

SECTION 230923.11 – CONTROL VALVES

- A. 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, except where noted, from the date of production with the first two years unconditional.

1.1 BALL-STYLE CONTROL VALVES

1. Manufactured, brand labeled or distributed by Belimo.
2. **NPS 2 (DN 50)** and Smaller: Provide a pipe package supplied by the valve manufacturer. 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. Shut-off valves 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.]**

- B. Ball Valves with Single Port and Characterized Disk:

1. Pressure Rating for **NPS 1 (DN 25)** and smaller: **600 psi (4136 kPa)**.
2. Pressure Rating for **NPS 1-1/4 (DN 32)** through **NPS 2 (DN 65)**: **400 psi (2758 kPa)**.
3. Pressure Rating for **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: **175 psi (1206 kPa)**.
4. Close-off Pressure for **NPS 2 (DN 50)** and smaller: **200 psig (1379 kPa)**.
5. Close-off Pressure for **NPS 2-1/2 (DN65)** through **NPS 6 (DN150)**: **100 psig (689 kPa)**
6. Media Temperature Range for **NPS 6 (DN150)** and smaller: **Zero to 250 deg F (Minus 18 to plus 120 deg C)**.
7. Control Port Leakage: 0%
8. Body and Tail Piece for **NPS 2 (DN 50)** and smaller: Forged brass with nickel plating.
9. Body and Tail Piece for **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: Cast iron GG25.
10. End Connections for **NPS 2 (DN50)** and smaller: NPT Female ends.
11. End Connections for **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: ANSI 125 type flange
12. Ball for **NPS 3/4 (DN 20)** and smaller: **[chrome-plated brass] [or] [stainless steel]**.
13. Ball for **NPS 1 (DN 25)** through **NPS 6 (DN 150)**: Stainless steel
14. Stem and Stem Extension:
 - a. Material: stainless steel or brass to match ball.
 - b. Blowout-proof design.
15. Ball Seats: Teflon PTFE.
16. Stem Seal: Dual EPDM O-rings (lubricated)
17. Characterizing Disc for **NPS 2 (DN 50)** and smaller: TEFZEL.
18. Characterizing Disc for **NPS 2-1/2 (DN 65)** through **NPS 6 (DN 150)**: Stainless steel
19. Flow Characteristic: Equal percentage.
20. Label each valve with following:
 - a. Manufacturer's name and model number.
 - b. Body size.
 - c. Flow directional arrow.

C. High Temperature Ball Valves with Single Port and Characterized Disk:

1. Pressure Rating for **NPS 1 (DN 25)** and smaller: **600 psi (4136 kPa)**.
2. Close-off Pressure for **NPS 1 (DN 25)** and smaller: **200 psig (1379 kPa)**.
3. Water Media Temperature Range for **NPS 1 (DN25)** and smaller: **60 to 266 deg F (plus 16 to plus 130 deg C)**.
4. Steam Media Temperature Range for **NPS 1 (DN 25)** and smaller: **Zero to 212 degF (Minus 18 to plus 100 deg C)** at 15 psi inlet pressure.
5. Body and Tail Piece for **NPS 1 (DN 25)** and smaller: Forged brass with nickel plating.
6. End Connections for **NPS 1 (DN25)** and smaller: NPT female ends.
7. Ball for **NPS 1 (DN 25)** and smaller: Stainless steel.
8. Stem and Stem Extension:
 - a. Material: stainless steel.
 - b. Blowout-proof design.
9. Ball Seats: ETFE.
10. Stem Seal: Dual EPDM O-rings (lubricated)
11. Characterizing Disc: TEFZEL.
12. Flow Characteristic: Equal percentage.
13. Label each valve with following:
 - a. Manufacturer's name and model number.
 - b. Body size.
 - c. Flow directional arrow.

D. Ball Valves with Two Ports and Characterized Disk:

1. Pressure Rating for **NPS 1 (DN 25)** and smaller: **600 psi (4136 kPa)**.
2. Pressure Rating for **NPS 1-1/4 (DN 32)** through **NPS 2 (DN 50)**: **400 psi (2758 kPa)**.
3. Close-off Pressure: **200 psig (1379 kPa)**.
4. Process Temperature Range: **Zero to 250 deg F (Minus 18 to plus 120 deg C)**.
5. Control Port Leakage: 0%
6. Body and Tail Piece: Forged brass with nickel plating.
7. End Connections: NPT female ends.
8. Ball for **NPS 3/4 (DN 20)** and smaller: **[chrome-plated brass] [or] [stainless steel]**.
9. Ball for **NPS 1 (DN 25)** through **NPS 2 (DN 65)**: Stainless steel
10. Stem and Stem Extension:
 - a. Material: stainless steel or brass to match ball.
 - b. Blowout-proof design.
11. Ball Seats: Teflon PTFE.
12. Stem Seal: Dual EPDM O-rings (lubricated)
13. Characterizing Disc for **NPS 1 (DN 25)** and smaller: TEFZEL.
14. Characterizing Disc for **NPS 1-1/4 (DN 32)** through **NPS 2 (DN 50)**: TEFZEL or stainless steel
15. Flow Characteristics for A-Port: Equal percentage.
16. Flow Characteristics for B-Port: Modified for constant common port flow.
17. Label each valve with following:
 - a. Manufacturer's name and model number.
 - b. Body size.
 - c. Flow directional arrow

