

Phoenix Controls Shut-off Valves are available in two valve designs: standard (Option S) and lower leakage (Option L). Both designs are intended for use in critical airflow applications, where isolating the HVAC system from the room is necessary.

Under normal operation, a Shut-off Valve provides the critical airflow control performance demanded by a modern research facility. In the shut-off mode, it provides low-leakage isolation of the HVAC system from the room. An example of a typical application is a laboratory research building space using gaseous biodecontamination.

**FEATURES**

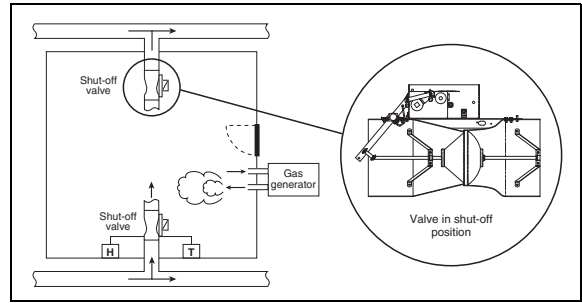
- The shut-off sequence can be initiated either locally through a universal input or remotely via the Celeris® network—either from the building management system (BMS) or Local Display Unit (LDU).
- The valve can function as a standalone device or in a fully integrated system.
- Celeris valve controllers provide room pressurization, temperature, humidity, occupancy and emergency control functions.
- Precise airflow control—The factory-calibrated flow rate controller performs accurately throughout its operating range.
- Self-balancing pressure-independent operation—The valve maintains the airflow set point by compensating automatically for static pressure fluctuations in the system.

**Low-leakage Shut-off Valve**

The Low-leakage Shut-off Valve accommodates applications requiring a near bubble-tight ventilation system for critical environments, needing emergency isolation or gaseous biodecontamination. This valve has been tested with ASME N510’s pressure decay method.\*

In many projects, the duct volume entering and exiting these critical spaces must be leak tested to ensure they are truly isolated. Most governing standards consider an acceptable leakage rate from 0.1 to 0.2% of volume per minute of the duct volume at a given pressure. The Low-leakage Shut-off Valve contributes minimally to the overall volume tested. This insignificant leakage volume, combined with the valve’s ability to control airflow precisely and compensate instantly to changes in pressure, makes the Low-leakage Shut-off Valve the ideal choice for these critical applications.

\* Source: American Society of Mechanical Engineers (ASME), *ASME N510, Testing of Nuclear Air-Treatment Systems*, 1989 (reaffirmed 1995).



Typical room setup for biodecontamination.

| FEATURE/OPTION                  | EXV/MAV                                |  |
|---------------------------------|--|--|
|                                 | L                                      | M                                      |
| Control type                    | L                                      | M                                      |
| Actuator type                   | Low-speed electric                     | High-speed electric                    |
| Response time                   | < 1 minute                             | < 1 second                             |
| Control platform                | Celeris, Theris, Tracel                | Celeris                                |
| Failsafe                        | Fail to last position                  | NO/NC/Last Position                    |
| Shut-off mode activation        | Local UI or remote via Celeris network | Local UI or remote via Celeris network |
| Flow alarm via feedback circuit | ✓                                      | ✓                                      |
| Flow alarm via pressure switch  | Option                                 | Option                                 |
| Shut-off function               | ✓                                      | ✓                                      |
| Factory-insulated valve body    | Supply valve only                      | Supply valve only                      |

All valves include a pressure-independent assembly, factory-calibrated position controller.

**FCC COMPLIANCE**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:  
 1. This device may not cause harmful interference.  
 2. This device must accept any interference received, including interference that may cause undesired operation.

**TABLE OF CONTENTS**

Specifications ..... 2  
 Shut-off Leakage Performance..... 2  
 Valve Controllers & Options..... 5  
 Ordering Guide ..... 6  
 Wiring ..... 7  
 Maintenance ..... 10  
 References ..... 10

## SPECIFICATIONS

---

### Construction [Standard Shut-off (Option S)]

- 16 ga. spun aluminum valve body with continuous welded seam
- Valve bodies available as uncoated aluminum or with corrosion-resistant baked phenolic coatings
- Composite Teflon® shaft bearings
- Spring grade stainless steel spring and polyester or PPS slider assembly
- Supply valves insulated with 3/8 (9.5 mm) flexible closed-cell polyethylene. Flame/smoke rating 25/50. Density 2.0 lb/ft<sup>3</sup> (32.0 kg/m<sup>3</sup>).

