14-1201-5 Rev. X

# VG1000 Series Forged Brass Ball Valves

## Installation Instructions

**Part No. 14-1201-5, Rev. X**
**Issued December 2018**

Refer to the QuickLIT website for the most up-to-date version of this document.

## 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.

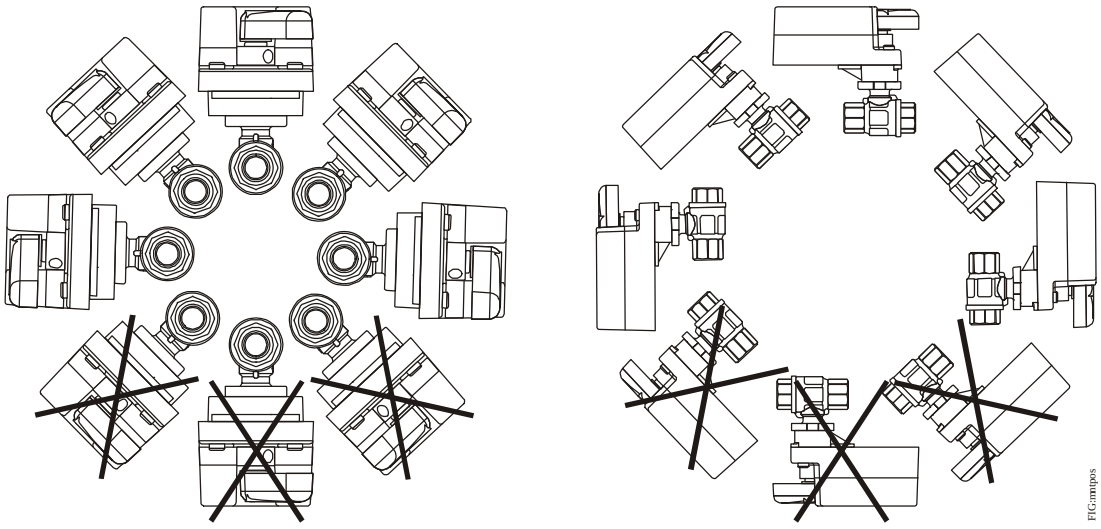
**IMPORTANT:** In steam applications, install the valve with the stem horizontal to the piping. Failure to follow these guidelines may shorten the life of the actuator.

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)**

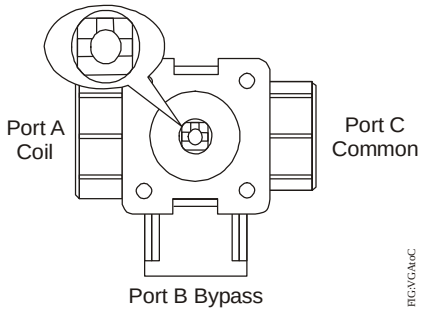



**Figure 3: VG1841 or VG1845 Series Three-Way Ball Valve (Port B Connected to Port C)**

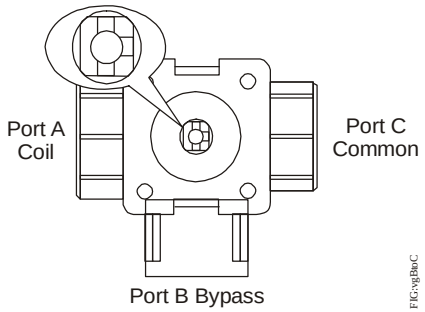
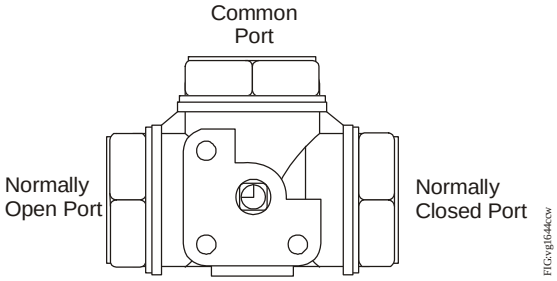



