

Table 14: Two-way stainless steel trim ball valves, spring return value open - valve normally open, VA9203/ VA9208 series actuators without switches

Fluid Temperatures: -22 to 212°F (-30 to 100°C) Not Rated for Steam Service				AC 24 V			AC 85-264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv	Closeoff psi	Spring return open - valve normally open - actuators without switches			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1245AA	1/2	0.3[1]	200	VG1245AA+923AGA	VG1245AA+923GGB	VG1245AA+923BGA	-
VG1245AB		0.5[1]		VG1245AB+923AGA	VG1245AB+923GGB	VG1245AB+923BGA	-
VG1245AA		0.8[1]		VG1245AC+923AGA	VG1245AC+923GGA	VG1245AC+923BGA	-
VG1245AD		1.2[1]		VG1245AD+923AGA	VG1245AD+923GGA	VG1245AD+923BGA	VG1245AD+923BUA
VG1245AE		1.9[1]		VG1245AE+923AGA	VG1245AE+923GGA	VG1245AE+923BGA	VG1245AE+923BUA
VG1245AF		2.9[1]		VG1245AF+932AGA	VG1245AF+923GGA	VG1245AF+923BGA	VG1245AF+923BUA
VG1245AG		4.7[1]		VG1245AG+923AGA	VG1245AG+923GGA	VG1245AG+923BGA	VG1245AG+923BUA
VG1245AL		7.4[1]		VG1245AL+923AGA	VG1245AL+923GGA	VG1245AL+923BGA	VG1245AL+923BUA
VG1245AN		11.7		VG1245AN+923AGA	VG1245AN+923GGA	VG1245AN+923BGA	VG1245AN+923BUA
VG1245BG	3/4	4.7[1]	200	VG1245BG+923AGA	VG1245BG+923GGA	VG1245BG+923BGA	VG1245BG+923BUA
VG1245BL		7.4[1]		VG1245BL+923AGA	VG1245BL+923GGA	VG1245BL+923BGA	VG1245BL+923BUA
VG1245BN		11.7		VG1245BN+923AGA	VG1245BN+923GGA	VG1245BN+923BGA	VG1245BN+923BUA
VG1245CL	1	7.4[1]	200	VG1245CL+923AGA	VG1245CL+923GGA	VG1245CL+923BGA	VG1245CL+923BUA
VG1245CN		11.7[1]		VG1245CN+923AGA	VG1245CN+923GGA	VG1245CN+923BGA	VG1245CN+923BUA
VG1245CP		18.7		VG1245CP+923AGA	VG1245CP+923GGA	VG1245CP+923BGA	VG1245CP+923BUA
Valve	Size, in.	Cv	Closeoff psi	Spring return open - valve normally open - actuators without switches			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-3	VA9208-BAA-3
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+928AGA	VG1245DN+928GGA	VG1245DN+938BGA	VG1245DN+938BAA
VG1245DP		18.7[1]		VG1245DP+928AGA	VG1245DP+928GGA	VG1245DP+938BGA	VG1245DP+938BAA
VG1245DR		29.2		VG1245DR+928AGA	VG1245DR+928GGA	VG1245DR+938BGA	VG1245DR+938BAA
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+928AGA	VG1245EP+928GGA	VG1245EP+938BGA	VG1245EP+938BAA
VG1245ER		29.2[1]		VG1245ER+928AGA	VG1245ER+928GGA	VG1245ER+938BGA	VG1245ER+938BAA
VG1245ES		46.8		VG1245ES+928AGA	VG1245ES+928GGA	VG1245ES+938BGA	VG1245ES+938BAA
VG1245FR	2	29.2[1]	200	VG1245FR+928AGA	VG1245FR+928GGA	VG1245FR+938BGA	VG1245FR+938BAA
VG1245FS		46.8[1]		VG1245FS+928AGA	VG1245FS+928GGA	VG1245FS+938BGA	VG1245FS+938BAA
VG1245FT		73.7		VG1245FT+928AGA	VG1245FT+928GGA	VG1245FT+938BGA	VG1245FT+938BAA

1. Valve has a characterizing disk.

Table 15: Two-way stainless steel trim ball valves, spring return valve closed - valve normally closed, VA9203/VA9208 series actuators without switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85-264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv	Closeoff psi	Spring return closed- valve normally closed - actuators without switches			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1245AA	1/2	0.3[1]	200	VG1245AA+943AGA	VG1245AA+943GGB	VG1245AA+943BGA	-
VG1245AB		0.5[1]		VG1245AB+943AGA	VG1245AB+943GGB	VG1245AB+943BGA	-
VG1245AA		0.8[1]		VG1245AC+943AGA	VG1245AC+943GGA	VG1245AC+943BGA	-
VG1245AD		1.2[1]		VG1245AD+943AGA	VG1245AD+943GGA	VG1245AD+943BGA	VG1245AD+943BUA
VG1245AE		1.9[1]		VG1245AE+943AGA	VG1245AE+943GGA	VG1245AE+943BGA	VG1245AE+943BUA
VG1245AF		2.9[1]		VG1245AF+943AGA	VG1245AF+943GGA	VG1245AF+943BGA	VG1245AF+943BUA
VG1245AG		4.7[1]		VG1245AG+943AGA	VG1245AG+943GGA	VG1245AG+943BGA	VG1245AG+943BUA
VG1245AL		7.4[1]		VG1245AL+943AGA	VG1245AL+943GGA	VG1245AL+943BGA	VG1245AL+943BUA
VG1245AN		11.7		VG1245AN+943AGA	VG1245AN+943GGA	VG1245AN+943BGA	VG1245AN+943BUA
VG1245BG	3/4	4.7[1]	200	VG1245BG+943AGA	VG1245BG+943GGA	VG1245BG+943BGA	VG1245BG+943BUA
VG1245BL		7.4[1]		VG1245BL+943AGA	VG1245BL+943GGA	VG1245BL+943BGA	VG1245BL+943BUA
VG1245BN		11.7		VG1245BN+943AGA	VG1245BN+943GGA	VG1245BN+943BGA	VG1245BN+943BUA
VG1245CL	1	7.4[1]	200	VG1245CL+943AGA	VG1245CL+943GGA	VG1245CL+943BGA	VG1245CL+943BUA
VG1245CN		11.7[1]		VG1245CN+943AGA	VG1245CN+943GGA	VG1245CN+943BGA	VG1245CN+943BUA
VG1245CP		18.7		VG1245CP+943AGA	VG1245CP+943GGA	VG1245CP+943BGA	VG1245CP+943BUA
Valve	Size, in.	Cv	Closeoff psi	Spring return closed - valve normally closed - actuators without switches			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-3	VA9208-BAA-3
VG1245DN	1-1/4	11.7[1]	200	VG1245DN+948AGA	VG1245DN+948GGA	VG1245DN+958BGA	VG1245DN+958BAA
VG1245DP		18.7[1]		VG1245DP+948AGA	VG1245DP+948GGA	VG1245DP+958BGA	VG1245DP+958BAA
VG1245DR		29.2		VG1245DR+948AGA	VG1245DR+948GGA	VG1245DR+958BGA	VG1245DR+958BAA
VG1245EP	1-1/2	18.7[1]	200	VG1245EP+948AGA	VG1245EP+948GGA	VG1245EP+958BGA	VG1245EP+958BAA
VG1245ER		29.2[1]		VG1245ER+948AGA	VG1245ER+948GGA	VG1245ER+958BGA	VG1245ER+958BAA
VG1245ES		46.8		VG1245ES+948AGA	VG1245ES+948GGA	VG1245ES+958BGA	VG1245ES+958BAA
VG1245FR	2	29.2[1]	200	VG1245FR+948AGA	VG1245FR+948GGA	VG1245FR+958BGA	VG1245FR+958BAA
VG1245FS		46.8[1]		VG1245FS+948AGA	VG1245FS+948GGA	VG1245FS+958BGA	VG1245FS+958BAA
VG1245FT		73.7		VG1245FT+948AGA	VG1245FT+948GGA	VG1245FT+958BGA	VG1245FT+958BAA

1. Valve has a characterizing disk.

Table 16: Two-way stainless steel trim ball valves, spring return open - valve normally open, VA9203/VA9208 series actuators without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85-264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V Proportional	On/Off	On/Off
Valve	Size, in.	Cv	Closeoff psi	Spring return open - valve normally open - actuators without switches			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1245AA	1/2	0.3[1]	200	VG1245AAH923AGA	VG1245AAH923GGB	VG1245AAH923BGA	-
VG1245AB		0.5[1]		VG1245ABH923AGA	VG1245ABH923GGB	VG1245ABH923BGA	-
VG1245AA		0.8[1]		VG1245ACH923AGA	VG1245ACH923GGA	VG1245ACH923BGA	-
VG1245AD		1.2[1]		VG1245ADH923AGA	VG1245ADH923GGA	VG1245ADH923BGA	VG1245ADH923BUA
VG1245AE		1.9[1]		VG1245AEH923AGA	VG1245AEH923GGA	VG1245AEH923BGA	VG1245AEH923BUA
VG1245AF		2.9[1]		VG1245AFH932AGA	VG1245AFH923GGA	VG1245AFH923BGA	VG1245AFH923BUA
VG1245AG		4.7[1]		VG1245AGH923AGA	VG1245AGH923GGA	VG1245AGH923BGA	VG1245AGH923BUA
VG1245AL		7.4[1]		VG1245ALH923AGA	VG1245ALH923GGA	VG1245ALH923BGA	VG1245ALH923BUA
VG1245AN		11.7		VG1245ANH923AGA	VG1245ANH923GGA	VG1245ANH923BGA	VG1245ANH923BUA
VG1245BG	3/4	4.7[1]	200	VG1245BGH923AGA	VG1245BGH923GGA	VG1245BGH923BGA	VG1245BGH923BUA
VG1245BL		7.4[1]		VG1245BLH923AGA	VG1245BLH923GGA	VG1245BLH923BGA	VG1245BLH923BUA
VG1245BN		11.7		VG1245BNH923AGA	VG1245BNH923GGA	VG1245BNH923BGA	VG1245BNH923BUA
VG1245CL	1	7.4[1]	200	VG1245CLH923AGA	VG1245CLH923GGA	VG1245CLH923BGA	VG1245CLH923BUA
VG1245CN		11.7[1]		VG1245CNH923AGA	VG1245CNH923GGA	VG1245CNH923BGA	VG1245CNH923BUA
VG1245CP		18.7		VG1245CPH923AGA	VG1245CPH923GGA	VG1245CPH923BGA	VG1245CPH923BUA
Valve	Size, in.	Cv	Closeoff psi	Spring return open - valve normally open - actuators without switches			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-3	VA9208-BAA-3
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH928AGA	VG1245DNH928GGA	VG1245DNH938BGA	VG1245DNH938BAA
VG1245DP		18.7[1]		VG1245DPH928AGA	VG1245DPH928GGA	VG1245DPH938BGA	VG1245DPH938BAA
VG1245DR		29.2		VG1245DRH928AGA	VG1245DRH928GGA	VG1245DRH938BGA	VG1245DRH938BAA
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH928AGA	VG1245EPH928GGA	VG1245EPH938BGA	VG1245EPH938BAA
VG1245ER		29.2[1]		VG1245ERH928AGA	VG1245ERH928GGA	VG1245ERH938BGA	VG1245ERH938BAA
VG1245ES		46.8		VG1245ESH928AGA	VG1245ESH928GGA	VG1245ESH938BGA	VG1245ESH938BAA
VG1245FR	2	29.2[1]	200	VG1245FRH928AGA	VG1245FRH928GGA	VG1245FRH938BGA	VG1245FRH938BAA
VG1245FS		46.8[1]		VG1245FSH928AGA	VG1245FSH928GGA	VG1245FSH938BGA	VG1245FSH938BAA
VG1245FT		73.7		VG1245FTH928AGA	VG1245FTH928GGA	VG1245FTH938BGA	VG1245FTH938BAA

1. Valve has a characterizing disk.

Table 17: Two-way stainless steel trim ball valves, spring return valve closed - valve normally closed, VA9203/VA9208 series without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85-264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv	Closeoff psi	Spring return closed - valve normally closed - actuators without switches			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1245AA	1/2	0.3[1]	200	VG1245AAH943AGA	VG1245AAH943GGB	VG1245AAH943BGA	-
VG1245AB		0.5[1]		VG1245ABH943AGA	VG1245ABH943GGB	VG1245ABH943BGA	-
VG1245AA		0.8[1]		VG1245ACH943AGA	VG1245ACH943GGA	VG1245ACH943BGA	-
VG1245AD		1.2[1]		VG1245ADH943AGA	VG1245ADH943GGA	VG1245ADH943BGA	VG1245ADH943BUA
VG1245AE		1.9[1]		VG1245AEH943AGA	VG1245AEH943GGA	VG1245AEH943BGA	VG1245AEH943BUA
VG1245AF		2.9[1]		VG1245AFH943AGA	VG1245AFH943GGA	VG1245AFH943BGA	VG1245AFH943BUA
VG1245AG		4.7[1]		VG1245AGH943AGA	VG1245AGH943GGA	VG1245AGH943BGA	VG1245AGH943BUA
VG1245AL		7.4[1]		VG1245ALH943AGA	VG1245ALH943GGA	VG1245ALH943BGA	VG1245ALH943BUA
VG1245AN		11.7		VG1245ANH943AGA	VG1245ANH943GGA	VG1245ANH943BGA	VG1245ANH943BUA
VG1245BG	3/4	4.7[1]	200	VG1245BGH943AGA	VG1245BGH943GGA	VG1245BGH943BGA	VG1245BGH943BUA
VG1245BL		7.4[1]		VG1245BLH943AGA	VG1245BLH943GGA	VG1245BLH943BGA	VG1245BLH943BUA
VG1245BN		11.7		VG1245BNH943AGA	VG1245BNH943GGA	VG1245BNH943BGA	VG1245BNH943BUA
VG1245CL	1	7.4[1]	200	VG1245CLH943AGA	VG1245CLH943GGA	VG1245CLH943BGA	VG1245CLH943BUA
VG1245CN		11.7[1]		VG1245CNH943AGA	VG1245CNH943GGA	VG1245CNH943BGA	VG1245CNH943BUA
VG1245CP		18.7		VG1245CPH943AGA	VG1245CPH943GGA	VG1245CPH943BGA	VG1245CPH943BUA
Valve	Size, in.	Cv	Closeoff psi	Spring return closed - valve normally closed - actuators without switches			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-3	VA9208-BAA-3
VG1245DN	1-1/4	11.7[1]	200	VG1245DNH948AGA	VG1245DNH948GGA	VG1245DNH958BGA	VG1245DNH958BAA
VG1245DP		18.7[1]		VG1245DPH948AGA	VG1245DPH948GGA	VG1245DPH958BGA	VG1245DPH958BAA
VG1245DR		29.2		VG1245DRH948AGA	VG1245DRH948GGA	VG1245DRH958BGA	VG1245DRH958BAA
VG1245EP	1-1/2	18.7[1]	200	VG1245EPH948AGA	VG1245EPH948GGA	VG1245EPH958BGA	VG1245EPH958BAA
VG1245ER		29.2[1]		VG1245ERH948AGA	VG1245ERH948GGA	VG1245ERH958BGA	VG1245ERH958BAA
VG1245ES		46.8		VG1245ESH948AGA	VG1245ESH948GGA	VG1245ESH958BGA	VG1245ESH958BAA
VG1245FR	2	29.2[1]	200	VG1245FRH948AGA	VG1245FRH948GGA	VG1245FRH958BGA	VG1245FRH958BAA
VG1245FS		46.8[1]		VG1245FSH948AGA	VG1245FSH948GGA	VG1245FSH958BGA	VG1245FSH958BAA
VG1245FT		73.7		VG1245FTH948AGA	VG1245FTH948GGA	VG1245FTH958BGA	VG1245FTH958BAA

1. Valve has a characterizing disk.

Table 18: Three-way stainless steel trim ball valves, non-spring return, VA9104 series electric actuators without switches

Fluid temperature: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V		
				On/off (floating) without timeout[1]	On/off (floating) with timeout	DC 0 to 10 V proportional
Valve	Size, in.	Cv (Port A/B)	Closeoff psi			
Actuators with M3 screw terminals				**VA9104-AGA-3S**	**VA9104-IGA-3S**	**VA9104-GGA-3S**
VG1845AA	1/2	0.3/0.2[2]	200	VG1845AD+9T4AGA	-	VG1845AD+9T4GGA
VG1845AB		0.5/0.3[2]		VG1845AD+9T4AGA	-	VG1845AD+9T4GGA
VG1845AC		0.8/0.4[2]		VG1845AD+9T4AGA	-	VG1845AD+9T4GGA
VG1845AD		1.2/0.7[2]		VG1845AD+9T4AGA	VG1845AD+9T4IGA	VG1845AD+9T4GGA
VG1845AE		1.9/1.2[2]		VG1845AE+9T4AGA	VG1845AE+9T4IGA	VG1845AE+9T4GGA
VG1845AF		2.9/1.9[2]		VG1845AF+9T4AGA	VG1845AF+9T4IGA	VG1845AF+9T4GGA
VG1845AG		4.7/2.9[2]		VG1845AG+9T4AGA	VG1845AG+9T4IGA	VG1845AG+9T4GGA
VG1845AL		7.4/4.7[2]		VG1845AL+9T4AGA	VG1845AL+9T4IGA	VG1845AL+9T4GGA
VG1845AN		11.7/5.8		VG1845AN+9T4AGA	VG1845AN+9T4IGA	VG1845AN+9T4GGA
VG1845BG	3/4	4.7/2.9[2]	200	VG1845BG+9T4AGA	VG1845BG+9T4IGA	VG1845BG+9T4GGA
VG1845BL		7.4/4.7[2]		VG1845BL+9T4AGA	VG1845BL+9T4IGA	VG1845BL+9T4GGA
VG1845BN		11.7/5.8		VG1845BN+9T4AGA	VG1845BN+9T4IGA	VG1845BN+9T4GGA
VG1845CL	1	7.4/4.7[2]	200	VG1845CL+9T4AGA	VG1845CL+9T4IGA	VG1845CL+9T4GGA
VG1845CN		11.7/7.4[2]		VG1845CN+9T4AGA	VG1845CN+9T4IGA	VG1845CN+9T4GGA
VG1845CP		18.7/9.4		VG1845CP+9T4AGA	VG1845CP+9T4IGA	VG1845CP+9T4GGA
Actuators with 120 in. (3.05 m) 19 AWG plenum cable				**VA9104-AGA-2S**	**VA9104-IGA-2S**	**VA9104-GGA-2S**
VG1845AA	1/2	0.3/0.2[2]	200	VG1845AD+9A4AGA	-	VG1845AD+9A4GGA
VG1845AB		0.5/0.3[2]		VG1845AD+9A4AGA	-	VG1845AD+9A4GGA
VG1845AC		0.8/0.4[2]		VG1845AD+9A4AGA	-	VG1845AD+9A4GGA
VG1845AD		1.2/0.7[2]		VG1845AD+9A4AGA	VG1845AD+9A4IGA	VG1845AD+9A4GGA
VG1845AE		1.9/1.2[2]		VG1845AE+9A4AGA	VG1845AE+9A4IGA	VG1845AE+9A4GGA
VG1845AF		2.9/1.9[2]		VG1845AF+9A4AGA	VG1845AF+9A4IGA	VG1845AF+9A4GGA
VG1845AG		4.7/2.9[2]		VG1845AG+9A4AGA	VG1845AG+9A4IGA	VG1845AG+9A4GGA
VG1845AL		7.4/4.7[2]		VG1845AL+9A4AGA	VG1845AL+9A4IGA	VG1845AL+9A4GGA
VG1845AN		11.7/5.8		VG1845AN+9A4AGA	VG1845AN+9A4IGA	VG1845AN+9A4GGA
VG1845BG	3/4	4.7/2.9[2]	200	VG1845BG+9A4AGA	VG1845BG+9A4IGA	VG1845BG+9A4GGA
VG1845BL		7.4/4.7[2]		VG1845BL+9A4AGA	VG1845BL+9A4IGA	VG1845BL+9A4GGA
VG1845BN		11.7/5.8		VG1845BN+9A4AGA	VG1845BN+9A4IGA	VG1845BN+9A4GGA
VG1845CL	1	7.4/4.7[2]	200	VG1845CL+9A4AGA	VG1845CL+9A4IGA	VG1845CL+9A4GGA
VG1845CN		11.7/7.4[2]		VG1845CN+9A4AGA	VG1845CN+9A4IGA	VG1845CN+9A4GGA
VG1845CP		18.7/9.4		VG1845CP+9A4AGA	VG1845CP+9A4IGA	VG1845CP+9A4GGA

1. To avoid excessive wear or drive time on the motor for the AGA models, use a controller or software that provides a timeout function to remove the signal at the end of rotation (stall).
2. Valve has a characterizing disk.

Table 19: Three-way stainless steel trim ball valves, non-spring return, VA9104 series electric actuators without switches with M9000-561 Thermal Barrier installed

Fluid temperature: -22 to 284°F (-30 to 140°C) water and 15 pi saturated steam				AC 24 V		
				On/off (floating) without timeout[1]	On/off (floating) with timeout	DC 0 to 10 V proportional
Valve	Size, in.	Cv (Port A/B)	Closeoff psi			
Actuators with M3 screw terminals with M9000-561 Thermal Barrier installed				**VA9104-AGA-3S**	**VA9104-IGA-3S**	**VA9104-GGA-3S**
VG1845AA	1/2	0.3/0.2[2]	200	VG1845ADH9T4AGA	-	VG1845ADH9T4GGA
VG1845AB		0.5/0.3[2]		VG1845ADH9T4AGA	-	VG1845ADH9T4GGA
VG1845AC		0.8/0.4[2]		VG1845ADH9T4AGA	-	VG1845ADH9T4GGA
VG1845AD		1.2/0.7[2]		VG1845ADH9T4AGA	VG1845ADH9T4IGA	VG1845ADH9T4GGA
VG1845AE		1.9/1.2[2]		VG1845AEH9T4AGA	VG1845AEH9T4IGA	VG1845AEH9T4GGA
VG1845AF		2.9/1.9[2]		VG1845AFH9T4AGA	VG1845AFH9T4IGA	VG1845AFH9T4GGA
VG1845AG		4.7/2.9[2]		VG1845AGH9T4AGA	VG1845AGH9T4IGA	VG1845AGH9T4GGA
VG1845AL		7.4/4.7[2]		VG1845ALH9T4AGA	VG1845ALH9T4IGA	VG1845ALH9T4GGA
VG1845AN		11.7/5.8		VG1845ANH9T4AGA	VG1845ANH9T4IGA	VG1845ANH9T4GGA
VG1845BG	3/4	4.7/2.9[2]	200	VG1845BGH9T4AGA	VG1845BGH9T4IGA	VG1845BGH9T4GGA
VG1845BL		7.4/4.7[2]		VG1845BLH9T4AGA	VG1845BLH9T4IGA	VG1845BLH9T4GGA
VG1845BN		11.7/5.8		VG1845BNH9T4AGA	VG1845BNH9T4IGA	VG1845BNH9T4GGA
VG1845CL	1	7.4/4.7[2]	200	VG1845CLH9T4AGA	VG1845CLH9T4IGA	VG1845CLH9T4GGA
VG1845CN		11.7/7.4[2]		VG1845CNH9T4AGA	VG1845CNH9T4IGA	VG1845CNH9T4GGA
VG1845CP		18.7/9.4		VG1845CPH9T4AGA	VG1845CPH9T4IGA	VG1845CPH9T4GGA
Actuators with 120 in. (3.05 m) 19 AWG plenum cable with M9000-561 Thermal Barrier installed				**VA9104-AGA-2S**	**VA9104-IGA-2S**	**VA9104-GGA-2S**
VG1845AA	1/2	0.3/0.2[2]	200	VG1845ADH9A4AGA	-	VG1845ADH9A4GGA
VG1845AB		0.5/0.3[2]		VG1845ADH9A4AGA	-	VG1845ADH9A4GGA
VG1845AC		0.8/0.4[2]		VG1845ADH9A4AGA	-	VG1845ADH9A4GGA
VG1845AD		1.2/0.7[2]		VG1845ADH9A4AGA	VG1845ADH9A4IGA	VG1845ADH9A4GGA
VG1845AE		1.9/1.2[2]		VG1845AEH9A4AGA	VG1845AEH9A4IGA	VG1845AEH9A4GGA
VG1845AF		2.9/1.9[2]		VG1845AFH9A4AGA	VG1845AFH9A4IGA	VG1845AFH9A4GGA
VG1845AG		4.7/2.9[2]		VG1845AGH9A4AGA	VG1845AGH9A4IGA	VG1845AGH9A4GGA
VG1845AL		7.4/4.7[2]		VG1845ALH9A4AGA	VG1845ALH9A4IGA	VG1845ALH9A4GGA
VG1845AN		11.7/5.8		VG1845ANH9A4AGA	VG1845ANH9A4IGA	VG1845ANH9A4GGA
VG1845BG	3/4	4.7/2.9[2]	200	VG1845BGH9A4AGA	VG1845BGH9A4IGA	VG1845BGH9A4GGA
VG1845BL		7.4/4.7[2]		VG1845BLH9A4AGA	VG1845BLH9A4IGA	VG1845BLH9A4GGA
VG1845BN		11.7/5.8		VG1845BNH9A4AGA	VG1845BNH9A4IGA	VG1845BNH9A4GGA
VG1845CL	1	7.4/4.7[2]	200	VG1845CLH9A4AGA	VG1845CLH9A4IGA	VG1845CLH9A4GGA
VG1845CN		11.7/7.4[2]		VG1845CNH9A4AGA	VG1845CNH9A4IGA	VG1845CNH9A4GGA
VG1845CP		18.7/9.4		VG1845CPH9A4AGA	VG1845CPH9A4IGA	VG1845CPH9A4GGA

1. To avoid excessive wear or drive time on the motor for the AGA models, use a controller or software that provides a timeout function to remove the signal at the end of rotation (stall).
2. Valve has a characterizing disk.

Table 20: Three-way stainless steel trim ball valves, non-spring return, VA9300 series electric actuators without switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC/DC 24 V		
				On/off	Floating	DC 0(2) to 10 V proportional
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**VA9310-HGA-2**		
VG1845DN	1-1/4	11.7[1]	200	VG1845DN+910HGA		
VG1845DP		18.7[1]		VG1845DP+910HGA		
VG1845DR		29.2		VG1845DR+910HGA		
VG1845EP	1-1/2	18.7[1]	200	VG1845EP+910HGA		
VG1845ER		29.2[1]		VG1845ER+910HGA		
VG1845ES		46.8		VG1845ES+910HGA		
VG1845FR	2	29.2[1]	200	VG1845FR+910HGA		
VG1845FS		48.8[1]		VG1845FS+910HGA		
VG1845FT		73.7		VG1845FT+910HGA		

1. Valve has a characterizing disk.

Table 21: Three-way stainless steel trim ball valves, non-spring return, VA9300 series electric actuators with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC/DC 24 V		
				On/off	Floating	DC 0(2) to 10 V proportional
Valve	Size, in.	Cv	Closeoff psi	VA9310-HGA-2 actuator with M9300-2 Switch Kit[1]		
VG1845AD	1/2	1.2[2]	200	VG1845AD+910HGC		
VG1845AE		1.9[2]		VG1845AE+910HGC		
VG1845AF		2.9[2]		VG1845AF+910HGC		
VG1845AG		4.7[2]		VG1845AG+910HGC		
VG1845AL		7.4[2]		VG1845AL+910HGC		
VG1845AN		11.7		VG1845AN+910HGC		
VG1845BG	3/4	4.7[2]	200	VG1845BG+910HGC		
VG1845BL		7.4[2]		VG1845BL+910HGC		
VG1845BN		11.7		VG1845BN+910HGC		
VG1845CL	1	7.4[2]	200	VG1845CL+910HGC		
VG1845CN		11.7[2]		VG1845CN+910HGC		
VG1845CP		18.7		VG1845CP+910HGC		
VG1845DN	1-1/4	11.7[2]	200	VG1845DN+910HGC		
VG1845DP		18.7[2]		VG1845DP+910HGC		
VG1845DR		29.2		VG1845DR+910HGC		
VG1845EP	1-1/2	18.7[2]	200	VG1845EP+910HGC		
VG1845ER		29.2[2]		VG1845ER+910HGC		
VG1845ES		46.8		VG1845ES+910HGC		
VG1845FR	2	29.2[2]	200	VG1845FR+910HGC		
VG1845FS		46.8[2]		VG1845FS+910HGC		
VG1845FT		73.7		VG1845FT+910HGC		

1. For field mounting order VA9310-HGA-2 and the M9300-2 Switch Kit separately.
2. Valve has a characterizing disk.

Table 22: Three-way stainless steel trim ball valves, non-spring return, VA9300 series actuators without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC/DC 24 V		
				On/off	Floating	DC 0(2) to 10 V proportional
Valve	**Size, in.**	**Cv**	**Closeoff psi**	**VA9310-HGA-2 with M9000-561 Thermal Barrier**		
VG1845DN	1-1/4	11.7[1]	200	VG1845DNH910HGA		
VG1845DP		18.7[1]		VG1845DPH910HGA		
VG1845DR		29.2		VG1845DRH910HGA		
VG1845EP	1-1/2	18.7[1]	200	VG1845EPH910HGA		
VG1845ER		29.2[1]		VG1845ERH910HGA		
VG1845ES		46.8		VG1845ESH910HGA		
VG1845FR	2	29.2[1]	200	VG1845FRH910HGA		
VG1845FS		48.8[1]		VG1845FSH910HGA		
VG1845FT		73.7		VG1845FTH910HGA		

1. Valve has a characterizing disk.

Table 23: Three-way stainless steel trim ball valves, non-spring return, VA9300 series electric actuators with switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC/DC 24 V		
				On/off	Floating	DC 0(2) to 10 V proportional
Valve	Size, in.	Cv	Closeoff psi	VA9310-HGA-2 actuator with M9300-2 Switch Kit and M9000-561 Thermal Barrier[1]		
VG1845AD	1/2	1.2[2]	200	VG1845ADH910HGC		
VG1845AE		1.9[2]		VG1845AEH910HGC		
VG1845AF		2.9[2]		VG1845AFH910HGC		
VG1845AG		4.7[2]		VG1845AGH910HGC		
VG1845AL		7.4[2]		VG1845ALH910HGC		
VG1845AN		11.7		VG1845ANH910HGC		
VG1845BG	3/4	4.7[2]	200	VG1845BGH910HGC		
VG1845BL		7.4[2]		VG1845BLH910HGC		
VG1845BN		11.7		VG1845BNH910HGC		
VG1845CL	1	7.4[2]	200	VG1845CLH910HGC		
VG1845CN		11.7[2]		VG1845CNH910HGC		
VG1845CP		18.7		VG1845CPH910HGC		
VG1845DN	1-1/4	11.7[2]	200	VG1845DNH910HGC		
VG1845DP		18.7[2]		VG1845DPH910HGC		
VG1845DR		29.2		VG1845DRH910HGC		
VG1845EP	1-1/2	18.7[2]	200	VG1845EPH910HGC		
VG1845ER		29.2[2]		VG1845ERH910HGC		
VG1845ES		46.8		VG1845ESH910HGC		
VG1845FR	2	29.2[2]	200	VG1845FRH910HGC		
VG1845FS		46.8[2]		VG1845FSH910HGC		
VG1845FT		73.7		VG1845FTH910HGC		

1. For field mounting order VA9310-HGA-2, M9300-2 Switch Kit and M9000-561 Thermal Barrier separately.
2. Valve has a characterizing disk.