### Construction [Low-leakage Shut-off (Option L)]

- Same construction as S Valve Design
- Cone gasket material in Class A, neoprene; Class B and C, Viton
- Seal wheel material is polypropylene

### Operating Range

- 32-122 °F (0-50 °C) ambient
- 10-90% non-condensing RH

### Performance

- Pressure independent over a 0.6" - 3.0" WC (150 - 750 Pa) drop across valve
- Volume control accurate to ±5% of airflow command signal throughout normal operating range
- No additional straight duct runs needed before or after valve
- Available in flows from 35 - 2600 CFM (60 - 2888 m<sup>3</sup>/hr)
- Shut-off leakage: See charts on pages 3 through 4.

### Power

- 24 Vac (±15%) @ 50/60 Hz

Response time:

- < 1 minute (control type L)
- < 1 second (control type M)

### Power Consumption

Singles/Dual *per valve*

- Low-speed Electric: 10 VA
- High-speed Electric: 70 VA

Notes:

1. All power consumption VA ratings listed here are based on fully-loaded I/O.

### VAV Controller

I/O:

- 3 universal inputs. Accepts volt, mA, ohms or NTC 2 or 3 thermistor signals.
- 1 digital input
- 2 analog outputs. Provides volt or mA signals.
- 1 digital output (Type C, 1 amp @ 24 Vac/Vdc)
- Input accuracy
  - Voltage, current, resistance: ±1% full scale
- Output accuracy
  - 0 to 10 Vdc: ±1% full scale into 10 kΩ minimum
  - 4 to 20 mA: ±1% full scale into 500 Ω +0/-50 Ω

### Agency Compliance

- CSA
- CE
- FCC Part 15
- FTT-10, 78 KB, bus topology, LonTalk™ network
- Building-level communications:
- TP-1250, 1.2 MB, bus or tiered topology, LonTalk™ network



Teflon is a registered trademark of DuPont Company.  
LonWorks is a registered trademark of Echelon Corporation.

## SHUT-OFF LEAKAGE PERFORMANCE

---

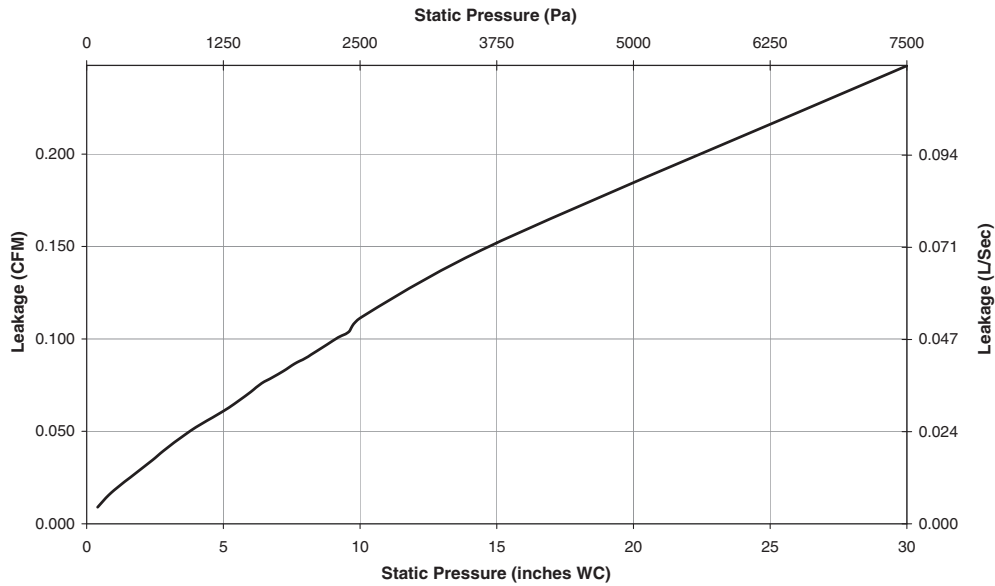
In the following graphs, the term *shut-off leakage* refers to the expected airflow through the valve in the shut-off position. The term *casing leakage* refers to the expected airflow through the penetrations of the valve body.

