

Appendix B

Building Automation System (BAS) Specifications Listing

1 Purpose and Instructions

The purpose of this document is to represent the capacities and characteristics of Components used in a Building Automation System Installation. The products listed in this document are approved for the use in BAS system installations for Penn State University Park and Commonwealth Campuses. The spec editor must use this document to represent products requested by the owner as a base of design. Additional products required above and beyond what is encompassed in this document to be listed in Section 2.7.

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RIBU1C

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50 VA Tranformer

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Uninterruptible Power Supplies

9SX1000 UPS

Zone Sensors

ZS2_CS

Air Flow Measuring Stations (AFMS)

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Airflow Measurement with Temperature and Alarm Capability

OVERVIEW



- Thermal Dispersion Technology
- Supports up to 16 Sensor Nodes
- NIST-traceable Calibration
- %-of-reading Accuracy
- Airflow and Status Alarm
- Temperature Output Capability
- Combination Analog/Network Models
- Three Mounting Styles
- Remote Transmitter with LCD Display
- 3-year Warranty

The GTx116-P+ is EBTRON’s top-of-the-line solution for accurate and repeatable measurement in ducts and plenums. Ideal for outdoor air delivery monitoring and airflow tracking applications. Temperature and alarm capability plus unsurpassed product features and connectivity options make this the best choice for today’s high performance buildings. Bluetooth® low energy technology interface.

Typical Applications

- ◆ Outdoor Air Delivery Monitoring
- ◆ Differential Airflow Tracking
- ◆ Hospital Pressurization
- ◆ Laboratory Pressurization
- ◆ Air Change Verification & Monitoring
- ◆ System Performance Monitoring

Benefits

- ◆ Comply with ASHRAE Standards
- ◆ Demonstrate Code Compliance
- ◆ Satisfy LEED Prerequisites and Credits
- ◆ Provide Acceptable IAQ
- ◆ Save Energy
- ◆ Reduce Liability
- ◆ Improve Performance

Product Highlights

- ◆ Best Installed Accuracy
- ◆ Low Airflow Capability
- ◆ Volumetric or Mass Airflow Measurement
- ◆ Long-term Stability
- ◆ “Plug and Play” Operation
- ◆ Intuitive User Interface
- ◆ Waterproof Sensor Assembly
- ◆ FEP Plenum Rated Cables

General

Probe and Sensor Node Configurations (max.)

- 2 probes x 8 sensor nodes/probe
- 4 probes x 4 sensor nodes/probe

Installed Airflow Accuracy¹

- Ducts/Plenums: ±3% of reading
- Non-ducted OA Intakes: better than or equal to ±5% of reading

P+ Sensor Density: Refer to the P+ sensor density table.

Sensor Node Averaging Method

- Airflow: Independent, arithmetic average
- Temperature: Independent, velocity weighted average

Listings & Compliance

- UL: UL-873 and CSA C22.2 No. 24
- CE: Yes
- BACnet International: BTL Listed (GTC116e and GTM116e transmitters)
- FCC: This device complies with Part 15 of the FCC rules
- RoHS: This device is RoHS2 compliant

Environmental Limits

- Temperature:
 - Probes: -20 to 160 °F [-28.9 to 71.1 °C]
 - Transmitter: -20 to 120 °F [-28.9 to 48.9 °C]
- Humidity: (non-condensing)
 - Probes: 0 to 100%
 - Transmitter: 5 to 95%

Individual Sensing Nodes

Sensing Node Sensors

- Self-heated sensor: Precision, hermetically sealed, bead-in-glass thermistor probe
- Temperature sensor: Precision, hermetically sealed, bead-in-glass thermistor probe

Sensing Node Housing

- Material: Glass-filled Polypropylene (Kynar[®] with /SS option)
- Sensor Potting Materials: Waterproof marine epoxy

Sensing Node Internal Wiring

- Type: Kynar[®] coated copper

Airflow Measurement

- Accuracy: ±2% of reading to NIST-traceable airflow standards (includes transmitter uncertainty)
- Calibrated Range: 0 to 5,000 fpm [25.4 m/s]
- Calibration Points: 16

Temperature Measurement

- Accuracy: ±0.15°F [0.08 °C] to NIST-traceable temperature standards (includes transmitter uncertainty)
- Calibrated Range: -20 to 160 °F [-28.9 to 71.1 °C]
- Calibration Points: 3

Sensor Probe Assembly

Tube

- Material: Gold anodized 6063 aluminum (316 stainless steel with /SS option)

Mounting Brackets

- Material: 304 stainless steel

Mounting Options & Size Limits¹

- Insertion: 6 to 191 in. [152.4 to 4851 mm]
- Stand-off: 6 to 190 in. [152.4 to 4826 mm]
- Internal: 8 to 194 in. [203.2 to 4928 mm]

Probe to Transmitter Cables

- Type: FEP jacket, plenum rated CMP/CL2P, UL/cUL listed, -67 to 302 °F [-55 to 150 °C], UV tolerant
- Standard Lengths: 10, 15, 20, 25, 30, 40 and 50 ft. [3.1, 4.6, 6.1, 7.6, 9.1, 12.2, and 15.2 m]
- Connecting Plug: 13/16" [20.63 mm] nominal diameter with gold-plated connector pins

Transmitter

Power Requirement: 24 VAC (22.8 to 26.4 under load) @20V-A max.

- Connector Receptacle Pins and PCB Connections: Gold-plated receptacle pins, PCB interconnects, PCB edge fingers, and test points
- User Interface: 2 line x16-character backlit LCD display and 4 button interface

B.A.S. Connectivity Options

- All Transmitters: Three field selectable (0-5/0-10 VDC or 4-20mA), scalable and isolated analog output signals (AO1=airflow, AO2=temperature or alarm, AO3=Not Used).
- GTA116e Transmitter: No additional connectivity to B.A.S.
- GTC116e Transmitter: One additional field selectable (BACnet MS/TP or Modbus RTU) and isolated RS-485 network connection - Individual sensor node airflow rates and temperatures are available via the network
- GTM116e Transmitter: One additional isolated Ethernet (simultaneously supported BACnet Ethernet or BACnet IP, Modbus TCP and TCP/IP) network connection - Individual sensor node airflow rates and temperatures are available via the network
- GTF116e Transmitter: One additional isolated Lonworks Free Topology network connection
- GTU116e Transmitter: One additional USB connection for thumb drive data-logging of sensor node airflow rates and temperatures

Airflow Alarm

- Type: Low and/or high user defined setpoint alarm
- Tolerance: User defined % of setpoint
- Delay: User defined
- Zero Disable: Alarm can be disabled when the airflow rate falls below the low limit cutoff value (unoccupied periods)
- Reset Method: Manual or automatic
- Visual Indication: Yes, LCD display
- Analog Signal Indication: Yes, on AO2 assignment

System Status Alarm

- Type: Sensor diagnostic system trouble indication
- Visual Indication: Yes, LCD display
- Analog Signal Indication: Yes, on AO2 assignment

EB-Link Bluetooth[®] low energy Interface for Android[®] and iPhone[®]:

- Display real-time airflow, velocity-weighted temperature, humidity, enthalpy, dew point, individual sensor node airflow/temperature data, settings and diagnostics.

¹ Installed airflow accuracy allows for additional uncertainty that results from averaging a finite number of sensors in a contorted velocity profile created from up and downstream disturbances. The specified installed accuracy is based on the P+ sensor density rules for installations that meet or exceed EBTRON minimum placement requirements. P+ sensor density rules may not be available in certain duct sizes due to sensor placement limitations.

Air Pressure Transducers and Accessories

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Pressure Probe Assemblies

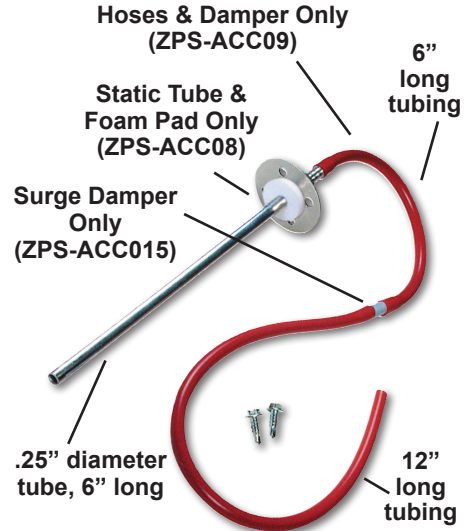
Overview

The Static Pressure Probe and Total Pressure Probe Assemblies connect to the BAPI Zone Pressure Sensor to provide duct static pressure or duct air velocity. The angled total probe faces into the airflow to sense the moving air's total pressure while the static probe senses static pressure.

Both probe assemblies include a tube and rubber hose with built in surge damper to smooth out variations in airflow for a more stable reading. The Static Pressure Probe is available individually while the Pitot Pressure Probe Assembly includes the total probe and the static probe assemblies.

ORDERING INFORMATION

- ZPS-ACC07... Static Pressure Probe Assembly, 6" long
- ZPS-ACC08... Aluminum static Tube Only (6") w/ Circular Foam
- ZPS-ACC09... Rubber Hoses w/ Surge Damper (includes a bulk head fitting)
- ZPS-ACC11... Pitot Pressure Probe Assembly, 3.5" long (includes the Static & Total Probe Assemblies)
- ZPS-ACC12... Pitot Pressure Probe Assembly, 6" long (includes the Static & Total Probe Assemblies)
- ZPS-ACC13... Total Tube Only (3.5") with Circular Foam (doesn't include hoses & damper)
- ZPS-ACC14... Total Tube Only (6") with Circular Foam (doesn't include hoses & damper)
- ZPS-ACC15... Surge Damper Only, 5 micron
- ZPS-ACC17... Static Tube Only (0.5") with Circular Foam (doesn't include hoses & damper)
- ZPS-ACC18... 2 Static Pressure Tube Assemblies, 6" Long
- ZPS-ACC21... Stainless Steel Static Tube Only (6") with Circular Foam and Mounting Screws (doesn't include hoses & damper)
- ZPS-ACC22... Static Tube Only, Zero Length, with Circular Foam and Mounting Screws



Static Pressure Probe Assembly



Total Pressure Probe Assembly



Static Tube Only, Zero Depth

Silicone Rubber Tubing

Overview

Made from a material that's used for green house glazing, this synthetic rubber tubing maintains its flexibility and resiliency over time.

Specifications:

- ID: 1/8 inch • OD: 1/4 inch • Bend Radius: 1/4 inch
- Hardness: 50 durometer • Tensile Strength: 1100 psi
- Application Temperature: -94 to 392°F (-70 to 200°C)
- Material: Silicone Rubber

ORDERING INFORMATION

- ZPS-SIL-250-125-50 50 foot roll of silicone rubber tubing



Silicone Rubber Tubing





Features & Options

- 10 Field Selectable Pressure Ranges and 5 Field Selectable Outputs
- Optional Display Shows Pressure Over the Entire Operational Range Regardless of Which Pressure Range is Selected
- Standard, Low and High Range Units
- Ranges and Outputs Can Be Set Without Power
- Free NIST Certificate Included with Each Unit

BAPI's Zone Pressure Multi-Sensor is the most flexible pressure sensor on the market. Output, range, units, directionality, and response time are quickly set in the field with no tools, no power and no small components.

The optional LCD display helps with troubleshooting because it displays the actual differential pressure over the entire operational range regardless of which individual pressure range is selected for output to the system controller. Three LEDs on the face of the unit indicate when the pressure is "Out of Range Low", "In Range" or "Out of Range High".



Ranges and Outputs Can Be Set Easily Without Tools and Without Powering the Unit

ZPM Pressure Multi-Sensor

Specifications

Power:

7 to 40 VDC (4 to 20 mA Output)
7 to 40 VDC or 18 to 32 VAC (0 to 5 or 1 to 5 V Output)
13 to 40 VDC or 18 to 32 VAC (0 to 10 or 2 to 10 V Output)

Power Consumption:

20 mA max, DC only at 4 to 20 mA Output
4.9 mA max DC at 0 to 5 VDC or 0 to 10 VDC Output
0.12 VA max AC at 0 to 5 VDC or 0 to 10 VDC Output

Load Resistance:

4 to 20 mA Output 850 Ω Maximum @ 24 VDC
0 to 5 V or 0 to 10 V output 6K to 10K Ω minimum

Accuracy for Standard Pressure Ranges at 72°F:

$\pm 0.25\%$ of range

Accuracy for Low Pressure Ranges at 72°F:

$\pm 0.5\%$ of range for the three lowest unidirectional and bidirectional ranges, $\pm 0.25\%$ of range all other ranges

Accuracy for High Pressure Ranges at 72°F:

$\pm 0.25\%$ on all ranges

Stability: $\pm 0.25\%$ F.S. per year

Environmental Op. Range: -4 to 140°F (-20 to 60°C)

Storage Temperature: -40 to 203°F (-40 to 95°C)

Temperature Error Low Range:

0.04% FS/°F (0.07% FS/°C)
(± 1.0 " W.C @ -4 to 140°F (-20 to 60°C))

Temperature Error Standard Range:

0.01% FS/°F (0.02% FS/°C)
(± 5.0 " W.C @ -4 to 140°F (-20 to 60°C))

Temperature Error High Range:

0.015% FS/°F (0.025% FS/°C)
(0 to 30" W.C @ -4 to 140°F (-20 to 60°C))

Overpressure:

Proof: 300.1 WC (10.83 PSI)
Burst: 512.6 WC (18.5 PSI)

Wiring:

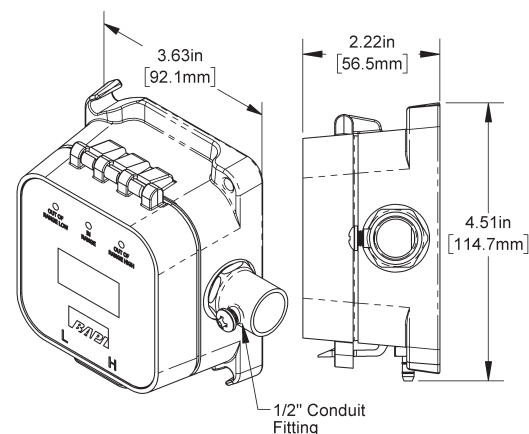
2 wires (4 to 20mA Current loop)*
3 wires (AC or DC powered, Voltage out)*

Humidity: 0 to 95% RH, non-condensing

Port Size: 1/4" tubing (1/8" to 3/16" I.D.)

Encl. Material: UV-resistant Polycarb., UL94, V-0

Enclosure Rating: IP44, NEMA 2



*BAPI recommends that you do not run wiring for the pressure transmitter in the same conduit as line voltage wiring or with wiring used to supply highly inductive loads such as motors, generators and coils.





Ordering Information

STANDARD RANGE UNITS

PART NUMBER **DESCRIPTION**

- BA/ZPM-SR-NT-D ZPM Standard Range Unit, No Tube or Probe included, with Display
- BA/ZPM-SR-ST-D ZPM Standard Range Unit, with Static Pressure Tube, with Display
- BA/ZPM-SR-AT-D ZPM Standard Range Unit, with Attached Static Tube, with Display
- BA/ZPM-SR-NT-ND ZPM Standard Range Unit, No Tube or Probe included, No Display
- BA/ZPM-SR-ST-ND..... ZPM Standard Range Unit, with Static Pressure Tube, No Display
- BA/ZPM-SR-AT-ND..... ZPM Standard Range Unit, with Attached Static Tube, No Display

LOW RANGE UNITS

- BA/ZPM-LR-NT-D ZPM Low Range Unit, No Tube or Probe included, with Display
- BA/ZPM-LR-ST-D ZPM Low Range Unit, with Static Pressure Tube, with Display
- BA/ZPM-LR-AT-D ZPM Low Range Unit, with Attached Static Tube, with Display
- BA/ZPM-LR-NT-ND..... ZPM Low Range Unit, No Tube or Probe included, No Display
- BA/ZPM-LR-ST-ND..... ZPM Low Range Unit, with Static Pressure Tube, No Display
- BA/ZPM-LR-AT-ND..... ZPM Low Range Unit, with Attached Static Tube, No Display

HIGH RANGE UNITS

- BA/ZPM-HR-NT-D ZPM High Range Unit, No Tube or Probe included, with Display
- BA/ZPM-HR-ST-D ZPM High Range Unit, with Static Pressure Tube, with Display
- BA/ZPM-HR-AT-D ZPM High Range Unit, with Attached Static Tube, with Display
- BA/ZPM-HR-NT-ND ZPM High Range Unit, No Tube or Probe included, No Display
- BA/ZPM-HR-ST-ND ZPM High Range Unit, with Static Pressure Tube, No Display
- BA/ZPM-HR-AT-ND ZPM High Range Unit, with Attached Static Tube, No Display

Pressure Range, Output Range and Inches of Water Column or Pascal Operation will be selected in the field for these units. Ranges and Outputs shown below:

Custom Ranges are also available. Contact your BAPI representative for ordering information.

Your Number: BA/ZPM-

Field Selectable Ranges and Outputs

STANDARD RANGE UNITS	
Inches WC	Pascals
0 to 1.00.....	0 to 250
0 to 2.00.....	0 to 300
0 to 2.50.....	0 to 500
0 to 3.00.....	0 to 1,000
0 to 5.00.....	0 to 1,250
-1.00 to 1.00	-250 to 250
-2.00 to 2.00	-300 to 300
-2.50 to 2.50	-500 to 500
-3.00 to 3.00 ...	-1,000 to 1,000
-5.00 to 5.00 ...	-1,250 to 1,250

LOW RANGE UNITS	
Inches WC	Pascals
0 to 0.10.....	0 to 30
0 to 0.25.....	0 to 50
0 to 0.50.....	0 to 100
0 to 0.75.....	0 to 175
0 to 1.00.....	0 to 250
-0.10 to 0.10	-30 to 30
-0.25 to 0.25	-50 to 50
-0.50 to 0.50	-100 to 100
-0.75 to 0.75	-175 to 175
-1.00 to 1.00	-250 to 250

HIGH RANGE UNITS	
Inches WC	Pascals
0 to 5.....	0 to 1,250
0 to 10.....	0 to 2,500
0 to 15.....	0 to 4,000
0 to 25.....	0 to 6,000
0 to 30.....	0 to 7,400

OUTPUTS AVAILABLE
4 to 20 mA
0 to 5 V
0 to 10 V
2 to 10 V
1 to 5 V



Air Temperature Sensors

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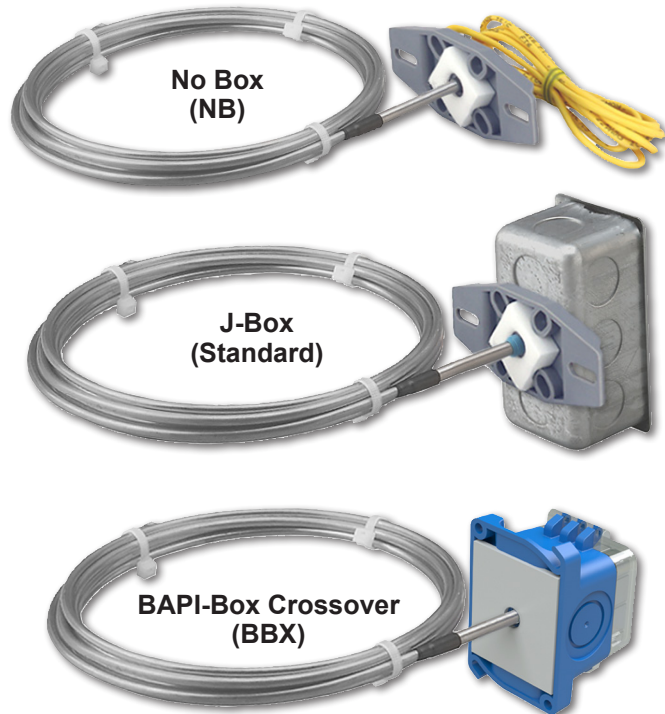
Features & Options

- Averaging Lengths: 8', 12' and 24'
- Three Enclosure Styles

BAPI Duct Averaging Units feature closed cell foam to seal the probe insertion hole and absorb vibration. Mounting tabs allow for easy installation to the duct. All units have etched Teflon leadwires and encapsulated sensors to create a watertight package that can perform under real world conditions.

Averaging probes should be used wherever there is a chance for stratified layers of hot and cold air. Averaging probes are made of bendable aluminum tubing and measure temperature along their entire length. Nylon tie straps are provided for mounting.

Duct Averaging Units come standard with a 2"x4" steel J-Box but are also available with no box or the new BAPI-Box Crossover enclosure.



Flexible Probe Bracket for Mounting Averaging Sensors

The Flexible Probe Bracket (FPB) is used to mount averaging sensors, low limit thermostats, or liquid fill thermostats.

The bracket is used to reverse the direction of the flexible probe with a smooth arc to eliminate the risk of kinking the sensor and damaging the probe. A fixed 1/4" probe may also be mounted as part of the bracket design using the scored break-off.

(See the Accessories Section for more information.)

Specifications

Environmental Operation Range:

Temperature:

BAPI-Box Crossover: -40 to 85 °C

Other Enclosures: -40 to 100 °C

Humidity: 0 to 95%, non-condensing

Sensing Element:

Thermistor or RTD (See Sensors Section for Specs.)

Probe Material:

Bendable Aluminum, 3/16" diameter

Enclosure Material:

Junction Box: Galvanized Steel

BAPI-Box Crossover:

UV-resistant polycarbonate, UL94, V-0

Enclosure Rating:

Junction Box: IP20, NEMA 1

BAPI-Box Crossover (BBX):

IP10, NEMA 1

IP44 with knockout plug in open port

Encl. Dimensions: H x W x D

BAPI-Box Crossover:

3.1 x 2.2 x 1.9" (79 x 56 x 49mm)

Junction Box

4.2 x 3.9 x 1.94" (106 x 98.4 x 49mm)

(For enclosure dimension drawings, see the end of the section.)





Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.



Duct Averaging Sensor Option Selection Guide

BA/ (#1) - (#2) - (#3) - (#4)

#1: Temperature Sensor (required)

1.8K 1.8K Thermistor

3K 3K Thermistor

10K-2 10K-2 Thermistor

10K-3 10K-3 Thermistor

10K-3[11K] 10K-3[11K] Thermistor

20K 20K Thermistor

1K[375] 1K Platinum RTD (375 curve)

1K[NI] 1K Ω Nickel RTD

1K 1K Platinum RTD (385 curve)

Transmitters below require a BAPI-Box Crossover Enclosure

T1K[32 TO 212F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range

T1K[20 TO 120F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range

T1K[0 TO 100F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range

T1K[0 TO 100C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°C Range

T1K[-7 TO 49C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range

T1K[-18 TO 38C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Range

Matched Transmitters are also available. Contact your BAPI representative for ordering.

#2: Probe Type and Length (required)

A-8' Flexible Averaging, 8' (2.4m) length

A-12' Flexible Averaging 12' (3.7m) length

A-24' Flexible Averaging 24' (7.3m) length

#3: Enclosure and Lead Length (optional, J-Box comes standard)

BBX BAPI-Box Crossover (IP10, NEMA 1)

NB No Box (comes with 6" Etched Teflon Leads)

#4: Test & Balance or Terminal Strip (optional, requires a BAPI-Box Crossover Enclosure)

TB Test & Balance Switch

TS Terminal Strip Connection

Additional options are available for these units but not shown in the configurator above. Contact your BAPI representative for the complete list of options.

Example Number: BA/ (**10K-2**) - (**A-8'**) - (**BBX**) - ()

Actual Number (with parenthesis removed): BA/10K-2-A-8'-BBX

Description: 10K-2 Thermistor, Duct Averaging Sensor, BAPI-Box Crossover Enclosure

Your Number: BA/

Gray shaded items follow the Buy and Resale Multiplier.





Features & Options

- Quick-Response Sensor
- IP66/NEMA 4 BAPI-Box 2 Enclosure Style
- Well-Vented Sensor Guard

Outside Air Units are designed to be mounted outdoors. The UV-resistant plastic shield keeps the sensor out of the sunlight and allows for excellent air circulation. The units are available in a BAPI-Box 2 polycarbonate enclosure which carries an IP66/NEMA 4 rating.

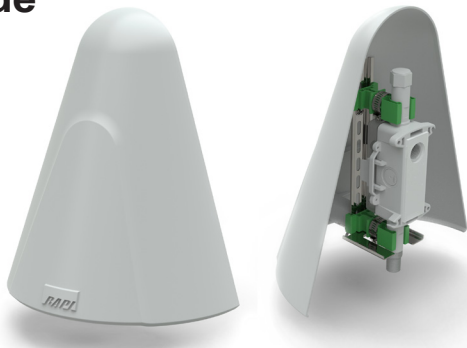
All Outside Air Units have etched Teflon leadwires and can withstand high humidity and condensation and perform under real world conditions. This is especially important in an outside air application which can be exposed to rain, snow and large temperature swings.



Outside Air Temperature Sensor in a BAPI-Box 2 Enclosure

Weather Shade

External temperature, humidity and air quality sensors can be affected by solar heat gain. The BAPI Weather Shade effectively blocks the solar heat gain, improving the accuracy of the sensor.



(See Accessories for more info.)

Specifications

Environmental Operation Range:

Temperature Sensor: -40 to 85 °C
 Temperature Transmitter: -20 to 70 °C
 Humidity: 0 to 100%, non-condensing

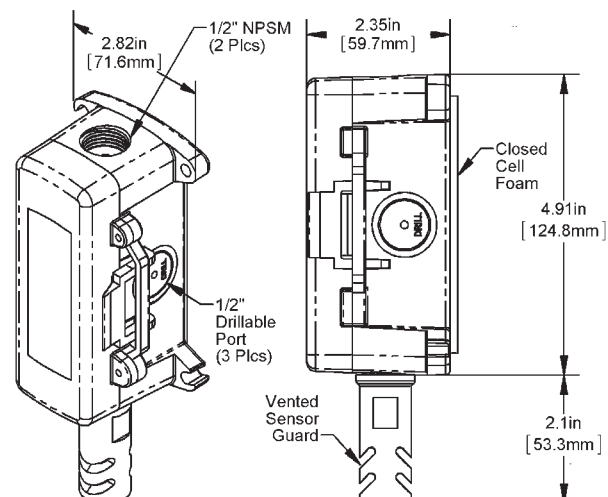
Sensing Element:

Thermistor or RTD
 (See Sensors Section for Specs.)

Enclosure Rating: IP66, NEMA 4

Enclosure Material:

UV-resistant polycarbonate, UL94, V-0





Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.



Outside Air Temperature Option Selection Guide

BA/ (#1) - (#2) - (#3) - (#4)

#1: Temperature Sensor (required)

- 1.8K1.8K Thermistor
- 3K3K Thermistor
- 10K-210K-2 Thermistor**
- 10K-310K-3 Thermistor
- 10K-3[11K].....10K-3[11K] Thermistor
- 20K20K Thermistor
- 1K[375]1K Platinum RTD (375 curve)
- 1K[Ni].....1K Ω Nickel RTD
- 1K1K Platinum RTD (385 curve)

Transmitters below require a BAPI-Box 2 Enclosure

- T1K[32 TO 212F]1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range
- T1K[20 TO 120F]1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range
- T1K[0 TO 100F]1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range
- T1K[0 TO 100C]1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°C Range
- T1K[-7 TO 49C]1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range
- T1K[-18 TO 38C]1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Range

Matched Transmitters are also available. Contact your BAPI representative for ordering.

#2: Outside Air Unit (required)

- OOutside Air Unit**

#3: Enclosure and Lead Length (required)

- BB2BAPI-Box 2 Polycarbonate Enclosure (IP66, NEMA 4)**

#4: Test & Balance or Terminal Strip (optional)

- TBTest & Balance Switch
- TSTerminal Strip Connection

Additional options are available for these units but not shown in this Selection Guide. Contact your BAPI representative for the complete list of options. Submittal sheets without List Prices can be downloaded from our website at www.bapihvac.com

Example Number: BA/(**10K-2**) - (**O**) - (**BB2**) - ()

Actual Number (with parenthesis removed): BA/10K-2-O-BB2

Description: 10K-2 Thermistor, Outside Air Temperature Sensor, BAPI-Box 2 Enclosure, No Test and Balance or Terminal Strip.

Your Number: BA/





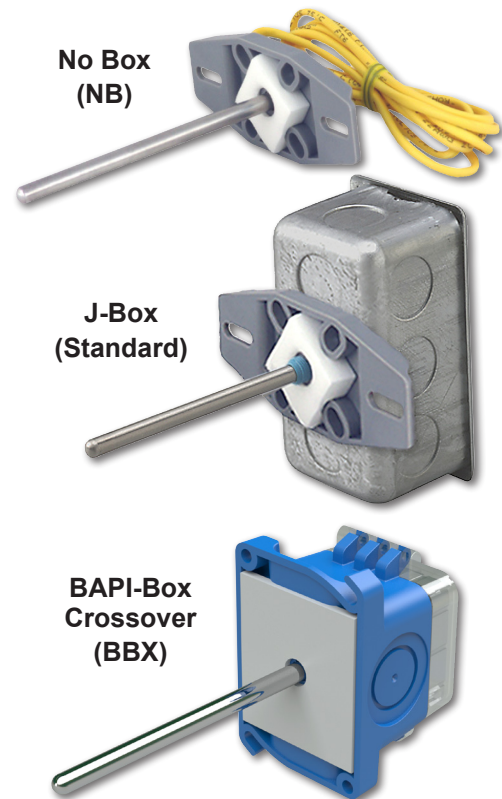
Features & Options

- Series 304 Stainless Steel Probes: 2, 4, 8, 12 and 18"
- Three Enclosure Styles
- Double Encapsulated Sensors & Etched Teflon Leads
- Limited Lifetime Warranty
- Wide Selection of Temperature Sensing Elements

Single Point Duct Units feature closed cell foam to seal the probe insertion hole and to absorb vibration. Mounting tabs allow for easy installation directly to the wall of the duct.

All Duct Units have etched Teflon leadwires and double encapsulated sensors to create a watertight package that can withstand high humidity and condensation and perform under real world conditions. Duct Units have probe lengths from 2" to 18" to accommodate most duct shapes and sizes. Custom probe lengths are also available.

Duct Units come standard with a 2"x4" steel J-Box but are also available with no box or the new BAPI-Box Crossover enclosure.



The New BAPI-Box Crossover Enclosure

The new BAPI-Box Crossover features a hinged cover with thumb latch for easy termination. A pierceable knockout plug is available for the open port. See the Accessories section for more info.

(Units shown with knockplug plug sold separately.)



Specifications

Environmental Operation Range:

Temperature:

BAPI-Box Crossover: -40 to 85 °C

Other Enclosures: -40 to 105 °C

Humidity: 0 to 100%, non-condensing

Sensing Element:

Thermistor or RTD (See Sensors Section for Specs.)

Probe Material:

Stainless Steel, 1/4" diameter

Enclosure Material:

Junction Box: Galvanized Steel

BAPI-Box Crossover:

UV-resistant polycarbonate, UL94, V-0

Enclosure Rating:

Junction Box: IP20, NEMA 1

BAPI-Box Crossover (BBX):
IP10, NEMA 1

IP44 with knockout plug in open port

Enclosure Dimensions: H x W x D

BAPI-Box Crossover:
3.1 x 2.2 x 1.9" (79 x 56 x 49mm)

Junction Box
4.2 x 3.9 x 1.94" (106 x 98.4 x 49mm)

(For enclosure dimension drawings, see the end of the section.)





Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.



Duct Temperature Option Selection Guide

BA/ (#1) - (#2) - (#3) - (#4)

#1: Temperature Sensor (required)

- 1.8K 1.8K Thermistor
- 3K 3K Thermistor
- 10K-2 10K-2 Thermistor**
- 10K-3 10K-3 Thermistor
- 10K-3[11K] 10K-3[11K] Thermistor
- 20K 20K Thermistor
- 1K[375] 1K Platinum RTD (375 curve)
- 1K[Ni] 1K Ω Nickel RTD
- 1K 1K Platinum RTD (385 curve)

Transmitters below require a BAPI-Box Crossover Enclosure

- T1K[32 TO 212F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range
- T1K[20 TO 120F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range
- T1K[0 TO 100F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range
- T1K[0 TO 100C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°C Range
- T1K[-7 TO 49C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range
- T1K[-18 TO 38C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Rang

Matched Transmitters are also available. Contact your BAPI representative for ordering.

#2: Probe Type and Length (required)

- D-2" Duct, 2" (51mm) length
- D-4" Duct, 4" (102mm) length
- D-8" Duct, 8" (203mm) length**
- D-12" Duct, 12" (305mm) length
- D-18" Duct, 18" (457mm) length

#3: Enclosure and Lead Length (optional, J-Box comes standard)

- BBX BAPI-Box Crossover (IP10, NEMA 1)
- NB-18" No Box, 18" Leads
- NB-5' No Box, 5' Leads
- NB-10' No Box, 10' Leads**
- NB-15' No Box, 15' Leads

#4: Test & Balance or Terminal Strip (optional, requires a BAPI-Box Crossover Enclosure)

- TB Test & Balance Switch
- TS Terminal Strip Connection

Additional options are available for these units but not shown in this Selection Guide. Contact your BAPI representative for the complete list of options.

Example Number: BA/(**10K-2**) - (**D-8"**) - (**NB-5'**) - ()

Actual Number (with parenthesis removed): BA/10K-2-D-8"-NB-5'

Description: 10K-2 Thermistor, Duct Temperature Sensor, No Box Enclosure with 5' Leads.

Your Number: BA/



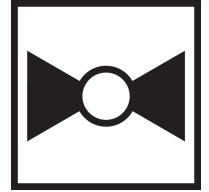
Control Valves

(This page is hyperlinked to the TOC)

Cutsheets to be inserted after this header document to create the section.



5-year warranty



Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	1.2
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Seat	PTFE
	End fitting	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	TR LRB(X) NR

Safety notes

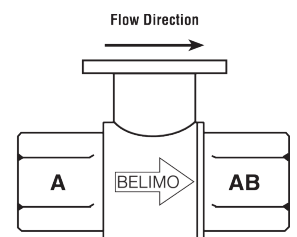
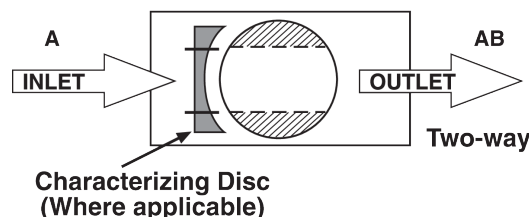


- **WARNING:** This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

Product features

Application This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

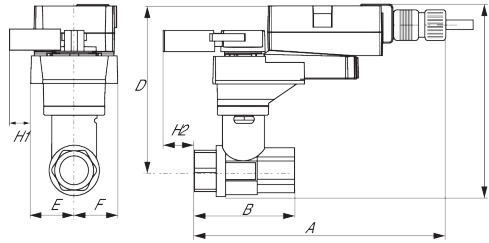
Flow/Mounting details



Dimensions

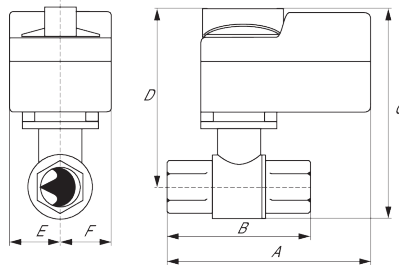
Dimensional drawings

LRB, LRX



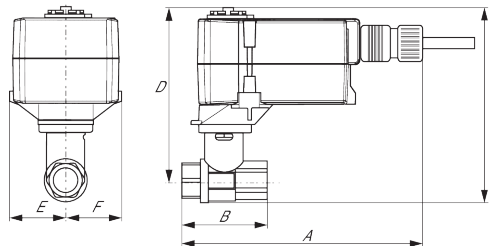
A	B	C	D	E	F	H1	H2
9.4" [239]	2.4" [60]	5.2" [132]	4.6" [117]	1.3" [33]	1.3" [33]	1.2" [30]	1.1" [28]

TR



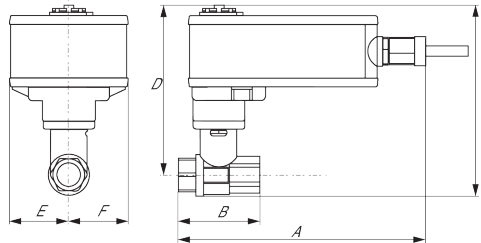
A	B	C	D	E	F
3.7" [95]	2.4" [60]	4.8" [122]	4.2" [107]	1.3" [33]	1.3" [33]

TFRB, TFRX



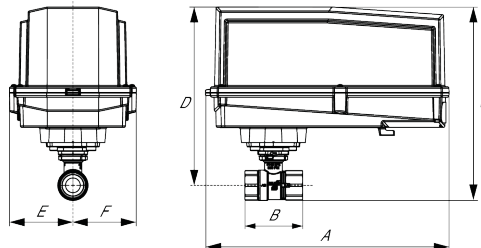
A	B	C	D	E	F
6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

LF

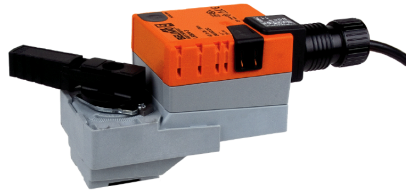


A	B	C	D	E	F
7.9" [200]	2.4" [60]	5.7" [146]	5.1" [129]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	2.4" [60]	7.7" [196]	7.0" [179]	3.1" [80]	3.1" [80]



5-year warranty



Technical data

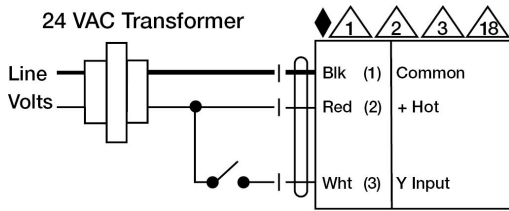
Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	1.5 W
	Power consumption in rest position	0.2 W
	Transformer sizing	2.5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic throughout 0...90° rotation
Functional data	Input Impedance	600 Ω
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	90 s
	Noise level, motor	35 dB(A)
Position indication	Mechanically, pluggable	
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
Servicing	maintenance-free	
Weight	Weight	1.1 lb [0.50 kg]

Electrical installation

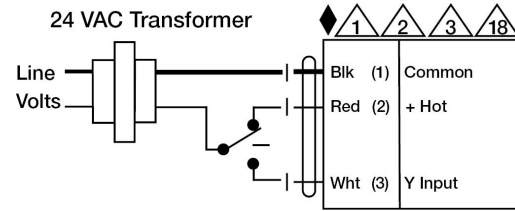
INSTALLATION NOTES

- Provide overload protection and disconnect as required.
- Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- Actuators may also be powered by 24 VDC.
- Actuators Hot wire must be connected to the control board common. Only connect common to neg. (-) leg of control circuits. Terminal models (-T) have no-feedback.
- Actuators with plenum cable do not have numbers; use color codes instead.
- Meets cULus requirements without the need of an electrical ground connection.
- Warning! Live Electrical Components!**

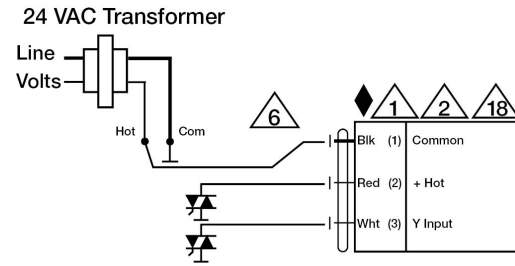
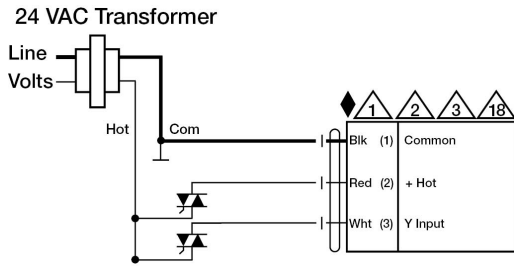
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



On/Off



Floating Point



Floating Point - Triac Sink

F6 Series 2-Way, ANSI Class 150 Butterfly Valve Reinforced Teflon Seat, 316 Stainless Disc



- Bubble tight shut-off to ANSI Class 150 Standards
- Long stem design allows for 2" insulation minimum
- Valve Face-to-face dimensions comply with API 609 & MSS-SP-68
- Designed to be installed between ASME/ANSI B16.5 Flanges
- Completely assembled and tested, ready for installation

Application

These valves are designed to meet the needs of HVAC and Commercial applications requiring positive shut-off for liquids at higher pressures and temperatures. Typical applications include chiller isolation, cooling tower isolation, change-over systems, large air handler coil control, bypass and process control applications. The large C_v values provide for an economical control valve solution for larger flow applications.

Dead End Service

Utilizes larger retainer ring set screws to allow the valve to be placed at the end of the line without a down stream flange in either flow direction while still holding full pressure.

Technical Data	
Service	chilled, hot water, 60% glycol, steam to 50 psi
Flow characteristic	modified equal percentage, unidirectional
Controllable flow range	82°
Sizes	2" to 24"
Type of end fitting	for use with ASME/class 125/150 flange
Materials	
Body	carbon steel full lug
Disc	316 stainless steel
Seat	RPTFE
Shaft	17-4 PH stainless
Gland seal	PTFE
Bushings	glass backed PTFE
Media temperature range	-20°F to 400°F [-30°C to 204°C]
Body pressure rating	ANSI Class 150
Close-off pressure	285 psi
Rangeability	100:1 (for 30 deg to 70 deg range)
Maximum velocity	32 FPS
Leakage	bubble tight

C _v 90°	C _v 60°	2-way Valves		Suitable Actuators							
		Inches	Type	Non Fail-Safe		Fail-Safe					
				150	300	Spring Return		Electronic			
			ANSI 150 2-way	150	300	150	300	150	300		
102	56	2	F650-150SHP	GM Series	PR Series	GM Series	PR Series	AF Series	AF Series	GK Series	GK Series
146	80	2½	F665-150SHP					AF Series	AF Series	GK Series	GK Series
228	125	3	F680-150SHP	PR Series	PR Series	PR Series	PR Series	PKR	PKR	PKR	PKR
451	248	4	F6100-150SHP								
714	392	5	F6125-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)
1103	607	6	F6150-150SHP								
2064	1135	8	F6200-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)
3517	1934	10	F6250-150SHP								
4837	2660	12	F6300-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)
6857	3592	14*	F6350-150SHP								
9287	4865	16*	F6400-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)
11400	6270	18*	F6450-150SHP								
14420	7590	20*	F6500-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)
22050	11550	24*	F6600-150SHP								

Valve	Size	C _v	MOD									ON/OFF
			10°	20°	30°	40°	50°	60°	70°	80°	90°	
F650-150SHP	2"	102	1.50	6.10	14	26	39	56	77	99	102	
F665-150SHP	2½"	146	2.20	8.80	20	37	55	80	110	142	146	
F680-150SHP	3"	228	3.40	14	32	57	87	125	171	221	228	
F6100-150SHP	4"	451	6.80	27	63	114	171	248	338	437	451	
F6125-150SHP	5"	714	11	43	100	180	271	393	536	693	714	
F6150-150SHP	6"	1103	17	66	154	278	419	607	827	1070	1103	
F6200-150SHP	8"	2064	31	124	289	520	784	1135	1548	2002	2064	
F6250-150SHP	10"	3517	53	211	492	886	1336	1934	2638	3411	3517	
F6300-150SHP	12"	4837	73	290	677	1219	1838	2660	3628	4692	4837	
F6350-150SHP	14"	6857	90	392	914	1646	2481	3592	4898	6530	6857	
F6400-150SHP	16"	9287	132	531	1230	2229	3361	4865	6634	8845	9287	
F6450-150SHP	18"	11400	171	684	1596	3873	4332	6270	8550	11270	11400	
F6500-150SHP	20"	14420	207	828	1932	3478	5244	7590	10350	13800	14420	
F6600-150SHP	24"	22050	315	1260	2940	5292	7890	11550	15750	21000	22050	

050904 - 02/12 - Subject to change. © Belimo Aircontrols (USA), Inc.

Maximum Dimensions (Inches)

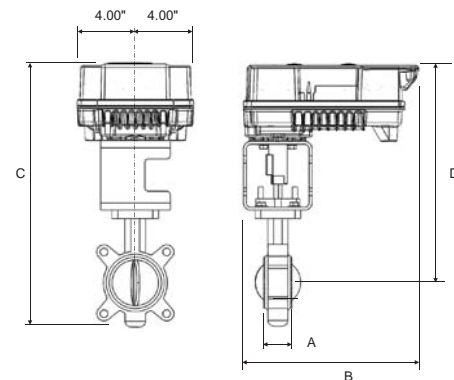
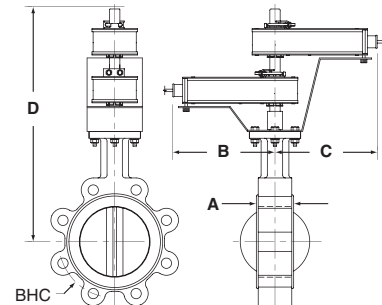
Valve	Size	C _v 90°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)	
F650-150SHP	2"	102	1.75	9.00	9.00	19.50	4.75	4	5/8-11 UNC	2*AF	150	Spring Return
F665-150SHP	2½"	146	1.88	9.00	9.00	20.00	5.50	4	5/8-11 UNC		150	
F680-150SHP	3"	228	1.92	9.00	9.00	20.50	6.00	4	5/8-11 UNC		150	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC	GK	150	Electronic Fail-Safe
F650-150SHP	2"	102	1.75	9.00	9.00	19.50	4.75	4	5/8-11 UNC		285	
F665-150SHP	2½"	146	1.88	9.00	9.00	20.00	5.50	4	5/8-11 UNC		285	
F680-150SHP	3"	228	1.92	9.00	9.00	20.50	6.00	4	5/8-11 UNC	2*GK	285	Electronic Fail-Safe
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		150	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		285	
F650-150SHP	2"	102	1.75	9.00	9.00	19.50	4.75	4	5/8-11 UNC	GM	285	Electronic Fail-Safe
F665-150SHP	2½"	146	1.88	9.00	9.00	20.00	5.50	4	5/8-11 UNC		285	
F680-150SHP	3"	228	1.92	9.00	9.00	20.50	6.00	4	5/8-11 UNC		285	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC	2*GM	150	Electronic Fail-Safe
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		285	
F6100-150SHP	4"	451	2.13	9.00	9.00	21.00	7.50	8	5/8-11 UNC		285	
F650-150SHP	2"	102	1.75	10.00	15.00	14.00	4.75	4	5/8-11 UNC	PR/PK	285	Non-Spring Return
F665-150SHP	2½"	146	1.88	10.00	16.00	14.00	5.50	4	5/8-11 UNC		285	
F680-150SHP	3"	228	1.92	10.00	17.00	15.00	6.00	4	5/8-11 UNC		285	
F6100-150SHP	4"	451	2.13	10.00	18.00	16.00	7.50	8	5/8-11 UNC	SY4...	285	Electronic Fail-Safe (K)
F6125-150SHP	5"	714	2.25	10.00	19.00	16.00	8.50	8	3/4-10 UNC		285	
F6150-150SHP	6"	1103	2.29	10.00	20.00	17.00	9.50	8	3/4-10 UNC		285	
F6200-150SHP	8"	2064	2.50	12.00	12.00	32.00	11.75	8	3/4-10 UNC	SY5...	285	Electronic Fail-Safe (K)
F6250-150SHP	10"	3517	2.81	12.00	12.00	33.00	14.25	12	7/8-9 UNC		150	
F6300-150SHP	12"	4837	3.23	12.00	12.00	35.00	17.00	12	7/8-9 UNC		285	
F6350-150SHP	14"	6857	3.62	14.00	14.00	36.00	18.75	12	1-8 UNC	SY7...	150	Electronic Fail-Safe (K)
F6400-150SHP	16"	9287	4.00	14.00	14.00	37.50	21.25	16	1-8 UNC		285	
F6450-150SHP	18"	11400	4.50	14.00	14.00	42.25	22.75	16	1 1/8-8 UNC		150	
F6500-150SHP	20"	14420	5.00	14.00	14.00	49.50	25.00	20	1 1/8-8 UNC	SY8...	285	Electronic Fail-Safe (K)
F6600-150SHP	24"	22050	6.06	14.00	14.00	56.25	29.50	20	1 1/4-8 UNC		150	

Dimension "A" does not include flange gaskets. (2 required per valve)

Application Notes

- Valves are rated at 285 psi differential pressure in the closed position @ 100°F media temperature.
- Valves are furnished with lugs tapped for use between ANSI Class 125/150 flanges conforming to ANSI B16.5 Standards.
- 2-way assemblies are furnished assembled, calibrated and tested, ready for installation.
- Dimension "D" allows for actuator(s) removal without the need to remove the valve from the pipe.
- Weather shields are available, dimensional data furnished upon request.
- Flange gaskets (2 required, not provided with valve) MUST be used between valve and ANSI flange.
- Flange bolts are not included with the valve. These are furnished by others.

Dimensions



Safety Notes

WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.P65Warnings.ca.gov

F7 Series 3-Way, ANSI Class 150 Butterfly Valve Reinforced Teflon Seat, 316 Stainless Disc



- Bubble tight shut-off to ANSI Class 150 Standards
- Long stem design allows for 2" insulation minimum
- Valve Face-to-face dimensions comply with API 609 & MSS-SP-68
- Designed to be installed between ASME/ANSI B16.5 Flanges
- Completely assembled and tested, ready for installation
- Tees comply with ASME/ANSI B16.1 Class 125 Flanges

Application

These valves are designed to meet the needs of HVAC and Commercial applications requiring positive shut-off for liquids at higher pressures and temperatures. Typical applications include chiller isolation, cooling tower isolation, change-over systems, large air handler coil control, bypass and process control applications. The large C_v values provide for an economical control valve solution for larger flow applications.

Dead End Service

Utilizes larger retainer ring set screws to allow the valve to be placed at the end of the line without a down stream flange in either flow direction while still holding full pressure.

Technical Data

Service	chilled, hot water, 60% glycol, steam to 50 psi
Flow characteristic	modified equal percentage, unidirectional
Controllable flow range	82°
Sizes	2" to 18"
Type of end fitting	for use with ASME/class 125/150 flanges
Materials	
Body	carbon steel full lug
Disc	316 stainless steel
Seat	RPTFE
Shaft	17-4 PH stainless
Gland seal	PTFE
Bushings	glass backed PTFE
Media temperature range	-20°F to 400°F [-30°C to 204°C]
Body pressure rating	ANSI Class 150
Close-off pressure	285 psi
Rangeability	100:1 (for 30 deg to 70 deg range)
Maximum velocity	32 FPS
Leakage	bubble tight

		3-way Valves		Suitable Actuators			
		Valve Nominal Size	Type	Non Fail-Safe		Electronic Fail-Safe	
C _v 90°	C _v 60°	Inches	ANSI 150 3-way	150	300	150	300
102	56	2	F750-150SHP	GM Series	PR Series	GM Series	PR Series
146	80	2½	F765-150SHP				
228	125	3	F780-150SHP				
451	248	4	F7100-150SHP	SY Series (2 Year Warranty)	SY Series (2 Year Warranty)	GK Series	PKR
714	393	5	F7125-150SHP				
1103	607	6	F7150-150SHP				
2064	1135	8	F7200-150SHP				
3517	1934	10	F7250-150SHP				
4837	2660	12	F7300-150SHP				
6857	3592	14*	F7350-150SHP				
9287	4865	16*	F7400-150SHP				
11400	6270	18*	F7450-150SHP				

Valve	Size	C _v	MOD								
			10°	20°	30°	40°	50°	60°	70°	80°	90°
F750-150SHP	2"	102	1.50	6.10	14	26	39	56	77	99	102
F765-150SHP	2½"	146	2.20	8.80	20	37	55	80	110	142	146
F780-150SHP	3"	228	3.40	14	32	57	87	125	171	221	228
F7100-150SHP	4"	451	6.80	27	63	114	171	248	338	437	451
F7125-150SHP	5"	714	11	43	100	180	271	393	536	693	714
F7150-150SHP	6"	1103	17	66	154	278	419	607	827	1070	1103
F7200-150SHP	8"	2064	31	124	289	520	784	1135	1548	2002	2064
F7250-150SHP	10"	3517	53	211	492	886	1336	1934	2638	3411	3517
F7300-150SHP	12"	4837	73	290	677	1219	1838	2660	3628	4692	4837
F7350-150SHP	14"	6857	103	411	960	1728	2606	3592	5143	6651	6857
F7400-150SHP	16"	9287	139	557	1300	2340	3529	4865	6965	9008	9287
F7450-150SHP	18"	11400	171	684	1596	2873	4332	6270	8550	11058	11400

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Maximum Dimensions (Inches)											
Valve	Size	C _v 90°	A	B	C	D(Max)	BHC	No. of Holes	Lug Bolt	Actuator	Close-Off (PSI)
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	GK	150
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		150
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		150
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	2*GK	285
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		285
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		285
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	GM	150
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		150
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		150
F7100-150SHP	4"	451	6.50	8.63	8.63	18.00	7.50	8	5/8-11 UNC		150
F750-150SHP	2"	102	4.50	6.38	6.38	16.50	4.75	4	5/8-11 UNC	2*GM	285
F765-150SHP	2½"	146	5.00	6.88	6.88	17.00	5.50	4	5/8-11 UNC		285
F780-150SHP	3"	228	5.50	7.56	7.56	17.50	6.00	4	5/8-11 UNC		285
F750-150SHP	2"	102	4.50	6.38	6.38	14.00	4.75	4	5/8-11 UNC	PR/PK	285
F765-150SHP	2½"	146	5.00	6.88	6.88	14.50	5.50	4	5/8-11 UNC		285
F780-150SHP	3"	228	5.50	7.56	7.56	15.00	6.00	4	5/8-11 UNC		285
F7100-150SHP	4"	451	6.50	8.63	8.63	16.00	7.50	8	5/8-11 UNC		285
F7125-150SHP	5"	714	7.50	9.75	9.75	24.25	8.50	8	3/4-10 UNC	SY4...	285
F7150-150SHP	6"	1103	8.00	10.25	10.25	24.75	9.50	8	3/4-10 UNC		285
F7200-150SHP	8"	2064	9.00	11.50	11.50	32.00	11.75	8	3/4-10 UNC	SY4...	150
F7250-150SHP	10"	3517	11.00	13.81	13.81	33.00	14.25	12	7/8-9 UNC	SY4...	150
										SY5...	285
										SY5...	150
F7300-150SHP	12"	4837	12.00	15.81	15.81	35.00	17.00	12	7/8-9 UNC	SY7...	285
F7350-150SHP	14"	6857	14.00	17.62	17.62	36.00	18.75	12	1-8 UNC	SY7...	285
F7400-150SHP	16"	9287	15.00	19.00	19.00	37.50	21.25	16	1-8 UNC	SY7...	150
										SY9...	285
F7450-150SHP	18"	11400	16.50	21.00	21.00	42.25	22.75	16	1 1/8-8 UNC	SY8...	150
										SY10...	285

Electronic Fail-Safe
Non-Spring Return
Electronic Fail-Safe (K)

Dimensions "A, B and C" do not include flange gaskets. (3 required per valve)

Application Notes

- Valves are rated at 285 psi differential pressure in the closed position @ 100°F media temperature.
- Valves are furnished with lugs tapped for use between ANSI Class 125/150 flanges conforming to ANSI B16.5 Standards.
- 3-way assemblies are furnished assembled with Tee, calibrated and tested, ready for installation. All 3-way assemblies require the customer to specify the 3-way configuration code prior to order entry to guarantee correct placement of valves and actuator(s) on the assembly.
- Dimension "D" allows for actuator(s) removal without the need to remove the valve from the pipe.
- Weather shields are available, dimensional data furnished upon request.
- Dual actuated valves have single actuators mounted on each valve shaft.
- Flange gaskets (3 required, not provided with valve) MUST be used between valve and ANSI flange.
- Flange bolts are not included with the valve. These are furnished by others.

Note: For tee configuration, please refer to page 5.

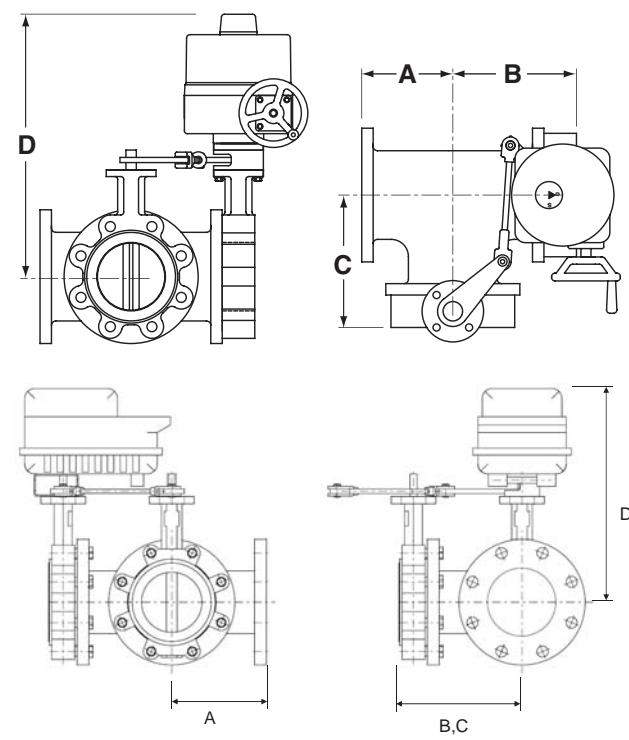
SHP series valves have a preferred flow direction.

Preferred Flowrate

Safety Notes

WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.P65Warnings.ca.gov

Dimensions



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0400



Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on Belimo standard and high performance valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC/VDC, 120 VAC and 230 VAC.

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Motor protection	H Class insulation (SY-1), F Class (SY-2...5)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-24) on/off, floating point (SY...24MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...24MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...24MFT) 1.0 mA/500mV
Feedback	(SY...24MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY4-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

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Power Supply

24 VAC/VDC 50/60Hz, single phase

Model	Torque	Speed	Power Consumption	Duty Cycle		Override	Weight
				On/Off	MFT		
SY4-24(MFT)	400Nm/3560 in-lbs	16s	6.0A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-24(MFT)	500Nm/4450 in-lbs	22s	6.5A	30%	75%	Hand Wheel	22kg/48.5 lb.

SY...120V Series Non-Spring Return Actuator

Technical Data - 120 VAC



Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on Belimo standard and high performance valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC/ VDC, 120 VAC and 230 VAC.

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Motor protection	H Class insulation (SY-1), F Class (SY-2...12)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-110) on/off, floating point (SY...120MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...120MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...120MFT) 1.0 mA/500mV
Feedback	(SY...120MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY4-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

Note: Leakage current is possible (<3.5 mA).
Connect ground before applying voltage.

Power Supply 120 VAC 50/60Hz, single phase

Model	Torque	Speed 60Hz	Speed 50Hz	Power Consumption	Duty Cycle		Override	Weight
					On/Off	Proportional		
SY4-120(MFT)	400Nm/3560 in-lbs	16s	18s	1.3A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-120(MFT)	500Nm/4450 in-lbs	22s	25s	1.5A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY6-120(MFT)	650Nm/5785 in-lbs	28s	31s	1.8A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY7-120(MFT)	1000Nm/8900 in-lbs	46s	55s	3.2A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY8-120(MFT)	1500Nm/13350 in-lbs	46s	55s	4.0A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY9-120(MFT)	2000Nm/17800 in-lbs	58s	70s	3.2A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY10-120(MFT)	2500Nm/22250 in-lbs	58s	70s	4.0A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY11-120(MFT)	3000Nm/26700 in-lbs	58s	70s	3.0A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY12-120(MFT)	3500Nm/31150 in-lbs	58s	70s	4.0A	30%	50%	Hand Wheel	56kg/123.5 lb.



Application:

The SY actuators are NEMA 4X rated and designed to meet the needs of HVAC and Commercial applications. Offered on Belimo standard and high performance valve series, these actuators are available for on/off and modulating applications. Depending on the application, they are available in 24 VAC/ VDC, 120 VAC and 230 VAC.