Table 24: Three-way stainless steel trim ball valves, spring return counterclockwise - Port A (coil) open, VA9203/VA9208 series actuators with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A open — valve spring return counterclockwise — actuator with one switch**			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1845AA	1/2	0.3/0.2[1]	200	VG1845AA+923AGB	VG1845AA+923GGB	VG1845AA+923BGB	-
VG1845AB		0.5/0.3[1]		VG1845AB+923AGB	VG1845AB+923GGB	VG1845AB+923BGB	-
VG1845AC		0.8/0.4[1]		VG1845AC+923AGB	VG1845AC+923GGB	VG1845AC+923BGB	-
VG1845AD		1.2/0.7[1]		VG1845AD+923AGB	VG1845AD+923GGB	VG1845AD+923BGB	VG1845AD+923BUB
VG1845AE		1.9/1.2[1]		VG1845AE+923AGB	VG1845AE+923GGB	VG1845AE+923BGB	VG1845AE+923BUB
VG1845AF		2.9/1.9[1]		VG1845AF+923AGB	VG1845AF+923GGB	VG1845AF+923BGB	VG1845AF+923BUB
VG1845AG		4.7/2.9[1]		VG1845AG+923AGB	VG1845AG+923GGB	VG1845AG+923BGB	VG1845AG+923BUB
VG1845AL		7.4/4.7[1]		VG1845AL+923AGB	VG1845AL+923GGB	VG1845AL+923BGB	VG1845AL+923BUB
VG1845AN		11.7/5.8		VG1845AN+923AGB	VG1845AN+923GGB	VG1845AN+923BGB	VG1845AN+923BUB
VG1845BG	3/4	4.7/2.9[1]	200	VG1845BG+923AGB	VG1845BG+923GGB	VG1845BG+923BGB	VG1845BG+923BUB
VG1845BL		7.4/4.7[1]		VG1845BL+923AGB	VG1845BL+923GGB	VG1845BL+923BGB	VG1845BL+923BUB
VG1845BN		11.7/5.8		VG1845BN+923AGB	VG1845BN+923GGB	VG1845BN+923BGB	VG1845BN+923BUB
VG1845CL	1	7.4/4.7[1]	200	VG1845CL+923AGB	VG1845CL+923GGB	VG1845CL+923BGB	VG1845CL+923BUB
VG1845CN		11.7/7.4[1]		VG1845CN+923AGB	VG1845CN+923GGB	VG1845CN+923BGB	VG1845CN+923BUB
VG1845CP		18.7/9.4		VG1845CP+923AGB	VG1845CP+923GGB	VG1845CP+923BGB	VG1845CP+923BUB
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A Open — valve spring return counterclockwise — actuator with two switches**			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1845DN	1-1/4	11.7/7.4[1]	200	VG1845DN+938AGC	VG1845DN+938GGC	VG1845DN+938BGC	VG1845DN+938BAC
VG1845DP		18.7/11.7[1]		VG1845DP+938AGC	VG1845DP+938GGC	VG1845DP+938BGC	VG1845DP+938BAC
VG1845DR		29.2/14.6		VG1845DR+938AGC	VG1845DR+938GGC	VG1845DR+938BGC	VG1845DR+938BAC
VG1845EP	1-1/2	18.7/11.7[1]	200	VG1845EP+938AGC	VG1845EP+938GGC	VG1845EP+938BGC	VG1845EP+938BAC
VG1845ER		29.2/18.7[1]		VG1845ER+938AGC	VG1845ER+938GGC	VG1845ER+938BGC	VG1845ER+938BAC
VG1845ES		46.8/23.4		VG1845ES+938AGC	VG1845ES+938GGC	VG1845ES+938BGC	VG1845ES+938BAC
VG1845FR	2	29.2/18.7[1]	200	VG1845FR+938AGC	VG1845FR+938GGC	VG1845FR+938BGC	VG1845FR+938BAC
VG1845FS		46.8/29.2[1]		VG1845FS+938AGC	VG1845FS+938GGC	VG1845FS+938BGC	VG1845FS+938BAC
VG1845FT		73.7/36.8		VG1845FT+938AGC	VG1845FT+938GGC	VG1845FT+938BGC	VG1845FT+938BAC

1. Valve has a characterizing disk.

Table 25: Three-way stainless steel trim ball valves, spring return clockwise – Port A (coil) closed with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A closed — valve spring return clockwise — actuator with one switch**			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1845AA	1/2	0.3/0.2[1]	200	VG1845AA+943AGB	VG1845AA+943GGB	VG1845AA+943BGB	-
VG1845AB		0.5/0.3[1]		VG1845AB+943AGB	VG1845AB+943GGB	VG1845AB+943BGB	-
VG1845AC		0.8/0.4[1]		VG1845AC+943AGB	VG1845AC+943GGB	VG1845AC+943BGB	-
VG1845AD		1.2/0.7[1]		VG1845AD+943AGB	VG1845AD+943GGB	VG1845AD+943BGB	VG1845AD+943BUB
VG1845AE		1.9/1.2[1]		VG1845AE+943AGB	VG1845AE+943GGB	VG1845AE+943BGB	VG1845AE+943BUB
VG1845AF		2.9/1.9[1]		VG1845AF+943AGB	VG1845AF+943GGB	VG1845AF+943BGB	VG1845AF+943BUB
VG1845AG		4.7/2.9[1]		VG1845AG+943AGB	VG1845AG+943GGB	VG1845AG+943BGB	VG1845AG+943BUB
VG1845AL		7.4/4.7[1]		VG1845AL+943AGB	VG1845AL+943GGB	VG1845AL+943BGB	VG1845AL+943BUB
VG1845AN		11.7/5.8		VG1845AN+943AGB	VG1845AN+943GGB	VG1845AN+943BGB	VG1845AN+943BUB
VG1845BG	3/4	4.7/2.9[1]	200	VG1845BG+943AGB	VG1845BG+943GGB	VG1845BG+943BGB	VG1845BG+943BUB
VG1845BL		7.4/4.7[1]		VG1845BL+943AGB	VG1845BL+943GGB	VG1845BL+943BGB	VG1845BL+943BUB
VG1845BN		11.7/5.8		VG1845BN+943AGB	VG1845BN+943GGB	VG1845BN+943BGB	VG1845BN+943BUB
VG1845CL	1	7.4/4.7[1]	200	VG1845CL+943AGB	VG1845CL+943GGB	VG1845CL+943BGB	VG1845CL+943BUB
VG1845CN		11.7/7.4[1]		VG1845CN+943AGB	VG1845CN+943GGB	VG1845CN+943BGB	VG1845CN+943BUB
VG1845CP		18.7/9.4		VG1845CP+943AGB	VG1845CP+943GGB	VG1845CP+943BGB	VG1845CP+943BUB
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A closed — valve spring return clockwise — actuator with two switches**			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1845DN	1-1/4	11.7/7.4[1]	200	VG1845DN+958AGC	VG1845DN+958GGC	VG1845DN+958BGC	VG1845DN+958BAC
VG1845DP		18.7/11.7[1]		VG1845DP+958AGC	VG1845DP+958GGC	VG1845DP+958BGC	VG1845DP+958BAC
VG1845DR		29.2/14.6		VG1845DR+958AGC	VG1845DR+958GGC	VG1845DR+958BGC	VG1845DR+958BAC
VG1845EP	1-1/2	18.7/11.7[1]	200	VG1845EP+958AGC	VG1845EP+958GGC	VG1845EP+958BGC	VG1845EP+958BAC
VG1845ER		29.2/18.7[1]		VG1845ER+958AGC	VG1845ER+958GGC	VG1845ER+958BGC	VG1845ER+958BAC
VG1845ES		46.8/23.4		VG1845ES+958AGC	VG1845ES+958GGC	VG1845ES+958BGC	VG1845ES+958BAC
VG1845FR	2	29.2/18.7[1]	200	VG1845FR+958AGC	VG1845FR+958GGC	VG1845FR+958BGC	VG1845FR+958BAC
VG1845FS		46.8/29.2[1]		VG1845FS+958AGC	VG1845FS+958GGC	VG1845FS+958BGC	VG1845FS+958BAC
VG1845FT		73.7/36.8		VG1845FT+958AGC	VG1845FT+958GGC	VG1845FT+958BGC	VG1845FT+958BAC

1. Valve has a characterizing disk.

Table 26: Three-way stainless steel trim ball valves, spring return counterclockwise - Port A (coil) open, VA9203/VA9208 series actuators with switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A open — valve spring return counterclockwise — actuator with one switch			
				VA9203-AGB-2Z	VA9203-GGB-2Z	VA9203-BGB-2	VA9203-BUB-2
VG1845AA	1/2	0.3/0.2[1]	200	VG1845AA+923AGB	VG1845AA+923GGB	VG1845AA+923BGB	-
VG1845AB		0.5/0.3[1]		VG1845AB+923AGB	VG1845AB+923GGB	VG1845AB+923BGB	-
VG1845AC		0.8/0.4[1]		VG1845AC+923AGB	VG1845AC+923GGB	VG1845AC+923BGB	-
VG1845AD		1.2/0.7[1]		VG1845AD+923AGB	VG1845AD+923GGB	VG1845AD+923BGB	VG1845AD+923BUB
VG1845AE		1.9/1.2[1]		VG1845AE+923AGB	VG1845AE+923GGB	VG1845AE+923BGB	VG1845AE+923BUB
VG1845AF		2.9/1.9[1]		VG1845AF+923AGB	VG1845AF+923GGB	VG1845AF+923BGB	VG1845AF+923BUB
VG1845AG		4.7/2.9[1]		VG1845AG+923AGB	VG1845AG+923GGB	VG1845AG+923BGB	VG1845AG+923BUB
VG1845AL		7.4/4.7[1]		VG1845AL+923AGB	VG1845AL+923GGB	VG1845AL+923BGB	VG1845AL+923BUB
VG1845AN		11.7/5.8		VG1845AN+923AGB	VG1845AN+923GGB	VG1845AN+923BGB	VG1845AN+923BUB
VG1845BG	3/4	4.7/2.9[1]	200	VG1845BG+923AGB	VG1845BG+923GGB	VG1845BG+923BGB	VG1845BG+923BUB
VG1845BL		7.4/4.7[1]		VG1845BL+923AGB	VG1845BL+923GGB	VG1845BL+923BGB	VG1845BL+923BUB
VG1845BN		11.7/5.8		VG1845BN+923AGB	VG1845BN+923GGB	VG1845BN+923BGB	VG1845BN+923BUB
VG1845CL	1	7.4/4.7[1]	200	VG1845CL+923AGB	VG1845CL+923GGB	VG1845CL+923BGB	VG1845CL+923BUB
VG1845CN		11.7/7.4[1]		VG1845CN+923AGB	VG1845CN+923GGB	VG1845CN+923BGB	VG1845CN+923BUB
VG1845CP		18.7/9.4		VG1845CP+923AGB	VG1845CP+923GGB	VG1845CP+923BGB	VG1845CP+923BUB
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A Open — valve spring return counterclockwise — actuator with two switches			
				VA9208-AGC-3	VA9208-GGC-3	VA9208-BGC-3	VA9208-BAC-3
VG1845DN	1-1/4	11.7/7.4[1]	200	VG1845DN+938AGC	VG1845DN+938GGC	VG1845DN+938BGC	VG1845DN+938BAC
VG1845DP		18.7/11.7[1]		VG1845DP+938AGC	VG1845DP+938GGC	VG1845DP+938BGC	VG1845DP+938BAC
VG1845DR		29.2/14.6		VG1845DR+938AGC	VG1845DR+938GGC	VG1845DR+938BGC	VG1845DR+938BAC
VG1845EP	1-1/2	18.7/11.7[1]	200	VG1845EP+938AGC	VG1845EP+938GGC	VG1845EP+938BGC	VG1845EP+938BAC
VG1845ER		29.2/18.7[1]		VG1845ER+938AGC	VG1845ER+938GGC	VG1845ER+938BGC	VG1845ER+938BAC
VG1845ES		46.8/23.4		VG1845ES+938AGC	VG1845ES+938GGC	VG1845ES+938BGC	VG1845ES+938BAC
VG1845FR	2	29.2/18.7[1]	200	VG1845FR+938AGC	VG1845FR+938GGC	VG1845FR+938BGC	VG1845FR+938BAC
VG1845FS		46.8/29.2[1]		VG1845FS+938AGC	VG1845FS+938GGC	VG1845FS+938BGC	VG1845FS+938BAC
VG1845FT		73.7/36.8		VG1845FT+938AGC	VG1845FT+938GGC	VG1845FT+938BGC	VG1845FT+938BAC

1. Valve has a characterizing disk.

Table 27: Three-way stainless steel trim ball valves, spring return clockwise – Port A (coil) closed, VA9203/ VA9208 series actuators with switches and optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A closed — valve spring return clockwise — actuator with one switch with M9000-561 Thermal Barrier			
				VA9203-AGB-2Z	VA9203-GGB-2Z	VA9203-BGB-2	VA9203-BUB-2
VG1845AA	1/2	0.3/0.2[1]	200	VG1845AAH943AGB	VG1845AAH943GGB	VG1845AAH943BGB	-
VG1845AB		0.5/0.3[1]		VG1845ABH943AGB	VG1845ABH943GGB	VG1845ABH943BGB	-
VG1845AC		0.8/0.4[1]		VG1845ACH943AGB	VG1845ACH943GGB	VG1845ACH943BGB	-
VG1845AD		1.2/0.7[1]		VG1845ADH943AGB	VG1845ADH943GGB	VG1845ADH943BGB	VG1845ADH943BUB
VG1845AE		1.9/1.2[1]		VG1845AEH943AGB	VG1845AEH943GGB	VG1845AEH943BGB	VG1845AEH943BUB
VG1845AF		2.9/1.9[1]		VG1845AFH943AGB	VG1845AFH943GGB	VG1845AFH943BGB	VG1845AFH943BUB
VG1845AG		4.7/2.9[1]		VG1845AGH943AGB	VG1845AGH943GGB	VG1845AGH943BGB	VG1845AGH943BUB
VG1845AL		7.4/4.7[1]		VG1845ALH943AGB	VG1845ALH943GGB	VG1845ALH943BGB	VG1845ALH943BUB
VG1845AN		11.7/5.8		VG1845ANH943AGB	VG1845ANH943GGB	VG1845ANH943BGB	VG1845ANH943BUB
VG1845BG	3/4	4.7/2.9[1]	200	VG1845BGH943AGB	VG1845BGH943GGB	VG1845BGH943BGB	VG1845BGH943BUB
VG1845BL		7.4/4.7[1]		VG1845BLH943AGB	VG1845BLH943GGB	VG1845BLH943BGB	VG1845BLH943BUB
VG1845BN		11.7/5.8		VG1845BNH943AGB	VG1845BNH943GGB	VG1845BNH943BGB	VG1845BNH943BUB
VG1845CL	1	7.4/4.7[1]	200	VG1845CLH943AGB	VG1845CLH943GGB	VG1845CLH943BGB	VG1845CLH943BUB
VG1845CN		11.7/7.4[1]		VG1845CNH943AGB	VG1845CNH943GGB	VG1845CNH943BGB	VG1845CNH943BUB
VG1845CP		18.7/9.4		VG1845CPH943AGB	VG1845CPH943GGB	VG1845CPH943BGB	VG1845CPH943BUB
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A closed — valve spring return clockwise — actuator with two switches with M9000-561 Thermal Barrier			
				VA9208-AGC-3	VA9208-GGC-3	VA9208-BGC-2	VA9208-BAC-3
VG1845DN	1-1/4	11.7/7.4[1]	200	VG1845DNH958AGC	VG1845DNH958GGC	VG1845DNH958BGC	VG1845DNH958BAC
VG1845DP		18.7/11.7[1]		VG1845DPH958AGC	VG1845DPH958GGC	VG1845DPH958BGC	VG1845DPH958BAC
VG1845DR		29.2/14.6		VG1845DRH958AGC	VG1845DRH958GGC	VG1845DRH958BGC	VG1845DRH958BAC
VG1845EP	1-1/2	18.7/11.7[1]	200	VG1845EPH958AGC	VG1845EPH958GGC	VG1845EPH958BGC	VG1845EPH958BAC
VG1845ER		29.2/18.7[1]		VG1845ERH958AGC	VG1845ERH958GGC	VG1845ERH958BGC	VG1845ERH958BAC
VG1845ES		46.8/23.4		VG1845ESH958AGC	VG1845ESH958GGC	VG1845ESH958BGC	VG1845ESH958BAC
VG1845FR	2	29.2/18.7[1]	200	VG1845FRH958AGC	VG1845FRH958GGC	VG1845FRH958BGC	VG1845FRH958BAC
VG1845FS		46.8/29.2[1]		VG1845FSH958AGC	VG1845FSH958GGC	VG1845FSH958BGC	VG1845FSH958BAC
VG1845FT		73.7/36.8		VG1845FTH958AGC	VG1845FTH958GGC	VG1845FTH958BGC	VG1845FTH958BAC

1. Valve has a characterizing disk.

Table 28: Three-way stainless steel trim ball valves, spring return counterclockwise – Port A (coil) open, VA9203/VA9208 series actuators without switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A open — valve spring return counterclockwise — actuator without switches			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1845AA	1/2	0.3[1]	200	VG1845AA+923AGA	VG1845AA+923GGA	VG1845AA+923BGA	-
VG1845AB		0.5[1]		VG1845AB+923AGA	VG1845AB+923GGA	VG1845AB+923BGA	-
VG1845AC		0.8[1]		VG1845AC+923AGA	VG1845AC+923GGA	VG1845AC+923BGA	-
VG1845AD		1.2[1]		VG1845AD+923AGA	VG1845AD+923GGA	VG1845AD+923BGA	VG1845AD+923BUA
VG1845AE		1.9[1]		VG1845AE+923AGA	VG1845AE+923GGA	VG1845AE+923BGA	VG1845AE+923BUA
VG1845AF		2.9[1]		VG1845AF+923AGA	VG1845AF+923GGA	VG1845AF+923BGA	VG1845AF+923BUA
VG1845AG		4.7[1]		VG1845AG+923AGA	VG1845AG+923GGA	VG1845AG+923BGA	VG1845AG+923BUA
VG1845AL		7.4[1]		VG1845AL+923AGA	VG1845AL+923GGA	VG1845AL+923BGA	VG1845AL+923BUA
VG1845AN		11.7		VG1845AN+923AGA	VG1845AN+923GGA	VG1845AN+923BGA	VG1845AN+923BUA
VG1845BG	3/4	4.7[1]	200	VG1845BG+923AGA	VG1845BG+923GGA	VG1845BG+923BGA	VG1845BG+923BUA
VG1845BL		7.4[1]		VG1845BL+923AGA	VG1845BL+923GGA	VG1845BL+923BGA	VG1845BL+923BUA
VG1845BN		11.7		VG1845BN+923AGA	VG1845BN+923GGA	VG1845BN+923BGA	VG1845BN+923BUA
VG1845CL	1	7.4[1]	200	VG1845CL+923AGA	VG1845CL+923GGA	VG1845CL+923BGA	VG1845CL+923BUA
VG1845CN		11.7[1]		VG1845CN+923AGA	VG1845CN+923GGA	VG1845CN+923BGA	VG1845CN+923BUA
VG1845CP		18.7		VG1845CP+923AGA	VG1845CP+923GGA	VG1845CP+923BGA	VG1845CP+923BUA
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A open — valve spring return counterclockwise — actuator without switches			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-2	VA9208-BAA-3
VG1845DN	1-1/4	11.7[1]	200	VG1845DN+928AGA	VG1845DN+928GGA	VG1845DN+938BGA	VG1845DN+938BAA
VG1845DP		18.7[1]		VG1845DP+928AGA	VG1845DP+928GGA	VG1845DP+938BGA	VG1845DP+938BAA
VG1845DR		29.2		VG1845DR+928AGA	VG1845DR+928GGA	VG1845DR+938BGA	VG1845DR+938BAA
VG1845EP	1-1/2	18.7[1]	200	VG1845EP+928AGA	VG1845EP+928GGA	VG1845EP+938BGA	VG1845EP+938BAA
VG1845ER		29.2[1]		VG1845ER+928AGA	VG1845ER+928GGA	VG1845ER+938BGA	VG1845ER+938BAA
VG1845ES		46.8		VG1845ES+928AGA	VG1845ES+928GGA	VG1845ES+938BGA	VG1845ES+938BAA
VG1845FR	2	29.2[1]	200	VG1845FR+928AGA	VG1845FR+928GGA	VG1845FR+938BGA	VG1845FR+938BAA
VG1845FS		46.8[1]		VG1845FS+928AGA	VG1845FS+928GGA	VG1845FS+938BGA	VG1845FS+938BAA
VG1845FT		73.7		VG1845FT+928AGA	VG1845FT+928GGA	VG1845FT+938BGA	VG1845FT+938BAA

1. Valve has a characterizing disk.

Table 29: Three-way stainless steel trim ball valves, spring return clockwise – Port A (coil) closed, VA9203/ VA9208 series actuators without switches

Fluid temperatures: -22 to 212°F (-30 to 100°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A closed — valve spring return clockwise — actuator without switches			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1845AA	1/2	0.3[1]	200	VG1845AA+943AGA	VG1845AA+943GGA	VG1845AA+943BGA	-
VG1845AB		0.5[1]		VG1845AB+943AGA	VG1845AB+943GGA	VG1845AB+943BGA	-
VG1845AC		0.8[1]		VG1845AC+943AGA	VG1845AC+943GGA	VG1845AC+943BGA	-
VG1845AD		1.2[1]		VG1845AD+943AGA	VG1845AD+943GGA	VG1845AD+943BGA	VG1845AD+943BUA
VG1845AE		1.9[1]		VG1845AE+943AGA	VG1845AE+943GGA	VG1845AE+943BGA	VG1845AE+943BUA
VG1845AF		2.9[1]		VG1845AF+943AGA	VG1845AF+943GGA	VG1845AF+943BGA	VG1845AF+943BUA
VG1845AG		4.7[1]		VG1845AG+943AGA	VG1845AG+943GGA	VG1845AG+943BGA	VG1845AG+943BUA
VG1845AL		7.4[1]		VG1845AL+943AGA	VG1845AL+943GGA	VG1845AL+943BGA	VG1845AL+943BUA
VG1845AN		11.7		VG1845AN+943AGA	VG1845AN+943GGA	VG1845AN+943BGA	VG1845AN+943BUA
VG1845BG	3/4	4.7[1]	200	VG1845BG+943AGA	VG1845BG+943GGA	VG1845BG+943BGA	VG1845BG+943BUA
VG1845BL		7.4[1]		VG1845BL+943AGA	VG1845BL+943GGA	VG1845BL+943BGA	VG1845BL+943BUA
VG1845BN		11.7		VG1845BN+943AGA	VG1845BN+943GGA	VG1845BN+943BGA	VG1845BN+943BUA
VG1845CL	1	7.4[1]	200	VG1845CL+943AGA	VG1845CL+943GGA	VG1845CL+943BGA	VG1845CL+943BUA
VG1845CN		11.7[1]		VG1845CN+943AGA	VG1845CN+943GGA	VG1845CN+943BGA	VG1845CN+943BUA
VG1845CP		18.7		VG1845CP+943AGA	VG1845CP+943GGA	VG1845CP+943BGA	VG1845CP+943BUA
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A closed — valve spring return clockwise — actuator without switches			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-3	VA9208-BAA-3
VG1845DN	1-1/4	11.7[1]	200	VG1845DN+948AGA	VG1845DN+948GGA	VG1845DN+958BGA	VG1845DN+958BAA
VG1845DP		18.7[1]		VG1845DP+948AGA	VG1845DP+948GGA	VG1845DP+958BGA	VG1845DP+958BAA
VG1845DR		29.2		VG1845DR+948AGA	VG1845DR+948GGA	VG1845DR+958BGA	VG1845DR+958BAA
VG1845EP	1-1/2	18.7[1]	200	VG1845EP+948AGA	VG1845EP+948GGA	VG1845EP+958BGA	VG1845EP+958BAA
VG1845ER		29.2[1]		VG1845ER+948AGA	VG1845ER+948GGA	VG1845ER+958BGA	VG1845ER+958BAA
VG1845ES		46.8		VG1845ES+948AGA	VG1845ES+948GGA	VG1845ES+958BGA	VG1845ES+958BAA
VG1845FR	2	29.2[1]	200	VG1845FR+948AGA	VG1845FR+948GGA	VG1845FR+958BGA	VG1845FR+958BAA
VG1845FS		46.8[1]		VG1845FS+948AGA	VG1845FS+948GGA	VG1845FS+958BGA	VG1845FS+958BAA
VG1845FT		73.7		VG1845FT+948AGA	VG1845FT+948GGA	VG1845FT+958BGA	VG1845FT+958BAA

1. Valve has a characterizing disk.

Table 30: Three-way stainless steel trim ball valves, spring return counterclockwise – Port A (coil) open, VA9203/VA9208 series actuators without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A open — valve spring return counterclockwise — actuator without switches with M9000-561 Thermal Barrier			
				VA9203-AGA-2Z	VA9203-GGA-2Z	VA9203-BGA-2	VA9203-BUA-2
VG1845AA	1/2	0.3[1]	200	VG1845AAH923AGA	VG1845AAH923GGA	VG1845AAH923BGA	-
VG1845AB		0.5[1]		VG1845ABH923AGA	VG1845ABH923GGA	VG1845ABH923BGA	-
VG1845AC		0.8[1]		VG1845ACH923AGA	VG1845ACH923GGA	VG1845ACH923BGA	-
VG1845AD		1.2[1]		VG1845ADH923AGA	VG1845ADH923GGA	VG1845ADH923BGA	VG1845ADH923BUA
VG1845AE		1.9[1]		VG1845AEH923AGA	VG1845AEH923GGA	VG1845AEH923BGA	VG1845AEH923BUA
VG1845AF		2.9[1]		VG1845AFH923AGA	VG1845AFH923GGA	VG1845AFH923BGA	VG1845AFH923BUA
VG1845AG		4.7[1]		VG1845AGH923AGA	VG1845AGH923GGA	VG1845AGH923BGA	VG1845AGH923BUA
VG1845AL		7.4[1]		VG1845ALH923AGA	VG1845ALH923GGA	VG1845ALH923BGA	VG1845ALH923BUA
VG1845AN		11.7		VG1845ANH923AGA	VG1845ANH923GGA	VG1845ANH923BGA	VG1845ANH923BUA
VG1845BG	3/4	4.7[1]	200	VG1845BGH923AGA	VG1845BGH923GGA	VG1845BGH923BGA	VG1845BGH923BUA
VG1845BL		7.4[1]		VG1845BLH923AGA	VG1845BLH923GGA	VG1845BLH923BGA	VG1845BLH923BUA
VG1845BN		11.7		VG1845BNH923AGA	VG1845BNH923GGA	VG1845BNH923BGA	VG1845BNH923BUA
VG1845CL	1	7.4[1]	200	VG1845CLH923AGA	VG1845CLH923GGA	VG1845CLH923BGA	VG1845CLH923BUA
VG1845CN		11.7[1]		VG1845CNH923AGA	VG1845CNH923GGA	VG1845CNH923BGA	VG1845CNH923BUA
VG1845CP		18.7		VG1845CPH923AGA	VG1845CPH923GGA	VG1845CPH923BGA	VG1845CPH923BUA
Valve	Size, in.	Cv (Port A/B)	Closeoff psi	Spring return Port A open — valve spring return counterclockwise — actuator without switches with M9000-561 Thermal Barrier			
				VA9208-AGA-2	VA9208-GGA-2	VA9208-BGA-3	VA9208-BAA-3
VG1845DN	1-1/4	11.7[1]	200	VG1845DNH928AGA	VG1845DNH928GGA	VG1845DNH938BGA	VG1845DNH938BAA
VG1845DP		18.7[1]		VG1845DPH928AGA	VG1845DPH928GGA	VG1845DPH938BGA	VG1845DPH938BAA
VG1845DR		29.2		VG1845DRH928AGA	VG1845DRH928GGA	VG1845DRH938BGA	VG1845DRH938BAA
VG1845EP	1-1/2	18.7[1]	200	VG1845EPH928AGA	VG1845EPH928GGA	VG1845EPH938BGA	VG1845EPH938BAA
VG1845ER		29.2[1]		VG1845ERH928AGA	VG1845ERH928GGA	VG1845ERH938BGA	VG1845ERH938BAA
VG1845ES		46.8		VG1845ESH928AGA	VG1845ESH928GGA	VG1845ESH938BGA	VG1845ESH938BAA
VG1845FR	2	29.2[1]	200	VG1845FRH928AGA	VG1845FRH928GGA	VG1845FRH938BGA	VG1845FRH938BAA
VG1845FS		46.8[1]		VG1845FSH928AGA	VG1845FSH928GGA	VG1845FSH938BGA	VG1845FSH938BAA
VG1845FT		73.7		VG1845FTH928AGA	VG1845FTH928GGA	VG1845FTH938BGA	VG1845FTH938BAA

1. Valve has a characterizing disk.

Table 31: Three-way stainless steel trim ball valves, spring return clockwise – Port A (coil) closed, VA9203/ VA9208 series actuators without switches with optional M9000-561 Thermal Barrier

Fluid temperatures: -22 to 284°F (-30 to 140°C) water and 15 psi saturated steam				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V Proportional	On/off	On/off
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A closed — valve spring return clockwise — actuator without switches with M9000-561 Thermal Barrier**			
				VA9203-AGA-2Z	**VA9203-GGA-2Z**	**VA9203-BGA-2**	**VA9203-BUA-2**
VG1845AA	1/2	0.3/0.2[1]	200	VG1845AAH943AGA	VG1845AAH943GGA	VG1845AAH943BGA	-
VG1845AB		0.5/0.3[1]		VG1845ABH943AGA	VG1845ABH943GGA	VG1845ABH943BGA	-
VG1845AC		0.8/0.4[1]		VG1845ACH943AGA	VG1845ACH943GGA	VG1845ACH943BGA	-
VG1845AD		1.2[1]		VG1845ADH943AGA	VG1845ADH943GGA	VG1845ADH943BGA	VG1845ADH943BUA
VG1845AE		1.9[1]		VG1845AEH943AGA	VG1845AEH943GGA	VG1845AEH943BGA	VG1845AEH943BUA
VG1845AF		2.9[1]		VG1845AFH943AGA	VG1845AFH943GGA	VG1845AFH943BGA	VG1845AFH943BUA
VG1845AG		4.7[1]		VG1845AGH943AGA	VG1845AGH943GGA	VG1845AGH943BGA	VG1845AGH943BUA
VG1845AL		7.4[1]		VG1845ALH943AGA	VG1845ALH943GGA	VG1845ALH943BGA	VG1845ALH943BUA
VG1845AN		11.7		VG1845ANH943AGA	VG1845ANH943GGA	VG1845ANH943BGA	VG1845ANH943BUA
VG1845BG	3/4	4.7[1]	200	VG1845BGH943AGA	VG1845BGH943GGA	VG1845BGH943BGA	VG1845BGH943BUA
VG1845BL		7.4[1]		VG1845BLH943AGA	VG1845BLH943GGA	VG1845BLH943BGA	VG1845BLH943BUA
VG1845BN		11.7		VG1845BNH943AGA	VG1845BNH943GGA	VG1845BNH943BGA	VG1845BNH943BUA
VG1845CL	1	7.4[1]	200	VG1845CLH943AGA	VG1845CLH943GGA	VG1845CLH943BGA	VG1845CLH943BUA
VG1845CN		11.7[1]		VG1845CNH943AGA	VG1845CNH943GGA	VG1845CNH943BGA	VG1845CNH943BUA
VG1845CP		18.7		VG1845CPH943AGA	VG1845CPH943GGA	VG1845CPH943BGA	VG1845CPH943BUA
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A closed — valve spring return clockwise — actuator without switches with M9000-561 Thermal Barrier**			
				VA9208-AGA-2	**VA9208-GGA-2**	**VA9208-BGA-2**	**VA9208-BAA-3**
VG1845DN	1-1/4	11.7[1]	200	VG1845DNH948AGA	VG1845DNH948GGA	VG1845DNH958BGA	VG1845DNH958BAA
VG1845DP		18.7[1]		VG1845DPH948AGA	VG1845DPH948GGA	VG1845DPH958BGA	VG1845DPH958BAA
VG1845DR		29.2		VG1845DRH948AGA	VG1845DRH948GGA	VG1845DRH958BGA	VG1845DRH958BAA
VG1845EP	1-1/2	18.7[1]	200	VG1845EPH948AGA	VG1845EPH948GGA	VG1845EPH958BGA	VG1845EPH958BAA
VG1845ER		29.2[1]		VG1845ERH948AGA	VG1845ERH948GGA	VG1845ERH958BGA	VG1845ERH958BAA
VG1845ES		46.8		VG1845ESH948AGA	VG1845ESH948GGA	VG1845ESH958BGA	VG1845ESH958BAA
VG1845FR	2	29.2[1]	200	VG1845FRH948AGA	VG1845FRH948GGA	VG1845FRH958BGA	VG1845FRH958BAA
VG1845FS		46.8[1]		VG1845FSH948AGA	VG1845FSH948GGA	VG1845FSH958BGA	VG1845FSH958BAA
VG1845FT		73.7		VG1845FTH948AGA	VG1845FTH948GGA	VG1845FTH958BGA	VG1845FTH958BAA

1. Valve has a characterizing disk.

Table 32: Two-way brass plated trim ball valves, non-spring return, VA9104 series electric actuators without switches

Fluid temperature: 23 to 203°F (-5 to 95°C) not rated for steam service				AC 24 V		
				On/off (floating) without timeout[1]	On/off (floating) with timeout	DC 0 to 10 V proportional
Valve	Size, in.	Cv	Closeoff psi	Actuators with M3 screw terminals		
				VA9104-AGA-3S	VA9104-IGA-3S	VA9104-GGA-3S
VG1245AA	1/2	0.3[2]	200	VG1245AA+9T4AGA	-	VG1245AA+9T4GGA
VG1245AB		0.5[2]		VG1245AB+9T4AGA	-	VG1245AB+9T4GGA
VG1245AC		0.8[2]		VG1245AC+9T4AGA	-	VG1245AC+9T4GGA
VG1241AD		1.2[2]		VG1241AD+9T4AGA	VG1241AD+9T4IGA	VG1241AD+9T4GGA
VG1241AE		1.9[2]		VG1241AE+9T4AGA	VG1241AE+9T4IGA	VG1241AE+9T4GGA
VG1241AF		2.9[2]		VG1241AF+9T4AGA	VG1241AF+9T4IGA	VG1241AF+9T4GGA
VG1241AG		4.7[2]		VG1241AG+9T4AGA	VG1241AG+9T4IGA	VG1241AG+9T4GGA
VG1241AL		7.4[2]		VG1241AL+9T4AGA	VG1241AL+9T4IGA	VG1241AL+9T4GGA
VG1241AN		11.7		VG1241AN+9T4AGA	VG1241AN+9T4IGA	VG1241AN+9T4GGA
VG1241BG	3/4	4.7[2]	200	VG1241BG+9T4AGA	VG1241BG+9T4IGA	VG1241BG+9T4GGA
VG1241BL		7.4[2]		VG1241BL+9T4AGA	VG1241BL+9T4IGA	VG1241BL+9T4GGA
VG1241BN		11.7		VG1241BN+9T4AGA	VG1241BN+9T4IGA	VG1241BN+9T4GGA
VG1241CL	1	7.4[2]	200	VG1241CL+9T4AGA	VG1241CL+9T4IGA	VG1241CL+9T4GGA
VG1241CN		11.7[2]		VG1241CN+9T4AGA	VG1241CN+9T4IGA	VG1241CN+9T4GGA
VG1241CP		18.7		VG1241CP+9T4AGA	VG1241CP+9T4IGA	VG1241CP+9T4GGA
Valve	Size, in.	Cv	Closeoff psi	Actuators with 120 in. (3.05 m) 19 AWG plenum cable		
				VA9104-AGA-2S	VA9104-IGA-2S	VA9104-GGA-2S
VG1245AA	1/2	0.3[2]	200	VG1245AA+9A4AGA	-	VG1245AA+9A4GGA
VG1245AB		0.5[2]		VG1245AB+9A4AGA	-	VG1245AB+9A4GGA
VG1245AC		0.8[2]		VG1245AC+9A4AGA	-	VG1245AC+9A4GGA
VG1241AD		1.2[2]		VG1241AD+9A4AGA	VG1241AD+9A4IGA	VG1241AD+9A4GGA
VG1241AE		1.9[2]		VG1241AE+9A4AGA	VG1241AE+9A4IGA	VG1241AE+9A4GGA
VG1241AF		2.9[2]		VG1241AF+9A4AGA	VG1241AF+9A4IGA	VG1241AF+9A4GGA
VG1241AG		4.7[2]		VG1241AG+9A4AGA	VG1241AG+9A4IGA	VG1241AG+9A4GGA
VG1241AL		7.4[2]		VG1241AL+9A4AGA	VG1241AL+9A4IGA	VG1241AL+9A4GGA
VG1241AN		11.7		VG1241AN+9A4AGA	VG1241AN+9A4IGA	VG1241AN+9A4GGA
VG1241BG	3/4	4.7[2]	200	VG1241BG+9A4AGA	VG1241BG+9A4IGA	VG1241BG+9A4GGA
VG1241BL		7.4[2]		VG1241BL+9A4AGA	VG1241BL+9A4IGA	VG1241BL+9A4GGA
VG1241BN		11.7		VG1241BN+9A4AGA	VG1241BN+9A4IGA	VG1241BN+9A4GGA
VG1241CL	1	7.4[2]	200	VG1241CL+9A4AGA	VG1241CL+9A4IGA	VG1241CL+9A4GGA
VG1241CN		11.7[2]		VG1241CN+9A4AGA	VG1241CN+9A4IGA	VG1241CN+9A4GGA
VG1241CP		18.7		VG1241CP+9A4AGA	VG1241CP+9A4IGA	VG1241CP+9A4GGA

1. To avoid excessive wear or drive time on the motor for the AGx models, use a controller or software that provides a timeout function to remove the signal at the end of rotation.
2. Valve has a characterizing disk.