### Note:

- Leakage data has been provided for pressures of 5", 10" and 30". These pressures are for reference only and were recorded during leak rate testing. For details, see the following graphs.
- System pressure for valve operation shall be as specified in the Ordering Guide, Flow/Pressure Operating Range Table, 0.6"-3.0" WC on page 6.

## Casing Leakage: Shut-off Valves (Options S and L)

Single Shut-off Valves Case Leakage (Option S and L)



**Note:**

- Leakage rates shown in this graph are for all four valve sizes: 8-, 10-, 12-, and 14-inch.
- Exceeds Eurovent Class A, B, C and D specifications (Eurovent Committee of Air Handling and Equipment Manufacturers) when valve duct surface areas are taken into account.
- Option S leakage rates are for all four valve sizes (8", 10", 12", 14").
- Option L leakage rates are for 8-, 10-, and 12-inch valves only. A 14-inch low-leakage valve is not available at this time.

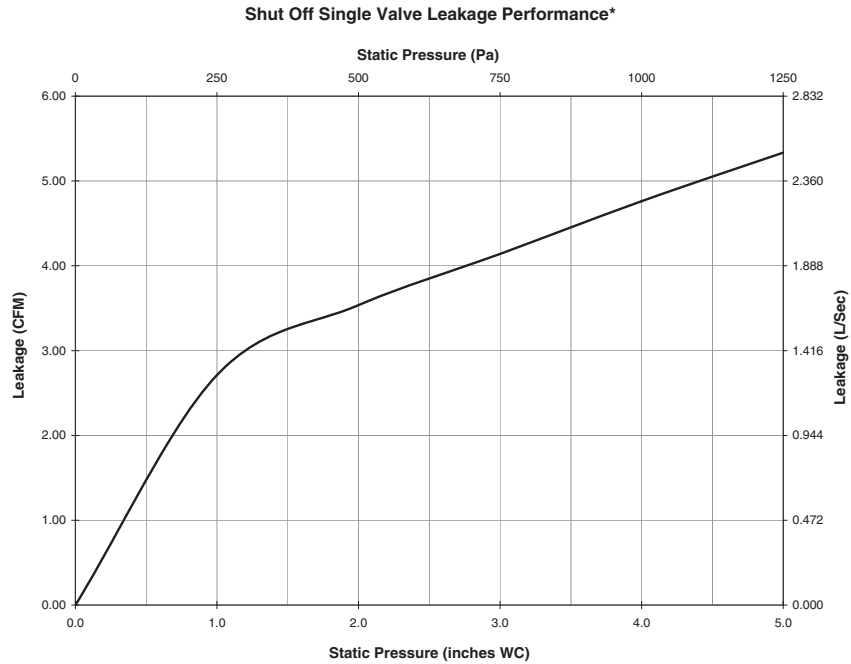
To calculate leakage areas that take into account valve and duct area, use the *Casing Leakage* graph above and the *Valve Area Specifications* table below. Select the valve leakage at the appropriate design pressure and the related valve area from the table and perform the calculation as in the following example:

$$\text{Leakage Specification} = \text{Leakage} / \text{Valve Area} = 0.150 \text{ CFM} / 3.60 \text{ ft}^2 = 0.42 \text{ CFM per ft}^2$$