Technical Data	
Electrical connection	½" conduit connector, screw terminals
Overload protection	thermally protected 135°C cut-out
Motor protection	H Class insulation (SY-1), F Class (SY-2...12)
Gear train	high alloy steel gear sets, self locking
Operating range	(SY...-220) on/off, floating point (SY...230MFT) 2-10 VDC, 4-20 mA, 0-10 VDC
Sensitivity	(SY...230MFT) 0.4 mA/200mV
Reversal hysteresis	(SY...230MFT) 1.0 mA/500mV
Feedback	(SY...230MFT) 2-10 VDC
Angle of rotation	90°
Direction of rotation	reversible
Position indication	top mounted domed indicator
Internal humidity control	resistive heating element
Auxiliary switches	factory set for 5° and 85° change of state SY1: (2) SPDT, min 1 mA, 24 VAC; max 3A, 250 VAC. SY4-12: (2) SPDT, min 1 mA, 24 VAC; max 5A, 250 VAC.
Ambient temperature	-22°F to +150°F [-30°C to +65°C]
Humidity range	up to 95%
Housing type	IP67, NEMA 4X
Housing material	die cast aluminum alloy
Agency listings	ISO, CE, cCSAus

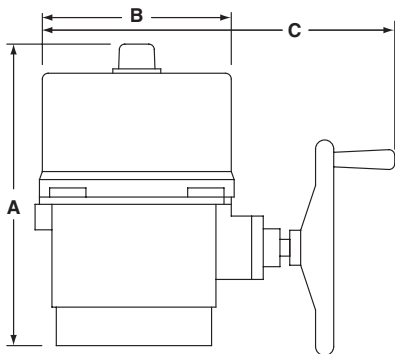
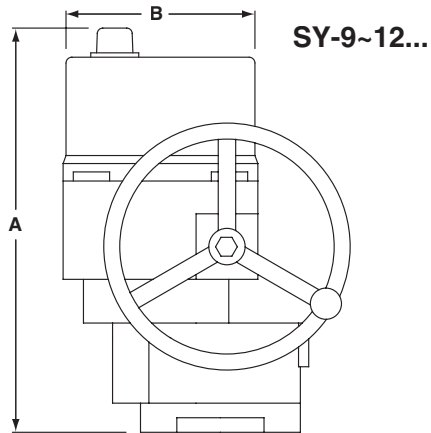
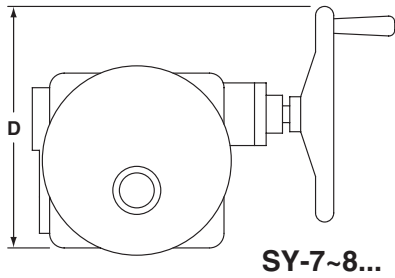
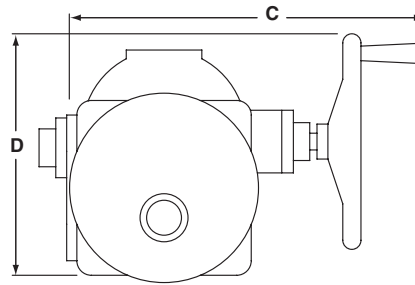
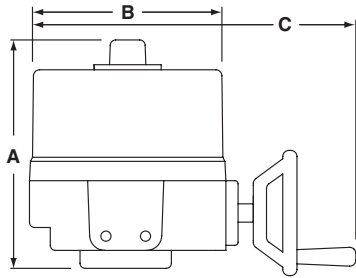
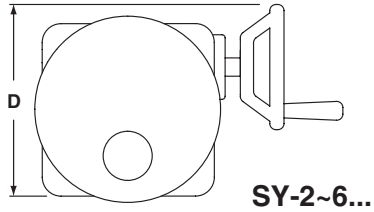
Power Supply 230 VAC 50/60Hz, single phase

Model	Torque	Speed 60Hz	Speed 50Hz	Power Consumption	Duty Cycle		Override	Weight
					On/Off	MFT		
SY4-230(MFT)	400Nm/3560 in-lbs	16s	18s	0.6A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY5-230(MFT)	500Nm/4450 in-lbs	22s	25s	0.7A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY6-230(MFT)	650Nm/5785 in-lbs	28s	31s	0.8A	30%	75%	Hand Wheel	22kg/48.5 lb.
SY7-230(MFT)	1000Nm/8900 in-lbs	46s	55s	1.6A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY8-230(MFT)	1500Nm/13350 in-lbs	46s	55s	2.0A	30%	75%	Hand Wheel	36kg/79.5 lb.
SY9-230(MFT)	2000Nm/17800 in-lbs	58s	70s	1.6A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY10-230(MFT)	2500Nm/22250 in-lbs	58s	70s	2.0A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY11-230(MFT)	3000Nm/26700 in-lbs	58s	70s	1.6A	30%	50%	Hand Wheel	56kg/123.5 lb.
SY12-230(MFT)	3500Nm/31150 in-lbs	58s	70s	2.2A	30%	50%	Hand Wheel	56kg/123.5 lb.

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SY... Series Non-Spring Return Actuator Dimensions

BELIMO



MODEL	DIM A (MAX)	Add to Dim A for cover removal	DIM B	DIM C (MAX)	DIM D
	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]	Inches [mm]
SY4~6	12.40 [315]	8.86 [225]	9.21 [234]	14.96 [380]	11.81 [300]
SY7~8	16.54 [420]	8.86 [225]	9.21 [234]	17.72 [450]	13.39 [340]
SY9~12	23.23 [590]	8.86 [225]	10.24 [260]	18.50 [470]	13.78 [350]

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Power Supply 24 VAC/VDC Single Phase

Model #	Torque	Speed 50 Hz/60 Hz	Current Draw (50 Hz)	Current Draw (60 Hz)	W (50 Hz)	W (60 Hz)	VA (50 Hz)	VA (60 Hz)	Override	Weight
PRBUP-3-T*	1400 in-lbs/ 160 Nm	35 seconds	0.8 A	0.8 A	20	20	20	20	Manual override crank	5.8 kg/12.8 lbs.
PRXUP-3-T*	1400 in-lbs/ 160 Nm	35, 30-120 seconds	0.8 A	0.8 A	20	20	20	20	Manual override crank	5.8 kg/12.8 lbs.
SY4-24	3540 in-lbs/ 400 Nm	30 seconds	9.5 A	9.5 A	208	212	228	228	Hand wheel	22 kg/48.5 lbs.
SY5-24	4430 in-lbs/ 500 Nm	35 seconds	9.3 A	9.4 A	178	168	223	227	Hand wheel	22 kg/48.5 lbs.

Power Supply 120 VAC Single Phase

Model #	Torque	Speed 50 Hz	Speed 60 Hz	Current Draw (50 Hz)	Current Draw (60 Hz)	W (50 Hz)	W (60 Hz)	VA (50 Hz)	VA (60 Hz)	Override	Weight
PRBUP-3-T*	1400 in-lbs/ 160 Nm	35 seconds	35 seconds	0.2 A	0.2 A	18	18	23	23	Manual override crank	5.8 kg/12.8 lbs.
PRXUP-3-T*	1400 in-lbs/ 160 Nm	35, 30-120 seconds	35, 30-120 seconds	0.2 A	0.2 A	18	18	23	23	Manual override crank	5.8 kg/12.8 lbs.
SY4-110	3540 in-lbs/ 400 Nm	21 seconds	18 seconds	2.2 A	1.8 A	240	196	264	216	Hand wheel	22 kg/48.5 lbs.
SY5-110	4430 in-lbs/ 500 Nm	29 seconds	25 seconds	2.2 A	1.8 A	242	193	264	216	Hand wheel	22 kg/48.5 lbs.
SY6-110	5750 in-lbs/ 650 Nm	37 seconds	32 seconds	2.2 A	1.8 A	247	198	264	216	Hand wheel	22 kg/48.5 lbs.
SY7-110	8850 in-lbs/ 1000 Nm	59 seconds	49 seconds	6.4 A	3.5 A	670	385	768	420	Hand wheel	36 kg/79.5 lbs.
SY8-110	13280 in-lbs/ 1500 Nm	60 seconds	50 seconds	8.2 A	4.8 A	847	514	984	576	Hand wheel	36 kg/79.5 lbs.
SY9-110	17700 in-lbs/ 2000 Nm	68 seconds	57 seconds	2.7 A	2.8 A	304	311	324	336	Hand wheel	72 kg/176.4 lbs.
SY10-110	22130 in-lbs/ 2500 Nm	75 seconds	62 seconds	2.8 A	2.9 A	318	335	336	348	Hand wheel	72 kg/176.4 lbs.
SY11-110	26550 in-lbs/ 3000 Nm	78 seconds	69 seconds	3.3 A	3.6 A	365	387	396	432	Hand wheel	72 kg/176.4 lbs.
SY12-110	30980 in-lbs/ 3500 Nm	72 seconds	60 seconds	3.7 A	3.8 A	415	422	444	456	Hand wheel	72 kg/176.4 lbs.

Power Supply 230 VAC Single Phase

Model #	Torque	Speed 50 Hz	Speed 60 Hz	Current Draw (50 Hz)	Current Draw (60 Hz)	W (50 Hz)	W (60 Hz)	VA (50 Hz)	VA (60 Hz)	Override	Weight
PRBUP-3-T*	1400 in-lbs/ 160 Nm	35 sec.	35 sec.	0.2 A	0.2 A	20	20	52	52	Manual override crank	5.8 kg/12.8 lbs.
PRXUP-3-T*	1400 in-lbs/ 160 Nm	35, 30-120 sec.	35, 30-120 sec.	0.2 A	0.2 A	20	20	52	52	Manual override crank	5.8 kg/12.8 lbs.
SY4-220	3540 in-lbs/ 400 Nm	21 seconds	18 seconds	1.1 A	0.9 A	221	180	253	207	Hand wheel	22 kg/48.5 lbs.
SY5-220	4430 in-lbs/ 500 Nm	29 seconds	25 seconds	1.1 A	0.9 A	216	179	253	207	Hand wheel	22 kg/48.5 lbs.
SY6-220	5750 in-lbs/ 650 Nm	38 seconds	31 seconds	1.0 A	0.9 A	193	177	230	207	Hand wheel	22 kg/48.5 lbs.
SY7-220	8850 in-lbs/ 1000 Nm	58 seconds	48 seconds	1.8 A	1.4 A	381	290	414	322	Hand wheel	36 kg/79.5 lbs.
SY8-220	13280 in-lbs/ 1500 Nm	59 seconds	49 seconds	1.9 A	1.4 A	428	294	437	322	Hand wheel	36 kg/79.5 lbs.
SY9-220	17700 in-lbs/ 2000 Nm	68 seconds	57 seconds	1.6 A	2.4 A	356	509	368	552	Hand wheel	72 kg/176.4 lbs.
SY10-220	22130 in-lbs/ 2500 Nm	73 seconds	62 seconds	1.7 A	2.5 A	377	531	391	579	Hand wheel	72 kg/176.4 lbs.
SY11-220	26550 in-lbs/ 3000 Nm	46 seconds	64 seconds	1.8 A	2.5 A	397	547	414	579	Hand wheel	72 kg/176.4 lbs.
SY12-220	30980 in-lbs/ 3500 Nm	74 seconds	61 seconds	1.8 A	2.4 A	409	505	414	552	Hand wheel	72 kg/176.4 lbs.

*-200 and -250 versions have the same ratings.

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Power Supply 24 VAC/VDC Single Phase

Model #	Torque	Speed 50 Hz/60 Hz	Current Draw (50 Hz)	Current Draw (60 Hz)	W (50 Hz)	W (60 Hz)	VA (50 Hz)	VA (60 Hz)	Override	Weight
PRXUP-MFT-T*	1400 in-lbs/160 Nm	30-120 sec.	0.9 A	0.9 A	20	20	20	20	Manual override crank	5.8 kg/12.8 lbs.
PKRXUP-MFT-T*	1400 in-lbs/160 Nm	30-120 sec.	2.2 A	2.2 A	52	52	55	55	Manual override crank	6.4 kg/14.1 lbs.
SY4-24MFT	3540 in-lbs/ 400 Nm	23 seconds	11.0 A	11.0 A	254	251	264	264	Hand wheel	22 kg/48.5 lbs.
SY5-24MFT	4430 in-lbs/ 500 Nm	30 seconds	10.2 A	10.2 A	232	230	245	245	Hand wheel	22 kg/48.5 lbs.

Power Supply 120 VAC Single Phase

Model #	Torque	Speed 50 Hz	Speed 60 Hz	Current Draw (50 Hz)	Current Draw (60 Hz)	W (50 Hz)	W (60 Hz)	VA (50 Hz)	VA (60 Hz)	Override	Weight
PRXUP-MFT-T*	1400 in-lbs/160 Nm	30-120 sec.	30-120 sec.	0.2 A	0.2 A	18	18	23	23	Manual override crank	5.8 kg/12.8 lbs.
PKRXUP-MFT-T*	1400 in-lbs/160 Nm	30-120 sec.	30-120 sec.	0.3 A	0.3 A	40	40	43	43	Manual override crank	6.4 kg/14.1 lbs.
SY4-120MFT	3540 in-lbs/ 400 Nm	16 seconds	17 seconds	2.3 A	2.4 A	258	256	276	288	Hand wheel	22 kg/48.5 lbs.
SY5-120MFT	4430 in-lbs/ 500 Nm	21 seconds	21 seconds	2.3 A	2.3 A	216	208	276	276	Hand wheel	22 kg/48.5 lbs.
SY6-120MFT	5750 in-lbs/ 650 Nm	28 seconds	29 seconds	2.2 A	2.2 A	240	236	264	264	Hand wheel	22 kg/48.5 lbs.
SY7-120MFT	8850 in-lbs/ 1000 Nm	41 seconds	44 seconds	1.8 A	1.7 A	198	192	216	204	Hand wheel	36 kg/79.5 lbs.
SY8-120MFT	13280 in-lbs/ 1500 Nm	48 seconds	48 seconds	2.6 A	2.6 A	275	266	312	312	Hand wheel	36 kg/79.5 lbs.
SY9-120MFT	17700 in-lbs/ 2000 Nm	47 seconds	47 seconds	3.6 A	3.4 A	397	382	432	408	Hand wheel	72 kg/176.4 lbs.
SY10-120MFT	22130 in-lbs/ 2500 Nm	52 seconds	51 seconds	4.0 A	4.0 A	450	445	480	480	Hand wheel	72 kg/176.4 lbs.
SY11-120MFT	26550 in-lbs/ 3000 Nm	55 seconds	56 seconds	3.1 A	3.0 A	332	318	372	360	Hand wheel	72 kg/176.4 lbs.
SY12-120MFT	30980 in-lbs/ 3500 Nm	61 seconds	62 seconds	3.6 A	3.4 A	386	368	432	408	Hand wheel	72 kg/176.4 lbs.

Power Supply 230 VAC Single Phase

Model #	Torque	Speed 50 Hz	Speed 60 Hz	Current Draw (50 Hz)	Current Draw (60 Hz)	W (50 Hz)	W (60 Hz)	VA (50 Hz)	VA (60 Hz)	Override	Weight
PRXUP-MFT-T*	1400 in-lbs/160 Nm	30-120 sec.	30-120 sec.	0.1 A	0.1 A	20	20	52	52	Manual override crank	5.8 kg/12.8 lbs.
PKRXUP-MFT-T*	1400 in-lbs/160 Nm	30-120 sec.	30-120 sec.	0.2 A	0.2 A	40	40	68	68	Manual override crank	6.4 kg/14.1 lbs.
SY4-230MFT	3540 in-lbs/ 400 Nm	16 seconds	17 seconds	1.1 A	1.1 A	222	217	253	253	Hand wheel	22 kg/48.5 lbs.
SY5-230MFT	4430 in-lbs/ 500 Nm	22 seconds	22 seconds	1.1 A	1.0 A	211	200	253	230	Hand wheel	22 kg/48.5 lbs.
SY6-230MFT	5750 in-lbs/ 650 Nm	32 seconds	32 seconds	1.1 A	1.1 A	236	232	253	253	Hand wheel	22 kg/48.5 lbs.
SY7-230MFT	8850 in-lbs/ 1000 Nm	44 seconds	44 seconds	0.9 A	0.8 A	167	157	207	184	Hand wheel	36 kg/79.5 lbs.
SY8-230MFT	13280 in-lbs/ 1500 Nm	55 seconds	57 seconds	1.3 A	1.4 A	288	286	299	322	Hand wheel	36 kg/79.5 lbs.
SY9-230MFT	17700 in-lbs/ 2000 Nm	61 seconds	61 seconds	1.1 A	1.1 A	240	233	253	253	Hand wheel	72 kg/176.4 lbs.
SY10-230MFT	22130 in-lbs/ 2500 Nm	72 seconds	70 seconds	1.4 A	1.4 A	277	284	322	322	Hand wheel	72 kg/176.4 lbs.
SY11-230MFT	26550 in-lbs/ 3000 Nm	44 seconds	48 seconds	2.0 A	1.9 A	376	363	460	437	Hand wheel	72 kg/176.4 lbs.
SY12-230MFT	30980 in-lbs/ 3500 Nm	47 seconds	51 seconds	2.2 A	2.0 A	490	456	506	460	Hand wheel	72 kg/176.4 lbs.

*-200 and -250 versions have the same ratings.

W546_12

SY Actuator Wiring Diagram, SY1...5-24V – On/Off
SY1...12-120V or 230V On/Off

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
 Power consumption and input impedance must be observed.

⚠ NOTES SY1...5-24

⚠ Each actuator should be powered by a single, isolated control transformer.

- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input.
- "H" cannot be connected to terminal #3 and #4 simultaneously.

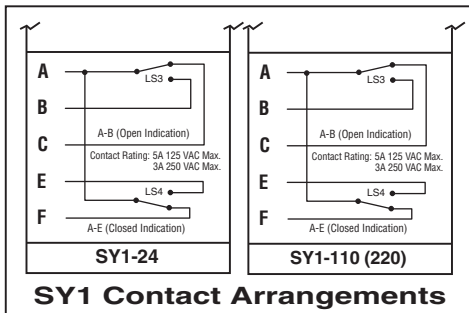
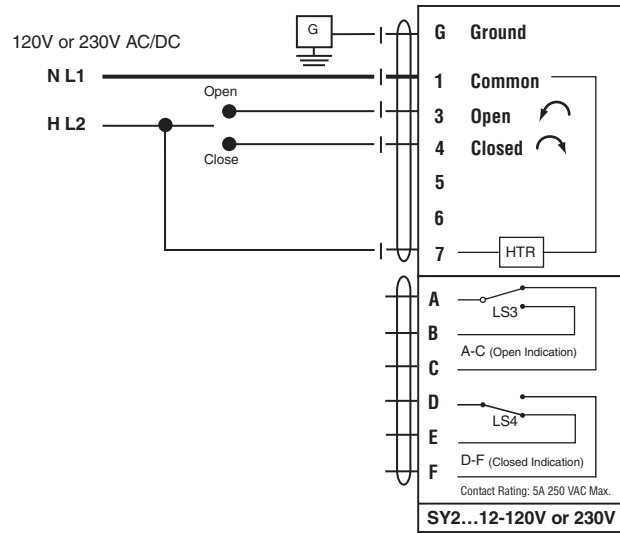
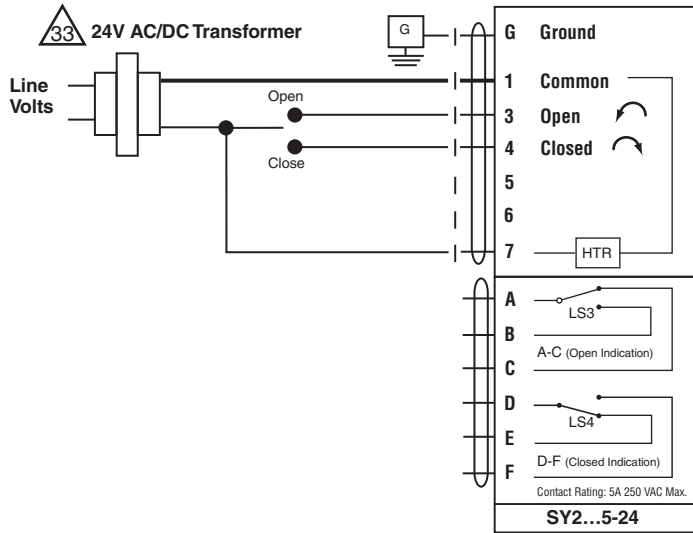
🔧 INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
 (Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
 3.75A X 24 VAC = 90VA Transformer).

⚠ NOTES SY1...12-120V or 230V

- **Caution:** Power Supply Voltage
- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input.
- "H" (L2) cannot be connected to terminal #3 and #4 simultaneously.



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Wiring for Control Valves

Proportional, 24V, 120/230V

W547_2_11

Actuator: SY2...5-24MFT SY2...12-120MFT SY2...12-230MFT

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

NOTES SY2...5-24MFT

- Each actuator should be powered by a single, isolated control transformer.
- Power supply Com/Neutral and Control Signal "-" wiring to a common is prohibited.

INSTALLATION NOTES

Observe Class 1 and Class 2 wiring restrictions.

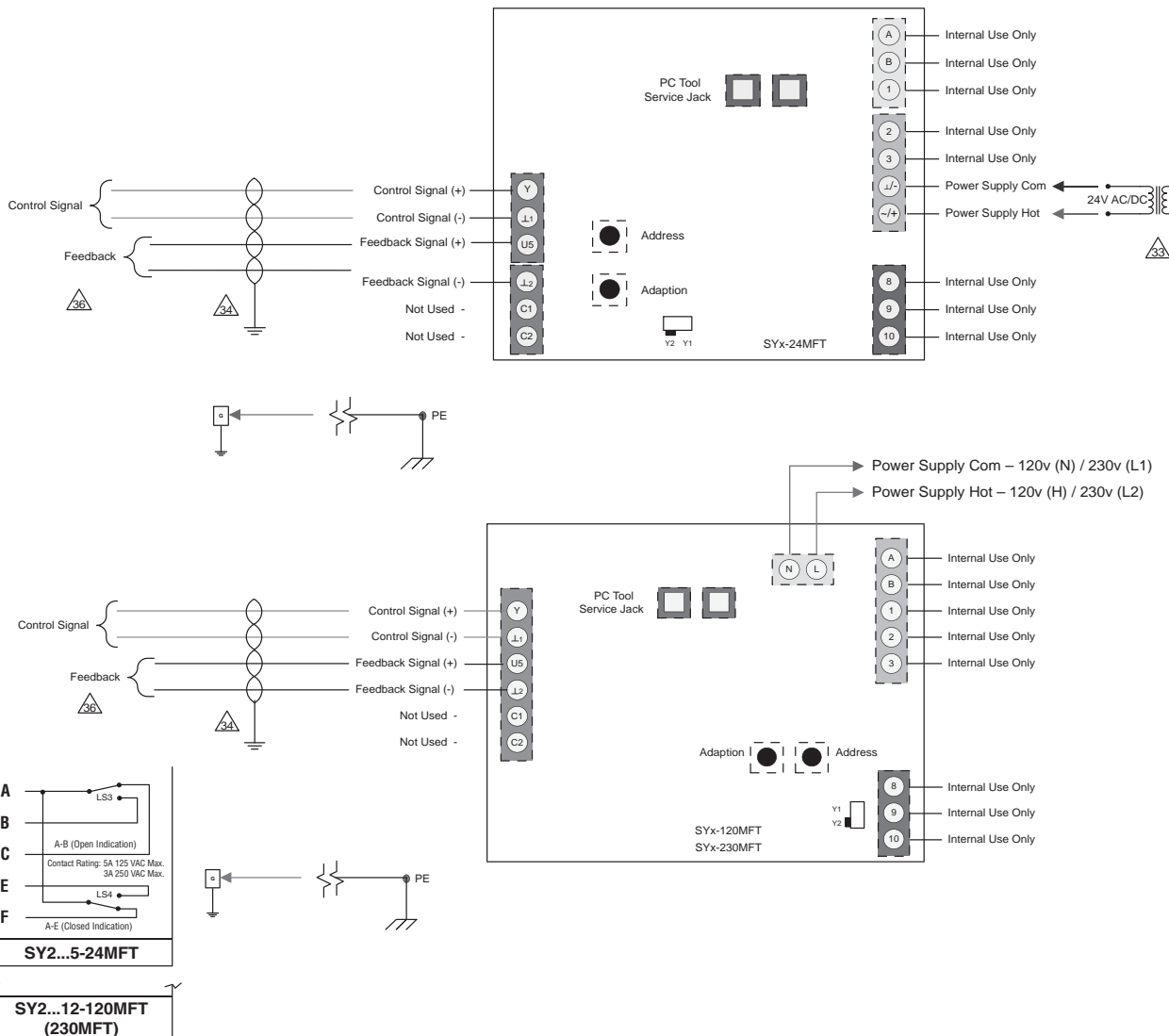
Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A, 3.75A X 24 VAC = 90VA Transformer)

APPLICATION NOTES

- Ground shielded wire at control panel chassis. Tape back ground at actuator.
- Use of feedback is optional.

NOTES SY2...12-120MFT (230MFT)

- Caution: Power supply voltage.



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W549_11

**SY Actuator Wiring Diagram, SY1...5-24 – Multiple Wiring
SY1...12-110 (220) – Multiple Wiring**

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF. This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor. On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, so while the actuator still turns in the commanded direction, the drag from the other reduces the torque output and causes overheating.

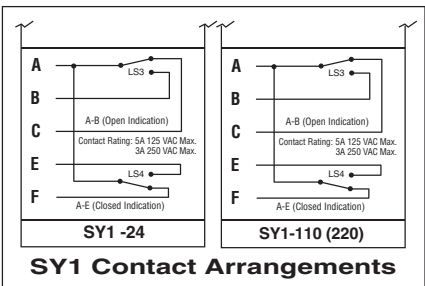
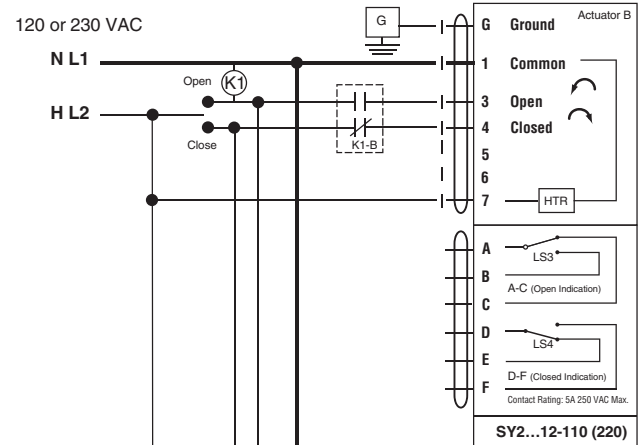
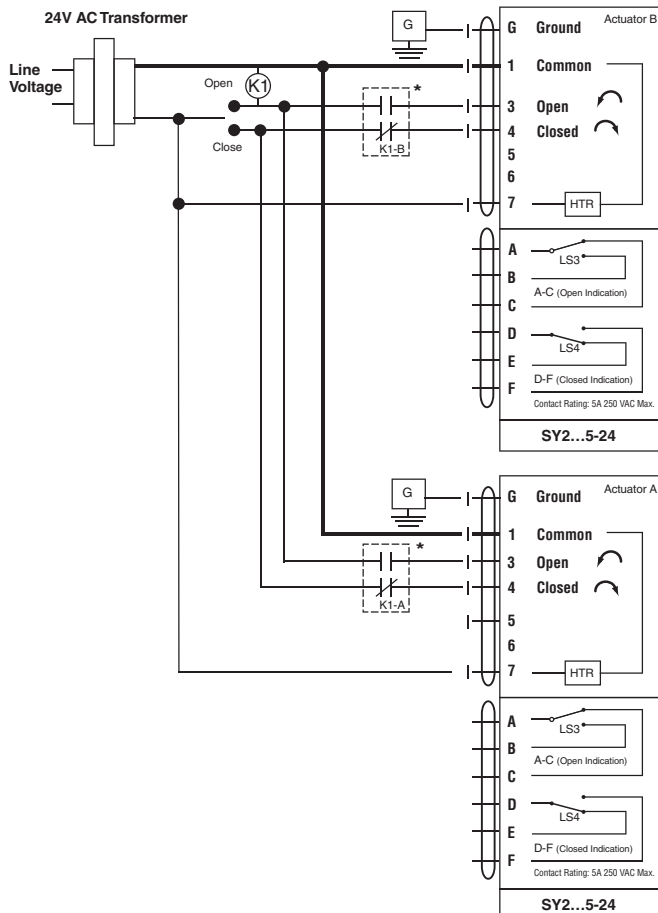
INSTALLATION NOTES

- Observe class 1 and class 2 wiring restrictions.
- Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

NOTES

- Caution:** Power Supply Voltage.
- Isolation relays must be used in parallel connection of multiple actuators using a common control signal input. Should be DPDT.
- "H" (L2) cannot be connected to terminal #3 and #4 simultaneously.
- Required:** Terminal #7 needs to be field wired to enable heater circuit.

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W550_2_11

Actuators: SY2...5-24MFT

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF.

This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor.

On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, so while the actuator still turns in the commanded direction, the drag from the other reduces the torque output and causes overheating.

INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.

Transformer sizing = SY actuator draw X 1.25 (safety margin)
(Ex. SY2-24 requires 3.0A x 1.25 = 3.75A,
3.75A X 24 VAC = 90VA Transformer).

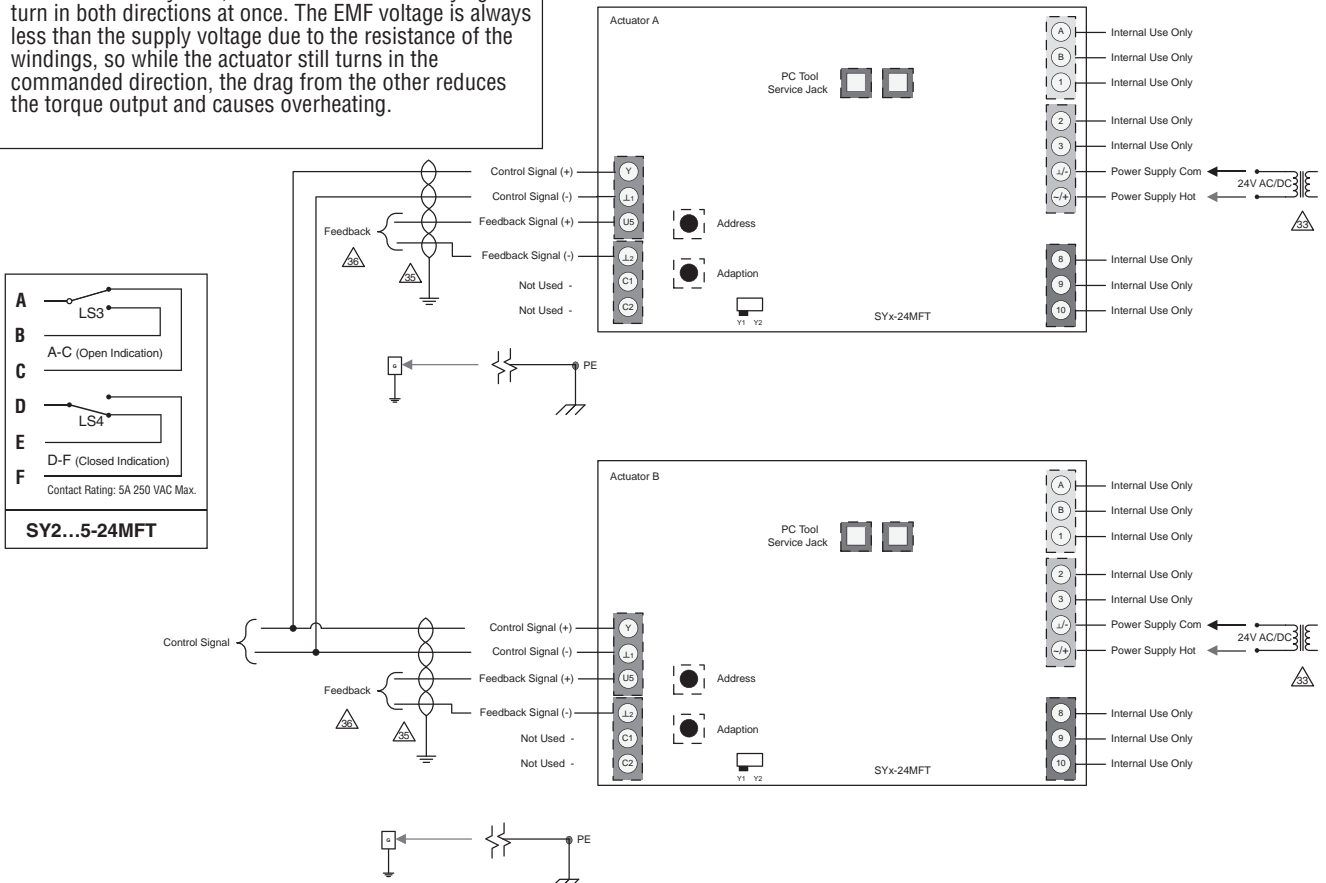
NOTES SY2...5-24MFT

Each actuator should be powered by a single, isolated control transformer.

APPLICATION NOTES

Recommended twisted shielded pair for control wiring.
Ground shielded wire at control panel chassis.
Tape back ground at actuator.

Use of feedback is optional.



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W552_2

Actuators: SY2...12-120MFT SY2...12-230MFT

Hazard Identification

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates an action or condition that may cause irreversible damage to the actuator(s) or associated equipment.

Equipment damage!
Power consumption and input impedance must be observed.

Isolation relays are required in parallel applications.

The reason parallel applications need isolation relays is that the motor uses two sets of windings, one for each direction. When one is energized to turn the actuator in a specific direction a voltage is generated in the other due to the magnetic field created from the first. It's called back EMF. This is OK with one actuator because the voltage generated in the second winding isn't connected to anything so there is no flow; it has no magnetic effect on the motor. On parallel applications without isolation, this EMF voltage energizes the winding it is connected to on the other actuators in the system, the actuators are then trying to turn in both directions at once. The EMF voltage is always less than the supply voltage due to the resistance of the windings, so while the actuator still turns in the commanded direction, the drag from the other reduces the torque output and causes overheating.



INSTALLATION NOTES

Observe class 1 and class 2 wiring restrictions.



APPLICATION NOTES



Recommended twisted shielded pair for control wiring. Ground shielded wire at control panel chassis. Tape back ground at actuator.

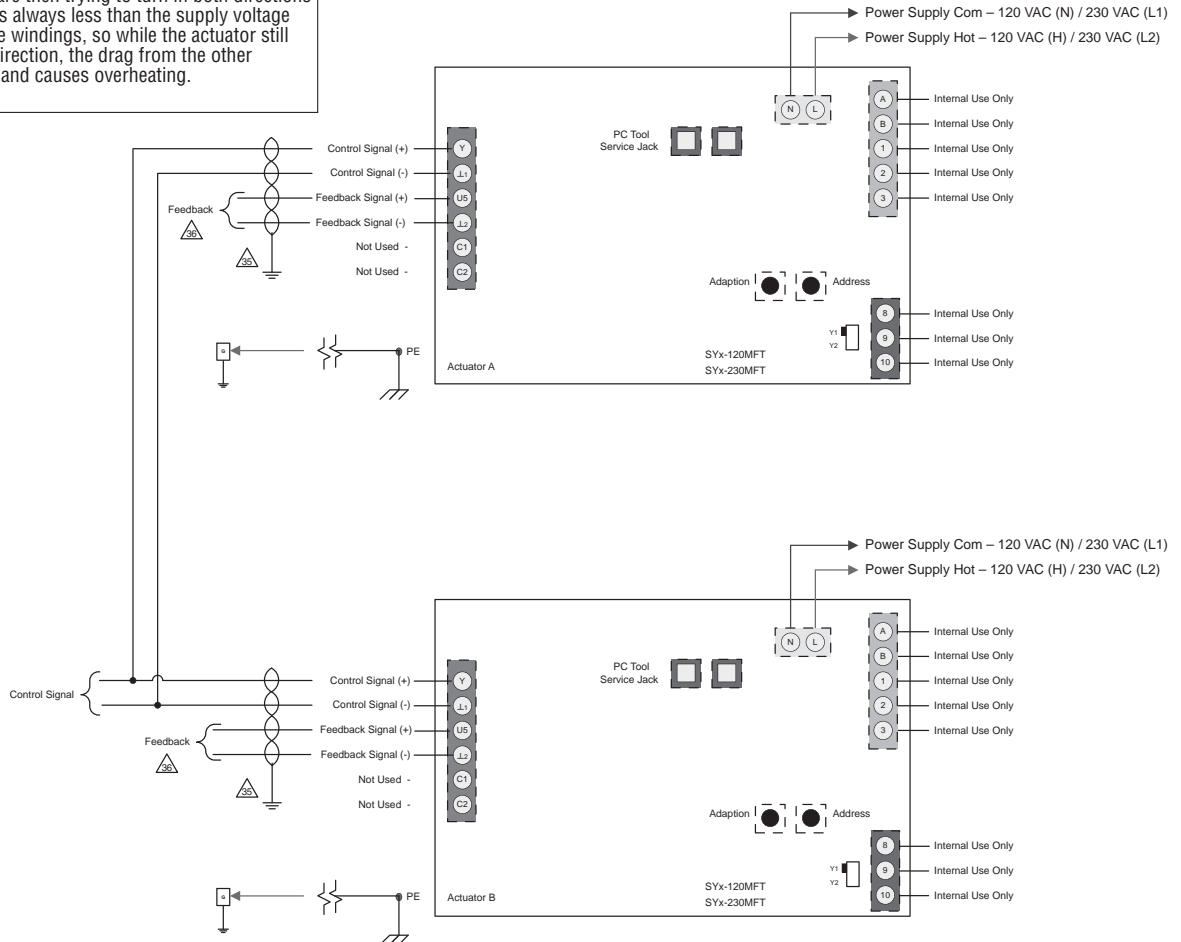
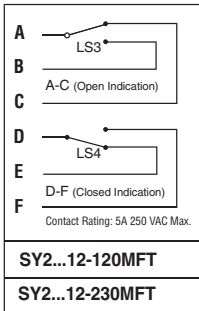


Use of feedback is optional.



NOTES SY2...12-120MFT (230MFT)

- **Caution:** Power supply voltage.



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AFBUP(-S)-X1, AFXUP(-S)-X1 Actuators, On/Off



Models

AFBUP-X1
AFBUP-S-X1
AFXUP-X1
AFXUP-S-X1

Technical Data	
Power supply	24...240 VAC -20% / +10%, 50/60 Hz 24...125 VDC ±10%
Power consumption	running 7 W
	holding 3.5 W
Transformer sizing	7 VA @ 24 VAC (class 2 power source) 8.5 VA @ 120 VAC 18 VA @ 240 VAC
Electrical connection	
AFBUP...	3 ft, 18 GA appliance cable, 1/2" conduit connector -S models: Two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
AFXUP...	3 ft [1m], 10 ft [3m] or 16 ft [5m] 18 GA appliance cable, with or without 1/2" conduit connector -S models: Two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection	Electronic throughout 0 to 95° rotation
Control	On/Off
Torque	180 in-lb [20 Nm] minimum
Direction of rotation	spring reversible with CW/CCW mounting
Mechanical angle of rotation	95° (adjustable with mechanical end stop, 35° to 95°)
Running time	motor < 75 sec
	spring 20 sec @ -4°F to 122°F [-20°C to 50°C]; < 60 sec @ -22°F [-30°C]
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Humidity	max. 95% RH non-condensing
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing	Nema 2, IP54, Enclosure Type2
Housing material	Zinc coated metal and plastic casing
Agency listings †	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC
Noise level	<50dB(A) motor @ 75 seconds ≤62dB(A) spring return
Servicing	maintenance free
Quality standard	ISO 9001
Weight	4.6 lbs (2.1 kg), 4.9 lbs (2.25 kg) with switches
† Rated Impulse Voltage 4kV, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.	
AFBUP-S-X1, AFXUP-S-X1	
Auxiliary switches	2 x SPDT 3A (0.5A) @ 250 VAC, UL Approved one set at +10°, one adjustable 10° to 90°

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Wiring Diagrams

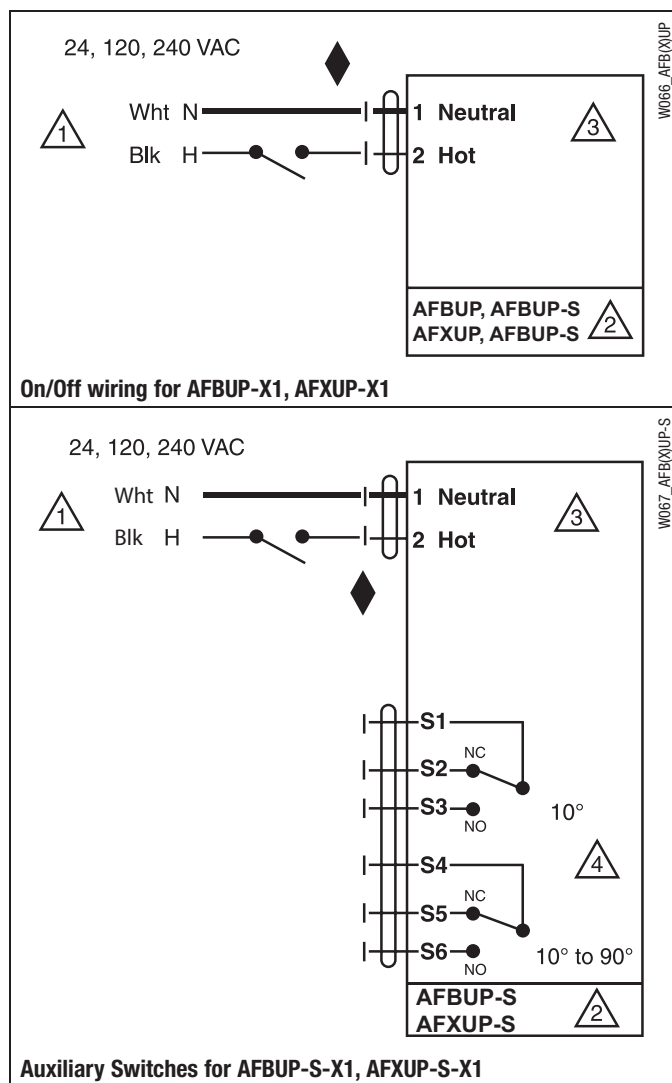
✂️ INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- 3 No ground connection is required.
- 4 For end position indication, interlock control, fan startup, etc.,
AFBUP-S-X1 and AFXUP-S-X1 incorporates two built-in auxiliary switches:
2 x SPDT, 3A (0.5A) @250 VAC, UL Approved, one switch is fixed at +10°,
one is adjustable 10° to 90°.

📄 APPLICATION NOTES

- ◆ Meets cULus requirements without the need of an electrical ground connection.

⚠️ WARNING Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



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AF Actuators, Multi-Function Technology



MFT CE



Models

- AFX24-MFT-X1
- AFX24-MFT-S-X1 w/built-in Aux. Switches
- 2* AFX24-MFT-X1
- 2* AFX24-MFT-S-X1

Technical Data	
Power supply	24 VAC, +/- 20%, 50/60 Hz 24 VDC, +20% / -10%
Power consumption	running 7.5 W holding 3 W
Transformer sizing	10 VA (Class 2 power source)
Electrical connection AFX...	3 ft [1m] default, 10 ft [3m] or 16 ft [5m] 18 GA appliance or plenum cables, with or without 1/2" conduit connector -S models: two 3 ft [1m] default, 10 ft [3m] or 16 ft [5m] appliance cables with or without 1/2" conduit connectors
Overload protection	electronic throughout 0 to 95° rotation
Operating range Y*	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, PWM, floating point, on/off)
Input impedance	100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1500 Ω for PWM, floating point and on/off control
Feedback output U*	2 to 10 VDC, 0.5 mA max
Torque	minimum 180 in-lb (20 Nm)
Direction of rotation*	spring reversible with cw/ccw mounting motor reversible with built-in switch
Mechanical angle of rotation*	95° (adjustable with mechanical end stop, 35° to 95°)
Running time	spring <20 sec @ -4°F to 122°F [-20° C to 50° C]; <60 sec @ -22°F [-30° C] motor* 150 seconds (default), variable (70 to 220 seconds)
Angle of rotation adaptation	off (default)
Override control*	min position = 0% mid. position = 50% max. position = 100%
Position indication	visual indicator, 0° to 95° (0° is spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Humidity	max. 95% RH, non-condensing
Ambient temperature	-22 to 122° F (-30 to 50° C)
Storage temperature	-40 to 176° F (-40 to 80° C)
Housing	NEMA 2, IP54, Enclosure Type 2
Housing material	zinc coated metal and plastic casing
Noise level	≤40dB(A) motor @ 150 seconds, run time dependent ≤62dB(A) spring return
Agency listings †	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC & 2006/95/EC
Quality standard	ISO 9001
Servicing	maintenance free
Weight	4.6 lbs. (1.9 kg), 4.9 lbs. (2 kg) with switch

* Variable when configured with MFT options

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

♦ Programmed for 70 sec motor run time. At 150 sec motor run time, transformer sizing is 8.5 VA and power consumption is 6 W running / 3 W holding.

AFX24-MFT-S-X1	
Auxiliary switches	2 x SPDT 3A (0.5A) @ 250 VAC, UL approved one set at +10°, one adjustable 10° to 90°

800-543-9038 USA

866-805-7089 CANADA

203-791-8396 LATIN AMERICA / CARIBBEAN

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Wiring Diagrams

INSTALLATION NOTES

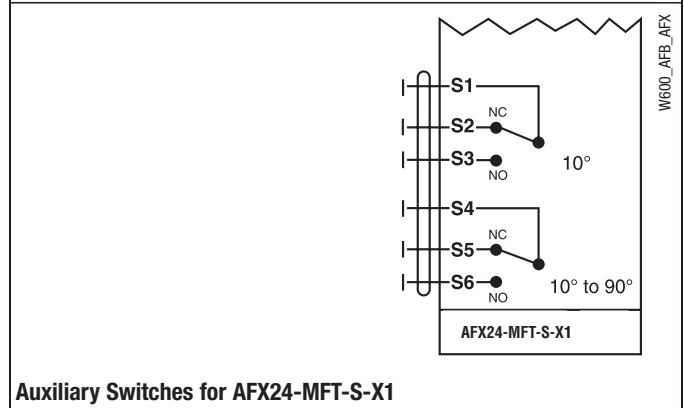
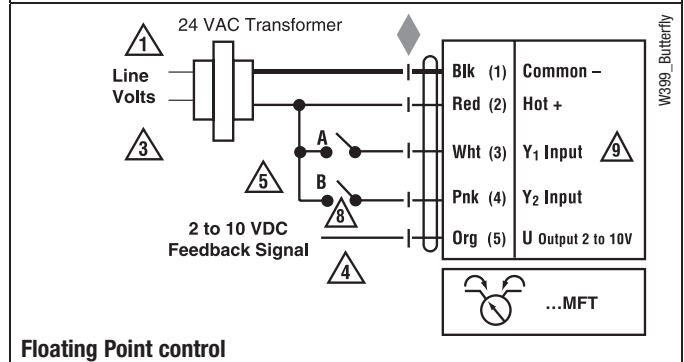
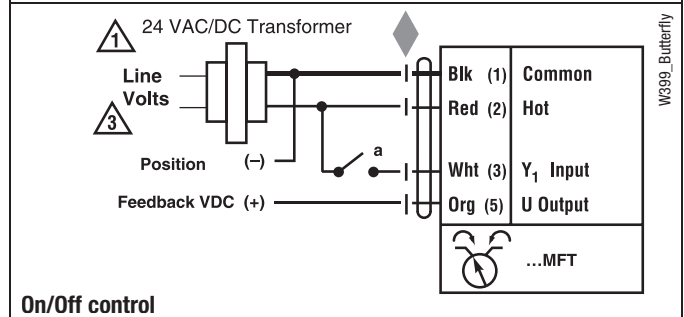
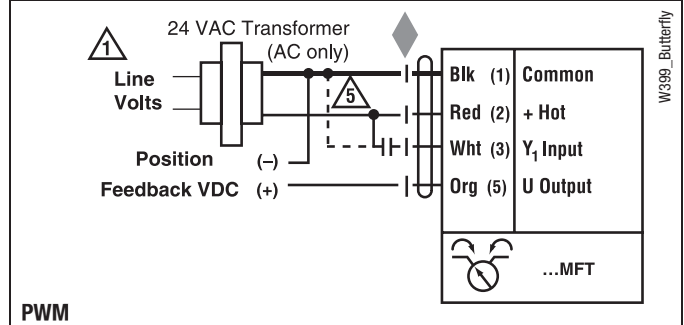
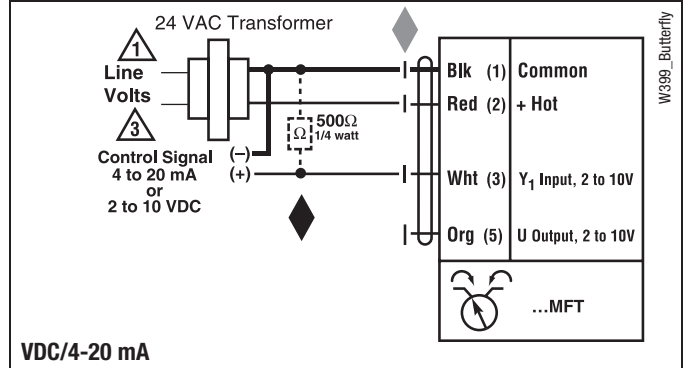
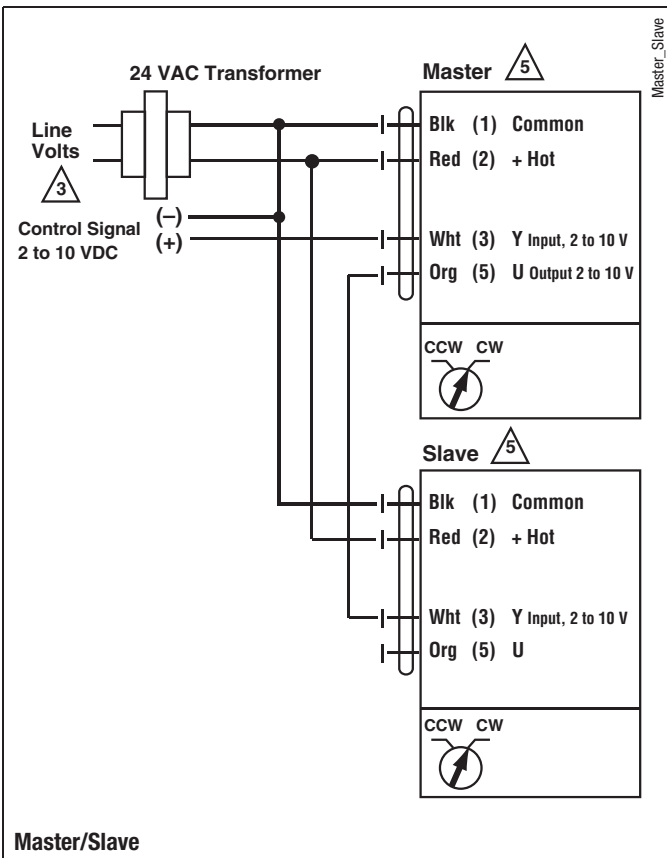
- 3 Actuators may also be powered by 24 VDC.
- 4 IN4004 or IN4007 diode (IN4007 supplied, Belimo part number 40155).
- 5 Triac A and B can also be contact closures.
- 6 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 7 Position feedback cannot be used with Triac sink controller. The actuators internal common reference is not compatible.

APPLICATION NOTES

- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.
- ◆ Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

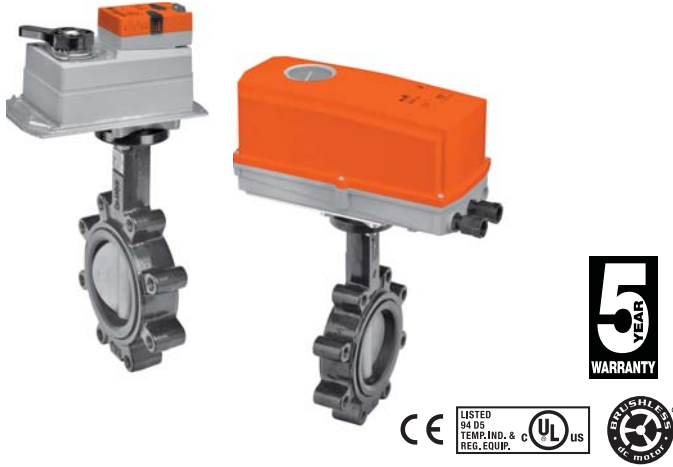
WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



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DKRX24-3-T, DKRX(B)24-3-T N4(H) NEMA 2/NEMA 4 Actuators, On/Off, Floating Point



Models

DKRX24-3-T	w/terminal block
DKRX24-3-T N4	w/terminal block
DKRB24-3-T N4H	w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC \pm 20/-10% 50/60 Hz
Power consumption	running 12W / heater 33W holding 3W
Transformer sizing	21 VA (class 2 power source) / heater 36 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 Ω at control input 1500 Ω floating point
Angle of rotation	90°
Position indication	visual pointer (N4)
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	150 seconds (default)
Fail-Safe	35 seconds
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001
Servicing	maintenance free

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Electrical Installation

Wiring diagram

Note

- Connect via safety isolation transformer.
- Parallel connection of other actuators possible.
- Note performance data for supply.

Cable lengths

Note

When several actuators are connected in parallel, the maximum cable length must be divided by the number of actuators.

Note

There are no special restrictions on installation if the supply and data cable are routed separately.

Cable colors:

- 1 = black
- 2 = red
- 3 = white
- 5 = orange

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)
L₂ = Customer cable
L_{tot} = Maximum cable length

Cross section L ₂	Max. cable length L _{tot} = L ₁ + L ₂		Example for DC
	AC	DC	
0.75 mm ²	≤30 m	≤5 m	1 m (L ₁) + 4 m (L ₂)
1.00 mm ²	≤40 m	≤8 m	1 m (L ₁) + 7 m (L ₂)
1.50 mm ²	≤70 m	≤12 m	1 m (L ₁) + 11 m (L ₂)
2.50 mm ²	≤100 m	≤20 m	1 m (L ₁) + 19 m (L ₂)

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)

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Wiring Diagrams

INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!** Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 8 Contact closures A & B also can be triacs.
- 8 A & B should both be closed for triac source and open for triac sink.
- 9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.

APPLICATION NOTES

- Meets UL requirements without the need of an electrical ground connection.
- WARNING Live Electrical Components!** During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

On/Off control

Floating Point control

24 VAC Transformer

Line Volts

Position (-)

Feedback VDC

Blk (1) Common

Red (2) Hot

Wht (3) Y₁ Input

Org (5)

...3

24 VAC Transformer

Line Volts

2 to 10 VDC Feedback Signal (-) (+)

Blk (1) - Common

Red (2) + Hot

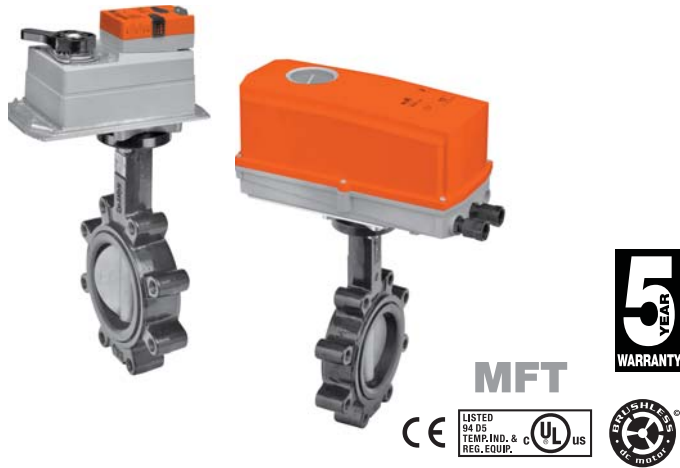
Wht (3) Y₁ Input

Org (5) U Output 2 to 10V

A

B

DKRX24-MFT-T, DKRX(B)24-MFT-T N4(H) NEMA 2/NEMA 4 Actuators, Multi-Function Technology



Models

DKRX24-MFT-T w/terminal block
 DKRX24-MFT-T N4 w/terminal block
 DKRB24-MFT-T N4H w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 12 W / heater 33W holding 3 W
Transformer sizing	21 VA (class 2 power source) / heater 36 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 k Ω (0.1 mA) 500 Ω 1500 Ω (floating point, on/off)
Angle of rotation	90° electronically variable
Position indication	visual pointer (N4)
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	150 seconds (default) variable (75 to 290 seconds)
Fail-Safe	35 seconds
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/GSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001
Servicing	maintenance free

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Wiring Diagrams

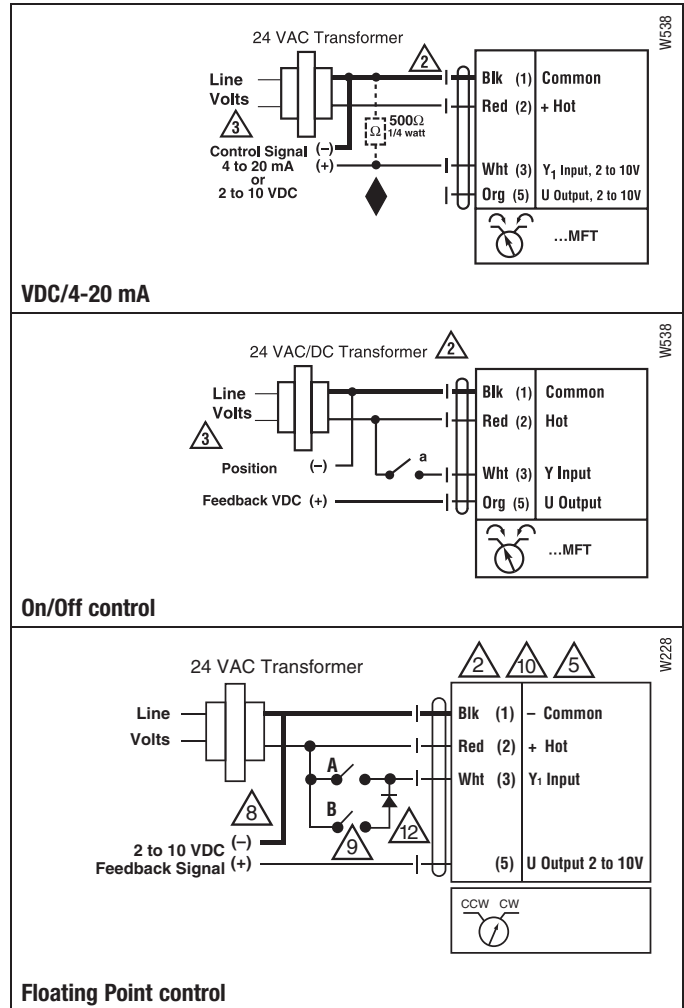
✂️ INSTALLATION NOTES

- ⚠️ **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- ⚠️ Actuators may also be powered by 24 VDC.
- ⚠️ Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- ⚠️ Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- ⚠️ Contact closures A & B also can be triacs.
- ⚠️ A & B should both be closed for triac source and open for triac sink.
For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
- ⚠️ IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

📄 APPLICATION NOTES

- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

⚠️ **WARNING Live Electrical Components!**
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



DRCX24-3-T, DRCX(B)24-3-T N4(H) NEMA 2/NEMA 4 Actuators, On/Off, Floating Point



Models

DRCX24-3-T	w/terminal block
DRCX24-3-T N4	w/terminal block
DRCB24-3-T N4H	w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC \pm 20/-10% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 9W / heater 29W holding 2W
Transformer sizing	12 VA (class 2 power source) / heater 27 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	1000 Ω at control input
Angle of rotation	90°
Position indication	visual pointer
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	35 seconds (default)
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

✂️ INSTALLATION NOTES

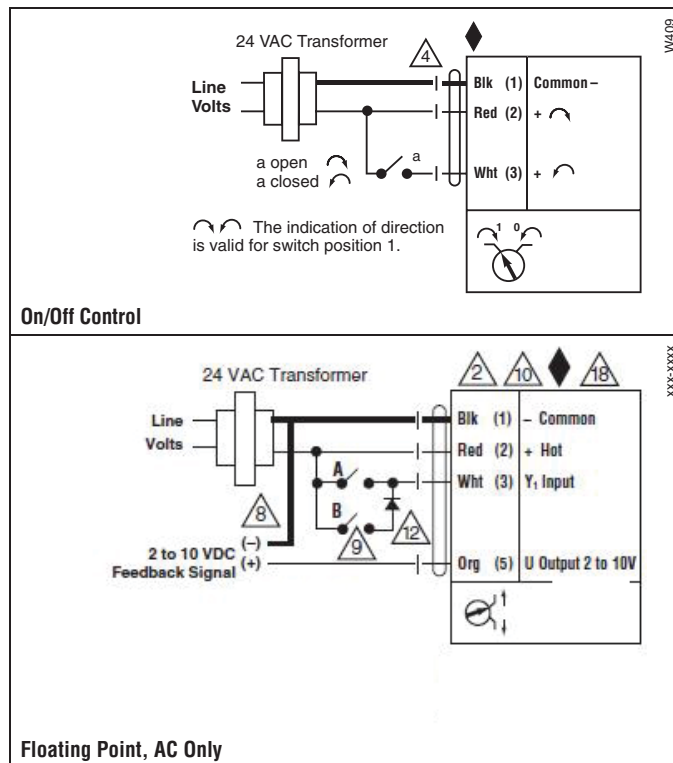
- ⚠️ **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- ⚠️ Actuators may also be powered by 24 VDC.
- ⚠️ Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- ⚠️ Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- ⚠️ Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.