Table 33: Two-way brass plated trim ball valves, non-spring return, VA9300 series electric actuators

Fluid temperature: 23 to 203°F (-5 to 95°C) not rated for steam service				AC/DC 24 V		
				On/off	Floating	DC 0(2) to 10 V proportional
Valve	Size, in.	Cv	Closeoff psi	Actuators without switches		
				VA9310-HGA-2		
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+910HGA		
VG1241DP		18.7[1]		VG1241DP+910HGA		
VG1241DR		29.2		VG1241DR+910HGA		
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+910HGA		
VG1241ER		29.2[1]		VG1241ER+910HGA		
VG1241ES		46.8		VG1241ES+910HGA		
VG1241FR	2	29.2[1]	200	VG1241FR+910HGA		
VG1241FS		46.8[1]		VG1241FS+910HGA		
VG1241FT		73.7		VG1241FT+910HGA		
Valve	Size, in.	Cv	Closeoff psi	Actuators with two switches		
				VA9310-HGA-2 actuator with M9300-2 Switch Kit[2]		
VG1241AD	1/2	1.2[1]	200	VG1241AD+910HGC		
VG1241AE		1.9[1]		VG1241AE+910HGC		
VG1241AF		2.9[1]		VG1241AF+910HGC		
VG1241AG		4.7[1]		VG1241AG+910HGC		
VG1241AL		7.4[1]		VG1241AL+910HGC		
VG1241AN		11.7		VG1241AN+910HGC		
VG1241BG	3/4	4.7[1]	200	VG1241BG+910HGC		
VG1241BL		7.4[1]		VG1241BL+910HGC		
VG1241BN		11.7		VG1241BN+910HGC		
VG1241CL	1	7.4[1]	200	VG1241CL+910HGC		
VG1241CN		11.7[1]		VG1241CN+910HGC		
VG1241CP		18.7		VG1241CP+910HGC		
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+910HGC		
VG1241DP		18.7[1]		VG1241DP+910HGC		
VG1241DR		29.2		VG1241DR+910HGC		
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+910HGC		
VG1241ER		29.2[1]		VG1241ER+910HGC		
VG1241ES		46.8		VG1241ES+910HGC		
VG1241FR	2	29.2[1]	200	VG1241FR+910HGC		
VG1241FS		46.8[1]		VG1241FS+910HGC		
VG1241FT		73.7		VG1241FT+910HGC		

1. Valve has a characterizing disk.
2. For field mounting order VA9310-HGA-2 and the M9300-2 Switch Kit separately.

Table 34: Two-way plated brass trim ball valves, spring return valve open - valve normally open, VA9203/ VA9208 series actuators with switches

Fluid temperatures: 23 to 203°F (-5 to 95°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv	Closeoff psi	Spring return open — valve normally open — actuators with one switch			
				VA9203-AGB-2Z	VA9203-GGB-2Z	VA9203-BGB-2	VA9203-BUB-2
VG1241AA	1/2	0.3[1]	200	VG1241AA+923AGB	VG1241AA+923GGB	VG1241AA+923BGB	-
VG1241AB		0.5[1]		VG1241AB+923AGB	VG1241AB+923GGB	VG1241AB+923BGB	-
VG1241AA		0.8[1]		VG1241AC+923AGB	VG1241AC+923GGB	VG1241AC+923BGB	-
VG1241AD		1.2[1]		VG1241AD+923AGB	VG1241AD+923GGB	VG1241AD+923BGB	VG1241AD+923BUB
VG1241AE		1.9[1]		VG1241AE+923AGB	VG1241AE+923GGB	VG1241AE+923BGB	VG1241AE+923BUB
VG1241AF		2.9[1]		VG1241AF+923AGB	VG1241AF+923GGB	VG1241AF+923BGB	VG1241AF+923BUB
VG1241AG		4.7[1]		VG1241AG+923AGB	VG1241AG+923GGB	VG1241AG+923BGB	VG1241AG+923BUB
VG1241AL		7.4[1]		VG1241AL+923AGB	VG1241AL+923GGB	VG1241AL+923BGB	VG1241AL+923BUB
VG1241AN		11.7		VG1241AN+923AGB	VG1241AN+923GGB	VG1241AN+923BGB	VG1241AN+923BUB
VG1241BG	3/4	4.7[1]	200	VG1241BG+923AGB	VG1241BG+923GGB	VG1241BG+923BGB	VG1241BG+923BUB
VG1241BL		7.4[1]		VG1241BL+923AGB	VG1241BL+923GGB	VG1241BL+923BGB	VG1241BL+923BUB
VG1241BN		11.7		VG1241BN+923AGB	VG1241BN+923GGB	VG1241BN+923BGB	VG1241BN+923BUB
VG1241CL	1	7.4[1]	200	VG1241CL+923AGB	VG1241CL+923GGB	VG1241CL+923BGB	VG1241CL+923BUB
VG1241CN		11.7[1]		VG1241CN+923AGB	VG1241CN+923GGB	VG1241CN+923BGB	VG1241CN+923BUB
VG1241CP		18.7		VG1241CP+923AGB	VG1241CP+923GGB	VG1241CP+923BGB	VG1241CP+923BUB
Valve	Size, in.	Cv	Closeoff psi	Spring return open — valve normally open — actuators with two switches			
				VA9208-AGC-3	VA9208-GGC-3	VA9208-BGC-3	VA9208-BAC-3
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+938AGC	VG1241DN+938GGC	VG1241DN+938BGC	VG1241DN+938BAC
VG1241DP		18.7[1]		VG1241DP+938AGC	VG1241DP+938GGC	VG1241DP+938BGC	VG1241DP+938BAC
VG1241DR		29.2		VG1241DR+938AGC	VG1241DR+938GGC	VG1241DR+938BGC	VG1241DR+938BAC
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+938AGC	VG1241EP+938GGC	VG1241EP+938BGC	VG1241EP+938BAC
VG1241ER		29.2[1]		VG1241ER+938AGC	VG1241ER+938GGC	VG1241ER+938BGC	VG1241ER+938BAC
VG1241ES		46.8		VG1241ES+938AGC	VG1241ES+938GGC	VG1241ES+938BGC	VG1241ES+938BAC
VG1241FR	2	29.2[1]	200	VG1241FR+938AGC	VG1241FR+938GGC	VG1241FR+938BGC	VG1241FR+938BAC
VG1241FS		46.8[1]		VG1241FS+938AGC	VG1241FS+938GGC	VG1241FS+938BGC	VG1241FS+938BAC
VG1241FT		73.7		VG1241FT+938AGC	VG1241FT+938GGC	VG1241FT+938BGC	VG1241FT+938BAC

1. Valve has a characterizing disk.

Table 35: Two-way plated brass trim ball valves, spring return valve closed - valve normally closed, VA9203/VA9208 series actuators with switches

Fluid temperatures: 23 to 203°F (-5 to 95°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv	Closeoff psi	Spring return closed — valve normally closed — actuators with one switch			
				VA9203-AGB-2Z	VA9203-GGB-2Z	VA9203-BGB-2	VA9203-BUB-2
VG1241AA	1/2	0.3[1]	200	VG1241AA+943AGB	VG1241AA+943GGB	VG1241AA+943BGB	-
VG1241AB		0.5[1]		VG1241AB+943AGB	VG1241AB+943GGB	VG1241AB+943BGB	-
VG1241AA		0.8[1]		VG1241AC+943AGB	VG1241AC+943GGB	VG1241AC+943BGB	-
VG1241AD		1.2[1]		VG1241AD+943AGB	VG1241AD+943GGB	VG1241AD+943BGB	VG1241AD+943BUB
VG1241AE		1.9[1]		VG1241AE+943AGB	VG1241AE+943GGB	VG1241AE+943BGB	VG1241AE+943BUB
VG1241AF		2.9[1]		VG1241AF+943AGB	VG1241AF+943GGB	VG1241AF+943BGB	VG1241AF+943BUB
VG1241AG		4.7[1]		VG1241AG+943AGB	VG1241AG+943GGB	VG1241AG+943BGB	VG1241AG+943BUB
VG1241AL		7.4[1]		VG1241AL+943AGB	VG1241AL+943GGB	VG1241AL+943BGB	VG1241AL+943BUB
VG1241AN		11.7		VG1241AN+943AGB	VG1241AN+943GGB	VG1241AN+943BGB	VG1241AN+943BUB
VG1241BG	3/4	4.7[1]	200	VG1241BG+943AGB	VG1241BG+943GGB	VG1241BG+943BGB	VG1241BG+943BUB
VG1241BL		7.4[1]		VG1241BL+943AGB	VG1241BL+943GGB	VG1241BL+943BGB	VG1241BL+943BUB
VG1241BN		11.7		VG1241BN+943AGB	VG1241BN+943GGB	VG1241BN+943BGB	VG1241BN+943BUB
VG1241CL	1	7.4[1]	200	VG1241CL+943AGB	VG1241CL+943GGB	VG1241CL+943BGB	VG1241CL+943BUB
VG1241CN		11.7[1]		VG1241CN+943AGB	VG1241CN+943GGB	VG1241CN+943BGB	VG1241CN+943BUB
VG1241CP		18.7		VG1241CP+943AGB	VG1241CP+943GGB	VG1241CP+943BGB	VG1241CP+943BUB
Valve	Size, in.	Cv	Closeoff psi	Spring return closed — valve normally closed — actuators with two switches			
				VA9208-AGC-3	VA9208-GGC-3	VA9208-BGC-3	VA9208-BAC-3
VG1241DN	1-1/4	11.7[1]	200	VG1241DN+958AGC	VG1241DN+958GGC	VG1241DN+958BGC	VG1241DN+958BAC
VG1241DP		18.7[1]		VG1241DP+958AGC	VG1241DP+958GGC	VG1241DP+958BGC	VG1241DP+958BAC
VG1241DR		29.2		VG1241DR+958AGC	VG1241DR+958GGC	VG1241DR+958BGC	VG1241DR+958BAC
VG1241EP	1-1/2	18.7[1]	200	VG1241EP+958AGC	VG1241EP+958GGC	VG1241EP+958BGC	VG1241EP+958BAC
VG1241ER		29.2[1]		VG1241ER+958AGC	VG1241ER+958GGC	VG1241ER+958BGC	VG1241ER+958BAC
VG1241ES		46.8		VG1241ES+958AGC	VG1241ES+958GGC	VG1241ES+958BGC	VG1241ES+958BAC
VG1241FR	2	29.2[1]	200	VG1241FR+958AGC	VG1241FR+958GGC	VG1241FR+958BGC	VG1241FR+958BAC
VG1241FS		46.8[1]		VG1241FS+958AGC	VG1241FS+958GGC	VG1241FS+958BGC	VG1241FS+958BAC
VG1241FT		73.7		VG1241FT+958AGC	VG1241FT+958GGC	VG1241FT+958BGC	VG1241FT+958BAC

1. Valve has a characterizing disk.

Table 36: Three-way brass plated trim ball valves, non-spring return, VA9300 series electric actuators

Fluid temperature: 23 to 203°F (-5 to 95°C) not rated for steam service				AC/DC 24 V		
				On/off	Floating	DC 0(2) to 10 V proportional
Valve	Size, in.	Cv	Closeoff psi	Actuators without switches		
				VA9310-HGA-2		
VG1841DN	1-1/4	11.7[1]	200	VG1841DN+910HGA		
VG1841DP		18.7[1]		VG1841DP+910HGA		
VG1841DR		29.2		VG1841DR+910HGA		
VG1841EP	1-1/2	18.7[1]	200	VG1841EP+910HGA		
VG1841ER		29.2[1]		VG1841ER+910HGA		
VG1841ES		46.8		VG1841ES+910HGA		
VG1841FR	2	29.2[1]	200	VG1841FR+910HGA		
VG1841FS		46.8[1]		VG1841FS+910HGA		
VG1841FT		73.7		VG1841FT+910HGA		
Valve	Size, in.	Cv	Closeoff psi	Actuators with two switches		
				VA9310-HGA-2 actuator with M9300-2 Switch Kit[2]		
VG1841AD	1/2	1.2[1]	200	VG1841AD+910HGC		
VG1841AE		1.9[1]		VG1841AE+910HGC		
VG1841AF		2.9[1]		VG1841AF+910HGC		
VG1841AG		4.7[1]		VG1841AG+910HGC		
VG1841AL		7.4[1]		VG1841AL+910HGC		
VG1841AN		11.7		VG1841AN+910HGC		
VG1841BG	3/4	4.7[1]	200	VG1841BG+910HGC		
VG1841BL		7.4[1]		VG1841BL+910HGC		
VG1841BN		11.7		VG1841BN+910HGC		
VG1841CL	1	7.4[1]	200	VG1841CL+910HGC		
VG1841CN		11.7[1]		VG1841CN+910HGC		
VG1841CP		18.7		VG1841CP+910HGC		
VG1841DN	1-1/4	11.7[1]	200	VG1841DN+910HGC		
VG1841DP		18.7[1]		VG1841DP+910HGC		
VG1841DR		29.2		VG1841DR+910HGC		
VG1841EP	1-1/2	18.7[1]	200	VG1841EP+910HGC		
VG1841ER		29.2[1]		VG1841ER+910HGC		
VG1841ES		46.8		VG1841ES+910HGC		
VG1841FR	2	29.2[1]	200	VG1841FR+910HGC		
VG1841FS		46.8[1]		VG1841FS+910HGC		
VG1841FT		73.7		VG1841FT+910HGC		

1. Valve has a characterizing disk.
2. For field mounting order VA9310-HGA-2 and the M9300-2 Switch Kit separately.

Table 37: Three-way plated brass trim ball valves, spring return counterclockwise - Port A (coil) open, VA9203/VA9208 series actuators with switches

Fluid temperatures: 23 to 203°F (-5 to 95°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	Size, in.	Cv (Port A/B)	Closeoff psig	Spring return Port A open — valve spring return counterclockwise — actuator with one switch			
				VA9203-AGB-2Z	VA9203-GGB-2Z	VA9203-BGB-2	VA9203-BUB-2
VG1841AA	1/2	0.3/0.2[1]	200	VG1841AA+923AGB	VG1841AA+923GGB	VG1841AA+923BGB	-
VG1841AB		0.5/0.3[1]		VG1841AB+923AGB	VG1841AB+923GGB	VG1841AB+923BGB	-
VG1841AC		0.8/0.4[1]		VG1841AC+923AGB	VG1841AC+923GGB	VG1841AC+923BGB	-
VG1841AD		1.2/0.7[1]		VG1841AD+923AGB	VG1841AD+923GGB	VG1841AD+923BGB	VG1841AD+923BUB
VG1841AE		1.9/1.2[1]		VG1841AE+923AGB	VG1841AE+923GGB	VG1841AE+923BGB	VG1841AE+923BUB
VG1841AF		2.9/1.9[1]		VG1841AF+923AGB	VG1841AF+923GGB	VG1841AF+923BGB	VG1841AF+923BUB
VG1841AG		4.7/2.9[1]		VG1841AG+923AGB	VG1841AG+923GGB	VG1841AG+923BGB	VG1841AG+923BUB
VG1841AL		7.4/4.7[1]		VG1841AL+923AGB	VG1841AL+923GGB	VG1841AL+923BGB	VG1841AL+923BUB
VG1841AN		11.7/5.8		VG1841AN+923AGB	VG1841AN+923GGB	VG1841AN+923BGB	VG1841AN+923BUB
VG1841BG	3/4	4.7/2.9[1]	200	VG1841BG+923AGB	VG1841BG+923GGB	VG1841BG+923BGB	VG1841BG+923BUB
VG1841BL		7.4/4.7[1]		VG1841BL+923AGB	VG1841BL+923GGB	VG1841BL+923BGB	VG1841BL+923BUB
VG1841BN		11.7/5.8		VG1841BN+923AGB	VG1841BN+923GGB	VG1841BN+923BGB	VG1841BN+923BUB
VG1841CL	1	7.4/4.7[1]	200	VG1841CL+923AGB	VG1841CL+923GGB	VG1841CL+923BGB	VG1841CL+923BUB
VG1841CN		11.7/7.4[1]		VG1841CN+923AGB	VG1841CN+923GGB	VG1841CN+923BGB	VG1841CN+923BUB
VG1841CP		18.7/9.4		VG1841CP+923AGB	VG1841CP+923GGB	VG1841CP+923BGB	VG1841CP+923BUB
Valve	Size, in.	Cv (Port A/B)	Closeoff psig	Spring return Port A open — valve spring return counterclockwise — actuator with two switches			
				VA9208-AGC-3	VA9208-GGC-3	VA9208-BGC-3	VA9208-BAC-3
VG1841DN	1-1/4	11.7/7.4[1]	200	VG1841DN+938AGC	VG1841DN+938GGC	VG1841DN+938BGC	VG1841DN+938BAC
VG1841DP		18.7/11.7[1]		VG1841DP+938AGC	VG1841DP+938GGC	VG1841DP+938BGC	VG1841DP+938BAC
VG1841DR		29.2/14.6		VG1841DR+938AGC	VG1841DR+938GGC	VG1841DR+938BGC	VG1841DR+938BAC
VG1841EP	1-1/2	18.7/11.7[1]	200	VG1841EP+938AGC	VG1841EP+938GGC	VG1841EP+938BGC	VG1841EP+938BAC
VG1841ER		29.2/18.7[1]		VG1841ER+938AGC	VG1841ER+938GGC	VG1841ER+938BGC	VG1841ER+938BAC
VG1841ES		46.8/23.4		VG1841ES+938AGC	VG1841ES+938GGC	VG1841ES+938BGC	VG1841ES+938BAC
VG1841FR	2	29.2/18.7[1]	200	VG1841FR+938AGC	VG1841FR+938GGC	VG1841FR+938BGC	VG1841FR+938BAC
VG1841FS		46.8/29.2[1]		VG1841FS+938AGC	VG1841FS+938GGC	VG1841FS+938BGC	VG1841FS+938BAC
VG1841FT		73.7/36.8		VG1841FT+938AGC	VG1841FT+938GGC	VG1841FT+938BGC	VG1841FT+938BAC

1. Valve has a characterizing disk.

Table 38: Three-way plated brass trim ball valves, spring return clockwise – Port A (coil) closed with switches

Fluid temperatures: 23 to 203°F (-5 to 95°C) not rated for steam service				AC 24 V			AC 85–264 V (VA9203) AC 120 V (VA9208)
				Floating	DC 0 to 10 V proportional	On/off	On/off
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A closed — valve spring return clockwise — actuator with one switch**			
				VA9203-AGB-2Z	**VA9203-GGB-2Z**	**VA9203-BGB-2**	**VA9203-BUB-2**
VG1841AA	1/2	0.3/0.2[1]	200	VG1841AA+943AGB	VG1841AA+943GGB	VG1841AA+943BGB	-
VG1841AB	1/2	0.5/0.3[1]	200	VG1841AB+943AGB	VG1841AB+943GGB	VG1841AB+943BGB	-
VG1841AC		0.8/0.4[1]		VG1841AC+943AGB	VG1841AC+943GGB	VG1841AC+943BGB	-
VG1841AD		1.2/0.7[1]		VG1841AD+943AGB	VG1841AD+943GGB	VG1841AD+943BGB	VG1841AD+943BUB
VG1841AE		1.9/1.2[1]		VG1841AE+943AGB	VG1841AE+943GGB	VG1841AE+943BGB	VG1841AE+943BUB
VG1841AF		2.9/1.9[1]		VG1841AF+943AGB	VG1841AF+943GGB	VG1841AF+943BGB	VG1841AF+943BUB
VG1841AG		4.7/2.9[1]		VG1841AG+943AGB	VG1841AG+943GGB	VG1841AG+943BGB	VG1841AG+943BUB
VG1841AL		7.4/4.7[1]		VG1841AL+943AGB	VG1841AL+943GGB	VG1841AL+943BGB	VG1841AL+943BUB
VG1841AN		11.7/5.8		VG1841AN+943AGB	VG1841AN+943GGB	VG1841AN+943BGB	VG1841AN+943BUB
VG1841BG	3/4	4.7/2.9[1]	200	VG1841BG+943AGB	VG1841BG+943GGB	VG1841BG+943BGB	VG1841BG+943BUB
VG1841BL		7.4/4.7[1]		VG1841BL+943AGB	VG1841BL+943GGB	VG1841BL+943BGB	VG1841BL+943BUB
VG1841BN		11.7/5.8		VG1841BN+943AGB	VG1841BN+943GGB	VG1841BN+943BGB	VG1841BN+943BUB
VG1841CL	1	7.4/4.7[1]	200	VG1841CL+943AGB	VG1841CL+943GGB	VG1841CL+943BGB	VG1841CL+943BUB
VG1841CN		11.7/7.4[1]		VG1841CN+943AGB	VG1841CN+943GGB	VG1841CN+943BGB	VG1841CN+943BUB
VG1841CP		18.7/9.4		VG1841CP+943AGB	VG1841CP+943GGB	VG1841CP+943BGB	VG1841CP+943BUB
Valve	**Size, in.**	**Cv (Port A/B)**	**Closeoff psi**	**Spring return Port A closed — valve spring return clockwise — actuator with two switches**			
				VA9208-AGC-3	**VA9208-GGC-3**	**VA9208-BGC-3**	**VA9208-BAC-3**
VG1841DN	1-1/4	11.7/7.4[1]	200	VG1841DN+958AGC	VG1841DN+958GGC	VG1841DN+958BGC	VG1841DN+958BAC
VG1841DP		18.7/11.7[1]		VG1841DP+958AGC	VG1841DP+958GGC	VG1841DP+958BGC	VG1841DP+958BAC
VG1841DR		29.2/14.6		VG1841DR+958AGC	VG1841DR+958GGC	VG1841DR+958BGC	VG1841DR+958BAC
VG1841EP	1-1/2	18.7/11.7[1]	200	VG1841EP+958AGC	VG1841EP+958GGC	VG1841EP+958BGC	VG1841EP+958BAC
VG1841ER		29.2/18.7[1]		VG1841ER+958AGC	VG1841ER+958GGC	VG1841ER+958BGC	VG1841ER+958BAC
VG1841ES		46.8/23.4		VG1841ES+958AGC	VG1841ES+958GGC	VG1841ES+958BGC	VG1841ES+958BAC
VG1841FR	2	29.2/18.7[1]	200	VG1841FR+958AGC	VG1841FR+958GGC	VG1841FR+958BGC	VG1841FR+958BAC
VG1841FS		46.8/29.2[1]		VG1841FS+958AGC	VG1841FS+958GGC	VG1841FS+958BGC	VG1841FS+958BAC
VG1841FT		73.7/36.8		VG1841FT+958AGC	VG1841FT+958GGC	VG1841FT+958BGC	VG1841FT+958BAC

1. Valve has a characterizing disk.

Table 39: Shipping weights, lb (kg)

Valve code number	Description	Shipping weight, lb (kg)
VG12xxAx	1/2 in. (DN15) two-way forged brass ball valve	0.8 (0.4)
VG12xxBx	3/4 in. (DN20) two-way forged brass ball valve	1.0 (0.5)
VG12xxCx	1 in. (DN25) two-way forged brass ball valve	1.8 (0.8)
VG12xxDx	1-1/4 in. (DN32) two-way forged brass ball valve	2.3 (1.0)
VG12xxEx	1-1/2 in. (DN40) two-way forged brass ball valve	3.8 (1.7)
VG12xxFx	2 in. (DN50) two-way forged brass ball valve	5.0 (2.3)
VG18xxAx	1/2 in. (DN15) three-way forged brass ball valve	1.25 (0.6)
VG18xxBx	3/4 in. (DN20) three-way forged brass ball valve	1.5 (0.7)
VG18xxCx	1 in. (DN25) three-way forged brass ball valve	2.75 (1.3)
VG18xxDx	1-1/4 in. (DN32) three-way forged brass ball valve	4.25 (1.9)
VG18xxEx	1-1/2 in. (DN40) three-way forged brass ball valve	6.25 (2.8)
VG18xxFx	2 in. (DN50) three-way forged brass ball valve	8.2 (3.7)

Table 40: Repair parts

Linkage	Replacement description	Replacement part code number
M9000-551	Linkage with handle for VA9104 series actuators	Unit replacement
M9000-560	Linkage for VA9203/VA9208 series actuators	Unit replacement
M9000-561	Thermal barrier for VA9104/VA9203/VA9208/VA9300 series actuators	Unit replacement
M9310-500	Linkage for M9300 actuators	Unit replacement

Application overview

Available in sizes 1/2 through 2 in. (DN15 through DN50), VG1000 Series Ball Valves are designed specifically for automated commercial HVAC service. These valves feature a forged brass body with either a chrome-plated brass ball for water or glycol solutions to 203°F (95°C), or a 300 Series stainless steel ball for high temperature water to 284°F (140°C) and saturated steam to 15 psi. The Amodel Flow Characterizing Disk maintains equal percentage flow characteristics for optimum temperature control, as shown in Figure 2. The blowout-proof stem and mounting flange, combined with an innovative double O-ring stem seal and self-centering stem bushing design (shown in Figure 3) provide quick and easy electric actuator field mounting while ensuring long life and leak-free valve performance. The specially engineered, graphite-reinforced PTFE seat with flexible PTFE seat design (backed with EPDM O-rings) significantly reduces the operating torque, allowing the smallest possible electric actuator available to provide the force required for the specific application. All valve and actuator assemblies provide 200 psig (1,379 kPa) closeoff pressure while ensuring operation after long idle periods. Because of their cost-effective, reliable design, VG1000 Series Ball Valves are maintenance free.

VA9000 Series Electric Actuators include mounting hardware for direct coupling to VG1000 Series Ball Valves. M9000 Series Electric Actuators require additional Valve Linkage Kits. See Table 32 and Table 33 for valid valve, actuator, and linkage kit combinations for assembly in the field.

VG1000 Series Ball Valves are designed for factory or field mounting to a wide variety of Johnson Controls® M9000 and VA9000 Series Electric Actuators. Control signal selections include:

- floating point without timeout
- on/off and floating point
- on/off
- proportional

Valve end connection

VG1000 Series 1/2, 3/4, and 1 in. (DN15, DN20, and DN25) valves are available in one of three end connections:

- NPT Threaded
- Sweat end for copper tubing
- Press end for copper tubing

Press end connected valves are designed for installation using RIDGID Pressing Tool Technology manufactured by the Ridgid Tool Corporation for use with the ProPress fitting system. Press end connections afford significant installation savings. Additional information on these tools can be found at www.ridgid.com.

VG1000 Series 1-1/4, 1-1/2, and 2 in. (DN32, DN40, and DN50) valves are available with NPT threaded ends only.

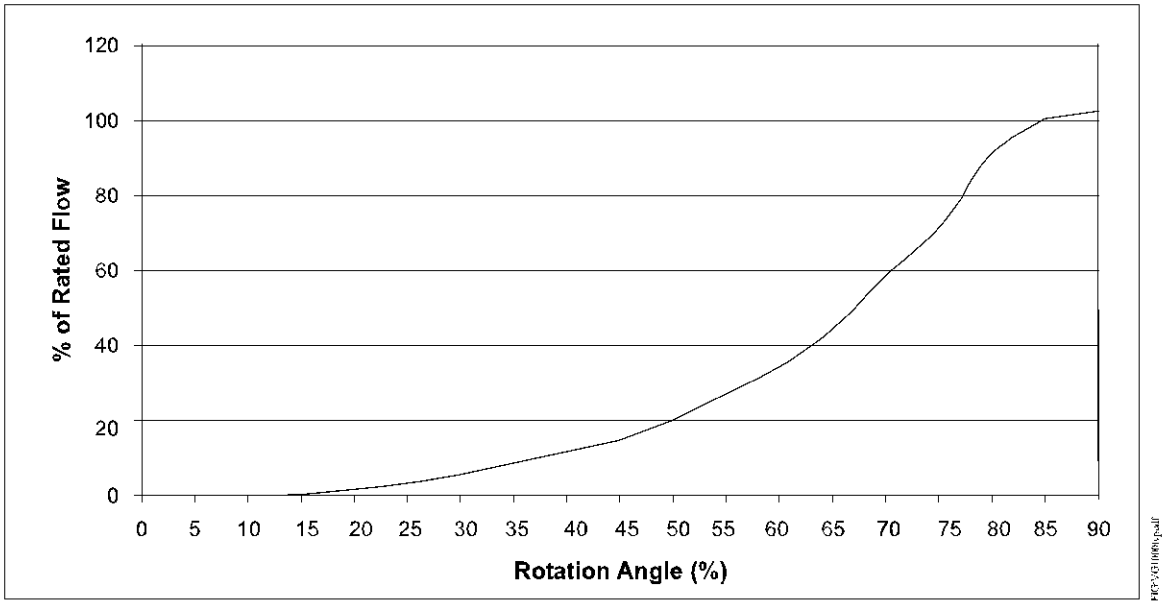


Figure 2: Typical two-way VG1000 series ball valve

See Figure 3 for typical VG1000 internal composition.

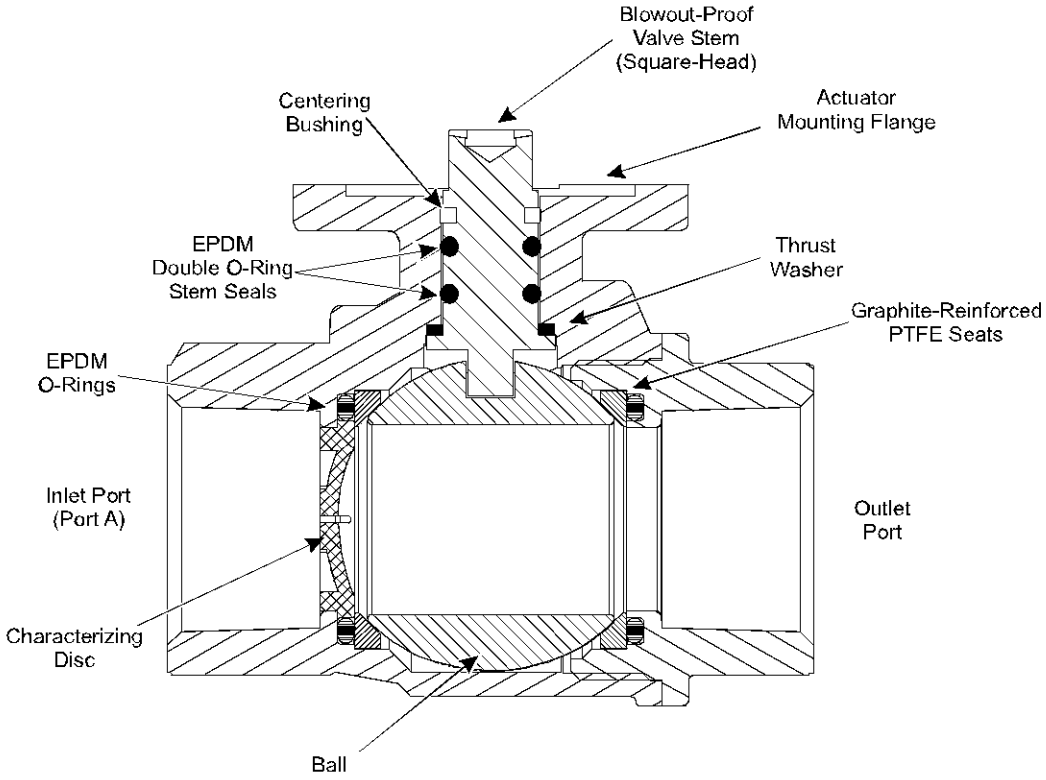
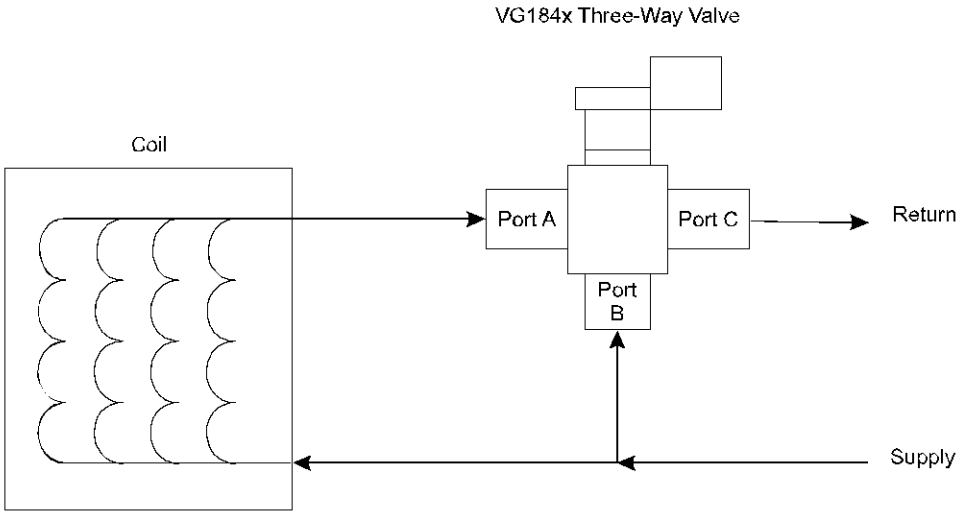
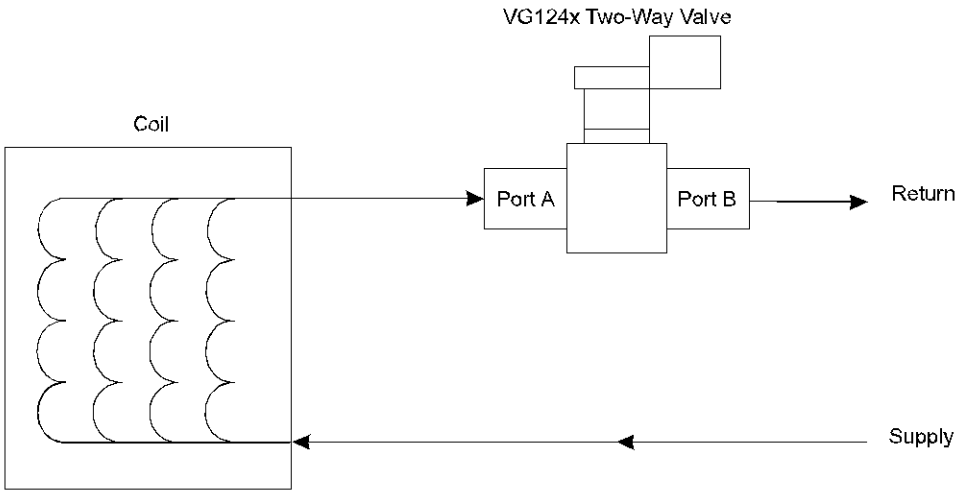


Figure 3: Internal view of a typical VG1000 series ball valve

See Figure 4 for typical piping applications.



Typical Three-Way Ball Valve Application



Typical Two-Way Ball Valve Application

Note: Mount the valve downstream from the coil to minimize heat transfer to the actuator.

Figure 4: Typical VG1000 piping

IMPORTANT: The VG1000 Series Valves are intended to control saturated steam, hot water, and chilled water flow under normal equipment operating conditions. Where failure or malfunction of the VG1000 Series Valve could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the system. Incorporate and maintain other devices such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the VG1000 Series Valve.

Electric actuator control signal action

Two-way VG1000 Series Ball Valves are fully open when the electric actuator is fully Counterclockwise (CCW) and fully closed when the electric actuator is fully Clockwise (CW). For three-way valves, the Port A and common port are fully open when the electric actuator is fully CCW, as shown in Figure 5. Port B and common port are fully open when the actuator is fully CW, as shown in Figure 6.

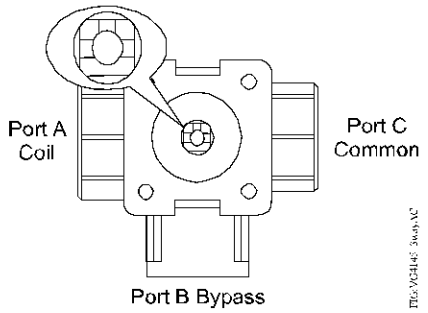


Figure 5: VG1841 or VG1845 series three-way ball valve (Port A Connected to Port C)

Note: VG1841 and VG1845 three-way ball valves have a different port configuration (as shown in Figure 5 and Figure 6) from the older VG1644 Series three-way ball valves (Figure 7), and you must change the piping to convert them to the new series of valves.

