

SECTION 230923.11 – CONTROL VALVES

1.1 GENERAL

Control valves assemblies shall be provided and delivered from a single manufacturer as a complete assembly. The manufacturer shall warrant all components for a period of 5 years from the date of production with the first two years unconditional.

1.2 BALL-STYLE CONTROL VALVES

- A. Manufactured, brand labeled or distributed by Belimo.
- B. Piping Package Option **NPS 2 (DN 50)** and smaller: Furnish a piping package with the control valve assembly, package to be supplied by the valve manufacturer, components as follows: the supply side of the coil shall contain a strainer/shut-off ball valve/drain [an integrated isolation ball valve/manual air vent] with P/T port; the return side of the coil shall contain a union fitting with a P/T port, ball-style control valve, an integrated manual balancing valve/union/isolation ball valve/manual air vent with P/T port. Isolation valves furnished as an integrated part of the ball-style control valve shall not be permitted. **[For ball valves with two ports, supply an integrated 100% port isolation valve/manual air vent with P/T port for field installation in the bypass of the circuit.] [A [12"] [24"] flexible hose set shall be provided for each coil supply and return connection.]**
- C. 2-way Ball Valve with Characterizing Disc
1. Materials:
 - a. Body:
 - 1) **NPS 2 (DN 50)** and smaller: Nickel plated (forged) brass;
 - 2) **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: Cast iron GG25.
 - b. Ball:
 - 1) **NPS ½, ¾ (DN 15, 20)**: **[Chrome Plated Brass]** or **[Stainless steel]**;
 - 2) **NPS 1 (DN 25)** through **NPS 6 (DN 150)**: Stainless steel.
 - c. Seats/Seals:
 - 1) PTFE (Teflon™), (2) EPDM O-rings.
 - d. Stem/Extension/Seals:
 - 1) **[Nickel plated brass]** or **[Stainless steel]** to match ball;
 - 2) Lubricated EPDM O-Rings (2).
 - e. Characterizing Disc:
 - 1) **NPS 2 (DN 50)** and smaller: PTFE (Tefzel™);
 - 2) **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: Stainless steel.
 2. Piping Connections:
 - a. **NPS 2 (DN 50)** and smaller: (2), female NPT.
 - b. **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: (2), flanged, **[ANSI Class 125B]** or **[ANSI Class 250]**
 3. Media: Water (maximum 60% aqueous propylene glycol solution).
 4. Performance:
 - a. Media Temperature:
 - 1) **NPS 2 (DN 150)** and smaller: **0°F to 250 °F (-18°C to 120°C)**;
 - 2) **NPS 2-1/2 (DN 65)** through **NPS 3 (DN 80)**: **0°F to 212°F (-18°C to 100°C)**;

- 3) **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: **0°F** to **250 °F** (**-18°C** to **120°C**).
 - b. Pressure:
 - 1) Body:
 - a) **NPS ½, ¾, 1, 1-1/4 (DN 15 to DN 32)**: **600 psig (4137 kPa)**;
 - b) **NPS 1-1/4, 1-1/2, 2 (DN 32 to DN 50)**: **400 psig (2758 kPa)**;
 - c) **NPS 2-1/2, through NPS 6 (DN 65 to DN 150)**: **400 psig (2758 kPa)**;
 - d) **NPS 2-1/2 through NPS 6 (DN 65 to DN 150)**: In accordance with **[ANSI Class 125B]** or **[ANSI Class 250]**.
 - 2) Maximum Operating Differential: **50 psid (345 kPa)**;
 - 3) Close-off (valve and actuation assembly):
 - a) **NPS ½ through NPS 2 (DN 15 to DN 50)**: **200 psid (1379 kPa)**;
 - b) **NPS 2-1/2 and NPS 3 (DN 65, DN 80)**: **100 psid (689 kPa)**;
 - c) **NPS 2-1/2 through NPS 6**: ANSI Class 125B: **175 psid (1206 kPa)**; ANSI Class 250: **310 psid (2137 kPa)**.
 - c. Leakage (A-AB): 0%.
5. Labeling: Valve body shall be furnished with a label containing the following data:
- a. Manufacturer's name and model number;
 - b. Nominal size.
- D. 2-way High Temperature Ball Valve with Characterizing Disc
1. Materials:
 - a. Body: DZR Brass;
 - b. Ball: Stainless steel;
 - c. Seats/Seals: ETFE, FKM O-ring (Viton™);
 - d. Stem/Seals: Stainless steel, EPDM O-ring;
 - e. Characterizing Disc: ETFE (Tefzel™).
 2. Piping Connections:
 - a. **NPS 1 (DN 25)** and smaller: (2), female NPT.
 3. Media: Steam (≤ 15 psig), Water (maximum 60% aqueous propylene glycol solution).
 4. Performance:
 - a. Media Temperature:
 - 1) Steam: Maximum **250°F (121°C)**;
 - 2) Water: **60°F to 266°F (16°C to 130°C)**.
 - b. Pressure:
 - 1) Body: **600 psi (4.1 MPa)**;
 - 2) Maximum Operating Differential:
 - a) Steam: **15 psid (103 kPa)**;
 - b) Water: **60 psid (414 kPa)**.
 - 3) Maximum Inlet: **15 psig (103 kPa)**, steam only;
 - 4) Close-off (valve and actuation assembly): **200 psid (1379 kPa)**.
 - c. Leakage: 0% (A-AB).
 5. Labeling: Valve body shall be furnished with a label containing the following data:
 - a. Manufacturer's name and model number;
 - b. Nominal size.
- E. 3-way Ball Valve with Characterizing Disc
1. Materials:
 - a. Body: Forged brass with nickel plating;