📄 APPLICATION NOTES

- ◆ Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

⚠️ **WARNING Live Electrical Components!**
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

⚠️ **WARNING Mechanical Precautions**
The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings



DRX24-MFT-T, DRX24-MFT-T N4, DRCX24-MFT-T, DRCX(B)24-MFT-T N4(H) NEMA 2/NEMA 4 Actuators, Multi-Function Technology



MFT



Models

DRX24-MFT-T	w/terminal block
DRX24-MFT-T N4	w/terminal block
DRCX24-MFT-T	w/terminal block
DRCX24-MFT-T N4	w/terminal block
DRCB24-MFT-T N4H	w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 6.5 W / heater 27W holding 2.5 W
Transformer sizing	9.5 VA (class 2 power source) / heater 25 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1000 Ω for floating point and on-off control
Angle of rotation	90° electronically variable
Position indication	visual pointer
Manual override	internal push button (UL Type 4) external push button (UL Type 2)
Running time	DRX... 150 seconds DRCX... 35 seconds
Humidity	5 to 100% RH (UL Type 4) 5 to 95% RH non condensation (UL Type 2)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66 UL Type 2/NEMA 2/IP54
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/GSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14"
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

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Wiring Diagrams

✂️ INSTALLATION NOTES

- ⚠️ **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- ⚠️ Actuators may also be powered by 24 VDC.
- ⚠️ Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
- ⚠️ Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- ⚠️ Contact closures A & B also can be triacs.
- ⚠️ A & B should both be closed for triac source and open for triac sink.
For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
- ⚠️ IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

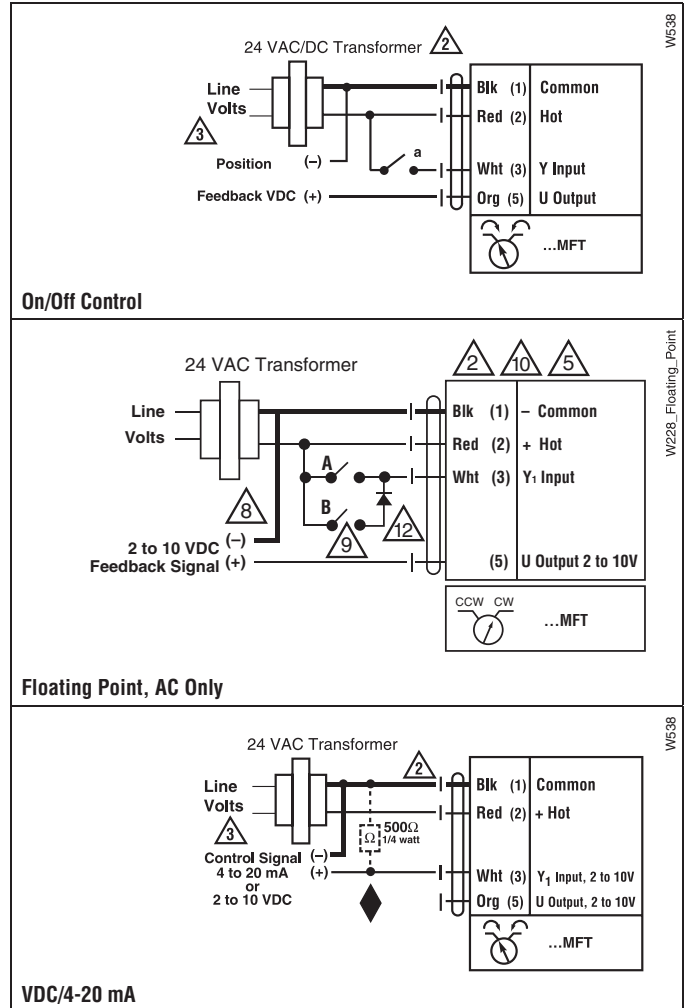
📄 APPLICATION NOTES

- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

⚠️ WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

⚠️ WARNING Mechanical Precautions
The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings



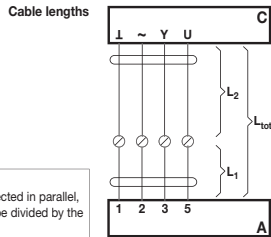
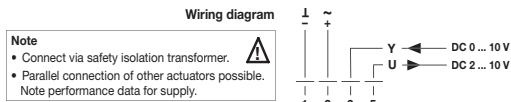


Models

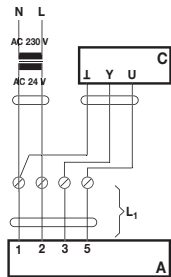
GKRB24-3-X1
GKRB24-3-5
GKB24-3-X1

Technical Data	
Power supply	24VAC ±20% 50/60Hz
Power consumption	12W (3W)
Transformer sizing	21VA (class 2 power source)
Electrical connection	18 GA plenum rated cable ½" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] 16 ft [5m]
Overload protection	electronic throughout 0 to 95 rotation
Operation range Y	on/off, floating point
Input impedance	100kΩ (0.1 mA), 500Ω 1500Ω (floating point, on/off)
Feedback output U	2 to 10VDC, 0.5mA max, VDC variable
Angle of rotation	max. 95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with switch
Fail-safe position	adjustable with dial or tool 0 to 100% in 10% increments
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	
normal operation	150 seconds (default), variable 90 to 150 seconds
fail-safe	35 seconds
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA2, IP54, UL enclosure type 2
Housing material	UL94-5VA
Agency list	cULus acc. to UL 60730-1A/-2-14 CAN/CSA E60730-1:02 CE acc. to 2004/108/EEC and 2006/95/EC
Noise level	< 45dB(A)
Servicing	maintenance free
Quality standard	ISO 9001

Electrical Installation



Note
When several actuators are connected in parallel, the maximum cable length must be divided by the number of actuators.



Note
There are no special restrictions on installation if the supply and data cable are routed separately.

Cable colors:
1 = black
2 = red
3 = white
5 = orange

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)
L₂ = Customer cable
L_{tot} = Maximum cable length

Cross section L ₂ 1/~	Max. cable length L _{tot} = L ₁ + L ₂		Example for DC
	AC	DC	
0.75 mm ²	≤30 m	≤5 m	1 m (L ₁) + 4 m (L ₂)
1.00 mm ²	≤40 m	≤8 m	1 m (L ₁) + 7 m (L ₂)
1.50 mm ²	≤70 m	≤12 m	1 m (L ₁) + 11 m (L ₂)
2.50 mm ²	≤100 m	≤20 m	1 m (L ₁) + 19 m (L ₂)

A = Actuator
C = Control unit
L₁ = Belimo connecting cable, 1 m (4 x 0.75 mm²)

Wiring Diagrams

INSTALLATION NOTES

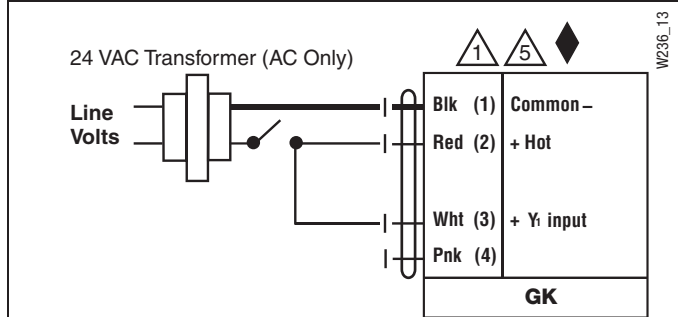
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 8 Contact closures A & B also can be triacs.
- 9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.

APPLICATION NOTES

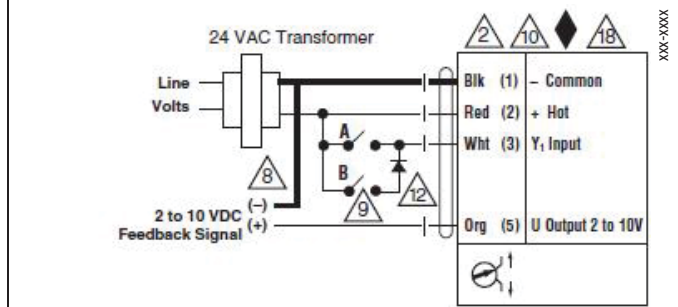
Meets UL requirements without the need of an electrical ground connection.

WARNING Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

NOTE: Wiring diagrams shown are for single actuator mounted solutions



On/Off control



Floating Point control



MFT



Models

GKRX24-MFT-X1
GKX24-MFT-X1

Technical Data	GKX24-MFT-X1
Power supply	24VAC \pm 20% 50/60Hz 24VDC \pm 10%
Power consumption	12W (3W)
Transformer sizing	21VA (class 2 power source)
Electrical connection	18 GA plenum rated cable ½" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] 16 ft [5m]
Overload protection	electronic throughout 0 to 95 rotation
Operation range Y	2 to 10 VDC, 4 to 20mA (default) variable (VDC,PWM, floating point, on/off)
Input impedance	100 k Ω (0.1 mA), 500 Ω 1500 Ω (PWM, floating point, on/off)
Feedback output U	2 to 10VDC, 0.5mA max, VDC variable
Angle of rotation	max. 95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with switch
Fail-safe position	adjustable with dial or tool 0 to 100% in 10% increments
Position indication	reflective visual indicator (snap-on)
Manual override	external push button
Running time	
normal operation	95 seconds (default), variable 90 to 150 seconds
fail-safe	35 seconds
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA2, IP54, UL enclosure type 2
Housing material	UL94-5VA
Agency list	cULus acc. to UL 60730-1A/-2-14 CAN/CSA E60730-1:02 CE acc. to 2004/108/EEC and 2006/95/EC
Noise level	< 45dB(A)
Servicing	maintenance free
Quality standard	ISO 9001

Note: GKR Actuators are on 2-way valves

GKX Actuators are on 3-way valves

Wiring Diagrams

INSTALLATION NOTES

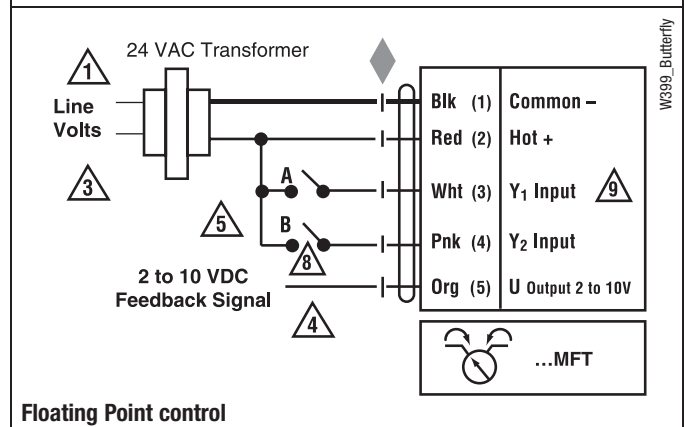
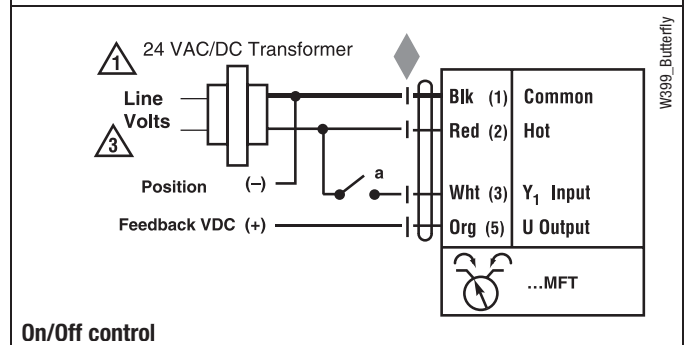
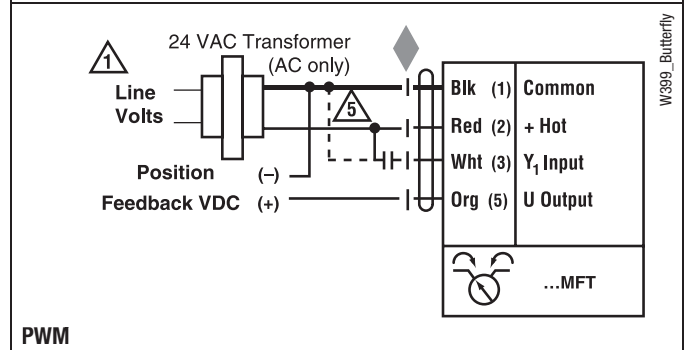
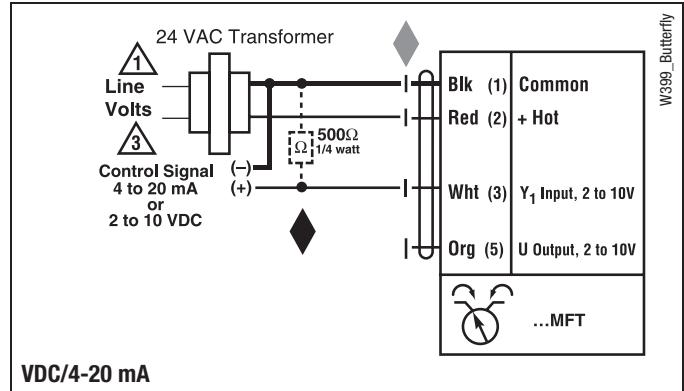
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- 8 Contact closures A & B also can be triacs.
- 9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.

APPLICATION NOTES

- ◆ Meets UL requirements without the need of an electrical ground connection.
- ◆ The ZG-R01 500 Ω resistor may be used.

WARNING Live Electrical Components!
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.


NOTE: Wiring diagrams shown are for single actuator mounted solutions





Models

AMB24-3-X1
ARB24-3-X1
ARB24-3-5

Technical Data	
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 2.0 W holding 0.2 W
Transformer sizing	5.5 VA (class 2 power source)
Electrical connection	3 ft, 18 GA plenum rated cable $\frac{1}{2}$ " conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Control	on/off, floating point
Input impedance	600 Ω
Angle of rotation	95°, adjustable with mechanical stop
Direction of rotation	reversible with protected  switch
Position indication	handle
Manual override	external push button
Running time	95 seconds
Humidity	5 to 95% RH non condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA 2/IP54
Housing material	UL94-5VA
Agency listings†	cULus according to UL 60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE according to 89/336/EEC (and 2006/95/EC for line voltage and/or -S versions)
Noise level	<45dB(A)
Quality standard	ISO 9001

Note: AR Actuators are on 2-way valves
AM Actuators are on 3-way valves

Wiring Diagrams

✂ **INSTALLATION NOTES**



CAUTION Equipment damage!

Actuators may be connected in parallel.
Power consumption and input impedance must be observed.



Actuators may also be powered by 24 VDC.



APPLICATION NOTES

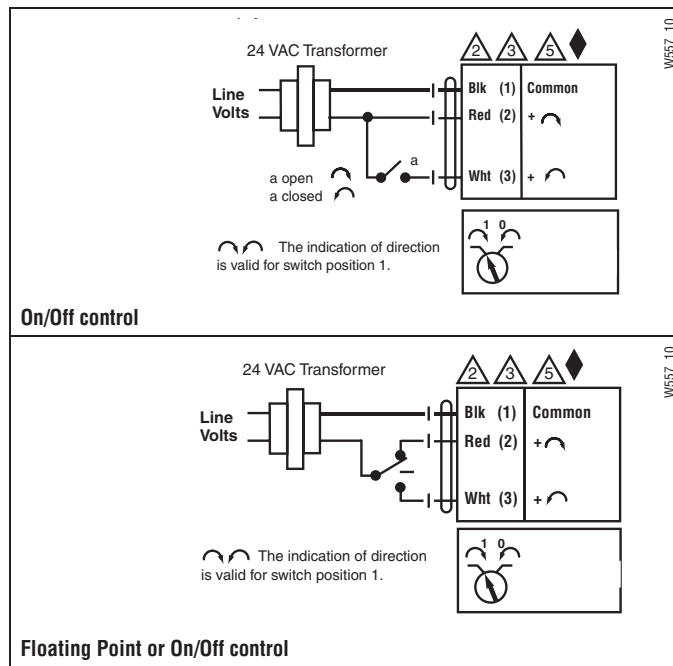


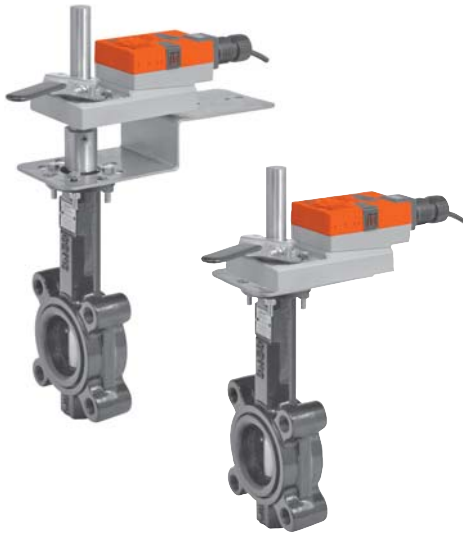
Meets cULus or UL and CSA requirements without the need of an electrical ground connection.



WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.





Models

AMX24-MFT-X1
ARX24-MFT-X1
ARB24-MFT-5

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 4 W holding 1.25 W
Transformer sizing	6 VA (class 2 power source)
Electrical connection	3 ft [1m], 10 ft [3m], 16 ft [5m] 18 GA plenum rated cable ½" conduit connector
Overload protection	electronic throughout 0° to 95° rotation
Operating range Y	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, PWM, floating point, on/off)
Input impedance	100k Ω (0.1 mA), 500 Ω 1500 Ω (PWM, floating point, on/off)
Feedback output U	2 to 10 VDC, 0.5 mA max VDC variable
Angle of rotation	95° electronically variable
Direction of rotation	reversible with protected switch
Position indication	handle
Manual override	external push button
Running time	150 seconds (default) variable (90 to 350 secs)
Humidity	5 to 95% RH non condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA 2/IP54
Housing material	UL94-5VA
Agency listings†	cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No. 24-93, CE according to 89/336/EEC
Noise level	<45dB(A)
Quality standard	ISO 9001

† Rated impulse voltage 4kV, Control pollution degree 3, Type of action 1

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Wiring Diagrams

✂️ INSTALLATION NOTES

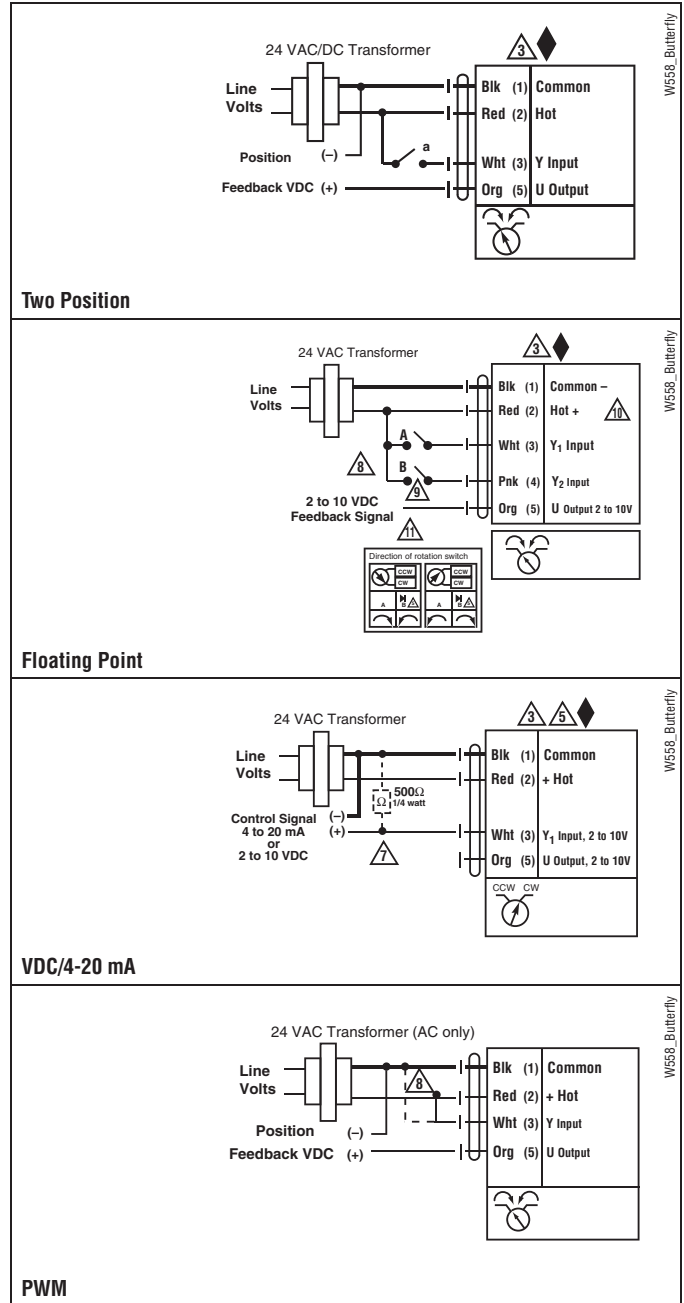
- ⚠️ 3 Actuators may also be powered by 24 VDC.
- ⚠️ 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- ⚠️ 6 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
- ⚠️ 8 Contact closures A & B also can be triacs.
- ⚠️ 8 A & B should both be closed for triac source and open for triac sink.
- ⚠️ 9 For triac sink the common connection from the actuator must be connected to the hot connection.

📄 APPLICATION NOTES

- ◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

⚠️ WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



GM/GR Actuators, On/Off, Floating Point



Models

- GMB24-3-X1
- GRB24-3-X1
- GRB24-3-5
- GRB24-3-7

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running 4.0 W holding 2 W
Transformer sizing	6 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable, 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Control signal	On/Off, Floating Point
Input impedance	600 Ω
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible with switch A/B
Position indication	0 to 1 and reversible indicator
Running time	150 sec.
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 2/IP54
Housing material	UL94-5VA (flammability rating)
Agency listings	cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93, CE according to 89/336/EEC
Noise level	max. 45 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001

Note: GR Actuators are on 2-way valves
GM Actuators are on 3-way valves

Wiring Diagrams

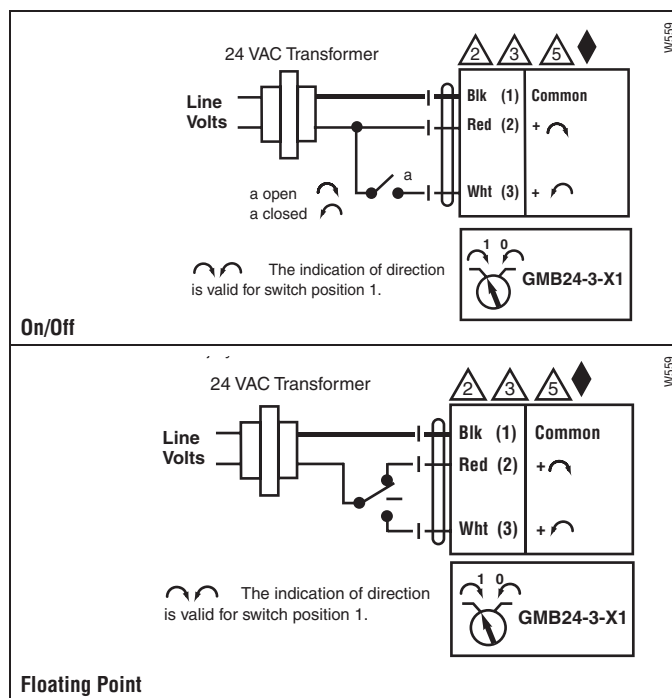
INSTALLATION NOTES

- CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- Actuators may also be powered by 24 VDC.
- Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.

APPLICATION NOTES

- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

WARNING Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



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MFT



Models

- GMX24-MFT-X1
- GRX24-MFT-X1
- GRB24-MFT-5
- GRX24-MFT-7

Technical Data	
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 4.5 W holding 2 W
Transformer sizing	7 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable, 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Control signal	2 to 10 VDC, 4 to 20 mA (with 500 Ω , 1/4 W resistor) ZG-R01
Input impedance	100 k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 750 Ω for PWM 1500 Ω for on/off and floating point
Angle of rotation	mechanically limited to 95°
Direction of rotation	reversible with switch A/B
Position indication	0 to 1 and reversible indicator
Running time	150 seconds
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 2/IP54
Housing material	UL94-5VA (flammability rating)
Agency listings	cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1, CSA C22.2 No.24-93, CE according to 89/336/EEC
Noise level	max. 45 dB(A)
Servicing	maintenance free
Quality standard	ISO 9001

Wiring Diagrams

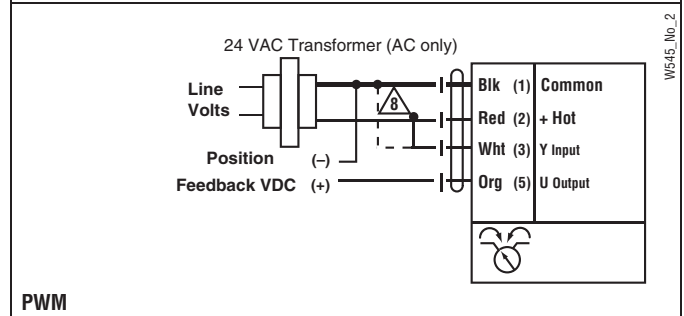
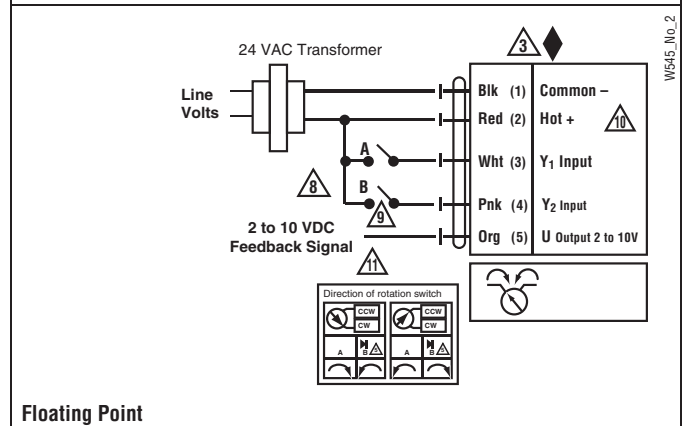
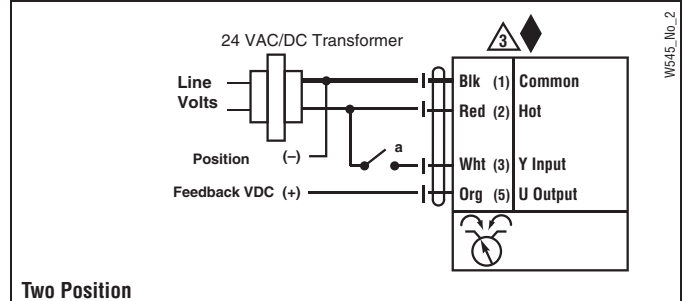
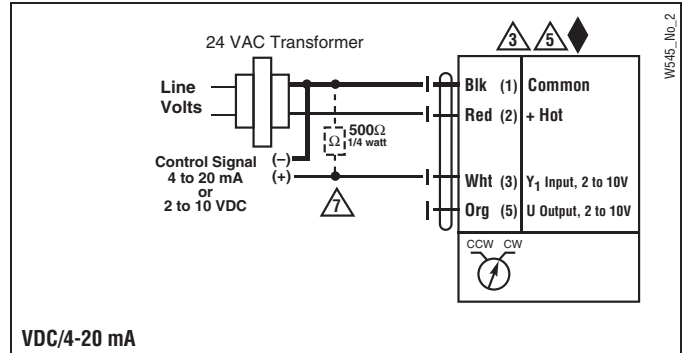
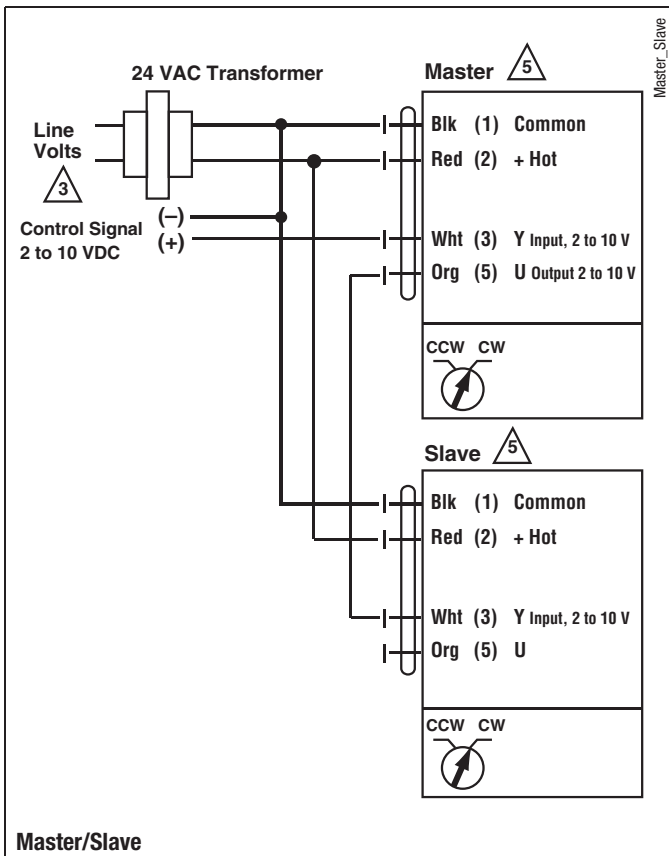
INSTALLATION NOTES

- 3 Actuators may also be powered by 24 VDC.
- 5 Actuators with plenum rated cable do not have numbers on wires; use color coded instead. Actuators with appliance rated cable use numbers.
- 8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller.

APPLICATION NOTES

- Meets cULus or UL and CSA requirements without the need of an electrical ground connection.
- 9 Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
- 11 Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.

WARNING Live Electrical Components!
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



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W545_No_2

W545_No_2

W545_No_2

W545_No_2

GRCX(B)24-3-T N4(H) NEMA 4 Actuators, On/Off, Floating Point






Models

GRCX24-3-T N4 w/terminal block
 GRXB24-3-T N4H w/heater


Technical Data	
Control	on/off, floating point
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 8W / heater 29W holding 2.5W
Transformer sizing	11 VA (class 2 power source) / heater 26 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	1000 Ω at control input
Angle of rotation	90°, adjustable with mechanical stop
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	35 seconds (default)
Humidity	5 to 100% RH (UL Type 4)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001


Wiring Diagrams


INSTALLATION NOTES

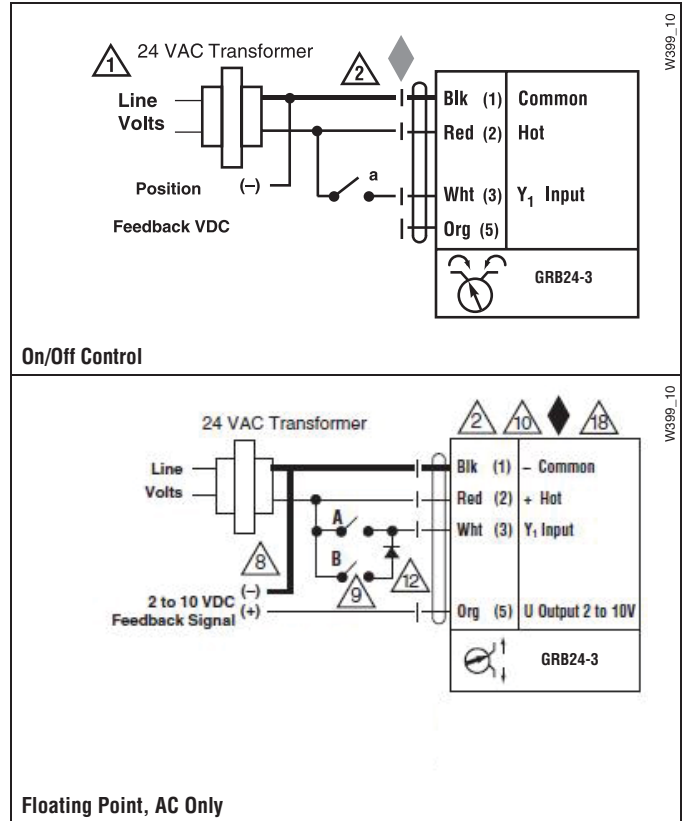
-  **CAUTION Equipment damage!**
Actuators may be connected in parallel. Power consumption and input impedance must be observed.
-  Actuators may also be powered by 24 VDC.
-  Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.

APPLICATION NOTES

-  Meets cULus or UL and CSA requirements without the need of an electrical ground connection. Use suitable flexible metallic conduit or its equivalent with the conduit fitting.

 **WARNING Live Electrical Components!**
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

 **WARNING Mechanical Precautions**
The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings



GRX(B)24-MFT-T N4(H) NEMA 4 Actuators, Multi-Function Technology



MFT



Models









GRX24-MFT-T N4 w/terminal block
 GRB24-MFT-T N4H w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 8 W / heater 29W holding 2.5 W
Transformer sizing	11 VA (class 2 power source) / heater 24 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 90° rotation
Input impedance	100 k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1000 Ω for floating point and on-off control
Angle of rotation	90°, adjustable with mechanical stop electronically variable
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	150 seconds (default) variable (75 to 290 seconds)
Humidity	5 to 100% RH (UL Type 4)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/GSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001


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Wiring Diagrams

INSTALLATION NOTES

-  **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
-  Actuators may also be powered by 24 VDC.
-  Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.
-  Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.
-  Contact closures A & B also can be triacs.
-  A & B should both be closed for triac source and open for triac sink. For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a Triac sink controller. The actuator internal common reference is not compatible.
-   IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

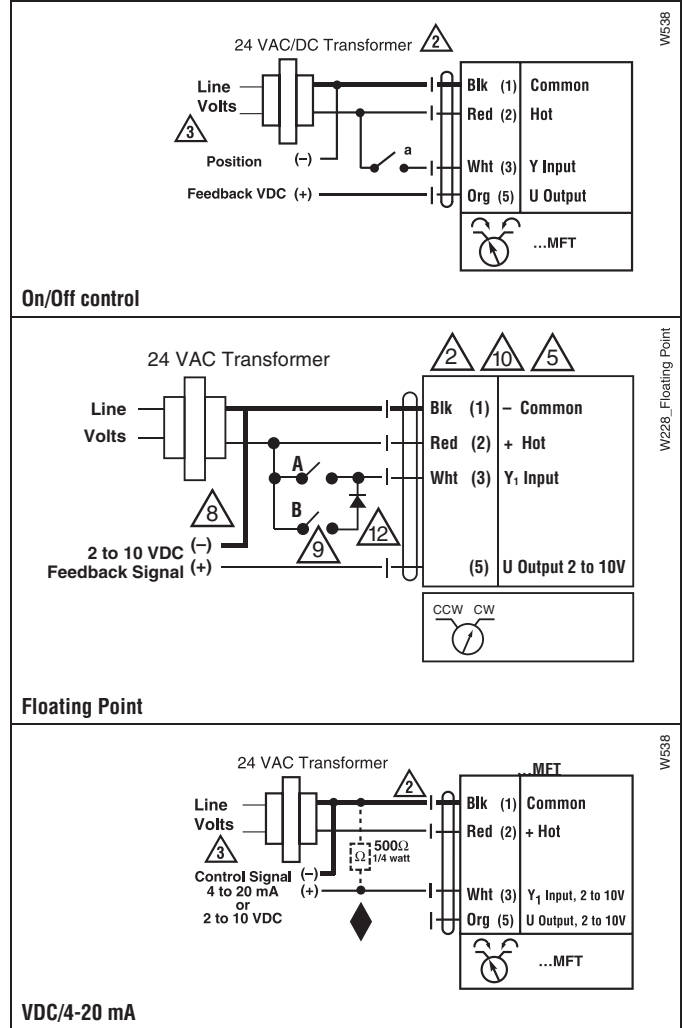
APPLICATION NOTES

-  The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

WARNING Live Electrical Components!
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

WARNING Mechanical Precautions
The mechanical end stops cannot be moved or repositioned. Doing so will adversely effect the operation of the valve.
The directional switch cannot be moved. Maintain Factory Settings

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GMCX(B)24-3-T-X1 N4(H) NEMA 4 Actuators, On/Off, Floating Point



Models

GMCX24-3-T-X1 N4 w/terminal block

GMCB24-3-T-X1 N4H w/heater

Technical Data	
Control	on/off, floating point
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 8W / heater 28W holding 2.5W
Transformer sizing	11 VA (class 2 power source) / heater 26 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	1000 Ω at control input
Angle of rotation	95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with  switch
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	35 seconds (default)
Humidity	5 to 100% RH (UL Type 4)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

Wiring Diagrams

✂️ INSTALLATION NOTES

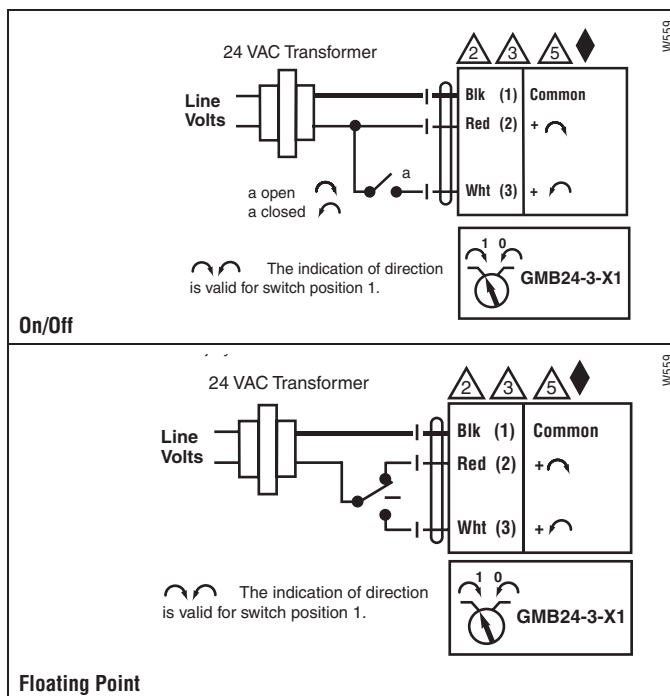
- ⚠️ **CAUTION Equipment damage!**
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.
- ⚠️ **3** Actuators may also be powered by 24 VDC.
- ⚠️ **5** Actuators with plenum rated cable do not have numbers on wires; use color codes instead. Actuators with appliance cables are numbered.

📄 APPLICATION NOTES

- ◆ Meets cULus or UL and CSA requirements without the need of an electrical ground connection.

⚠️ WARNING Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.






MFT



Models

GMX24-MFT-T-X1 N4 w/terminal block
 GMB24-MFT-T-X1 N4H w/heater

Technical Data	
Control	2 to 10 VDC, 4 to 20 mA (default) variable (VDC, floating point, on/off)
Power supply	24 VAC \pm 20% 50/60 Hz 24 VDC \pm 10%
Power consumption	running 8 W / heater 29W holding 2.5 W
Transformer sizing	11 VA (class 2 power source) / heater 26 VA
Electrical connection	screw terminal (for 22 to 12 AWG wire)
Overload protection	electronic throughout 0° to 95° rotation
Input impedance	100 k Ω for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA 1000 Ω for floating point and on-off control
Angle of rotation	95°, adjustable with mechanical stop electronically variable
Direction of rotation	reversible with  switch
Position indication	visual pointer
Manual override	internal push button (UL Type 4)
Running time	150 seconds (default) variable (75 to 290 seconds)
Humidity	5 to 100% RH (UL Type 4)
Ambient temperature	-22°F to 122°F [-30°C to 50°C]
Storage temperature	-40°F to 176°F [-40°C to 80°C]
Housing type	UL Type 4/NEMA 4/IP66
Housing material	Polycarbonate
Agency listings	cULus according to UL 60730-1A, UL 60730-2-14 and CAN/CSA E60730-1; Certified to IEC/EN 60730-1 and IEC/EN 60730-2-14
EMC	CE according to 2004/108/EC
Quality standard	ISO 9001

- 8 Contact closures A & B also can be triacs. A & B should both be closed for triac source and open for triac sink.
- 9 For triac sink the common connection from the actuator must be connected to the hot connection of the controller.

APPLICATION NOTES

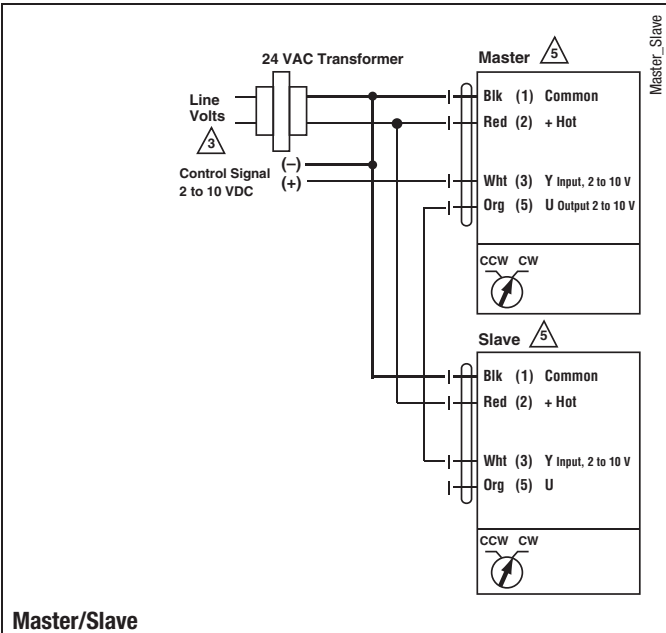
The ZG-R01 500 Ω resistor may be used.

WARNING Live Electrical Components!
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

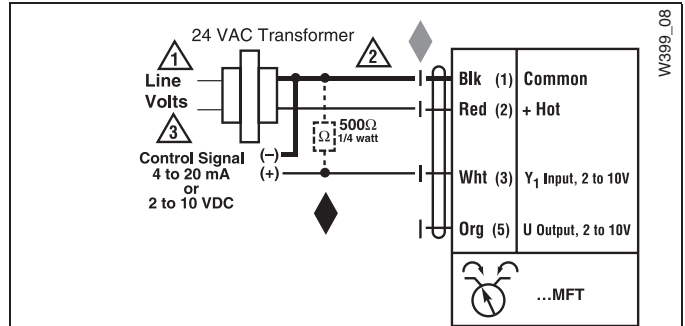
Wiring Diagrams

INSTALLATION NOTES

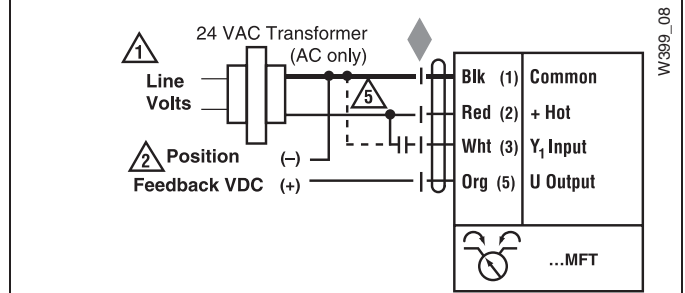
- 1 Provide overload protection and disconnect as required.
- 2 **CAUTION Equipment Damage!**
 Actuators may be connected in parallel if not mechanically mounted to the same shaft. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 4 Position feedback cannot be used with Triac sink controller. The actuator internal common reference is not compatible.
- 5 Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 VAC line.



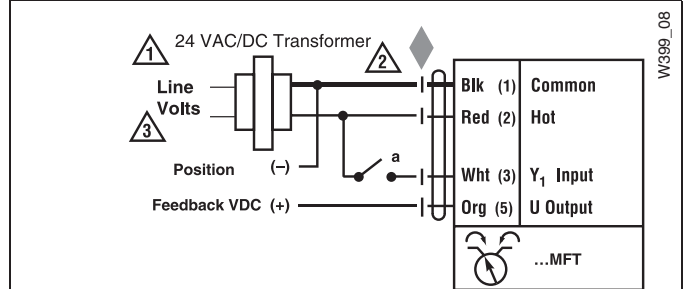
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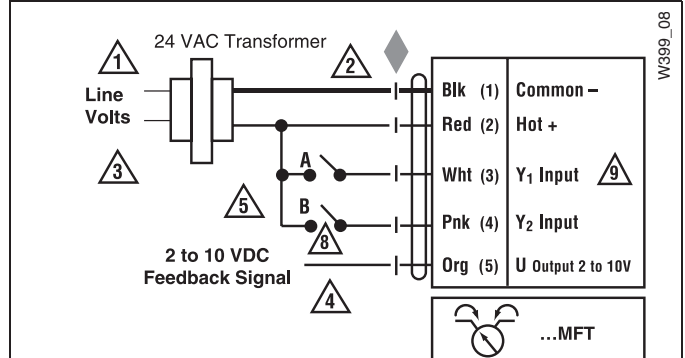
VDC/4-20 mA



PWM



On/Off control



PRBUP-MFT-T

Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Operating Range Y	2 to 10 VDC, 4 to 20 mA variable (VDC, floating point, on/off)
Input Impedance	100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for On/Off
Feedback Output U	2 to 10 VDC, 0.5 mA max, VDC variable
Angle of Rotation	90°
Torque motor	Min. 1400 in-lbs [160 Nm]
Direction of Rotation (Motor)	reversible with app
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4
Housing Material	Aluminum die cast and plastic casing
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°
Communication	BACnet MS/TP
Passive Sensor Inputs	2 (PT1000) (NI1000) (NTC)

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

◆ Meets cULus requirements without the need of an electrical ground connection.

UP Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 240 VDC.

⚡ Disconnect power.

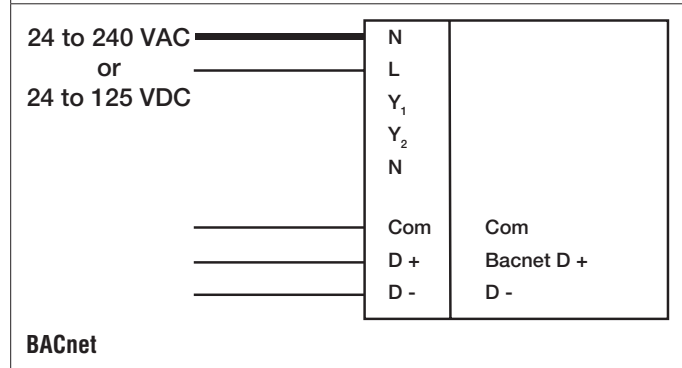
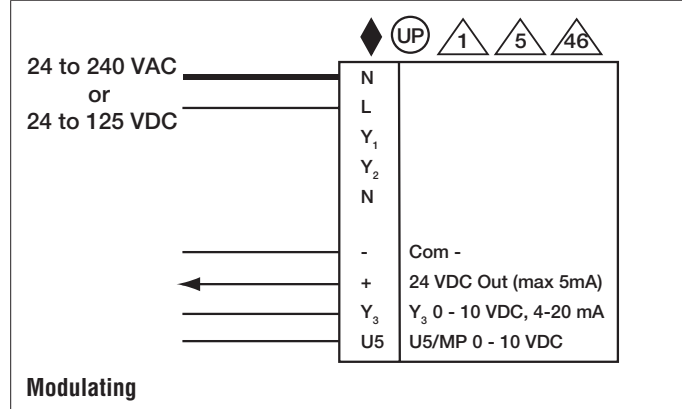
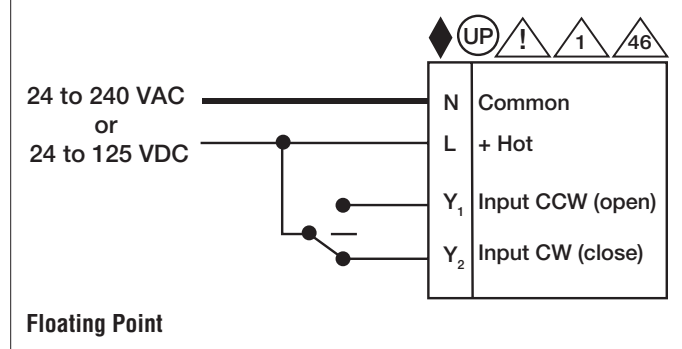
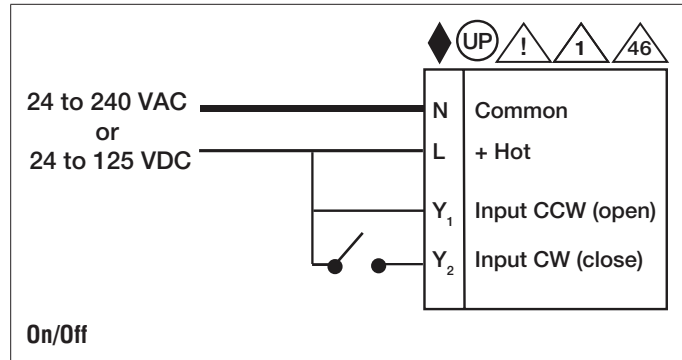
1 Provide overload protection and disconnect as required.

4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.

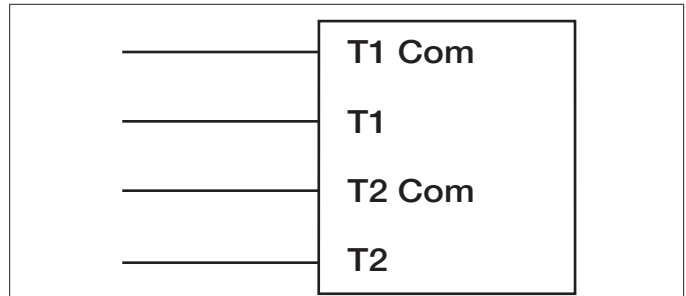
5 Only connect common to negative (-) leg of control circuits.

46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

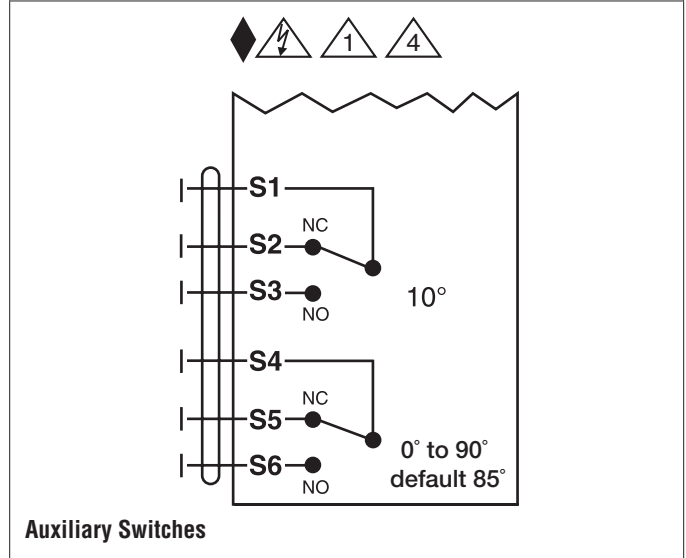
! **WARNING! LIVE ELECTRICAL COMPONENTS!**
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



PRBUP-MFT-T
Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



Temperature Sensors



Auxiliary Switches

Date created, 11/29/2017 - Subject to change. © Belimo Aircontrols (USA), Inc.

PRXUP-3-T

On/Off, Floating Point, Non-Spring Return, 24-240 V, NEMA 4X



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Input Impedance	1000 Ω
Angle of Rotation	90°
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4X
Housing Material	aluminum die cast polycarbonate cover
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

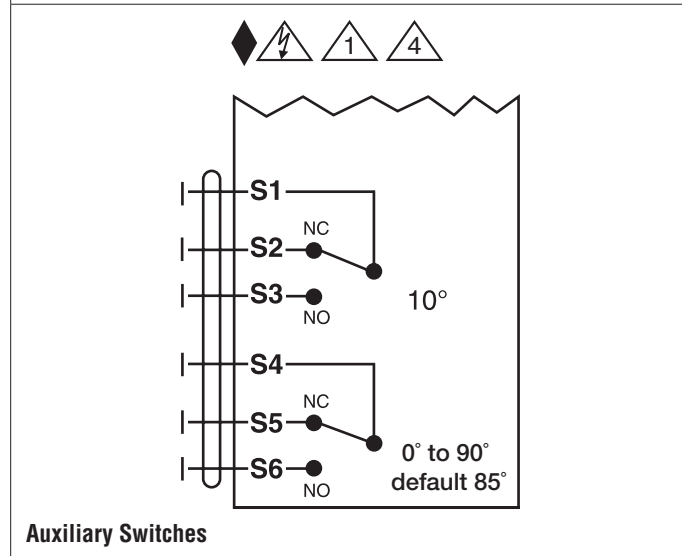
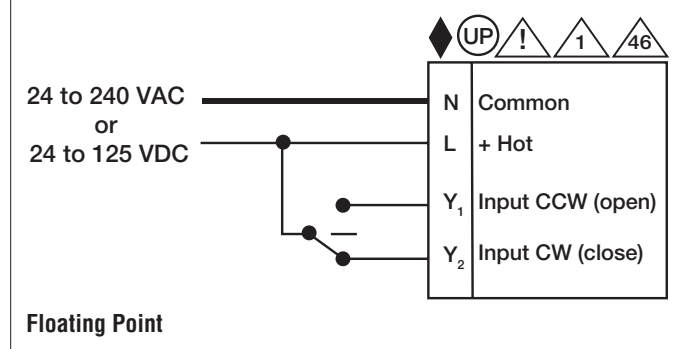
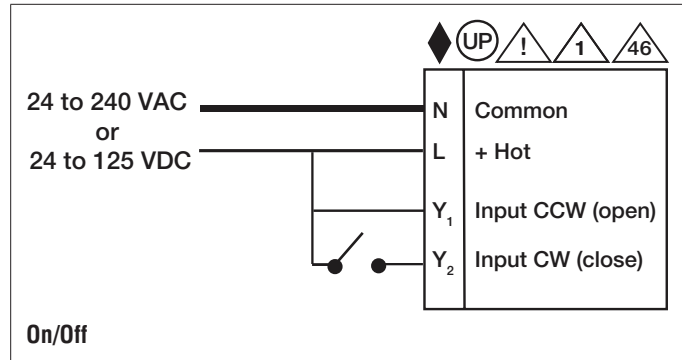
The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- UP Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 125 VDC.
- ⚡ Disconnect power.
- 1 Provide overload protection and disconnect as required.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

! WARNING! LIVE ELECTRICAL COMPONENTS!
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PRXUP-MFT-T

Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Operating Range Y	2 to 10 VDC, 4 to 20 mA variable (VDC, floating point, on/off)
Input Impedance	100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for On/Off
Feedback Output U	2 to 10 VDC, 0.5 mA max, VDC variable
Angle of Rotation	90°
Torque motor	Min. 1400 in-lbs [160 Nm]
Direction of Rotation (Motor)	reversible with app
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4
Housing Material	Aluminum die cast and plastic casing
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°
Communication	BACnet MS/TP
Passive Sensor Inputs	2 (PT1000) (NI1000) (NTC)

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

◆ Meets cULus requirements without the need of an electrical ground connection.

UP Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 240 VDC.

⚡ Disconnect power.

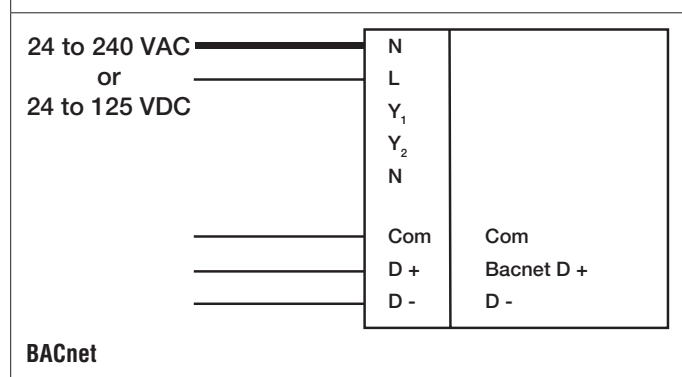
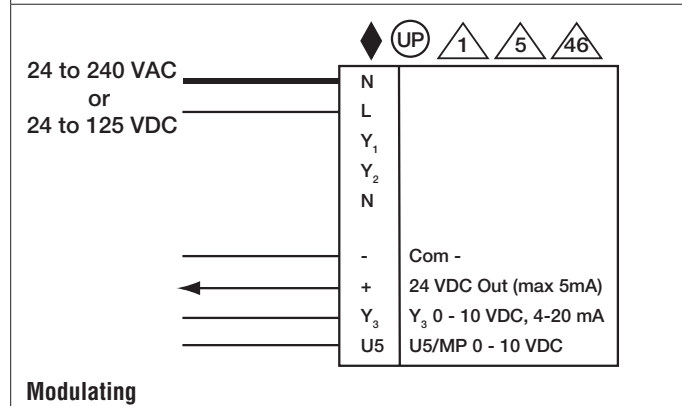
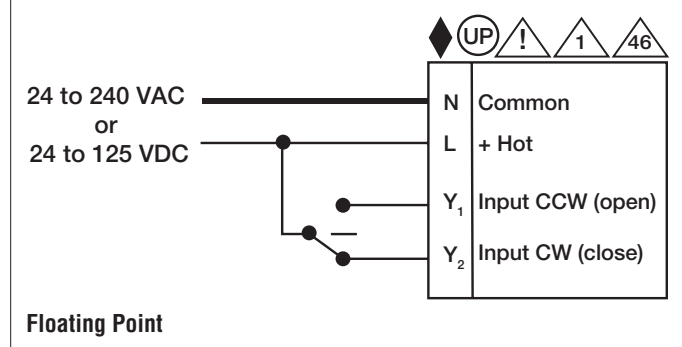
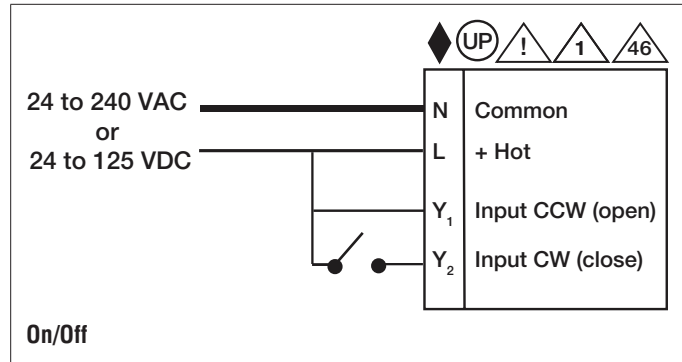
1 Provide overload protection and disconnect as required.

4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.