For non-spring return and spring-to-open proportional control models in the direct-acting mode, a minimum control signal drives the electric actuator to the fully CCW position, whereas a maximum control signal drives the electric actuator to the fully CW position.

For spring-to-close proportional control models in the direct-acting mode, a minimum control signal drives the electric actuator to the fully CW position, whereas a maximum control signal drives the electric actuator to the fully CCW position.

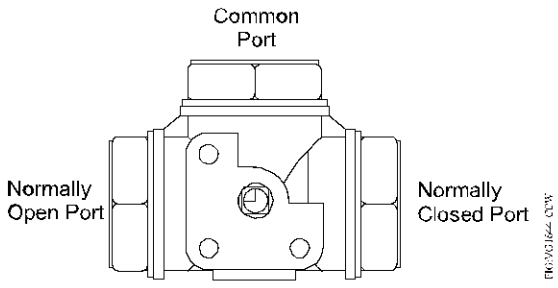


Figure 7: Top view of VG1644 series three-way ball valve (actuator fully CCW)

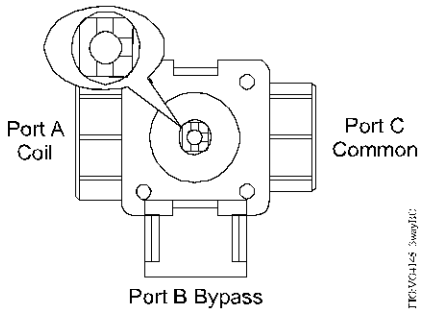


Figure 6: VG1841 or VG1845 series three-way ball valve (Port B Connected to Port C)

For non-spring return floating or on/off (floating) control models, a control signal to Terminal 2 (or wire 2) of a VA9104, M(VA)910x, or M(VA)93xx Series Actuator drives the electric actuator to the fully CW position. Likewise, a control signal to Terminal 3 (or wire 3) of a VA9104, M910x, or M(VA)93xx Series Actuator drives the electric actuator to the fully CCW position.

A control signal to Wire 3 of side A mounted (away from the valve) VA9203 or VA9208 Series actuated spring-to-open floating control valve assembly drives the electric actuator to the fully CW position. Likewise, a control signal to Wire 4 of a floating CCW-face VA9203 Series or VA9208 Series Actuator, or removal of the control signal from Wire 3 of an on/off CCW-face VA9203 Series or VA9208 Series actuated spring-to-open valve assembly, drives the electric actuator to the fully CCW position.

A control signal to Wire 3 of a CW-face (mounted away from the valve) VA9203 Series or VA9208 Series actuated spring-to-close floating control valve assembly drives the electric actuator to the fully CCW position. Likewise, a control signal to Wire 4 of a floating CW-face VA9203 Series or VA9208 Series Actuator, or removal of the control signal from Wire 3 of an on/off CW-face VA9203 Series or VA9208 Series actuated spring-to-close valve assembly, drives the electric actuator to the fully CW position.

Electric actuator selection

VG1000 Series Ball Valves are designed for factory or field mounting to a variety of M9000 and VA9000 Series Actuators. VA9000 Series Actuators include all hardware necessary for attachment to the valve. M9000 Series Actuators require an additional linkage. See Table .

Note: To avoid excessive wear or drive time on the motor for VA9104 and M9104, 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 GGx models have an auto shutoff to avoid excessive wear or drive time on the motor.

For more information on these electric actuator series as well as details on models available, refer to the following documents:

- *VA9104-xGA-2S, -3S Series Electric Non-Spring Return Valve Actuators Product Bulletin (LIT-12011050)*
- *M9104-xGA-2S, -3S Series Electric Non-Spring Return Actuators Product Bulletin (LIT-1201742)*
- *VA9203 Series Electric Spring Return Actuator Product Bulletin (LIT-12011702)*
- *VA9208 Series Electric Spring Return Actuator Product Bulletin (LIT-12011622)*
- *M(VA)9300 Series Electric Non-Spring Return Actuators Product Bulletin (LIT-12012069)*

Linkage kit and weather shield selection

The M9000-551 and M9000-561 Valve Linkage Kits and M9000-342 Weather Shield are designed specifically for field mounting Johnson Controls M(VA)9104 and M(VA)9300 Series Non-Spring Return and M(VA)9203 and M(VA)9208 Series Spring Return Electric Actuators to VG1000 Series Ball Valves.

For more information on the M9000-551 Linkage Kit, refer to the *M9000-551 Ball Valve Linkage Kit Installation Instructions (Part No. 34-636-1816).*

For more information on the M9000-342 Weather Shield, refer to the *M9000-342 Valve Weather Shield Kit Installation Instructions (Part No. 34-636-2499).*

For more information on the M9000-560 Ball Valve Linkage, refer to the *M9000-560 Ball Valve Linkage Kit and M9000-561 Thermal Barrier Installation Instructions (Part No. 34-636-2227).*

Valid ball valve, electric actuator, linkage kit, and weather shield combinations (for assembly in the field) (Part 1 of 3)

Valve Size, in. (DN)	Valve code numbers			Actuator base number[1]	Linkage kit code number			Weather shield
	NPT end connection	Sweat end connection	Press end connection		Fluid temperatures (<203°F [95°C])	Fluid temperatures (<212°F [100°C])	Fluid temperatures (≥212°F [100°C])	
1/2 (DN15)	VG1241Ax VG1841Ax		VG1291Ax VG1891Ax	VA9104[2]	None required	Not rated	Not rated	M9000-342
				M9104[2]	M9000-551			
				VA9300	None required			
				M9300	M9310-500			
				VA9203	None required			
				M9203	M9000-560			
	VG1245Ax VG1845Ax	VG1275Ax VG1875Ax	VG1295Ax VG1895Ax	VA9104[2]	None required		M9000-561	
				M9104[2]	M9000-551			
				VA9300	None required			
				M9300	M9310-500			
				VA9203	None required			
				M9203	M9000-560			

Valid ball valve, electric actuator, linkage kit, and weather shield combinations (for assembly in the field) (Part 2 of 3)

Valve Size, in. (DN)	Valve code numbers			Actuator base number[1]	Linkage kit code number			Weather shield
	NPT end connection	Sweat end connection	Press end connection		Fluid temperatures (<203°F [95°C])	Fluid temperatures (<212°F [100°C])	Fluid temperatures (≥212°F [100°C])	
3/4 (DN20)	VG1241Bx VG1841Bx		VG1291Bx VG1891Bx	VA9104[2]	None required	Not rated	Not rated	M9000-342
				M9104[2]	M9000-551			
				VA9300	None required			
				M9300	M9310-500			
				VA9203	None required			
				M9203	M9000-560			
	VG1245Bx VG1845Bx	VG1275Bx VG1875Bx	VG1295Bx VG1895Bx	VA9104[2]	None required		M9000-561	
				M9104[2]	M9000-551			
				VA9300	None required			
				M9300	M9310-500			
				VA9203	None required			
				M9203	M9000-560			
1 (DN25)	VG1241Cx VG1841Cx	VG1271Cx VG1871Cx	VG1291Cx VG1891Cx	VA9104[2]	None required	Not rated	Not rated	M9000-342
				M9104[2]	M9000-551			
				VA9300	None required			
				M9300	M9310-500			
				VA9203	None required			
				M9203	M9000-560			
	VG1245Cx VG1845Cx	VG1275Cx VG1875Cx	VG1295Cx VG1895Cx	VA9104[2]	None required		M9000-561	
				M9104[2]	M9000-551			
				VA9300	None required			
				M9300	M9310-500			
				VA9203	None required			
				M9203	M9000-560			
1-1/4 (DN32)	VG1241Dx VG1841Dx			VA9300	None required	Not rated	Not rated	M9000-342
				M9300	M9310-500			
				VA9208	None required			
				M9208	M9000-550			
	VG1245Dx VG1845Dx			VA9300	None required		M9000-561	
				M9300	M9310-500			
				VA9208	None required			
				M9208	M9000-550			

Valid ball valve, electric actuator, linkage kit, and weather shield combinations (for assembly in the field) (Part 3 of 3)

Valve Size, in. (DN)	Valve code numbers			Actuator base number[1]	Linkage kit code number			Weather shield
	NPT end connection	Sweat end connection	Press end connection		Fluid temperatures (<203°F [95°C])	Fluid temperatures (<212°F [100°C])	Fluid temperatures (≥212°F [100°C])	
1-1/2 (DN40)	VG1241Ex VG1841Ex			VA9300	None required	Not rated	Not rated	M9000-342
				M9300	M9310-500			
				VA9208	None required			
				M9208	M9000-550			
	VG1245Ex VG1845Ex			VA9300	None required		M9000-561	
				M9300	M9310-500			
				VA9208	None required			
				M9208	M9000-550			
2 (DN50)	VG1241Fx VG1841Fx			VA9300	None required	Not rated	Not rated	M9000-342
				M9300	M9310-500			
				VA9208	None required			
				M9208	M9000-550			
	VG1245Fx VG1845Fx			VA9300	None required		M9000-561	
				M9300	M9310-500			
				VA9208	None required			
				M9208	M9000-550			

1. VA9104, M9104, VA9300, and M9300 Series Actuators are non-spring return, and VA9203, M9203, VA9208, and M9208 Series Actuators are spring return. Note: VA9104, M9104, VA9300, M9300, VA9203, M9203, VA9208, and M9208 have a maximum fluid temperature limit of 212°F (100°C) unless used with the M9000-561 Thermal Barrier.
2. To avoid excessive wear or drive time on the motor for VA9104 and M9104 use a controller and/or software that provides a timeout function to remove the signal at the end of rotation (stall). The IGx and GGx models have an automatic shutoff to avoid excessive wear or drive time on the motor.

See Figure 8 for dimension drawings of the Non-Spring Return VA9104 Series Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves. See Table 41 and Table 42 for specific model linkage dimensions.

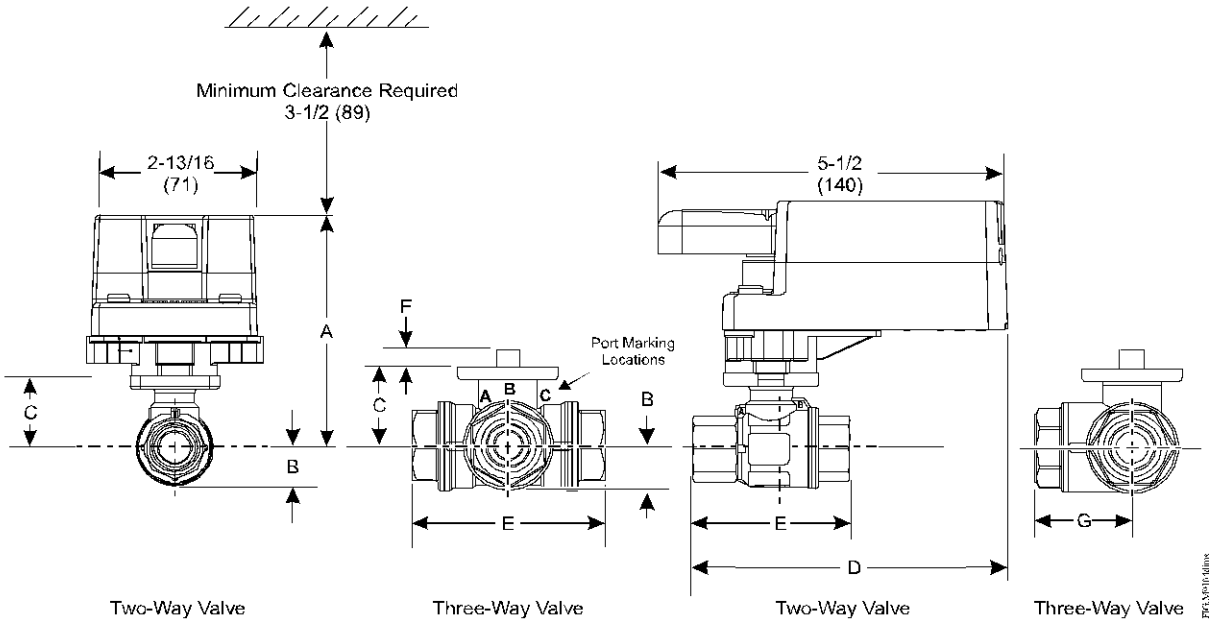


Figure 8: VA9104 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with NPT end connections dimensions, in. (mm)

Table 41: VA9104 or M9104 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve dimensions, in. (mm)

Valve size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	3-7/8 (98)	21/32 (17)	1-7/32 (31)	5-7/64 (129)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	3-7/8 (98)	21/32 (17)	1-7/32 (31)	5-7/32 (133)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	3-11/16 (100)	3/4 (19)	1-19/64 (33)	5-9/16 (141)	3-13/32 (87)	11/32 (9)	1-11/16 (43)

1. Port A must always be connected to the coil.

Table 42: VA9104 actuated VG1275 and VG1875 series ball valve with sweat end connections and VA9104 actuated VG1295 and VG1895 series ball valves with press end connections dimensions, in. (mm)

Valve size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	3-7/8 (98)	21/32 (17)	1-7/32 (31)	5-45/64 (145)	3-25/32 (96)	11/32 (9)	2-13/16 (55)
3/4 (DN20)	3-7/8 (98)	21/32 (17)	1-7/32 (31)	5-57/64(150)	4-3/32 (104)	11/32 (9)	2-15/32 (62)
1 (DN25)	3-15/16 (100)	3/4 (19)	1-19/64 (33)	6-1/8 (156)	4 21/32 (118)	11/32 (9)	2-27/32 (72)

1. Port A must always be connected to the coil.

See Figure 9 for dimensions of the Non-Spring Return VA9104 Series Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valve with optional M9000-561 Thermal Barrier installed. See Table 43 for specific model dimensions.

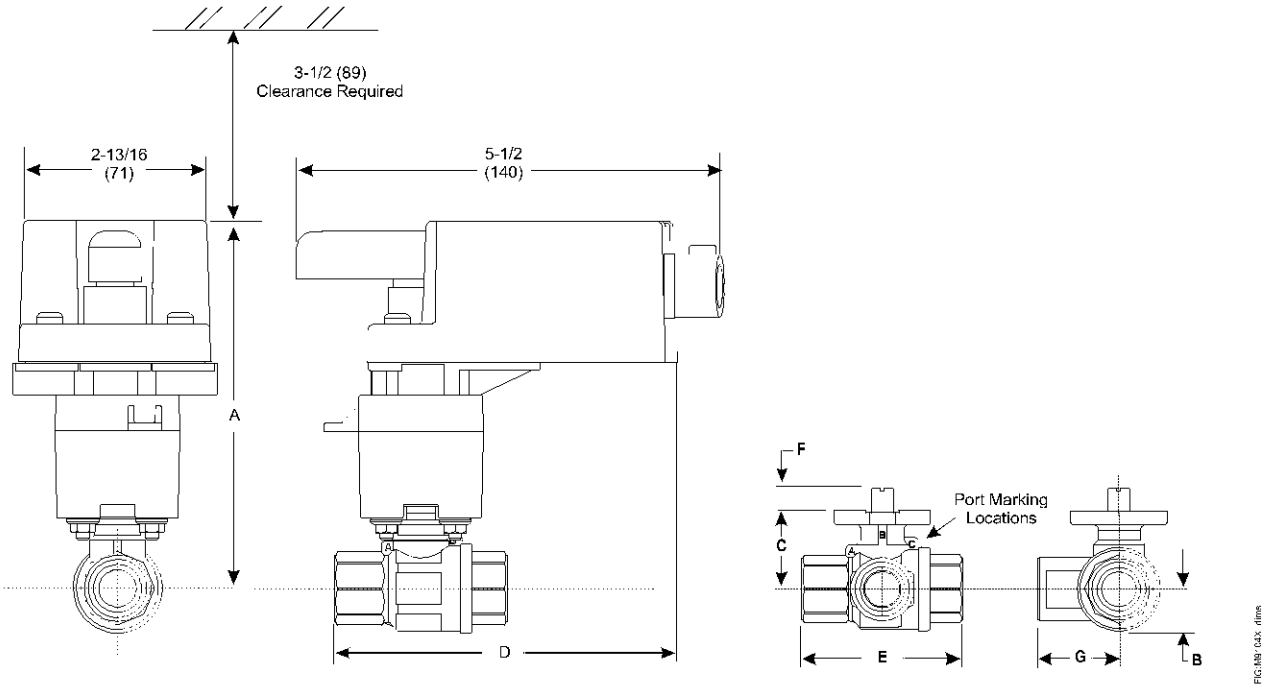


Figure 9: VA9104 actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with NPT end connections with optional M9000-561 Thermal Barrier dimensions, in. (mm)

Table 43: VA9104 actuated VG1241, VG1245, VG1841, and VG1845 series NPT ball valves with optional M9000-561 Thermal Barrier installed dimensions, in. (mm)

Valve Size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	5-11/32 (135)	21/32 (17)	1-7/32 (31)	5-45/64 (145)	3-25/32 (96)	11/32 (9	1-1/4 (32)
3/4 (DN20)	5-11/32 (135)	21/32 (17)	1-7/32 (31)	5-57/64 (150)	4-3/32 (104)	11/32 (9)	1-13/32 (36)
1 (DN25)	5-27/64 (137)	3/4 (19)	1-19/64 (33)	6-1/8 (156)	4-41/64 (118)	11/32 (9)	1-45/46 (43)

1. On models with the flow-characterizing disk, the disk is located in Port A. Port A must be the inlet.

See Figure 10 for dimensions of the Spring Return VA9203 Series Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves. See Table 44 and Table 45 for specific model linkage dimensions.

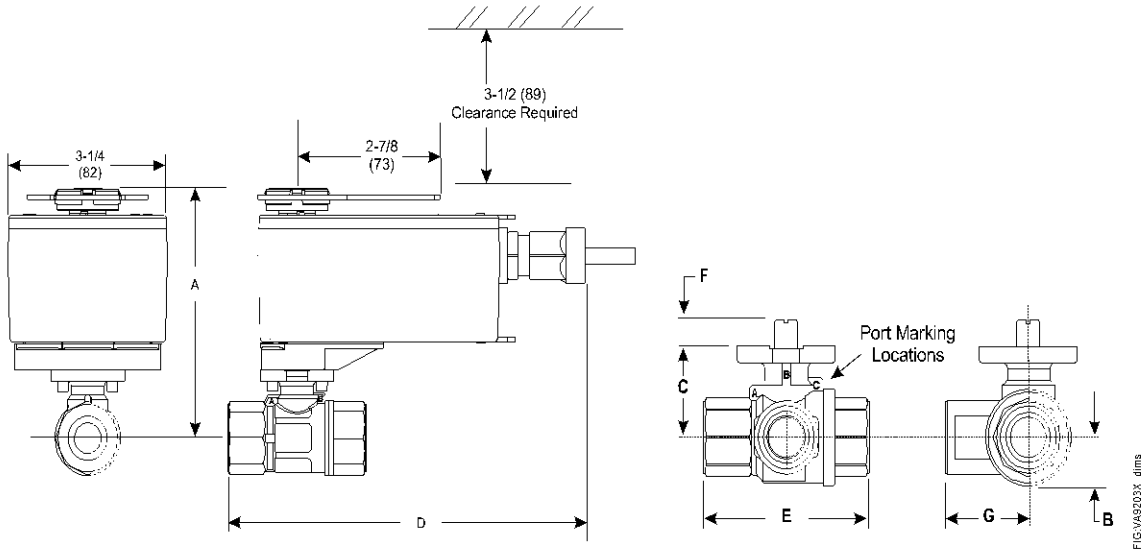


Figure 10: VA9203 actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with NPT end connections dimensions, in. (mm)

Table 44: VA9203 actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with NPT end connections dimensions, in. (mm)

Valve size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	4-1/4 (108)	21/32 (17)	1-7/32 (31)	6-23/32 (171)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	4-1/4 (108)	21/32 (17)	1-7/32 (31)	6-7/8 (175)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	4-9/32 (109)	3/4 (19)	1-19/64 (33)	7-7/64 (181)	3-13/32 (87)	11/32 (9)	1-45/64 (43)

1. Port A must always be connected to the coil.

Table 45: VA9203 actuated VG1271, VG1275, VG1871, and VG1875 series sweat ball valve and VA9203 actuated VG1291, VG1295, VG1891, and VG1895 series press ball valve dimensions, in. (mm)

Valve size, in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	4-5/8 (117)	21/32 (17)	1-7/32 (31)	7-13/64 (183)	3-25/32 (96)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	4-5/8 (117)	21/32 (17)	1-7/32 (31)	7-3/4 (197)	4-3/32 (104)	11/32 (9)	1-13/32 (36)
1 (DN25)	4-11/16 (119)	3/4 (19)	1-19/64 (33)	8-3/16 (208)	4-41/64 (118)	11/32 (9)	1-45/64 (43)

1. Port A must always be connected to the coil.

See Figure 11 for dimensions of the VA9203 Spring Return Series Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves with optional M9000-561 Thermal Barrier installed. See Table 46 for specific model linkage dimensions.

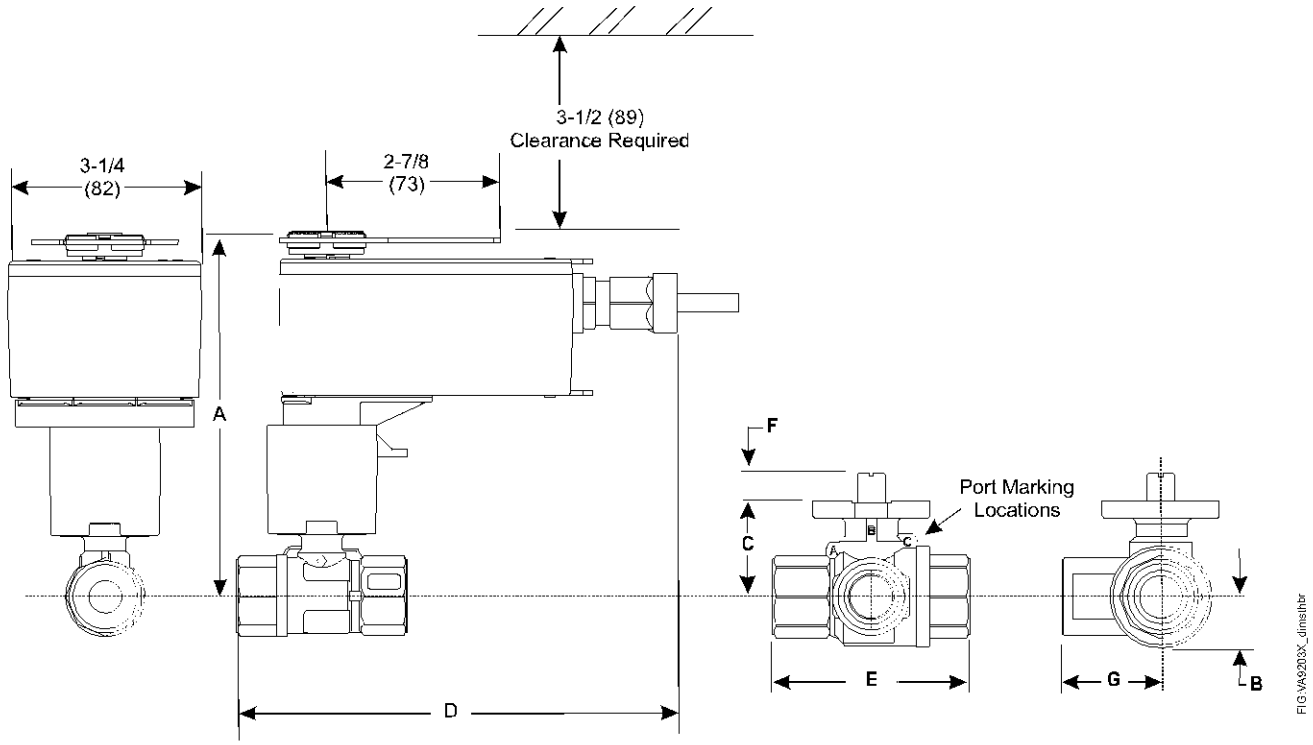


Figure 11: Spring return VA9203 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with optional M9000-561 Thermal Barrier installed dimensions, in. (mm)

Table 46: VA9203 actuated VG1241, VG1245, VG1841, and VG1845 series NPT ball valve with optional Thermal Barrier installed dimensions, in. (mm)

Valve Size in. (DN)[1]	A	B	C	D	E	F	G
1/2 (DN15)	6 (152)	21/32 (17)	1-7/32 (31)	6-31/32 (177)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	6 (152)	21/32 (17)	1-7/32 (31)	7-1/8 (181)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	6-1/16 (154)	3/4 (19)	1-19/64 (33)	7-31/64 (190)	3-13/32 (87)	11/32 (9)	1-45/64 (43)

1. Port A must always be connected to the coil.

See Figure 12 for dimensions of the Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve. See Table 47 for specific model linkage dimensions.

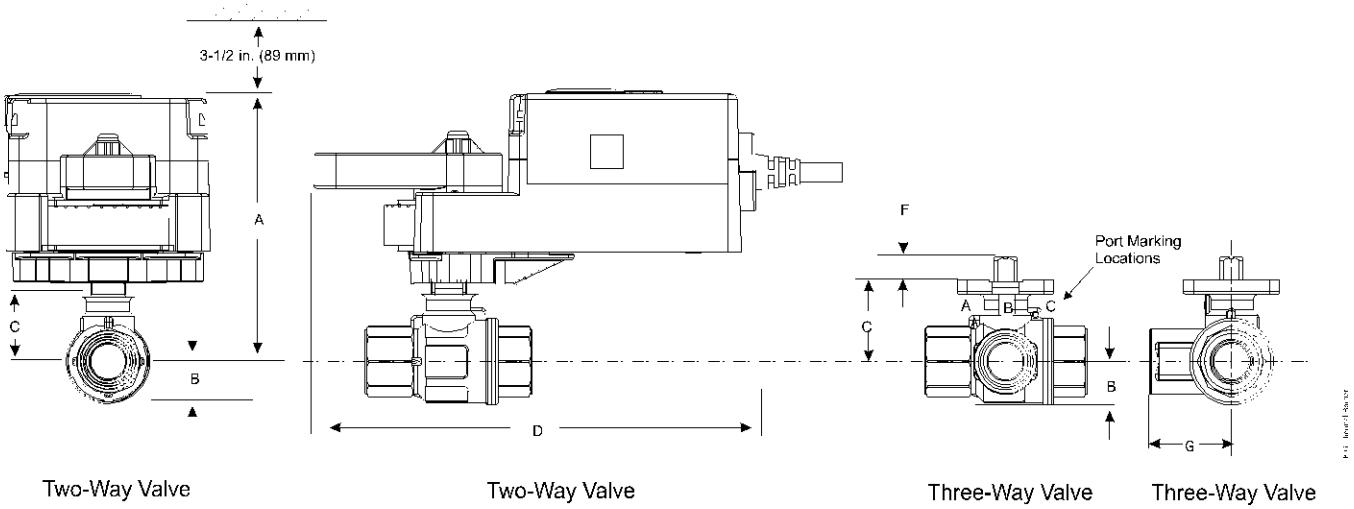


Figure 12: Non-spring return VA9300 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve dimensions, in. (mm)

Table 47: VA9300 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve dimensions, in. (mm)

Valve size, in. (DN)	A	B	C	D	E	F	G
1/2 (DN15)	4-3/8 (111)	21/32 (17)	1-7/32 (31)	6-13/32 (163)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	4-3/8 (111)	21/32 (17)	1-7/32 (31)	6-13/32 (163)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	4-7/16 (113)	3/4 (19)	1-5/16 (33)	6-13/32 (163)	3-13/32 (87)	11/32 (9)	1-45/64 (43)
1-1/4 (DN32)	4-7/8 (124)	1-1/32 (26)	1-23/32 (44)	6-13/32 (163)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	5-1/32 (128)	1-1/8 (29)	1-7/8 (48)	6-13/32 (163)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	5-1/4 (133)	1-15/32 (37)	2-1/16 (53)	6-13/32 (163)	4-27/32 (123)	11/32 (9)	2-27/64 (62)

See Figure 13 for dimensions of the Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with a M9300-2 Switch Kit
See Table 48 for specific model linkage dimensions.

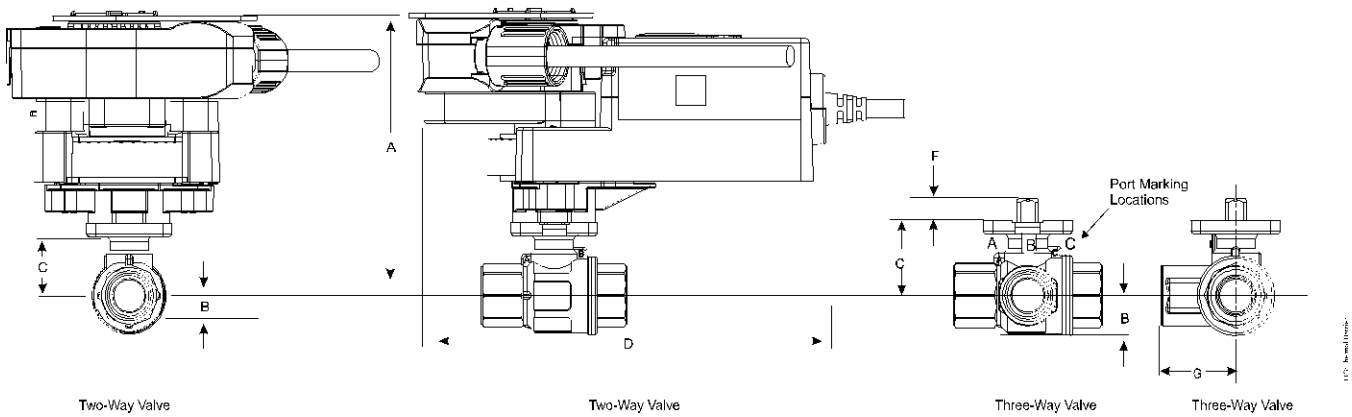


Figure 13: Non-spring return VA9300 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with M9300-2 Switch Kit dimensions, in. (mm)

Table 48: VA9300 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with M9000-2 Switch Kit dimensions, in. (mm)

Valve size, in. (DN)	A	B	C	D	E	F	G
1/2 (DN15)	4-3/4 (120.7)	21/32 (17)	1-7/32 (31)	6-21/32 (169)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	4-3/4 (120.7)	21/32 (17)	1-7/32 (31)	6-21/32 (169)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	4-21/25 (122.7)	3/4 (19)	1-5/16 (33)	6-21/32 (169)	3-13/32 (87)	11/32 (9)	1-45/64 (43)
1-1/4 (DN32)	5-1/4 (133.7)	1-1/32 (26)	1-23/32 (44)	6-21/32 (169)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	5-3/7 (137.7)	1-1/8 (29)	1-7/8 (48)	6-21/32 (169)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	5-5/8 (142.7)	1-15/32 (37)	2-1/16 (53)	6-21/32 (169)	4-27/32 (123)	11/32 (9)	2-27/64 (62)

See Figure 14 for dimensions of the Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier. See Table 49 for specific model linkage dimensions.

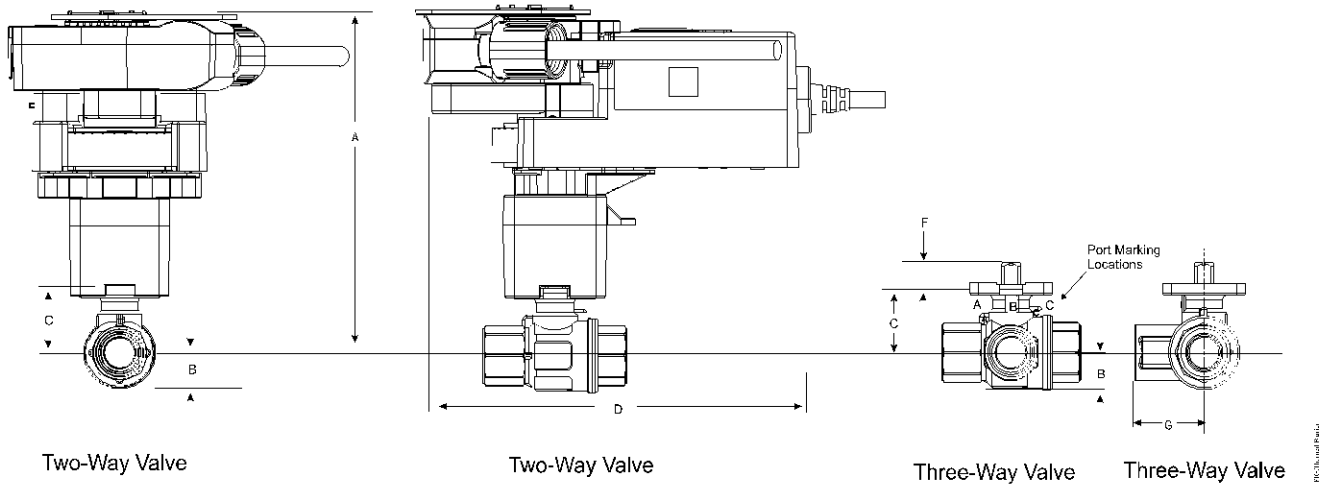


Figure 14: Non-spring return VA9300 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with optional M9000-561 Thermal Barrier dimensions, in. (mm)

Table 49: VA9300 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with optional M9000-561 Thermal Barrier dimensions, in. (mm)

Valve size, in. (DN)	A	B	C	D	E	F	G
1/2 (DN15)	5-3/4 (146)	21/32 (17)	1-7/32 (31)	6-13/32 (163)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	5-3/4 (146)	21/32 (17)	1-7/32 (31)	6-13/32 (163)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	5-13/16 (148)	3/4 (19)	1-5/16 (33)	6-13/32 (163)	3-13/32 (87)	11/32 (9)	1-45/64 (43)
1-1/4 (DN32)	6-1/4 (159)	1-1/32 (26)	1-23/32 (44)	6-13/32 (163)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	6-13/32 (163)	1-1/8 (29)	1-7/8 (48)	6-13/32 (163)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	6-5/8 (168)	1-15/32 (37)	2-1/16 (53)	6-13/32 (163)	4-27/32 (123)	11/32 (9)	2-27/64 (62)

See Figure 15 for dimensions of the Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier and M9300-2 Switch Kit. See Table 50 for specific model linkage dimensions.