### Valve Area Specifications

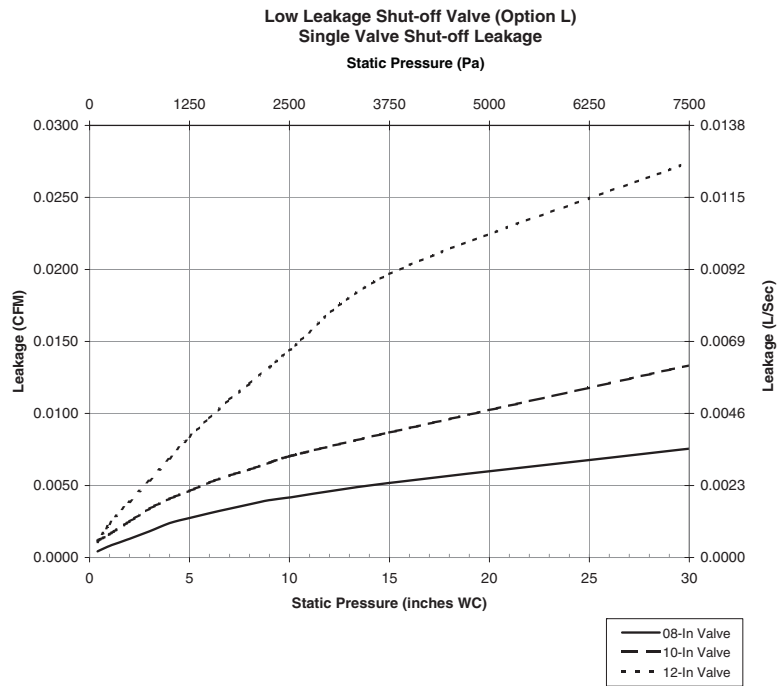
| Valve Size | Area (ft <sup>2</sup> ) | Area (m <sup>2</sup> ) |
|------------|-------------------------|------------------------|
| 8-inch     | 3.60                    | 0.33                   |
| 10-inch    | 4.26                    | 0.40                   |
| 12-inch    | 6.28                    | 0.58                   |
| 14-inch    | 8.52                    | 0.79                   |

## Shut-off Leakage: Standard Shut-off Valve (Option S)



**Note:** Leakage rates shown in this graph are for all four valve sizes: 8, 10, 12, and 14-inch.

## Shut-off Leakage: Low Leakage Shut-off Valve (Option L)



## RECOMMENDED VALVE CONSTRUCTION FOR DECONTAMINATION

| Gaseous Decontamination Agent | Recommended Valve Construction |
|-------------------------------|--------------------------------|
| Hydrogen peroxide vapor       | A                              |
| Ethylene oxide                | B                              |
| Ammonium chloride             | A                              |
| Chlorine dioxide              | A**                            |
| Paraformaldehyde              | A                              |

**Note:**  
 -See Ordering Guide > Valve Construction for details about these construction codes.  
 -Chemical resistance data acquired from Compass Corrosion Guide.  
 -\*\*For concentrations up to 800 ppm. To achieve higher concentrations during decontamination use Construction B valves.

## TYPICAL VALVE CONTROLLERS AND OPTIONS

### Valve Controller Designation

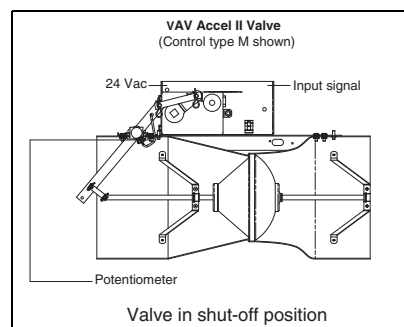
**Controller Type E**—Suitable for supply, make-up air, and general exhaust valve applications

### Valve Options *(components added to enhance a valve's functions)*

**Single square flange (SFX)**—Provides a single connection from a round single body valve to a square duct (on the inlet of single body exhaust valves; discharge of single body supply valves). Typically used in Neutralizer™ applications.

**Two square flanges (SFB)**—Transitions each end of a single body valve from a round to square duct.

**Pressure switch (PSL)**—Detects low static pressure across the valve. Installed on non-hood exhaust valves to provide low static pressure alarm monitoring.



# ORDERING GUIDE

## MAV A 1 12 M - S M E H O - PSL

### VALVE FAMILY

EXV = Celeris exhaust valve  
 MAV = Celeris supply valve (comes standard with insulation)

### VALVE CONSTRUCTION

A = Body and cone uncoated aluminum; uncoated 316 stainless steel shaft  
 B = Body and cone with baked-on phenolic coating; PFA-coated 316 stainless steel shaft  
 C = Body and cone with baked-on phenolic coating; hardware with titanium or baked-on epoxy phenolic coating; PFA-coated 316 stainless steel shaft

### NUMBER OF VALVE BODIES

F = Single valve body with welded circular flange  
 1 = One valve body no flange  
 2 = Two valve bodies as one unit (dual); 10", 12", and 14" valves only