5 Only connect common to negative (-) leg of control circuits.

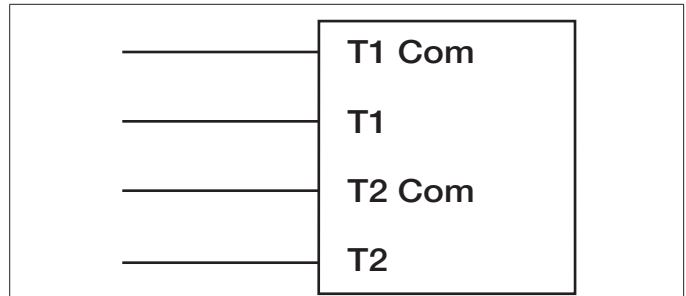
46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

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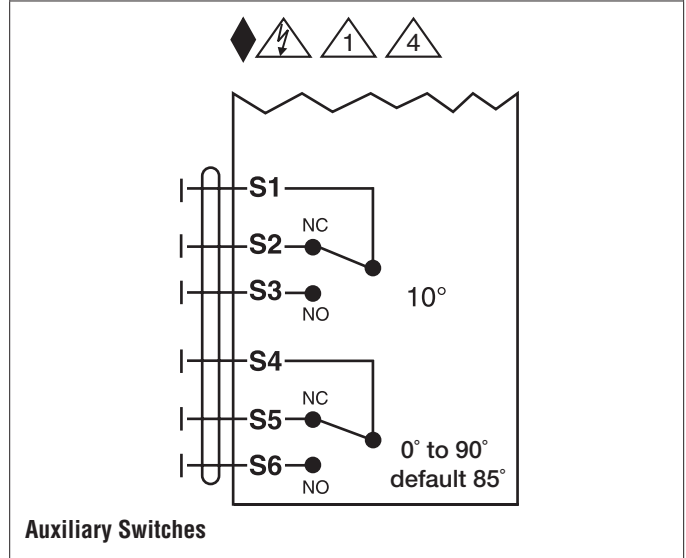


PRXUP-MFT-T

Modulating, Non-Spring Return, 24-240 V, NEMA 4X with BACnet



Temperature Sensors



Auxiliary Switches

Date created, 11/29/2017 - Subject to change. © Belimo Aircontrols (USA), Inc.

PRBUP-3-T

On/Off, Floating Point, Non-Spring Return, 24-240 V, NEMA 4X



Technical Data

Power Supply	24...240 VAC, -20% / +10%, 50/60 Hz, 24...125 VDC, -20% / +10%
Power Consumption Running	20 W @ 24 V, 18 W @ 120 V, 20 W @ 230 V
Power Consumption Holding	3.5 W @ 24 V, 4 W @ 120 V, 6 W @ 230 V
Transformer Sizing	20 VA @ 24 VAC/DC (class 2 power source), 23 VA @ 120 VAC/DC, 52 VA @ 230 VAC
Electrical Connection	terminal block
Overload Protection	electronic throughout 0° to 90° rotation
Input Impedance	1000 Ω
Angle of Rotation	90°
Position Indication	integral pointer and bottom mounted reflective indicators
Manual Override	7 mm hex crank, supplied
Running Time (Motor)	35 sec
Ambient Humidity	5 to 100% RH (UL Type 4)
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Housing	NEMA 4X, IP66/67, UL Enclosure Type 4X
Housing Material	aluminum die cast polycarbonate cover
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	68 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	12.8 lbs [5.8kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 0° to 90°

Application

PR Series valve actuators are designed with an integrated linkage and visual position indicators. For outdoor applications, the installed valve must be mounted with the actuator at or above horizontal. For indoor applications the actuator can be in any location including directly under the valve.

Operation

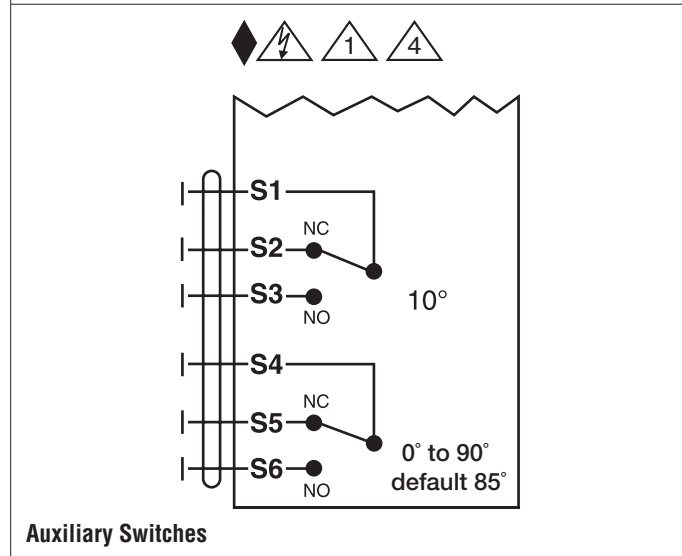
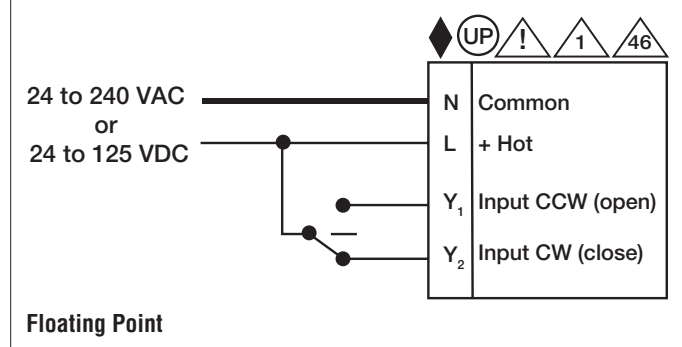
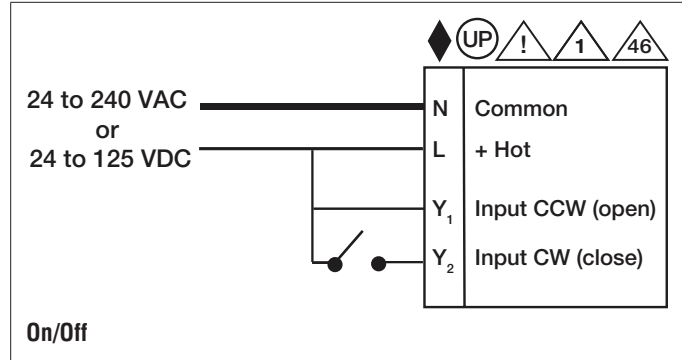
The PR series actuator provides 90° of rotation and a visual indicator shows the position of the valve. The PR Series actuator uses a low power consumption brushless DC motor and is electronically protected against overload. A universal power supply is furnished to connect supply voltage in the range of 24-240 VAC and 24-125 VDC. Included is a smart heater with thermostat to eliminate condensation. Two auxiliary switches are provided; one set at 10° open and the other is field adjustable. Running time is field adjustable from 30-120 seconds by using the Near Field Communication (NFC) app and a smart phone.

†Use 60°C/75°C copper wire size range 12-28 AWG, stranded or solid. Use flexible metal conduit. Push the listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 4000V. Type of action 1. Control pollution degree 3.

Wiring Diagrams

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- Ⓢ Universal Power Supply (UP) models can be supplied with 24 VAC up to 240 VAC, or 24 VDC up to 125 VDC.
- ⚡ Disconnect power.
- 1 Provide overload protection and disconnect as required.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

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GRB120-3-5-14

On/Off Floating Point, Non-Spring Return, 110 V



Technical Data	
Power Supply	100-240 VAC ± 20%, 50/60 Hz
Power Consumption Running	4 W
Power Consumption Holding	2 W
Transformer Sizing	7 VA @ 24 VAC (class 2 power source)
Electrical Connection	18 GA appliance rated cable with 1/2" conduit connector protected NEMA 2 (IP54) 3 ft [1m] 10 ft [3m] and 16 ft [5m]
Overload Protection	electronic throughout 0° to 95° rotation
Input Impedance	600 Ω
Angle of Rotation	90°, adjustable with mechanical stop
Direction of Rotation (Motor)	reversible with built-in switch
Manual Override	external push button
Running Time (Motor)	150 sec
Humidity	5 to 95% RH non-condensing
Ambient Temperature Range	-22°F to +122°F [-30°C to +50°C]
Storage Temperature Range	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA 2, IP42, UL enclosure type 2
Housing Material	UL94-5VA
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	<45 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	3.5 lb [1.6 kg]

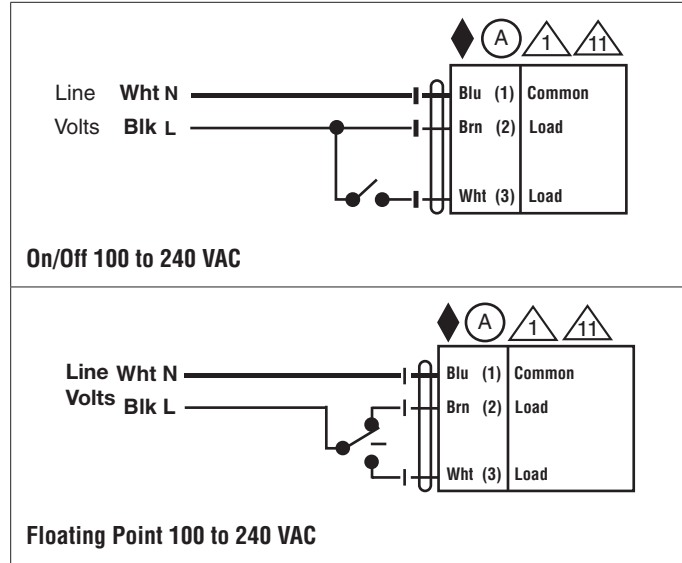
†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

Wiring Diagrams

✂ INSTALLATION NOTES

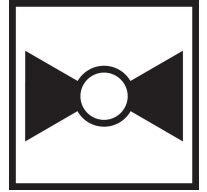
- Actuators with appliance cables are numbered.
- Provide overload protection and disconnect as required.
- Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
- Meets cULus requirements without the need of an electrical ground connection.

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5-year warranty



Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	1.2
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Seat	PTFE
	End fitting	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	TR LRB(X) NR

Safety notes

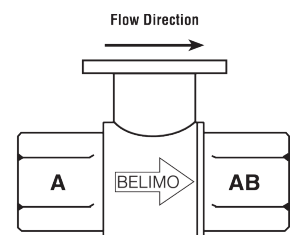
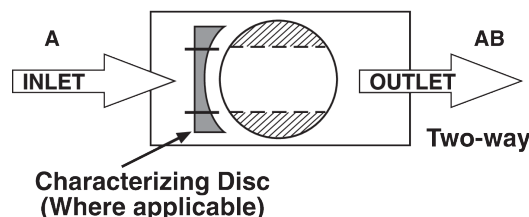


- **WARNING:** This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

Product features

Application This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

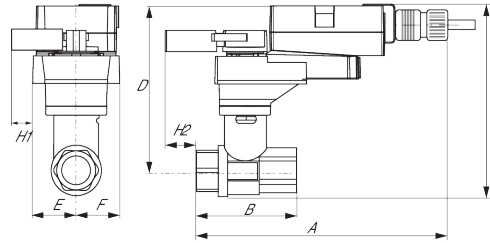
Flow/Mounting details



Dimensions

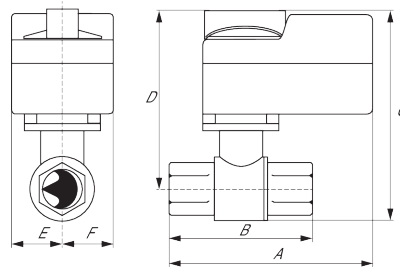
Dimensional drawings

LRB, LRX



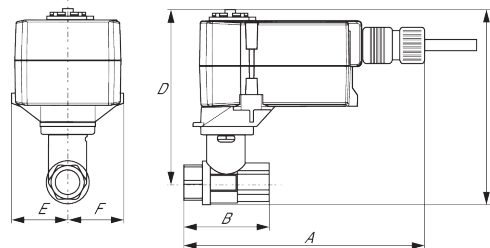
A	B	C	D	E	F	H1	H2
9.4" [239]	2.4" [60]	5.2" [132]	4.6" [117]	1.3" [33]	1.3" [33]	1.2" [30]	1.1" [28]

TR



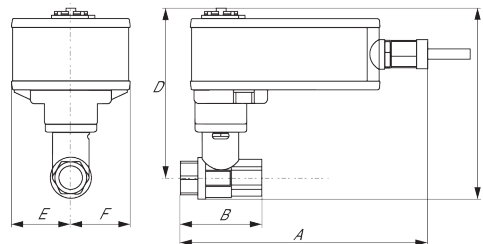
A	B	C	D	E	F
3.7" [95]	2.4" [60]	4.8" [122]	4.2" [107]	1.3" [33]	1.3" [33]

TFRB, TFRX



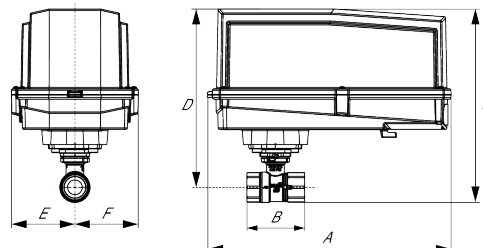
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6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

LF



A	B	C	D	E	F
7.9" [200]	2.4" [60]	5.7" [146]	5.1" [129]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	2.4" [60]	7.7" [196]	7.0" [179]	3.1" [80]	3.1" [80]



5-year warranty



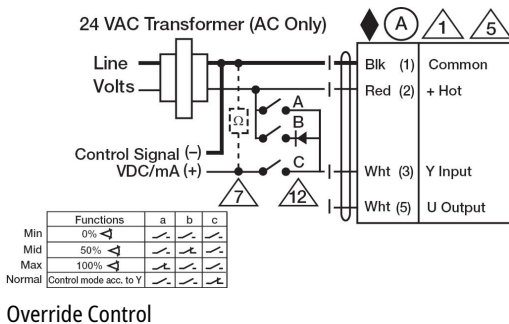
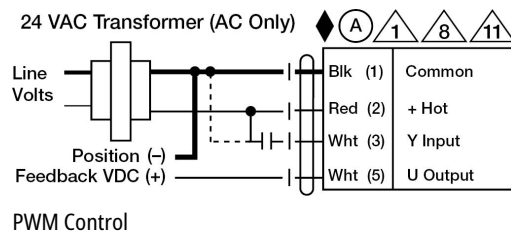
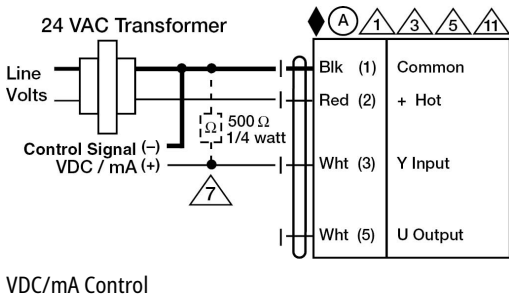
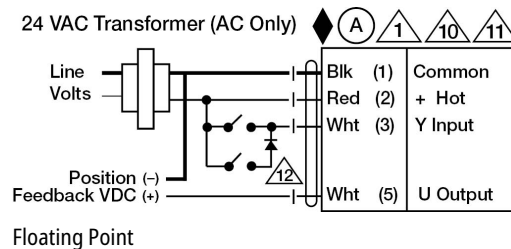
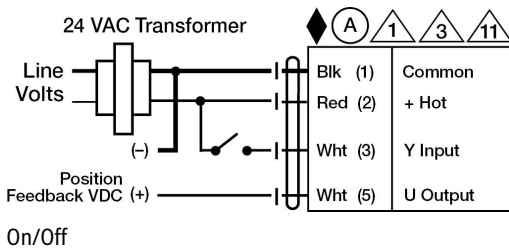
Technical data

Electrical data	Nominal voltage	AC/DC 24 V	
	Nominal voltage frequency	50/60 Hz	
	Power consumption in operation	2.5 W	
	Power consumption in rest position	1 W	
	Transformer sizing	5 VA (class 2 power source)	
	Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector	
	Overload Protection	electronic throughout 0...95° rotation	
Functional data	Operating range Y	2...10 V	
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)	
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point	
	Operating range Y variable	Start point	0.5...30 V
		End point	2.5...32 V
	Options positioning signal	variable (VDC, on/off, floating point)	
	Position feedback U	2...10 V	
	Position Feedback	2...10 V, Max. 0.5 mA, VDC variable	
	Position feedback U note	Max. 0.5 mA	
	Position feedback U variable	VDC variable	
	Direction of motion motor	selectable with switch 0/1	
	Direction of motion fail-safe	reversible with cw/ccw mounting	
	Angle of rotation	90°	
	Running Time (Motor)	default 150 s, variable 75...300 s	
	Running time motor variable	75...300 s	
	Running time fail-safe	<25 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]	
	Running time fail-safe note	@ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]	
	Noise level, motor	50 dB(A)	
	Noise level, fail-safe	62 dB(A)	
Position indication	Mechanical		
Safety data	Degree of protection IEC/EN	IP54	
	Degree of protection NEMA/UL	NEMA 2	
	Enclosure	UL Enclosure Type 2	
	Agency Listing	cULus acc. To UL 873 and CAN/CSA C22.2 No. 24-93	
	Quality Standard	ISO 9001	
	Ambient temperature	-22...122°F [-30...50°C]	
	Storage temperature	-40...176°F [-40...80°C]	
	Ambient humidity	max. 95% r.H., non-condensing	
	Servicing	maintenance-free	
Weight	Weight	3.1 lbs (1.40 kg.)	

Electrical installation

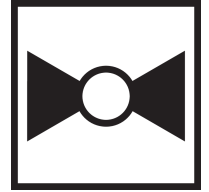
✂️ INSTALLATION NOTES

- Ⓐ Actuators with appliance cables are numbered.
- ⚠️1 Provide overload protection and disconnect as required.
- ⚠️2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- ⚠️4 Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
- ⚠️3 Actuators may also be powered by 24 VDC.
- ⚠️4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- ⚠️5 Only connect common to negative (-) leg of control circuits.
- ⚠️7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
- ⚠️8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.
- ⚠️10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.
- ⚠️11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
- ⚠️12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).
- ◆ Meets cULus requirements without the need of an electrical ground connection.
- ⚠️4 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- ⚠️! **Warning! Live Electrical Components!**
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5-year warranty



Technical data

Functional data	Valve Size	0.5" [15]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	1.2
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Seat	PTFE
	End fitting	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	stainless steel
Suitable actuators	Non-Spring	TR LRB(X) NR

Safety notes

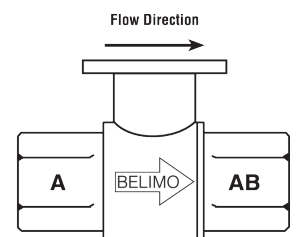
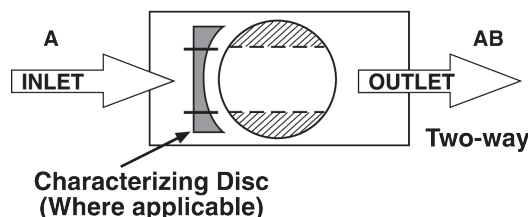


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Product features

Application This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

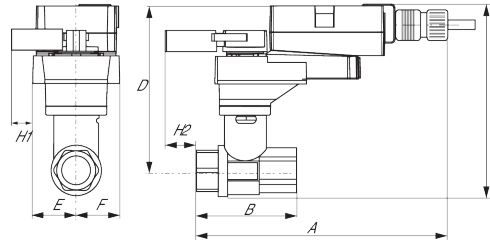
Flow/Mounting details



Dimensions

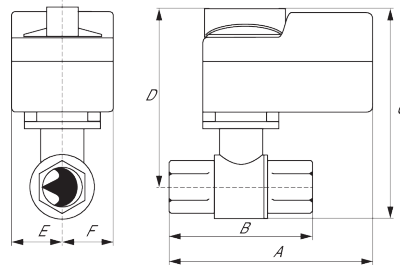
Dimensional drawings

LRB, LRX



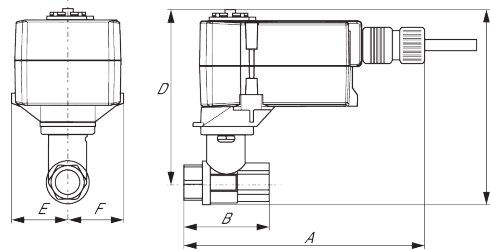
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TR



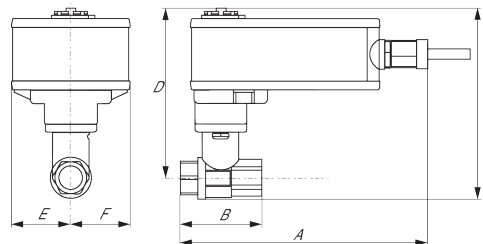
A	B	C	D	E	F
3.7" [95]	2.4" [60]	4.8" [122]	4.2" [107]	1.3" [33]	1.3" [33]

TFRB, TFRX



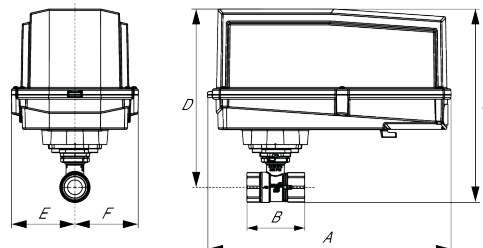
A	B	C	D	E	F
6.6" [167]	2.4" [60]	4.9" [124]	4.3" [110]	1.5" [39]	1.5" [39]

LF

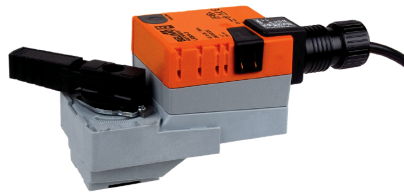


A	B	C	D	E	F
7.9" [200]	2.4" [60]	5.7" [146]	5.1" [129]	1.8" [46]	1.8" [46]

ARB N4, ARX N4, NRB N4, NRX N4



A	B	C	D	E	F
11.4" [289]	2.4" [60]	7.7" [196]	7.0" [179]	3.1" [80]	3.1" [80]



5-year warranty



Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	1.5 W
	Power consumption in rest position	0.4 W
	Transformer sizing	3 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic throughout 0...90° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Position feedback U	2...10 V
	Position Feedback	2...10 V
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	90 s
	Noise level, motor	35 dB(A)
	Position indication	Mechanically, pluggable
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.1 lb [0.50 kg]

Electrical installation

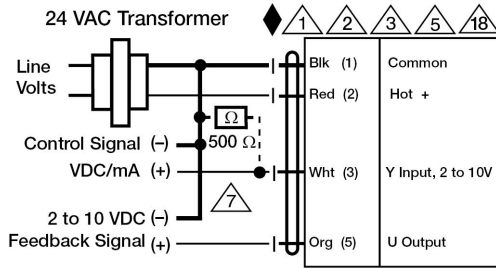
✂️ INSTALLATION NOTES

- 1 Provide overload protection and disconnect as required.
- 2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.
- 3 Actuators may also be powered by 24 VDC.
- 5 Only connect common to negative (-) leg of control circuits.

- A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
- Actuators with plenum cable do not have numbers; use color codes instead.
- Meets cULus requirements without the need of an electrical ground connection.

Warning! Live Electrical Components!

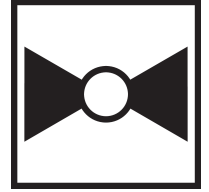
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



2...10 V / 4...20 mA Control



2-year warranty



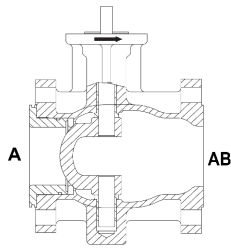
Technical data

Functional data	Valve Size	3" [80]
	Fluid	chilled or hot water, up to 60% glycol, steam
	Fluid Temp Range (water)	-22...380°F [-30...193°C]
	Fluid Temp Range (steam)	-22...380°F [-30...193°C]
	Body Pressure Rating	ANSI Class 150
	Close-off pressure Δps	250 psi
	Servicing	repack/rebuild kits available
	Rangeability Sv	300:1
	Maximum differential pressure (water)	150 psi
	Max Differential Pressure (Steam)	100 psi
	Close-Off Pressure (Steam)	150 psi
	Flow Pattern	2-way
	Leakage rate	ANSI Class IV
	Controllable flow range	75°
	Cv	207
	Maximum Inlet Pressure (Steam)	200 psi
	ANSI Class	150
Materials	Housing	WCC grade carbon steel
	Seat	PTFE
	End fitting	125/150 lb flanged, ASME/ANSI b16.1/b16.5
	Ball	stainless steel
Suitable actuators	Non-Spring	SY1 AMB(X) PRB(X)
	Electronic fail-safe	GKB(X) PKRB(X)

Product features

- Product features** Fast quarter turn open or closed operation, stainless-steel ball and stem, positive isolation, two-piece body construction
- Application** This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

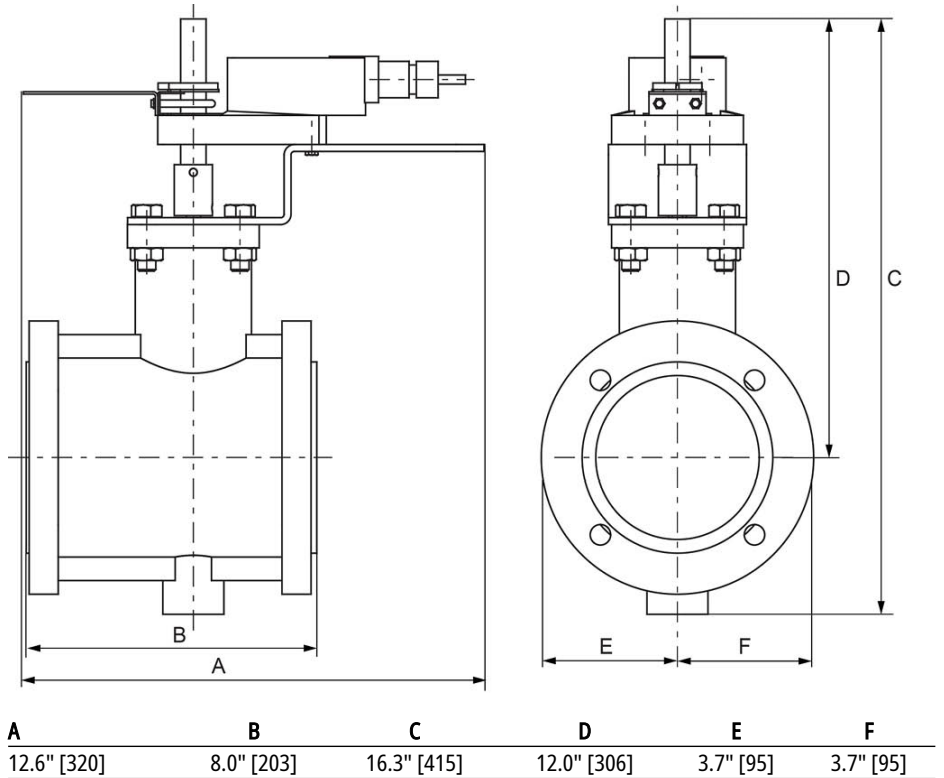
Flow/Mounting details



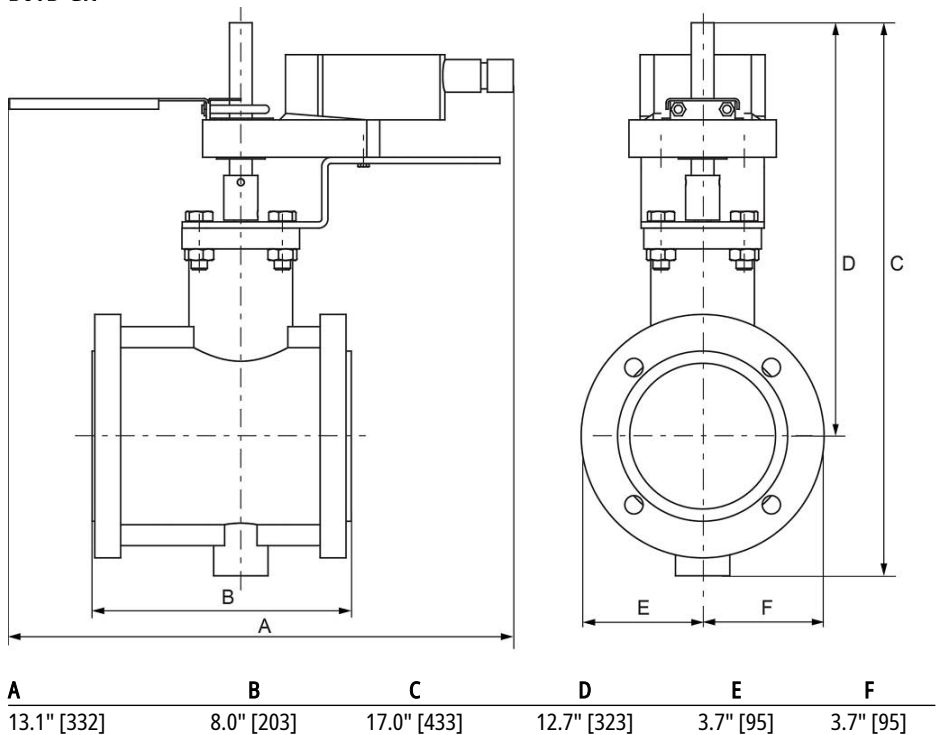
Dimensions

Dimensional drawings

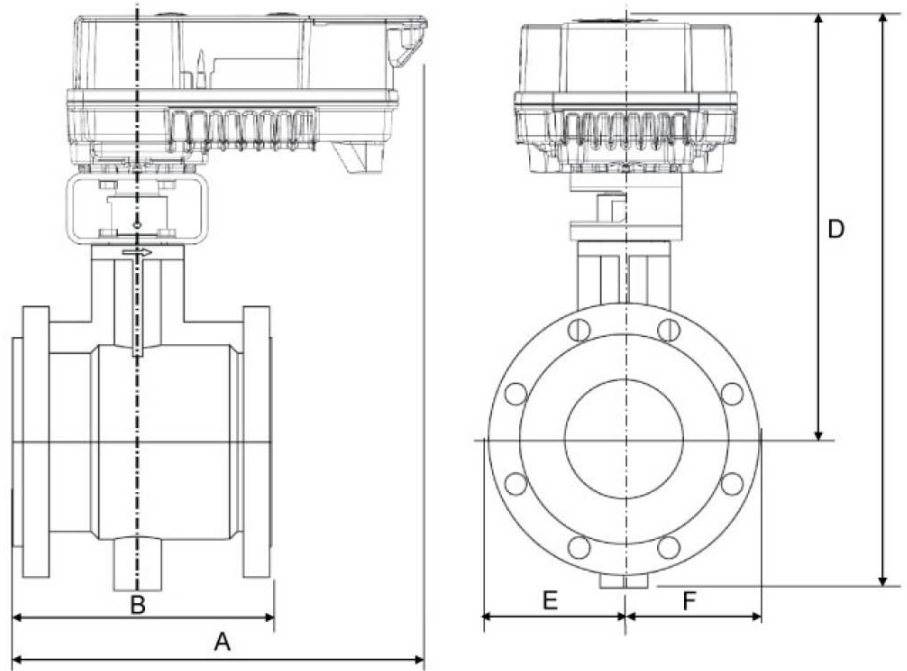
B6VB-AM



B6VB-GK

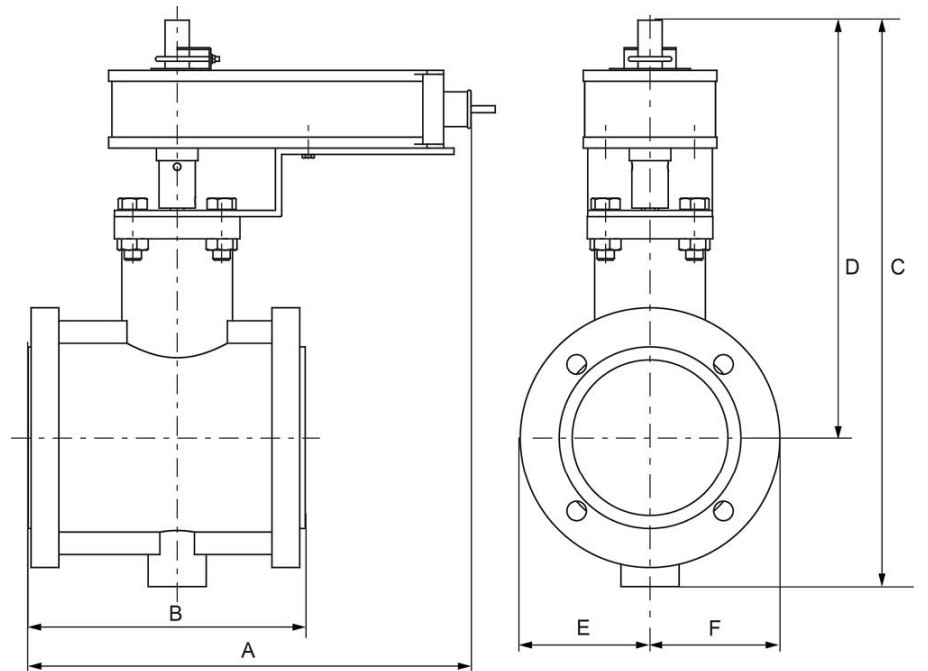


B6VB-PR



A	B	C	D	E	F
11.8" [299]	8.0" [203]	18.9" [480]	14.6" [371]	3.9" [100]	3.9" [100]

B6VB-AF



A	B	C	D	E	F
12.7" [323]	8.0" [203]	16.4" [416]	12.0" [306]	3.7" [95]	3.7" [95]



5-year warranty



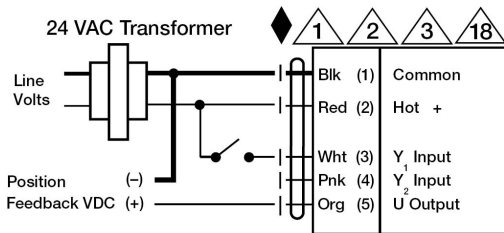
Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	3.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	6 VA
	Electrical Connection	18 GA plenum cable, 3 ft [1 m], with 1/2" conduit connector (10 ft [3 m] and 15 ft [5 m] available)
	Overload Protection	electronic throughout 0...95° rotation
Functional data	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA, 1500 Ω for PWM, On/Off and Floating point
	Operating range Y variable	Start point 0.5...30 V End point 2.5...32 V
	Options positioning signal	variable (VDC, PWM, on/off, floating point)
	Position feedback U	2...10 V
	Position Feedback	2...10 V, Max. 0.5 mA, VDC variable
	Position feedback U note	Max. 0.5 mA
	Position feedback U variable	VDC variable
	Direction of motion motor	selectable with switch 0/1
	Manual override	external push button
	Angle of rotation	Max. 95°, adjustable with mechanical stop
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	default 150 s, variable 90...350 s
	Running time motor variable	90...350 s
Noise level, motor	45 dB(A)	
Position indication	Mechanically, integrated, two-section	
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...150°F [-30...65°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
	Weight	Weight

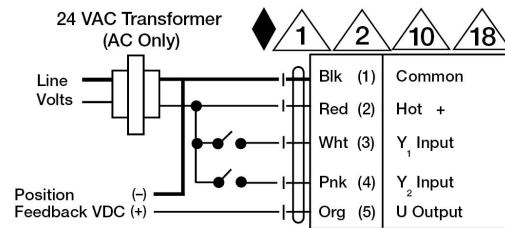
Electrical installation

✂ INSTALLATION NOTES

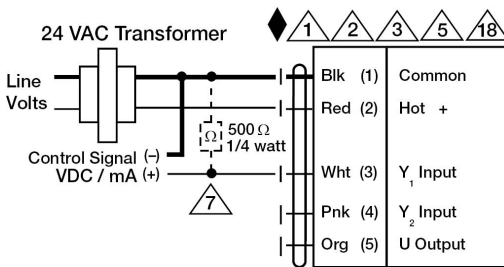
- Ⓐ Actuators with appliance cables are numbered.
- ⚠ Provide overload protection and disconnect as required.
- ⚠ Actuators may also be powered by 24 VDC.
- ⚠ Only connect common to negative (-) leg of control circuits.
- ⚠ A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.
- ⚠ Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 V line.
- ⚠ For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.
- ⚠ Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
- ⚠ IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).
- ◆ Meets cULus requirements without the need of an electrical ground connection.
- ⚠ **Warning! Live Electrical Components!**
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



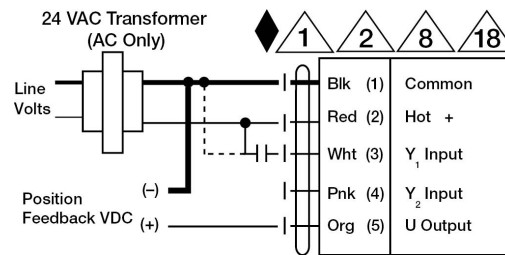
On/Off



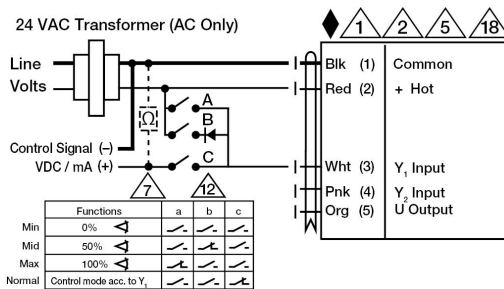
Floating Point



VDC/mA Control



PWM Control



Override Control

Control Wire

(This page is hyperlinked to the TOC)

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Multi-Conductor, Shielded, Plenum NEC Type CMP and/or CL3P



PART NUMBER	NO. OF COND.	AWG. SIZE	COND. STRAND	NOM. INSUL. THICKNESS		NOM. JACKET WALL		NOMINAL O.D.	WEIGHT POUNDS
				INCHES	MM	INCHES	MM		
22 AWG CONDUCTORS									
W221P-2044	2	22	7/30	0.008	0.20	0.015	0.38	0.128	13 lbs.
W223C-2144	3	22	7/30	0.008	0.20	0.015	0.38	0.131	16 lbs.
W224C-2020	4	22	7/30	0.008	0.20	0.015	0.38	0.147	19 lbs.
W226C-2077	6	22	7/30	0.008	0.20	0.015	0.38	0.173	24 lbs.
W228C-2032	8	22	7/30	0.008	0.20	0.015	0.38	0.184	28 lbs.
20 AWG CONDUCTORS									
W201P-2057	2	20	7/28	0.009	0.23	0.015	0.38	0.143	15 lbs.
W203C-2173	3	20	7/28	0.009	0.23	0.015	0.38	0.151	19 lbs.
W204C-2124	4	20	7/28	0.009	0.23	0.015	0.38	0.166	24 lbs.
18 AWG CONDUCTORS									
W181P-2040	2	18	7/26	0.008	0.20	0.015	0.38	0.164	21 lbs.
W183C-2058	3	18	7/26	0.008	0.20	0.015	0.38	0.169	28 lbs.
W184C-2059	4	18	7/26	0.008	0.20	0.015	0.38	0.185	36 lbs.
W186C-2055	6	18	7/26	0.009	0.23	0.015	0.38	0.231	51 lbs.
W188C-2030	8	18	7/26	0.009	0.23	0.015	0.38	0.252	60 lbs.
W1810C-2088	10	18	7/26	0.009	0.23	0.015	0.38	0.270	70 lbs.
W1812C-2145	12	18	7/26	0.009	0.23	0.015	0.38	0.279	85 lbs.
16 AWG CONDUCTORS									
W161P-2084	2	16	19/.0117	0.008	0.20	0.015	0.38	0.179	27 lbs.
W163C-2018	3	16	19/.0117	0.008	0.20	0.015	0.38	0.190	37 lbs.
W164C-2155	4	16	19/.0117	0.008	0.20	0.015	0.38	0.209	48 lbs.
14 AWG CONDUCTORS									
W141P-2087*	2	14	19/.0147	0.008	0.20	0.015	0.38	0.207	40 lbs.
W144C-2297*	4	14	19/.0147	0.008	0.20	0.015	0.38	0.260	75 lbs.
12 AWG CONDUCTORS									
W121P-2144*	2	12	19/.0185	0.008	0.20	0.015	0.38	0.244	55 lbs.
W124C-2273*	4	12	19/.0185	0.008	0.20	0.015	0.38	0.288	120 lbs.

* NEC CL3P only



Designed to Meet UL 910
Test For Flame Propagation
& Smoke Density
Underwriters Laboratories Inc.

Color Code Chart

NO. OF COND.	COLOR	NO. OF COND.	COLOR
1	Black	5	Brown
2	White	6	Blue
3	Red	7	Orange
4	Green	8	Yellow

Product Construction

CONDUCTOR:

- Stranded bare copper per ASTM B-3, B-8 and B-286

INSULATION:

- Premium grade color coded Plenum Rated PVC

SHIELD:

- Overall Flexfoil® polyester supported aluminum foil
- Stranded tinned copper drain wire

JACKET:

- Premium grade Plenum Rated PVC
- Multiple jacket colors available – consult sales office
- Sequential footage markings to facilitate installation
- Suitable for use from -20°C to + 75°C
- Ripcord available – consult Customer Service for details

APPLICATIONS:

- Power limited control circuits
- Wiring of the following systems:
 - Intercom
 - Security
 - Audio
 - Background music
- Suggested voltage rating: 300 volts

COMPLIANCES:

- NEC Article 725 Type CL3P (UL: 75°C, 150V)
- NEC Article 800 Type CMP (UL: 75°C, 300V)

PACKAGING:

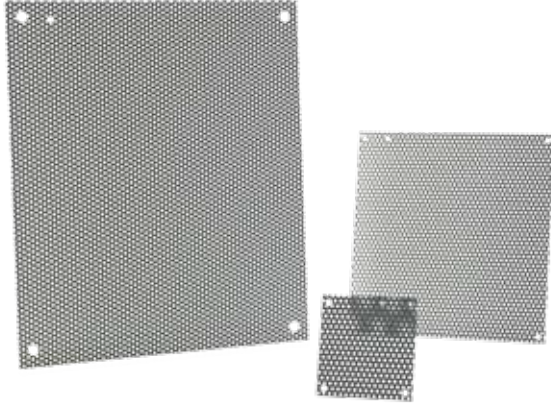
- 1000' (305m) Pull-Pac® Cartons
- 1000' (305m) Reels
- Other put-ups available – consult Customer Service

CONNECT^{AIR}
GENUINE CABLE GROUP

Control Enclosures and Perforated Panel

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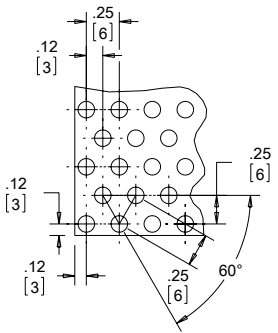
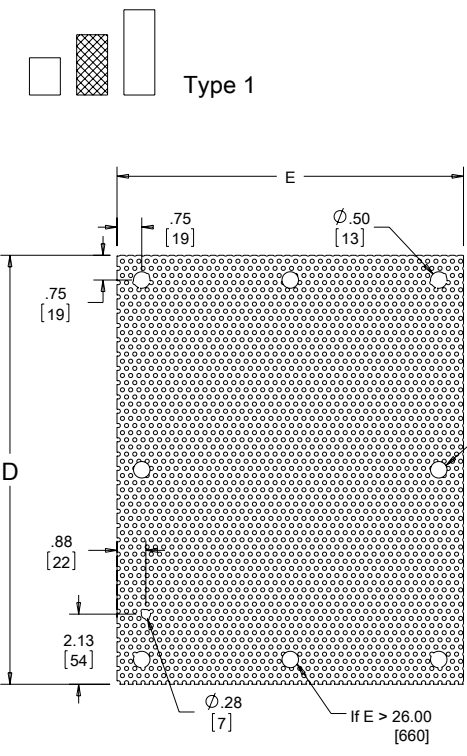
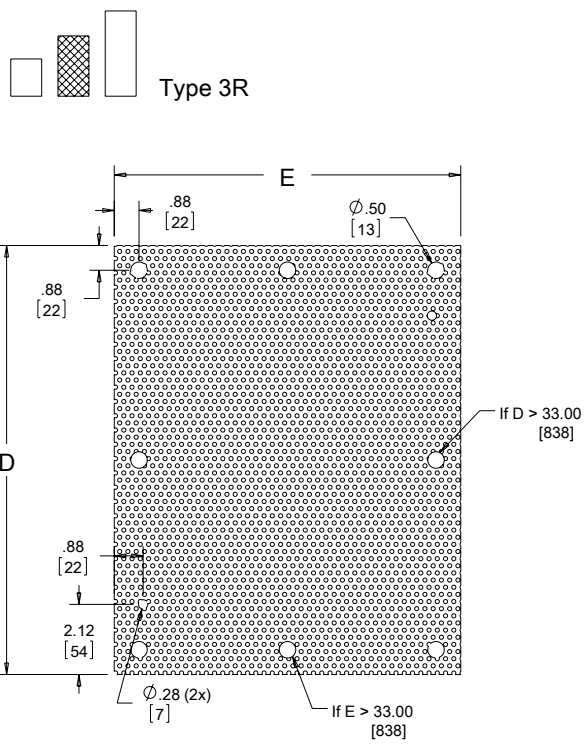
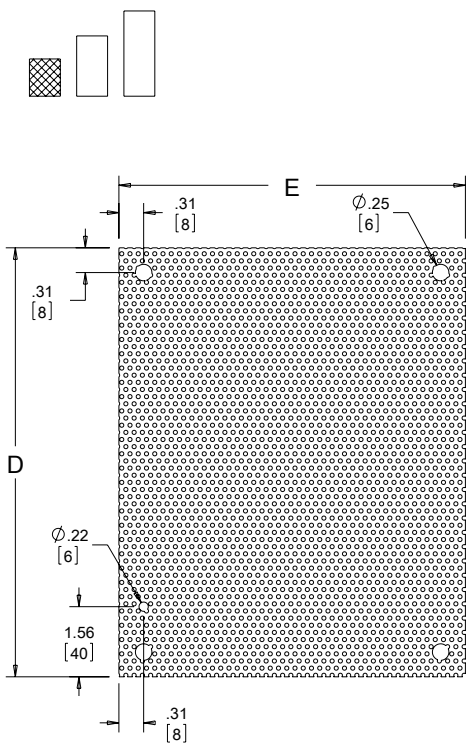
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PERFORATED PANELS


Perforated panels are 16 gauge steel and accept self-tapping screws and eliminate the need to measure, mark and drill when mounting components. Use for mounting lightweight control components.

BULLETIN: PNL P

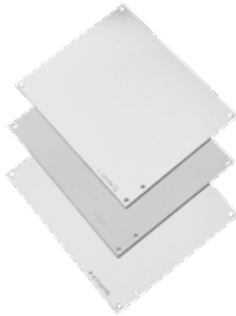
Catalog Number	Use in	Panel Size D x E (in.)	Panel Size D x E (mm)
A6N6PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	4.25 x 4.25	108 x 108
A8N6PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	6.25 x 4.25	159 x 108
A8N8PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	6.25 x 6.25	159 x 159
A10N8PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	8.25 x 6.25	210 x 159
A10N10PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	8.25 x 8.25	210 x 210
A12N10PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	10.25 x 8.25	260 x 210
A12N12PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	10.25 x 10.25	260 x 260
A14N12PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	12.25 x 10.25	311 x 260
A16N12PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	14.25 x 10.25	362 x 260
A20N12PP	Small Type 1 Panel Enclosures and Small Type 3R Boxes	18.25 x 10.25	464 x 260
A16N12MPP	Medium Type 1 Panel Enclosures	13.00 x 10.50	330 x 267
A16N16MPP	Medium Type 1 Panel Enclosures	13.00 x 14.50	330 x 368
A16N20MPP	Medium Type 1 Panel Enclosures	13.00 x 18.50	330 x 470
A18N18MPP	Medium Type 1 Panel Enclosures	15.00 x 16.50	381 x 419
A20N12MPP	Medium Type 1 Panel Enclosures	17.00 x 10.50	432 x 267
A20N16MPP	Medium Type 1 Panel Enclosures	17.00 x 14.50	432 x 368
A20N20MPP	Medium Type 1 Panel Enclosures	17.00 x 18.50	432 x 470
A24N16MPP	Medium Type 1 Panel Enclosures	21.00 x 14.50	533 x 368
A24N20MPP	Medium Type 1 Panel Enclosures	21.00 x 18.50	533 x 470
A24N24MPP	Medium Type 1 Panel Enclosures	21.00 x 22.50	533 x 572
A30N20MPP	Medium Type 1 Panel Enclosures	26.00 x 18.50	660 x 470
A30N24MPP	Medium Type 1 Panel Enclosures	26.00 x 22.50	660 x 572
A30N30MPP	Medium Type 1 Panel Enclosures	26.00 x 28.50	660 x 724
A36N24MPP	Medium Type 1 Panel Enclosures	32.00 x 22.50	813 x 572
A36N30MPP	Medium Type 1 Panel Enclosures	32.00 x 26.50	813 x 724
A16P12PP	Medium Type 3R Hinged-Cover Panel Enclosures	13.00 x 9.00	330 x 229
A16P16PP	Medium Type 3R Hinged-Cover Panel Enclosures	13.00 x 13.00	330 x 330
A20P16PP	Medium Type 3R Hinged-Cover Panel Enclosures	17.00 x 13.00	432 x 330
A18P18PP	Medium Type 3R Hinged-Cover Panel Enclosures	15.00 x 15.00	381 x 381
A20P20PP	Medium Type 3R Hinged-Cover Panel Enclosures	17.00 x 17.00	432 x 432
A24P20PP	Medium Type 3R Hinged-Cover Panel Enclosures	21.00 x 17.00	533 x 432
A24P24PP	Medium Type 3R Hinged-Cover Panel Enclosures	21.00 x 21.00	533 x 533
A30P24PP	Medium Type 3R Hinged-Cover Panel Enclosures	27.00 x 21.00	686 x 533
A36P24PP	Medium Type 3R Hinged-Cover Panel Enclosures	33.00 x 21.00	838 x 533
A30P30PP	Medium Type 3R Hinged-Cover Panel Enclosures	27.00 x 27.00	686 x 686
A36P30PP	Medium Type 3R Hinged-Cover Panel Enclosures	33.00 x 27.00	838 x 686
A36P36PP	Medium Type 3R Hinged-Cover Panel Enclosures	33.00 x 33.00	838 x 838



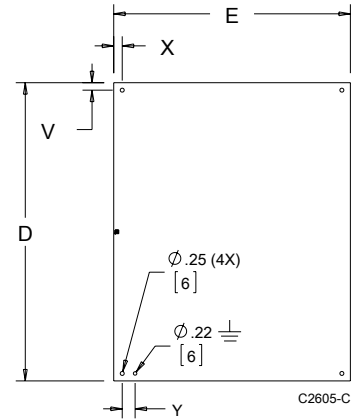
87756306

PANELS FOR JUNCTION BOXES

BULLETIN: PNLJ, PNLWM



Steel panels are 14 gauge, finished with white polyester powder paint or with a conductive, corrosion-resistant coating. Stainless steel panels are 14 gauge Type 304 and have a commercial #3 finish which is protected on one side with a plastic film. Aluminum panels are 5052-H32 aluminum alloy 0.080-in. (2-mm) thick and protected on one side with a plastic film. Panel mounting hardware is furnished with all enclosures which accept these panels.



Catalog Number	Material	Panel Size D x E (in.)	Panel Size D x E (mm)	V (in.)	V (mm)	X (in.)	X (mm)	Y (in.)	Y (mm)
A4P4G	Conductive	2.88 x 2.88	73 x 73	.31	8	.31	8	1.25	32
A6P4	Painted steel	4.88 x 2.88	124 x 73	.31	8	.31	8	1.25	32
A6P4G	Conductive steel	4.88 x 2.88	124 x 73	.31	8	.31	8	1.25	32
A6P4SS	Stainless Steel	4.88 x 2.88	124 x 73	.31	8	.31	8	1.25	32
A6P4AL	Aluminum	4.88 x 2.88	124 x 73	.31	8	.31	8	1.25	32
A6P6	Painted steel	4.88 x 4.88	124 x 124	.31	8	.31	8	1.25	32
A6P6G	Conductive steel	4.88 x 4.88	124 x 124	.31	8	.31	8	1.25	32
A6P6SS	Stainless Steel	4.88 x 4.88	124 x 124	.31	8	.31	8	1.25	32
A6P6AL	Aluminum	4.88 x 4.88	124 x 124	.31	8	.31	8	1.25	32
A7P7G	Conductive	5.88 x 5.88	149 x 149	.31	8	.31	8	1.25	32
A8P6	Painted steel	6.75 x 4.88	171 x 124	.25	6	.31	8	1.25	32
A8P6G	Conductive steel	6.75 x 4.88	171 x 124	.25	6	.31	8	1.25	32
A8P6SS	Stainless Steel	6.75 x 4.88	171 x 124	.25	6	.31	8	1.25	32
A8P6AL	Aluminum	6.75 x 4.88	171 x 124	.25	6	.31	8	1.25	32
A8P8	Painted steel	6.75 x 6.88	171 x 175	.25	6	.31	8	1.25	32
A8P8G	Conductive Steel	6.75 x 6.88	171 x 175	.25	6	.31	8	1.25	32
A8P8AL	Aluminum	6.75 x 6.88	171 x 175	.25	6	.31	8	1.25	32
A9P6G	Conductive	7.38 x 4.63	187 x 118	.31	8	.31	8	1.25	32
A10P8	Painted steel	8.75 x 6.88	222 x 175	.25	6	.31	8	1.25	32
A10P8G	Conductive steel	8.75 x 6.88	222 x 175	.25	6	.31	8	1.25	32
A10P8SS	Stainless Steel	8.75 x 6.88	222 x 175	.25	6	.31	8	1.25	32
A10P8AL	Aluminum	8.75 x 6.88	222 x 175	.25	6	.31	8	1.25	32
A10P10	Painted steel	8.75 x 8.88	222 x 226	.25	6	.31	8	1.25	32
A10P10G	Conductive steel	8.75 x 8.88	222 x 226	.25	6	.31	8	1.25	32
A10P10AL	Aluminum	8.75 x 8.88	222 x 226	.25	6	.31	8	1.25	32
A12P6	Painted steel	10.75 x 4.88	273 x 124	.25	6	.31	8	1.25	32
A12P6G	Conductive steel	10.75 x 4.88	273 x 124	.25	6	.31	8	1.25	32
A12P10	Painted steel	10.75 x 8.88	273 x 226	.25	6	.31	8	1.25	32
A12P10G	Conductive steel	10.75 x 8.88	273 x 226	.25	6	.31	8	1.25	32
A12P10SS	Stainless Steel	10.75 x 8.88	273 x 226	.25	6	.31	8	1.25	32
A12P10AL	Aluminum	10.75 x 8.88	273 x 226	.25	6	.31	8	1.25	32
A12P12	Painted steel	10.75 x 10.88	273 x 276	.25	6	.31	8	1.25	32
A12P12G	Conductive steel	10.75 x 10.88	273 x 276	.25	6	.31	8	1.25	32
A12P12SS	Stainless Steel	10.75 x 10.88	273 x 276	.25	6	.31	8	1.25	32
A14P8	Painted steel	12.75 x 6.88	324 x 175	.25	6	.31	8	1.25	32
A14P8G	Conductive steel	12.75 x 6.88	324 x 175	.25	6	.31	8	1.25	32
A14P12	Painted steel	12.75 x 10.88	324 x 276	.25	6	.31	8	1.25	32
A14P12G	Conductive steel	12.75 x 10.88	324 x 276	.25	6	.31	8	1.25	32
A14P12SS	Stainless Steel	12.75 x 10.88	324 x 276	.25	6	.31	8	1.25	32
A14P12AL	Aluminum	12.75 x 10.88	324 x 276	.25	6	.31	8	1.25	32
A16P10	Painted steel	14.75 x 8.88	375 x 226	.25	6	.31	8	1.25	32
A16P10G	Conductive steel	14.75 x 8.88	375 x 226	.25	6	.31	8	1.25	32
A16P14	Painted steel	14.75 x 12.88	375 x 327	.25	6	.31	8	1.25	32
A16P14G	Conductive steel	14.75 x 12.88	375 x 327	.25	6	.31	8	1.25	32
A16P14SS	Stainless Steel	14.75 x 12.88	375 x 327	.25	6	.31	8	1.25	32
A16P14AL	Aluminum	14.75 x 12.88	375 x 327	.25	6	.31	8	1.25	32
A18P16	Painted steel	16.75 x 14.88	425 x 378	.25	6	.31	8	1.25	32
A18P16G	Conductive steel	16.75 x 14.88	425 x 378	.25	6	.31	8	1.25	32
A18P16SS	Stainless Steel	16.75 x 14.88	425 x 378	.25	6	.31	8	1.25	32
A18P16AL	Aluminum	16.75 x 14.88	425 x 378	.25	6	.31	8	1.25	32
A20P16J	Painted	18.75 x 14.88	476 x 378	.47	12	.54	14	.81	21
A20P16JAL	Aluminum	18.75 x 14.88	476 x 378	.47	12	.54	14	.81	21

COMPOSITE PANELS FOR JUNCTION BOXES AND UL/NEMA WALL-MOUNT ENCLOSURES

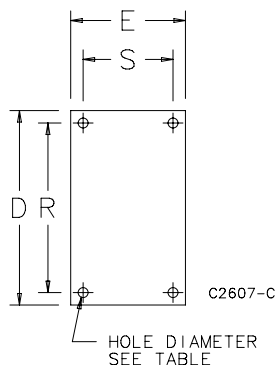
Manufactured from light-brown, reinforced phenolic laminate sheet stock. This material has exceptional strength and chemical resistance, which makes it ideally suited for the most corrosive environments. Composite panels are intended for use in corrosion-resistant enclosures. Panel sizes are available for junction boxes and UL/NEMA size enclosures. Composite panels may be drilled

and tapped but work equally as well with self-threading or thread-cutting screws. Refer to the table for recommended mounting specifications.

BULLETIN: PNLC

Standard Product

Catalog Number	Panel Size D x E in./mm	R in./mm	S in./mm	Hole Dia. in./mm	Panel Thickness in./mm
A6P4C	4.88 x 2.88 124 x 73	4.25 108	2.25 57	0.25 6	0.12 3
A6P6C	4.88 x 4.88 124 x 124	4.25 108	4.25 108	0.25 6	0.12 3
A8P6C	6.75 x 4.88 171 x 124	6.25 159	4.25 108	0.25 6	0.12 3
A10P8C	8.75 x 6.88 222 x 175	8.25 210	6.25 159	0.25 6	0.12 3
A12P10C	10.75 x 8.88 273 x 226	10.25 260	8.25 210	0.25 6	0.19 5
A14P12C	12.75 x 10.88 324 x 276	12.25 311	10.25 260	0.25 6	0.19 5
A16P14C	14.75 x 12.88 375 x 327	14.25 362	12.25 311	0.25 6	0.19 5
A18P16C	16.75 x 14.88 425 x 379	16.25 413	14.25 362	0.25 6	0.19 5
A20P16C	17.00 x 13.00 432 x 330	15.25 387	11.25 286	0.50 13	0.19 5
A20P20C	17.00 x 17.00 432 x 432	15.25 387	15.25 387	0.50 13	0.19 5
A24P20C	21.00 x 17.00 533 x 432	19.25 489	15.25 387	0.50 13	0.19 5
A24P24C	21.00 x 21.00 533 x 533	19.25 489	19.25 489	0.50 13	0.19 5
A30P24C	27.00 x 21.00 686 x 533	25.25 641	19.25 489	0.50 13	0.19 5



Composite Panel Mounting Recommendations

Screw Type	Screw Size	Hole Size in./mm	Max. Insertion Torque (lb.) in 0.12 in. Material	Max. Insertion Torque (lb.) in 0.19 in. Material	Max. Load (lb. per screw) in 0.12 in. Material	Max. Load (lb. per screw) in 0.19 in. Material
Machine (tapped hole)	8-32	.136 3	15	25	40	45
Machine (tapped hole)	10-32	.161 4	15	25	35	40
Machine (tapped hole)	1/4-20	.204 5	20	25	30	35
Thread Cutting Type T	8-32	.144 4	15	25	40	45
Thread Cutting Type T	10-32	.166 4	15	25	35	40
Thread Cutting Type T	1/4-20	.288 7	20	25	30	35
Sheet Metal A-B	8-32	.147 4	Not recommended	10	40	45
Sheet Metal A-B	10-32	.166 4	Not recommended	10	35	40
Sheet Metal A-B	1/4-20	.221 6	Not recommended	15	30	35

JUNCTION BOX AND WALL-MOUNT ENCLOSURE SWING-OUT PANEL KIT

Kits allow mounting standard Hoffman junction box and NEMA style panels (purchase separately) near the front of the enclosure for easy access to or reading of gauges, switches, pilot lights and other components. Kits consist of heavy-gauge brackets and hinges which are easily installed by drilling small holes in the sides of the enclosure and bolting the brackets in place. External screws are stainless steel; internal components are plated steel. All mounting hardware and instructions are provided. Sealing washers ensure the enclosure will meet original JIC or NEMA standards after installation.