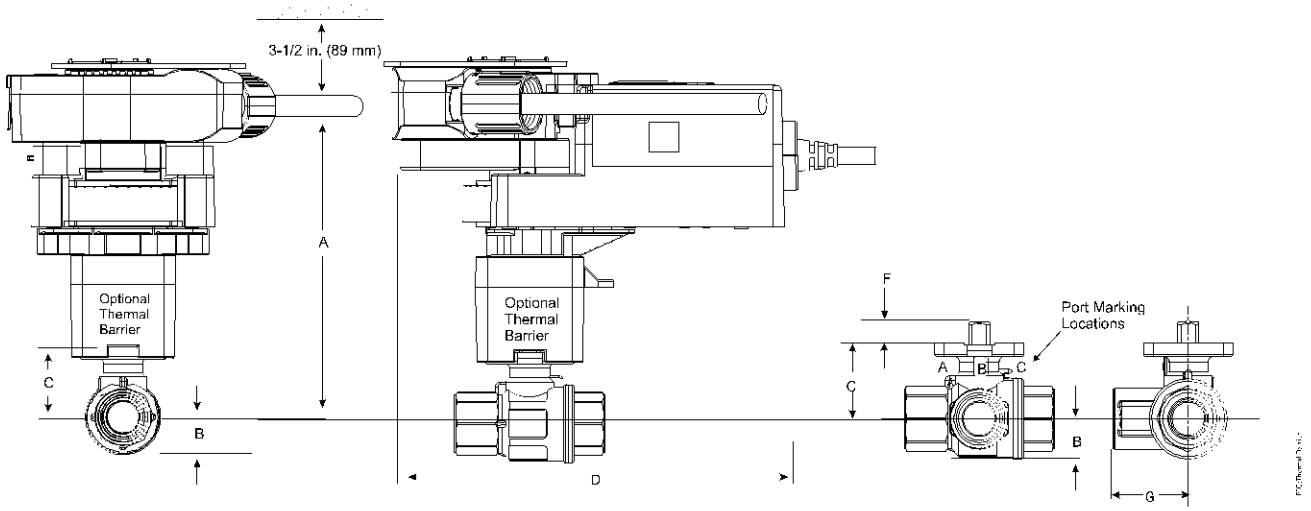


Figure 15: Non-Spring Return VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with optional M9000-551 Thermal Barrier and M9000-2 Switch Kit dimensions, in. (mm)

Table 50: VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with optional M9000-561 Thermal Barrier and M9300-2 Switch Kit dimensions, in. (mm)

Valve Size, in. (DN)	A	B	C	D	E	F	G
1/2 (DN15)	6-3/25 (155.7)	21/32 (17)	1-7/32 (31)	6-21/32 (169)	2-33/64 (64)	11/32 (9)	1-1/4 (32)
3/4 (DN20)	6-3/25 (155.7)	21/32 (17)	1-7/32 (31)	6-21/32 (169)	2-51/64 (71)	11/32 (9)	1-13/32 (36)
1 (DN25)	6-1/5 (157.7)	3/4 (19)	1-5/16 (33)	6-21/32 (169)	3-13/32 (87)	11/32 (9)	1-45/64 (43)
1-1/4 (DN32)	6-16/25 (168.7)	1-1/32 (26)	1-23/32 (44)	6-21/32 (169)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	6-4/5 (172.7)	1-1/8 (29)	1-7/8 (48)	6-21/32 (169)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	6 (177.2)	1-15/32 (37)	2-1/16 (53)	6-21/32 (169)	4-27/32 (123)	11/32 (9)	2-27/64 (62)

See Figure 16 for dimensions of the Spring Return VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves. See Table 51 for specific model linkage dimensions.

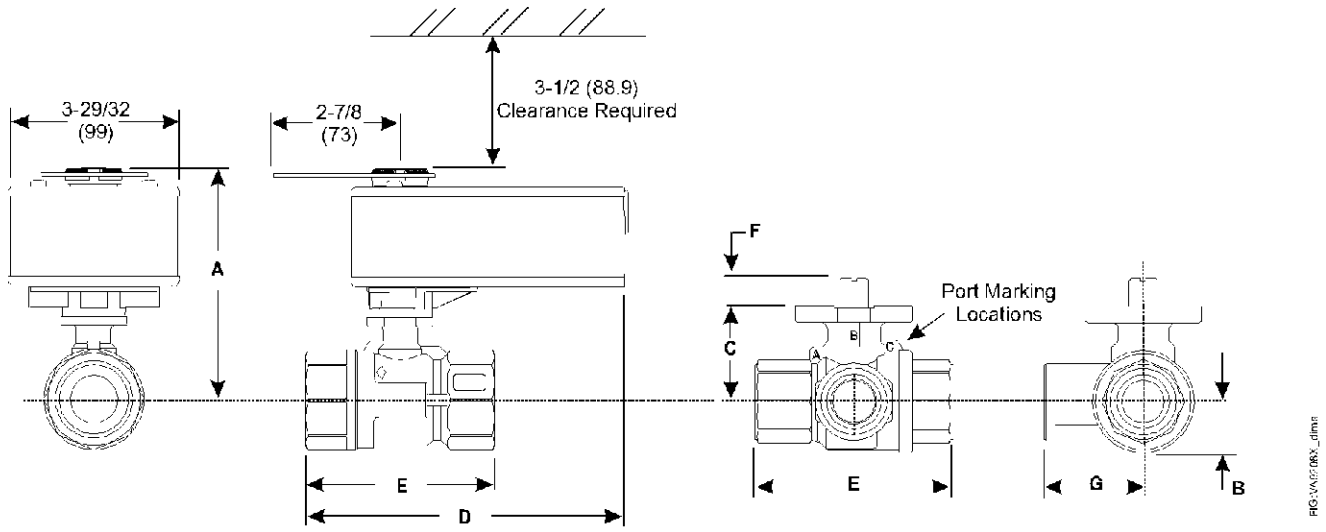


Figure 16: Spring return VA9208 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve dimensions, in. (mm)

Table 51: VA9208 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve dimensions, in. (mm)

Valve size in. (DN)	Valve style[1]	A	B	C	D	E	F	G
1-1/4 (DN32)	All	7-11/16 (195)	1-1/32 (26)	1-23/32 (44)	7-5/32 (182)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	All	7-7/8 (200)	1-9/64 (29)	1-57/64 (48)	7-3/8 (187)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	2-way	8-1/32 (204)	1-15/32 (37)	2-1/8 (54)	7-19/32 (193)	4-27/32 (123)	11/32 (9)	2-27/64 (62)
	3-way				7-7/8 (200)			

1. Port A must always be connected to the coil.

See Figure 17 for dimensions of the Spring Return VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series NPT End Connection Ball Valves with M9000-561 Thermal Barrier. See Table 52 for specific model linkage dimensions.

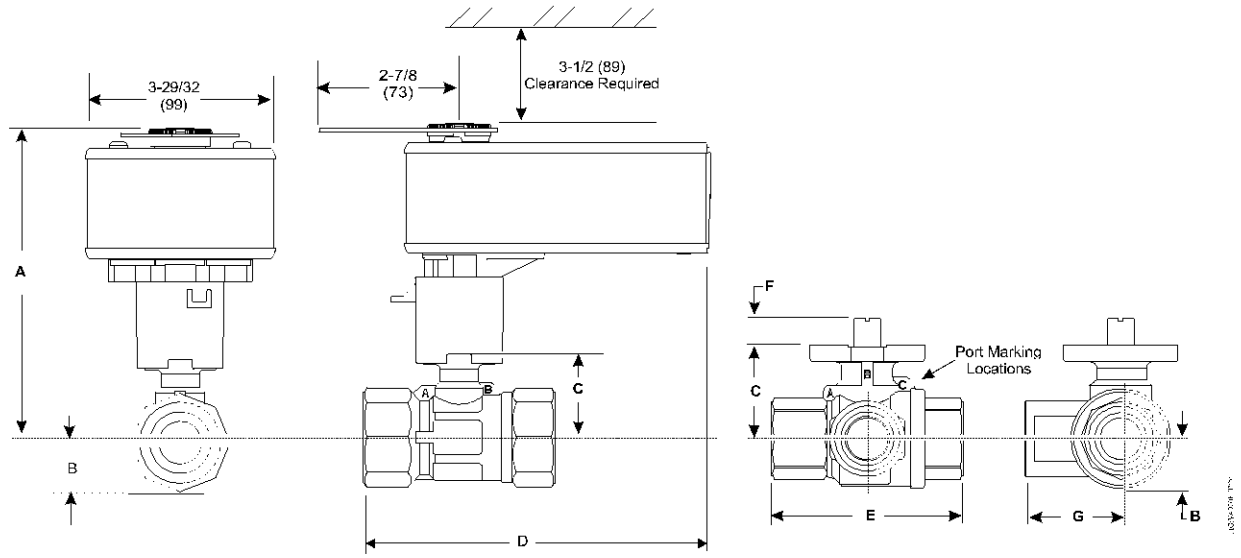


Figure 17: Spring Return VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with optional M9000-561 Thermal Barrier installed dimensions, in. (mm)

Table 52: VA9208 actuated VG1241, VG1245, VG1841, and VG1845 series ball valve with optional M9000-561 Thermal Barrier installed dimensions, in. (mm)

Valve Size in. (DN)[1]	Valve Style	A	B	C	D	E	F	G
1-1/4 (DN32)	All	9-17/64 (235)	1-1/32 (26)	1-23/32 (44)	7-1/4 (184)	3-15/16 (100)	11/32 (9)	1-31/32 (50)
1-1/2 (DN40)	All	9-15/16 (240)	1-9/64 (29)	1-57/64 (48)	7-7/16 (189)	4-21/64 (110)	11/32 (9)	2-11/64 (55)
2 (DN50)	2-way	9-31/32 (244)	1-15/32 (37)	2-1/8 (54)	7-11/16 (195)	4-27/32 (123)	11/32 (9)	N/A
	3-way				7-7/8 (200)			2-27/64 (62)

1. Port A must always be connected to the coil.

Technical specifications

VG1000 Series Forged Brass Ball Valves for Assembly in the Field

Service[1]		Hot water, chilled water, 50/50 glycol solutions, and 15 psig (103 kPa) saturated steam[2] for HVAC systems
Fluid temperature limits	**Water**	VG12x1 and VG18x1 Series: 23 to 203°F (-5 to 95°C)
		VG12x5 and VG18x5 Series: -22 to 284°F (-30 to 140°C)
	Steam[2]	VG12x1 and VG18x1 Series: not rated for steam service
		VG12x5 and VG18x5 Series: 15 psig (103 kPa) at 250°F (121°C)
Maximum actuator fluid temperature limits	**212°F (100°C)**	VA9104, VA9300, VA9203, VA9208
	284°F (140°C)	VA9104, VA9300, VA9203, VA9208 with M9000-561 Thermal Barrier
Valve body pressure rating	**Water**	VG1241, VG1245, VG1841, and VG1845 Series: 580 psig (4,000 kPa) (PN40), 464 psig (3,196 kPa) at 284°F (140°C) (PN40)
		VG1275 and VG1875 Series: 300 psig (2,067 kPa)
		VG1295 and VG1895 Series: 300 psig (2,067 kPa)
	Steam[2]	15 psig (103 kPa) saturated steam
Maximum closeoff pressure	**VG12x1 and VG12x5 Series:**	200 psid (1,378 kPa)
Maximum recommended operating pressure drop		50 psid (340 kPa)
Flow characteristics	**Two-way**	Equal percentage
	Three-way	Equal percentage flow characteristics of in-line port (coil) and linear flow characteristics of angle port (bypass)
Rangeability[3]		Greater than 500:1
Minimum ambient operating temperature	**-4°F (-20°C)**	VA9104 Series Non-Spring Return Actuators
	-22°F (-30°C)	VA9203 and VA9300 Series Spring Return Actuators
	-40°F (-40°C)	VA9208 Series Spring Return Actuators
Maximum ambient operating temperature[2] **(limited by the actuator and linkage)**	**140°F (60°C)**	VA9104 and VA9300 Series Non-Spring Return Actuators VA9203 and VA9208 Series Spring Return Actuators
Leakage		0.01% of maximum flow per ANSI/FCI 70-2, Class 4
		1% of maximum flow for three-way bypass port
End Connections		NPT: 1/2 through 2 in.
		Sweat: 1/2 through 1 in. (DN15 through DN25)
		Press (ProPress® compatible): 1/2 through 1 in. (DN15 through DN25)
Materials	**Body**	Forged brass
	Ball	VG12x1 and VG18x1 Series: chrome plated brass
		VG12x5 and VG18x5 Series: 300 Series Stainless Steel
	Blowout-proof stem	VG12x1 and VG18x1 Series: nickel plated brass
		VG12x5 and VG18x5 Series: 300 Series Stainless Steel
	Seats	Graphite-reinforced PTFE with EPDM O-ring backing
	Stem Seals	EPDM double O-rings
	Characterizing Disk	AMODEL® AS-1145HS Polyphthalamide Resin
Compliance CRN		For NPT threaded valves with Stainless Steel Ball (VG1x45...): 0C16910.5C

1. Refer to the VDI 2035 Guideline for recommended proper water treatment.
2. In steam applications, install the valve with the stem horizontal to the piping and wrap the valve and piping with insulation.
3. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Patents

Patents: http://jcipat.com

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 - CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

Contact information

Contact your local branch office: www.johnsoncontrols.com/locations

Contact Johnson Controls: www.johnsoncontrols.com/contact-us

Variable Speed Drives Series III: Open, Bypass, and Disconnect Models

Product Bulletin

Code No. LIT-12013114
Issued July 2019

Overview

Johnson Controls® Variable Speed Drives Series III (VSDs) control the speed of AC induction motors used in fan and pump applications.

VSD Series III include the following key enhancements:

- Sensor/Actuator (SA) bus is built-in. There is no option card.
- Standard conformal coating
- Available 100K short circuit current rating (SCCR) for disconnect and bypass models
- Service switch option on bypass models
- Broken belt software feature
- Damper end switch logic for bypass
- Impact resistant one piece plastic enclosure

Figure 1: Variable Speed Drives Series III complete enclosed product family

Variable Speed Drives Series III features

VSD Series III include the following hardware features:

- Integrated common mode reduction 5% DC link choke with input surge protection
- Variable torque rated for HVAC and HVACR demands
- 110% variable torque overload
- Type 1/IP21 and Type 12/IP54 enclosures available for open drive and drive only models
- Real-time clock to support calendaring and programmable logic controller (PLC) functionality
- Hand-off- auto (HOA) graphic LCD display and keypad to support simple menu navigation and on-screen diagnostics
- Auto operation from keypad and two configurable soft keys
- Conformal coated control and power boards standard provides greater resistance to environmental containments.
- Power the control logic from an external auxiliary control panel for internal drive functions and fieldbus if necessary
- Standard Input/Output (I/O): 8 digital inputs (DI), 1 digital output (DO), 2 analog inputs (AI), 2 analog outputs (AO), 2 form C relays (FC), 1 form A relays (FA)
- Standard communications used to not delay a job as a result of waiting for option cards: BACnet/IP and MS/TP, Modbus TCP, Modbus Remote Terminal Unit (RTU), Johnson Controls SA bus
- Two expansion slots to support additional I/O

Johnson Controls

- Quick disconnect terminals for I/O connections to support fast and easy installation
- Multi-color pilot light is optional on bypass and standard on disconnect models
- Three contactor manual bypass with multi-color pilot light for when no specification is provided
- Two contactor bypass with isolation fusing, manual bypass and mulit-color pilot light to meet isolation fusing specifications
- Redundant Auto, Run and Fault LEDs located to replicate keypad LEDs in the event the keypad is removed
- Two contactor bypass with optional service switch for specification matching
- 100K SCCR for bypass panels as a standard option to keep solution price competitive when 100K SCCR is non-negotiable.

VSD Series III include the following software features:

- Active energy control to minimize energy losses in the motor, resulting in industry-leading energy efficiency for your application
- Energy savings calculator
- Quick Start Wizard upon initial power-up supports fast and easy installation
- Broken belt detects when the equipment requires maintenance
- Standard applications: standard, multi-proportional-integral-derivative (PID), and advanced control.
- Set up multiple drives quickly with the copy and paste functionality on the drive keypad
- Fast and easy installation for most applications through pre-programmed I/O
- Dynamic motor regenerative energy management
- Advanced PC tool with diagnostic capabilities
- Two keypad software keys for easy menu navigation and shortcuts

Ordering information

See Table 1 for ordering information and an explanation of the ordering codes depending on your requirements for the Variable Speed Drives Series III you want to order, using the example of VS3-1D5-2-N1B-2.

Horsepower

Use the relevant hp code to correlate job data with the Variable Speed Drives Series III you want to order. The motor's FLA must not exceed the published current output of the drive you select. Make sure to verify motor FLA in some applications, for example, cooling towers that utilize lower speed motors with 1200 rpm or 900 rpm. See Table 2 to Table 4 for the FLA of the VSD Series III.

Voltage

Bypass and disconnect models default to the 100K SCCR design as a function of hp, changing the order code character from number 1, 2, 4, or 5 to the corresponding 100K SCCR voltage code A, B, C, or D. For example, VS3-050-4-N1B-2 becomes VS3-050-C-N1B-2.

Use the following guidance to generate the correct order code:

- If you order 208 V or 230 V models that use 30 hp and larger, default to voltage order code A or B.
- If you order 480 V models that use 50 hp and larger, default to voltage code C.
- If you order any compact disconnect models (N1C), use the 100K SCCR order code A, B, C, or D.
- If you order 575 V enclosed products, use the 100K SCCR order code D for voltage.

Note: Get the 100K SCCR option on any disconnect or bypass model across the hp range.

Bypass configuration

The bypass configuration two contactor manual bypass with isolation fusing and multi-color pilot light under order code F limits hp to the following:

- 208 V or 230 V models have a limit of 20 hp.
- 480 V models have a limit of 40 hp.
- This is not applicable to 575 V models.

Table 1: Ordering guide

						VS3	-	1D5	-	2	-	N1B	-	2
Product family code														
Horsepower	001	005	020	050	125									
	1D5	7D5	025	060	150									
	002	010	030	075	200									
	003	015	040	100	250									
Voltage	1	208 V	A	208 V 100K SCCR										
	2	230 V	B	230 V 100K SCCR										
	4	480 V	C	480 V 100K SCCR										
	5	575 V	D	575 V 100K SCCR										
Style	N1B	NEMA1 bypass												
	N2B	NEMA 12 bypass												
	N3B	NEMA 3R bypass without space heater												
	S3B	NEMA 3R bypass with space heater												
	N1C	NEMA 1 compact disconnect												
	N1D	NEMA 1 disconnect (includes pilot light)												
	N2D	NEMA 12 disconnect (includes pilot light)												
	N3D	NEMA 3R disconnect without space heater												
	S3D	NEMA 3R disconnect with space heater												
	UL1	NEMA 1 open drive												
	UL2	NEMA 12 open drive												
Bypass configuration	0	None, used for open and disconnect drives												
	2	Two contactor bypass												
	S	Two contactor bypass with service switch												
	3	Three contactor manual bypass with multi-color pilot light												
	F	Two contactor manual bypass with isolation fusing and multi-color pilot light												
	Q	575 V only, three contactor electronic bypass												

Applications

Install open drives inside a customer supplied cabinet. Open drives are a popular choice for installers retrofitting an existing field installation and for OEMs. Open drives are available in NEMA 1 and NEMA 12 enclosures.

Compact disconnect drives add circuit protection to an open drive. The use of a compact disconnect drive is ideal when there is no branch circuit protection, if the existing control panels are too small to house the drive, or if they are strictly low voltage panels. For OEMs that add drives to existing equipment designs compact disconnect drives are also ideal. Compact disconnect drives are available in NEMA 1 enclosures only.

Division 15, 16, or 17 specify bypass drives. Bypass drives are shipped to the job site for field installation. You can run the motor across the line without assistance from the drive with a bypass drive solution. The benefit of a bypass solution is that in the event of drive failure the equipment keeps running if on full speed operation. All bypass drives include a disconnect switch.

Disconnect drives are the same form factor as a bypass drive and include a pilot light to indicate operation status. Disconnect drives are popular in pumping applications.

Bypass and disconnect drives are available in NEMA 1, NEMA 12, and NEMA 3R enclosures.

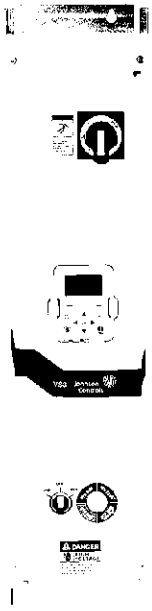
NEMA 3R enclosures are the only suitable enclosure type for outdoor or rooftop mounting.

Variable Speed Drives Series III model types

Figure 2: Open drive model

Figure 3: Compact disconnect model

Figure 4: Bypass or disconnect model



Selection charts for open drives

Table 2: 200 - 230 V open drives

hp	NEMA 1 (UL Type 1)	NEMA 12 (UL Type 12)	Output current (A)	Frame size	Weight (lbs)
1	VS3-001-2-UL1-0	VS3-001-2-UL2-0	4.8	1	14
1.5	VS3-1D5-2-UL1-0	VS3-1D5-2-UL2-0	6.6		
2	VS3-002-2-UL1-0	VS3-002-2-UL2-0	7.8		
3	VS3-003-2-UL1-0	VS3-003-2-UL2-0	11		
5	VS3-005-2-UL1-0	VS3-005-2-UL2-0	17.5	2	23
7.5	VS3-7D5-2-UL1-0	VS3-7D5-2-UL2-0	25		
10	VS3-010-2-UL1-0	VS3-010-2-UL2-0	31		
15	VS3-015-2-UL1-0	VS3-015-2-UL2-0	48	3	50
20	VS3-020-2-UL1-0	VS3-020-2-UL2-0	61		
25	VS3-025-2-UL1-0	VS3-025-2-UL2-0	75	4	75
30	VS3-030-2-UL1-0	VS3-030-2-UL2-0	88		
40	VS3-040-2-UL1-0	VS3-040-2-UL2-0	114		
50	VS3-050-2-UL1-0	VS3-050-2-UL2-0	143	5	154
60	VS3-060-2-UL1-0	VS3-060-2-UL1-0	170		
75	VS3-075-2-UL1-0	VS3-075-2-UL2-0	211		
100	VS3-100-2-UL1-0	VS3-100-2-UL2-0	261	6	247
125	VS3-125-2-UL1-0	VS3-125-2-UL2-0	312		

Table 3: 480 V open drives

hp	NEMA 1 (UL Type 1)	NEMA 12 (UL Type 12)	Output current (A)	Frame size	Weight (lbs)
1.5	VS3-1D5-4-UL1-0	VS3-1D5-4-UL2-0	3.3	1	14
2	VS3-002-4-UL1-0	VS3-002-4-UL2-0	4.3		
3	VS3-003-4-UL1-0	VS3-003-4-UL2-0	5.6		
5	VS3-005-4-UL1-0	VS3-005-4-UL2-0	9		
7.5	VS3-7D5-4-UL1-0	VS3-7D5-4-UL2-0	12		
10	VS3-010-4-UL1-0	VS3-010-4-UL2-0	16	2	23
15	VS3-015-4-UL1-0	VS3-015-4-UL2-0	23		
20	VS3-020-4-UL1-0	VS3-020-4-UL2-0	31		
25	VS3-025-4-UL1-0	VS3-025-4-UL2-0	38	3	50
30	VS3-030-4-UL1-0	VS3-030-4-UL2-0	46		
40	VS3-040-4-UL1-0	VS3-040-4-UL2-0	61		
50	VS3-050-4-UL1-0	VS3-050-4-UL2-0	72	4	78
60	VS3-060-4-UL1-0	VS3-060-4-UL1-0	87		
75	VS3-075-4-UL1-0	VS3-075-4-UL2-0	105		
100	VS3-100-4-UL1-0	VS3-100-4-UL2-0	140	5	154
125	VS3-125-4-UL1-0	VS3-125-4-UL2-0	170		
150	VS3-150-4-UL1-0	VS3-150-4-UL2-0	205		
200	VS3-200-4-UL1-0	VS3-200-4-UL2-0	261	6	247
250	VS3-250-4-UL1-0	VS3-250-4-UL2-0	310		

Table 4: 575 V open drives

hp	NEMA 1 (UL Type)	NEMA 12 (UL Type 12)	Output current (A)	Frame size	Weight (lbs)
3	VS3-003-5-UL1-0	VS3-003-5-UL2-0	4.5	1	14
5	VS3-005-5-UL1-0	VS3-005-5-UL2-0	7.5		
7.5	VS3-7D5-5-UL1-0	VS3-7D5-5-UL2-0	10		
10	VS3-010-5-UL1-0	VS3-010-5-UL2-0	13.5	2	23
15	VS3-015-5-UL1-0	VS3-015-5-UL2-0	18		
20	VS3-020-5-UL1-0	VS3-020-5-UL2-0	22		
25	VS3-025-5-UL1-0	VS3-025-5-UL2-0	27	3	50
30	VS3-030-5-UL1-0	VS3-030-5-UL2-0	34		
40	VS3-040-5-UL1-0	VS3-040-5-UL2-0	41		
50	VS3-050-5-UL1-0	VS3-050-5-UL2-0	52	4	78
60	VS3-060-5-UL1-0	VS3-060-5-UL1-0	62		
75	VS3-075-5-UL1-0	VS3-075-5-UL2-0	80		
100	VS3-100-5-UL1-0	VS3-100-5-UL2-0	100	5	154
125	VS3-125-5-UL1-0	VS3-125-5-UL2-0	125		
150	VS3-150-5-UL1-0	VS3-150-5-UL2-0	144		
200	VS3-200-5-UL1-0	VS3-200-5-UL2-0	208	6	247
250	VS3-250-5-UL1-0	VS3-250-5-UL2-0	250		

Open drive dimensions

Figure 5: Variable Speed Drives Series III Open drive dimensions in inches and mm

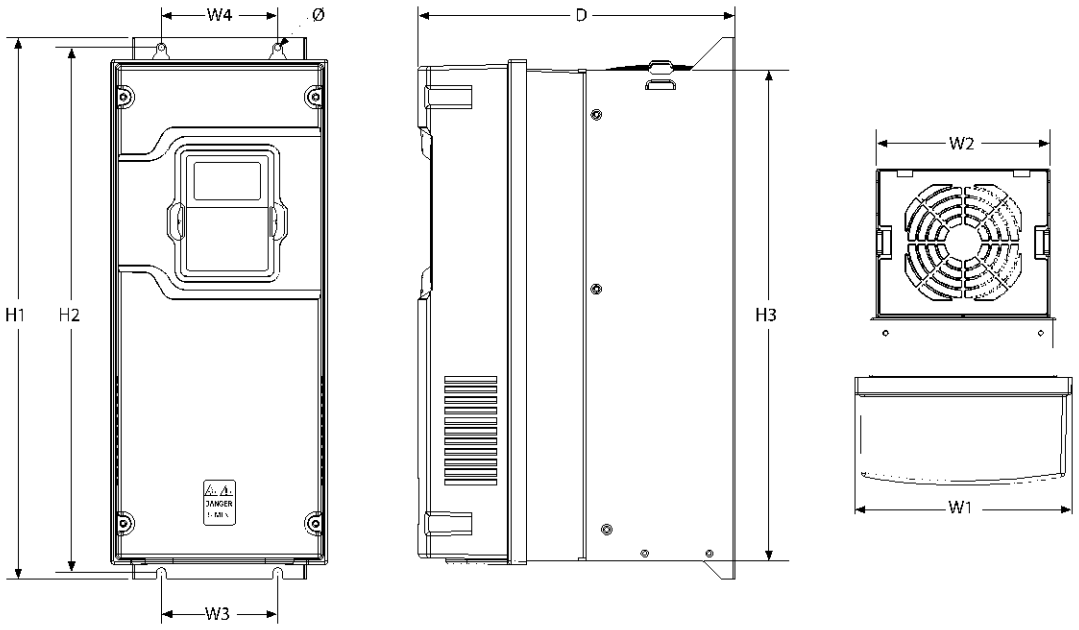


Table 5: Variable Speed Drives Series III Open drive dimensions

Frame (FR)	hp			Inches (mm)							lbs (kg)
	200 V - 230 V	480 V	575 V	D	H1	H2	H3	W1	W2	W3 = W4	Weight
1	1 2 3	1.5 2 3 5 7.5	3 5	7.91 (200.9)	12.87 (326.9)	12.28 (311.9)	11.50 (292.1)	6.02 (153.0)	4.80 (121.9)	3.94 (100.1)	14 (6.3)
2	5 7.5 10	10 15 20	10 15 20	9.63 (244.7)	16.50 (419.1)	15.98 (405.9)	14.96 (380.0)	6.61 (167.8)	5.28 (134.1)	3.54 (90.00)	23 (10.4)
3	15 20	25 30 40	25 30 40	10.44 (265.1)	21.97 (558.0)	21.46 (545.0)	20.41 (518.5)	8.06 (204.6)	7.24 (183.9)	4.92 (125.0)	50 (22.7)
4	25 30 40	50 60 75	50 60 75	11.57 (294.0)	24.80 (629.9)	24.31 (617.5)	23.27 (591.1)	9.36 (237.7)	9.13 (237.7)	8.07 (205.0)	78 (35.38)
5	50 60 75	100 125 150	100 125 150	13.41 (340.7)	34.98 (888.5)	29.65 (753.1)	27.83 (706.9)	11.34 (288.0)	11.10 (281.9)	8.66 (220.0)	154 (69.9)
6	100 125	200 250	200 250	14.61 (371.0)	34.04 (864.5)	33.27 (845.0)	40.75 (1035.0)	19.13 (486.0)	18.90 (480.0)	15.75 (400.0)	247 (112)

Selection charts for disconnect drives

Table 6: 208 V compact disconnect drives - NEMA 1 (UL Type 1)

hp	Order code	Output current (A)	Frame size	Weight (lbs)
1	VS3-001-A-N1C-0	4	H1D	19
1.5	VS3-1D5-A-N1C-0	6.8		
2	VS3-002-A-N1C-0	7.5		
3	VS3-003-A-N1C-0	10.6		
5	VS3-005-A-N1C-0	16.7	H2D	28
7.5	VS3-7D5-A-N1C-0	24.3		
10	VS3-010-A-N1C-0	30.8		
15	VS3-015-A-N1C-0	46.2	H3D	55
20	VS3-020-A-N1C-0	59.4		
25	VS3-025-A-N1C-0	74.8	H4D	83
30	VS3-030-A-N1C-0	88		
40	VS3-040-A-N1C-0	114		

Table 7: 230 V compact disconnect drives - NEMA 1 (UL Type 1)

hp	Order code	Output current (A)	Frame size	Weight (lbs)
1	VS3-001-B-N1C-0	4.2	H1D	19
1.5	VS3-1D5-B-N1C-0	6		
2	VS3-002-B-N1C-0	6.8		
3	VS3-003-B-N1C-0	9.6		
5	VS3-005-B-N1C-0	15.2	H2D	28
7.5	VS3-7D5-B-N1C-0	22		
10	VS3-010-B-N1C-0	28		
15	VS3-015-B-N1C-0	42	H3D	55
20	VS3-020-B-N1C-0	54		
25	VS3-025-B-N1C-0	68	H4D	83
30	VS3-030-B-N1C-0	80		
40	VS3-040-B-N1C-0	104		

Table 8: 480 V compact disconnect drives - NEMA 1 (UL Type 1)

hp	Order code	Output current (A)	Frame size	Weight (lbs)
1.5	VS3-1D5-C-N1C-0	3.3	H1D	19
2	VS3-002-C-N1C-0	4.3		
3	VS3-003-C-N1C-0	5.6		
5	VS3-005-C-N1C-0	9		
7.5	VS3-7D5-C-N1C-0	12		
10	VS3-010-C-N1C-0	16	H2D	28
15	VS3-015-C-N1C-0	23		
20	VS3-020-C-N1C-0	31		
25	VS3-025-C-N1C-0	38	H3D	55
30	VS3-030-C-N1C-0	46		
40	VS3-040-C-N1C-0	61		
50	VS3-050-C-N1C-0	72	H4D	83
60	VS3-060-C-N1C-0	87		
75	VS3-075-C-N1C-0	105		

Table 9: 575 V compact disconnected drives - NEMA 1 (UL Type 1)

hp	Order code	Output current (A)	Frame size	Weight (lbs)
3	VS3-003-D-N1C-0	4.5	H1D	19
5	VS3-005-D-N1C-0	7.5		
7.5	VS3-7D5-D-N1C-0	10		
10	VS3-010-D-N1C-0	13.5	H2D	28
15	VS3-015-D-N1C-0	18		
20	VS3-020-D-N1C-0	22		
25	VS3-025-D-N1C-0	27	H3D	55
30	VS3-030-D-N1C-0	34		
40	VS3-040-D-N1C-0	41		

hp	Order code	Output current (A)	Frame size	Weight (lbs)
50	VS3-050-D-N1C-0	52	H4D	83
60	VS3-060-D-N1C-0	62		
75	VS3-075-D-N1C-0	80		

Compact disconnect drive dimensions

Figure 6: Frame size H1D and H2D in inches (mm)

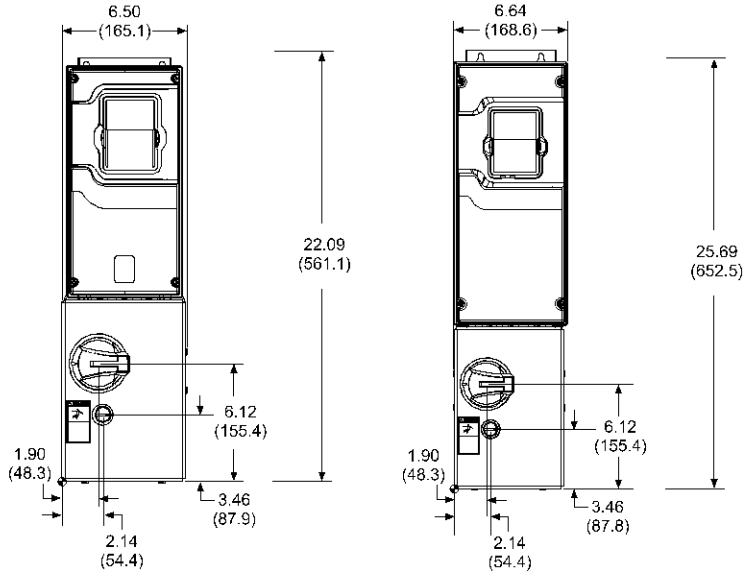
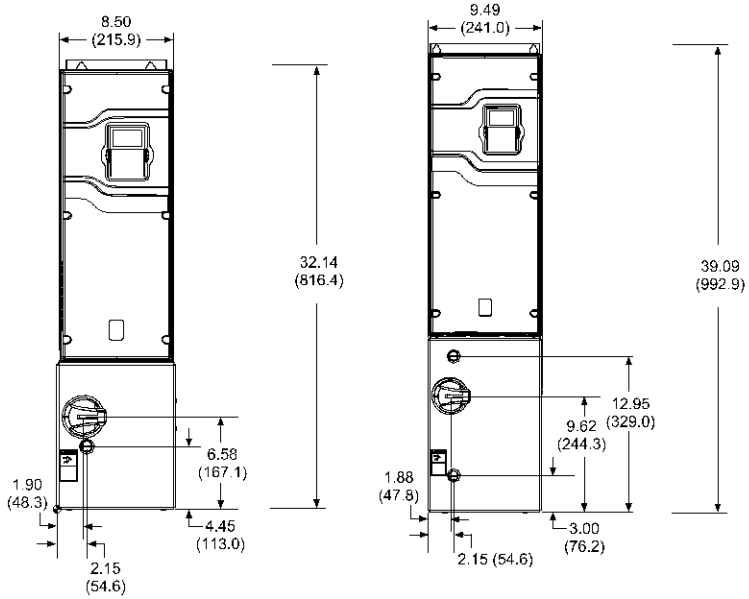


Figure 7: Frame size H3D and H4D in inches (mm)



Note: Depth not shown in the following models:

- H1D: 10.12 in. (257 mm)
- H2D: 11.94 in. (303.2 mm)
- H3D: 12.05 in. (306 mm)
- H4D: 12.53 in. (318.3 mm)