**Figure 4: Top View of VG1644 Series Three-Way Ball Valve (Actuator Fully**




**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.

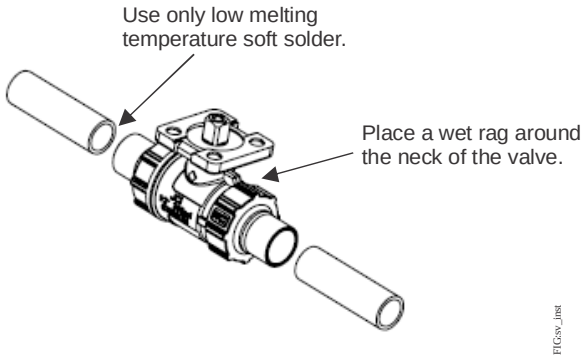
### *Press Valve Installation*

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)**

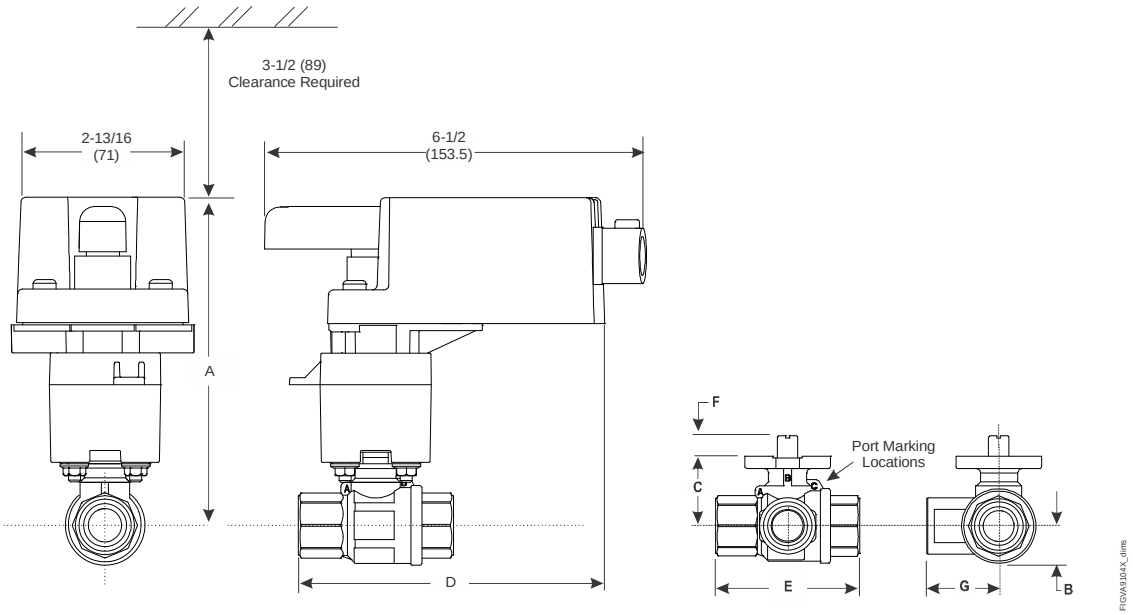



**Table 1: VA9104 or M9104 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-551 Linkage Dimensions, in. (mm)**

| 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)**

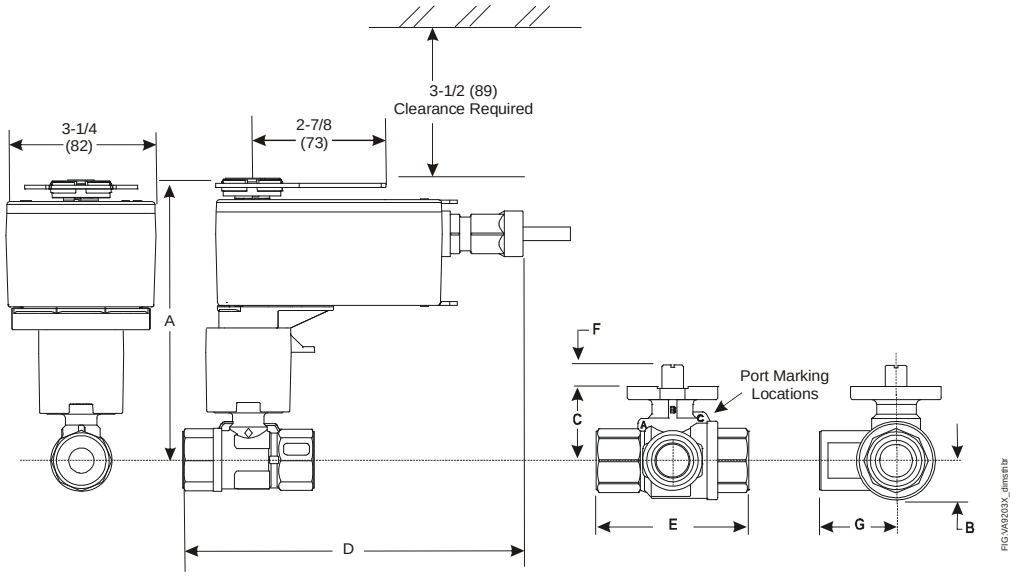



**Table 3: VA9203 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with NPT End Connections Dimensions, in. (mm)**

| 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)**

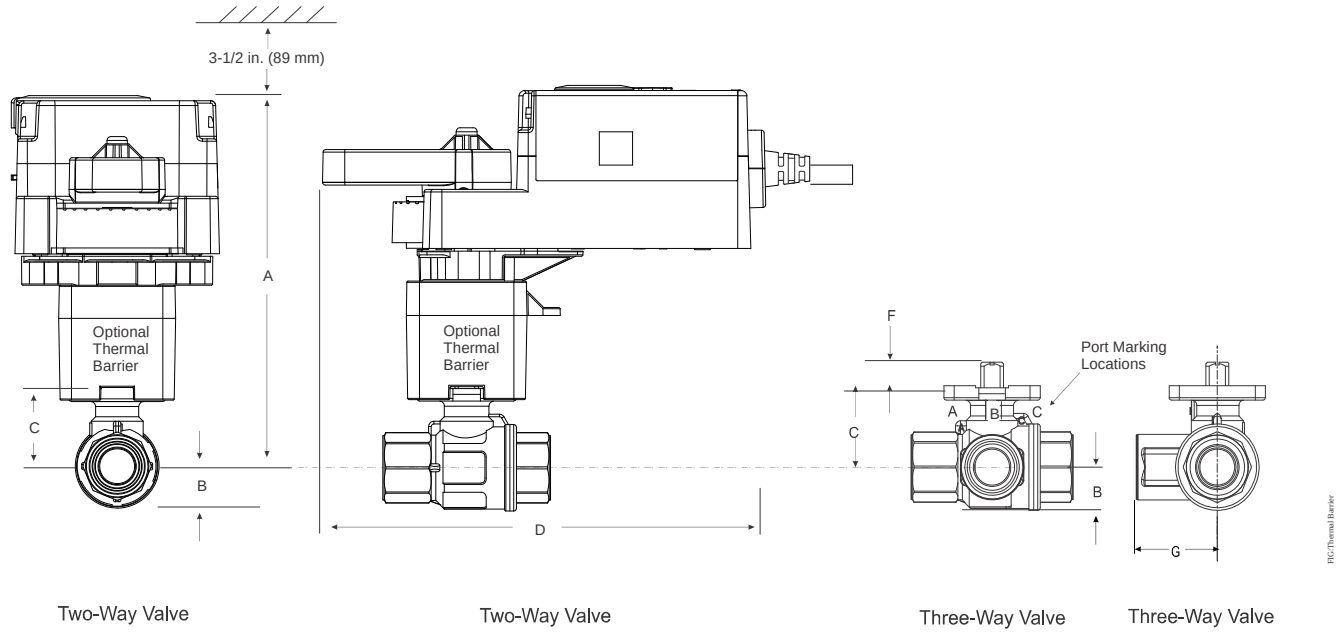