Swing-Out Panel Kits do not fit single-door disconnect enclosures.

BULLETIN: A80

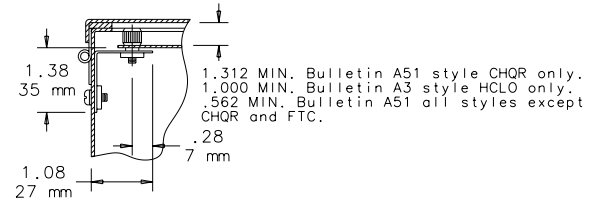
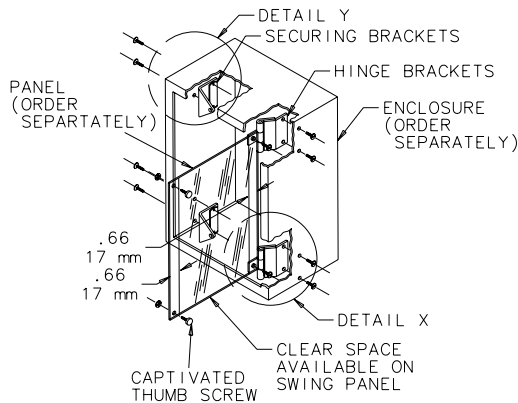


Catalog Number	Description	Maximum Load (lb.)	Maximum Load (kg)	Use In
AJCDFK	Junction Box Kit	25	11.3	- Junction boxes where A x B is 8.00 x 6.00 in. (203 x 152 mm) or larger - HCL0 Type 3R enclosures where A x B is 16.00 x 12.00 in. (406 x 305 mm) or smaller
ANADFK	Wall-Mount Enclosure Kit	100	45.4	- One-door Type 4, 4X, 12 and 13 enclosures where A x B is 12.00 x 12.00 in. (305 x 305 mm) or larger - HCL0 Type 3R enclosures where A x B is 16.00 x 16.00 in. (406 x 406 mm) or larger - HCR Type 3R enclosures where A x B is 16.00 x 12.00 (406 x 305 mm) or larger - Type 1 enclosures where A x B is 42.00 x 30.00 in. (1067 x 762 mm) or larger

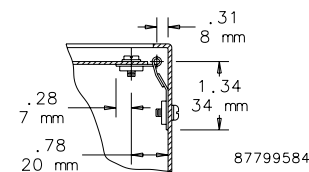
Both kits maintain UL Type 4 and Type 4X rating when properly installed in a Hoffman enclosure.

Maximum load includes the weight of the panel plus the weight of the components, with the weight of the components spread evenly over the panel.

Junction Box Swing-Out Panel Kit

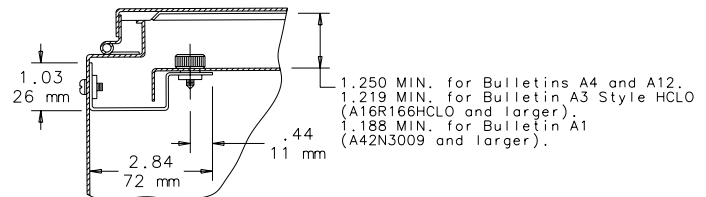
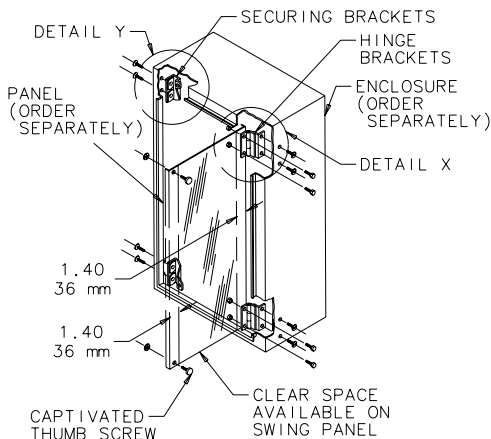


DETAIL Y

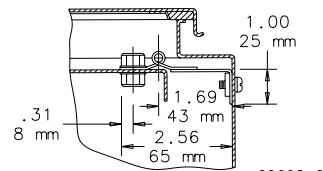


DETAIL X

Wall-Mount Enclosure Swing-Out Panel Kit



DETAIL Y

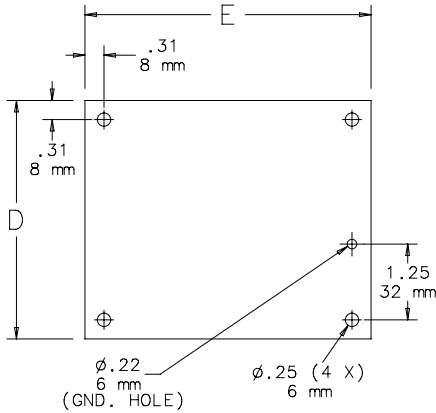


DETAIL X

PANELS FOR TYPE 1 ENCLOSURES AND SMALL TYPE 3R ENCLOSURES

Steel panels are 14 gauge, finished with white polyester powder paint. Panel mounting hardware is furnished with enclosure.

BULLETIN: PNLT1



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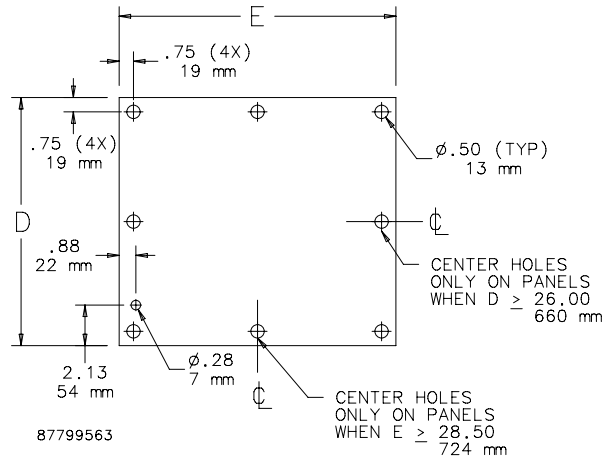
Catalog Number	Panel Size D x E (in.)	Panel Size D x E (mm)
A6N4P	4.25 x 2.25	108 x 57
A6N6P	4.25 x 4.25	108 x 108
A8N6P	6.25 x 4.25	159 x 108
A8N8P	6.25 x 6.25	159 x 159
A10N8P	8.25 x 6.25	210 x 159
A10N10P	8.25 x 8.25	210 x 210
A12N10P	10.25 x 8.25	260 x 210
A12N12P	10.25 x 10.25	260 x 260
A14N12P	12.25 x 10.25	311 x 260
A16N12P	14.25 x 10.25	362 x 260
A20N12P	18.25 x 10.25	464 x 260

PANELS FOR MEDIUM TYPE 1 ENCLOSURES

Steel panels are 14 or 12 gauge with a white polyester powder paint finish. Panel mounting hardware is furnished with enclosure.

BULLETIN: PNLT1

Catalog Number	Panel Thickness (ga.)	Panel Size D x E (in.)	Panel Size D x E (mm)
A16N12MP	14	13.00 x 10.50	330 x 267
A20N12MP	14	17.00 x 10.50	432 x 267
A16N16MP	14	13.00 x 14.50	330 x 368
A20N16MP	14	17.00 x 14.50	432 x 368
A24N16MP	14	21.00 x 14.50	533 x 368
A18N18MP	14	15.00 x 16.50	381 x 419
A16N20MP	14	13.00 x 18.50	330 x 470
A20N20MP	14	17.00 x 18.50	432 x 470
A24N20MP	14	21.00 x 18.50	533 x 470
A30N20MP	14	26.00 x 18.50	660 x 470
A24N24MP	12	21.00 x 22.50	533 x 571
A30N24MP	12	26.00 x 22.50	660 x 571
A36N24MP	12	32.00 x 22.50	813 x 571
A30N30MP	12	26.00 x 28.50	660 x 724
A36N30MP	12	32.00 x 28.50	813 x 724



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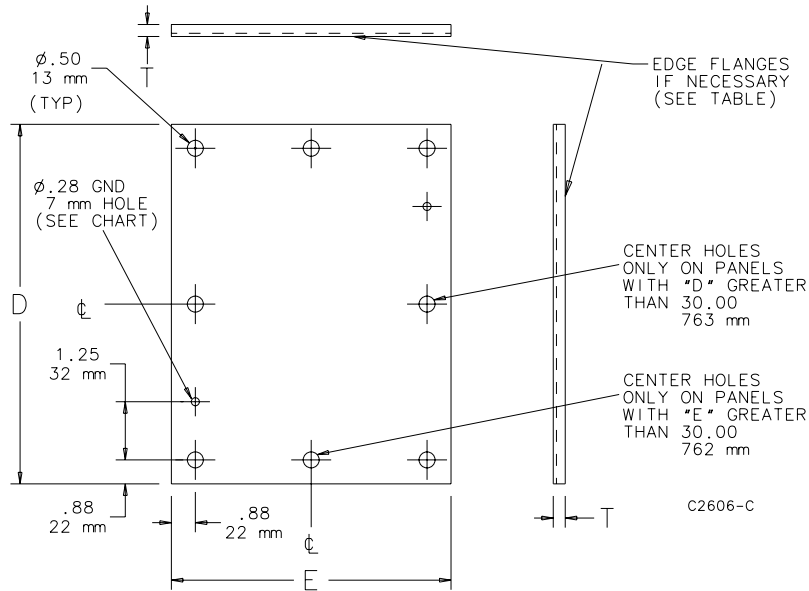
PANELS FOR TYPE 3R, 4, 4X, 12 AND 13 ENCLOSURES

Steel panels are 12 gauge, finished with white polyester powder paint or a conductive, corrosion-resistant coating. Larger panels have flanges on two or four sides. Some larger steel panels are 10 gauge and include extra holes for panel lifting. Aluminum panels are 5052-H32 aluminum alloy. Larger panels have flanges on four sides. Aluminum panels are protected on one side with a plastic film. Stainless steel panels are Type 316 stainless steel. Panel mounting hardware is furnished with all enclosures which accept these panels.

BULLETIN: PNLFS, PNLJ, PNLWJ

Catalog Number	Material	Panel Size D x E (in.)	Panel Size D x E (mm)	Panel Gauge or Thickness	Edge Flanges	T (in.)	T (mm)	Number of Holes
A12P24	Painted steel	9.00 x 21.00	229 x 533	12 ga.	0	—	—	4
A12P24G	Conductive steel	9.00 x 21.00	229 x 533	12 ga.	0	—	—	4
A16P12	Painted steel	13.00 x 9.00	330 x 229	12 ga.	0	—	—	4
A16P12G	Conductive steel	13.00 x 9.00	330 x 229	12 ga.	0	—	—	4
A16P12SS6	Stainless Steel	13.00 x 9.00	330 x 229	12 ga.	0	—	—	4
A16P12AL	Aluminum	13.00 x 9.00	330 x 229	0.10 in./3 mm	0	—	—	4
A16P16	Painted steel	13.00 x 13.00	330 x 330	12 ga.	0	—	—	4
A16P16G	Conductive steel	13.00 x 13.00	330 x 330	12 ga.	0	—	—	4
A16P16SS6	Stainless Steel	13.00 x 13.00	330 x 330	12 ga.	0	—	—	4
A16P16AL	Aluminum	13.00 x 13.00	330 x 330	0.10 in./3 mm	0	—	—	4
A18P18	Painted steel	15.00 x 15.00	381 x 381	12 ga.	0	—	—	4
A18P18G	Conductive steel	15.00 x 15.00	381 x 381	12 ga.	0	—	—	4
A20P12	Painted steel	17.00 x 9.00	432 x 229	12 ga.	0	—	—	4
A20P12G	Conductive steel	17.00 x 9.00	432 x 229	12 ga.	0	—	—	4
A20P16	Painted steel	17.00 x 13.00	432 x 330	12 ga.	0	—	—	4
A20P16G	Conductive steel	17.00 x 13.00	432 x 330	12 ga.	0	—	—	4
A20P16SS6	Stainless Steel	17.00 x 13.00	432 x 330	12 ga.	0	—	—	4
A20P16AL	Aluminum	17.00 x 13.00	432 x 330	0.10 in./3 mm	0	—	—	4
A20P20	Painted steel	17.00 x 17.00	432 x 432	12 ga.	0	—	—	4
A20P20G	Conductive steel	17.00 x 17.00	432 x 432	12 ga.	0	—	—	4
A20P20SS6	Stainless steel	17.00 x 17.00	432 x 432	12 ga.	0	—	—	4
A20P20AL	Aluminum	17.00 x 17.00	432 x 432	0.10 in./3 mm	0	—	—	4
A24P16	Painted steel	21.00 x 13.00	533 x 330	12 ga.	0	—	—	4
A24P16G	Conductive steel	21.00 x 13.00	533 x 330	12 ga.	0	—	—	4
A24P16SS6	Stainless Steel	21.00 x 13.00	533 x 330	12 ga.	0	—	—	4
A24P20	Painted steel	21.00 x 17.00	533 x 432	12 ga.	2	0.75	19	4
A24P20G	Conductive steel	21.00 x 17.00	533 x 432	12 ga.	2	0.75	19	4
A24P20SS6	Stainless Steel	21.00 x 17.00	533 x 432	12 ga.	2	0.75	19	4
A24P20AL	Aluminum	21.00 x 17.00	533 x 432	0.10 in./3 mm	4	0.75	19	4
A24P24	Painted steel	21.00 x 21.00	533 x 533	12 ga.	2	0.75	19	4
A24P24G	Conductive steel	21.00 x 21.00	533 x 533	12 ga.	2	0.75	19	4
A24P24SS6	Stainless Steel	21.00 x 21.00	533 x 533	12 ga.	2	0.75	19	4
A24P24AL	Aluminum	21.00 x 21.00	533 x 533	0.10 in./3 mm	2	0.75	19	4
A30P16	Painted steel	27.00 x 13.00	686 x 330	12 ga.	2	0.75	19	4
A30P16G	Conductive steel	33.00 x 27.00	838 x 686	12 ga.	2	0.75	19	4
A30P20	Painted steel	27.00 x 17.00	686 x 432	12 ga.	2	0.75	19	4
A30P20G	Conductive steel	27.00 x 17.00	686 x 432	12 ga.	2	0.75	19	4
A30P20SS6	Stainless Steel	27.00 x 17.00	686 x 432	12 ga.	2	0.75	19	4
A30P24	Painted steel	27.00 x 21.00	686 x 533	12 ga.	2	0.75	19	4
A30P24G	Conductive steel	27.00 x 21.00	686 x 533	12 ga.	2	0.75	19	4
A30P24SS6	Stainless Steel	27.00 x 21.00	686 x 533	12 ga.	2	0.75	19	4
A30P24AL	Aluminum	27.00 x 21.00	686 x 533	0.10 in./3 mm	2	0.75	19	4
A30P30	Painted steel	27.00 x 27.00	686 x 686	12 ga.	4	0.75	19	4
A30P30G	Conductive steel	27.00 x 27.00	686 x 686	12 ga.	4	0.75	19	4
A30P30SS6	Stainless Steel	27.00 x 27.00	686 x 686	12 ga.	4	0.75	19	4
A36P16	Painted steel	33.00 x 13.00	838 x 330	12 ga.	2	0.75	19	4
A36P16G	Conductive steel	33.00 x 13.00	838 x 330	12 ga.	2	0.75	19	4
A36P24	Painted steel	33.00 x 21.00	838 x 533	12 ga.	2	0.75	19	6
A36P24G	Conductive steel	33.00 x 21.00	838 x 533	12 ga.	2	0.75	19	6
A36P24SS6	Stainless Steel	33.00 x 21.00	838 x 533	12 ga.	2	0.75	19	6
A36P24AL	Aluminum	33.00 x 21.00	838 x 533	0.10 in./3 mm	2	0.75	19	6
A36P30	Painted steel	33.00 x 27.00	838 x 686	12 ga.	4	0.75	19	6
A36P30G	Conductive steel	33.00 x 27.00	838 x 686	12 ga.	4	0.75	19	6
A36P30SS6	Stainless Steel	33.00 x 27.00	838 x 686	12 ga.	4	0.75	19	6
A36P30AL	Aluminum	33.00 x 27.00	838 x 686	0.10 in./3 mm	4	0.75	19	6
A36P36	Painted steel	33.00 x 33.00	838 x 838	12 ga.	4	0.75	19	8
A36P36G	Conductive steel	33.00 x 33.00	838 x 838	12 ga.	4	0.75	19	8
A36P36SS6	Stainless Steel	33.00 x 33.00	838 x 838	12 ga.	4	0.75	19	8
A40P24	Painted steel	37.00 x 21.00	940 x 533	12 ga.	4	0.75	19	6
A40P24G	Conductive steel	37.00 x 21.00	940 x 533	12 ga.	4	0.75	19	6
A40P30	Painted steel	37.00 x 29.00	940 x 737	12 ga.	4	0.75	19	4 (no D dim. center hole)
A40P30G	Conductive steel	37.00 x 29.00	940 x 737	12 ga.	4	0.75	19	4 (no D dim. center hole)
A42P24	Painted steel	39.00 x 21.00	991 x 533	12 ga.	2	0.75	19	6
A42P24G	Conductive steel	39.00 x 21.00	991 x 533	12 ga.	2	0.75	19	6
A42P30	Painted steel	39.00 x 27.00	991 x 686	12 ga.	4	0.75	19	6
A42P30G	Conductive steel	39.00 x 27.00	991 x 686	12 ga.	4	0.75	19	6
A42P30SS6	Stainless Steel	39.00 x 27.00	991 x 686	12 ga.	4	0.75	19	6
A42P36	Painted steel	39.00 x 33.00	991 x 838	12 ga.	4	0.75	19	8
A42P36G	Conductive steel	39.00 x 33.00	991 x 838	12 ga.	4	0.75	19	8
A42P36SS6	Stainless Steel	39.00 x 33.00	991 x 838	12 ga.	4	0.75	19	8
A42P42	Painted steel	39.00 x 39.00	991 x 991	12 ga.	4	0.75	19	8

Catalog Number	Material	Panel Size D x E (in.)	Panel Size D x E (mm)	Panel Gauge or Thickness	Edge Flanges	T (in.)	T (mm)	Number of Holes
A42P42G	Conductive steel	39.00 x 39.00	991 x 991	12 ga.	4	0.75	19	8
A48P24	Painted steel	45.00 x 21.00	1143 x 533	12 ga.	2	0.75	19	6
A48P24G	Conductive steel	45.00 x 21.00	1143 x 533	12 ga.	2	0.75	19	6
A48P30	Painted steel	45.00 x 27.00	1143 x 686	12 ga.	4	0.75	19	6
A48P30G	Conductive steel	45.00 x 27.00	1143 x 686	12 ga.	4	0.75	19	6
A48P36	Painted steel	45.00 x 33.00	1143 x 838	12 ga.	4	0.75	19	8
A48P36G	Conductive steel	45.00 x 33.00	1143 x 838	12 ga.	4	0.75	19	8
A48P36SS6	Stainless Steel	45.00 x 33.00	1143 x 838	12 ga.	4	0.75	19	8
A48P36AL	Aluminum	45.00 x 33.00	1143 x 838	0.10 in./3 mm	4	0.75	19	8
A48P42	Painted steel	45.00 x 39.00	1143 x 991	12 ga.	4	0.75	19	8
A48P42G	Conductive steel	45.00 x 39.00	1143 x 991	12 ga.	4	0.75	19	8
A48P48	Painted steel	44.00 x 44.00	1118 x 1118	10 ga.	4	0.88	22	8
A48P48G	Conductive steel	44.00 x 44.00	1118 x 1118	10 ga.	4	0.88	22	8
A54P42	Painted steel	50.00 x 38.00	1270 x 965	12 ga.	4	0.75	19	8
A54P42G	Conductive steel	50.00 x 38.00	1270 x 965	10 ga.	4	0.75	19	8
A60P24	Painted steel	57.00 x 21.00	1448 x 533	12 ga.	4	0.75	19	6
A60P24G	Conductive steel	57.00 x 21.00	1448 x 533	12 ga.	4	0.75	19	6
A60P30	Painted steel	57.00 x 27.00	1448 x 686	12 ga.	4	0.75	19	6
A60P30G	Conductive steel	57.00 x 27.00	1448 x 686	12 ga.	4	0.75	19	6
A60P36	Painted steel	57.00 x 33.00	1448 x 838	12 ga.	4	0.75	19	8
A60P36G	Conductive steel	57.00 x 33.00	1448 x 838	12 ga.	4	0.75	19	8
A60P36SS6	Stainless Steel	57.00 x 33.00	1448 x 838	12 ga.	4	0.75	19	8
A60P36AL	Aluminum	57.00 x 33.00	1448 x 838	0.10 in./3 mm	4	0.75	19	8
A60BFP42	Painted steel	56.00 x 38.00	1422 x 965	10 ga.	4	0.88	22	10
A60BFP42G	Conductive steel	56.00 x 38.00	1422 x 965	10 ga.	4	0.88	22	10
A60P48	Painted steel	56.00 x 44.00	1422 x 1118	10 ga.	4	0.88	22	12
A60P48G	Conductive steel	56.00 x 44.00	1422 x 1118	10 ga.	4	0.88	22	12
A60P60	Painted steel	56.00 x 56.00	1422 x 1422	10 ga.	4	0.88	22	10
A60P60G	Conductive steel	56.00 x 56.00	1422 x 1422	10 ga.	4	0.88	22	10
A72P36	Painted steel	69.00 x 33.00	1753 x 838	12 ga.	4	0.75	19	8
A72P36G	Conductive steel	69.00 x 33.00	1753 x 838	12 ga.	4	0.75	19	8
A72P60	Painted steel	68.00 x 56.00	1727 x 1422	10 ga.	4	0.88	22	12
A72P60G	Conductive steel	68.00 x 56.00	1727 x 1422	10 ga.	4	0.88	22	12
A72P72	Painted steel	68.00 x 68.00	1727 x 1727	10 ga.	4	0.88	22	10
A72P72G	Conductive steel	68.00 x 68.00	1727 x 1727	10 ga.	4	0.88	22	10

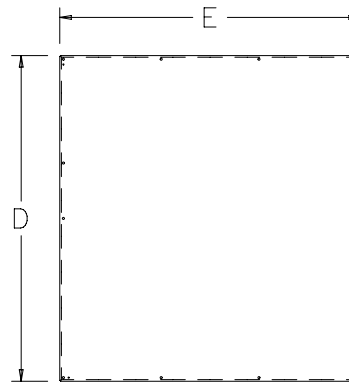


PANELS FOR LARGE BULLETIN A27, A28, A28S4 AND A34 MULTI-DOOR ENCLOSURES

Extra panels for large enclosures (Bulletins A27, A28, A28S4 and A34) can be ordered for panel assembly prior to receiving the enclosures (enclosures include panels). Panels are 10 gauge steel with .80-in. (20-mm) flanges on four sides. Finish is white polyester powder paint or a conductive, corrosion-resistant coating. Two extra holes are provided for lifting and installing panels. Mounting hardware included with enclosure.

BULLETIN: PNLFS

Catalog Number	Finish	Panel Size D x E (in.)	Panel Size D x E (mm)	Number of Holes	Fits Enclosure Height
A72PM28	Painted steel	60.00 x 21.75	1524 x 552	8	72 in.
A72PM28G	Conductive	60.00 x 21.75	1524 x 552	8	72 in.
A72PM34	Painted steel	60.00 x 27.75	1524 x 705	8	72 in.
A72PM34G	Conductive	60.00 x 27.75	1524 x 705	8	72 in.
A72PM40	Painted steel	60.00 x 33.75	1524 x 857	8	72 in.
A72PM40G	Conductive	60.00 x 33.75	1829 x 857	8	72 in.
A72PM54	Painted steel	60.00 x 48.00	1524 x 1219	10	72 in.
A72PM54G	Conductive	60.00 x 48.00	1524 x 1219	10	72 in.
A72PM66	Painted steel	60.00 x 60.00	1524 x 1524	10	72 in.
A72PM66G	Conductive	60.00 x 60.00	1524 x 1524	10	72 in.
A72PM78	Painted steel	60.00 x 72.00	1524 x 1829	12	72 in.
A72PM78G	Conductive	60.00 x 72.00	1524 x 1829	12	72 in.
A84PM40	Painted steel	72.00 x 33.75	1829 x 857	8	84 in.
A84PM40G	Conductive	72.00 x 33.75	1829 x 857	8	84 in.
A84PM78	Painted steel	72.00 x 72.00	1829 x 1829	12	84 in.
A84PM78G	Conductive	72.00 x 72.00	1829 x 1829	12	84 in.
A86PM37	Painted steel	78.00 x 34.00	1981 x 864	8	86 in.
A86PM37G	Conductive	78.00 x 34.00	1981 x 864	8	86 in.
A86PM75	Painted steel	78.00 x 70.00	1981 x 1778	12	86 in.
A86PM75G	Conductive	78.00 x 70.00	1981 x 1778	12	86 in.
A90PM40	Painted steel	78.00 x 33.75	1981 x 857	8	90 in.
A90PM40G	Conductive	78.00 x 33.75	1981 x 857	8	90 in.
A90PM78	Painted steel	78.00 x 72.00	1981 x 1829	12	90 in.
A90PM78G	Conductive	78.00 x 72.00	1981 x 1829	12	90 in.



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PANELS FOR FREE-STAND TYPE 1 LARGE ONE-DOOR ENCLOSURES

Panels for free-stand Type 1 large one-door standard and disconnect enclosures are 12 gauge steel. Panels have either polyester powder paint finish or a conductive, corrosion-resistant coating.

BULLETIN: A38P

Catalog Number	Finish	Panel Size D x E (in.)	Panel Size D x E (mm)
A37P21N	Painted steel	37.16 x 21.50	944 x 546
A37P21NG	Conductive	37.16 x 21.50	944 x 546
A49P21N	Painted steel	49.16 x 21.50	1249 x 546
A49P21NG	Conductive	49.16 x 21.50	1249 x 546
A61P21N	Painted steel	61.16 x 21.50	1553 x 546
A73P21N	Painted steel	73.16 x 21.50	1858 x 546
A73P21NG	Conductive	73.16 x 21.50	1858 x 546
A49P32N	Painted steel	49.16 x 32.00	1249 x 813
A49P32NG	Conductive	49.16 x 32.00	1249 x 813
A61P32N	Painted steel	61.16 x 32.00	1553 x 813
A61P32NG	Conductive	61.16 x 32.00	1553 x 813
A73P32N	Painted steel	73.16 x 32.00	1858 x 813
A73P32NG	Conductive	73.16 x 32.00	1858 x 813

PANELS FOR FREE-STAND TYPE 1 LARGE TWO-DOOR ENCLOSURES

Panels for free-stand Type 1 large two-door standard and disconnect enclosures are 10 gauge steel. Panels have either polyester powder paint finish or a conductive, corrosion-resistant coating.

BULLETIN: A38P

Catalog Number	Finish	Panel Size D x E (in.)	Panel Size D x E (mm)
A37P48N	Painted steel	37.16 x 48.00	944 x 1219
A37P48NG	Conductive	37.16 x 48.00	944 x 1219
A49P48N	Painted steel	49.16 x 48.00	1249 x 1219
A49P48NG	Conductive	49.16 x 48.00	1249 x 1219
A49P68N	Painted steel	49.16 x 68.00	1249 x 1727
A49P68NG	Conductive	49.16 x 68.00	1249 x 1727
A61P68N	Painted steel	61.16 x 68.00	1553 x 1727
A61P68NG	Conductive	61.16 x 68.00	1553 x 1727
A73P68N	Painted steel	73.16 x 68.00	1858 x 1727
A73P68NG	Conductive	73.16 x 68.00	1858 x 1727

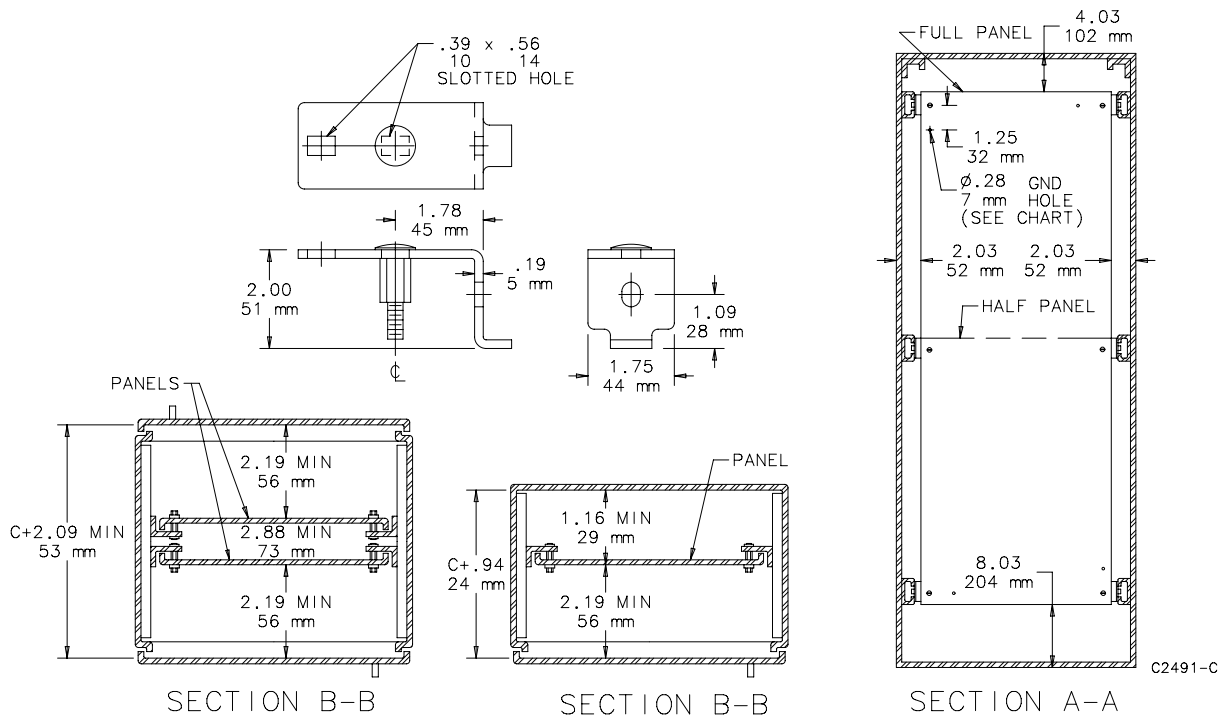
PANELS FOR FREE-STAND TYPE 4, 4X AND 12 SINGLE- AND DUAL-ACCESS ONE-DOOR ENCLOSURES WITH MOUNTING CHANNEL

Panels for one-door, single-access and one-door, dual-access Free-Stand Type 12 Enclosures, Free-Stand Type 4 Enclosures and One-Door Type 4X Free-Stand Fiberglass Enclosures. Panels are 12 gauge steel and can be positioned anywhere along horizontal mounting channels (see dimension drawing Sections B-B for limitations). Half-length panels can be located in the upper or lower portion of the enclosure. Panels are finished with white polyester powder paint or a conductive, corrosion-resistant coating and furnished with plated mounting hardware.

BULLETIN: PNL30, PNLFS

Catalog Number	Description	Finish	Panel Size (in.)	Panel Size (mm)	Fits Enclosure A x B (in.)	Fits Enclosure A x B (mm)
A60P24F1	Full Panel	Painted steel	48.00 x 20.00	1218 x 508	60.00 x 24.00	1524 x 610
A60P24F1G	Full Panel	Conductive	48.00 x 20.00	1218 x 508	60.00 x 24.00	1524 x 610
A60P24F2	Half Panel	Painted steel	24.88 x 20.00	632 x 508	60.00 x 24.00	1524 x 610
A60P24F2G	Half Panel	Conductive	24.88 x 20.00	632 x 508	60.00 x 24.00	1524 x 610
A72P24F1	Full Panel	Painted steel	60.00 x 20.00	1524 x 508	72.00 x 24.00	1829 x 610
A72P24F1G	Full Panel	Conductive	60.00 x 20.00	1524 x 508	72.00 x 24.00	1829 x 610
A72P24F2	Half Panel	Painted steel	30.88 x 20.00	784 x 508	72.00 x 24.00	1829 x 610
A72P24F2G	Half Panel	Conductive	30.88 x 20.00	784 x 508	72.00 x 24.00	1829 x 610
A90P24F1	Full Panel	Painted steel	78.00 x 20.00	1981 x 508	90.00 x 24.00	2286 x 610
A90P24F1G	Full Panel	Conductive	78.00 x 20.00	1981 x 508	90.00 x 24.00	2286 x 610
A90P24F2	Half Panel	Painted steel	39.88 x 20.00	1013 x 508	90.00 x 24.00	2286 x 610
A90P24F2G	Half Panel	Conductive	39.88 x 20.00	1013 x 508	90.00 x 24.00	2286 x 610
A72P30F1	Full Panel	Painted steel	60.00 x 26.00	1524 x 660	72.00 x 30.00	1829 x 762
A72P30F1G	Full Panel	Conductive	60.00 x 26.00	1524 x 660	72.00 x 30.00	1829 x 762
A72P30F2	Half Panel	Painted steel	30.88 x 26.00	784 x 660	72.00 x 30.00	1829 x 762
A72P30F2G	Half Panel	Conductive	30.88 x 26.00	784 x 660	72.00 x 30.00	1829 x 762
A60P36F1	Full Panel	Painted steel	48.00 x 32.00	1219 x 813	60.00 x 36.00	1524 x 914
A60P36F1G	Full Panel	Conductive	48.00 x 32.00	1219 x 813	60.00 x 36.00	1524 x 914
A60P36F2	Half Panel	Painted steel	24.88 x 32.00	632 x 813	60.00 x 36.00	1524 x 914
A60P36F2G	Half Panel	Conductive	24.88 x 32.00	632 x 813	60.00 x 36.00	1524 x 914
A72P36F1	Full Panel	Painted steel	60.00 x 32.00	1524 x 813	72.00 x 36.00	1829 x 914
A72P36F1G	Full Panel	Conductive	60.00 x 32.00	1524 x 813	72.00 x 36.00	1829 x 914
A72P36F2	Half Panel	Painted steel	30.88 x 32.00	784 x 813	72.00 x 36.00	1829 x 914
A72P36F2G	Half Panel	Conductive	30.88 x 32.00	784 x 813	72.00 x 36.00	1829 x 914
A90P36F1	Full Panel	Painted steel	78.00 x 32.00	1981 x 813	90.00 x 36.00	2286 x 914
A90P36F1G	Full Panel	Conductive	78.00 x 32.00	1981 x 813	90.00 x 36.00	2286 x 914
A90P36F2	Half Panel	Painted steel	39.88 x 32.00	1013 x 813	90.00 x 36.00	2286 x 914
A90P36F2G	Half Panel	Conductive	39.88 x 32.00	1013 x 813	90.00 x 36.00	2286 x 914

Use combinations of panels for 3-5 door A 28 enclosures.



PANELS FOR FREE-STAND TYPE 4, 4X AND 12 SINGLE- AND DUAL-ACCESS TWO-DOOR ENCLOSURES WITH MOUNTING CHANNEL

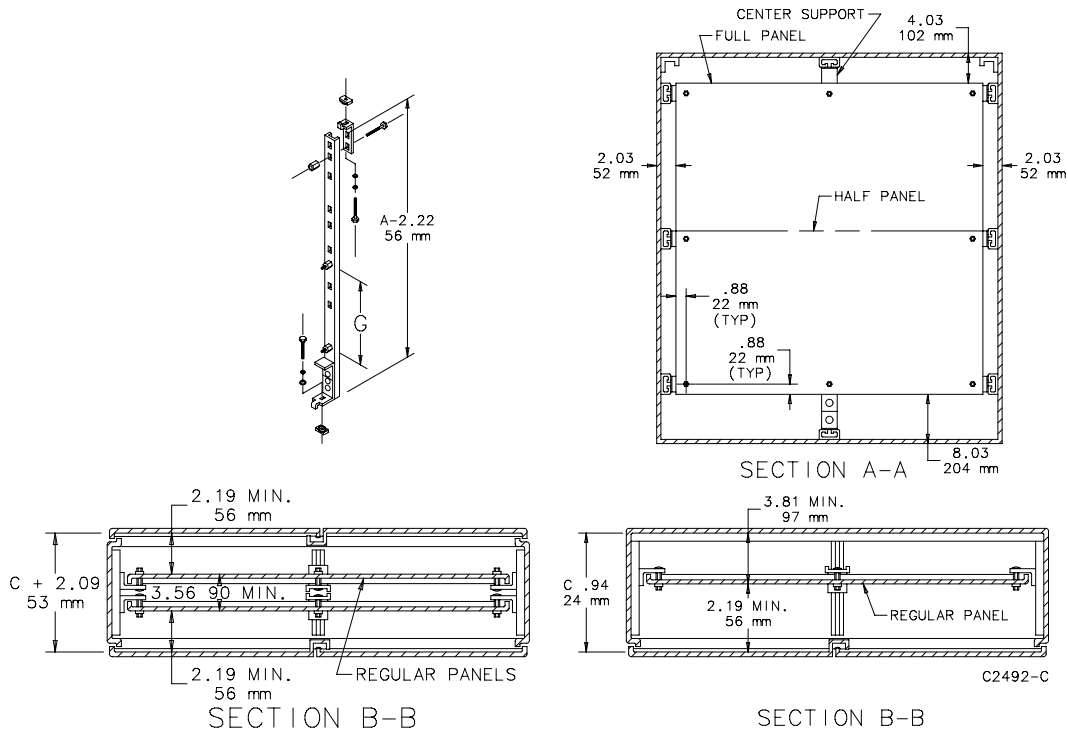
Panels for two-door single access and two-door dual access Free-Stand Type 4, 4X and 12 Enclosures with mounting channel are 10 gauge steel and can be positioned anywhere along horizontal mounting channels [see Sections B-B for limitations]. Half-length panels can be located in the upper or lower portion of the enclosure.

Panels are finished with white polyester powder paint or a conductive, corrosion-resistant coating and furnished with plated mounting hardware.

Center support is furnished with each full panel or half panel for two-door enclosures. The center support attaches to the top and bottom mounting channels and can be positioned from front to back in the enclosure. The center support can be used with heavy duty panel supports to support panels of various heights.

BULLETIN: PNL30, PNLFS

Catalog Number	Description	Fits Enclosure A x B (in.)	Fits Enclosure A x B (mm)	Panel Size (in.)	Panel Size (mm)	G (in.)	G (mm)
A60P48F1	Full Panel	60.00 x 48.00	1524 x 1219	48.00 x 44.00	1219 x 1118	23.12	587
A60P48F1G	Full Panel	60.00 x 48.00	1524 x 1219	48.00 x 44.00	1219 x 1118	23.12	587
A72P48F1	Full Panel	72.00 x 48.00	1829 x 1219	60.00 x 44.00	1524 x 1118	29.12	740
A72P48F1G	Full Panel	72.00 x 48.00	1829 x 1219	60.00 x 44.00	1524 x 1118	29.12	740
A72P48F2	Half Panel	72.00 x 48.00	1829 x 1219	30.88 x 44.00	784 x 1118	29.12	740
A72P48F2G	Half Panel	72.00 x 48.00	1829 x 1219	30.88 x 44.00	784 x 1118	29.12	740
A90P48F1	Full Panel	90.00 x 48.00	2286 x 1219	78.00 x 44.00	1981 x 1118	38.12	968
A90P48F1G	Full Panel	90.00 x 48.00	2286 x 1219	78.00 x 44.00	1981 x 1118	38.12	968
A90P48F2	Half Panel	90.00 x 48.00	2286 x 1219	39.88 x 44.00	1013 x 1118	38.12	968
A90P48F2G	Half Panel	90.00 x 48.00	2286 x 1219	39.88 x 44.00	1013 x 1118	38.12	968
A72P60F1	Full Panel	72.00 x 60.00	1829 x 1524	60.00 x 56.00	1524 x 1422	29.12	740
A72P60F1G	Full Panel	72.00 x 60.00	1829 x 1524	60.00 x 56.00	1524 x 1422	29.12	740
A72P60F2	Half Panel	72.00 x 60.00	1829 x 1524	30.88 x 56.00	784 x 1422	29.12	740
A72P60F2G	Half Panel	72.00 x 60.00	1829 x 1524	30.88 x 56.00	784 x 1422	29.12	740
A72P72F1	Full Panel	72.00 x 72.00	1829 x 1829	60.00 x 68.00	1524 x 1727	29.12	740
A72P72F1G	Full Panel	72.00 x 72.00	1829 x 1829	60.00 x 68.00	1524 x 1727	29.12	740
A72P72F2	Half Panel	72.00 x 72.00	1829 x 1829	30.88 x 68.00	784 x 1727	29.12	740
A72P72F2G	Half Panel	72.00 x 72.00	1829 x 1829	30.88 x 68.00	784 x 1727	29.12	740
A90P72F1	Full Panel	90.00 x 72.00	2286 x 1829	78.00 x 68.00	1981 x 1727	38.12	968
A90P72F1G	Full Panel	90.00 x 72.00	2286 x 1829	78.00 x 68.00	1981 x 1727	38.12	968
A90P72F2	Half Panel	90.00 x 72.00	2286 x 1829	39.88 x 68.00	1013 x 1727	38.12	968
A90P72F2G	Half Panel	90.00 x 72.00	2286 x 1829	39.88 x 68.00	1013 x 1727	38.12	968



SIDE-MOUNTED PANELS

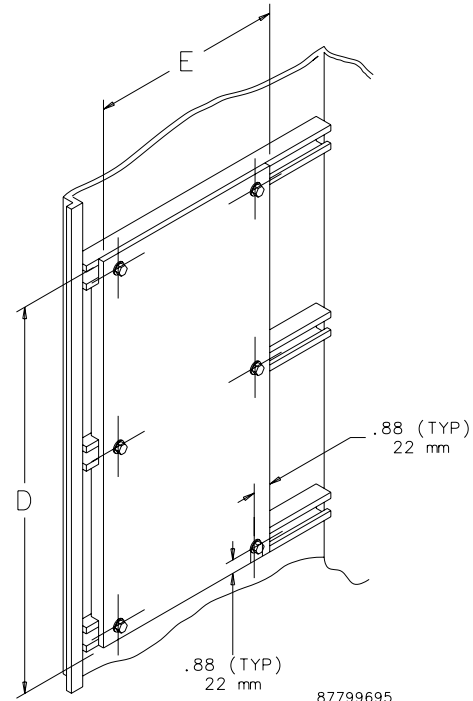
Panels provide extra mounting space on the sides of enclosures. 12 gauge steel side-mounting panels are painted white. Conductive panels are steel with a conductive, corrosion-resistant coating. Panels attach securely to mounting channels. Plated steel mounting hardware is furnished.

BULLETIN: PNL30, PNLFS

Catalog Number	Description	Panel Size D x E in./mm	Fits Enclosure A in./mm
A60SMP14	Painted steel	48.00 x 14.00 1219 x 356	60.00 1524
A60SMP14G	Conductive	48.00 x 14.00 1219 x 356	60.00 1524
A72SMP14	Painted steel	60.00 x 14.00 1524 x 356	72.00 1829
A72SMP14G	Conductive	60.00 x 14.00 1524 x 356	72.00 1829
A72SMP20	Painted steel	60.00 x 20.00 1524 x 508	72.00 1829
A72SMP20G	Conductive	60.00 x 20.00 1524 x 508	72.00 1829
A90SMP14	Painted steel	78.00 x 14.00 1981 x 356	90.00 2286
A90SMP14G	Conductive	78.00 x 14.00 1981 x 356	90.00 2286
A90SMP20	Painted steel	78.00 x 20.00 1981 x 508	90.00 2286
A90SMP20G	Conductive	78.00 x 20.00 1981 x 508	90.00 2286

A90SMP14 and A90SMP14G will not fit 18.06-in. deep two-door enclosures (FSD style) if regular panel is also installed.

A90SMP20 and A90SMP20G will not fit 20.12-in. deep enclosures. Will not fit 24.12-in. deep two-door enclosures (FSD style) if regular panel is also installed.



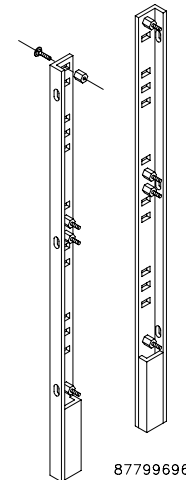
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HEAVY DUTY PANEL SUPPORTS

Heavy Duty Panel Supports, sold in pairs, are used in place of the panel supports furnished with panels when heavy equipment will be installed on the panels. They extend to the bottom of the enclosure. Adjustable mounting studs allow mounting of different height panels or a combination of panels. Use mounting hardware furnished with panels.

BULLETIN: A80

Catalog Number	Fits Enclosure A in./mm	Support Length in./mm
A60FSHDPS	60.00 1524	57.25 1454
A72FSHDPS	72.00 1829	69.25 1759
A90FSHDPS	90.00 2286	87.25 2216



87799696

CENTER PANEL SUPPORTS

Center panel supports are used with Free-Stand Type 12 (Bulletin A30) two-door enclosures. They permit the installation of panels, swing-out panels and rack-mounting angles sized for one-door enclosures. The Center Panel Support can be positioned from front to back of the enclosure.

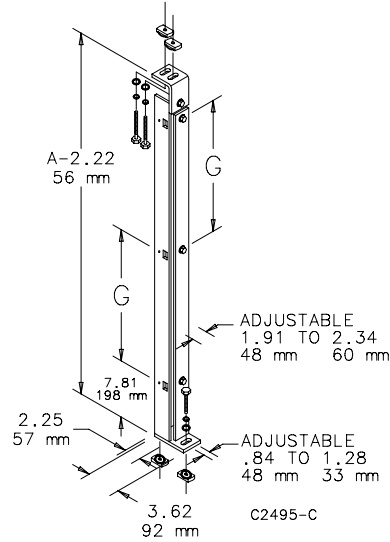
BULLETIN: A80

Standard Product Panel Supports

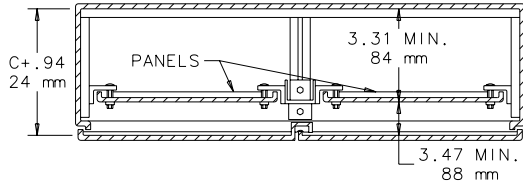
Catalog Number	Fits Enclosure A (in.)	Fits Enclosure A (mm)	G (in.)	G (mm)
A60FSCPS	60.00	1524	23.12	587
A72FSCPS	72.00	1829	29.12	740
A90FSCPS	90.00	2286	36.12	914

Accessory Width with Center Panel Supports

Two Door Enclosure Width (in.)	Two Door Enclosure Width (mm)	Accessory Width (in.)	Accessory Width (mm)
48.00	1219	24.00	610
60.00	1524	30.00	762
72.00	1829	36.00	914

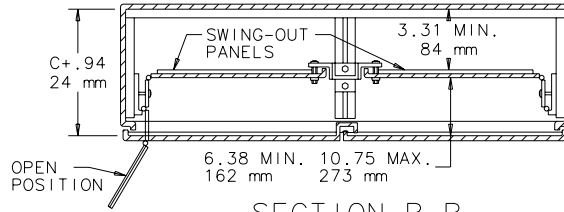


Center Panel Supports Enclosure Section Views



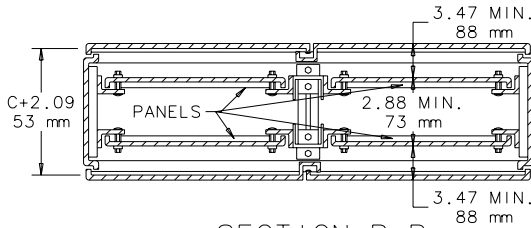
SECTION B-B

Showing two panels (for one-door enclosures) and center panel support mounted in two-door enclosure.



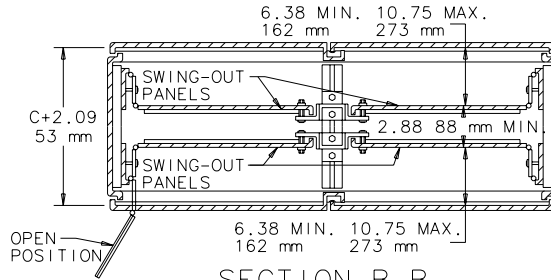
SECTION B-B

Showing four swing-out panels and center panel support mounted in two-door enclosure.



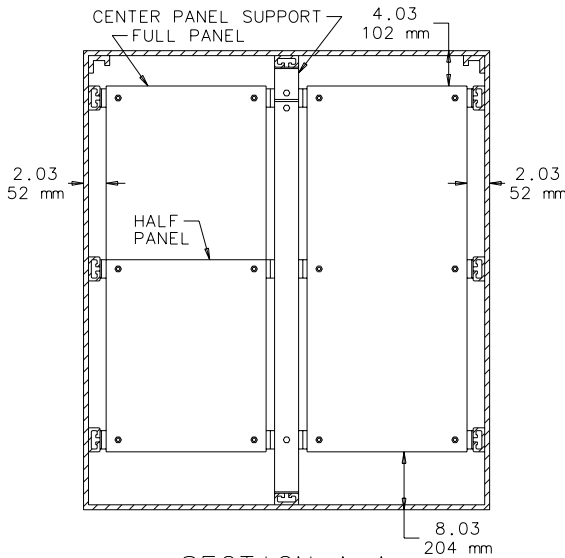
SECTION B-B

Showing four panels (for one-door enclosures) and two center panel supports mounted in two-door access enclosure.



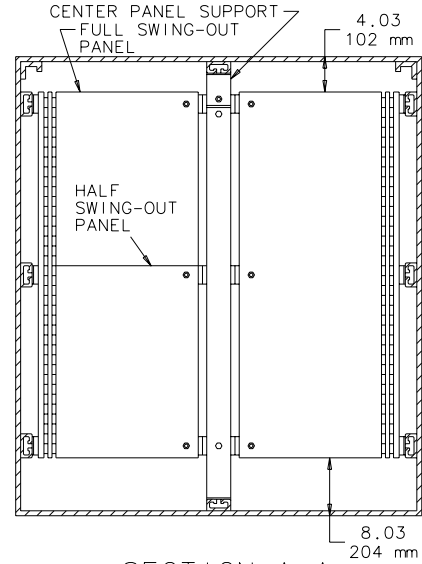
SECTION B-B

Showing four swing-out panels and two center panel supports mounted in two-door dual access enclosure.



SECTION A-A

Panels shown are for one-door free-stand enclosures. Half panel fits in top or bottom half of enclosure.



SECTION A-A

Showing swing-out panels installed in one-door enclosure.

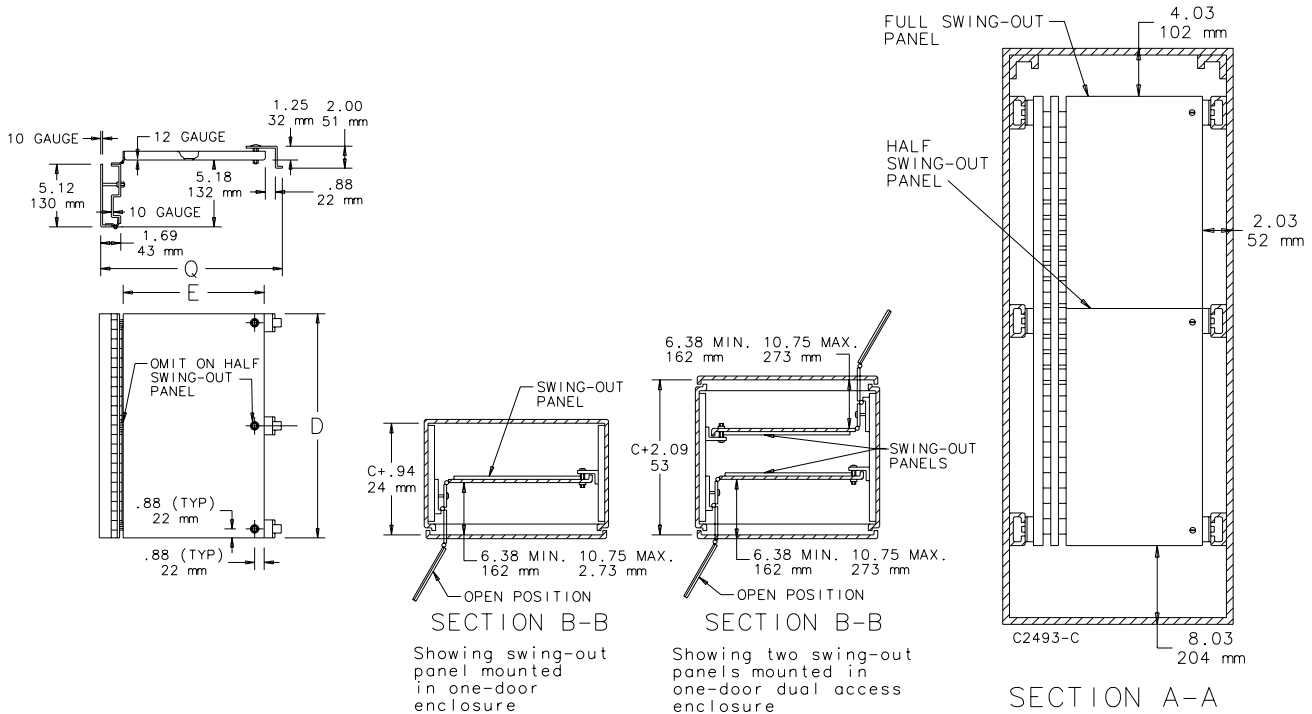
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SWING-OUT PANELS FOR FREE-STAND TYPE 4, 4X AND 12 ENCLOSURES WITH MOUNTING CHANNEL

Panels for Free-Stand Type 12 Enclosures, Free-Stand Type 4 Enclosures and One-Door Type 4X Free-Stand Fiberglass Enclosures. Full-length and half-length swing-out panels are available. Half-length panels can be located in the upper or lower portion of the enclosure. Swing-out panels have a 10 gauge steel support frame and two heavy-gauge continuous hinges which permit the panel to swing completely out of the enclosure if it is located within approximately 10.75 in. (273 mm) of the door. These panels are 12 gauge steel and can be mounted on either side of the enclosure. Panels are finished with white polyester powder paint and furnished with plated mounting hardware.

BULLETIN: PNL30

Catalog Number	Description	Panel Size D x E (in.)	Panel Size D x E (mm)	Fits Enclosure A x B (in.)	Fits Enclosure A x B (mm)	Q (in.)	Q (mm)
A72SP24F3	Full Panel	60.00 x 18.81	1524 x 478	72.00 x 24.00	1829 x 610	21.84	555
A72SP24F4	Half Panel	30.88 x 18.81	784 x 478	72.00 x 24.00	1829 x 610	21.84	555
A72SP30F3	Full Panel	60.00 x 24.81	1524 x 630	72.00 x 30.00	1829 x 762	27.84	707
A72SP30F4	Half Panel	30.88 x 24.81	784 x 630	72.00 x 30.00	1829 x 762	27.84	707
A72SP36F3	Full Panel	60.00 x 30.81	1524 x 783	72.00 x 36.00	1829 x 914	33.84	860
A72SP36F4	Half Panel	30.88 x 30.81	784 x 783	72.00 x 36.00	1829 x 914	33.84	860
A90SP36F3	Full Panel	78.00 x 30.81	1981 x 783	90.00 x 36.00	2286 x 914	33.84	860
A90SP36F4	Half Panel	39.88 x 30.81	1013 x 783	90.00 x 36.00	2286 x 914	33.84	860



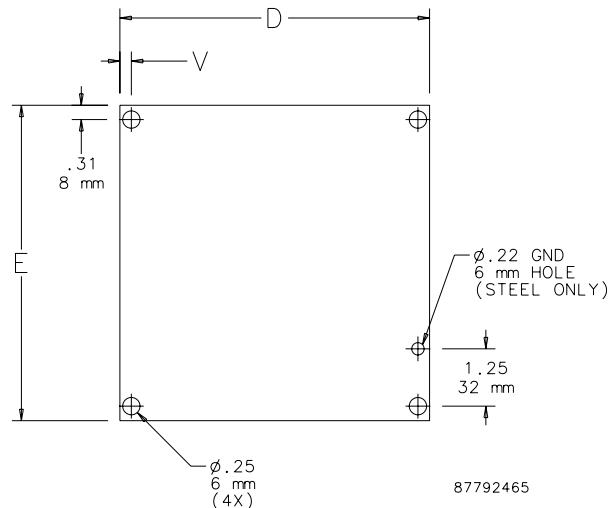
PANELS FOR WIFI CABINETS AND SMALL WALL-MOUNT ENCLOSURES



Panels are available in both steel and wood. Steel panels are 14 gauge steel with a white polyester powder paint finish. Wood panels are 3/4-in. plywood and are unfinished. Wood panels are supplied with Fiberglass Hinged-Cover and POLYPRO Type 4X WiFi Cabinets.

BULLETIN: DWS12, PNLJ, PNLWM

Catalog Number	Material	Panel Size D x E (in.)	Panel Size D x E (mm)	V (in.)	V (mm)
A6P6	Steel	4.88 x 4.88	124 x 124	0.31	8
A6P6WD	Wood	4.88 x 4.88	124 x 124	0.31	8
A16P14	Steel	14.75 x 12.88	375 x 327	0.25	6
A16P14WD	Wood	14.75 x 12.88	375 x 327	0.25	6
A18P16	Steel	16.75 x 14.88	425 x 378	0.25	6
A18P16WD	Wood	16.75 x 14.88	425 x 378	0.25	6



MEDIUM, TYPE 1

INDUSTRY STANDARDS

 UL 50, 50E Listed; Type 1; File No. E27567
 cUL Listed per CSA C22.2 No 40; Type 1; File No. E27567

 NEMA/EEMAC Type 1
 CSA, File 42184: Type 1
 IEC 60529, IP30

APPLICATION

These enclosures have a size range of 16 x 12 x 6-in. to 36 x 30 x 12-in. and meet basic functionality requirements for applications that do not require oil- or dust-tight enclosures.

FEATURES

- Doors have butt hinges
- Collar studs provided for mounting optional panel
- Slotted flush latches; optional latches available
- Mounting holes on back of enclosure

SPECIFICATIONS

- 14 or 12 gauge steel

FINISH

ANSI 61 gray polyester powder paint finish inside and out over pretreated surfaces. Optional solid panels are white and optional perforated panels are gray.

ACCESSORIES
See also Accessories.