### VALVE SIZE

08 = 8" valve (7.88"/200 mm actual diameter); see Note 1  
 10 = 10" valve (9.67"/246 mm actual diameter)  
 12 = 12" valve (11.84"/301 mm actual diameter)  
 14 = 14" valve (13.88"/353mm actual diameter); see Note 2

### FLOW/PRESSURE OPERATING RANGE

See Flow/Pressure Operating Range table below.  
 M = Medium pressure operation; pressure independent over a range of 0.6 to 3.0" WC (150 to 750 Pa), associated pressure switch trips at 0.3" WC

### VALVE OPTIONS

EVI = Exhaust valve with insulation blocks and insulation  
 IBO = Insulation blocks only, no insulation  
 PSL = Pressure switch, low limit  
 REI = Remote electronics - indoor applications only; see Note 5  
 WRE = Weather resistant electronics - outdoor applications, electric actuation only; see Note 4  
 SFB = Square flanges on both ends of single-body valves  
 SFX = Single square flange mounted on either the exhaust inlet or supply discharge

### FAIL-SAFE POSITION

C = Normally closed  
 O = Normally opened  
 Z = Fails to last position

### VALVE ORIENTATION

H = Horizontal  
 U = Vertical upflow  
 D = Vertical downflow

### VALVE CONTROLLER DESIGNATION

E = Electronic controller  
 H = Hood exhaust valve with pressure switch; see Note 3

### CONTROL TYPE

Pneumatic actuation is not available on standard or low-leakage shut-off valves  
 I = IP54 low-speed electric; only available on single-body valves in sizes 0, L = Low-speed electric  
 M = High-speed electric

### VALVE DESIGN

S = Standard shut-off valve (metal-on-metal seal); see Note 1  
 L = Low leakage shut-off valve (gasketed seal); see Notes 1, 2

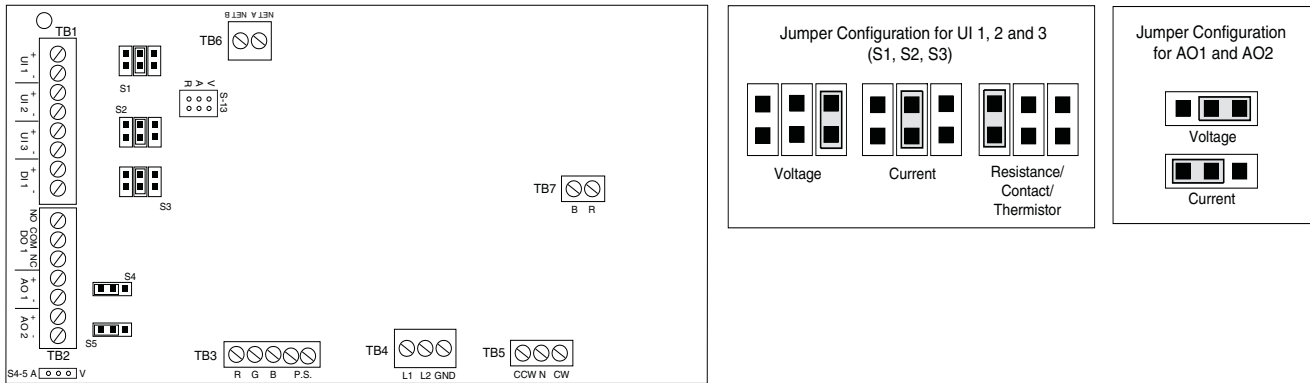
### FLOW/PRESSURE OPERATING RANGE FOR SHUT-OFF VALVE DESIGNS S AND L

| Designation         | Size | Operating Range in CFM (m3/hr) |                        | Pressure Drop Across Valve  |
|---------------------|------|--------------------------------|------------------------|-----------------------------|
|                     |      | Single                         | Dual                   |                             |
| M = Medium Pressure | 08"  | 35-600<br>(60-1015)            | —                      | 0.6-3.0" WC<br>(150-750 Pa) |
|                     | 10"  | 50-850<br>(85-1440)            | 100-1700<br>(170-2880) |                             |
|                     | 12"  | 90-1300<br>(155-2205)          | 180-2600<br>(310-4410) |                             |
|                     | 14"  | 200-1600<br>(340-2715)         | 400-3200<br>(680-5430) |                             |