Selection charts

Table 10: 208 V disconnect drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
1	VS3-001-1-N1D-0	VS3-001-1-N2D-0	VS3-001-1-N3D-0	4.6	H1S	H3X
1.5	VS3-1D5-1-N1D-0	VS3-1D5-1-N2D-0	VS3-1D5-1-N3D-0	6.6		
2	VS3-002-1-N1D-0	VS3-002-1-N2D-0	VS3-002-1-N3D-0	7.5		
3	VS3-003-1-N1D-0	VS3-003-1-N2D-0	VS3-003-1-N3D-0	10.6		
5	VS3-005-1-N1D-0	VS3-005-1-N2D-0	VS3-005-1-N3D-0	16.7	H2S	
7.5	VS3-7D5-1-N1D-0	VS3-7D5-1-N2D-0	VS3-7D5-1-N3D-0	24.3		
10	VS3-010-1-N1D-0	VS3-010-1-N2D-0	VS3-010-1-N3D-0	30.8		
15	VS3-015-1-N1D-0	VS3-015-1-N2D-0	VS3-015-1-N3D-0	46.2	H3	
20	VS3-020-1-N1D-0	VS3-020-1-N2D-0	VS3-020-1-N3D-0	59.4		
25	VS3-025-1-N1D-0	VS3-025-1-N2D-0	VS3-025-1-N3D-0	74.8	H4	BX
30	VS3-030-A-N1D-0	VS3-030-A-N2D-0	VS3-030-A-N3D-0	88		
40	VS3-040-A-N1D-0	VS3-040-A-N2D-0	VS3-040-A-N3D-0	114		
50	VS3-050-A-N1D-0	VS3-050-A-N2D-0	VS3-050-A-N3D-0	143	CX	CX
60	VS3-060-A-N1D-0	VS3-060-A-N2D-0	VS3-060-A-N3D-0	169		
75	VS3-075-A-N1D-0	VS3-075-A-N2D-0	VS3-075-A-N3D-0	211		
100	VS3-100-A-N1D-0	VS3-100-A-N2D-0	VS3-100-A-N3D-0	261	DX	DX

Table 11: 230 V disconnect drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
1	VS3-001-2-N1D-0	VS3-001-2-N2D-0	VS3-001-2-N3D-0	4.2	H1S	H3X
1.5	VS3-1D5-2-N1D-0	VS3-1D5-2-N2D-0	VS3-1D5-2-N3D-0	6		
2	VS3-002-2-N1D-0	VS3-002-2-N2D-0	VS3-002-2-N3D-0	6.8		
3	VS3-003-2-N1D-0	VS3-003-2-N2D-0	VS3-003-2-N3D-0	9.6		
5	VS3-005-2-N1D-0	VS3-005-2-N2D-0	VS3-005-2-N3D-0	15.2	H2S	
7.5	VS3-7D5-2-N1D-0	VS3-7D5-2-N2D-0	VS3-7D5-2-N3D-0	22		
10	VS3-010-2-N1D-0	VS3-010-2-N2D-0	VS3-010-2-N3D-0	28		
15	VS3-015-2-N1D-0	VS3-015-2-N2D-0	VS3-015-2-N3D-0	42	H3	
20	VS3-020-2-N1D-0	VS3-020-2-N2D-0	VS3-020-2-N3D-0	54		

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
25	VS3-025-2-N1D-0	VS3-025-2-N2D-0	VS3-025-2-N3D-0	68	H4	BX
30	VS3-030-B-N1D-0	VS3-030-B-N2D-0	VS3-030-B-N3D-0	80		
40	VS3-040-B-N1D-0	VS3-040-B-N2D-0	VS3-040-B-N3D-0	104		
50	VS3-050-B-N1D-0	VS3-050-B-N2D-0	VS3-050-B-N3D-0	130	CX	CX
60	VS3-060-B-N1D-0	VS3-060-B-N2D-0	VS3-060-B-N3D-0	154		
75	VS3-075-B-N1D-0	VS3-075-B-N2D-0	VS3-075-B-N3D-0	192		
100	VS3-100-B-N1D-0	VS3-100-B-N2D-0	VS3-100-B-N3D-0	248	DX	DX
125	VS3-125-B-N1D-0	VS3-125-B-N2D-0	VS3-125-B-N3D-0	312		

Table 12: 480 V disconnect drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
1.5	VS3-1D5-4-N1D-0	VS3-1D5-4-N2D-0	VS3-1D5-4-N3D-0	3	H1S	H3X
2	VS3-002-4-N1D-0	VS3-002-4-N2D-0	VS3-002-4-N3D-0	3.4		
3	VS3-003-4-N1D-0	VS3-003-4-N2D-0	VS3-003-4-N3D-0	4.8		
5	VS3-005-4-N1D-0	VS3-005-4-N2D-0	VS3-005-4-N3D-0	7.6		
7.5	VS3-7D5-4-N1D-0	VS3-7D5-4-N2D-0	VS3-7D5-4-N3D-0	11		
10	VS3-010-4-N1D-0	VS3-010-4-N2D-0	VS3-010-4-N3D-0	14	H2	
15	VS3-015-4-N1D-0	VS3-015-4-N2D-0	VS3-015-4-N3D-0	21		
20	VS3-020-4-N1D-0	VS3-020-4-N2D-0	VS3-020-4-N3D-0	27		
25	VS3-025-4-N1D-0	VS3-025-4-N2D-0	VS3-025-4-N3D-0	34	H3	
30	VS3-030-4-N1D-0	VS3-030-4-N2D-0	VS3-030-4-N3D-0	40		
40	VS3-040-4-N1D-0	VS3-040-4-N2D-0	VS3-040-4-N3D-0	52		
50	VS3-050-C-N1D-0	VS3-050-C-N2D-0	VS3-050-C-N3D-0	65	H4	BX
60	VS3-060-C-N1D-0	VS3-060-C-N2D-0	VS3-060-C-N3D-0	77		
75	VS3-075-C-N1D-0	VS3-075-C-N2D-0	VS3-075-C-N3D-0	96		
100	VS3-100-C-N1D-0	VS3-100-C-N2D-0	VS3-100-C-N3D-0	124	CX	CX
125	VS3-125-C-N1D-0	VS3-125-C-N2D-0	VS3-125-C-N3D-0	156		
150	VS3-150-C-N1D-0	VS3-150-C-N2D-0	VS3-150-C-N3D-0	180		
200	VS3-200-C-N1D-0	VS3-200-C-N2D-0	VS3-200-C-N3D-0	240	DX	DX
250	VS3-250-C-N1D-0	VS3-250-C-N2D-0	VS3-250-C-N3D-0	302		

Table 13: 575 V disconnect drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
3	VS3-003-D-N1D-0	VS3-003-D-N2D-0	VS3-003-D-N3D-0	3.9	H1	H3X
5	VS3-005-D-N1D-0	VS3-005-D-N2D-0	VS3-005-D-N3D-0	6.1		
7.5	VS3-7D5-D-N1D-0	VS3-7D5-D-N2D-0	VS3-7D5-D-N3D-0	9		
10	VS3-010-D-N1D-0	VS3-010-D-N2D-0	VS3-010-D-N3D-0	11		
15	VS3-015-D-N1D-0	VS3-015-D-N2D-0	VS3-015-D-N3D-0	17	H2	
20	VS3-020-D-N1D-0	VS3-020-D-N2D-0	VS3-020-D-N3D-0	22		
25	VS3-025-D-N1D-0	VS3-025-D-N2D-0	VS3-025-D-N3D-0	27	H3	
30	VS3-030-D-N1D-0	VS3-030-D-N2D-0	VS3-030-D-N3D-0	32		
40	VS3-040-D-N1D-0	VS3-040-D-N2D-0	VS3-040-D-N3D-0	41		
50	VS3-050-D-N1D-0	VS3-050-D-N2D-0	VS3-050-D-N3D-0	52	H4	BX
60	VS3-060-D-N1D-0	VS3-060-D-N2D-0	VS3-060-D-N3D-0	62		
75	VS3-075-D-N1D-0	VS3-075-D-N2D-0	VS3-075-D-N3D-0	77		
100	VS3-100-D-N1D-0	VS3-100-D-N2D-0	VS3-100-D-N3D-0	99	CX	CX
125	VS3-125-D-N1D-0	VS3-125-D-N2D-0	VS3-125-D-N3D-0	125		
150	VS3-150-D-N1D-0	VS3-150-D-N2D-0	VS3-150-D-N3D-0	144		
200	VS3-200-D-N1D-0	VS3-200-D-N2D-0	VS3-200-D-N3D-0	192	DX	DX
250	VS3-250-D-N1D-0	VS3-250-D-N2D-0	VS3-250-D-N3D-0	242		

Table 14: 208 V bypass drive

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
1	VS3-001-1-N1B-x	VS3-001-1-N2B-x	VS3-001-1-x3B-x	4.6	H1S	H3X
1.5	VS3-1D5-1-N1B-x	VS3-1D5-1-N2B-x	VS3-1D5-1-x3B-x	6.6		
2	VS3-002-1-N1B-x	VS3-002-1-N2B-x	VS3-002-1-x3B-x	7.5		
3	VS3-003-1-N1B-x	VS3-003-1-N2B-x	VS3-003-1-x3B-x	10.6		
5	VS3-005-1-N1B-x	VS3-005-1-N2B-x	VS3-005-1-x3B-x	16.7	H2S	
7.5	VS3-7D5-1-N1B-x	VS3-7D5-1-N2B-x	VS3-7D5-1-x3B-x	24.3		
10	VS3-010-1-N1B-x	VS3-010-1-N2B-x	VS3-010-1-x3B-x	30.8		
15	VS3-015-1-N1B-x	VS3-015-1-N2B-x	VS3-015-1-x3B-x	46.2	H3	
20	VS3-020-1-N1B-x	VS3-020-1-N2B-x	VS3-020-1-x3B-x	59.4		
25	VS3-025-1-N1B-x	VS3-025-1-N2B-x	VS3-025-1-x3B-x	74.8	H4	CX
30	VS3-030-A-N1B-x	VS3-030-A-N2B-x	VS3-030-A-x3B-x	88		
40	VS3-040-A-N1B-x	VS3-040-A-N2B-x	VS3-040-A-x3B-x	114		

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
50	VS3-050-A-N1B-x	VS3-050-A-N2B-x	VS3-050-A-x3B-x	143	DX	DX
60	VS3-060-A-N1B-x	VS3-060-A-N2B-x	VS3-060-A-x3B-x	169		
75	VS3-075-A-N1B-x	VS3-075-A-N2B-x	VS3-075-A-x3B-x	211		
100	VS3-100-A-N1B-x	VS3-100-A-N2B-x	VS3-100-A-x3B-x	261		

Table 15: 230 V bypass drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
1	VS3-001-2-N1B-x	VS3-001-2-N2B-x	VS3-001-2-x3B-x	4.2	H1S	H3X
1.5	VS3-1D5-2-N1B-x	VS3-1D5-2-N2B-x	VS3-1D5-2-x3B-x	6		
2	VS3-002-2-N1B-x	VS3-002-2-N2B-x	VS3-002-2-x3B-x	6.8		
3	VS3-003-2-N1B-x	VS3-003-2-N2B-x	VS3-003-2-x3B-x	9.6		
5	VS3-005-2-N1B-x	VS3-005-2-N2B-x	VS3-005-2-x3B-x	15.2	H2S	
7.5	VS3-7D5-2-N1B-x	VS3-7D5-2-N2B-x	VS3-7D5-2-x3B-x	22		
10	VS3-010-2-N1B-x	VS3-010-2-N2B-x	VS3-010-2-x3B-x	28		
15	VS3-015-2-N1B-x	VS3-015-2-N2B-x	VS3-015-2-x3B-x	42	H3	
20	VS3-020-2-N1B-x	VS3-020-2-N2B-x	VS3-020-2-x3B-x	54		
25	VS3-025-2-N1B-x	VS3-025-2-N2B-x	VS3-025-2-x3B-x	68	H4	CX
30	VS3-030-B-N1B-x	VS3-030-B-N2B-x	VS3-030-B-x3B-x	80		
40	VS3-040-B-N1B-x	VS3-040-B-N2B-x	VS3-040-B-x3B-x	104		
50	VS3-050-B-N1B-x	VS3-050-B-N2B-x	VS3-050-B-x3B-x	130	DX	DX
60	VS3-060-B-N1B-x	VS3-060-B-N2B-x	VS3-060-B-x3B-x	154		
75	VS3-075-B-N1B-x	VS3-075-B-N2B-x	VS3-075-B-x3B-x	192		
100	VS3-100-B-N1B-x	VS3-100-B-N2B-x	VS3-100-B-x3B-x	248		
125	VS3-125-B-N1B-x	VS3-125-B-N2B-x	VS3-125-B-x3B-x	312		

Table 16: 480 V bypass drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
1.5	VS3-1D5-4-N1B-x	VS3-1D5-4-N2B-x	VS3-1D5-4-x3B-x	3	H1S	H3X
2	VS3-002-4-N1B-x	VS3-002-4-N2B-x	VS3-002-4-x3B-x	3.4		
3	VS3-003-4-N1B-x	VS3-003-4-N2B-x	VS3-003-4-x3B-x	4.8		
5	VS3-005-4-N1B-x	VS3-005-4-N2B-x	VS3-005-4-x3B-x	7.6		
7.5	VS3-7D5-4-N1B-x	VS3-7D5-4-N2B-x	VS3-7D5-4-x3B-x	11		
10	VS3-010-4-N1B-x	VS3-010-4-N2B-x	VS3-010-4-x3B-x	14	H2	
15	VS3-015-4-N1B-x	VS3-015-4-N2B-x	VS3-015-4-x3B-x	21		
20	VS3-020-4-N1B-x	VS3-020-4-N2B-x	VS3-020-4-x3B-x	27		
25	VS3-025-4-N1B-x	VS3-025-4-N2B-x	VS3-025-4-x3B-x	34	H3	
30	VS3-030-4-N1B-x	VS3-030-4-N2B-x	VS3-030-4-x3B-x	40		
40	VS3-040-4-N1B-x	VS3-040-4-N2B-x	VS3-040-4-x3B-x	52		
50	VS3-050-C-N1B-x	VS3-050-C-N2B-x	VS3-050-C-x3B-x	65	H4	CX
60	VS3-060-C-N1B-x	VS3-060-C-N2B-x	VS3-060-C-x3B-x	77		
75	VS3-075-C-N1B-x	VS3-075-C-N2B-x	VS3-075-C-x3B-x	96		
100	VS3-100-C-N1B-x	VS3-100-C-N2B-x	VS3-100-C-x3B-x	124	DX	DX
125	VS3-125-C-N1B-x	VS3-125-C-N2B-x	VS3-125-C-x3B-x	156		
150	VS3-150-C-N1B-x	VS3-150-C-N2B-x	VS3-150-C-x3B-x	180		
200	VS3-200-C-N1B-x	VS3-200-C-N2B-x	VS3-200-C-x3B-x	240		
250	VS3-250-C-N1B-x	VS3-250-C-N2B-x	VS3-250-C-x3B-x	302		

Table 17: 575 V bypass drives

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
3	VS3-003-D-N1B-x	VS3-003-D-N2B-x	VS3-003-D-x3B-x	3.9	H1	H3X
5	VS3-005-D-N1B-x	VS3-005-D-N2B-x	VS3-005-D-x3B-x	6.1		
7.5	VS3-7D5-D-N1B-x	VS3-7D5-D-N2B-x	VS3-7D5-D-x3B-x	9		
10	VS3-010-D-N1B-x	VS3-010-D-N2B-x	VS3-010-D-x3B-x	11	H2	
15	VS3-015-D-N1B-x	VS3-015-D-N2B-x	VS3-015-D-x3B-x	17		
20	VS3-020-D-N1B-x	VS3-020-D-N2B-x	VS3-020-D-x3B-x	22		
25	VS3-025-D-N1B-x	VS3-025-D-N2B-x	VS3-025-D-x3B-x	27	H3	
30	VS3-030-D-N1B-x	VS3-030-D-N2B-x	VS3-030-D-x3B-x	32		
40	VS3-040-D-N1B-x	VS3-040-D-N2B-x	VS3-040-D-x3B-x	41		
50	VS3-050-D-N1B-x	VS3-050-D-N2B-x	VS3-050-D-x3B-x	52	H4	CX
60	VS3-060-D-N1B-x	VS3-060-D-N2B-x	VS3-060-D-x3B-x	62		
75	VS3-075-D-N1B-x	VS3-075-D-N2B-x	VS3-075-D-x3B-x	77		

					Frame size	
hp	**NEMA 1 (UL Type 1)**	**NEMA 12 (UL Type 12)**	**NEMA 3R**	**Output current (A)**	**NEMA 1**	**NEMA 12 and NEMA 3R**
100	VS3-100-D-N1B-x	VS3-100-D-N2B-x	VS3-100-D-x3B-x	99	DX	DX
125	VS3-125-D-N1B-x	VS3-125-D-N2B-x	VS3-125-D-x3B-x	125		
150	VS3-150-D-N1B-x	VS3-150-D-N2B-x	VS3-150-D-x3B-x	144		
200	VS3-200-D-N1B-x	VS3-200-D-N2B-x	VS3-200-D-x3B-x	192		
250	VS3-250-D-N1B-x	VS3-250-D-N2B-x	VS3-250-D-x3B-x	242		

Disconnect and bypass drive dimensions

The following dimension diagrams show the different frame sizes and their packaged weight. All measurements are in inches and millimeters. Figure 8, 9, 10, 11, 12, and 14 show the top view of each frame size. The bottom including mounting holes is a mirror image of the top view. Figure 13, 15, 16, 17, 18, 19, and 20 show only the bottom view of each frame size.

Figure 8: H1S 49.3 lbs

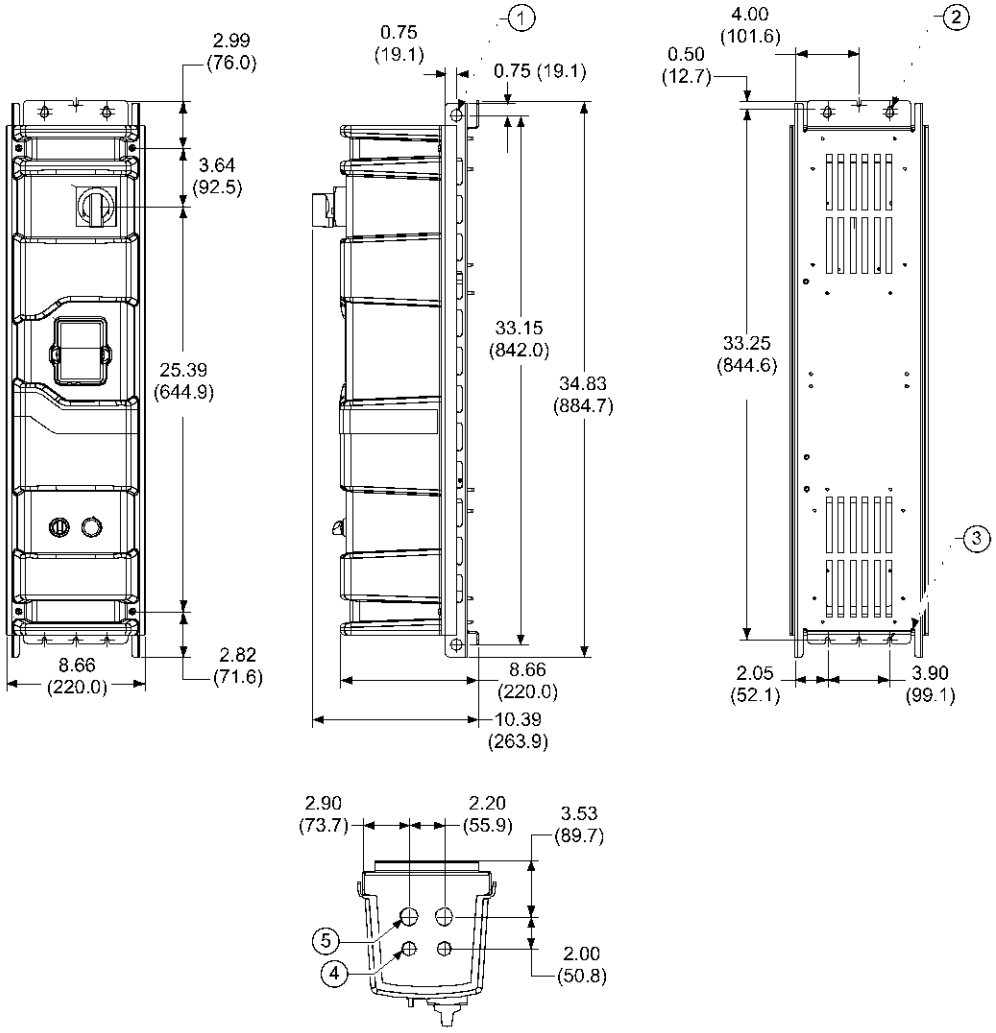


Table 18: Lifting holes and mounting slot diameters of the frame size H1S

Number	Description
1	Ø 0.75 in. (Ø 19.1 mm), lifting holes, four places
2	Ø 0.30 in. (Ø 7.6 mm), mounting slot, two places
3	Ø 0.27 in. (Ø 6.9 mm), mounting slot, two places
4	Ø 0.875 in. (Ø 22.2 mm), two places
5	Ø 1.109 in. (Ø 28.2 mm), two places

Figure 9: H1 62.8 lbs

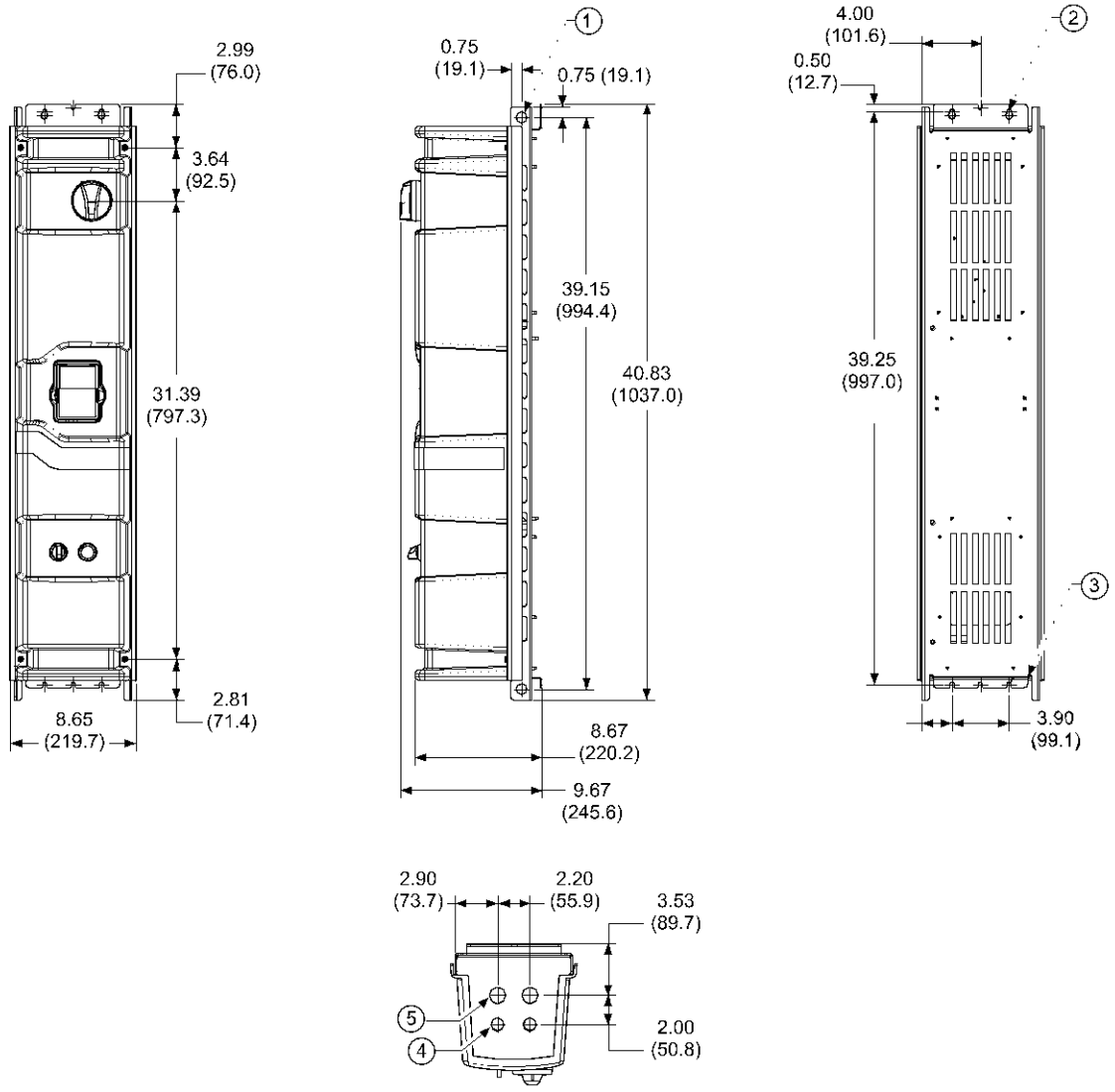


Table 19: Lifting holes and mounting slot diameters of the frame size H1

Number	Description
1	Ø 0.75 in. (Ø 19.1 mm), lifting holes, four places
2	Ø 0.30 in. (Ø 7.6 mm), mounting slot, two places
3	Ø 0.27 in. (Ø 6.9 mm), mounting slot, two places
4	Ø 0.875 in. (Ø 22.2 mm), two places
5	Ø 1.109 in. (Ø 28.2 mm), two places

Figure 10: H2S 66.2 lbs

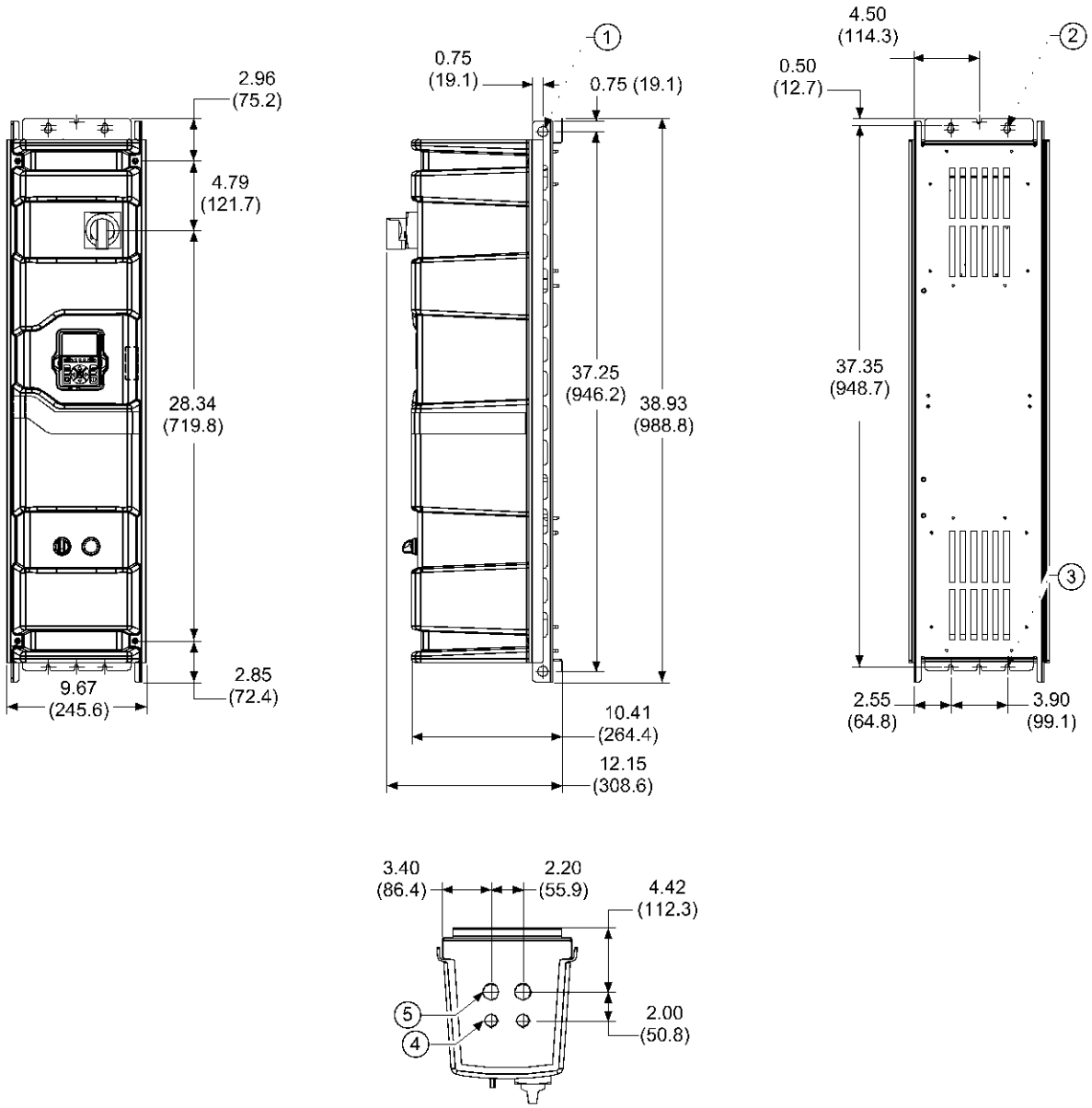


Table 20: Lifting holes and mounting slot diameters of the frame size H2S

Number	Description
1	Ø 0.75 in. (Ø 19.1 mm), lifting holes, four places
2	Ø 0.30 in. (Ø 7.6 mm), mounting slot, two places
3	Ø 0.27 in. (Ø 6.9 mm), mounting slot, two places
4	Ø 0.875 in. (Ø 22.2 mm), two places
5	Ø 1.109 in. (Ø 28.2 mm), two places

Figure 11: H2 63.7 lbs

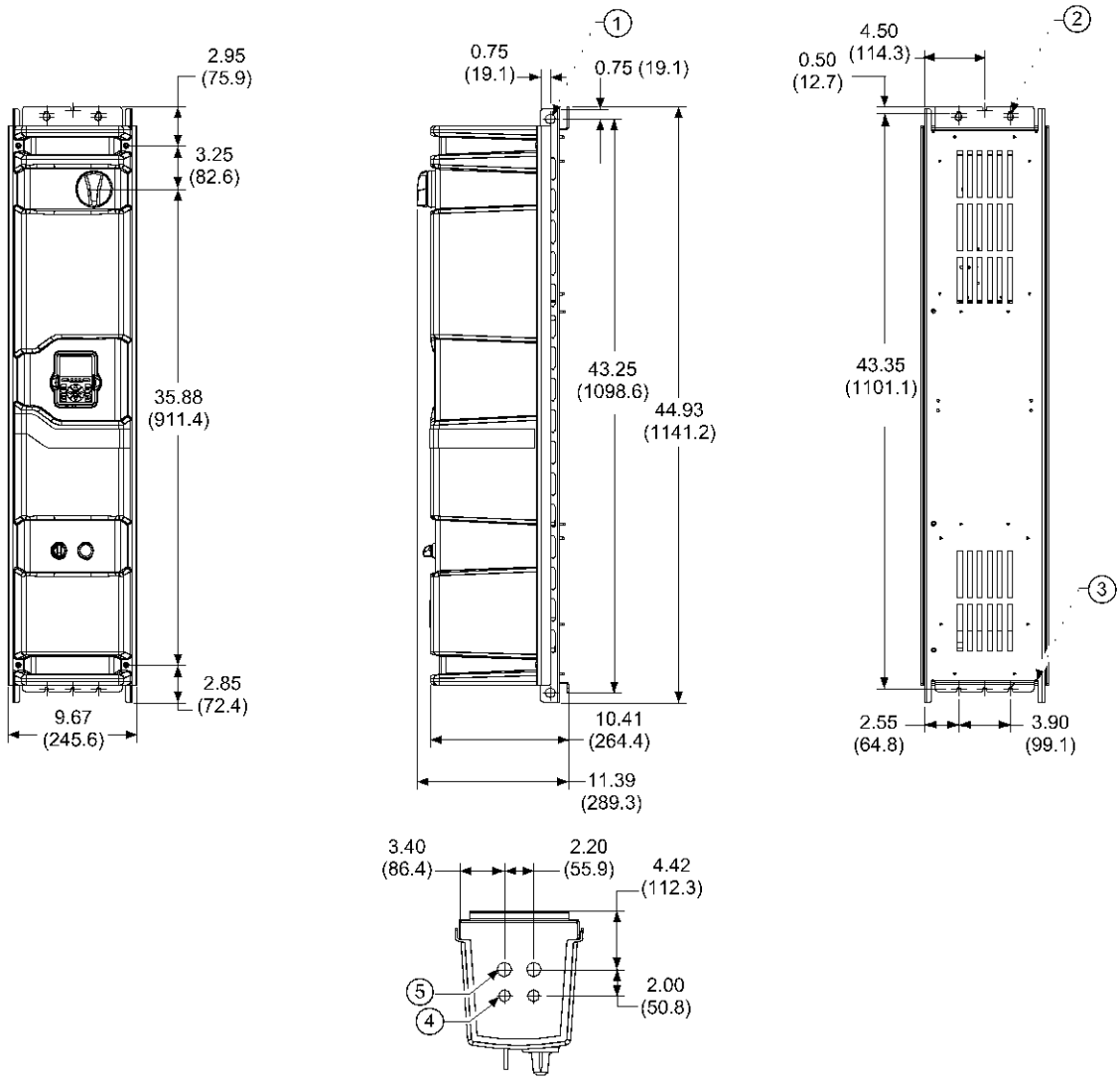


Table 21: Lifting holes and mounting slot diameters of the frame size H2

Number	Description
1	Ø 0.75 in. (Ø 19.1 mm), lifting holes, four places
2	Ø 0.30 in. (Ø 7.6 mm), mounting slot, two places
3	Ø 0.27 in. (Ø 6.9 mm), mounting slot, two places
4	Ø 0.875 in. (Ø 22.2 mm), two places
5	Ø 1.109 in. (Ø 28.2 mm), two places