E. Ball Valves with Six Ports and Two Characterized Disks:

1. Pressure Rating for **NPS 3/4" (DN 20)** and Smaller: **232 psi (1600 kPa)**.
2. Close-off Pressure: **50 psig (345 kPa)**.
3. Process Temperature Range: **43 degF to 180 deg (6 to 82 deg C)**.
4. Body and Tail Piece: Forged brass with nickel plating.
5. End Connections: NPT.
6. Ball for **NPS 3/4 (DN 20)** and Smaller: Chrome-plated brass.
7. Stem and Stem Extension:
 - a. Material: brass to match ball.
 - b. Blowout-proof design.
8. Ball Seats: Teflon PTFE.
9. Stem Seal: EPDM O-rings (lubricated)
10. Characterizing Disc: Chrome plated steel.
11. Flow Characteristics: Linear.
12. Leakage: 0%
13. Controllable Flow Range: Sequence 1 is 0 to 30 degree angle; Dead zone is 30 to 60 degree angle; Sequence 2 is 60 to 90 degree angle.
14. Label each valve with following:
 - a. Manufacturer's name and model number.
 - b. Body size.
 - c. Flow directional arrow
 - d. Port numbers

1.2 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

- A. Manufactured, brand labeled or distributed by Belimo.
- B. The valve assembly (control valve and actuator) shall be provided and delivered from a single manufacturer.
- C. Agency Listings: ISO 9001, cULus, CE, CSA, and UL 2043The manufacturer shall warrant all components for a period of 5 years from the date of production with the first two years unconditional.
- D. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.
- E. Actuators for Steam Control Valves: Shutoff against [1.2] [1.5] <Insert number> times steam design pressure.
- F. Position indicator and graduated scale on each actuator.
- G. Type: Motor operated, with gears, electric and electronic. Overload protected electronically throughout rotation.
- H. Voltage: [Voltage selection delegated to professional designing control system] [24-V ac] [120-V ac] <Insert requirement>.
- I. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage at the valve close-off pressure for system design.

- J. Function properly within a range of 80 to 120 percent of nameplate voltage.
- K. Two-Position Actuators: Single direction, fail safe or reversing type.
- L. Modulating Actuators:
 - 1. Operation: Capable of stopping at all points across full range, and starting in either direction from any point in range.
 - 2. Control Input Signal:
 - a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position and other input drives actuator to close position. No signal of either input 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-**]V dc [**and**] [**4- to 20-mA**] signals.
 - c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to pulse duration (length) of signal from a dry contact closure, triac sink, or source controller.
 - d. Programmable Multi-Function:
 - 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 initiated to adapt 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, number of hours powered and number of hours in motion.
- M. Position Feedback:
 - 1. [**Equip**] [**Where indicated, equip**] two-position actuators with limits 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 a position feedback through [**current**] [**or**] [**voltage**] signal for remote monitoring.
 - 3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.
- N. 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 adjustable between 0 to 100% in 10 degree increments with a 2 second [**Insert timing between 0-10 seconds**] operational delay.
- O. Integral Overload Protection:
 - 1. Provide electronic overload protection throughout the entire operating range in both directions.

- P. Valve Attachment:
1. Attach actuator to valve drive shaft in a way that ensures 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.

- Q. 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)**] <Insert temperature range>.
 2. Humidity: Suitable for humidity range encountered by application; non-condensing environment.

- R. Enclosure:
1. Suitable for ambient conditions encountered by application.
 2. NEMA Type 2 for indoor and protected applications.
 3. NEMA Type 4 or Type 4X for outdoor and unprotected applications.
 4. Provide actuator enclosure with heater and control where required by application.

- S. Stroke Time:
1. Operate valve from fully closed to fully open within [**15**] [**60**] [**75**] [**90**] [**150**] <Insert number> seconds.
 2. Operate valve from fully open to fully closed within [**15**] [**60**] [**75**] [**90**] [**150**] <Insert number> seconds.
 3. Move valve to failed position within [**5**] [**15**] [**30**] <Insert number> seconds.

1.3 Select operating speed to be compatible with equipment and system operation