### NOTES:

- 8-inch shut-off valves (Design = S or L) are only available as uncoated (Construction = A).
- 14-inch valves are currently not available as low-leakage shut-off (Design = L).
- Celeris hood valves cannot have low-speed actuators (Control Type = L or I).
- Option WRE: Weather Resistant Electronics, outdoor installations. Applies to ELECTRICALLY actuated valves with sufficient IP ratings only (Control = I or M only for single-body valves; Control = L or M only for multi-body valves). HORIZONTAL orientation ONLY.
  - Includes sealed Vpot and large weather-resistant IP66 box mounted on base channel that houses the controller and all electric connections to/from it.
  - When used in Low-Speed Electric applications for 08", 10", and 12" single-body valves, WRE must ALSO be ordered with Control Type = I (IP54 actuator) in place of the standard Control Type L.
  - When used in High-Speed Electric applications, standard actuators are sufficient (Control Type = E or M) since they are IP56 actuators.
  - REQUIRES use of a dog house enclosure, provided by others, to protect valve from the elements and maintain temperature and humidity conditions within Phoenix specifications.
- Option REI: Remote Electronics, Indoor installations ONLY. The distance to the valve controller is limited to:
  - 40 inches (1 meter) of 18 gauge cable for high-speed electric actuators (Control Type = M).
  - 150 feet (45.7 meters) of 22 gauge cable for low-speed electric actuators (Control Type = L or I).