Figure 12: H3 153 lbs

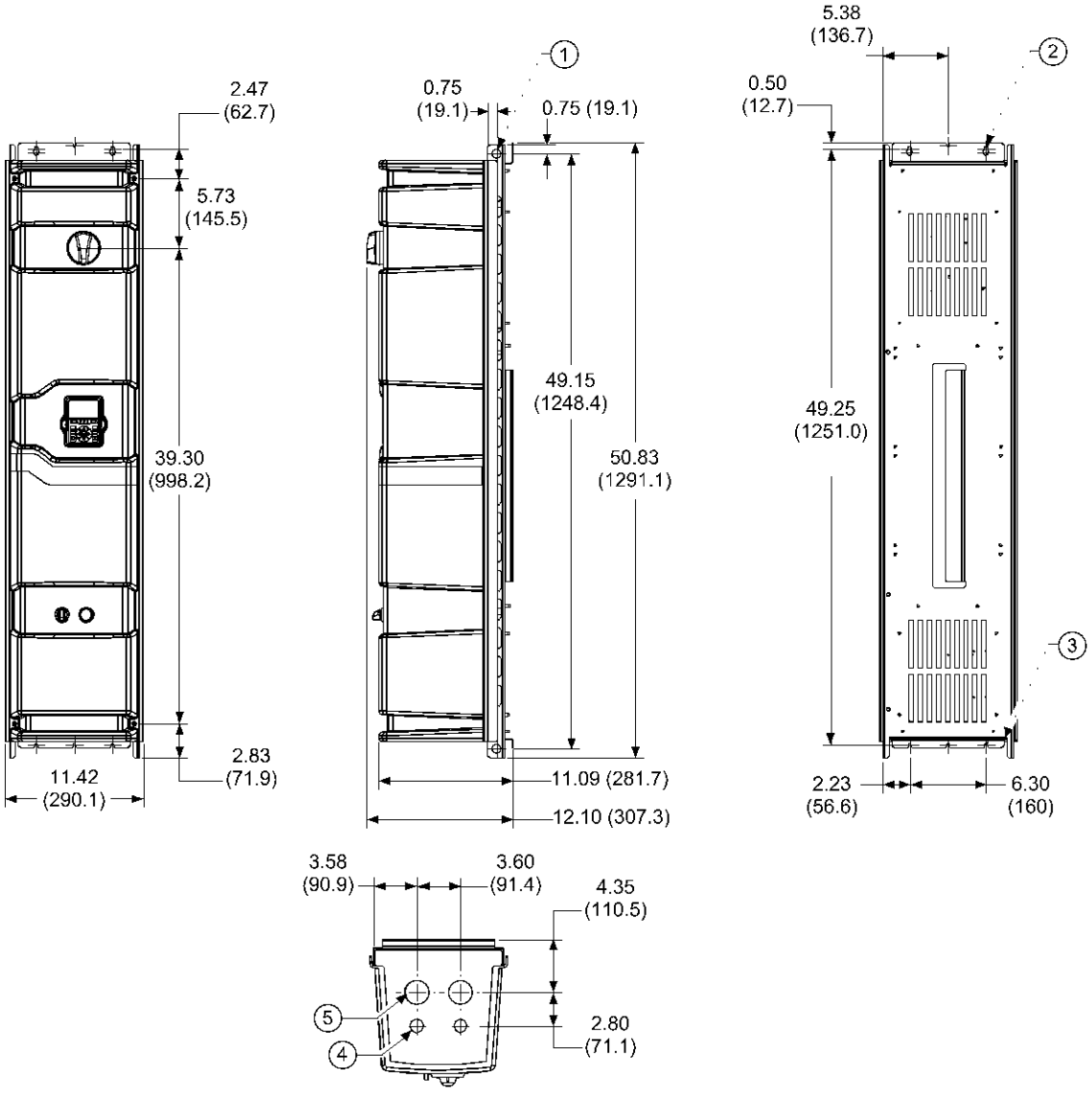
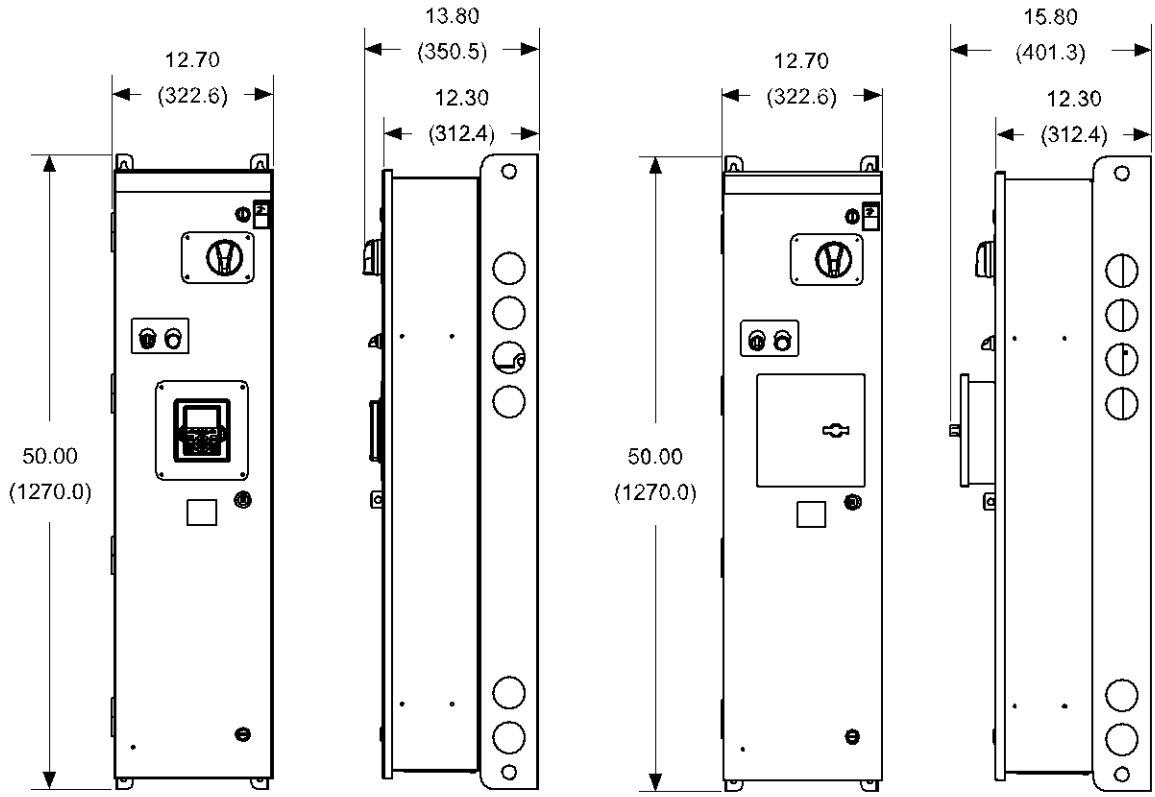


Table 22: Lifting holes and mounting slot diameters of the frame size H3

Number	Description
1	Ø 0.75 in. (Ø 19.1 mm), lifting holes, four places
2	Ø 0.30 in. (Ø 7.6 mm), mounting slot, two places
3	Ø 0.27 in. (Ø 6.9 mm), mounting slot, two places
4	Ø 1.109 in. (Ø 28.2 mm), two places
5	Ø 1.984 in. (Ø 50.4 mm), two places

Figure 13: H3X Type 12 206 lbs; Type 3R 216 lbs



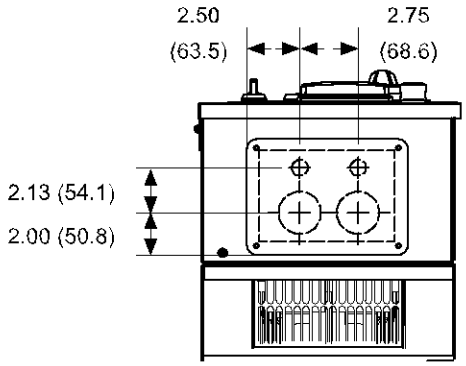


Figure 14: H4 215 lbs

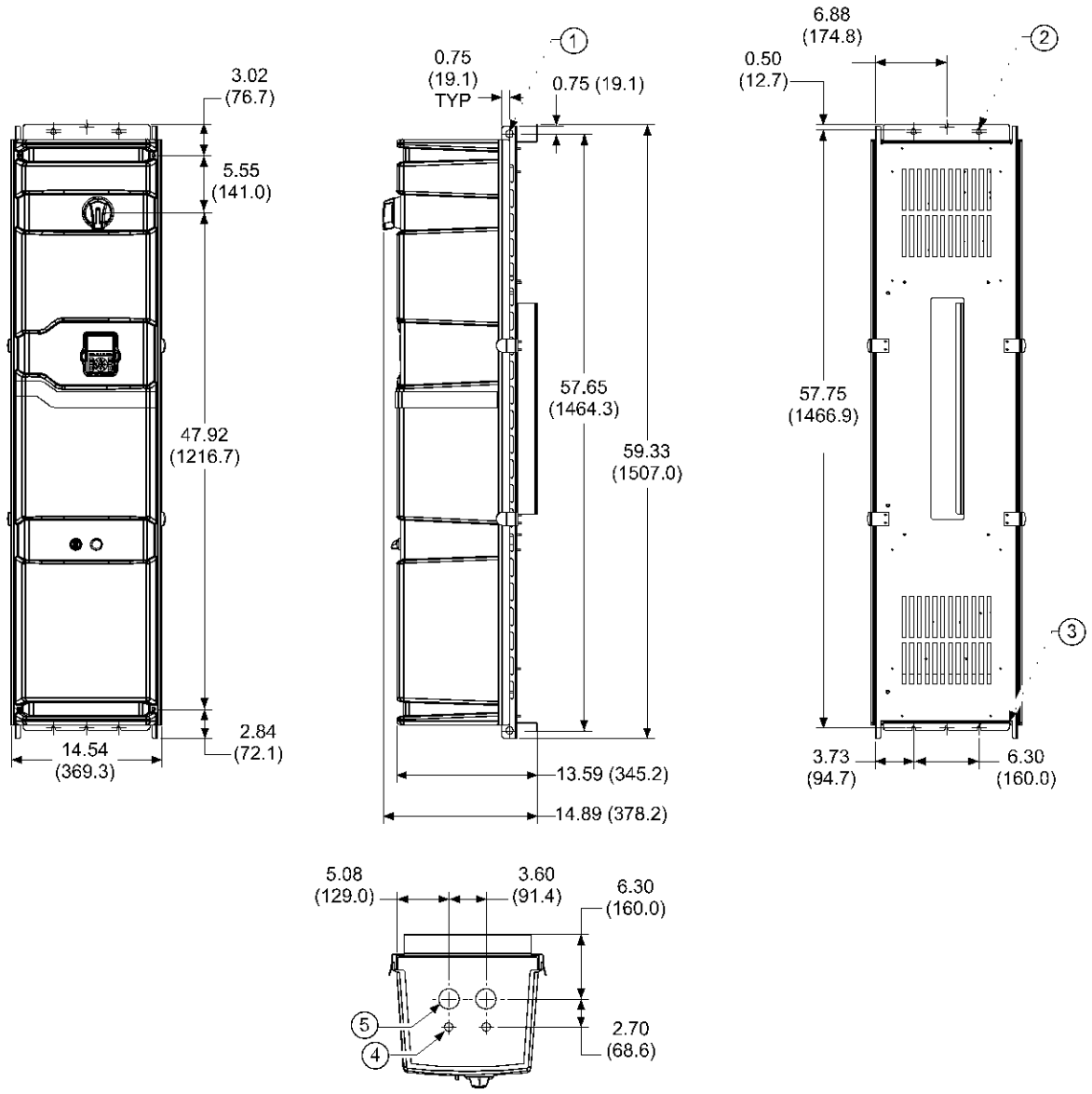


Table 23: Lifting holes and mounting slot diameters of the frame size H4

Number	Description
1	Ø 0.75 in. (Ø 19.1 mm), lifting holes, four places
2	Ø 0.30 in. (Ø 7.6 mm), mounting slot, two places
3	Ø 0.27 in. (Ø 6.9 mm), mounting slot, two places
4	Ø 0.875 in. (Ø 22.2 mm), two places
5	Ø 1.984 in. (Ø 50.4 mm), two places

Figure 15: BX Type 12 311 lbs

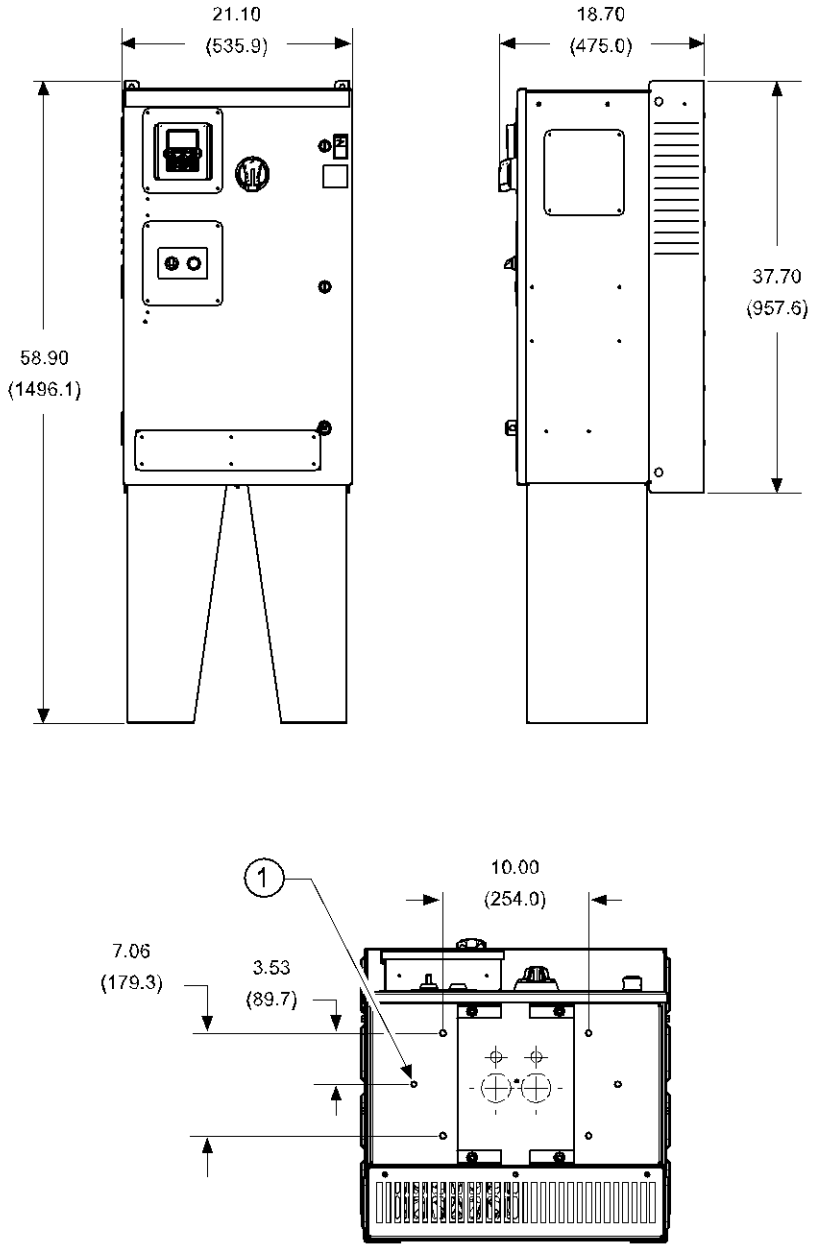


Table 24: Mounting slot diameter of the frame size BX Type 12

Number	Description
1	Ø 0.44 in. (Ø 11.2 mm), mounting for six 3/8 hex hd bolts

Figure 16: BX Type 3R 335 lbs

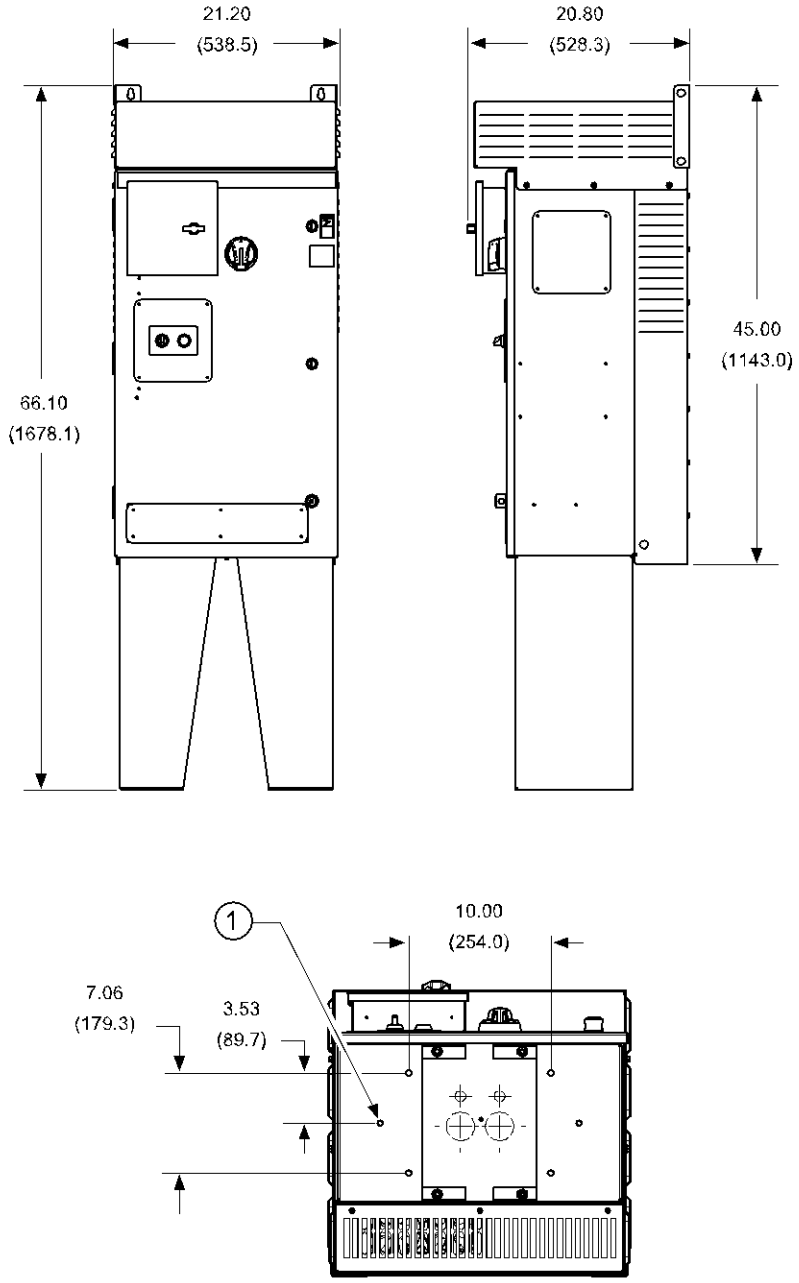
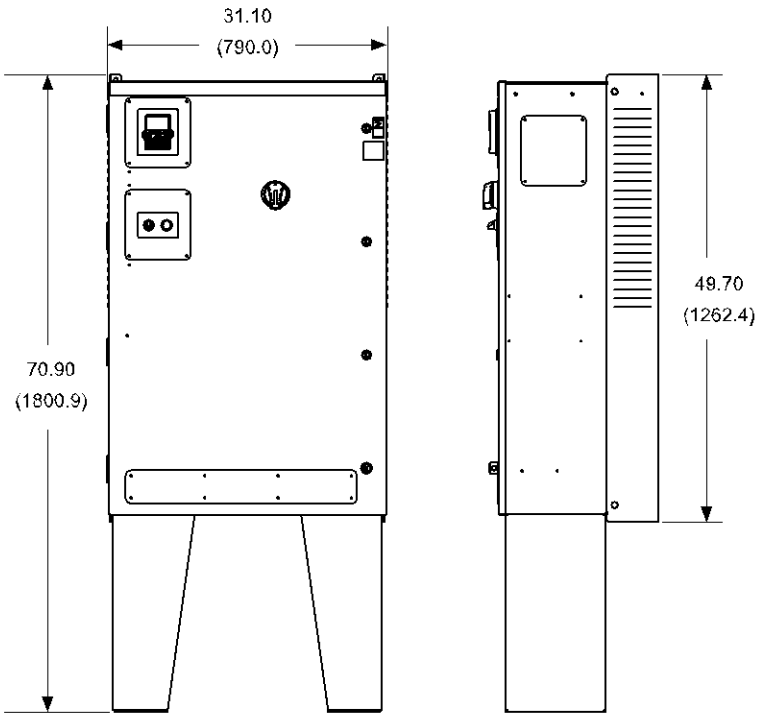


Table 25: Mounting slot diameter of the frame size BX Type 3R

Number	Description
1	Ø 0.44 in. (Ø 11.2 mm), mounting for six 3/8 hex hd bolts

Figure 17: CX Type 1 and CX Type 12 536 lbs



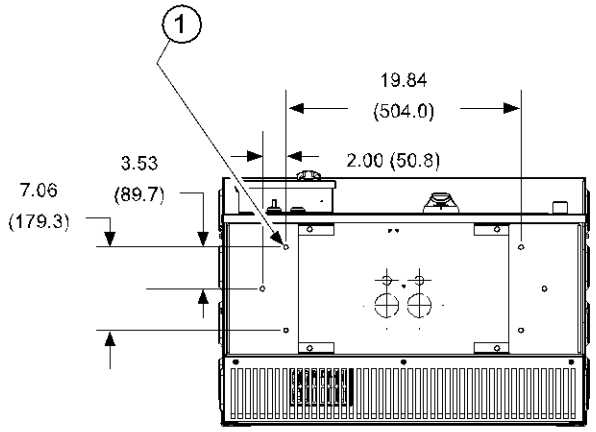
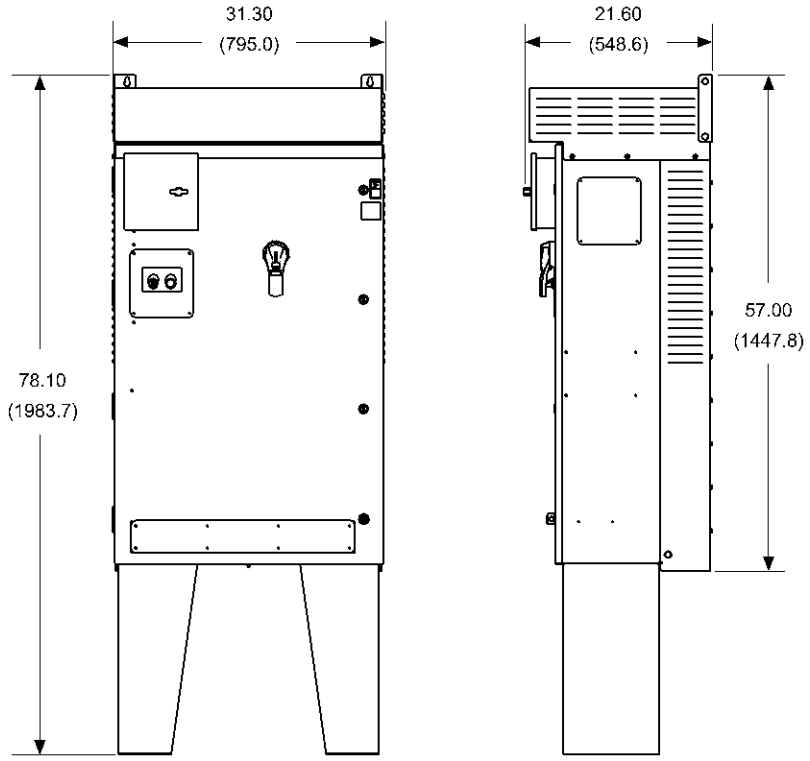


Table 26: Mounting slot diameter of the frame size CX Type 1 and the CX Type 12

Number	Description
1	Ø 0.44 in. (Ø 11.2 mm), mounting for six 3/8 hex hd bolts

Figure 18: CX Type 3R 560 lbs



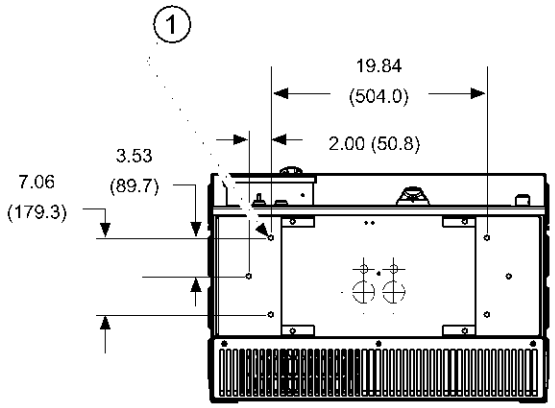


Table 27: Mounting slot diameter of the frame size CX Type 3R

Number	Description
1	Ø 0.44 in. (Ø 11.2 mm), mounting for six 3/8 hex hd bolts

Figure 19: DX Type 1 and DX Type 12 1003 lbs

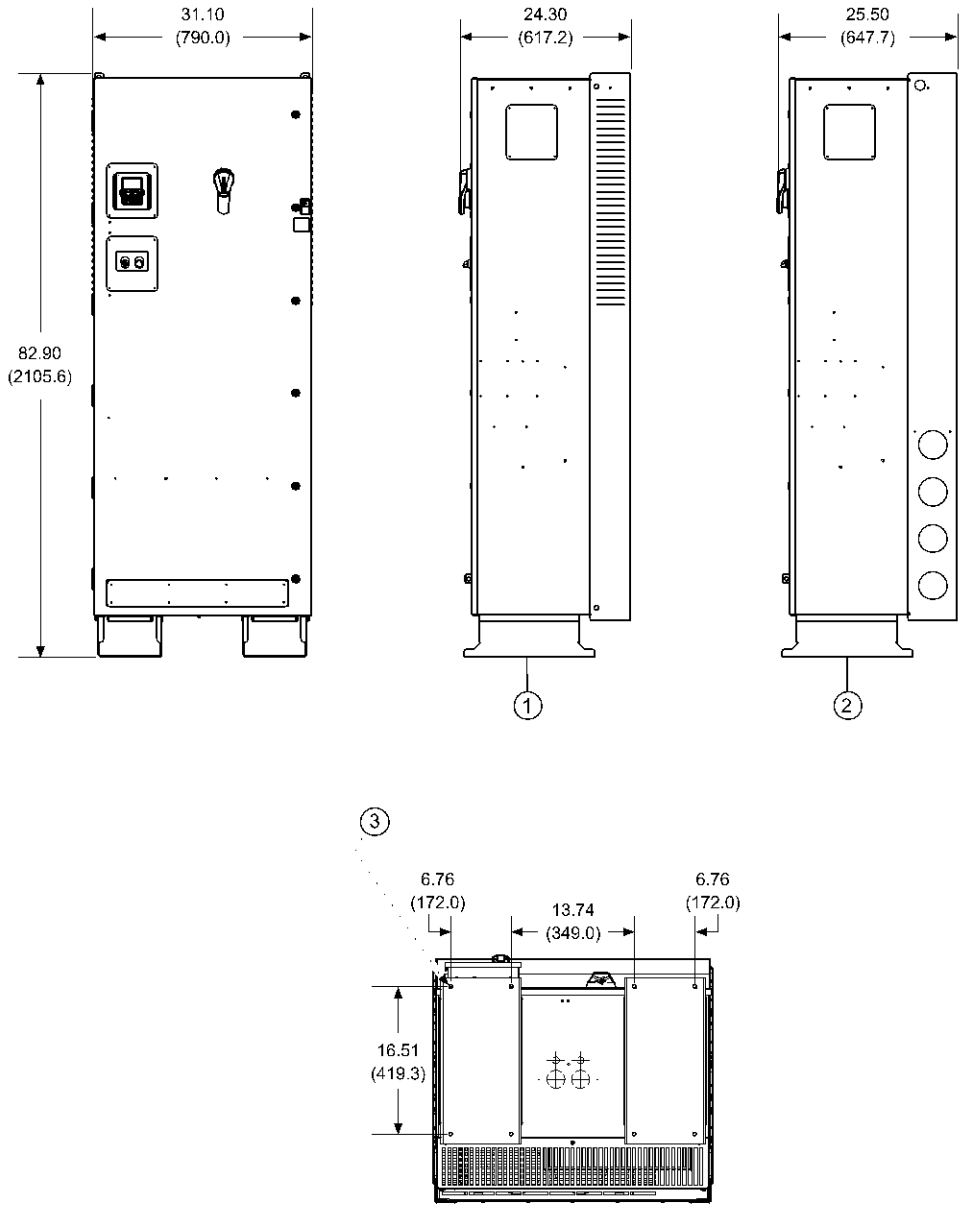


Table 28: Mounting slot diameter of the frame size DX Type 1 and DX Type 12

Number	Description
1	Frame 5
2	Frame 6
3	Ø 0.44 in. (Ø 11.2 mm), mounting for six 3/8 hex hd bolts

Figure 20: DX Type 3R 1053 lbs

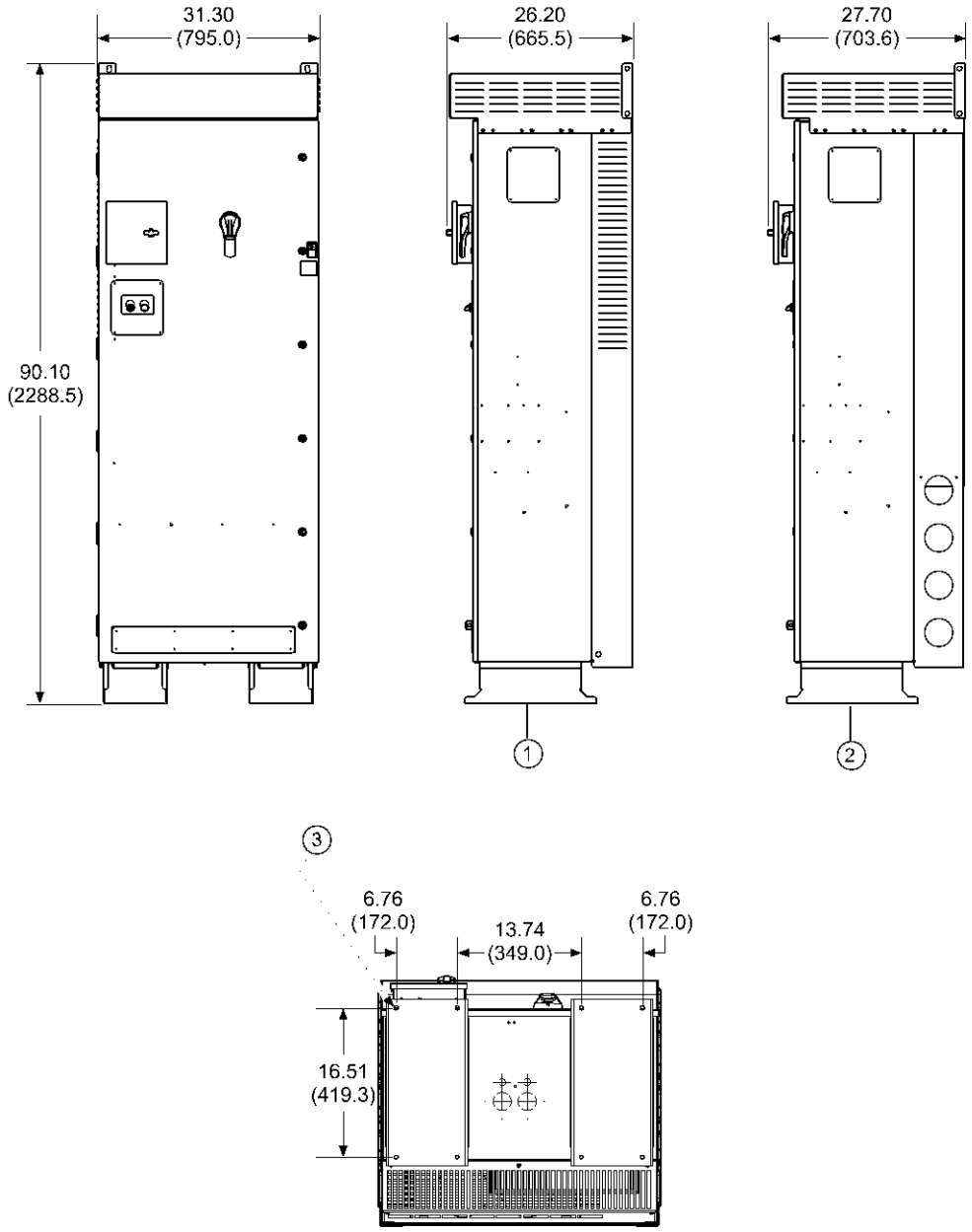


Table 29: Frame sizes and mounting slot diameter

Number	Description
1	Frame 5
2	Frame 6
3	Ø 0.44 in. (Ø 11.2 mm), mounting for six 3/8 hex hd bolts

Typical enclosed drive configuration

Figure 21: Bypass model

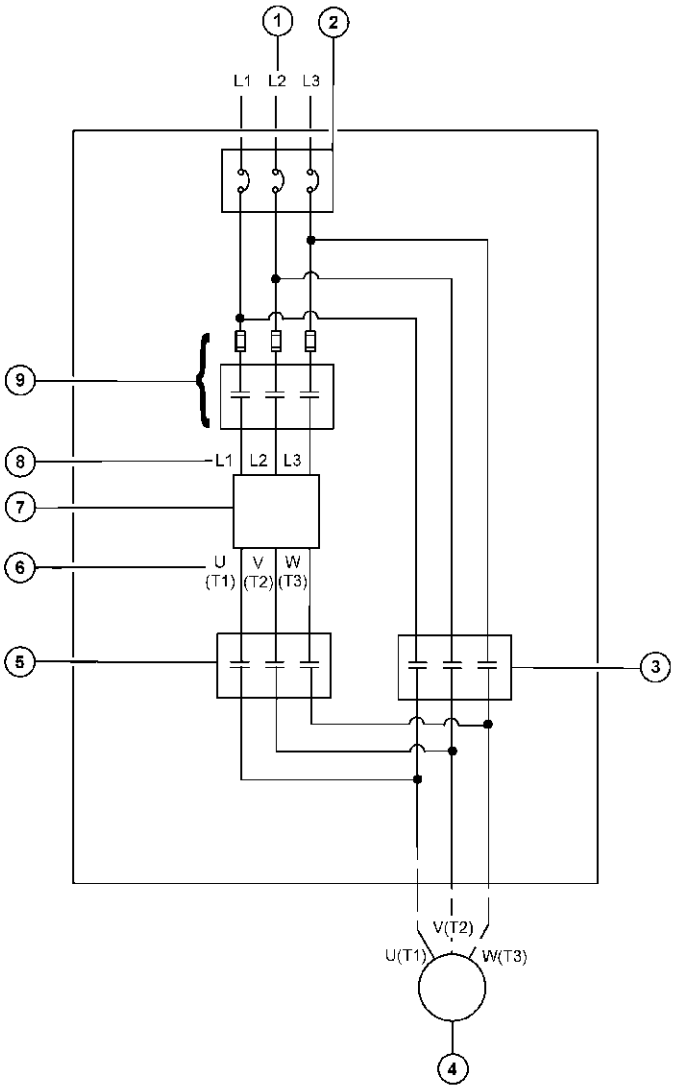


Table 30: IntelliPass Power and motor terminal wiring

Number	Description
1	Incoming power
2	Circuit breaker or disconnect (manual motor protector)
3	Bypass contactor
4	Motor
5	Output contactor
6	Output
7	Drive
8	Input
9	Optional fuse or drive input contactor