- b. Ball:
 - 1) **NPS ½, ¾ (DN 15, 20): [Chrome plated brass] or [Stainless steel];**
 - 2) **NPS 1 (DN 25) through NPS 2 (DN 50):** Stainless steel.
 - c. Stem/Extension/Seals:
 - 1) **[Nickel plated brass] or [Stainless steel]** to match ball (see E1b(1) above);
 - 2) Lubricated EPDM O-Rings.
 - d. Seat/Seals: PTFE (Teflon™), EPDM O-rings;
 - e. Characterizing Disc: ETFE (Tefzel™).
- 2. Piping Connections: **NPS 1/2 (DN 15) through NPS 2 (DN 50):** (3), female NPT.
 - 3. Media: Water (maximum 60% aqueous propylene glycol solution).
 - 4. Performance:
 - a. Inherent Flow Characteristics:
 - 1) Control port (A): Equal percentage;
 - b. Pressure:
 - 1) Body:
 - a) **NPS ½, ¾, 1, 1-1/4 (DN 15 to DN 32): 600 psig (4137 kPa);**
 - b) **NPS 1-1/4, 1-1/2, 2 (DN 32 to DN 50): 400 psig (2758 kPa);**
 - 2) Maximum Operating Differential: **50 psid (345 kPa);**
 - 3) Close-off (valve and actuation assembly): **200 psid (1379 kPa).**
 - c. Leakage:
 - 1) A-B: 0%;
 - 2) B-AB: 2% of maximum rated valve C_v.
 - 5. Labeling: Valve body shall be furnished with a label containing the following data:
 - a. Manufacturer's name and model number.
 - b. Nominal size.

F. 2-way and 3-way Reduced Port Ball Valve:

- 1. Materials:
 - a. Body: Forged brass
 - b. Ball: Chrome plated brass
 - c. Seats/Seals: PTFE (Teflon™), EPDM O-Rings
 - d. Stem/Extension/Seals: Brass, lubricated EPDM O-rings (2)
- 2. Piping Connections: **NPS 1 (DN 25)** and smaller: **[Female NPT] or [Brazed].**
- 3. Media: Water (maximum 60% aqueous propylene glycol solution).
- 4. Performance:
 - a. Inherent Flow Characteristics:
 - 1) 2-way: Equal percentage;
 - 2) 3-way diverting: Linear.
 - b. Media Temperature: **0°F to 212 °F (-18°C to 100°C);**
 - c. Pressure:
 - 1) Body: **360 psig (2482 kPa);**
 - 2) Maximum Operating Differential: **40 psid (276 kPa);**
 - 3) Close-off (valve and actuation assembly);
 - a) 2-way: **75 psid (517 kPa);**
 - b) 3-way: **40 psid (276 kPa).**
 - d. Leakage: 0%.
- 5. Labeling: Valve body shall be furnished with a label containing the following data:
 - a. Manufacturer's name and model number;
 - b. Nominal size.

G. 6-way Ball Valve with Characterizing Discs

1. Materials:
 - a. Body: Nickel plated brass;
 - b. Ball: Chrome plated brass;
 - c. Stem/Extension/Seals: Nickel plated brass, EPDM O-rings (2);
 - d. Seat/Seals: PTFE (Teflon™), EPDM O-rings;
 - e. Characterizing Disc: Chrome plated steel.
2. Piping Connections: **NPS 1/2 (DN 15)** through **NPS 1 (DN 25)**; (6), Female NPT.
3. Media: Water (maximum 60% aqueous propylene glycol solution).
4. Performance:
 - a. Media Temperature: **43°F to 180 °F (6°C to 82°C)**;
 - b. Pressure:
 - 1) Body: **232 psig (16 kPa)**;
 - 2) Maximum Operating Differential: **15 psid (103 kPa)**;
 - 3) Close-off (valve and actuation assembly): **50 psid (345 kPa)**.
 - c. Leakage: 0%.
5. Labeling: Valve body shall be furnished with a label containing the following data:
 - a. Manufacturer's name and model number;
 - b. Nominal size.