**WIRING** (See submittal wiring diagram for project-specific details.)



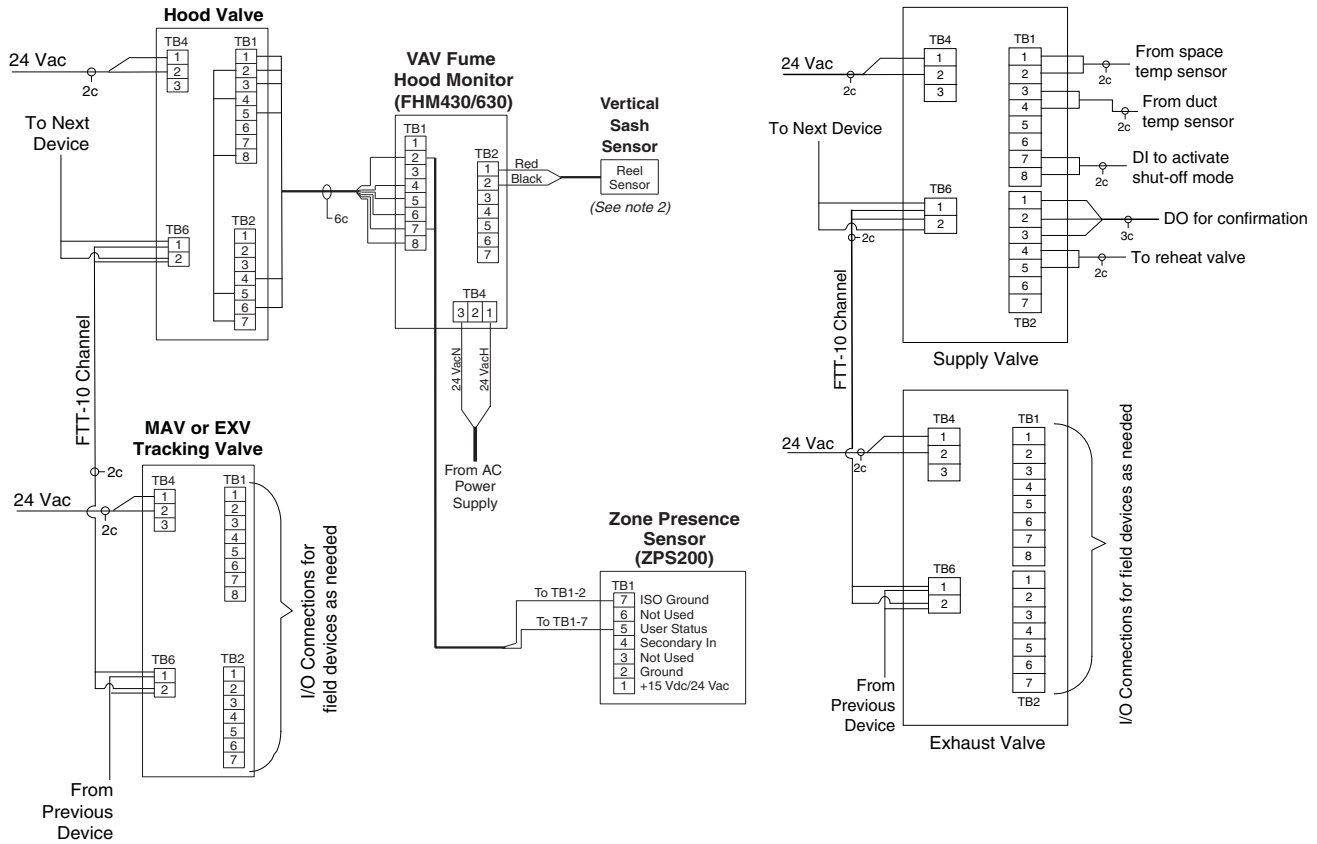
**Note:**

- Power—14 AWG (Controller Type M). High-speed electric valves must be connected in a star configuration.
- Power—18 AWG (Controller Type L).
- Control signal—22 AWG multi conductor, twisted pair.
- Communication—22 AWG level 4; 16 AWG Belden 8471 (or equivalent).
- Each termination block (except TBs 3, 5, 7) uses an unpluggable connector with screw-down terminations for ease of installation.

**TERMINAL BLOCKS—CELERIS VALVE CONTROLLERS**

| Terminal Block | Typical Function               | No. of Terminations |
|----------------|--------------------------------|---------------------|
| TB1            | Input Connections              | 8                   |
| TB2            | Output Connections             | 7                   |
| TB3            | vPot & Pressure Switch         | 5                   |
| TB4            | Power (24 Vac Input)           | 2                   |
| TB5            | Actuator (control type L only) | 3                   |
| TB6            | Communication (FTT-10)         | 2                   |
| TB7            | Actuator (control type M only) | 2                   |

## Typical Wiring Diagram: Hood Application Tracking Pair



### Notes:

1. Eight-conductor wire is Belden 9421 (22 AWG) or equivalent. (Tape back unused conductors.)
2. Sash sensor is provided with two-conductor cable. See combination sash sensors for exception.

## Network Wiring

### Room-level Network

Echelon Corporation has tested and approved 5 cables types for use with the FTT10 communications transceiver. Based on availability, cost and maximum distance limitations, we have focused our recommendation on two cable types:

- Generic NEMA level 4 cable, 22 AWG (0.65 mm)\*
- Belden 8471 16 AWG (1.3 mm) cable, (or equivalent)

*NOTE: \*Level 4 cable specified by Echelon as originally defined by the NEMA differs from the Category 4 specification proposed by the Electronic Industries Association/Telecommunication Industry Association (EIA/TIA).*

The cables Phoenix Controls recommends are two-conductor, twisted-pair (TP) without a shield. A shield, or drain wire, is not required for Celeris communications wiring and should not be used. Both of these cables are available from multiple sources either solid or stranded, in plenum and non-plenum rated versions.

- If two conductors are to be placed in a terminal opening, twist the bare conductors prior to inserting these in the terminal opening.
- If a wall-mounted sensor with a communications jack is used, the connections to the jack must be treated as either a bus connection or an EOL connection.
- While the room-level communications wiring is not polarity sensitive, it is recommended that a consistent color-coding and polarity convention be followed.
- Each terminal on the terminal block will accommodate up to two 16 AWG (1.3 mm) stranded conductors.
- Communications connections are to be made following a bus or daisy chain topology.
- Two end-of-line (EOL) terminators must be installed, one at each end of the room-level network.

### Maximum Cable Lengths

- When using Level 4 cable operating in a bus topology, the maximum cable length is 4500 feet (1370 meters).
- When using 16 AWG cable operating in a bus topology, the maximum cable length is 8800 feet (2680 meters).