**Table 5: VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Dimensions, in. (mm)**

| 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)**

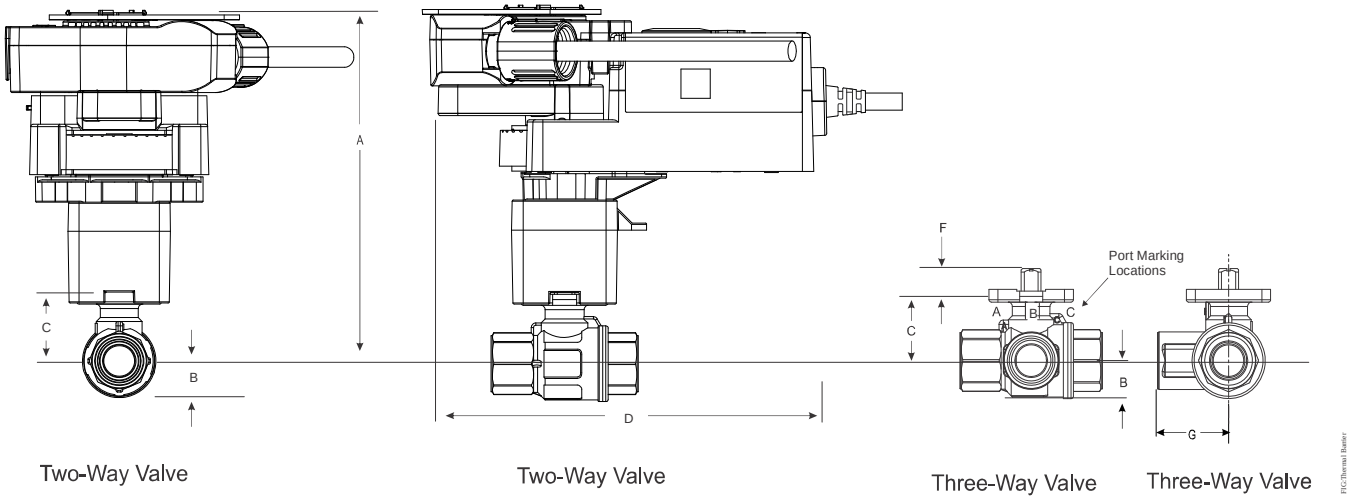



**Table 6: VA9300 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier and M9300-2 Switch Kit Dimensions, in. (mm)**

| 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)**

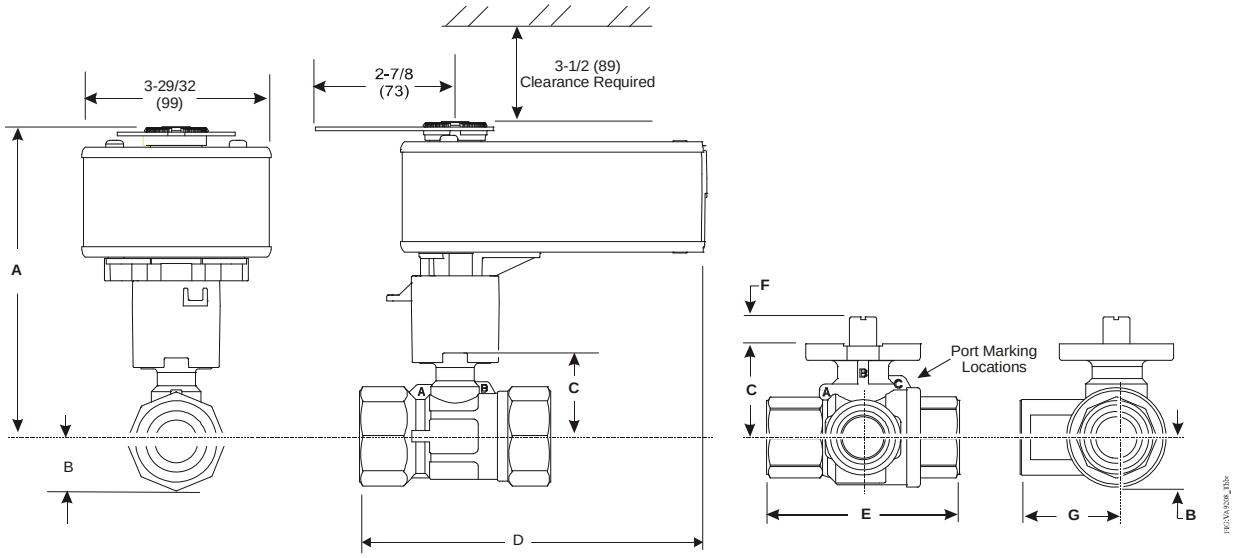


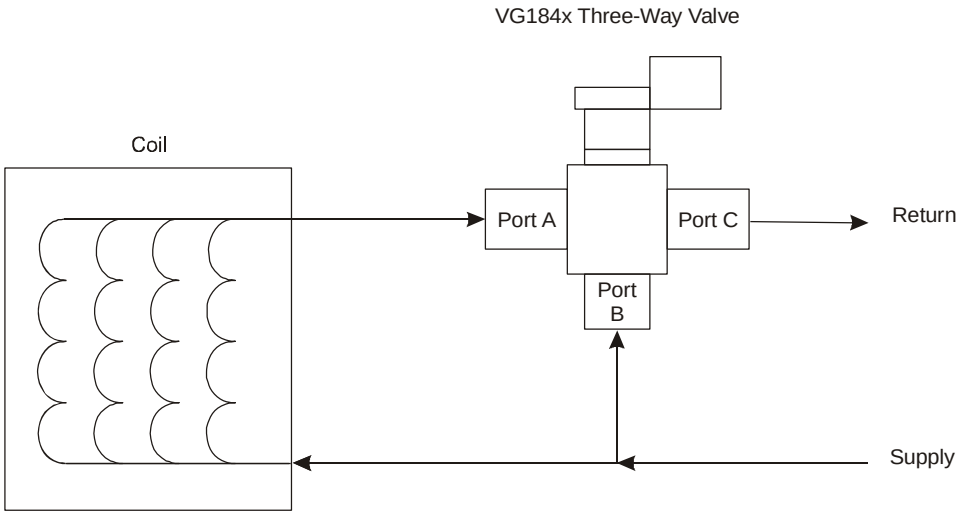

**Table 7: VA9208 Actuated VG1241, VG1245, VG1841, and VG1845 Series Ball Valve with Optional M9000-561 Thermal Barrier Installed Dimensions, in. (mm)**

| 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) |

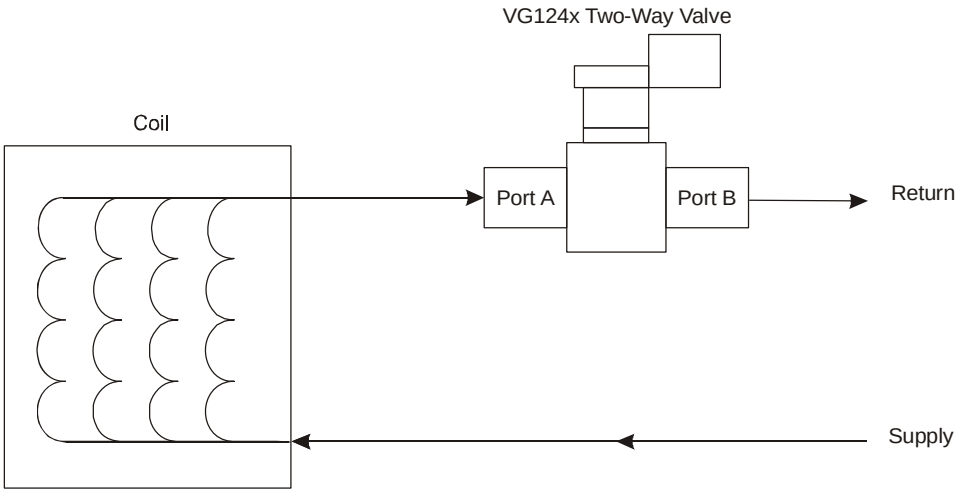
1. Port A must always be connected to the coil.

## Piping

**Figure 11: Typical VG1000 Piping**




**Typical Three-Way Ball Valve Application**




**Typical Two-Way Ball Valve Application**

FIG-VG1000_typpip