 T-Handle Latch and Keyed Cylinder Lock Kits
 Electric Heater
 Electrical Interlocks
 Grounding Device
 Panels for Medium Type 1 Enclosures
 Rack Mounting Angles - U Style (Type RA)
 Touch-Up Paint
 Steel and Stainless Steel Window Kits

BULLETIN: A1M

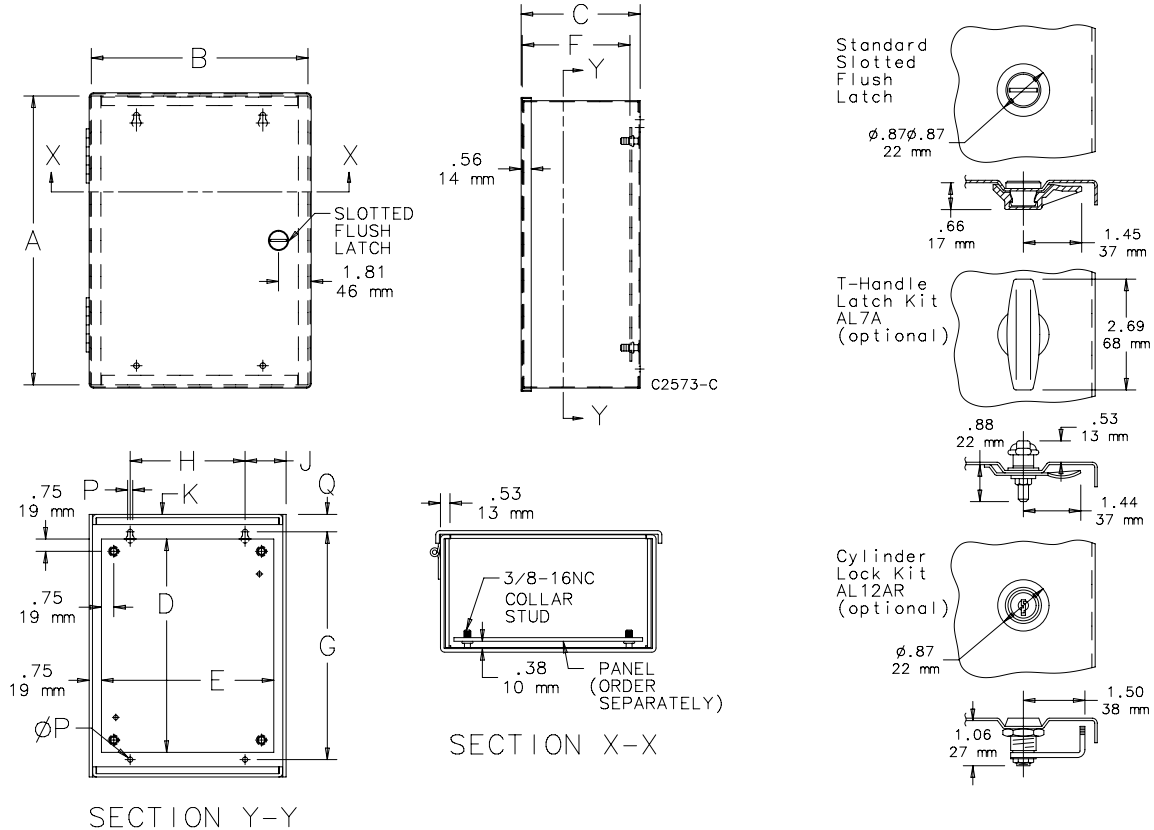
Standard Product

Catalog Number	AxBxC in./mm	Panel	Perforated Panel	Panel Size D x E in./mm	Panel Gauge	G in./mm	H in./mm	J in./mm	Q in./mm	P in./mm	F in./mm	K in./mm
A16N12ALP	16.00 x 12.00 x 6.62 406 x 305 x 168	A16N12MP	A16N12MPP	13.00 x 10.50 330 x 267	14	13.88 353	7.00 178	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A16N16ALP	16.00 x 16.00 x 6.62 406 x 406 x 168	A16N16MP	A16N16MPP	13.00 x 14.50 330 x 368	14	13.88 353	11.00 279	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A16N20ALP	16.00 x 20.00 x 6.62 406 x 508 x 168	A16N20MP	A16N20MPP	13.00 x 18.50 330 x 470	14	13.88 353	15.00 381	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A20N16ALP	20.00 x 16.00 x 6.62 508 x 406 x 168	A20N16MP	A20N16MPP	17.00 x 14.50 432 x 368	14	17.88 454	11.00 279	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A20N20ALP	20.00 x 20.00 x 6.62 508 x 508 x 168	A20N20MP	A20N20MPP	17.00 x 18.50 432 x 470	14	17.88 454	15.00 381	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A24N16ALP	24.00 x 16.00 x 6.62 610 x 406 x 168	A24N16MP	A24N16MPP	21.00 x 14.50 533 x 368	14	21.88 556	11.00 279	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A24N20ALP	24.00 x 20.00 x 6.62 610 x 508 x 168	A24N20MP	A24N20MPP	21.00 x 18.50 533 x 470	14	21.88 556	15.00 381	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A24N24ALP	24.00 x 24.00 x 6.62 610 x 610 x 168	A24N24MP	A24N24MPP ^a	21.00 x 22.50 533 x 572	12	21.88 556	19.00 483	2.50 64	1.06 27	0.31 8	6.00 152	1.50 38
A30N24ALP	30.00 x 24.00 x 6.62 762 x 610 x 168	A30N24MP	A30N24MPP ^a	26.00 x 22.50 660 x 572	12	27.50 699	16.75 425	3.62 92	1.25 32	0.44 11	6.00 152	2.00 51
A36N24ALP	36.00 x 24.00 x 6.62 914 x 610 x 168	A36N24MP	A36N24MPP ^a	32.00 x 22.50 813 x 572	12	33.50 851	16.75 425	3.62 92	1.25 32	0.44 11	6.00 152	2.00 51
A36N30ALP	36.00 x 30.00 x 6.62 914 x 762 x 168	A36N30MP	A36N30MPP ^a	32.00 x 28.50 813 x 724	12	33.50 851	22.75 578	3.62 92	1.25 32	0.44 11	6.00 152	2.00 51
A16N12BLP	16.00 x 12.00 x 8.62 406 x 305 x 219	A16N12MP	A16N12MPP	13.00 x 10.50 330 x 267	14	13.88 353	7.00 178	2.50 64	1.06 27	0.31 8	8.00 203	1.50 38
A20N12BLP	20.00 x 12.00 x 8.62 508 x 305 x 219	A20N12MP	A20N12MPP	17.00 x 10.50 432 x 267	14	17.88 454	7.00 178	2.50 64	1.06 27	0.31 8	8.00 203	1.50 38
A20N16BLP	20.00 x 16.00 x 8.62 508 x 406 x 219	A20N16MP	A20N16MPP	17.00 x 14.50 432 x 368	14	17.88 454	11.00 279	2.50 64	1.06 27	0.31 8	8.00 203	1.50 38
A20N20BLP	20.00 x 20.00 x 8.62 508 x 508 x 219	A20N20MP	A20N20MPP	17.00 x 18.50 432 x 470	14	17.88 454	15.00 381	2.50 64	1.06 27	0.31 8	8.00 203	1.50 38
A24N20BLP	24.00 x 20.00 x 8.62 610 x 508 x 219	A24N20MP	A24N20MPP	21.00 x 18.50 533 x 470	14	21.88 556	15.00 381	2.50 64	1.06 27	0.31 8	8.00 203	1.50 38
A24N24BLP	24.00 x 24.00 x 8.62 610 x 610 x 219	A24N24MP	A24N24MPP ^a	21.00 x 22.50 533 x 572	12	21.88 556	19.00 483	2.50 64	1.06 27	0.31 8	8.00 203	1.50 38

Catalog Number	AxBxC in./mm	Panel	Perforated Panel	Panel Size D x E in./mm	Panel Gauge	G in./mm	H in./mm	J in./mm	Q in./mm	P in./mm	F in./mm	K in./mm
A30N20BLP	30.00 x 20.00 x 8.62 762 x 508 x 219	A30N20MP	A30N20MPP ^a	26.00 x 18.50 660 x 470	12	27.50 699	15.00 381	2.50 64	1.25 32	0.44 11	8.00 203	2.00 51
A30N24BLP	30.00 x 24.00 x 8.62 762 x 610 x 219	A30N24MP	A30N24MPP ^a	26.00 x 22.50 660 x 572	12	27.50 699	16.75 425	3.62 92	1.25 32	0.44 11	8.00 203	2.00 51
A30N30BLP	30.00 x 30.00 x 8.62 762 x 762 x 219	A30N30MP	A30N30MPP ^a	26.00 x 28.50 660 x 724	12	27.50 699	22.75 578	3.62 92	1.25 32	0.44 11	8.00 203	2.00 51
A36N24BLP	36.00 x 24.00 x 8.62 914 x 610 x 219	A36N24MP	A36N24MPP ^a	32.00 x 22.50 813 x 572	12	33.50 851	16.75 425	3.62 92	1.25 32	0.44 11	8.00 203	2.00 51
A36N30BLP	36.00 x 30.00 x 8.62 914 x 762 x 219	A36N30MP	A36N30MPP ^a	32.00 x 28.50 813 x 724	12	33.50 851	22.75 578	3.62 92	1.25 32	0.44 11	8.00 203	2.00 51
A18N18CLP	18.00 x 18.00 x 10.62 457 x 457 x 270	A18N18MP	A18N18MPP	15.00 x 16.50 381 x 419	14	15.88 403	13.00 330	2.50 64	1.06 27	0.31 8	10.00 254	1.50 38
A24N20CLP	24.00 x 20.00 x 10.62 610 x 508 x 270	A24N20MP	A24N20MPP	21.00 x 18.50 533 x 470	14	21.88 556	15.00 381	2.50 64	1.06 27	0.31 8	10.00 254	1.50 38
A30N24CLP	30.00 x 24.00 x 10.62 762 x 610 x 270	A30N24MP	A30N24MPP ^a	21.00 x 22.50 533 x 572	12	27.50 699	16.75 425	3.62 92	1.25 32	0.44 11	10.00 254	2.00 51
A24N24DLP	24.00 x 24.00 x 12.62 610 x 610 x 321	A24N24MP	A24N24MPP ^a	21.00 x 22.50 533 x 572	12	21.88 556	19.00 483	2.50 64	1.06 27	0.31 8	12.00 305	1.50 38
A30N24DLP	30.00 x 24.00 x 12.62 762 x 610 x 321	A30N24MP	A30N24MPP ^a	26.00 x 22.50 660 x 724	12	27.50 699	16.75 425	3.62 92	1.25 32	0.44 11	12.00 305	2.00 51
A36N30DLP	36.00 x 30.00 x 12.62 914 x 762 x 321	A36N30MP	A36N30MPP ^a	32.00 x 28.50 813 x 724	12	33.50 851	22.75 578	3.62 92	1.25 32	0.44 11	12.00 305	2.00 51

Purchase panels separately.

^aFlanged on all four sides



Damper Actuators

(This page is hyperlinked to the TOC)

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5-year warranty



Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	5 W
	Power consumption in rest position	2.5 W
	Transformer sizing	7.5 VA (class 2 power source)
	Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic throughout 0...95° rotation
	Electrical Protection	actuators are double insulated
Functional data	Torque motor	180 in-lb [20 Nm]
	Direction of motion motor	selectable by ccw/cw mounting
	Direction of motion fail-safe	reversible with cw/ccw mounting
	Manual override	5 mm hex crank (3/16" Allen), supplied
	Angle of rotation	95°, adjustable with mechanical end stop, 35...95°
	Angle of rotation note	adjustable with mechanical end stop, 35...95°
	Running Time (Motor)	75 s
	Running time fail-safe	<20 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
	Running time fail-safe note	@ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
	Noise level, motor	50 dB(A)
	Noise level, fail-safe	62 dB(A)
	Shaft Diameter	1/2...1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
	Position indication	Mechanical
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
	Weight	Weight
Materials	Housing material	Galvanized steel and plastic housing

Product features

Application	For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two AF's can be piggybacked for torque loads of up to 266 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.
Operation	The AF..24 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The AF..24 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The AF..24 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.
Typical specification	On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Accessories

Electrical accessories	Description	Type
	Auxiliary switch, mercury-free, {	P475
	Auxiliary switch, mercury-free, {	P475-1
	Signal Simulator, Power supply AC 230 V, {	PS-100
	Cable Conduit Connector 1/2", {	TF-CC US
	Transformer, AC 120 V to AC 24 V, 40 VA, {	ZG-X40
Mechanical accessories	Description	Type
	Anti-rotation bracket AF/NF.	AF-P
	Shaft extension 240 mm Ø20 mm for damper shaft Ø 8...22.7 mm	AV8-25
	End stop indicator	IND-AFB
	Shaft clamp reversible, for central mounting, for damper shafts Ø12.7 / 19.0 / 25.4 mm, {	K7-2
	Ball joint suitable for damper crank arm KH8 / KH10	KG10A
	Ball joint suitable for damper crank arm KH8	KG8
	Actuator arm, for 3/4" shafts, clamping range Ø10...22 mm, Slot width 8.2 mm, {	KH-AFB
	Damper crank arm Slot width 8.2 mm, clamping range Ø14...25 mm	KH10
	Damper crank arm Slot width 8.2 mm, for Ø1.05"	KH12
	Damper crank arm Slot width 8.2 mm, clamping range Ø10...18 mm	KH8
	Push rod for KG10A ball joint (36" L, 3/8" diameter).	SH10
	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).	SH8
	TOOL-06 8mm-10mm Wrench	TOOL-06
	Retrofit clip	Z-AF
	Base plate extension	Z-SF
	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).	ZG-100
	Univ. right angle bracket 13x11x7-7/16" (HxWxbase).	ZG-101
	Dual actuator mounting bracket.	ZG-102
	Right angle bracket for ZS-260.	ZG-109
	Stand-off bracket for ZS-260.	ZG-110
	AFB(X)/NFB(X) U bracket 5-7/8x5-1/2x2-19/32" (HxWxD).	ZG-118
	Jackshaft mounting bracket.	ZG-120
	Mounting kit for linkage operation for flat and side installation	ZG-AFB
	Mounting kit for foot mount installation	ZG-AFB118
	Damper clip for damper blade, 3.5" width.	ZG-DC1
	Damper clip for damper blade, 6" width.	ZG-DC2
	1" diameter jackshaft adaptor (11" L).	ZG-JSA-1
	1-5/16" diameter jackshaft adaptor (12" L).	ZG-JSA-2
	1.05" diameter jackshaft adaptor (12" L).	ZG-JSA-3

Weather shield 13x8x6" [330x203x152 mm] (LxWxH), {	ZS-100
Base Plate, for ZS-100	ZS-101
Weather shield 16x8-3/8x4" [406x213x102 mm] (LxWxH), {	ZS-150
Explosion Proof Housing 16x10x6.435" [406x254x164 mm] (LxWxH), UL and CSA, Class I, Zone 1&2, Groups B, C, D, (NEMA 7), Class III, Hazardous (classified)	ZS-260
Locations, outdoor application NEMA 4, {	
Weather shield 17-1/4x8-3/4x5-1/2" [438x222x140 mm] (LxWxH), NEMA 4X, with mounting brackets, {	ZS-300
Weather shield 17-1/4x8-3/4x5-1/2" [438x222x140 mm] (LxWxH), NEMA 4X, with mounting brackets, {	ZS-300-5
Shaft extension 1/2", {	ZS-300-C1
Shaft extension 3/4", {	ZS-300-C2
Shaft extension 1", {	ZS-300-C3

Electrical installation

Warning! Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

◆ Meets cULus requirements without the need of an electrical ground connection.

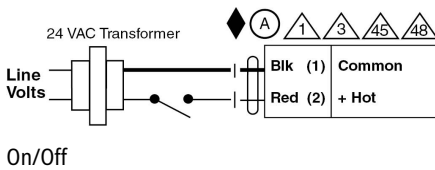
Ⓐ Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

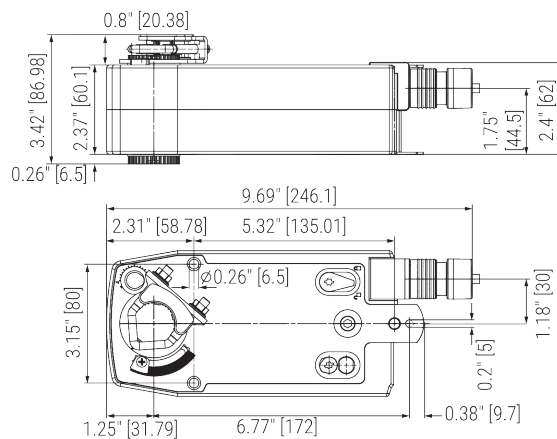
45 Actuators may be powered in parallel. Power consumption must be observed.

48 Parallel wiring required for piggy-back applications.



Dimensions

Dimensional drawings





5-year warranty



Technical data

Electrical data	Nominal voltage	AC/DC 24 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA plenum cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic throughout 0...95° rotation
	Electrical Protection	actuators are double insulated
Functional data	Torque motor	35 in-lb [4 Nm]
	Operating range Y	2...10 V
	Operating range Y note	4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
	Input Impedance	100 kΩ for 2...10 V (0.1 mA), 500 Ω for 4...20 mA
	Position feedback U	2...10 V
	Position Feedback	2...10 V, Max. 0.7 mA
	Position feedback U note	Max. 0.7 mA
	Direction of motion motor	selectable with switch 0/1
	Direction of motion fail-safe	reversible with cw/ccw mounting
	Angle of rotation	Max. 95°
	Running Time (Motor)	150 s constant, independent of load
	Running time motor note	constant, independent of load
	Running time fail-safe	<25 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
	Running time fail-safe note	@ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
	Noise level, motor	30 dB(A)
	Noise level, fail-safe	62 dB(A)
Shaft Diameter	3/8...1/2" round, centers on 1/2"	
Position indication	Mechanical	
Safety data	Degree of protection IEC/EN	IP54
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. To UL 873 and CAN/CSA C22.2 No. 24-93
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	3.4 lb [1.5 kg]
Materials	Housing material	galvanized steel

Product features

- Application** For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft from 3/8" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. For shafts up to 3/4" use K6-1 accessory. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication.
- Operation** The LF series actuators provide true spring return operation for reliable fail-safe application and positive close-off on air tight dampers. The spring return system provides consistent torque to the damper with, and without, power applied to the actuator. The LF series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°. The LF24-SR US uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.
- Typical specification** Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 3/4" diameter and center on a 1/2" shaft (default). Actuator shall deliver a minimum output torque of 35 in-lbs. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 feedback signal shall be provided for position feedback. The actuator must be designed so that they may be used for either clockwise or counter clockwise failsafe operation. Actuators shall be cULus listed, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Accessories

Electrical accessories	Description	Type
		IRM-100
	Auxiliary switch, mercury-free, {	P475
	Auxiliary switch, mercury-free, {	P475-1
	Signal Simulator, Power supply AC 230 V, {	PS-100
		PTA-250
	Positioner for wall mounting	SGA24
	Positioner for front-panel mounting	SGF24
	Resistor, 500 Ω, 1/4" wire resistor with 6" pigtail wires, {	ZG-R01
	Resistor Kit, 50% voltage divider, {	ZG-R02
	Mounting plate for SGF.	ZG-SGF
	Transformer, AC 120 V to AC 24 V, 40 VA, {	ZG-X40
Mechanical accessories	Description	Type
	Shaft extension 170 mm Ø10 mm for damper shaft Ø 6...16 mm	AV6-20
	End stop indicator	IND-LF
	Standard LF clamp (3/8" to 1/2").	K6 US
	Shaft clamp reversible, clamping range Ø16...20 mm, {	K6-1
	Ball joint suitable for damper crank arm KH8 / KH10	KG10A
	Ball joint suitable for damper crank arm KH8	KG6
	Ball joint suitable for damper crank arm KH8	KG8
	Actuator arm, clamping range Ø8...16 mm, Slot width 8.2 mm, {	KH-LF
	V-bolt Kit for KH-LF.	KH-LFV
	Damper crank arm Slot width 8.2 mm, for Ø1.05"	KH12
	Damper crank arm Slot width 6.2 mm, clamping range Ø10...18 mm	KH6
	Damper crank arm Slot width 8.2 mm, clamping range Ø10...18 mm	KH8
	Anti-rotation bracket LF.	LF-P
	Push rod for KG10A ball joint (36" L, 3/8" diameter).	SH10
	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).	SH8
	TOOL-06 8mm-10mm Wrench	TOOL-06
	Angle of rotation limiter, with end stop, {	ZDB-LF

Form fit adapter 8x8 mm, {	ZF8-LF
Right angle bracket for ZS-260.	ZG-109
Stand-off bracket for ZS-260.	ZG-110
LF right angle bracket 4-1/2x5-1/2x2-1/2" (HxWxD).	ZG-112
Damper clip for damper blade, 3.5" width.	ZG-DC1
Damper clip for damper blade, 6" width.	ZG-DC2
LF crankarm adaptor kit (includes ZG-112).	ZG-LF112
LF crankarm adaptor kit (T bracket included).	ZG-LF2
Shaft extension for 3/8" diameter shafts (4" L).	ZG-LMSA-1
Shaft extension for 1/2" diameter shafts (5" L).	ZG-LMSA-1/2-5
Weather shield 13x8x6" [330x203x152 mm] (LxWxH), {	ZS-100
Base Plate, for ZS-100	ZS-101
Weather shield 16x8-3/8x4" [406x213x102 mm] (LxWxH), {	ZS-150
Explosion Proof Housing 16x10x6.435" [406x254x164 mm] (LxWxH), UL and CSA, Class I, Zone 1&2, Groups B, C, D, (NEMA 7), Class III, Hazardous (classified) Locations, outdoor application NEMA 4, {	ZS-260
Weather shield 17-1/4x8-3/4x5-1/2" [438x222x140 mm] (LxWxH), NEMA 4X, with mounting brackets, {	ZS-300
Weather shield 17-1/4x8-3/4x5-1/2" [438x222x140 mm] (LxWxH), NEMA 4X, with mounting brackets, {	ZS-300-5
Shaft extension 1/2", {	ZS-300-C1
Shaft extension 3/4", {	ZS-300-C2
Shaft extension 1", {	ZS-300-C3

Electrical installation
⚠ Warning! Live Electrical Components!

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◆ Meets cULus requirements without the need of an electrical ground connection.

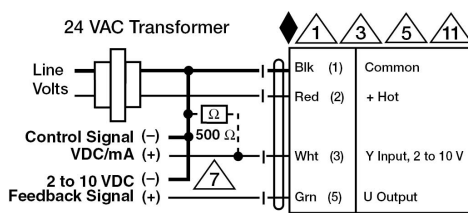
⚠1 Provide overload protection and disconnect as required.

⚠3 Actuators may also be powered by 24 VDC.

⚠5 Only connect common to negative (-) leg of control circuits.

⚠7 A 500 Ω resistor (ZG-R01) converts the 4...20 mA control signal to 2...10 V.

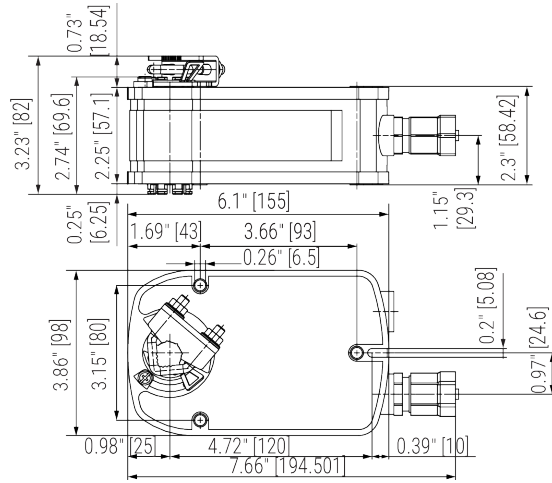
⚠11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.



2...10 V / 4...20 mA Control

Dimensions

Dimensional drawings



Edge Devices

(This page is hyperlinked to the TOC)

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7D1XS3A100 Lenovo ThinkSystem
SE350 Edge Server: 4C 32GB 2x120GB
2x480GB SSDs
<https://pierson.it/>

ThinkSystem SE350

Purpose-built IoT, Edge server



Purpose Built Edge Server for Compute & Storage

Today, remote locations are forced to make a choice between underpowered IOT gateways and PCs, or overpowered and non-rugged datacenter centric servers. Now they have an option—a right-sized compact compute and storage server designed specifically to meet the needs of remote locations.

The Lenovo ThinkSystem SE350 is an Intel® Xeon® D-2100-based 1U height, half-width, and short-depth Edge server that can go anywhere. It can be hung on a wall, stacked on a shelf, or mounted in a rack. This rugged Edge server can handle temperatures from 0-55°C as well as tolerance to locations with high-dust and vibration.

The SE350 is designed to virtualize traditional IT and OT applications as well as new transformative IOT and AI systems, providing the processing power, storage, accelerator, and networking techniques required for today's Edge workloads.

Secure, Connected and Reliable

At Lenovo, security begins with design and continues through supply chain, delivery, and the full lifecycle of the system.

The SE350 equips ThinkShield security with cybersecurity capabilities with key encrypted storage and secured bios, and physical security capabilities such as a locking bezel, intrusion and tamper protection mechanisms.

The SE350 provides numerous connectivity options with wired and secure wireless Wi-Fi and LTE connection abilities. Reliability features such as wireless failover, redundant boot and data drives, high temperature components and support for hyperconverged clustering keep critical Edge workloads running.

Agility and Remote Manageability

It is costly and time consuming to send IT staff to remote sites. The SE350 features XClarity Controller, an enterprise-grade embedded management engine. It also supports XClarity Administrator, which enables IT managers to efficiently maintain server, storage, and networking infrastructure and accelerate services provisioning.

In addition to a dedicated wired networking management port, the SE350 can deliver management over a secure wireless connection so IT managers can perform updates, management tasks, and access sites even when the primary site internet connection is down.

Lenovo™

Specifications

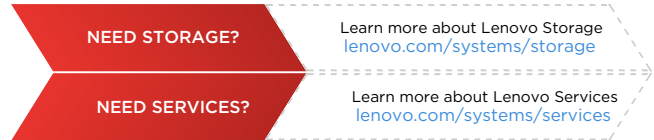
Form Factor	1U height, half width edge server; Height: 40mm, Width: 215mm, Depth: 376mm
Processor	1-socket Intel® Xeon® D-2100, up to 16 cores
Memory	Up to 256GB in 4x slots, using 64GB DIMMs; 2133/2400/2666MHz TruDDR4
Internal Storage Options	<ul style="list-style-type: none"> • 2x M.2 2280 SATA boot drives + 8x M.2 22110 NVMe data storage drives • 2x M.2 2280 SATA boot drives + 4x M.2 22110 NVMe/SATA data storage drives • SED, high temperature, high capacity, and high endurance drive options • Optional encryption key deletion on tamper or theft detection
RAID Support	Software RAID available
Mounting Options	<ul style="list-style-type: none"> • Single node mounting options for desktop, VESA, DIN, wall, or ceiling • Multi-node stackable bookend options • E1 Enclosure for two nodes side-by-side and 4x power supplies. Depth: 735mm, Height: 1U • E2 Short Depth Enclosure for two nodes sides by side + 4x power supplies: Depth: 440mm, Height: 2U • Locking bezels and dust filter options
Power	Dual-redundant external power supplies 100-240V AC Single DC supply: -48VDC (-40VDC to -72VDC) @8.4A
Network Interfaces (Wired)	<ul style="list-style-type: none"> • 2x10GbE (SFP+), 2x 10/100MB/1GbE, 2x 1GbE management • 2x10GbE (SFP+), 4x switch 10/100MB/1GbE, 1GbE management
Network Interfaces (Wireless)	<ul style="list-style-type: none"> • Four wireless SMA connectors for LTE & Wi-Fi • Wi-Fi 64/128-bits encrypted WEP, WPA, WPA2, 802.11 a/b/g/n/ac • 3G/4G Cellular LTE 3GPP Release 12 450Mbps DL/50Mbps UL • 5G ready
Accelerators and PCIe Expansion	<ul style="list-style-type: none"> • 1x PCIe 3.0 x16 75W or 4x M.2 22110 • Support for 1x NVIDIA® T4 GPU for AI inference • Support for GPU, FPGA, ASIC accelerators • Support for operational technology networks • 1x PCIe network card expansion <ul style="list-style-type: none"> ◦ 4x 1GbE RJ45 PCIe ◦ 2x 10GBASE-T PCIe • 2x 10/25GbE SFP28 PCIe
I/O	<ul style="list-style-type: none"> • Front: 1x VGA, 2x USB 3.0, 1x XClarity Controller management mini-USB • Rear: 1x RJ45 Console Serial, 2x USB 2.0 • USB and Console ports can be disabled
Systems Management	Lenovo XClarity Administrator with mobile option
Environmental	Extended operating temperature of 0-55°C, up to 30G shock & 3Grms vibration, IEC 60068, MIL-STD-810G, optional dust filter
Security	<ul style="list-style-type: none"> • ThinkShield Key Vault secure management with motion and intrusion tamper protection • Optional Key Vault SED encrypted storage for boot and data drives • Lenovo Trusted Supplier Program, Secure boot, and Smart USB Protections, Lenovo Wi-Fi Security, Lenovo LTE Security • Optional Kensington keyed lock compatible chassis • Nationz TPM 2.0 for customers in China • Cable locking bezel
Operating Systems	Microsoft Windows Server, SLES, Ubuntu, RHEL, VMware ESXi, Scale Computing HC3. Visit lenovopress.com/osig for details
Limited Warranty	1-year, 3-year warranty extendable to 5-year, next business day 9x5; optional service upgrades

About Lenovo

Lenovo (HKSE: 992) (ADR: LNVGY) is a US\$45 billion Fortune 500 company and a global technology leader in driving Intelligent Transformation. Lenovo's data center solutions (ThinkSystem, ThinkAgile) are creating the capacity and computing power that are changing business and society.

For More Information

To learn more about the ThinkSystem SE350, contact your Lenovo representative or Business Partner, or visit lenovo.com/systems/servers. For more details consult the SE350 Product Guide, lenovopress.com/lp1168.



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Humidity Sensors

(This page is hyperlinked to the TOC)

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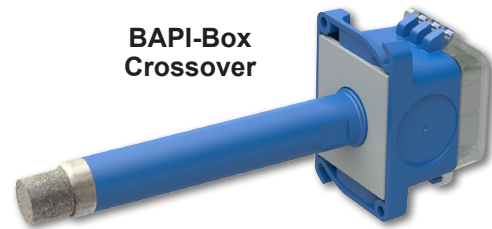


Features & Options

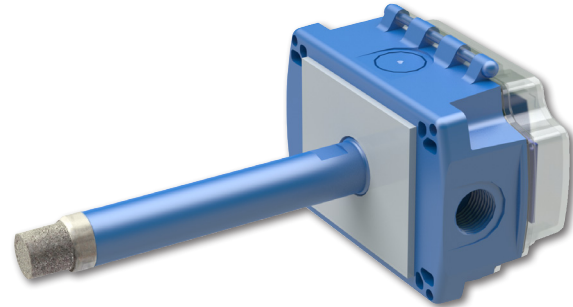
- 10 Points of Calibration from 10 to 90% RH
- Humidity Only or Temp./Humidity Combination
- Replaceable Stainless Steel Filter
- Green Power Indication LED on BAPI-Box Crossover Units
- 2% and 3% RH Accuracies

Humidity control is an important aspect of any climate control system. Therefore, humidity sensors must be both accurate and dependable. BAPI's humidity transmitters are calibrated at 10 points from 10 to 90% RH for accuracy, eliminating field calibration.

The Duct Units are also extremely dependable, featuring two of the most watertight enclosures available today. The BAPI-Box and BAPI-Box Crossover Enclosures are made of UV-resistant polycarbonate and carry an IP66 rating. The BAPI-Box is only available for units with a temperature transmitter and a humidity transmitter.

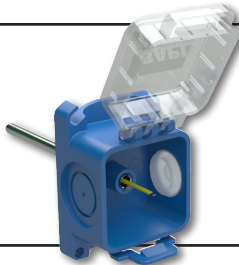


BAPI-Box Crossover



BAPI-Box

(only available for units with a temperature transmitter and a humidity transmitter)



The BAPI-Box Crossover Enclosure

The BAPI-Box Crossover features a hinged cover with thumb latch for easy termination. A pierceable knockout plug is available for the open port. See the Accessories section for more info.

(Unit shown with knockplug plug sold separately.)

Specifications

Power and Consumption:

- 10 to 35 VDC, 22 mA max. (for units with 0 to 5 VDC or 4 to 20 mA Humidity Outputs)
- 15 to 35 VDC, 6 mA max. (for units with 0 to 10 VDC Humidity Output)
- 12 to 27 VAC, 0.53 VA max. (for units with 0 to 5 VDC Humidity Outputs)
- 15 to 27 VAC, 0.14 VA max. (for units with 0 to 10 VDC Humidity Output)

Enclosure Dimensions: H x W x D

- BAPI-Box Crossover:.....3.1 x 2.2 x 1.9" (79 x 56 x 49mm)
- BAPI-Box.....5 x 4.1 x 2.5" (127 x 104 x 63.5mm)

(For enclosure dimension drawings, turn to the end of the section.)

Sensor:

- Humidity:
 - Capacitive 2% or 3%RH (10 to 90% RH @ 23°C)
- Temperature:
 - Thermistor or RTD (See Sensors section for specs)

Enclosure Rating:

- BAPI-Box Crossover: IP10, NEMA 1 (IP44 with knockout plug)
- BAPI-Box: IP66, NEMA 4X

Enclosure Material:

UV-res. Polycarbonate, UL 94, V-0

Environmental Operation Range:

- Temp: -40 to 158°F (-40 to 70°C)
- Humidity: 0% to 100% RH
- Fully Temperature Compensated





Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.

Duct Humidity Sensor Option Selection Guide

BA/ (#1) - (#2) - (#3)

#1: Temperature Sensor or Transmitter (optional)

- 1.8K 1.8K Thermistor
- 3K 3K Thermistor
- 10K-2 10K-2 Thermistor**
- 10K-3 10K-3 Thermistor
- 10K-3[11K] 10K-3[11K] Thermistor
- 20K 20K Thermistor
- 1K[375] 1K Platinum RTD (375 curve)
- 1K[Ni] 1K Ω Nickel RTD
- 1K 1K Platinum RTD (385 curve)

Temperature Transmitters below require a BAPI-Box Enclosure

- T1K[32 TO 212F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range
- T1K[20 TO 120F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range
- T1K[0 TO 100F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range
- T1K[0 TO 100C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°C Range
- T1K[-7 TO 49C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range
- T1K[-18 TO 38C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Range

Matched Transmitters are also available. Contact your BAPI representative for ordering.

#2: Humidity Output (required)

- H200 ±2% Humidity Transmitter with Interchangeable Output of 0 to 5 V or 4 to 20 mA**
- H210 ±2% Humidity Transmitter with 0 to 10 V Output
- H212 ±2% Humidity Transmitter with 2 to 10 V Output
- H300 ±3% Humidity Transmitter with Interchangeable Output of 0 to 5 V or 4 to 20 mA
- H310 ±3% Humidity Transmitter with 0 to 10 V Output
- H312 ±3% Humidity Transmitter with 2 to 10 V Output

#3: Enclosure Style (required)

- D-BBX BAPI-Box Crossover (IP10, NEMA 1)
- D-BB BAPI-Box (for units with a humidity and temperature transmitter only)**

Additional options are available for these units but not shown in this Selection Guide. Contact your BAPI representative for the complete list of options. Submittal sheets without List Prices can be downloaded from our website at www.bapihvac.com

Example Number: BA/(**10K-2**) - (**H200**) - (**D-BBX**)

Actual Number (with parenthesis removed): BA/10K-2-H200-D-BBX

Description: 10K-2 Thermistor, 0 to 5V or 4 to 20mA Humidity Output, BAPI-Box Crossover IP10-rated Enclosure.

Your Number: BA/



Hydronic Pressure Sensors

(This page is hyperlinked to the TOC)

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Model 231

Multi-Configurable, Wet-to-Wet
Differential Pressure Transducer

Features

- Dual sensors
- Suitable for harsh environments
- 3 & 5 valve manifold assembly options
- 4 Field Selectable Outputs
- 8 Field Selectable Pressure Ranges
- Field Accessible Push-Button Zero & Remote Zero
- Hinged Cover
- Optional LCD Display
- NEMA 4 Rated Housing, All Cast Aluminum
- CE & RoHS Compliant

Applications

- Energy management systems
- Process control systems
- Flow measurement of various gases or liquids
- Liquid level measurement of pressurized vessels
- Pressure drop across filters

Setra's 231 is a multi-configurable, wet-to-wet differential pressure transducer offering the user an all-in-one device with field selectable pressure ranges and analog outputs. The device is offered with an optional 3 or 5 valve machined brass manifold for ease of installation and maintenance. The 231 has a robust, NEMA 4 enclosure with a hinged, captive cover allowing for easy access to switches for adjusting the range and output. An optional display is available that allows users to view high, low, and differential pressure readings on a simple rotating cycle.

Field selectable pressure ranges

The 231 offers 8 field selectable pressure ranges which can be changed using a slide switch, reducing risk of installing the wrong range unit. The multi-range functionality allows the user to hold less inventory and add additional flexibility in the field.

Quick and simple installation

The 231 provides the user with an optional 3 or 5 valve machined brass manifold which can save money on installation and maintenance. The single piece construction of the brass body has no internal process connections, eliminating the risk of internal leaks.

Robust enclosure for difficult applications

The 231 NEMA 4 housing offers an optional LCD display for instant indication of the high, low and differential pressure readings. A hinged enclosure makes it suitable for harsh environments and saves the hassle of misplacing it when completing a difficult installation.



Specifications

Electrical data (voltage)

Circuit	3-Wire
Excitation	15 to 30 VDC/18 to 30 VAC (Reverse Excitation Protected)
Output¹	0 to 5 VDC, 0 to 10 VDC, 1 to 5 VDC
Output impedance	30 Ω
Circuit consumption	8 mA (typ.) at 5 VDC, 8 mA (typ) at 10 VDC, 40 mA (typ.) at 18-30 VAC

Electrical data (current)

Circuit	2-wire (reverse excitation protected)
Output²	4 to 20 mA
External load	0 to 250 Ω
Min. supply voltage	15 VDC + 0.02 x (resistance of receiver plus line)
Max. supply voltage	30 VDC + 0.004 x (resistance of receiver plus line)

Physical description

Case	Die cast aluminum, powder coated
Pressure fittings	1/8-18 NPT internal
Electrical connection	1/2 in. conduit
Size	4.0 x 6 x 2 in. (102 x 152 x 51 mm)
Weight	1.5 lb
Sensor vacuity volume	0.2 cc

Environmental data

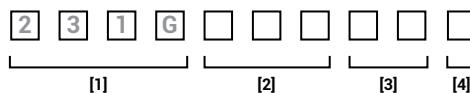
Operating³ temperature °F (°C)	-4 to +185 (-20 to -85)
Storage temperature °F (°C)	-4 to +185 (-20 to +85)
Vibration	10g from 50Hz to 2000 Hz
Shock	200g

¹ Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater.
² Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.
³ Operating temperature limits of the electronics only. Pressure media temperatures may be considerably higher or lower.
⁴ RSS of Non-Linearity, Hysteresis, and Non-Repeatability.
⁵ Units calibrated at nominal 70°F. Maximum thermal error computed from this datum.

Specifications subject to change without notice.

Ordering information

Example part number: 231GMS12FD;
 Model 231, 5 PSID up to 50 PSID, 1/8" NPT Int. fitting, and LCD display:



[1]
Model
231G Model 231

[2]	Range specifications¹	
	Unidirectional	Bidirectional
MS1	5, 10, 25, 50 PSID	±5, ±10, ±25, ±50 PSID
MS2	10, 20, 50, 100 PSID	±10, ±20, ±50, ±100 PSID
MS3	25, 50, 125, 250 PSID	±25, ±50, ±125, ±250 PSID

[3]	Pressure connection
2F	1/8-18 NPT female (standard) sensor (conduit version)
3V	3-V manifold assembled w/ Model 231
5V	5-V manifold assembled w/ Model 231

[4]	Display
N	No display
D	LCD display

¹ Maximum line pressure is maximum range of pressure ordered.

Performance data

Accuracy RSS⁴ (at constant temp.)

Pressure ranges A, B, C:	±1.0% FS
Pressure ranges D:	±2.0% FS

Pressure ranges (PSID)

Range code	A	B	C	D	Max. line pressure
MS1	50	25	10	5	50
MS2	100	50	20	10	100
MS3	250	125	50	25	250

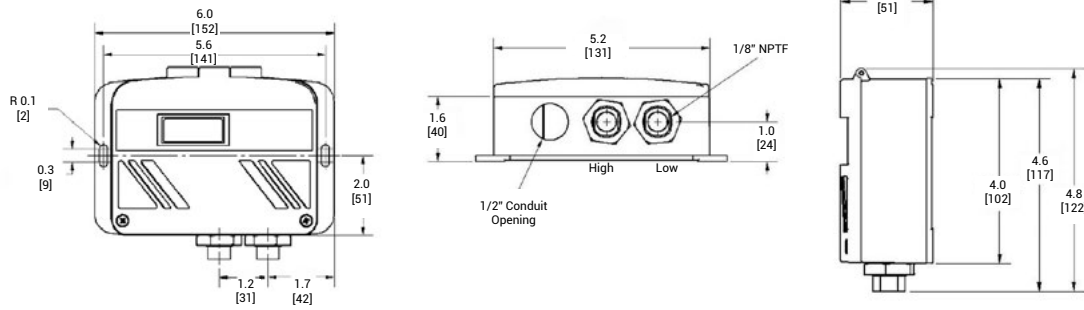
Pressure media

Liquids or Gases Compatible with 17-4 PH Stainless Steel
 Note: Hydrogen not recommended for use with 17-4 PH stainless steel

Thermal effects⁵

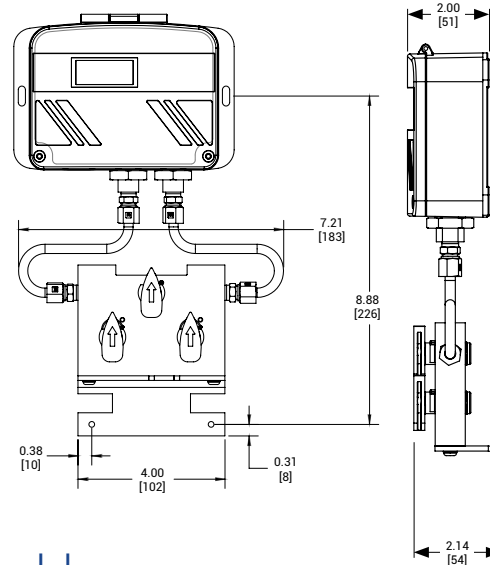
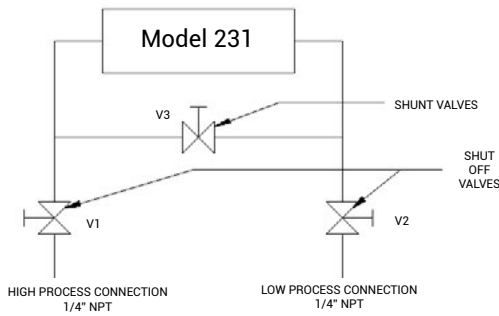
Compensated range °F (°C)	+32 to +130 (0 to +54)
Zero/Span Shift %FS/100°F (50°C)	2.0 (1.8)
Warm-up shift	<0.12% FS
Surge damping	1 to 5 sec. (selectable)
Proof pressure	2 x Full Scale
Burst pressure	15 x Full Scale (50 PSI), 10 x Full Scale (75 x 150 PSI), 8 x Full Scale (250 PSI)

Dimensions



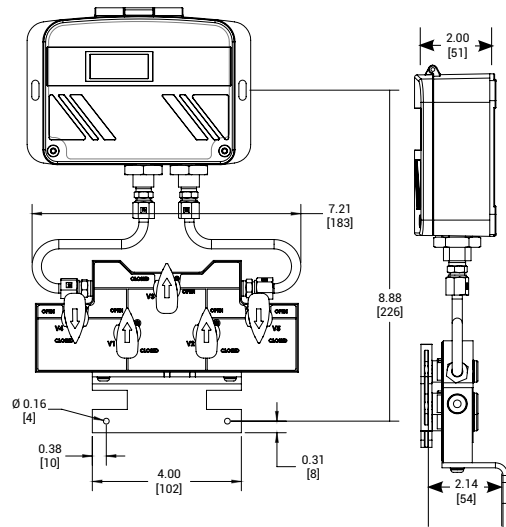
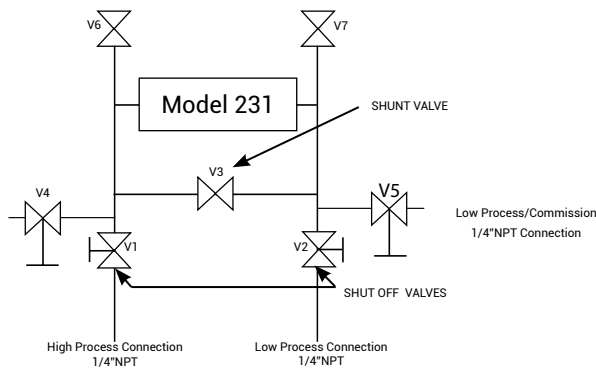
Dimensions - 3 valve manifold assembly

Manifold Block: Brass
 Valves (3): V1 for connection to +port, V2 for connection to -port, V3 for equalizing pressure
 Valve type: 90 Degree On/Off
 Process Connections: 1/4" -18 NPT Internal Thread



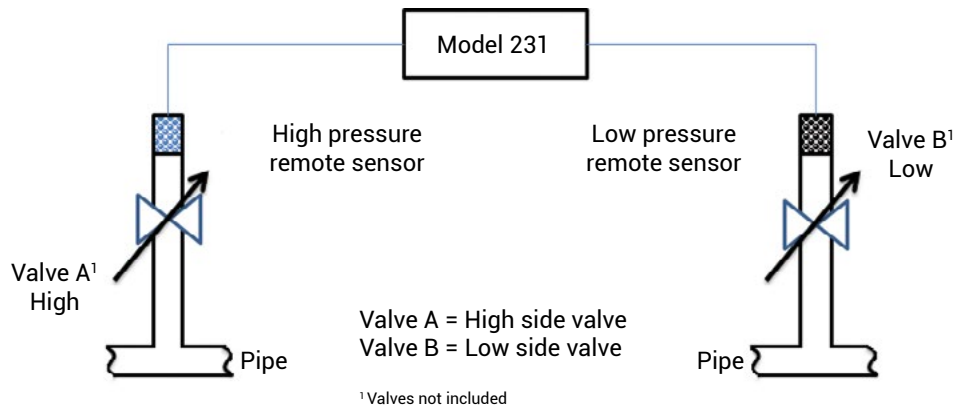
Dimensions - 5 valve manifold assembly

Manifold Block: Brass
 Valves (5): V1 for connection to ±port, V2 for connection to -port, V3 for equalizing pressure, V4 for connection to external gauge or alternate plumbing configuration, V5 for connection to external gauge or alternate plumbing configuration
 Valve Type: 90 Degree On/Off
 Process Connection: 1/4" -18 NPT Internal Thread



inches (mm)

Installation



Pressure range code selector

NOTE: Please read before ordering.

1. Examine the pressure application and determine what is the Highest System Line Pressure.
2. Determine what is the Differential Pressure being measured.
3. Find the MAX. Line Pressure in the table on the right that is \geq to your Highest System Line Pressure.
4. Verify that your DP falls within the selectable ranges in that row.
5. Follow that row to the left and select that range code.

Range Code	A	B	C	D	Max. Line Pressure
MS1	50	25	10	5	50
MS2	100	50	20	10	100
MS3	250	125	50	25	250

Example:

Highest system line pressure: 125 PSIG
 Differential pressure measured: 50 PSID
 "Max line pressure" \geq to system line pressure: 250 PSID (50 PSID DP falls within ranges in this row)
 Select range code: MS3

Model 209

OEM Pressure Transducer

The Model 209 pressure transducer is designed for Industrial and OEM customers who require high performance, reliability and versatility at an affordable price. It offers exceptional $\pm 0.25\%$ FS accuracy with pressure ranges from 1 PSI up to 10,000 PSI to meet a multitude of demanding applications. The 209 features all stainless steel wetted materials and offers many pressure and electrical connections to satisfy challenging installation requirements. The 209 features a patented overpressure stop to protect the sensor against unexpected spikes or in high pulsation applications.



True Low Range Sensor

The Model 209's capacitive transducer is designed for industrial applications with demanding price and performance requirements. The Model 209 offers exceptional reliability in typical industrial grade environments. The true low range sensor design offers high performance with no additional amplification required to meet range requirements down to 1 PSI.

Flexibility for Many Applications

The 209 transducer offers many pressure and electrical fittings covering many installation configurations. It minimizes additional engineering time to accommodate the sensor, allowing for earlier project completion and quicker time to market.

Robust Design & Construction for Reliable Service

The Model 209 is designed and built to withstand demanding applications. The industrial construction, with optional positive overpressure stop, enables the sensor to withstand overpressure conditions up to 16X the rated range.

- Rugged For Demanding Applications
- Full Span Ranges Down to 1 PSI
- Highly Configurable Design

Model 209 Features:

- High Overpressure Option Available on Select Ranges
- Operates Over a Wide Temperature Band
- Compatible w/ a Variety of Gases & Liquids
- Operates on Low Cost Unregulated DC Power
- Suitable For High Shock & Vibration Applications
- No Seals or O-Rings to Cause Leakage
- No Brazed Joints Susceptible to Corrosion Problems
- CE & RoHS Compliant

Applications:

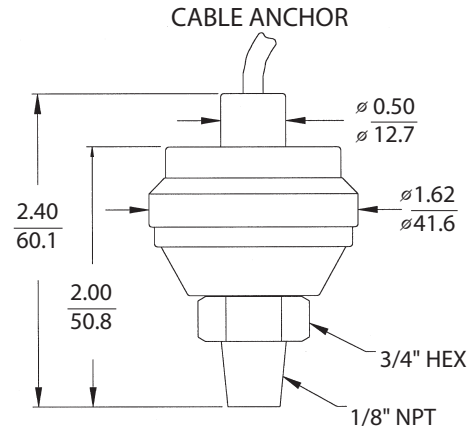
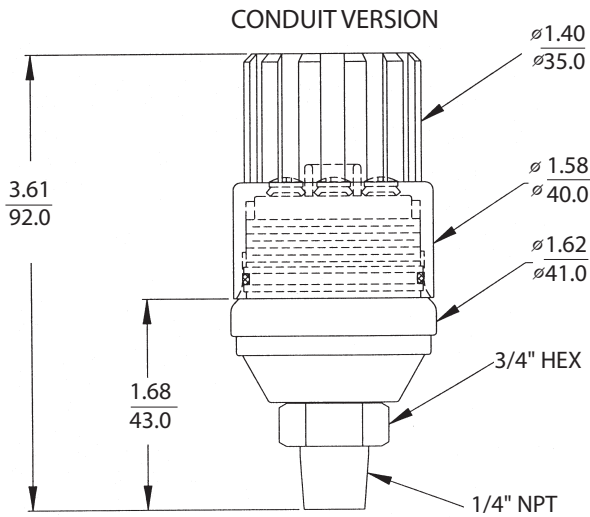
- Industrial OEM Equipment
- Hydraulic Systems
- Compressor Control
- HVAC/R Equipment
- Industrial Engines

Model 209

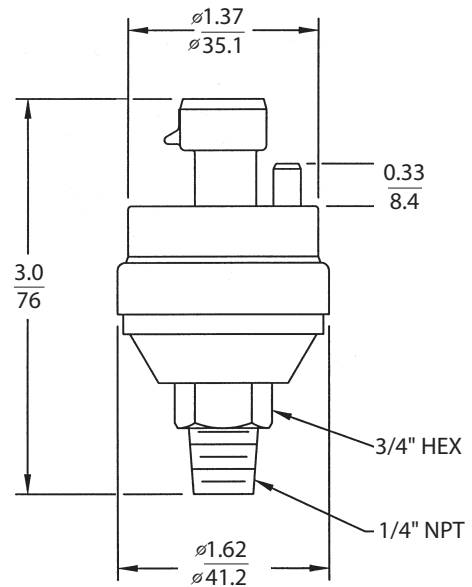
OEM Pressure Transducer



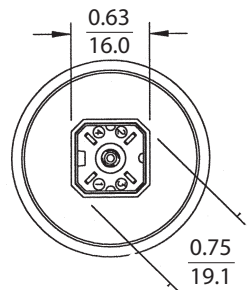
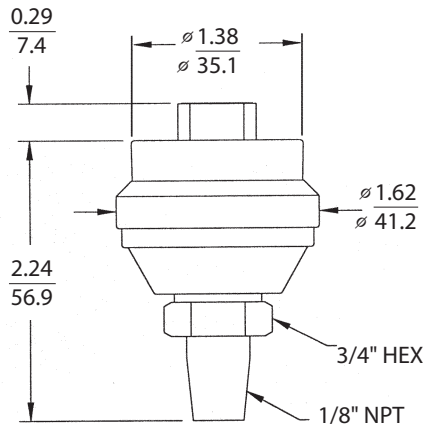
DIMENSIONS



OPTIONAL 3-Pin PACKARD CONNECTOR
Type: P2S Series 150



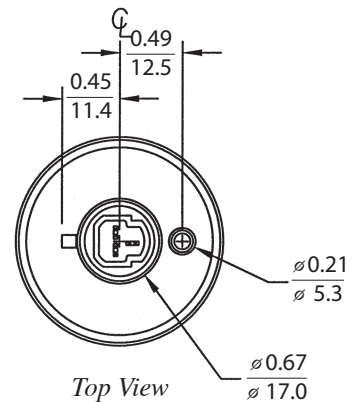
OPTIONAL HIRSCHMANN CONNECTOR
Type: G4A1M #931807-106



Top View

Mating Hirschmann Connector G4WIF available. See table below to order.

in.
mm



Top View

Mating Packard Connectors available. See table below to order.

Model 209

OEM Pressure Transducer

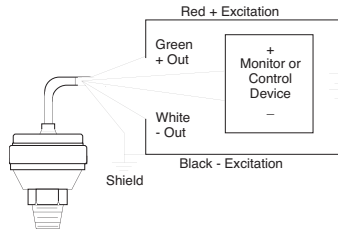


WIRING

CABLE ANCHOR

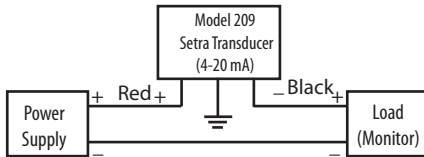
Voltage Output

The Model 209 voltage output is a 3-wire circuit. If the 209 is supplied with 2 feet of cable, the electrical connection is as follows:



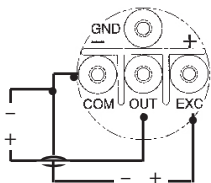
Current Output

The Model 209 True 2-wire device. If the 209 is supplied with 2 feet of cable, the electrical connection is as follows:

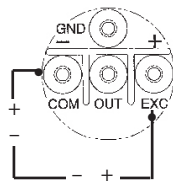


CONDUIT VERSION

Voltage

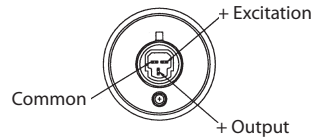


Current



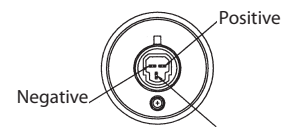
3-PIN PACKARD CONNECTOR

Voltage



Top View: 3-Pin Packard Connector
Type: P2S Series 150

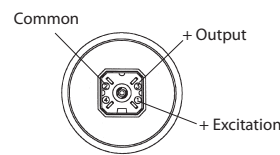
Current



Top View: 3-Pin Packard Connector
Type: P2S Series 150

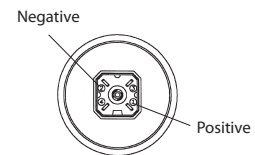
HIRSCHMANN CONNECTOR

Voltage



Top View: Hirschmann Connector
Type: G4A1M#931807-106

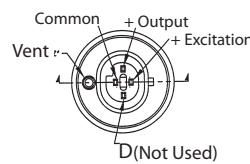
Current



Top View: Hirschmann Connector
Type: G4A1M#931807-106

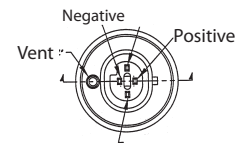
4-PIN PACKARD CONNECTOR

Voltage



Top View: 4-Pin Packard Connector
Type: Metri-Pack 150

Current



Top View: 4-Pin Packard Connector
Type: Metri-Pack 150

Model 209

OEM Pressure Transducer



ORDERING INFORMATION

2 0 9 1 - [] [] [] [] - [] - [] [] [] - [] [] [] - [] [] [] - [] [] []

Model	Range Code				Pressure Type		Pressure Fitting		Output ⁶		Elec. Termination		Options		
2091 = Model 209	Range Code	PSI	Range Code	PSI	G	Gauge	2M	1/4" NPT Male	11	4-20 mA	XX	Cable length in feet		H	High Overpressure Capability (Only available on 25 PSI up to 1500 PSI Pressure Ranges)
	001P	0 to 1	500P	0 to 500	C	Compound	J7	7/16" SAE Male	24	0.5 to 5.5 VDC	P1	Packard (3-Pin) ²			
	002P	0 to 2	10CP	0 to 1,000	S	Sealed ¹	1M	1/8" NPT Male	27	1 to 5 VDC	P3	Packard (4-Pin) ³			
	005P	0 to 5	15CP	0 to 1,500	V	Vacuum	L4	1/4 Female SAE Internal 7/16-20 w/ Schrader Pin	28	1 to 6 VDC	H2	Hirschmann, ("Mini") ⁴			
	010P	0 to 10	20CP	0 to 2,000			G4 ⁵	1/2" A Male	45	0.5 to 4.5 VDC	A1	Terminal Block w/ Conduit Cover			
	025P	0 to 25	30CP	0 to 3,000			P1	1/8" NPT Female Bulkhead (Available on Ranges > 50 PSI)							
	050P	0 to 50	50CP	0 to 5,000											
	100P	0 to 100	10KP	0 to 10,000											
	200P	0 to 200	Z01P	0 to -14.7 PSI											
	250P	0 to 250													

Ordering Example: 2091001PG2M1102 = Model 209, 0 to 1 PSI Range, Gauge Pressure, 1/4" NPT Male Fitting, 4 to 20 mA Output, 2 ft. Cable.

¹ Sealed version available on 200 PSI ranges and above.
² Order Setra Part #577 for Mating Connector.
³ Order Setra Part #857 for Mating Connector.
⁴ Order Setra Part #590 for Mating Connector.
⁵ Only available for pressure ranges below 25 PSI.
⁶ Consult factory for other output options.

ACCESSORIES

577	3-Pin Mating Packard Kit
581	Cable Assembly - Packard, 3-pin (3 ft.)
582	Cable Assembly - Packard, 3-pin (6 ft.)
590	Mating Hirschmann Kit
857	4-Pin Mating Packard Kit

GENERAL SPECIFICATIONS

Performance Data		Environmental Data	
Accuracy RSS ¹ (at constant temp)	±0.25% FS	Operating ³ Temperature °F (°C)	-40 to +185 (-40 to +85)
Non-Linearity, BFSL	±0.22% FS	Storage Temperature °F (°C)	-40 to +185 (-40 to +85)
Hysteresis	0.10% FS	Shock ²	200g operating
Non-Repeatability	0.05% FS	Acceleration	10 g Maximum ⁵
Thermal Effects		Shock ²	200g Operating
Compensated Range °F (°C)	-4 to +176 (-20 to +80)	Vibration ⁴	20g
Zero Shift %FS/100°F (%FS/50°C)	±2.0 (±1.8)	Environmental Protection	Weather Resistant
Span Shift %FS/100°F (%FS/50°C)	±1.5 (±1.3)	Electrical Data (Voltage)	
Warm-up Shift	0.1% FS Total	Circuit	3-Wire (COM, OUT, EXC)
Response Time	5 milliseconds	Excitation	9 to 30 VDC
Long Term Stability	0.5% FS/1 YR	Output ⁶	0.5 to 5.5 VDC ⁷
Pressure Media		Output Impedance	10 ohms
Liquids and gases compatible with 17-4 PH Stainless Steel. ²		Electrical Data (Current)	
Physical Description		Circuit	2-Wire
Case	Stainless Steel & Valox	Output ⁸	4 to 20mA ⁹
Wetted Material	17-4 PH Stainless Steel	External Load	0 to 800 ohms
Electrical Connection	2 ft. multiconductor cable	Minimum supply voltage (VDC)	9+ 0.02 x (Resistance of receiver plus line)
Pressure Fitting ⁵	1/4" - 18 NPT external, 17-4 PH Stainless Steel	Maximum supply voltage (VDC)	30+ 0.004 x (Resistance of receiver plus line).
Vent	Through cable	¹ RSS of Non-Linearity, Hysteresis, and Non-Repeatability. ² Note: Hydrogen not recommended for use with 17-4 PH Stainless Steel. ³ Mil-Std. 202, Method 213B, Cond. C ⁴ Mil-Std. 202, Method 204, Cond. C ⁵ See ordering information for other fittings available (minimum quantities apply). ⁶ Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater. ⁷ Zero output factory set to within ±50mV. Span (Full Scale) output factory set to within ±50mV. ⁸ Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load. ⁹ Zero output factory set to within ±0.16mA. Span (Full Scale) output factory set to within ±0.16mA. Specifications subject to change without notice.	
Weight (approx.)	2.3 ounces (65 grams)		

PROOF PRESSURE

Full Scale Range (PSI)	Standard		Option	
	Proof Pressure (PSI)	Burst Pressure (PSI)	High Proof Pressure (PSI)	High Burst Pressure (PSI)
1	2	250	N/A	N/A
2	4	250	N/A	N/A
5	10	250	N/A	N/A
10	20	500	N/A	N/A
25	50	500	N/A	N/A
50	100	750	800	5,000
100	200	1,000	1,000	5,000
200	400	2,000	1,500	5,000
250	500	2,000	2,000	8,000
500	1,000	3,000	2,500	10,000
1,000	2,000	5,000	4,000	10,000
1,500	2,500	6,000	5,000	12,000
2,000	3,000	6,500	N/A	N/A
3,000	4,500	7,500	N/A	N/A
5,000	7,500	10,000	N/A	N/A
10,000	12,500	20,000	N/A	N/A
-14.7 (Vacuum)	10	15	N/A	N/A

Hydronic Temperature Sensors and Wells

(This page is hyperlinked to the TOC)

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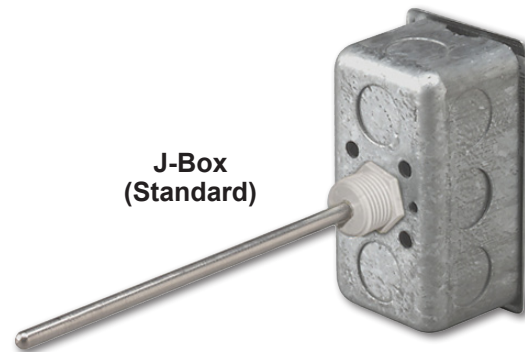
Features & Options

- Probe Lengths: 2", 4" & 8" (fit standard BAPI Thermowell lengths)
- Series 304 Stainless Steel Probes and three Enclosure Styles
- Double Encapsulated Sensors & Etched Teflon Leadwires

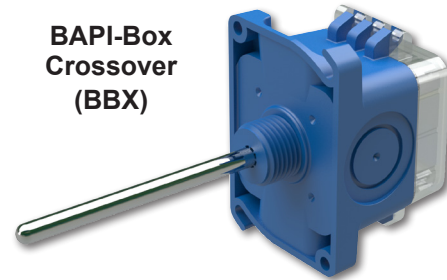
Immersion Units are available in 2", 4" and 8" probe lengths. The sensor is potted inside a 1/4" stainless steel probe with thermally conductive compound.