### Phoenix Controls Wiring Recommendations

- Use cables recommended by Phoenix Controls.
- Stranded wire is strongly recommended for ease of installation.
- Follow good wiring practices:
  - Do not run the communications cable in the same conduit or wire way as the power cables.
  - If the communications cables must cross power cables, it is best to do so at a 90-degree angle.
  - Shield or drain wires, if present, should be wrapped with insulating tape to prevent contact with exposed conductors or contacts.
  - Maintain a consistent color code or polarity all the way through the wiring system.
  - All connections must meet the requirements of an NEC Class 2 circuit.
  - Local and national electrical codes take precedence.

### Transformers

The Celeris Valve Controller (CVC) requires the use of a step-down transformer (either 120/24 volt or 240/24 volt). Any transformer used to power CVCs must meet the requirements of an NEC Class 2 circuit.

- The secondary transformer must be limited to a maximum of 30 Vac.
- Secondary power shall be current limited with either internal circuit breaker protection or with a four-amp slow blow fuse, in accordance with NEC Class 2 power requirements.

Phoenix Controls offers the following recommendations; however, designers, installers and owners should always consult their national and local electrical codes before selecting transformers for their systems.

- Transformers should not exceed 100 VA. Use multiple transformers, rather than larger transformers, when more than 100 VA is required.
- Each pressurization zone should have either a dedicated single-phase primary circuit or a secondary circuit disconnect.
- If an earth ground is provided, it should not be connected to the CVC, even though there is a three-terminal connector on the CVC board.

*NOTE: AC line voltage polarity must be maintained on all CVC and AC powered ancillary devices.*

### Transformer Sizing

To size a transformer, all of the VA loads for the circuit must be totaled. This table outlines the power ratings of Celeris products and related outside purchased equipment. Use these values to size the power transformers for the Celeris system.

| Celeris Valve Controller (CVC)       |                        |        |
|--------------------------------------|------------------------|--------|
| Control type L (low-speed electric)  | Single/dual valve body | 10 VA  |
| Control type M (high-speed electric) | Single/dual valve body | 70 VA  |
| External Devices                     |                        |        |
| Router/repeater modules              |                        | 2 VA   |
| Sensor                               | Approved thermistor    | 0 VA   |
| Heating valve                        | Belimo LM24 (2-state)  | 3 VA   |
| Heating valve                        | Belimo LM24SR (propor) | 4 VA   |
| Each 4-20 mA device                  | Example: transducers   | 0.5 VA |

### Power Conductor Sizing

- For low-speed valves in a bus configuration:

As a rule of thumb for loads up to 100 VA, use 18 AWG cable with a maximum length of 110 feet (33 meters) between the transformer and the last daisy-chained device.

- For a more exact length per load number, refer to the following chart.
- For high-speed valves in a star configuration, refer to the 14 AWG column of this chart.

| Maximum wire length (in feet) given a wire gauge and VA delivery by transformer |            |        |        |        |        |
|---|------------|--------|--------|--------|--------|
| VA Delivered  | Wire Gauge |        |        |        |        |
|   | 14 AWG     | 16 AWG | 18 AWG | 20 AWG | 22 AWG |
| 10  | 2880       | 1743   | 1095   | 695    | 433    |
| 20  | 1440       | 871    | 548    | 347    | 216    |
| 30  | 960        | 580    | 365    | 213    | 144    |
| 40  | 720        | 435    | 274    | 174    | 108    |
| 50  | 576        | 348    | 219    | 139    | 86     |
| 60  | 480        | 290    | 182    | 115    | 72     |
| 70  | 411        | 249    | 156    | 99     | 61     |
| 80  | 360        | 217    | 136    | 86     | 54     |
| 90  | 320        | 193    | 121    | 77     | 48     |
| 100   | 288        | 174    | 110    | 69     | 43     |

## MAINTENANCE

---

Shut-off valves require no ongoing preventive maintenance. Once the field engineer has completed the field startup, the valves will provide years of continuous operation.

## REFERENCES

---

*American Society of Mechanical Engineers (ASME). ANSI/ASME N510-1989(R1995): Testing of Nuclear Air-Treatment Systems. New York: ASME, 1989 (reaffirmed 1995).*