**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** 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.

**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

## 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)<br>**VG12x5 and VG18x5 Series:** -22 to 284°F (-30 to 140°C) |
| | Steam | **VG12x1 Series:** Not Rated for Steam Service<br>**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:**<br>580 psig (4,000 kPa) at 203°F (95°C) (PN40)<br>464 psig (3,196 kPa) at 284°F (140°C) (PN40) |
| | | **VG1275 and VG1875 Series:**<br>300 psig (2,067 kPa) |
| | | **VG1295 and VG1895 Series:**<br>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<br>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<br>VA9203 and VA9208 Series Spring Return Actuators |
| **Leakage** | | 0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4<br>(Two- and Three-Way Control Port)<br>1% of Maximum Flow for Three-Way Bypass Port |
| **End Connections** | | National Pipe Thread (NPT): 1/2 to 2 in. (DN15 to DN50)<br>Sweat: 1/2 to 1 in. (DN15 to DN25)<br>Use a low melting point solder.<br>Press (ProPress compatible): 1/2 to 1 in. (DN15 to DN25)<br>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<br>VG12x5 and VG18x5 Series: 300 Series Stainless Steel |
| | Blowout-Proof Stem | VG12x1 and VG18x1 Series: Nickel Plated Brass<br>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...):<br>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.


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*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.*


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