All Immersion Units have etched Teflon leadwires and double encapsulated sensors to create a watertight package that can withstand high humidity and condensation.

Immersion Units come standard with a 2"x4" steel J-Box but are also available with the metal Weatherproof enclosure or the new BAPI-Box Crossover enclosure.



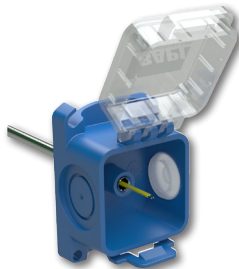
J-Box
(Standard)



BAPI-Box
Crossover
(BBX)

The BAPI-Box Crossover

The new BAPI-Box Crossover enclosure features a hinged cover with thumb latch for easy termination. A pierceable knockout plug is available for the open port. See the Accessories section for more info.



(Shown with knockout plug sold separately.)

BAPI Thermowells

Immersion Unit Probes are designed to be inserted into a Thermowell. For more info on Thermowells, see page A40.



Specifications

Environmental Operation Range:

Temperature:

BAPI-Box Crossover: -40 to 85 °C

Other Enclosures: -40 to 100 °C

Humidity: 0 to 100%, non-condensing

Sensing Element:

Thermistor or RTD (See Sensors Section for Specs.)

Probe Material:

Stainless Steel, 1/4" diameter

Enclosure Material:

Junction Box: Galvanized Steel

BAPI-Box Crossover:

UV-resistant polycarbonate, UL94, V-0

Enclosure Rating:

Junction Box: IP20, NEMA 1

BAPI-Box Crossover (BBX):

IP10, NEMA 1

IP44 with knockout plug in open port

Encl. Dimensions: H x W x D

BAPI-Box Crossover:

3.1 x 2.2 x 1.9" (79 x 56 x 49mm)

Junction Box

4.2 x 3.9 x 1.94" (106 x 98.4 x 49mm)

(For enclosure dimension drawings, see the end of the section.)



Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.



Immersion Sensor Option Selection Guide

BA/ (#1) - (#2) - (#3) - (#4)

#1: Temperature Sensor (required)

- 1.8K 1.8K Thermistor
- 3K 3K Thermistor
- 10K-2 10K-2 Thermistor
- 10K-3 10K-3 Thermistor
- 10K-3[11K] 10K-3[11K] Thermistor
- 20K 20K Thermistor
- 1K[375] 1K Platinum RTD (375 curve)
- 1K[NI] 1K Ω Nickel RTD
- 1K 1K Platinum RTD (385 curve)

Transmitters below require a BAPI-Box Crossover Enclosure

- T1K[32 TO 212F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range
- T1K[20 TO 120F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range
- T1K[0 TO 100F] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range
- T1K[0 TO 100C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°C Range
- T1K[-7 TO 49C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range
- T1K[-18 TO 38C] 1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Range

Matched Transmitters are also available. Contact your BAPI representative for ordering.

#2: Probe Type and Length (required)

- I-2" Immersion, 2" (51mm) length
- I-4" Immersion, 4" (102mm) length
- I-8" Immersion, 8" (203mm) length

#3: Enclosure and Lead Length (optional, comes standard with Junction Box)

- BBX BAPI-Box Crossover (IP10, NEMA 1)

#4: Test & Balance or Terminal Strip (optional, requires a BAPI-Box Crossover Enclosure)

- TB Test & Balance Switch
- TS Terminal Strip Connection

Additional options are available for these units but not shown in this Selection Guide. Contact your BAPI representative for the complete list of options. Submittal sheets without List Prices can be downloaded from our website at www.bapihvac.com

Example Number: BA/ (**10K-2**) - (**I-2"**) - (**BBX**) - ()

Actual Number (with parenthesis removed): BA/10K-2-I-2"-BBX

Description: 10K-2 Thermistor, Immersion Sensor, BAPI-Box Crossover, No Test and Balance or Terminal Strip.

Your Number: BA/





Features & Options

- Three Lengths: 2", 4" and 8"
(Fit standard Immersion Unit lengths)
- Stainless Steel (304 or 316) or Brass
- Two Part (Welded) or Machined Construction
- Other Lengths Available Upon Request
- Limited Lifetime Warranty

Standard Thermowells available from BAPI include 304 stainless steel (machined), 316 stainless steel (machined), brass (machined), and two part* (welded) 304 stainless steel. These wells are offered in 2", 4" and 8" lengths with 1/2" NPT external and 1/2" NPSM internal. Other lengths and thread diameters are available upon request.

The Thermowell chosen for an installation is governed mainly by the corrosion conditions the well will face. The machined stainless steel wells all come with a mirror polish to provide maximum corrosion resistance.

Occasionally, the material consideration is one of strength rather than corrosion. For example, a machined stainless steel well may be required for high pressure water service where otherwise a brass or two part stainless steel well would be satisfactory from a corrosion standpoint.

Note: The two part welded stainless steel thermowells are not intended for service in moving water. They may be used in catch basins, sumps or large storage tanks with small inlet and outlet pipes. Do not mount the two part welded stainless steel thermowells close to the inlet or outlet pipe of the tank.

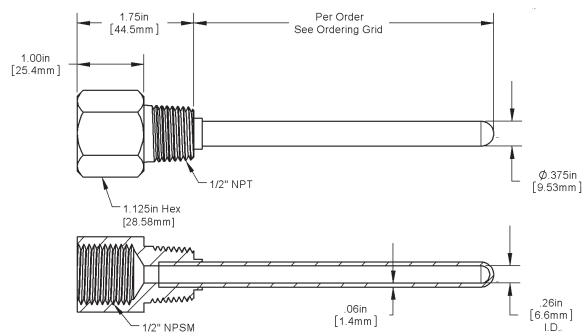


**Machined
Thermowell**

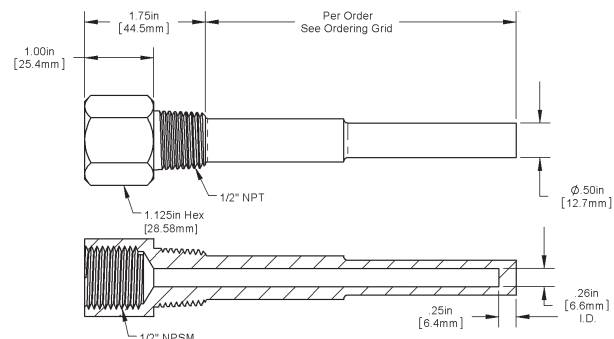


**Two Part (welded)
Thermowell**

Specifications



**Two Part (Welded) Thermowell
304 Stainless Steel**



**Machined Thermowell
304 or 316 Stainless Steel or Brass**

**NPT= National Pipe Taper
NPSM=National Pipe Straight Mechanical (not tapered)**





Ordering Information		Thermowells
BA/		
	Unit Type	
	2"	Two Part (Welded) 304 Stainless Steel - 2"
	4"	Two Part (Welded) 304 Stainless Steel - 4"
	8"	Two Part (Welded) 304 Stainless Steel - 8"
	2" M304	Machined 304 Stainless Steel - 2"
	4" M304	Machined 304 Stainless Steel - 4"
	8" M304	Machined 304 Stainless Steel - 8"
	2" M316	Machined 316 Stainless Steel - 2"
	4" M316	Machined 316 Stainless Steel - 4"
	8" M316	Machined 316 Stainless Steel - 8"
	2" MB	Machined Brass - 2"
	4" MB	Machined Brass - 4"
	8" MB	Machined Brass - 8"
EXAMPLE		
BA/	4" M304	
Example Part Number: BA/4"M304 4" Machined 304 Stainless Steel Thermowell		
Your Part Number:		

Note: Standard thread size is 1/2" NPT external, and 1/2" NPSM internal.
 2" wells have an insertion length of 2.5" (11.43 cm).
 4" wells have an insertion length of 4.5" (11.43 cm).
 8" wells have an insertion length of 7.5" (19.05 cm).

Gray shaded items follow the Buy and Resale Multiplier.

Comparing the Wake Frequency and the Resonant Frequency

Well failures, in most cases, are not due to the effects of pressure or temperature on the well. The calculations necessary to provide adequate strength, under given conditions, are familiar enough to permit proper choice of wall thickness and material. The values shown in Table 1 are conservative, and intended primarily as a guide. Less familiar, and more dangerous, are the **vibration effects** to which wells are subjected. Fluid, flowing by the well, forms a turbulent wake (called the Von Karman Trail) which has a definite frequency, based on the diameter of the well and the velocity of the fluid. It is important that the well have sufficient stiffness so that the wake frequency will never equal the resonant (natural) frequency of the well itself. If the resonant frequency of the well coincided with the wake frequency, the well would vibrate to destruction and break off in the piping. Wells are also safe if the resonant frequency is well **below** the wake frequency or if the fluid velocity is constantly fluctuating through the critical velocity point. Nevertheless, if the installation is not hampered by the use of a sufficiently stiff well, we recommend the values given in Table 2 not be exceeded.

Table 1: Pressure Rating versus Temperature

Thermowell Material	Temperature in Degrees Fahrenheit						
	70°F	200°F	400°F	600°F	800°F	1000°F	1200°F
	Pressure Rating (Pounds per Square Inch)						
Brass	5000	4200	1000	-	-	-	-
Welded 304 S.S.	982	820	675	604	550	510	299
304 S.S.	7000	6200	5600	5400	5200	4500	1650
316 S.S.	7000	7000	6400	6200	6100	5100	2500

**Table 2:
Maximum Fluid Velocity versus Insertion Length**

Thermowell Material	Fluid Type	Insertion Length (inches)		
		1-2"	1-4"	1-8"
		Maximum Fluid Velocity (Feet per Second)		
Brass	Air/Steam	207	75.5	27.3
	Water	59.3	32.2	19.7
Welded 304 S.S.	Air/Steam	169	61	20
	Water	88	20	10
304 S.S.	Air/Steam	300	109	39.5
	Water	148	82.2	-

The values shown in Table Two are based on operating temperatures of 350°F for brass and 1,000°F for stainless steel (S.S.). Slightly higher velocities are possible at lower temperatures.

Leak Detectors

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Features & Options

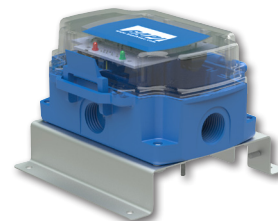
- Detection Within 5 Seconds with Local LED Alarm Indication
- 5 Amp or 0.5 Amp Relays @ 30VAC/DC
- One Piece, Rope or Remote Sensor Design
- NEMA 4 Enclosure

The Water Leak Detector is designed to sense the presence of water and alert a central monitoring system of the potentially destructive situation. Upon water detection, the alarm relays change state, and a local red LED illuminates. The transmitter can be set for latching or non-latching alarm, and normally energized or normally de-energized operation.

Detector with Remote Sensor



Detector with Attached Sensor



Detector with Rope Sensor



Specifications

Power: 24VAC/VDC +/- 10%
 5 Amp Relays: 4 Watt/ 4 VA max
 0.5 Amp Relays: 2 Watt/ 2 VA max (not intended to switch a load)

Wiring: Flex Connector or Liquid Tight Fitting
 Relays.....Up to 6 wires for Alarm Contacts
 Transmitter2 wires for Power

Sensor:

AttachedSS probe w/ adjustable depth screw from 0.063 to 0.84"
 Remote Sensor w/ adjustable depth from 0.062 to 0.5", Mounts to pan with industrial adhesive tape or 0.172" mounting holes
 Rope Long Line Wire Sensor, Plenum Rated.
 Detects 1/8" of water over the full length.

Alarm Contacts:

LDT1:..... One SPST, 0.5A relay output, 10W max.
LDT2:..... Two SPST, 0.5A relay outputs, 10W max.
LDT3: One SPDT, 5A relay output
LDT4:..... Two SPDT, 5A relay outputs

Indication: 1 Green Power LED, 1 Red Alarm LED

Reset Action: If latching, local pushbutton or power interrupt

Termination: Terminal Strip, 12 to 24 AWG

Latching and Supervised Relay Options:

Latching..... Relay stays in alarm until manually reset or power is cycled
 Non-Latching.. Relay automatically resets after water is removed (default)
 Unsupervised.. Relay energizes on water detection
 Supervised..... Relay de-energizes on water detection (default)
 Note: Relay de-energizes on loss of power

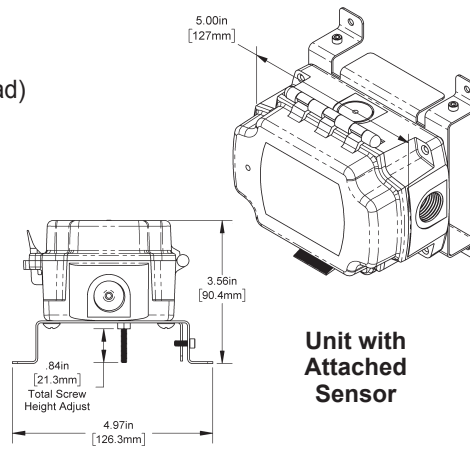
Enclosure Ratings:

Remote Sensor.. Submersible, with FEP plenum-rated, waterproof cable
 Detector..... BAPI-Box, NEMA 4 Polycarbonate Enclosure

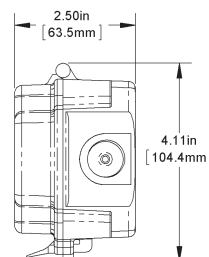
Ambient:

Remote Sensor..... -40 to 185°F (-40 to 85°C), 0 to 100%RH, Condensing
 Rope Sensor..... 32 to 167°F (0 to 75°C), 0 to 95%RH, Non-condensing
 Detector (BB)..... -40 to 185°F (-40 to 85°C), 0 to 95%RH, Non-condensing

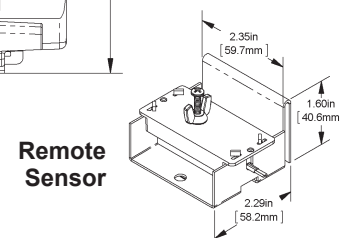
Agency: RoHS, UL94V-0 , UV-rated in Enclosure



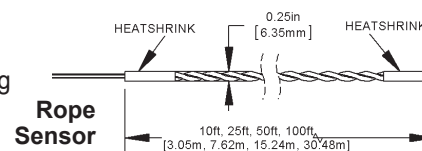
Unit with Attached Sensor



Unit with Remote or Rope Sensor



Remote Sensor



Rope Sensor





Water Leak Detector Option Selection Guide

BA/ (#1) - (#2) - (#3)

#1: Leak Detector Transmitter (required)

- LDT1..... Water leak detector transmitter w/ one 0.5A SPST contacts
- LDT2..... Water leak detector transmitter w/ two 0.5A SPST contacts
- LDT3..... Water leak detector transmitter w/ one SPDT 5A contacts
- LDT4..... Water leak detector transmitter w/ two SPDT 5A contacts

#2: Probe Sensor (required)

- PS..... Probe Sensor built into the enclosure
- RS5..... Remote Spot Sensor with 5 foot FEP cable
- RS10..... Remote Spot Sensor with 10 foot FEP cable
- RS25..... Remote Spot Sensor with 25 foot FEP cable
- RR10 Remote Rope Sensor with 10 foot Plenum Rated Sensor Cable
- RR25 Remote Rope Sensor with 25 foot Plenum Rated Sensor Cable
- RR50 Remote Rope Sensor with 50 foot Plenum Rated Sensor Cable
- RR100 Remote Rope Sensor with 100 foot Plenum Rated Sensor Cable

#3: Enclosure and Fitting Options (required)

- BB..... BAPI-Box enclosure, IP66 rated
- BB-LTF BAPI-Box enclosure, IP66 rated, w/ Liquid tight fitting
- BB-GFF BAPI-Box enclosure, IP66 rated, w/ flex connector

Submittal sheets without List Prices can be downloaded from our website at www.bapihvac.com

Example Number: BA/ (**LDT1**) - (**RR10**) - (**BB**)

Actual Number (with parenthesis removed): BA/LDT1-RR10-BB

Description: Detector with one 0.5A contact, 10' Remote Rope Sensor and BAPI-Box Enclosure

Your Number: BA/

Replacement Remote Spot or Remote Rope Sensors

For use as updates to existing systems or built-in (-PS) probe Sensors

Sensor Type

- BA/RS5..... Remote Spot Water Sensor with 5 foot FEP cable
- BA/RS10..... Remote Spot Water Sensor with 10 foot FEP cable
- BA/RS25..... Remote Spot Water Sensor with 25 foot FEP cable
- BA/RR10..... Remote Rope Sensor with 10 foot Plenum Rated Sensor Cable
- BA/RR25..... Remote Rope Sensor with 25 foot Plenum Rated Sensor Cable
- BA/RR50..... Remote Rope Sensor with 50 foot Plenum Rated Sensor Cable
- BA/RR100..... Remote Rope Sensor with 100 foot Plenum Rated Sensor Cable

Your Number: BA/



AG-1200+

Float Switch System for Metal and Plastic Secondary Pans

The AG-1200+ has all of the features of the 1100+ plus an innovative two-piece clamp design which allows it to be mounted to a metal drain pan (without a lip) or inferior, non-AquaGuard plastic drain pan (with a lip) in 10 seconds or less, without the need for a drain hole in the pan.

Key Features

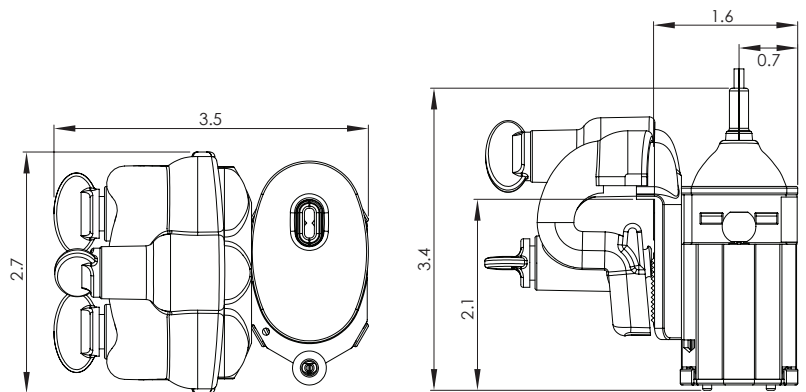
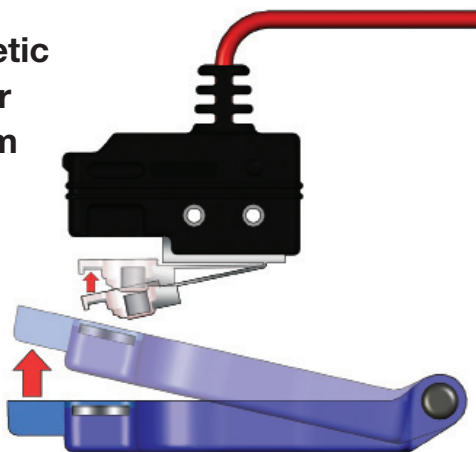
- 5 amp high-capacity sensor designed for metal and plastic pans
- The industry leading float switch for metal and plastic drain pans
- Easy, no-drill installation
- Protective housing keeps out insulation and debris
- NEW Open circuit wiring option



Product Specs

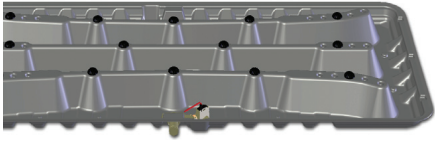
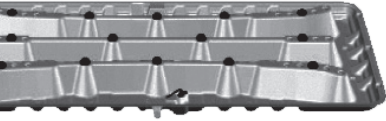
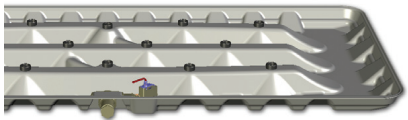
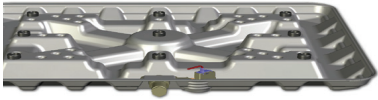
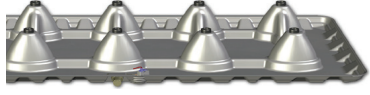


- UL LISTED (UL 508)
- NORMALLY CLOSED OR NORMALLY OPEN
- VERTICAL TRIGGER DEPTH OF 3/4 INCH
- VOLTAGE RATING: 24VAC, 5.0A

Magnetic Trigger System



DRAIN PAN SELECTION CHART



Secondary Pan Model	Pan Size	External Pan Size			Max Unit Size		Recommended Application
Goliath Series							
		<u>Width</u>	<u>Length</u>	<u>Height</u>	<u>Width</u>	<u>Length</u>	Hangable When additional clearance is needed under air handler for drain. General Purpose for both furnace and air handler installation.
	30x50	30.25"	50.50"	4.00"	27.25"	47.50"	
	30x62	30.38"	63.00"	4.25"	27.38"	60.00"	
	28x57	28.38"	57.25"	5.25"	25.38"	54.25"	
	28x69	28.25"	69.13"	4.25"	26.00"	66.50"	
	30x66	30.25"	66.50"	4.00"	27.25"	64.00"	
Goliath Value Series							
		<u>Width</u>	<u>Length</u>	<u>Height</u>	<u>Width</u>	<u>Length</u>	Non-Hangable General purpose for air handler installation.
	30x50	30.25"	50.50"	4.00"	27.25"	47.5"	
	30x62	30.38"	63.00"	4.25"	27.38"	60.00"	
	30x66	30.25"	66.50"	4.00"	27.25"	64.00"	
Goliath Low Profile							
	26x56	26.50"	56.63"	2.75"	23.50"	53.63"	Hangable When space is at a minimum in a garage or attic.
Goliath Furnace Series							
	30x36	30.50"	37.50"	3.00"	27.50"	34.50"	Non-Hangable For Vertical, upflow installation of furnace or air handler.
Goliath Furnace Series							
		<u>Width</u>	<u>Length</u>	<u>Height</u>	<u>Width</u>	<u>Length</u>	Non-Hangable When greater clearance height is needed to accommodate piping under furnace.
	34x64	34.13"	64.13"	7.50"	31.13"	61.13"	
	34x79	33.75"	79.00"	7.50"	30.75"	76.00"	
Titan Flexible Series							
		<u>Width</u>	<u>Length</u>	<u>Height</u>	<u>Width</u>	<u>Length</u>	Non-Hangable Flexible and durable enough to bend and fit into tight spaces.
	24x24	24.00"	24.00"	2.25"	20.00"	20.50"	
	26x26	26.00"	26.00"	2.25"	22.00"	22.50"	
	30x30	30.00"	30.00"	2.25"	26.00"	26.50"	
	32x32	32.00"	32.00"	2.25"	28.00"	28.50"	
Titan Flexible Series							
		<u>Width</u>	<u>Length</u>	<u>Height</u>	<u>Width</u>	<u>Length</u>	Hangable Flexible and durable enough to bend and fit into tight spaces.
	30x50	30.25"	50.50"	2.50"	27.25"	47.50"	
	30x62	30.38"	63.00"	2.50"	27.38"	60.00"	



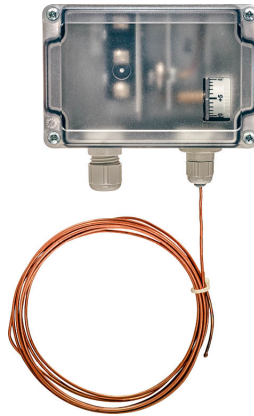
Peripherals and Accessories

(This page is hyperlinked to the TOC)

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Low Temperature Detection Sensor

For monitoring the temperatures of water/air heaters in ventilation and air conditioning systems to prevent frost damage to the cooling registers. Manual or automatic reset versions and adjustable setpoints. The frost alarm is provided with a 1-pole changeover switch.


Type Overview

Type	Output signal temperature switch	Additional features	Probe length
01DTS-504	changeover	Auto reset	10 ft [3 m]
01DTS-504X	changeover	Manual reset	10 ft [3 m]
01DTS-505	changeover	Auto reset	20 ft [6 m]
01DTS-505X	changeover	Manual reset	20 ft [6 m]

Technical Data

Electrical Data	Cable entry	Cable gland cap nut with strain relief Ø6...8 mm
Functional Data	Output signal switch note	1x SPDT (4A @ AC/DC 24V)
	Application	air
Measuring Data	Measuring values	temperature
	Measuring range temperature	15...60°F [-10...15°C]
	Accuracy temperature active	±0.9°F [±0.5°C]
Materials	Cable gland	PA6, gray
	Housing	Base: ABS, gray seal: 0467 NBR70, black cover ABS, transparent
	Probe material	Copper/vapor filled R507
Safety Data	Ambient humidity	max. 95% r.H., non-condensing
	Ambient temperature	-30...160°F [-35...70°C]
	Fluid temperature	-30...120°F [-35...50°C]
	Protection class IEC/EN	III protective extra-low voltage (peIv)
	EU Conformity	CE Marking
	Certification IEC/EN	IEC/EN 60730-1
	Degree of protection IEC/EN	IP65
	Degree of protection NEMA/UL	NEMA 4
	Quality Standard	ISO 9001

Safety Notes



This device has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application. Unauthorised modifications are prohibited. The product must not be used in relation with any equipment that in case of a failure may threaten humans, animals or assets.

Ensure all power is disconnected before installing. Do not connect to live/operating equipment.

Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.

The device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

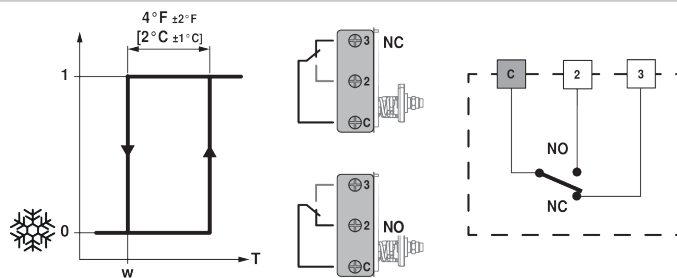


During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Scope of delivery

Scope of delivery	Description	Type
	Mounting kit, with mounting brackets	A-22D-A08

Wiring Diagram

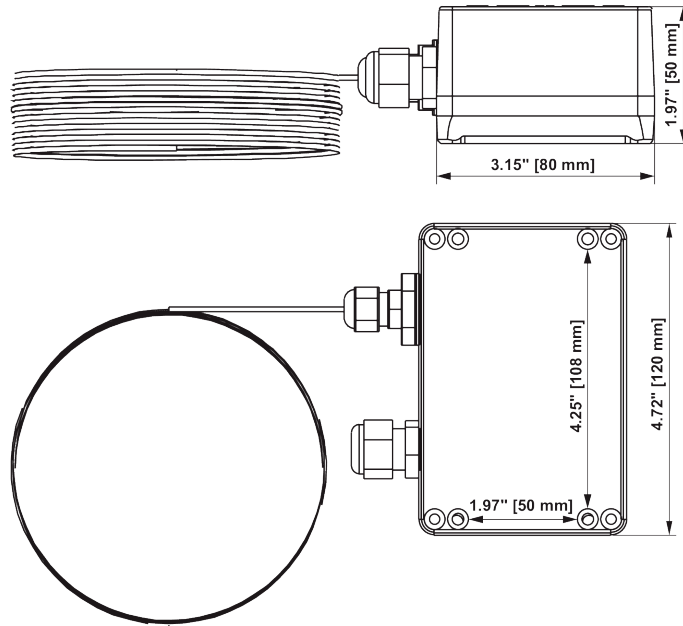


set point range (factory setting 41°F [5°C])

If the capillary leaks, the switch changes to the frost position.

Dimensions

Dimensions

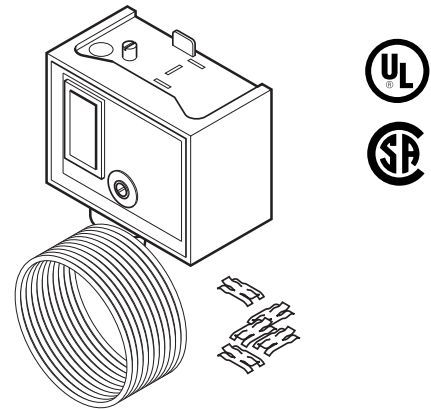


Type	Probe length	Weight
01DTS-504	10 ft [3 m]	0.89 lb [0.41 kg]
01DTS-504X	10 ft [3 m]	0.89 lb [0.41 kg]
01DTS-505	20 ft [6 m]	1.01 lb [0.46 kg]
01DTS-505X	20 ft [6 m]	1.01 lb [0.46 kg]

Application

The TC-5231, TC-5232, and TC-5241 low temperature thermostats are used to control temperature in air conditioning or refrigeration systems. The low temperature thermostat measures the coldest one-foot section along the entire 20-foot sensing element.

The low temperature thermostats are applicable to various applications such as: low temperature control of steam coils; frost indication in storehouses or orchards; temperature control of freezer cabinets, display cases, beverage coolers, milk cooling tanks, and air conditioners.



Features

- 20 ft. (6.1 m) element senses temperature over a large area. Control responds to coldest one-foot section of the sensor.
- Adjustable setpoint from 35 to 60°F (1.7 to 15.5°C) with 5°F (3°C) fixed differential.
- SPDT and DPST versions.
- Rated for use at 17 full load amps (120/208/240 Vac), 24 non-inductive amps (120/208/240 Vac), and 16 non-inductive amps (24 Vac). Capable of controlling refrigeration equipment directly.
- UL and CSA approved.
- Capillary clips provided.

Applicable Literature

- Electric/Electronic Products Catalog, F-27382
- Environmental Controls Application Manual, F-21335

SPECIFICATIONS

Setpoint Dial Range: Dual marked 35 to 60°F (1.7 to 15.5°C).

Sensing Element: Vapor pressure type, copper construction.

Response: To lowest temperature sensed by any one-foot section of its element. Altitude causes the control to operate approximately 1°F colder per 1000 ft. of elevation.

Differential: 5°F (3°C) fixed.

Electrical Switch: Snap action SPDT or DPST. Refer to Table-1.

Ratings, Refer to Table-1 and Table-2.

Connections:

TC-52xx, Screw terminals.

Mounting: In any position on any surface not subject to excessive vibration.

Housing: Molded gray PVC plastic cover with a zinc-plated steel main enclosure with a 1/2 in. conduit opening.

Ambient Temperature Limits:

Shipping and Storage, -40 to 150°F (-40 to 66°C).

Operating, Must be 5°F (3°C) above setpoint to a maximum of 150°F (66°C) at case.

Thermal Sensing Element, 300°F (149°C).

Humidity:

Enclosure, 5 to 95% RH, non-condensing.

Thermal Sensing Element, 0 to 100% RH.

Enclosure Rating: NEMA Type 1.

Dimensions:

Case, 2.7 H x 3.44 W x 1.97 D in. (69 x 87 x 50 mm).

Element, 3/32 in. O.D. x 20 ft. length (2.4 mm x 6.1 m).

Agency Approvals: UL 873 Temperature-Indicating and -Regulating Equipment and CSA Certified.

Table-1 Model Chart.

Model Number	Device Type	Electrical Switch	Voltage Vac	Full Load Amps	Locked Rotor Amps	Pilot Duty (VA)	Non-Inductive Amps
TC-5231	Low temp auto reset	SPDT ^e	24 ^a	—	—	100	16
			120	17	102	720	24
			208				
			240 ^c				
			277	—	—	—	7.2
TC-5232	Low temp auto reset	DPST ^d	24 ^a	—	—	100	16
			120 ^c	24	144	125	24
			208 ^c				
			240 ^c				
			277	—	—	—	7.2
TC-5241	Low temp manual reset ^b	SPDT ^e	24 ^a	—	—	100	16
			120	17	102	720	24
			208				
			240 ^c				
			277	—	—	—	7.2

^a Less than 0.5 Amp is not recommended.

^b Reset cannot be accomplished until the sensed temperature is at least 5°F above setpoint.

^c Full load and locked rotor ratings are suitable for hermetic compressors only.

^d Limit two separate circuit loads with common return to < 5885 VA. Only one load may be a motor load.

^e Do not exceed pilot duty rating on one side of switch.

Table-2 DC Ratings for TC-5232 Only.

Volts	FLA	LRA	NIA	PD VA
120	4.6	46	3	57.5
240	2.3	23	0.5	57.5
600	—	—	—	57.5

TYPICAL APPLICATIONS (wiring diagrams)

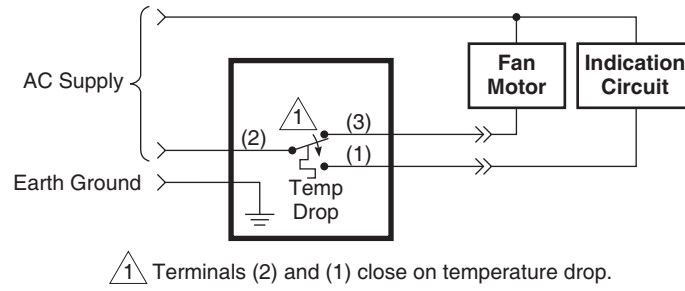
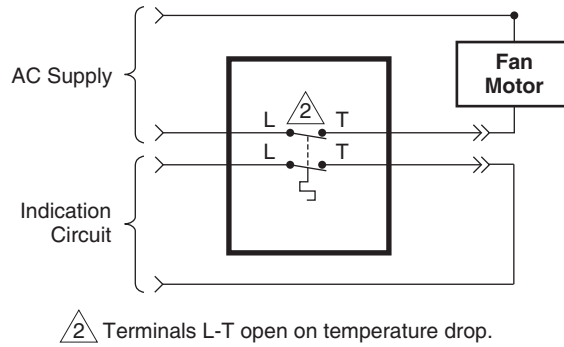


Figure-1 TC-5231 and TC-5241 Typical Application.



Note: Contacts are not rated for dry circuit applications.
Less than 1 Amp is not recommended.

Figure-2 TC-5232 Typical Application.

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Job wiring diagrams
- Tools (not provided):
 - Voltage meter/indicator
 - Appropriate drill and drill bit for mounting screws
 - Appropriate screwdrivers and wrenches
- Mounting screws, two (2) #10 maximum (not provided)
- Capillary mounting clips (5 provided)
- Training: Installer must be a qualified, experienced technician



▼ **WARNING**

- The TC-5231 series, TC-5232, and TC-5241 series devices are designed for use *only* as operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) that protect against, or systems (alarm, supervisory systems) that warn, of control failure.
 - Disconnect the power supply (line power) before and during installation to prevent possible electrical shock and equipment damage.
 - Make all connections in accordance with the wiring diagram and in accordance with the National and Local Electrical Code. *Use copper conductors only.*
 - Do not restore electrical power until installation is complete.
-

▼ **CAUTION**

- Do not exceed the electrical ratings indicated on the label inside the cover of the device.
 - Avoid locations where excessive moisture, corrosive fumes, or vibration are present. Use only in locations suitable for NEMA Type 1 rated devices.
-

Mounting

▼ **CAUTION**

- Do not kink the capillary or the thermostat will be damaged.
 - To achieve optimum performance, do not mount the thermal element in a vertical pattern.
-

1. Select a location that permits proper capillary routing. It is important not to twist or strain the control body or shifting of the calibration may result.

NOTE

- Use only the mounting holes provided in the control frame. Make sure the mounting surface is flat. Mounting the device to an uneven surface may cause improper control operation.
 - Do not let any part of the capillary touch any surface that is colder than the desired sensing area.
 - Do not crush or deform the sensing element when clamping.
 - Do not cut the capillary or bulb. Avoid sharp bends, kinks, strains, or pinch marks in the capillary. Never allow the capillary to rest against sharp edges or rub against metal surfaces.
-

2. Provide a drip loop in the capillary if the body is mounted in any position other than upright. The thermal element is usually located on the downstream side of the coil.
3. Allow slack so that the capillary is not taut. Install the thermal element securely in the controlled media for maximum sensing capability and minimum vibration damage.
4. Serpentine the element in a horizontal pattern so that it is exposed to all areas where low temperatures are possible. See Figure-3.
5. Secure the element into place using the five capillary clips provided.
6. Remove the cover. See Figure-4.
7. Mount the case with two screws (#10 maximum) in the screw slots in the back of the case. See Figure-6.
8. Connect the appropriate wiring. Follow the wiring instructions in the Wiring section.

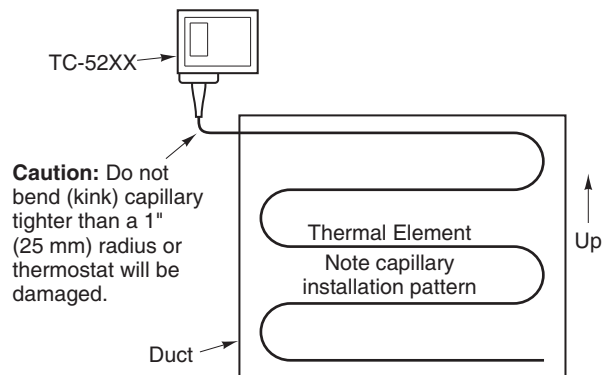


Figure-3 Thermal Element Location.

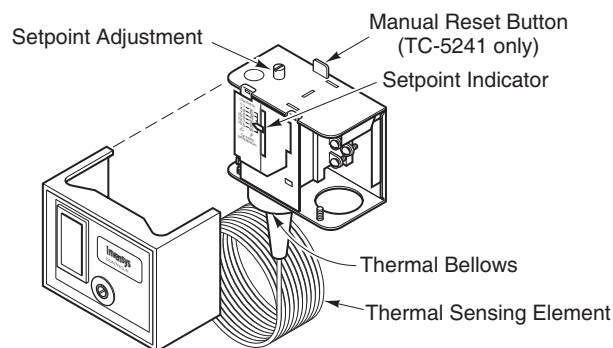


Figure-4 TC-52xx with Cover Removed.

Wiring

NOTE

Do not adjust the pointer beyond the highest and lowest marks on the scaleplate. The scaleplate is only for reference, and the final settings should be verified with a thermometer.

▼ CAUTION

The terminals must not be bent, cut off, drilled, or retapped.

1. Provide a drip loop in the wiring to prevent water from reaching the thermostat.
2. Loosen the green grounding screw provided on the TC-52xx case to connect the unit to earth ground.
3. Loosen the terminal screws and make the appropriate power wiring connections to the numbered terminals. The TC-52xx case has an opening for a 1/2 in. conduit fitting. See Figure-1 and Figure-2 for TC-52xx models.
4. Replace the cover.
5. Adjust the setpoint by turning the setpoint screw until the scale pointer is properly positioned.
6. Check for proper operation of the device. Follow the instructions in the Checkout section.
7. At initial start-up of the equipment, observe the capillary for excessive vibration and make corrections as required.

CHECKOUT

▼ CAUTION

The unit includes a mechanical stop to prevent adjustment below 35°F (2°C). Do not attempt to set below 35°F (2°C), or the device may be damaged.

1. If the ambient temperature at the thermal element is within the 35 to 55°F (2 to 13°C) setpoint range, turn the adjustment screw located in the top of the case until the setpoint exceeds the ambient temperature. Confirm that the snap acting switch has operated.
2. Turn the setpoint adjustment screw until the indicating pointer is at the desired setpoint temperature.
3. On the TC-5241 model, push the manual reset button to put the thermostat into service.

Manual Operation of Switch

▼ CAUTION

- When the sensed temperature is below setpoint, the switch is open (terminals 2–3 on TC-52x1 and terminals L–T on TC-5232), and the tab at the end of the bellows lever is down. The switch can be momentarily closed by lifting the tab with a screwdriver. See Figure-5.
- Do not attempt to manually operate the thermostat in any other way as this can damage equipment and void the warranty.

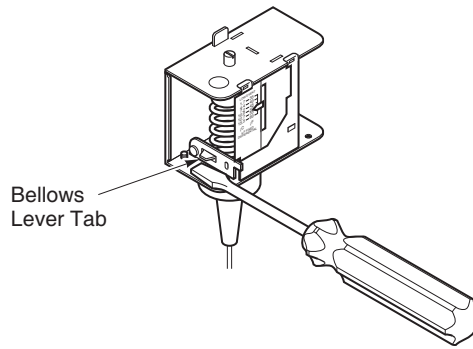


Figure-5 Manual Operation of Switch on TC-5231 and TC-5241.

CALIBRATION

All thermostats are precision calibrated at the factory.

REPAIR

This thermostat is not field repairable. Replace the device if necessary.

DIMENSIONAL DATA

Dimensions are shown in inches (millimeters).

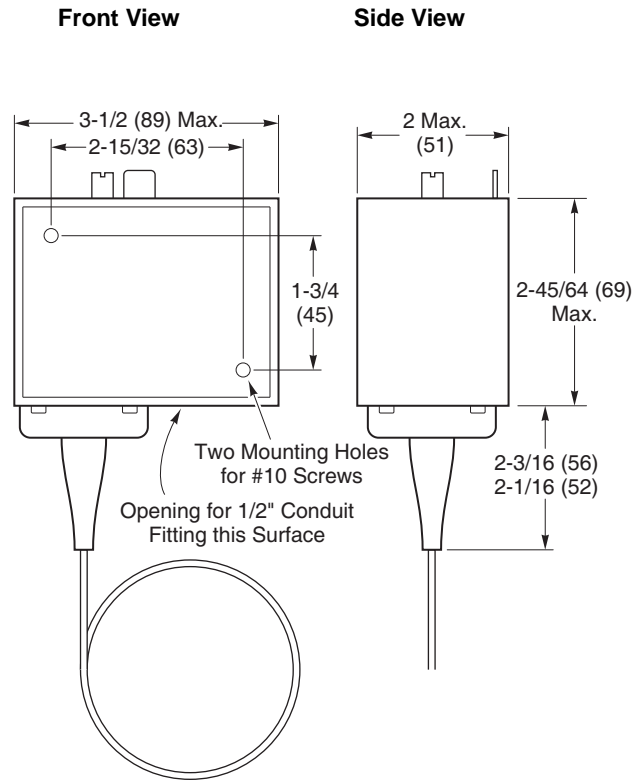


Figure-6 TC-52xx Mounting Dimensions.

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FEATURES

- Push, twist, keyed, or break glass switch
- Standard and custom labeling available
- Optional clear hinged cover
- Multiple depths available for different contact points
- 16 gauge steel or plastic construction
- Surface or flush mounted
- 600V rated insulation voltage
- 10 amp rated thermal current

Quickly disconnect systems in an emergency with a modular switch station specially tailored to your application.

Our wide array of Emergency Switch Boxes allow you to select the right labeling, switch style, and construction that provides the perfect solution for the occupants you're protecting to quickly and effectively react to an emergency situation. With models suitable for indoor or outdoor applications in multiple sizes that can each be customized with your choice of contact block and optional cover, you'll be hard-pressed to not find the exact switch you need in this extensive line.



CONTACT BLOCKS (NOT INCLUDED WITH STATION)

Standard breakglass station box holds 2 max, plastic box holds 2 max, and metal box holds 4 max

Part #	Description
SAENOCB	Normally open contact block
SAENCCB	Normally closed contact block

EMERGENCY HVAC STATIONS

Part #	Label	Construction	Mount	NEMA Rating	Switch
HVAC120	HVAC SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
HVAC120-MT4	HVAC SHUT-DOWN	Deep Plastic	Surface	4 (Weatherproof)	Push/Pull
HVAC120-TWIL24R	HVAC SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	24V LED Push/Turn
HVAC120F	HVAC SHUT-DOWN	Steel	Flush	4 (Weatherproof)	Push/Pull
HVAC120F-KR	HVAC SHUT-DOWN	Steel	Flush	4 (Weatherproof)	Push/Key
HVAC120F-MO-IL	HVAC SHUT-DOWN	Steel	Flush	4 (Weatherproof)	24V LED Push/Pull
HVAC120FN1	HVAC SHUT-DOWN	Steel	Flush	1 (Indoor)	Push/Pull
HVAC120FWB-KR	HVAC SHUT-DOWN	Steel	Flush	1 (Indoor)	Push/Key
HVAC120FWB-TW	HVAC SHUT-DOWN	Steel	Flush	1 (Indoor)	Push/Turn
HVAC120MT4IL24R	HVAC SHUT-DOWN	Deep Steel	Surface	4 (Weatherproof)	24V LED Push/Pull
HVAC120N1	HVAC SHUT-DOWN	Steel	Surface	1 (Indoor)	Push/Pull

BOILER SHUT DOWN STATIONS

Part #	Label	Construction	Mount	NEMA Rating	Switch
BSD120	BOILER SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
BSD120-KR	BOILER SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Key
BSD120-MO	BOILER SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Momentary
BSD120-TW	BOILER SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Turn
BSD120FN1	BOILER SHUT-DOWN	Steel	Flush	1 (Indoor)	Push/Pull
BSD120N1	BOILER SHUT-DOWN	Steel	Surface	1 (Indoor)	Push/Pull
BSD120N1-MO	BOILER SHUT-DOWN	Steel	Surface	1 (Indoor)	Push/Momentary
BSD120N1-TW	BOILER SHUT-DOWN	Steel	Surface	1 (Indoor)	Push/Turn
BSD120N4	BOILER SHUT-DOWN	Steel	Surface	4 (Weatherproof)	Push/Pull

FUEL SHUT OFF STATIONS

Part #	Label	Construction	Mount	NEMA Rating	Switch
FS120	FUEL SHUT-OFF	Plastic	Surface	4 (Weatherproof)	Push/Pull
FS120FN1	FUEL SHUT-OFF	Steel	Flush	1 (Indoor)	Push/Pull
FS120N1	FUEL SHUT-OFF	Steel	Surface	1 (Indoor)	Push/Pull

EMERGENCY ELECTRICAL DISCONNECT STATIONS

Part #	Label	Construction	Mount	NEMA Rating	Switch
ST120ES	EMERGENCY STOP	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120ES-TW	EMERGENCY STOP	Plastic	Surface	4 (Weatherproof)	Push/Turn
ST120ESFN1	EMERGENCY STOP	Steel	Flush	1 (Indoor)	Push/Pull
ST120ESFWB-KR	EMERGENCY STOP	Steel	Flush	1 (Indoor)	Push/Key
ST120ESFWB-TW	EMERGENCY STOP	Steel	Flush	1 (Indoor)	Push/Turn
ST120ESN1	EMERGENCY STOP	Steel	Surface	1 (Indoor)	Push/Pull
ST120ESN1-KR	EMERGENCY STOP	Steel	Surface	1 (Indoor)	Push/Key
ST120ESN1-TW	EMERGENCY STOP	Steel	Surface	1 (Indoor)	Push/Turn
ST120ESO	EMER SHUT-OFF	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120ESON1	EMER SHUT-OFF	Steel	Surface	1 (Indoor)	Push/Pull
ST120FN1	EMER ELEC DISC	Steel	Flush	1 (Indoor)	Break Glass
ST120FN1-BP2	EMER ELEC DISC	Steel	Flush	1 (Indoor)	Break Glass/Push
ST120FN1-SL-BSD	BOILER SHUT DOWN	Steel	Flush	1 (Indoor)	Break Glass
ST120FN1-SL-HSD	HVAC SHUT DOWN	Steel	Flush	1 (Indoor)	Break Glass
ST120FN1SLHSBP2	HVAC SHUT DOWN	Steel	Flush	1 (Indoor)	Break Glass/Push
ST120PB	EMER POWER OFF	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120PBFWB	HVAC POWER OFF	Steel	Flush	1 (Indoor)	Push/Pull
ST120SL-SL-BS	BOILER STOP	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-BSD	BOILER SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-CSD	CHILLER SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-EXH	EXH FAN SHT-DWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-EXH3	EXH FAN 3 SHTDWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-FAN	EMER EXHAUST FAN	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-HESO	HVAC EMER SHUT OFF	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-HSN	HVAC SHUT-DOWN	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-RPG	REFRIGERANT PURG	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-SO	EMER SHUT-OFF	Plastic	Surface	4 (Weatherproof)	Push/Pull
ST120SL-SL-VSTR	EMER VENTI START	Plastic	Surface	4 (Weatherproof)	Push/Pull

EMERGENCY ELECTRICAL DISCONNECT STATIONS (CONTINUED)

Part #	Label	Construction	Mount	NEMA Rating	Switch
ST120SLF-SL-BSD	BOIL SHUT-DOWN	Steel	Flush	4 (Weatherproof)	Push/Pull
ST120SLFN1SLBSD	BOIL SHUT-DOWN	Steel	Flush	1 (Indoor)	Push/Pull
ST120SLFN1SLCS	CHILLER STOP	Steel	Flush	1 (Indoor)	Push/Pull
ST120SLFN1SLESD	EMER SHUT-DOWN	Steel	Flush	1 (Indoor)	Push/Pull
ST120SSLFN1SLHSD	HVAC SHUT DOWN	Steel	Flush	1 (Indoor)	Push/Pull
ST120SLFN1SLODS	O/A DAM SHT-DWN	Steel	Flush	1 (Indoor)	Push/Pull
ST120SLFN1SLVS	VENTILATION STOP	Steel	Flush	1 (Indoor)	Push/Pull
ST120SLN1-SL-BD	BOIL SHUT DOWN	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-BS	EMER BOIL STOP	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-CS	CHILLER STOP	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-FP	FLOOD PREVENTION	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-FS	FUEL SHUT-OFF	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-HR	EME HRC-1 STOP	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-HS	HVAC SHUT DOWN	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-IM	INFECT MODE	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-SD	EMER SHUT DOWN	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-SO	EMER SHUT-OFF	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-ST	SMOKE TUNNEL STP	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN1-SL-VS	VENTILATE STOP	Steel	Surface	1 (Indoor)	Push/Pull
ST120SLN-SL-VT	VENTILAT START	Steel	Surface	1 (Indoor)	Push/Pull
ST120SN1	EMER ELEC DISC	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-BP1	EMER ELEC DISC	Steel	Surface	1 (Indoor)	Break Glass/Push
ST120SN1-BP2	EMER ELEC DISC	Steel	Surface	1 (Indoor)	Break Glass/Push
ST120SN1-MT1	EMER ELEC DISC	Deep Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-BDC	BOIL DISCONNECT	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-BSD	BOIL SHUT DOWN	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-CS	CHILLER STOP	Steel	Surface	1 (Indoor)	Break Glass
ST120SN-SL-CSD	CHILLER SHUT DW	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-EF1	EF-1 HIGH SPED	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-EF2	EF-2 HIGH SPED	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-EVS	EMER VENT STAR	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-FAN	EMER EXHST FAN	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-VFS	VENT FAN START	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1-SL-VSS	VENT SYS SHDWN	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1SLBSDB1	BOIL SHUT DOWN	Steel	Surface	1 (Indoor)	Break Glass
ST120SN1SLBSBD2	BOIL SHUT DOWN	Steel	Surface	1 (Indoor)	Break Glass

EMERGENCY ELECTRICAL DISCONNECT STATIONS (CONTINUED 2)

Part #	Label	Construction	Mount	NEMA Rating	Switch
ST120SN1SLFANB1	EMER FAN SH DW	Steel	Surface	3R (Outdoor)	Break Glass
ST120SN1SHSDB1	HVAC SHUT DOWN	Steel	Surface	3R (Outdoor)	Break Glass
ST120SN1SLHSDB2	HVAC SHUT DOWN	Steel	Surface	4 (Weatherproof)	Break Glass/Push
ST120SN1SLSDBP2	EMER SHUT DOWN	Steel	Surface	4 (Weatherproof)	Break Glass/Push
ST120SN3-SL-BSD	BOIL SHUT DOWN	Steel	Surface	4 (Weatherproof)	Break Glass/Push
ST120SN3-SL-GSP	GENERATOR STOP	Steel	Surface	4 (Weatherproof)	Break Glass/Push
ST120SN3R	ELE DISCONNECT	Steel	Surface	4 (Weatherproof)	Break Glass
ST120SN3R-SLVSS	VENT SYS SHDWN	Steel	Surface	4 (Weatherproof)	Break Glass
ST120SN4-BP2	EMER ELEC DISC	Steel	Surface	1 (Indoor)	Break Glass/Push
ST120SN4-SL-CSD	CHIL SHUT DOWN	Steel	Surface	1 (Indoor)	Break Glass
ST120SN4-SL-HSD	HVAC SHUT DOWN	Steel	Surface	1 (Indoor)	Break Glass
ST120SN4SLFSDB1	FAN SHUT DOWN	Steel	Surface	1 (Indoor)	Break Glass/Push
ST120SN4SXSL-BSD	BOILER SHUT DN	Steel	Surface	3R (Outdoor)	Break Glass
ST120SN4XSL-RFL	REFRIGRT LEAK	Steel	Surface	3R (Outdoor)	Break Glass

GENERATOR STOP STATION

Part #	Label	Construction	Mount	NEMA Rating	Switch
GS120N1	GENERATOR STOP	Steel	Surface	1 (Indoor)	Push/Pull

ACCESSORIES

Part #	Description
SAECLHCOV1	Clear polycarbonate cover for steel enclosure
SAECLHCOV1-PVC	Clear polycarbonate cover for plastic enclosure
SAEENS	Spare break glass plate

iStation

Surface Mount Boxes

UL Plenum Rated ISB Surface Mount Box

Features

- Surface Mounting
- Accepts Standard Jacks, Fiber and AV Connections
- Delivers Connectivity to Plenum Areas
- UL Listed for Use in Air Handling Spaces With Jack Installed

Ordering Information

Description	Color	UPC Number	Catalog Number
iStation UL Plenum Rated ISB Surface Mount Box, 2-Port	Office White	662620246369	ISB2OWP

Listings

UL and cUL Listed 1863
ANSI/TIA/EIA-606A compliant
ADA compliant
RoHS Compliant

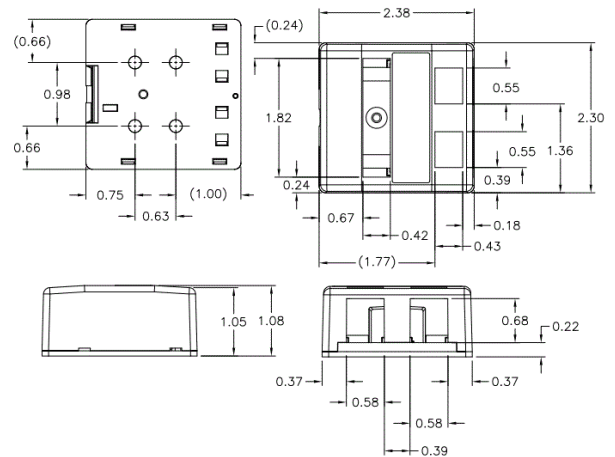
Specifications

Material	High-impact thermoplastic (UL 94V-0)
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Applications

Open office environments
Compact surface mount environments
Retrofits to support data, voice, and multimedia applications
Accepts Hubbell HJ and HXJ jacks and audio/video keystone connectors

HUBBELL



Online Resources

[eCatalog](#)

Dimensions in Inches (mm)

Hubbell Wiring Device-Kellems • Hubbell Incorporated (Delaware) • 40 Waterview Drive • Shelton, CT 06484

Phone (800) 288-6000 • Fax (800) 255-1031 • Specifications subject to change without notice.



HX00 SERIES

On/Off Status Current Switches



Reliable

More reliable for status than relays across auxiliary contacts

Installation flexibility

Removable mounting bracket provides installation flexibility

Ideal for direct-drive units

Ideal for direct-drive units, unit vents, fan coil units, exhaust fans, and other fixed loads

Flexibility

Bracket on H900 can be installed in three different configurations

Low setpoint

Minimum trip point as low as 0.5 A (H608)...avoids the need for multiple wraps of the conductor through the sensor even on loads as small as 1/5 HP

Quick installation

Split-core H300, H600 and H900 for fast retrofit installation

Hawkeye x00 on/off current switches provide a cost-effective solution for monitoring status on unit vents, exhaust fans, recirculation pumps, and other fixed loads where belt loss is not a concern.

Veris has applied new technology to the H300, H600, and H800 models to achieve impressive improvement in turn-on levels. The Hawkeye H300 and H600 have the lowest turn-on current in the industry at a mere 0.15 A!

APPLICATIONS

- Electrical load status
- Direct-drive units, exhaust fans, process motors, and other fixed loads
- Lighting run times and status
- VFD output On/Off status
- Direct-Drive units, unit vents, fan coil units, exhaust fans, and other fixed loads

SPECIFICATIONS

Sensor Power	N.O models: Induced from monitored current; H800NC: 5 to 30 Vdc, permanently connected
Insulation Class	600 Vac RMS (UL), 300 Vac RMS (CE*)
Frequency Range	50/60 Hz, On/Off status for Variable Frequency Drive (VFD) outputs at 12 to 115 Hz (a)
Temperature Range: H800NC, H300, H900	-15 to 60 °C (5 to 140 °F)
H600	-15 to 40 °C (5 to 104 °F) (to 200 A);
H800, H800HV	-15 to 60 °C (5 to 140 °F) (to 150 A) -40 to 50 °C (-40 to 122 °F) (to 200 A); -40 to 75 °C (-40 to 167 °F) (to 100 A, and 0.25 A status output)
Humidity Range	10 to 90% RH non-condensing
Off State Leakage (H800NC Only)	34 µA @ 5 Vdc, 200 µA @ 30 Vdc
On State Voltage Drop (H800NC Only)	1.9 Vdc (max.) @ 0.1 A

Terminal Block Wire Size H600, H800, H900 H300	24 to 14 AWG (0.2 to 2.1 mm ²); 22 to 16 AWG (0.3 to 1.3 mm ²)
Terminal Block Torque H600, H800, H900 H300	3.5 to 4.4 in-lbs (0.4 to 0.5 N-m); 7 in-lbs (0.8 N-m)

WARRANTY

Limited Warranty	5 years
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AGENCY APPROVALS

Agency approvals	UL 508 open device listing; CE: EN61010-1, CAT III, Pollution Degree 2, basic insulation
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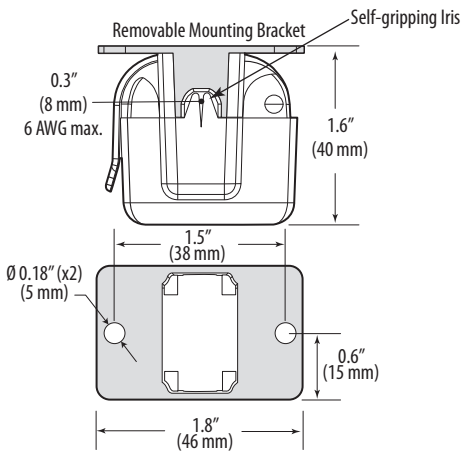
*The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

Note: Do not use the LED status indicators as evidence of applied voltage.