Figure 22: Disconnect model

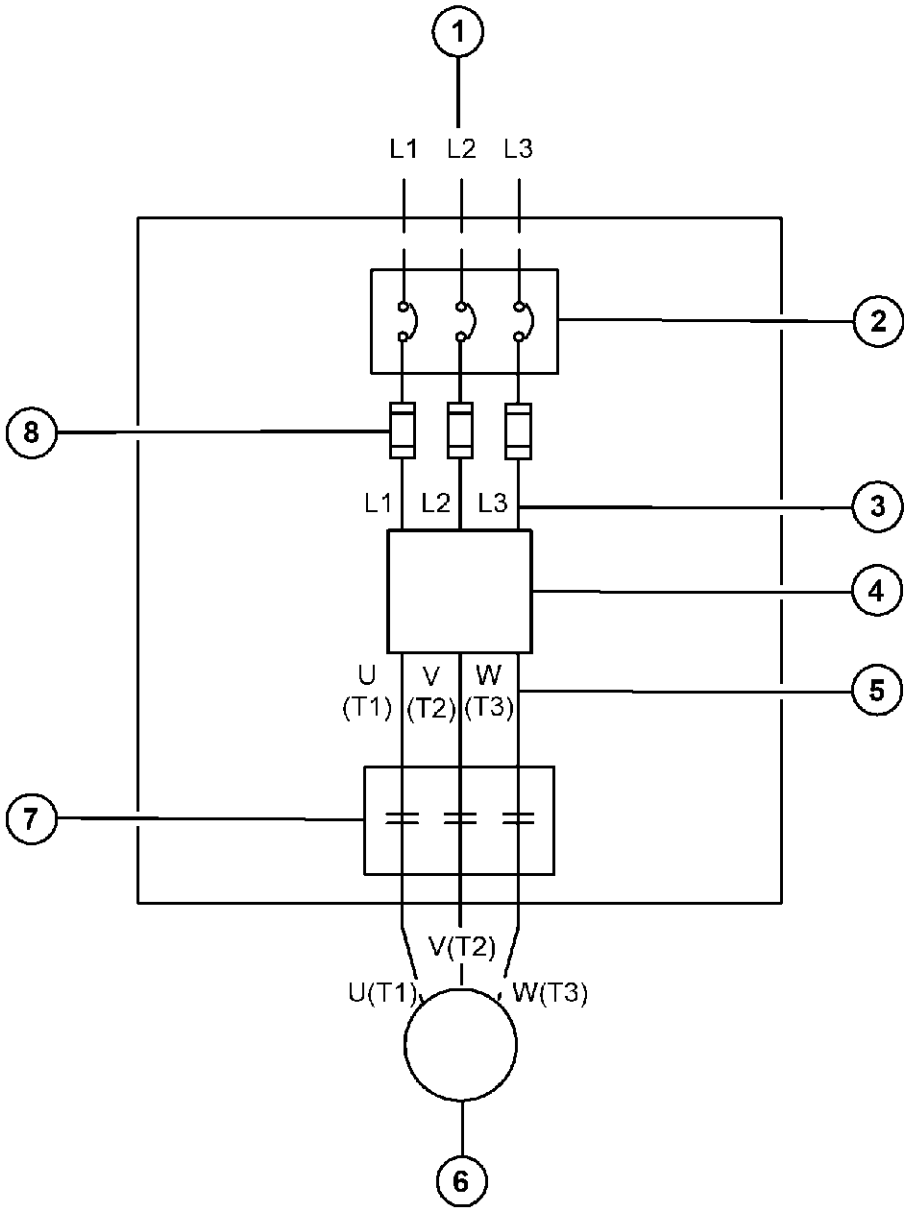


Table 31: IntelliDisconnect power wiring

Number	Description
1	Incoming power
2	Circuit breaker or disconnect (manual motor protector)
3	Input
4	Drive
5	Output
6	Motor
7	Optional output contactor
8	Optional fuses

Factory-set control terminal functions

Table 32: I/O connection

Pin	Signal name	Signal	Default setting	Description
1	+10 V	Reference output voltage	—	10 VDC supply source
2	AI1+	Analog input 1	0 V – 10 V	Voltage speed reference Programmable to 4 mA – 20 mA
3	AI1–	Analog input 1 ground	—	Analog input 1 common Ground
4	AI2+	Analog input 2	4 mA – 20 mA	Current speed reference Programmable to 0 V – 10 V
5	AI2–	Analog input 2 ground	—	Analog input 2 common Ground
6	GND	I/O signal ground	—	I/O ground for reference and control
7	DIN5	Digital input 5	Preset speed B0	Sets frequency output to preset speed 1
8	DIN6	Digital input 6	Preset speed B1	Sets frequency output to preset speed 2
9	DIN7	Digital input 7	—	—
10	DIN8	Digital input 8	Force remote	Input takes variable-frequency drive (VFD) from local to remote
11	CMB	DI5 to DI8 common	Grounded	Allows source input
12	GND	I/O signal ground	—	I/O ground for reference and control
13	24 V	+24 VDC output	—	Control voltage output 100 mA max
14	DO1	Digital output 1	Ready	Shows the drive is ready to run
15	24 Vo	+24 VDC output	—	Control voltage output 100 mA max
16	GND	I/O signal ground	—	I/O ground for reference and control
17	AO1+	Analog output 1	Output frequency	Shows output frequency to motor 0 Hz – 60 Hz 4 mA – 20 mA
18	AO2+	Analog output 2	Motor current	Shows motor current of motor 0 to FLA 4 mA – 20 mA
19	24 Vi	+24 VDC input	—	External control voltage input
20	DIN1	Digital input 1	Run forward	Input starts drive in forward direction Start enable
21	DIN2	Digital input 2	Run reverse	Input starts drive in reverse direction Start enable
22	DIN3	Digital input 3	External fault	Input causes drive to fault
23	DIN4	Digital input 4	Fault reset	Input resets active faults
24	CMA	DI1 to DI4 common	Grounded	Allows source input
25	A	RS-485 signal A	—	Fieldbus communication Modbus, BACnet
26	B	RS-485 signal B	—	Fieldbus communication Modbus, BACnet
27	R3NO	Relay 3 normally open	At speed	Relay output 3 shows VFD is at reference frequency

Table 32: I/O connection (Continued)

Pin	Signal name	Signal	Default setting	Description
28	R1NC	Relay 1 normally closed	Run	Relay output 1 shows VFD is in a run state
29	R1CM	Relay 1 common		
30	R1NO	Relay 1 normally open		
31	R3CM	Relay 3 common	At speed	Relay output 3 shows VFD is at reference frequency
32	R2NC	Relay 2 normally closed	Fault	Relay output 2 shows VFD is in a fault state
33	R2CM	Relay 2 common		
34	R2NO	Relay 2 normally open		

Figure 23: Variable Speed Drives Series III keypad

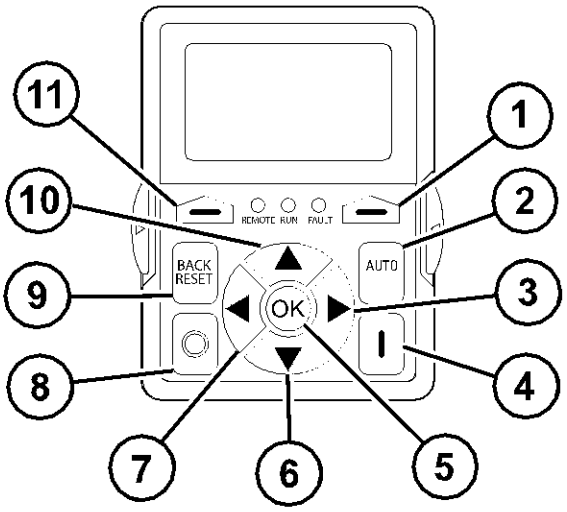


Table 33: VSD Series III keypad buttons

Number	Button
1	Programmable soft key 2
2	Auto control place select
3	Move cursor right
4	Start or Hand button
5	Enter Menu or confirm selection
6	Decrease value or scroll down in menu
7	Move cursor left
8	Stop or Off button
9	Back or Reset button
10	Increase value or scroll up in menu
11	Programmable soft key 1

Variable Speed Drives Series III open drive technical specifications

Attribute	Description	Specification
Input ratings	Input voltage U_{in}	208 V – 240 V, 380 V – 500 V – 600 V, -15% to 10%
	Input frequency	50 Hz – 60 Hz Variation up to 45 Hz – 66 Hz
	Connection to power	Once per minute or less
	Starting delay	3 s for Frame 1 to Frame 2, 4 s for Frame 3, 5 s for Frame 4, 6 s for Frame 5 and Frame 6
	Short-circuit withstand rating	100 kilo ampere interrupting capacity (kAIC); 5 kAIC without fuses or breakers
Output ratings	Output voltage	0 to U_{in}
	Continuous output current	I_L: ambient temperature maximum 104°F (40°C), up to 140°F (60°C) with derating, overload 1.1 x I_L (1 min/10 min)
	Overload current	110% for variable torque
	Initial output current	200% (2 s/20 s)
	Output frequency	0 Hz – 400 Hz
	Frequency resolution	0.01 Hz
Control characteristics	Control methods	Frequency control Speed control Open-loop speed control Open-loop torque control
	Switching frequency	230 V/480 V range: Frame 1 to Frame 3: 1 kHz – 12 kHz Frame 4 to Frame 6: 1 kHz – 10 kHz 230 V/480 V defaults: Frame 1 to Frame 3: 4 kHz Frame 4 to Frame 5: 3.6 kHz Frame 6: 2 kHz 575 V range: Frame 1 to Frame 6: 1 kHz – 6 kHz 575 V defaults: Frame 1 to Frame 4: 3 kHz Frame 5 to Frame 6: 2 kHz Automatic switching frequency derating in case of overload.
	Frequency reference	Analog input: resolution 0.1% (10-bit), accuracy +1% Analog output: resolution 0.1% (10-bit), accuracy +1% Panel reference: resolution 0.01 Hz
	Field weakening point	20 Hz – 400 Hz
	Acceleration time	0.1 s – 3000 s
	Deceleration time	0.1 s – 3000 s
	Braking torque	DC brake 30% x motor rated torque (Tn) (without brake chopper) Dynamic braking (with optional brake chopper using an external brake resistor): 100% continuous maximum rating

Attribute	Description	Specification
Ambient conditions	Ambient operating temperature	14°F or no frost to 122°F, up to 140°F (-10°C or no frost to 50°C, up to 60°C) with derating constant torque (CT) 14°F or no frost to 122°F, up to 140°F (-10°C or no frost to 40°C, up to 60°C) with derating variable torque (VT)
	Storage temperature	-40°F to 158°F (-40°C to 70°C)
	Relative humidity	0% - 95% RH, noncondensing, non-corrosive
	Air quality: • Chemical vapors • Mechanical particles	Tested according to IEC 600068-2-60 test key: Flowing mixed gas corrosion test, Method 1 (H2S [hydrogen sulfide] and SO2 [sulfur dioxide]) Designed according to: IEC 60721-3-3, unit in operation, class 3C2 IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity without derating up to 3280 ft (1000 m); 1% derating for each 328 ft (100 m) above 3280 ft (1000 m); max. 9842 ft (3000 m) 2000 m for corner grounded earth main systems For 575 V product, maximum altitude is 6561 ft (2000 m) regardless of main system
	Vibration: • EN 61800-5-1 • EN 60668-2-6	5 Hz – 150 Hz Displacement amplitude: 1 mm; peak at 5 Hz –15.8 Hz Frame 1 to Frame 6 Maximum acceleration amplitude: 1 g at 15.8 Hz – 150 Hz Frame 1 to Frame 6
	Shock: • ISTA 1 A • EN 60068-2-27	Storage and shipping: maximum 15 g, 11 ms in package
	Overvoltage	Overvoltage category III
	Pollution degree	Pollution degree 2
	Enclosure class for open drives and drive only models	IP21/Type 1 standard in entire kW/hp range IP54/Type 12 option **Note:** Keypad or keypad hole plug required to be mounted in drive for IP54/Type 12 rating
	Immunity	Fulfills EN 61800-3 (2004), first and second environment
	MTBF	Frame 1: 165,457 hours Frame 2: 134,833 hours Frame 3: 102,515 hours Frame 4: 121,567 hours Frame 5: 108,189 hours Frame 6: 100,000 hours
	Noise	Frame 1: 51.2 dB Frame 2: 58.6 dB Frame 3: 61 dB Frame 4: 68 dB Frame 5: 69.1 dB Frame 6: 73.2 dB
Standards	Safety	UL 508C, CSA C22.2 No. 274-13 and EN 61800-5-1

Attribute	Description	Specification
	EMC	FCC Part 15 Subpart B, ICES-003 and EN 618000-3, Category C2 The drive can be modified for IT networks and corner grounding TN system
	Electrostatic discharge	Second environment, IEC 61000-4-2, 4 kV CD or 8 kV AD, Criterion B
	Fast transient burst	Second environment, IEC 61000-4-4, 2 kV/5 kHz, Criterion B
	Dielectrical strength	Primary to secondary: 3600 VAC/5100 VDC
	Approvals	RCM, RoHS, CE, UL and cUL (see nameplate for more detailed approvals)
Fieldbus connections		Onboard: BACnet/IP, BACnet MS/TP, Modbus TCP, Modbus RTU

Series Y63, Y64, Y65, Y66, and Y69 Transformers

Product Bulletin

Code No. LIT-125755
Issued July 16, 2009
Supersedes December 17, 2002

The Series Y63, Y64, Y65, Y66, and Y69 Transformers provide 24 VAC power for loads of 40 VA through 300 VA. These transformers are designed for use on digital controllers, gas controls, ignition systems, motor actuators, staging controls, and most other 24 VAC Heating, Ventilation, Air Conditioning, and Refrigeration (HVACR) control systems.

The Y6x Series meets the requirements of UL 1585, UL 506, and CSA C22.2 No. 66, providing compliance in both the United States and Canada. The Y63, Y64, Y65, and Y66 transformers are listed as Class 2 transformers (UL 1585, CSA C22.2 No. 66). The Y69 is listed as a general purpose transformer (UL 506, CSA C22.2 No. 66).

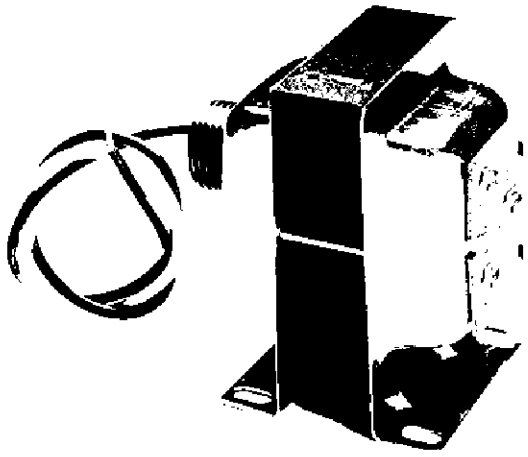


Figure 1: Model Y65T31-0 Transformer

Table 1: Features and Benefits

Features	Benefits
Split-Bobbin Design	Provides best primary/secondary isolation.
Multi-Tap Primaries	Reduce stocking requirements and offers application flexibility.
Choice of Foot, Plate, or Conduit Hub Mounting	Provides mounting flexibility.
Choice of Primary Voltages	Meets a wide range of power requirements from 24 VAC through 480 VAC.
Color-Coded Lead Wires	Provide simplicity and standardization.
cULus Listed or cURus Recognized	Meets US and Canadian requirements for Class 2 transformers (Y63, Y64, Y65, and Y66) and general purpose transformers (Y69).
Built-In, Easy-Reset Circuit Breakers	Eliminate replacement time and cost caused by burnout (Y63, Y64, Y66, and Y69).
Open Frame Y65 Models	Serve as ideal models when end bells are not required.

Selecting a Transformer

See Table 2 to select the appropriate transformer for your application.

Note: All conduit fittings are 1/2-14 National Pipe Straight Threads (NPSTs). Performance and dimension specifications are nominal and are subject to accepted manufacturing tolerances and applications.

IMPORTANT: The new line of transformers does not offer exact replacements for older styles. Some dimensions and voltages have changed. The VA rating for 100 VA transformers has changed to 92 VA to comply with UL 1585.

Johnson Controls

Table 2: Transformer Selection Table

Code No.	Primary Voltage VAC	Secondary Voltage VAC	Primary Connection	Second Connection	Mounting	Agency Requirement
40 VA Capacity Transformers with Energy Limiting Type Overload Protection						
Y65G13-0 (Figure 2)	24	24	Male Fitting 8 in. primary leads	Male Fitting 30 in. secondary leads	Foot	cULus Class 2
Y65A13-0 (Figure 2)	120	24	Male Fitting 8 in. primary leads	Male Fitting 30 in. secondary leads	Foot	cULus Class 2
Y65A21-0 (Figure 3)	120	24	End Bell holes 8 in. primary leads	Three screw terminals (one is blind)	4 in. x 4 in. Plate	cULus Class 2
Y65T31-0 (Figure 4)	120/208/240	24	Male Fitting 8 in. primary leads	Three screw terminals (one is blind)	Foot 4 in. x 4 in. Plate[1]	cULus Class 2
Y65T42-0 (Figure 5)	120/208/240	24	Common Male Fitting 8 in. primary leads	Common Male Fitting 8 in. secondary leads	Hub 4 in. x 4 in. Plate[1]	cURus Class 2
Y65T54-0 (Figure 6)	120/208/240	24	8 in. primary leads	8 in. secondary leads	Foot-skeleton	cURus Class 2
Y65S13-0 (Figure 7)	208/240	24	Male Fitting 8 in. primary leads	Male Fittings 30 in. secondary leads	Foot	cULus Class 2
Y65F13-0 (Figure 7)	277/480	24	Male Fitting 8 in. primary leads	Male Fitting 30 in. secondary leads	Foot	cULus Class 2
Y65F42-0 (Figure 8)	277/480	24	Common Male Fitting 8 in. primary leads	Common Male Fitting 8 in. secondary leads	Hub 4 in. x 4 in. Plate[1]	cURus Class 2
50 VA Capacity Transformers with Circuit Breakers						
Y63T22-0 (Figure 9)	120/208/240	24	End bell Hole 8 in. primary leads	End bell Hole 8 in. secondary leads	4 in. x 4 in. Plate	cURus Class 2
Y63T31-0 (Figure 10)	120/208/240	24	Male Fitting 8 in. primary leads	Three screw terminals (one is blind)	Foot 4 in. x 4 in. Plate[1]	cULus Class 2
Y63F22-0 (Figure 11)	277/480	24	End bell Hole 8 in. primary leads	End bell Hole 8 in. secondary leads	4 in. x 4 in. Plate	cURus Class 2
75 VA Capacity Transformers with Circuit Breakers						
Y66T12-0 (Figure 12)	120/208/240	24	Common Male Fitting 8 in. primary leads	Common Male Fitting 8 in. secondary leads	Foot	cURus Class 2
Y66T13-0 (Figure 13)	120/208/240	24	Male Fitting 8 in. primary leads	Male Fitting 30 in. secondary leads	Foot	cULus Class 2
Y66F12-0 (Figure 14)	277/480	24	Common Male Fitting 8 in. primary leads	Common Male Fitting 8 in. secondary leads	Foot	cURus Class 2
Y66F13-0 (Figure 15)	277/480	24	Male Fitting 8 in. primary leads	Male Fitting 30 in. secondary leads	Foot	cULus Class 2
92 VA Capacity Transformers with Circuit Breakers						
Y64T15-0 (Figure 16)	120/208/240	24	Male Fitting 8 in. primary leads	Female Fitting 30 in. secondary leads	Foot	cULus Class 2
Y64T21-0 (Figure 17)	120/208/240	24	End bell holes 8 in. primary leads	Three screw terminals (one is blind)	Plate	cULus Class 2
Y64T22-0 (Figure 18)	120/208/240	24	End bell Hole 8 in. primary leads	End bell Hole 8 in. secondary leads	Plate	cURus Class 2
300 VA Capacity Transformers with Circuit Breakers						
Y69T15-0 (Figure 19)	120/208/240	24	Male Fitting 8 in. primary leads	Female Fitting 30 in. secondary leads	Foot	cULus Power Transformer

1. 4 in. x 4 in. plate and nut packed with transformer.

Dimensions

Note: The following dimensions are nominal and are subject to accepted manufacturing tolerances and application variables.

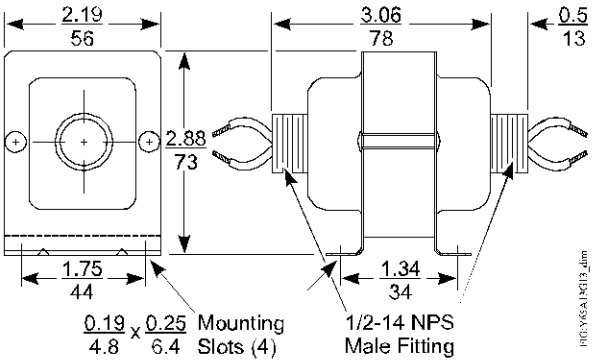


Figure 2: Dimensions for Y65A13 and Y65G13 Types, in./mm

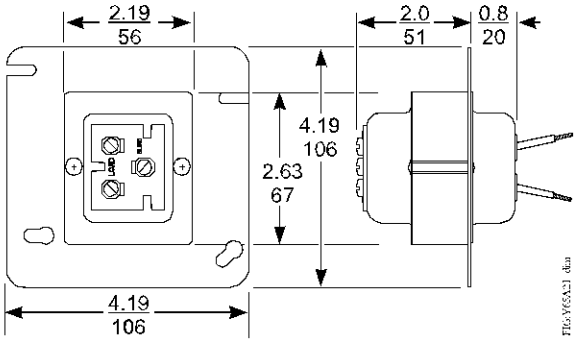


Figure 3: Dimensions for Y65A21 Type, in./mm

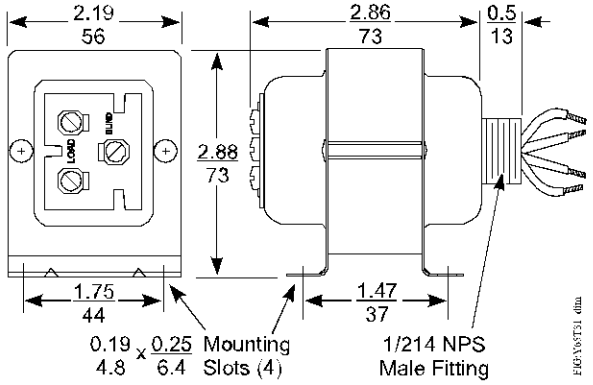


Figure 4: Dimensions for Y65T31 Type, in./mm

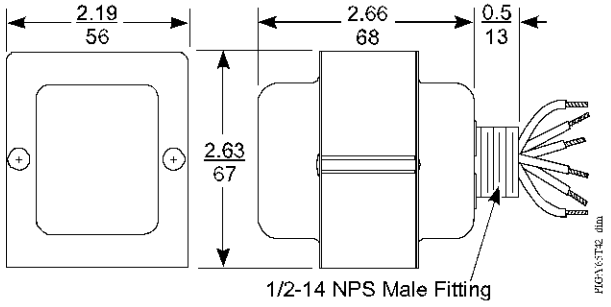


Figure 5: Dimensions for Y65T42 Type, in./mm

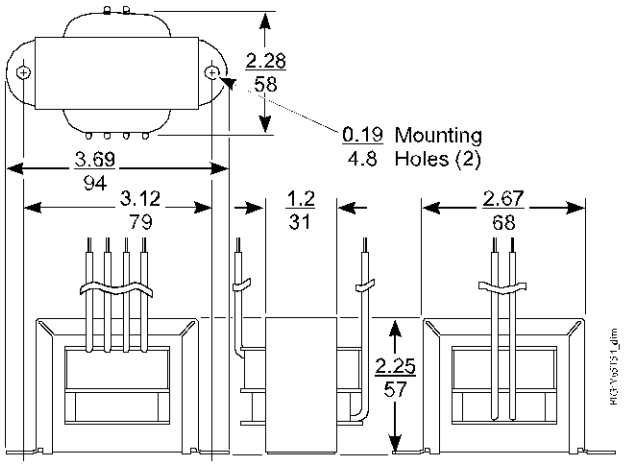


Figure 6: Dimensions for Y65T54 Type, in./mm

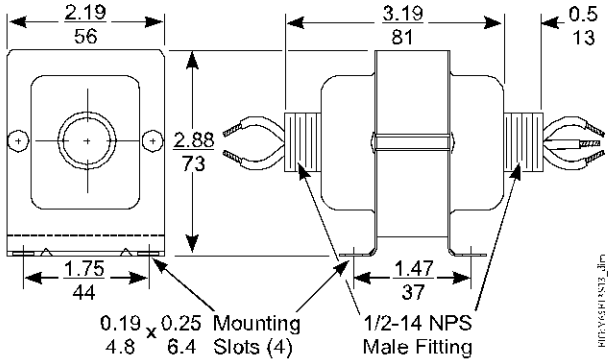


Figure 7: Dimensions for Y65F13 and Y65S13 Types, in./mm

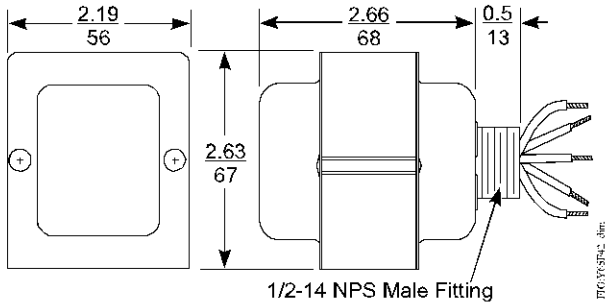


Figure 8: Dimensions for Y65F42 Type, in./mm

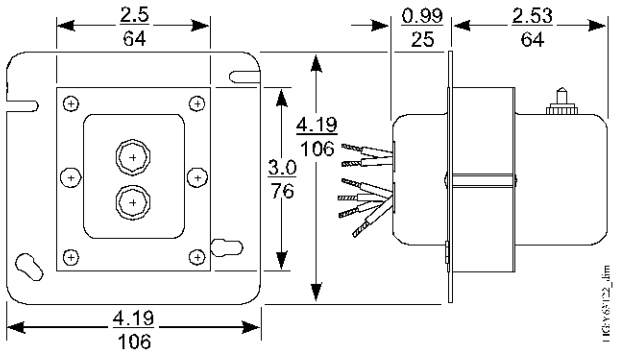


Figure 9: Dimensions for Y63T22 Type, in./mm

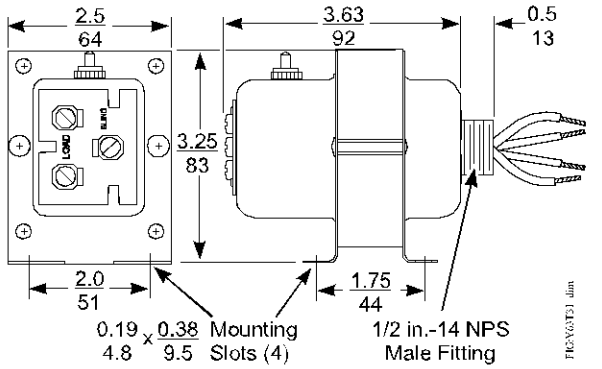


Figure 10: Dimensions for Y63T31 Type, in./mm

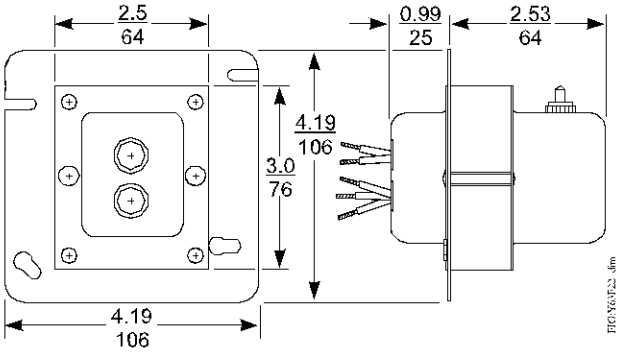


Figure 11: Dimensions for Y63F22 Type, in./mm

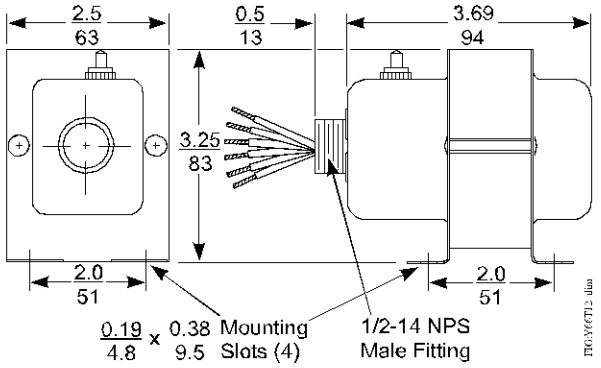


Figure 12: Dimensions for Y66T12 Type, in./mm

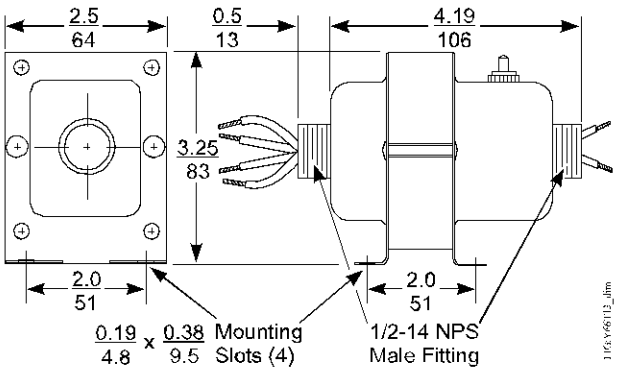


Figure 13: Dimensions for Y66T13 Type, in./mm

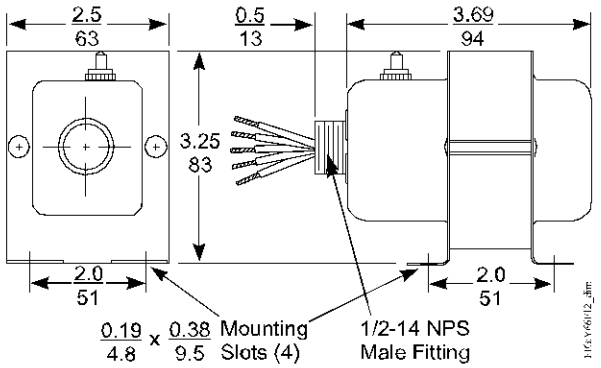


Figure 14: Dimensions for Y66F12 Type, in./mm

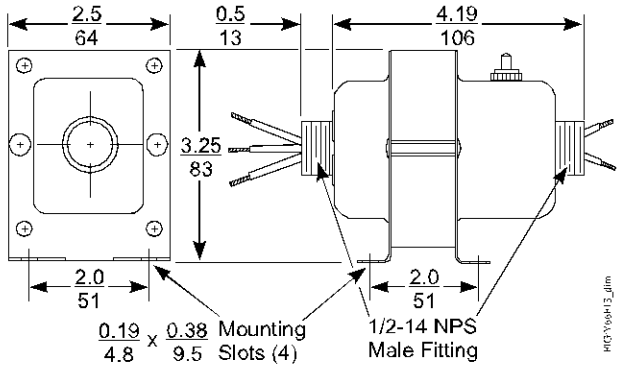


Figure 15: Dimensions for Y66F13 Type, in./mm

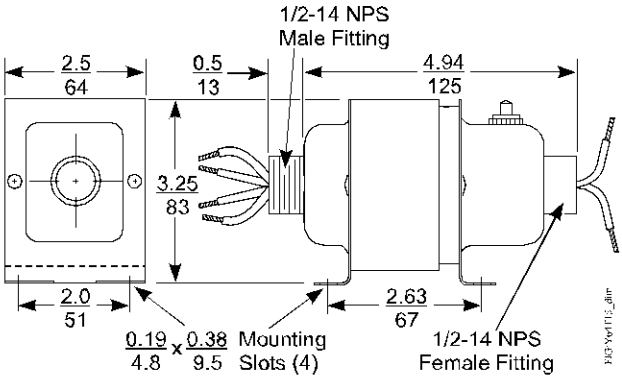


Figure 16: Dimensions for Y64T15 Type, in./mm

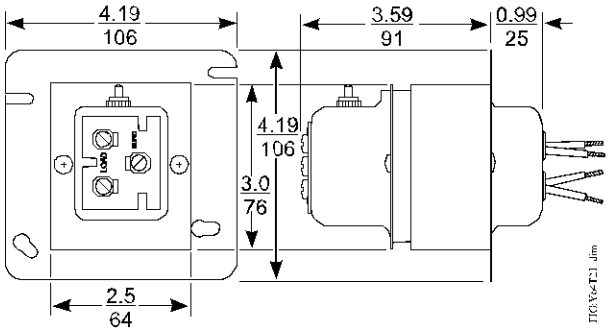


Figure 17: Dimensions for Y64T21 Type, in./mm

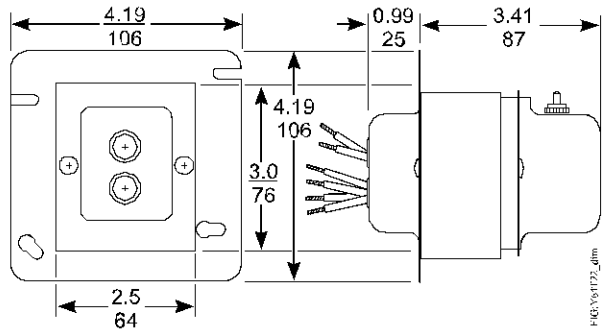


Figure 18: Dimensions for Y64T22 Type, in./mm

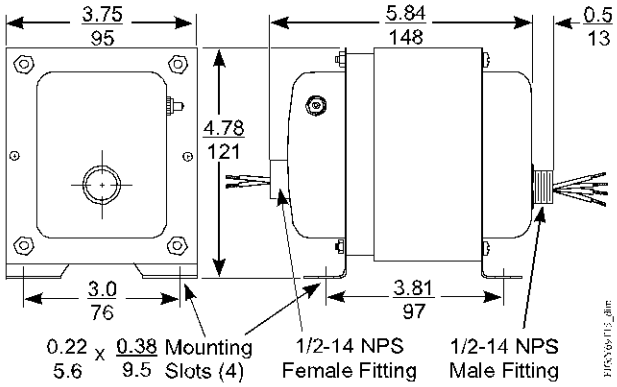


Figure 19: Dimensions for Y69T15 Type, in./mm

Repair Information

Do not make field repairs to the transformers. For a replacement transformer, contact the nearest Johnson Controls® distributor or sales representative.

Technical Specifications

Series Y63, Y64, Y65, Y66, and Y69 Transformers

Product	Series Y63, Y64, Y65, Y66, Y69 Transformers	
Input Power Requirements	24–480 VAC at 60 Hz	
Full Load Secondary Voltage	23.5 VAC (Nominal)	
Open Circuit Secondary Voltage (No Load)	27.0 VAC (Nominal)	
Full Load Secondary VA Rating	**Series** Y63 Y64 Y65 Y66 Y69	**Volt-Amperes** 50 VA 92 VA 40 VA 75 VA 300 VA
Finish	End bells, frame, feet, and mounting plates are corrosion resistant	
Ambient Operating Temperature	-40 to 104°F (-40 to 40°C)	
Ambient Storage Temperature	-40 to 140°F (-40 to 60°C)	
Shipping Weight	Y63 Y64 Y65 Y66 Y69	3.0 lb/1.4 kg 4.0 lb/1.8 kg 2.0 lb/0.9 kg 3.0 lb/1.4 kg 11.0 lb/5.0 kg
Agency Compliance	UL Listed Y63, Y64, Y65, Y66; File E95575, CCN's XOKV (US) and XOKV7 (Canada) UL Recognized Y63, Y64, Y65, Y66; File E95575, CCN's XOKV2 (US) and XOKV8 (Canada) UL Listed Y69; File E95138, CCN's XPTQ (US) and XPTQ7 (Canada) All transformers are Class 2 except the Y69 (300 VA), which is listed as a power transformer.	

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office or call 1-800-275-5676. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Johnson Controls

Building Efficiency
507 E. Michigan Street, Milwaukee, WI 53202

Published in U.S.A. www.johnsoncontrols.com