1.3 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

- A. Manufactured, brand labeled or distributed by Belimo.
- B. Agency Listings: ISO 9001, UL 873 or UL 60730, CE, and CSA.
- C. The valve assembly (control valve and actuator) shall be provided and delivered from a single manufacturer.
- D. The manufacturer shall warrant all components for a period of 5 years from the date of production with the first two years unconditional.
- E. Type: Motor operated, with gears, electric and electronic.
- F. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.
- G. Actuators for Steam Control Valves: Shutoff against [1.2] [1.5] <Insert number> times steam design pressure.
- H. Voltage:
 1. [See Drawings] [Voltage selection is delegated to professional designing control system] [24 V] [120 V] [230 V] <Insert requirement>.
 2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage and temperatures.
- I. Two-Position Actuators: Single direction, spring return or reversing type.
 1. Low voltage actuators [24 V] or wide range line voltage [120-230 V] or Universal voltage [24-230 V]

J. Modulating Actuators:

1. Capable of stopping at numerous points across full movement range, and starting in either direction from any point in range.
2. Control Input Signal:
 - a. Three Point, Tristate, or Floating Point: One input drives actuator towards open position, and other input drives actuator towards closed position. No signal to either input actuator remains in last position.
 - b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for **[zero- to 10] [or] [2- to 10] VDC [and] [4- to 20-mA]** signals.
 - c. Pulse Width Modulation (PWM): Actuator drives to a commanded position according to a pulse duration (length) of signal from a dry-contact closure, triac sink or source controller.
 - d. Programmable:
 - 1) Control Input, Position Feedback, Mechanical Travel, and Running Time: Factory or field software programmable without the use of actuator mounted switches.
 - 2) Adaptation: Upon adjustment of operating parameters, adaptation shall be available to initiate adaption of the input, feedback and run time, to the actual mechanical angle of rotation or travel.
 - 3) Diagnostic: Feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
 - 4) Service Data: Include, at a minimum, the ratio of the number of hours in motion and the number of hours powered.
 - e. Digital control:
 - 1) Valve actuators with built-in digital control for BACnet [MS/TP] or Modbus [RTU].
 - 2) Valve actuators with built-in digital control for BACnet [IP] or Modbus [TCP].

K. Position Feedback:

1. **[Equip] [Where indicated, equip]** two-position actuators with auxiliary switches or other positive means of a position indication signal for remote monitoring of **[open] [and] [close]** position.
2. **[Equip] [Where indicated, equip]** modulating actuators with analog position feedback through **[voltage]** signal for remote monitoring.
3. **[Equip] [Where indicated, equip]** digitally controlled [BACnet MS/TP] or [Modbus RTU] actuators with position feedback data point.
4. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

L. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Mechanical spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Electronic fail-safe shall incorporate an active balancing circuit to maintain equal charging rates among the Super Capacitors. The power fail position shall be proportionally adjustable between 0 to 100% in 10 degree increments with a 2 second **[Insert timing between 0-10 seconds]** operational delay.

- M. Integral Overload Protection:
1. Provide electronic overload protection throughout the entire operating range in both directions.
- N. Valve Attachment:
1. Attach actuator to valve drive shaft in a way that ensure maximum transfer of power and torque without slippage.
 2. Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.
 3. V-bolt dual nut clamp with a V-shaped toothed cradle; directly couple and mount to the valve bonnet stem; or ISO-style direct-coupled mounting pad.
- O. Temperature and Humidity:
1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of [**minus 22 to plus 122 deg F ((minus 30 to plus 50 deg C))**].
 2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.
- P. Enclosure:
1. Suitable for ambient conditions encountered by application.
 2. NEMA Type 1 for indoor installation in an equipment enclosure.
 3. NEMA Type 2 for indoor and protected applications.
 4. NEMA Type 4 or Type 4X for outdoor and unprotected applications.
 5. Provide actuator enclosure with a heater and controller where required by application.
- Q. Stroke Time:
1. Operate damper from fully closed to fully open within [**15**] [**60**] [**75**] [**90**] [**150**] **<Insert number>** seconds.
 2. Operate damper from fully open to fully closed within [**15**] [**60**] [**75**] [**90**] [**150**] **<Insert number>** seconds.
 3. Move damper to fail-safe position within [**5**] [**15**] [**30**] **<Insert number>** seconds.
 4. Select operating speed to be compatible with equipment and system operation.
 5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.
- R. **Optional Addressable Actuator**
1. **Controlled via BACnet MS/TP or Modbus RTU.**
 - a. Internal converter for one (optional) sensor (active sensor or switching contact) for transmission of the sensor signal to a higher-level system.
 2. **Controlled via the Cloud, BACnet IP or Modbus TCP.**
 - a. Internal converter for two (optional) sensors (passive sensor, active sensor or switching contact) for transmission of the sensor signal to a higher-level system.