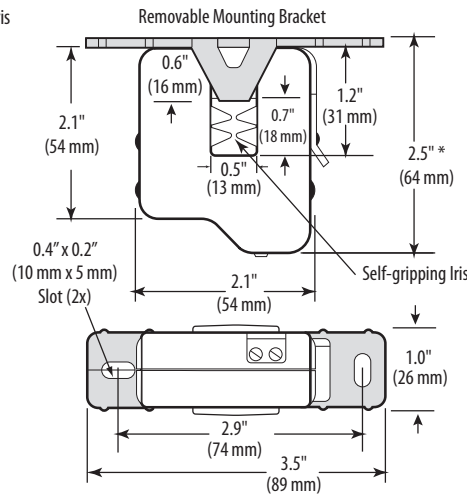
(a) VFD systems generate fields that can disrupt electrical devices. Ensure that these fields are minimized and are not affecting the sensor.



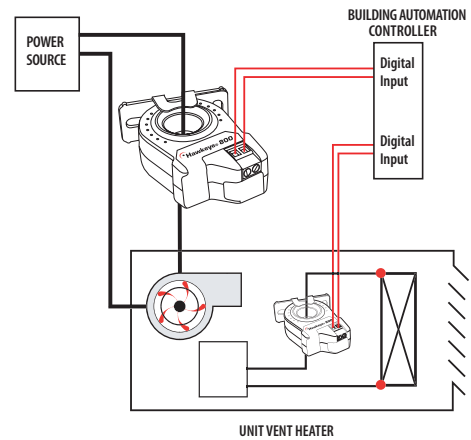
H300
Dimensional Drawing



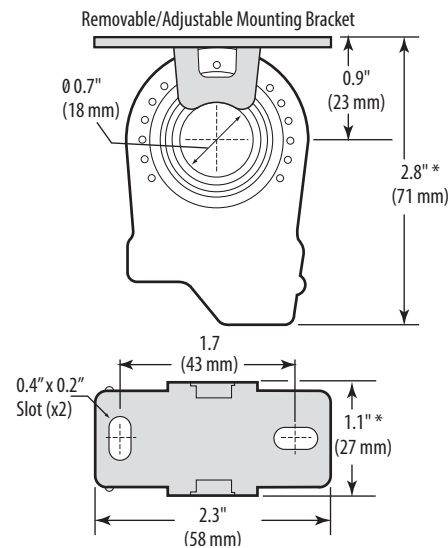
H600
Dimensional Drawing



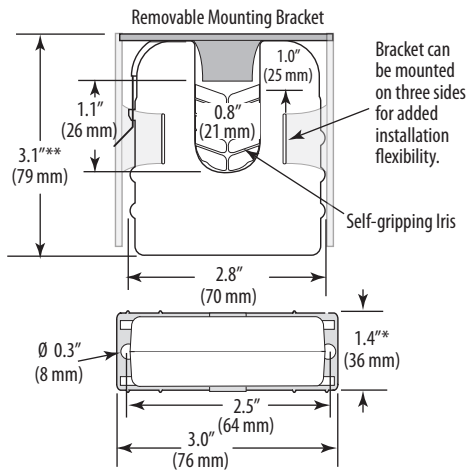
UNIT VENT HEATER CONTROL
Wiring Diagram



H800, H800HV, H800NC
Dimensional Drawing



H900
Dimensional Drawing



* Terminal block may extend up to 1/8" over the height dimensions shown.
** Slide switch may extend up to 1/4" over the height dimensions shown.

ORDERING INFORMATION

MODEL	AMPERAGE RANGE @ 50/60 HZ ONLY	STATUS OUTPUT (MAX.)	TRIP POINT	HOUSING	UL	CE	LEAD FREE
H300	0.15 to 60 A	N.O. 1.0 A @ 30 Vac/dc	0.15 A or less	Split-core	• ²	•	
H600	0.15 to 200 A	N.O. 1.0 A @ 30 Vac/dc	0.15 A or less	Split-core	• ¹	•	
H800	0.25 to 200 A	N.O. 1.0 A @ 30 Vac/dc	0.25 A or less	Solid-core	• ¹	•	
H800NC	0.5 to 200 A	N.C. 0.1 A @ 30 Vdc	0.5 A or less	Solid-core	• ¹		•
H800HV	0.75 to 200 A	N.O. 0.5 A @ 250 Vac/dc	0.75 A or less	Solid-core	• ³		
H900	1.5 to 200 A	N.O. 1.0 A @ 30 Vac/dc	1.5 A or less	Split-core	•	•	

- Listed for use on 75°C insulated conductors.
- Product provides functional insulation only.
- Listed for use on 90°C insulated conductors.



HX22 SERIES

Load Trending with 0 to 5 Vdc Output



The Hawkeye 622-xx, 722, 822, and 922 provide accurate load trending information with a proportional 0 to 5 Vdc output signal. Slide-switches provide easy field selection of monitored amperage range without jumpers (available on some models).

SPECIFICATIONS

Sensor Power	Induced from monitored conductor
Insulation Class	600 Vac RMS (UL), 300 Vac RMS (CE ¹)
Frequency Range	50/60 Hz nominal
Temperature Range	-15 to 60 °C (5 to 140 °F)
Humidity Range	10 to 90% RH non-condensing
Accuracy	±2% F.S. from 10% to 100% (range)
Response Time	2 sec.
Terminal Block Wire Size	24 to 14 AWG (0.2 to 2.1 mm ²)
Terminal Block Torque	3.5 to 4.4 in-lbs (0.4 to 0.5 N-m)

WARRANTY

Limited Warranty	5 years
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AGENCY APPROVALS

Agency Approvals	UL 508 open device listing; CE: EN61010-1, CAT III, Pollution Degree 2, basic insulation
------------------	--



1. The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

Self-powered analog

Self-powered analog current sensor simplifies installation

No external power required

No external power required for sensor

Retrofit

Self-gripping, split-core design for fast retrofit installation...no need to remove conductor (H622-xx, H922)

New construction

Economical solid-core models feature adjustable bracket for easy alignment (H722xC)

Factory calibrated

Factory calibrated ranges for increased flexibility and resolution

No jumpers

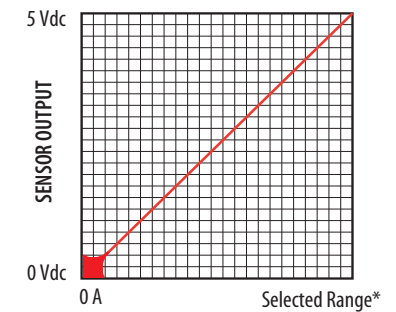
No jumpers on unit...reduces installation error

APPLICATIONS

- Load trending
- Motor control
- Positive proof of flow

EXAMPLE LINEAR OUTPUT

Scale software as shown

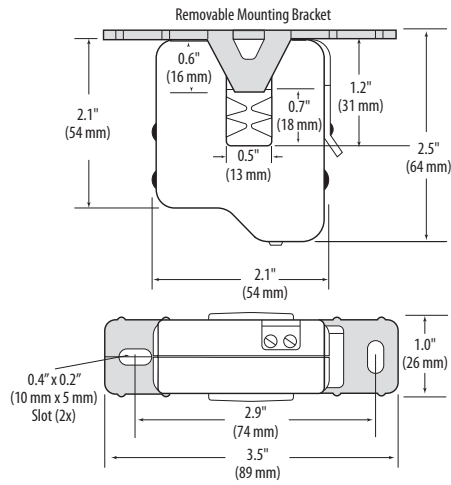


SENSED AMPS
*Factory calibrated ranges selected with the amperage range switch



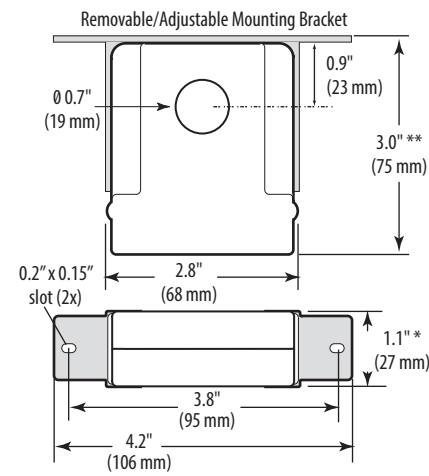
H622-XX

Dimensional Drawing



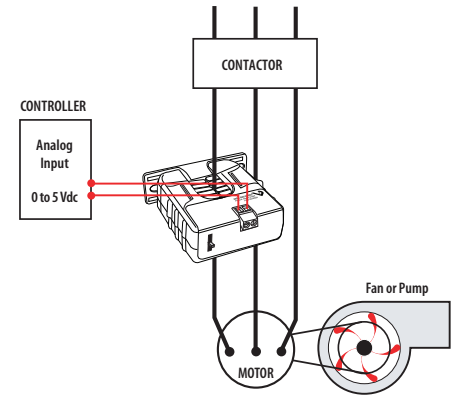
H722LC/H722HC

Dimensional Drawing



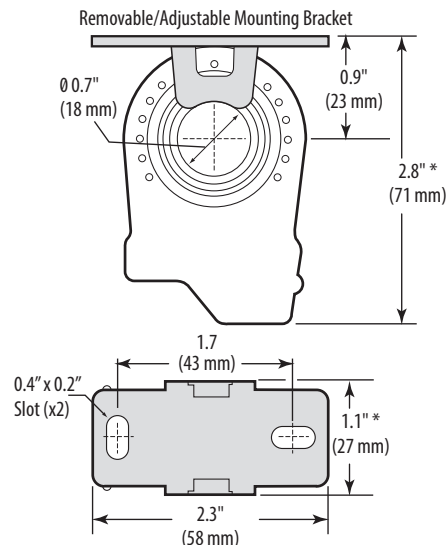
MONITORING FAN /PUMP MOTORS FOR POSITIVE PROOF OF FLOW

Wiring Diagram



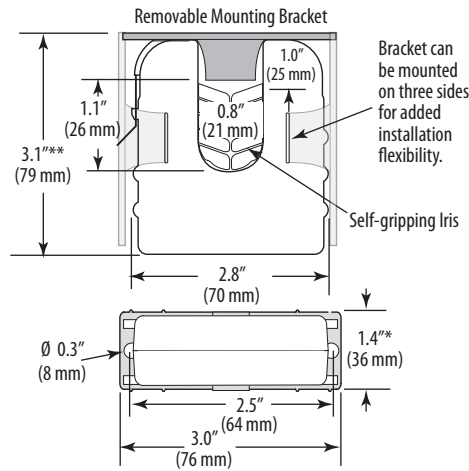
H822/H822-20

Dimensional Drawing



H922

Dimensional Drawing



* Terminal block may extend up to 1/8" over the height dimensions shown.

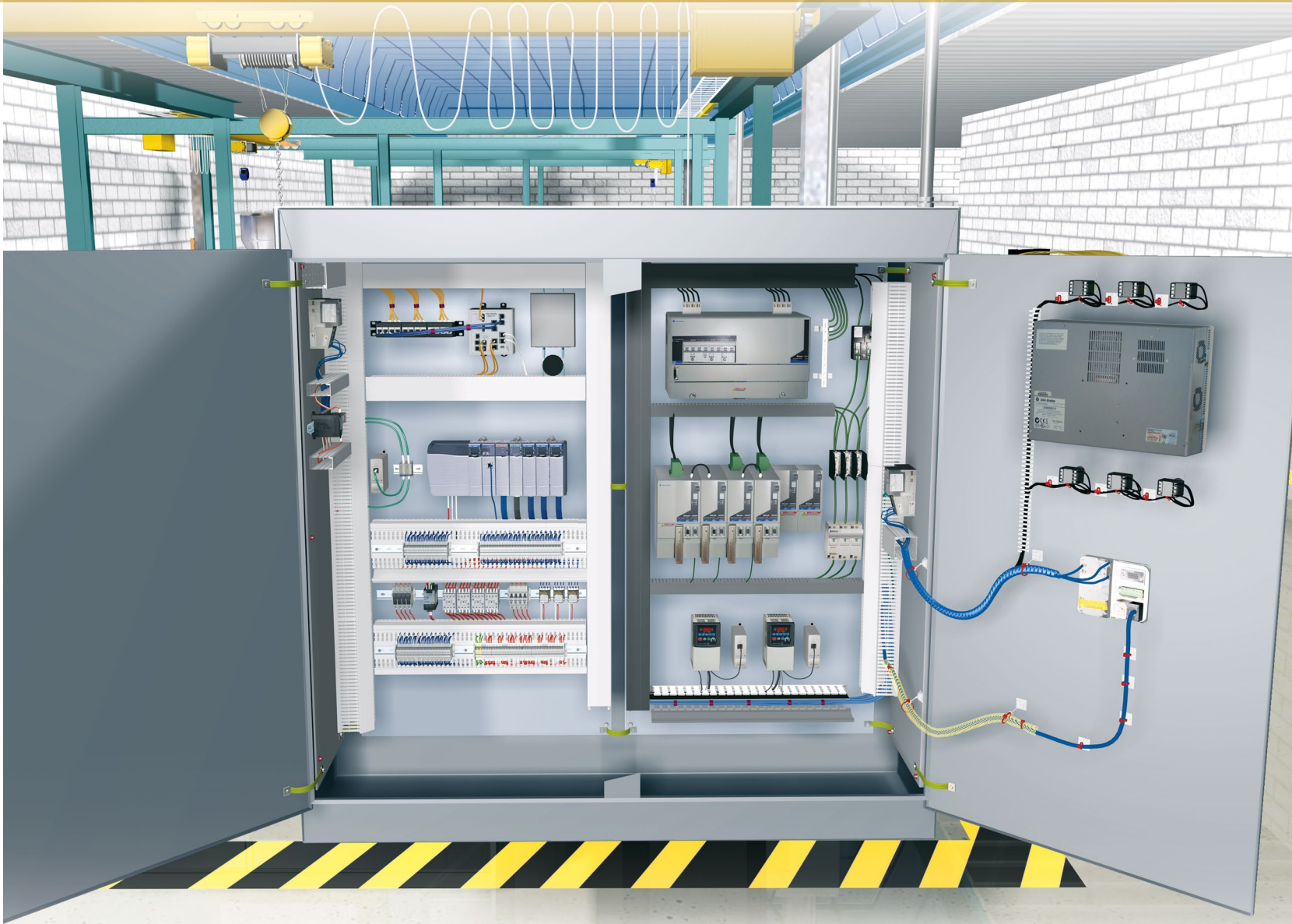
** Slide switch may extend up to 1/4" over the height dimensions shown.

ORDERING INFORMATION

MODEL	AMPERAGE RANGE	SENSOR OUTPUT	HOUSING	UL	CE	LEAD FREE
H622-10	0 to 10 A	0 to 5 Vdc	Split-core	•	•	
H622-20	0 to 20 A		Split-core	•	•	
H722LC	0 to 10/20/40 A		Solid-core	•	•	
H722HC	0 to 50/100/200 A		Solid-core	•	•	
H822	0 to 10 A		Solid-core	•		•
H822-20	0 to 20 A		Solid-core	•		•
H922	0 to 30/60/120 A		Split-core	• ¹	•	
H922030A	0 to 30 A		Split-core		•	
H922060A	0 to 60 A		Split-core		•	
H922120A	0 to 120 A		Split-core		•	

1. Listed for use on 75°C insulated conductors.



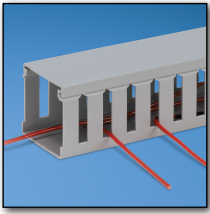


Wiring Duct Product Selection Guide

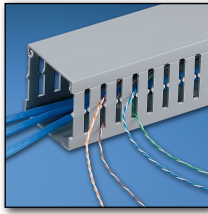
Organize • Connect • Protect

Comprehensive Wiring Duct Solutions

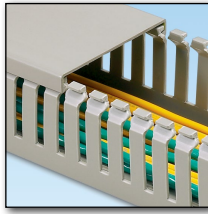
PVC Flush Cover Wiring Duct



**Type G, Wide Slots,
Wide Fingers**

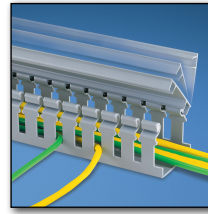


**Type F, Narrow Slots,
Narrow Fingers**

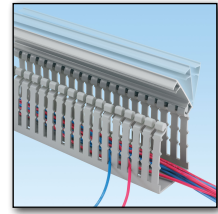


**Type MC, Narrow Slots,
Narrow Fingers, Metric**

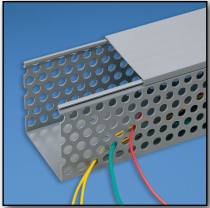
PVC Hinged Cover Wiring Duct



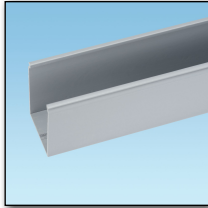
**Type H, Hinged Cover,
Wide Slots**



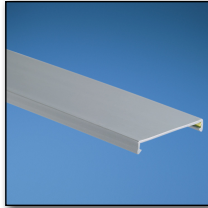
**Type HN, Hinged
Cover, Narrow Slots**



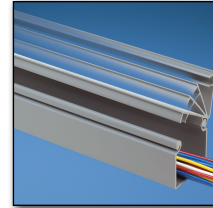
**Type D,
Round Holes**



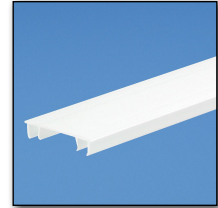
Type FS, Solid Wall



**Type C Covers for
Type F, G, D, FS, and
MC Wiring Duct**

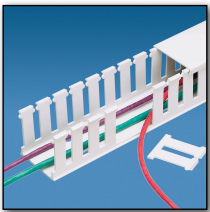


**Type HS, Hinged Cover,
Solid Wall**

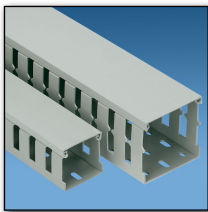


**Type HC Covers
for Type HN, H, and
HS Wiring Duct**

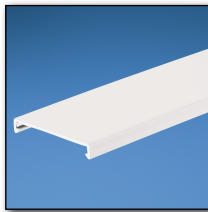
Halogen-Free Wiring Duct



**Type NE,
Halogen-Free,
Wide Slots**

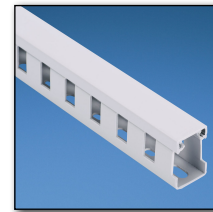


**Type NNC,
Halogen-Free,
Wide Slots, Metric**

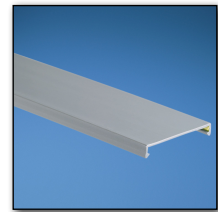


**Type NC Covers
for Type NE and
NNC Wiring Duct**

Low-Smoke, Halogen-Free Wiring Duct

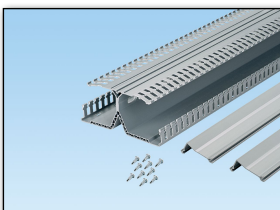


**Type TNC, Low Smoke,
Halogen-Free,
Wide Slots, Metric**

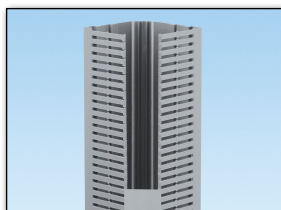


**Type TNC Covers for
Type TNC Wiring Duct**

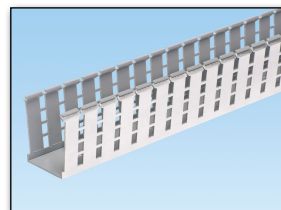
PanelMax™ Space Optimization and Noise Mitigation Products



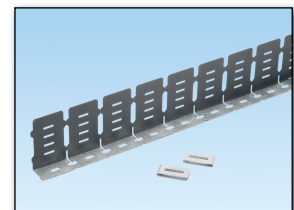
**Type DRD,
DIN Rail Wiring Duct***



**Type CWD,
Corner Wiring Duct
(use 2" Type C Cover)**



Shielded Wiring Duct



EMI Noise Shield

These wiring duct types are sold base and cover separately: G, F, D, FS, HN, H, HS, NE, CWD, and Shielded.
These wiring duct types are sold base and cover together: DRD, NNC, TNC, and MC.
*DIN Rail not included.

Panduct® Type D, G, F and FS Wiring Duct – Wire Fill Capacity

Nominal Duct Size (W x H) In.	Nominal Area In. ²	Electrical															Communication							
		8 AWG			10 AWG			12 AWG			14 AWG			16 AWG			18 AWG			22 AWG	23 AWG	23/24 AWG	24 AWG	Fiber Cable
		0.216	0.164	0.13	0.141	0.152	0.111	0.124	0.133	0.096	0.111	0.118	0.084	0.100	0.106	0.085	0.330	0.25	0.190	0.118				
	THHN	THHN	THHN	MTW	MTW	THHN	MTW	MTW	THHN	MTW	MTW	THHN	MTW	MTW	THHN	MTW	6A	6	5e	3.0 mm				
0.50 x 0.50	0.250	3	5	8	7	6	11	9	8	15	11	10	20	14	12	19	1	2	3	10				
0.50 x 1.00	0.500	6	10	16	14	12	23	18	16	31	23	20	40	28	25	39	2	4	7	20				
0.50 x 2.00	1.000	12	21	33	28	24	46	37	32	62	46	41	80	57	50	79	5	9	15	40				
0.75 x 0.75	0.563	6	11	19	16	13	26	20	18	34	26	23	45	32	28	44	2	5	8	23				
0.75 x 1.00	0.750	9	15	25	21	18	34	27	24	46	34	30	60	42	38	59	3	6	11	30				
0.75 x 1.50	1.125	13	23	38	32	27	52	41	36	69	52	46	91	64	57	88	5	10	17	46				
0.75 x 2.00	1.500	18	31	50	43	37	69	55	48	93	69	61	121	85	76	118	7	13	23	61				
1.00 x 1.00	1.000	12	21	33	28	24	46	37	32	62	46	41	80	57	50	79	5	9	15	40				
1.00 x 1.50	1.500	18	31	50	43	37	69	55	48	93	69	61	121	85	76	118	7	13	23	61				
1.00 x 2.00	2.000	24	42	67	57	49	92	74	64	124	92	82	161	114	101	158	10	18	31	81				
1.00 x 3.00	3.000	36	63	101	86	74	139	111	96	186	139	123	242	171	152	237	15	27	47	122				
1.00 x 4.00	4.000	48	84	135	114	98	185	148	129	248	185	164	323	228	203	316	20	36	63	163				
1.50 x 1.00	1.500	18	31	50	43	37	69	55	48	93	69	61	121	85	76	118	7	13	23	61				
1.50 x 1.50	2.250	27	47	76	64	55	104	83	72	139	104	92	182	128	114	177	11	20	35	92				
1.50 x 2.00	3.000	36	63	101	86	74	139	111	96	186	139	123	242	171	152	237	15	27	47	122				
1.50 x 3.00	4.500	55	95	152	129	111	208	167	145	279	208	184	364	257	228	355	23	41	71	184				
1.50 x 4.00	6.000	73	127	202	172	148	278	222	193	372	278	246	485	342	305	474	31	54	94	245				
2.00 x 1.00	2.000	24	42	67	57	49	92	74	64	124	92	82	161	114	101	158	10	18	31	81				
2.00 x 1.50	3.000	36	63	101	86	74	139	111	96	186	139	123	242	171	152	237	15	27	47	122				
2.00 x 2.00	4.000	48	84	135	114	98	185	148	129	248	185	164	323	228	203	316	20	36	63	163				
2.00 x 3.00	6.000	73	127	202	172	148	278	222	193	372	278	246	485	342	305	474	31	54	94	245				
2.00 x 4.00	8.000	97	169	270	229	197	371	297	258	496	371	328	647	457	406	632	41	73	126	327				
2.00 x 5.00	10.000	122	212	338	287	247	463	371	323	620	463	410	809	571	508	790	52	91	158	409				
2.50 x 3.00	7.500	91	159	253	215	185	347	278	242	465	347	307	607	428	381	593	39	68	118	307				
3.00 x 1.00	3.000	36	63	101	86	74	139	111	96	186	139	123	242	171	152	237	15	27	47	122				
3.00 x 2.00	6.000	73	127	202	172	148	278	222	193	372	278	246	485	342	305	474	31	54	94	245				
3.00 x 3.00	9.000	110	191	304	258	222	417	334	290	558	417	369	728	514	457	711	47	82	142	368				
3.00 x 4.00	12.000	146	254	405	344	296	556	445	387	744	556	492	971	685	610	949	62	109	189	491				
3.00 x 5.00	15.000	183	318	507	431	370	695	557	484	930	695	615	1214	857	762	1186	78	137	237	614				
4.00 x 1.50	6.000	73	127	202	172	148	278	222	193	372	278	246	485	342	305	474	31	54	94	245				
4.00 x 2.00	8.000	97	169	270	229	197	371	297	258	496	371	328	647	457	406	632	41	73	126	327				
4.00 x 3.00	12.000	146	254	405	344	296	556	445	387	744	556	492	971	685	610	949	62	109	189	491				
4.00 x 4.00	16.000	195	339	540	459	395	742	594	516	992	742	656	1295	914	813	1265	83	146	253	655				
4.00 x 5.00	20.000	244	424	676	574	494	927	743	646	1240	927	820	1619	1142	1017	1581	104	182	316	819				
6.00 x 4.00	24.000	293	509	811	689	593	1113	891	775	1488	1113	984	1943	1371	1220	1898	125	219	379	983				

General Formula

Panduit Wiring Duct wire fills are calculated using the following general formula:

$$50\% \text{ Wire fill} = 50\% \text{ of } \left(\frac{\text{Usable Duct Area}}{\text{Wire Area}} \right)$$

Why use a 50% Wire Fill?

As specified in NFPA79-2012 section 13.5.2, Percentage Fills of Raceways (Ducts), a 50% wire fill is given as the maximum wire fill capacity in all Panduit Wiring Ducts. This helps ensure general safe wiring practices are followed. In actual practice, a 50% wire fill is the maximum amount of wiring the duct can hold given the additional airspace created between cables by non-uniform cable shapes, cable interlacing, and cable packing factors.

Wire Area

The wire area formula is converted to allow calculation using the cable diameter:

$$\begin{aligned} A_{\text{WIRE}} &= \pi r^2 \\ A_{\text{WIRE}} &= (\pi/4) \times D^2 \\ A_{\text{WIRE}} &= 0.785 \times D^2 \end{aligned}$$

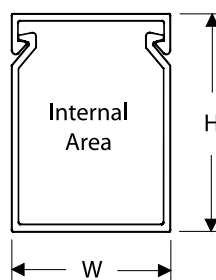
Formula Derivation

Inserting the elements from above into the general formula results in the following:

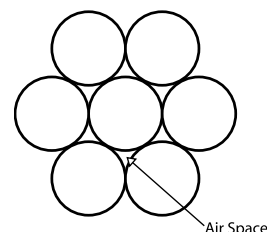
$$50\% \text{ Wire fill} = 0.50 \left(\frac{(W \times H) \times 0.90}{0.785 \times D^2} \right)$$

Note: When calculating wire fill capacity using the above formula, variables W, H, and D must be expressed in same units (i.e. mm or inches).

Calculation of Internal Area



Air Space Allotment



What is the Usable Duct Area?

The usable area we define as the calculation of internal area that can be occupied by wires or cables. Accounting for thickness of material, 90% of the nominal area (WxH) is used in the formula.

Simplifying this formula results in the formula used for wire fill calculation:

$$50\% \text{ Wire fill} = \left(\frac{W \times H}{1.75 \times D^2} \right)$$

Part Numbering System for Panduct® Wiring Duct

G	2	X	2	LG	—	6	-A
Type	Nominal Width		Nominal Height	Color		Length	Options
G = Wide Slot F = Narrow Slot FL = Flexible Duct FS = Solid Wall H = Hinged Cover Wide Slot HN = Hinged Cover, Narrow Slot HS = Hinged Cover, Solid Wall D = Round Hole NNC = Halogen-Free, Metric NE = Halogen-Free MC = Narrow Slot, Metric TNC = Low Smoke, Halogen-Free	In. or mm		In. or mm	LG = Light Gray WH = White BL = Black IB = Intrinsic Blue IG = International Gray		6 ft. or 2m	-A = Adhesive backed NM = No mounting holes = Leave blank for no options

Part Numbering System for Panduct® PanelMax™ DIN Rail Wiring Duct

DRD	22	LG	6
Type	Size	Color	Length
DRD = DIN Rail Duct	Capability Height 22 = 2" Height 33 = 3" Height 44 = 4" Height	LG = Light Gray WH = White	6 ft.

Part Numbering System for Panduct® PanelMax™ Corner Wiring Duct

CWD	2	LG	6
Type	Size	Color	Length
CWD = Corner Wiring Duct	Capability Height 2 = 2" Height 3 = 3" Height 4 = 4" Height	LG = Light Gray WH = White	6 ft.

Part Numbering System for Panduct® Wiring Duct Covers

C	2	LG	6
Type	Width	Color	Length
C = Cover HC = Hinged Cover NC = Halogen-Free TNC = Low Smoke, Halogen-Free DRDC = DIN Rail Duct	In. or mm	LG = Light Gray WH = White BL = Black IB = Intrinsic Blue IG = International Gray	6 ft. or 2m

Panduct® PanelMax™ Shielded Wiring Duct

Shielded wiring duct is a Type G style duct with bridges wrapped with an aluminum foil shield. Sold in 6 ft. lengths, available in three (3) sizes and uses Type C covers and uses standard cover part number C2LG6.

Part Number	Size (W x H)
G2X2LG6EMI	2" x 2"
G2X3LG6EMI	2" x 3"
G2X4LG6EMI	2" x 4"

Panduct® PanelMax™ Noise Shield

Noise shield is zinc-plated steel and black powder coated except at bonding locations. Each kit contains two (2) 3 ft. sections and four (4) bonding clips.*

Part Number	Size (H)
SD2EMI	2"
SD3EMI	3"
SD4EMI	4"

*Additional bonding clips available – SDCLIP (2 per package).

Wiring Duct Material Properties

Rigid Polyvinyl Chloride (PVC)

A general purpose lead-free material for indoor applications. It has a UL 94 flame class of V-0 with a UL recognized continuous-use temperature up to 50°C (122°F). Used in the manufacture of the following types of Panduit wiring duct and covers: G, F, D, FS, MC, H, HN, HS, CWD, DRD.

Halogen-Free, Polyphenylene Oxide (PPO)

A special purpose material for use in halogen-free or high-temperature applications. It has a UL 94 flame class of V-0 with a UL recognized continuous-use temperature up to 95°C (203°F) and is 20% lighter than PVC. Used in the manufacture of the following types of Panduit wiring duct and covers: NE and NNC.

Low-Smoke, Halogen-Free, Polyphenylene Ether + High Impact Polystyrene (PPE + HIPS)

A special purpose material for use in low-smoke, halogen-free, and high-temperature applications. It has a UL 94 flame class of V-0 with a UL recognized continuous-use temperature up to 105°C (221°F). Meets the regulatory requirements of the mass transit industry and other applications where fire and public safety are critical; such as in trains, buses, offshore oil and gas platforms, and other similar environments. Used in the manufacture of Type TNC wiring duct and covers.

Polypropylene (PP)

A flexible material with a UL 94 flame class of V-2 with a UL recognized continuous-use temperature up to 65°C (149°F). Used in the manufacture of Type FL flexible wiring duct.

Recommended Precaution when using Type NE, NS, NNC, and TNC Wiring Duct

Cleaning solvents and cutting fluids that contain any of the following chemical agents should not come into contact with these types of wiring duct or covers. These chemicals are the most commonly known to cause stress cracking.

- Hydrocarbons
- Phenols
- Ketones
- Amines
- Ethers
- Organic, inorganic, and oxidizing acids
- Petrol

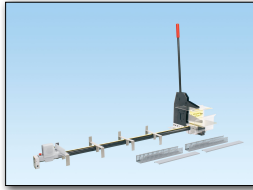
Refer to www.panduit.com for more information on chemical resistance.

Unmatched Expertise

Panduit continually invests in resources to solve your greatest business and technology challenges. Our network of sales, technical support, distribution, and manufacturing teams are readily accessible to help you with your project needs.

Complete Your Installation with Accessories and Installation Tools

Wire Duct Cutting Tools



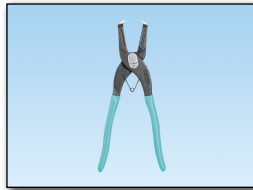
PBDCT –
Bench Mount Duct Cutting Tool



DCT –
Hand-Held Duct Cutting Tool



DNT-100 –
Duct Notching Tool

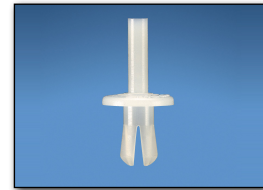


DFCT –
Duct Finger Cutting Tool

Wire Duct Installation Tools

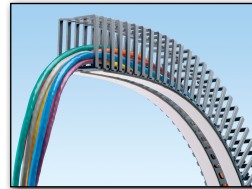


TNR –
Nylon Rivet Installation Tool



Nylon Rivets:
NR1-C – 100 pcs.
NR1-M – 1000 pcs.

Accessories

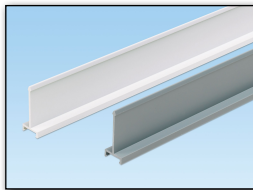


Type FL –
Flexible Wiring Duct; available
in lengths of 500mm and in
three sizes: 12mm x 12mm,
25mm x 25mm, 50mm x 50mm

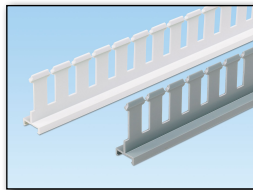


Adhesive Tape –
Available in roll form or
factory applied on select sizes

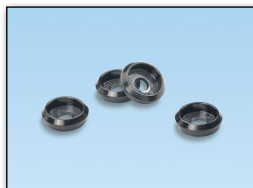
Divider Walls



PVC Divider Walls:
Light Gray White
D2H6 – 2" (H) **D2HWH6** – 2"
D3H6 – 3" **D3HWH6** – 3"
D4H6 – 4" **D4HWH6** – 4"



PVC Slotted Divider Walls:
Light Gray White
SD2H6 – 2" (H) **SD2HWH6** – 2"
SD3H6 – 3" **SD3HWH6** – 3"
SD4H6 – 4" **SD4HWH6** – 4"

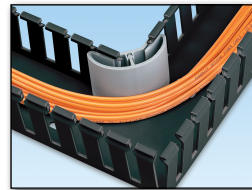


DB-C –
Divider Wall Base for
mounting all types of
divider walls; halogen-free

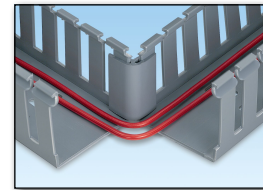


Halogen-Free Divider Walls:
NNC50DWH2 – 50mm (H)
NNC75DWH2 – 75mm
Low Smoke, Halogen-Free:
TNC50D2 – 50mm
TNC75D2 – 75mm

Corner Strips

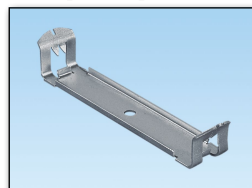


CSC1LG6 –
6 ft. length strip with
bend radius control



CS1LG6 –
6 ft. length strip

Snap-Clip Mounting Brackets



For Wiring Duct Types

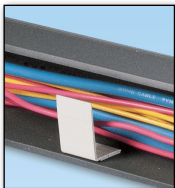
G, F, FS, and D:

- S1F-C – 1" duct width
- S1.5F-C – 1.5" duct width
- S2F-C – 2" duct width
- S3F-C – 3" duct width
- S4F-C – 4" duct width

For Wiring Duct Type NE:

- SNS.5-C – 0.5" duct width
- SNS.75-C – 0.75" duct width
- SNS1-C – 1" duct width
- SNS1.5-C – 1.5" duct width
- SNS2-C – 2" duct width
- SNS3-C – 3" duct width

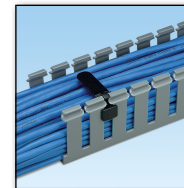
Wire Retainers



For Type FS and D Wiring Duct:
WRS-A-C10 – for 1" – 2" duct width








For Type F and HN Wiring Duct:
FWR-C – for 1.5" – 4" duct width
For Type MC Wiring Duct:
FMWR-C – for 1.5" – 4" duct width



For Type G and H Wiring
WR2-C – for 2" duct width
WR3-C – for 3" duct width
WR4-C – for 4" duct width
WR5-C – for 5" duct width
WR2H-C – for 2" hinged duct

Panduit Wiring Duct Approvals and Compliances

Agency Mark	Agency	Requirement	Classification/Performance	Wiring Duct Types/Products
	Underwriters Laboratories, Inc. File No. E147128	UL 1565	Material Flame Class V-0 Continuous-use temperature up to 50°C (122°F)	All wiring duct types and covers
		UL 1565 CSA C22.2 No. 18.5-13	Material Flame Class V-0 Continuous-use temperature up to 50°C (122°F)	Type H, HS, HN, and DRD
	Underwriters Laboratories, Inc.	UL 508 section 15	An insulating barrier material shall comply with the minimum material properties indicated in Table 15.1	PVC divider walls
		UL 508 sections 34 and 181	Qualifies as a metal barrier with required thickness as indicated in Table 6.1	SD*EMI metal barrier
	Canadian Standards Association File No. 016446	CSA C22.2 No. 18.5-13	Material Flame Class V-0 Continuous-use temperature up to 50°C (122°F)	All wiring duct types and covers (except H, HS, and HN)
	European Union	Low Voltage Directive 2006/95/EC	<ul style="list-style-type: none"> CDS (cable ducting system for impact 2 J) Minimum storage, transport, installation, and application temperature: -5°C (23°F) Maximum application temperature: 60°C (140°F) Non-flame propagating Without electrical continuity Cover removable without a tool 	H, HS, G, F, D, MC, FS, NNC, NE, DRD, and TNC
		EN 50085-1 EN 50085-2-3		
	European Union	EN 45545-2	Type NNC and Type NE: Exterior (R23) - HL1 Type TNC: Interior (R22) - HL2 & Exterior (R23) - HL2	NNC and TNC
	DIN German Institute for Standardization	DIN 43659	<ul style="list-style-type: none"> Specifies dimensions for slotted trunkings used in electrical switch-gear assemblies and that conform to DIN VDE 060 Part 506 Channel mounting hole pattern, slot dimensions, pitch, and location Distance from first to last like-size mounting hole Minimum overall product length 	MC, NNC, and TNC
		DIN 5510-2 DIN 54837	Burning Class: S4 Smoke Class: SR2 Dripping Class: ST2	TNC
	AFNOR French Association of Normalization	NF F 16-101 NF F 16-102	Type NNC Wiring Duct Classification = F3/I4 Type TNC Wiring Duct Classification = F1/I4	NNC and TNC
	UNIFER Italian Railway Standards	EN ISO 11925-2	Pass 30-second flame application	TNC
	FRA – Federal Railroad Administration	49 CFR Part 238	Surface Flammability: < 35 Smoke Density D_s (1.5) < 100 D_s (4.0) < 200	TNC
	NFPA – National Fire Protection Association	NFPA130		
	National Fire Protection Agency	NFPA 79-2015, Section 13.3.1 IEC 60332-1	Non-metallic duct shall be permitted (inside enclosures) only when they are made with a flame-retardant material; flame-retardant material is defined in the standard by the IEC 60332-1 test method	All wiring duct types and covers (except FL)
		NFPA 79-2015, Section 13.5.2	Panduit publishes a maximum percentage wire fill for common wire types equal to 50% of the interior cross-sectional area of the wiring duct	All wiring duct types and covers
		NFPA 79-2015, section 13.1.6.9	Panduit bend radius control accessories can be mounted at right angles and T junctions created using wiring duct in order to maintain cable bend radius control	Corner strip with 1" bend radius control
	European Union	European Directive 2011/65/EU	Meets the requirements on the Restriction of Hazardous Substances and is free of the six substances listed in the directive	All wiring duct products

For more information

Visit us at www.panduit.com

Contact Customer Service by email: cs@panduit.com
or by phone: 800.777.3300

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WDSG03-SA-ENG

Replaces WDSG02-SA-ENG

3/2016





ONICON

Flow and Energy Measurement

F-3200 INLINE ELECTROMAGNETIC FLOW METER

ONICON's F-3000 Series is a family of inline flow meters that provide accurate, reliable flow measurement for a variety of applications.



• Chilled Water • Hot Water • Domestic Water • Condenser Water •



Faraday's Law states that a voltage will be induced in a conductor (the conductive fluid) when it passes through a magnetic field (generated by the meter), and that voltage will be directly proportional to the velocity of the conductor (the fluid). This voltage is measured by electrodes on opposite sides of the flow tube and used to calculate the flow velocity.

DESCRIPTION

ONICON F-3000 Series Inline Electromagnetic Flow Meters are suitable for measuring electrically conductive liquids in a wide variety of applications. The F-3200 can be configured to provide analog outputs for flow rate, programmable pulse outputs for flow totalization, and serial communications via an RS485 network.

APPLICATIONS

- HVAC hydronic applications including chilled water, heating hot water and condenser water
- Bi-directional flow for primary/secondary bypass and thermal storage applications
- Domestic cold and hot water applications
- Clean process flow applications with conductivities greater than 5 $\mu\text{S}/\text{cm}$

FEATURES

Exceptional Performance & Accuracy – F-3000 series inline meters deliver unmatched accuracy in installations with just three diameters of straight pipe upstream of the meter!

Easy to Install and Use - Every ONICON meter is individually wet calibrated and programmed for the application - saving start-up and commissioning time!

Excellent Long Term Reliability - ONICON electromagnetic flow meters have no moving parts and employ state-of-the-art electronics, ensuring years of accurate, trouble-free performance.

Redundant Outputs – The F-3000 series inline meters can be ordered with an additional redundant analog output. This optional feature can provide a cost-effective alternative in Mission Critical applications which require redundant flow measurements.

CALIBRATION

Every ONICON F-3000 series flow meter is wet calibrated in a flow laboratory against standards that are directly traceable to international standards. A certificate of calibration accompanies every meter.



For energy measurement applications, the F-3200 flow meter can be specified together with an ONICON BTU Meter, forming a complete energy measurement system.

SPECIFICATIONS*

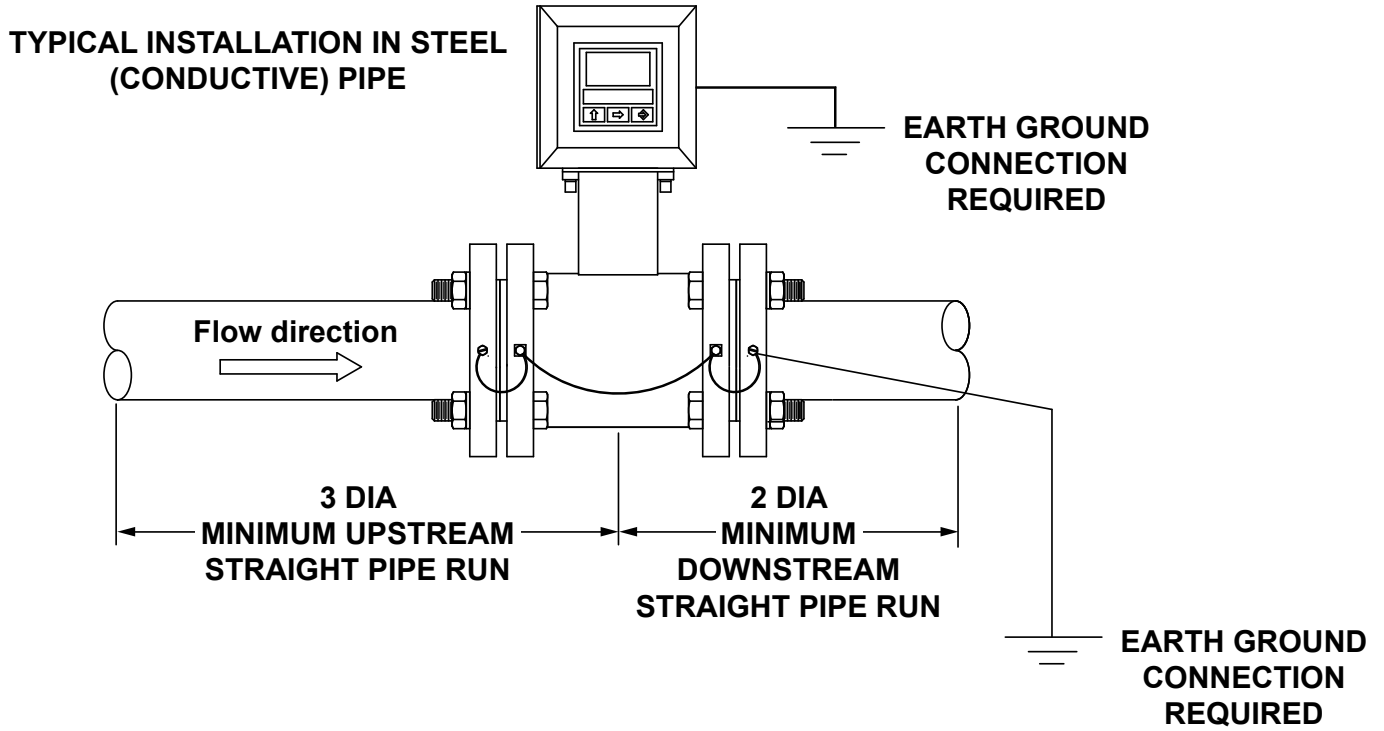
F-3200 TRANSMITTER		
PERFORMANCE	ACCURACY	± 0.2% of reading from 1.6 to 33 ft/s ± 0.0033 ft/s at flow rates < 1.6 ft/s
	MINIMUM CONDUCTIVITY	5 µS/cm
INPUT POWER**	AVAILABLE OPTIONS	<ul style="list-style-type: none"> • Low Power, 24 VAC/DC, 50/60 Hz, 12 VA • High Power, 110 - 240 VAC, 50/60 Hz, 12 VA
I/O SIGNALS**	AVAILABLE OPTIONS	<ul style="list-style-type: none"> • Two (2) digital outputs, one (1) digital input and one (1) analog output • Four (4) digital outputs, one (1) digital input and two (2) analog outputs • MODBUS RTU (RS485)
ELECTRONICS ENCLOSURE**	IP67 (NEMA 4X) enclosure with display	
	AVAILABLE OPTIONS	<ul style="list-style-type: none"> • Integral mount • Remote (wall) mount with kit, up to 325 ft in fluids with conductivity ≥ 200 µS/cm
	DISPLAY	16-character, 8 - line, 128x64 graphic LCD with back light
	AMBIENT CONDITIONS	Transmitter: -4 °F to 140 °F
PROGRAMMING	Menu driven user interface via three (3) programming keys	
ELECTRICAL CONNECTIONS	INPUT POWER	Removable terminal blocks for use with 14 - 22 gauge wire
	I/O SIGNALS	Removable terminal blocks for use with 18 - 24 gauge wire
	COIL & ELECTRODES	Removable terminal blocks for use with sensor cable provided
APPROVALS	CE	2014/30/EU EMC Directive
		2014/35/EU LVD Directive
F-3000 SERIES FLOW SENSOR		
PERFORMANCE	SENSING METHOD	Electromagnetic sensing (no moving parts)
OPERATING CONDITIONS	FLUID TEMPERATURE RANGE	See Liner Selection Table on back page
	FLUID PRESSURE RANGE	See Liner Selection Table on back page
FLOW SENSOR DESIGN**	FLOW TUBE	304 SS
	ELECTRODES	Qty: Three (3), round, 316 SS
FLOW BODY**	AVAILABLE OPTIONS***	<ul style="list-style-type: none"> • Carbon Steel • Polypropylene • Stainless Steel
FLOW LINER**	AVAILABLE OPTIONS***	<ul style="list-style-type: none"> • PTFE • Ebonite • Polypropylene
PROCESS CONNECTIONS**	AVAILABLE OPTIONS	<ul style="list-style-type: none"> • Flanged connections ANSI Class 150 or ANSI Class 300 • Wafer mount
APPROVALS	NSF/ANSI CE	61 E97/23/CE PED Directive

* SPECIFICATIONS subject to change without notice.

** See model codification for additional information regarding option selections.

*** Selection based on application.

TYPICAL INSTALLATION



FLANGED AND WAFER MODELS OPERATING RANGE					
PIPE SIZE (Inches)	FLOW RATE (GPM) (0.1 ft/sec - 33 ft/sec)	PIPE SIZE (Inches)	FLOW RATE (GPM) (0.1 ft/sec - 33 ft/sec)	PIPE SIZE (Inches)	FLOW RATE (GPM) (0.1 ft/sec - 33 ft/sec)
1	0.2 - 79	5	5.9 - 1,981	16	61 - 20,288
1½	0.6 - 203	6	8.5 - 2,853	18	77 - 25,678
2	0.9 - 317	8	15 - 5,072	20	95 - 31,701
2½	1.6 - 536	10	24 - 7,925	24	137 - 45,649
3	2.4 - 812	12	34 - 11,412	42	417 - 139,800
4	3.8 - 1,268	14	47 - 15,533	48	547 - 182,596

METER ORDERING INFORMATION

Meter Model Number Coding = F-32BB-CDEF(-SPC)

F-32BB = Inline Electromagnetic Flow Meter

BB = Meter Size

01 = 1"	04 = 4"
15 = 1.5"	05 = 5"
02 = 2"	06 = 6"
25 = 2.5"	08 = 8"
03 = 3"	10 = 10"
nn = meter size, 12" - 48"	

C = Body Material, Liner and Electrode Configuration

- 1 = Carbon Steel, PTFE Liner and 3 SS Electrodes
- 2 = Carbon Steel, Polypropylene Liner, 3 SS Electrodes and Viton O-rings
- 3 = Carbon Steel, Ebonite Liner and 3 SS Electrodes

D = Process Connection

- 0 = Wafer Connection
- 1 = ANSI 150 Flanges
- 3 = ANSI 300 Flanges

E = Input Power

- 1 = Low Power, 24 VAC/DC
- 2 = High Power, 120 - 240 VAC

F = Electronics Enclosure Mounting Configuration

- 4 = Integral IP67 enclosure
- 5 = Remote IP67 enclosure

SPC = Special Configuration

- 101 = Aux outputs, redundant analog and pulse signals
- 102 = MODBUS RTU (RS485) serial communication

LINER SELECTION TABLE

Material	Line Size Flanged and Wafer	Grade	Color	Temperature Range	Pressure Range Based on Liner	Abrasion Resistance (Carbon Steel = 100)
Ebonite	8 - 48"	Food	Amber	32°F - 175°F	580 psi ¹	90 - 118
Polypropylene	1 - 6"	Food	Gray	32°F - 140°F	232 psi	122
PTFE	1 - 48"	Food	White	0 - 266°F ³	580 psi ^{1 2}	78
Notes	Description					
1	Flanged meter pressure rating is the lesser of 580 psi or the flange rating.					
2	Wafer style meters above 6" are limited to 232 psi.					
3	Remote mount electronics option required for application temperature above 212°F.					





ONICON
Flow and Energy Measurement

F-3500 SERIES INSERTION ELECTROMAGNETIC FLOW METERS

F-3500 series flow meters combine the convenience of an insertion style design with the reliability of electromagnetic flow measurement. They are ideal for measuring flow in a wide variety of applications.



- Chilled Water • Heating Hot Water • Domestic/Municipal Water •
- Condenser Water •

F-3500 SERIES

INSERTION ELECTROMAGNETIC FLOW METERS



DESCRIPTION

ONICON's F-3500 series insertion electromagnetic flow meters are suitable for measuring electrically conductive liquids in a wide variety of applications. Each F-3500 provides a single analog output for flow rate, a high resolution frequency output to drive peripheral devices, a scalable pulse output for totalization, and an empty pipe alarm signal.



Standard Configuration



Small Pipe Configuration

Two versions of the F-3500 are available. The standard configuration F-3500 is suitable for pipe sizes ranging from 3" to 72" in diameter. The small pipe configuration F-3500 is suitable for pipes ranging in size from 1 1/4" to 2 1/2" in diameter.

Optional remote displays and BTU measurement systems are also available for both versions.

APPLICATIONS

- Chilled water
- Heating hot water
- Condenser water
- Domestic/municipal water
- Water/glycol

FEATURES

Simple Installation and Commissioning - Factory programmed and ready for use upon delivery.

Exceptional Performance & Value - Insertion style design provides cost-effective solution for accurate and reliable flow measurement in larger pipe sizes.

Excellent Long Term Reliability - Low maintenance, no-moving-parts flow sensing technology works well in difficult flow measurement applications such as open loop condenser water flow.

Highly Accurate Over a Wide Flow Range - Highly efficient sensor design and continuous auto-zero function improve accuracy and sensitivity, particularly at low flow rates.

Simplified Hot Tap Insertion Design - Standard on every insertion flow meter, this feature allows for insertion and removal by hand without a system shutdown.

Ideal Solution for Retrofits - The innovative hot tap adapter design allows for wet tapping pipes without interrupting flow.

CALIBRATION

Every ONICON flow meter is wet calibrated in a flow laboratory against standards that are directly traceable to National Institute of Standards and Technology (N.I.S.T.). A certificate of calibration accompanies every meter.



ONICON's F-3500 Insertion Electromagnetic Flow Meter combined with the System-20 BTU Meter forms an energy measurement system with unsurpassed accuracy and reliability.

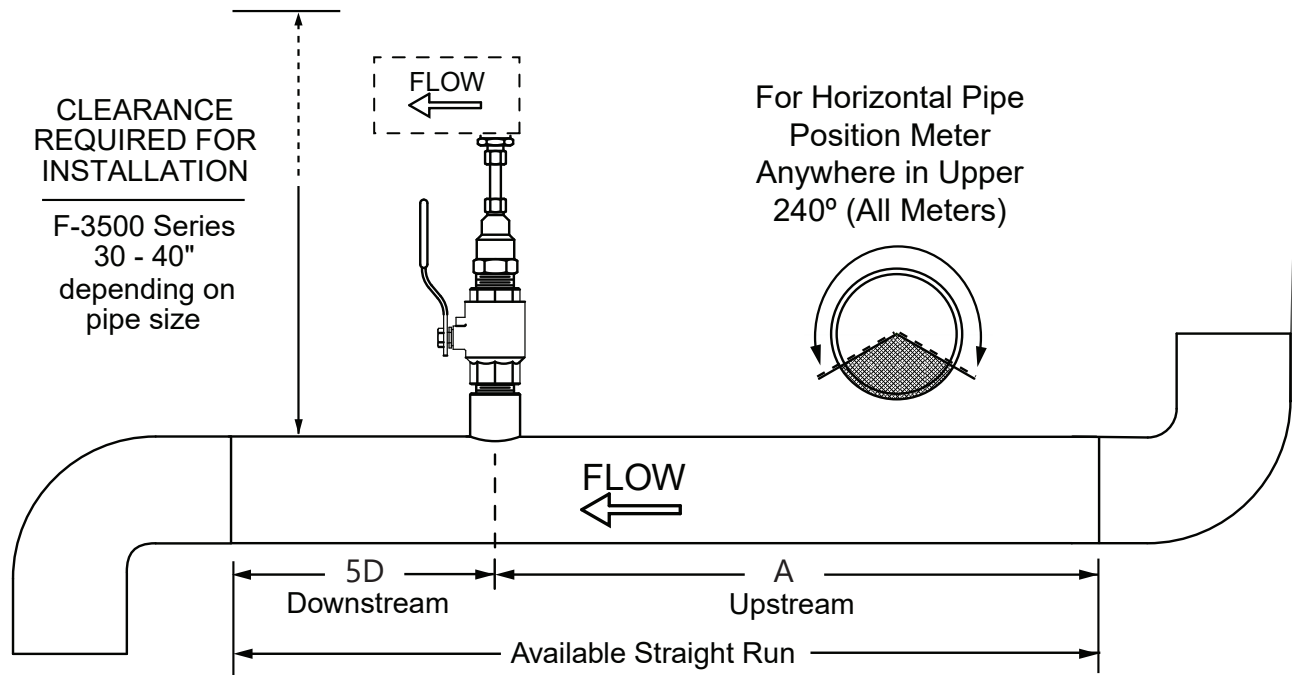
SPECIFICATIONS*

MODEL F-3500		
PERFORMANCE	ACCURACY	±1.0% of reading from 2 - 20 ft/s ±0.02 ft/s below 2 ft/s
	MINIMUM CONDUCTIVITY	25 µS/cm
INPUT POWER	20 - 28 VDC, 250 mA at 24 VDC 20 - 28 VAC, 60 Hz, 6 VA	
I/O SIGNAL	ANALOG OUTPUT (ISOLATED)	Selectable: 4-20 mA, 0-10 V or 0-5 V
	FREQUENCY OUTPUT	0-15 V peak pulse, 0-500 Hz
	SCALABLE PULSE OUTPUT	Isolated solid state dry contact Contact rating: 50 VDC, 100 mA maximum Pulse Duration: 0.5, 1, 2 or 6 seconds
ELECTRONICS ENCLOSURE	Weathertight NEMA 4 aluminum enclosure	
ELECTRICAL CONNECTIONS	10' of PVC jacketed cable with ½" NPT conduit connection	
FLOW RANGE	0.1 ft/s to 20 ft/s (200:1 turndown)	
SENSING METHOD	Electromagnetic sensing (no moving parts)	
PIPE SIZE RANGE	AVAILABLE OPTIONS	Standard Configuration: 3 - 72" nominal diameter Small Pipe Configuration: 1¼ - 2½" nominal diameter
LIQUID TEMPERATURE RANGE	15°F to 250°F	
AMBIENT TEMPERATURE RANGE	-20°F to 150°F	
OPERATING PRESSURE	400 psi maximum	
PRESSURE DROP	Standard Configuration: 0.1 psi at 12 ft/s in 3" pipe, decreasing as line size increases Small Pipe Configuration: 0.33 psi at 8 ft/s in 1.25" pipe, decreasing as the line size increases	
MATERIAL	Wetted metal components: 316 Stainless Steel Sensor head: XAREC Optional: NSF/ANSI 61/372 version	
APPROVAL	SAFE DRINKING WATER	NSF/ANSI 61
	LEAD CONTENT VERIFICATION	NSF/ANSI 372

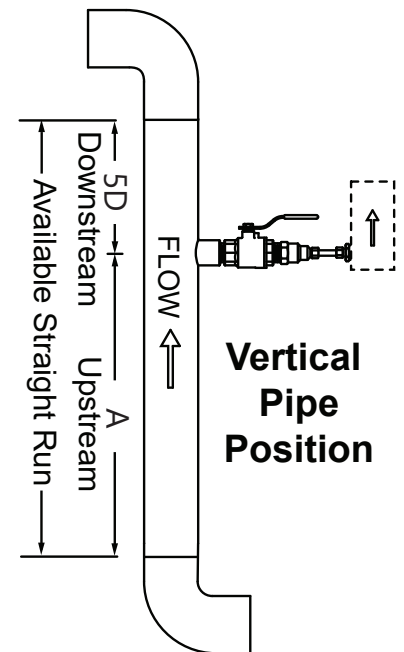
*Specifications subject to change without notice.

OPERATING RANGE FOR COMMON PIPE SIZES					
PIPE SIZE (inches)	FLOW RATE (GPM) (0.1 ft/s to 20 ft/s)	PIPE SIZE (inches)	FLOW RATE (GPM) (0.1 ft/s to 20 ft/s)	PIPE SIZE (inches)	FLOW RATE (GPM) (0.1 ft/s to 20 ft/s)
1¾	0.4 - 95	6	9 - 1,800	18	70 - 14,600
1½	0.6 - 130	8	16 - 3,100	20	86 - 18,100
2	1.0 - 200	10	24 - 4,900	24	125 - 26,500
2½	1.1 - 230	12	35 - 7,050	30	223 - 41,900
3	2.4 - 460	14	42 - 8,600	36	304 - 60,900
4	4 - 800	16	55 - 11,400		

STRAIGHT RUN INFORMATION



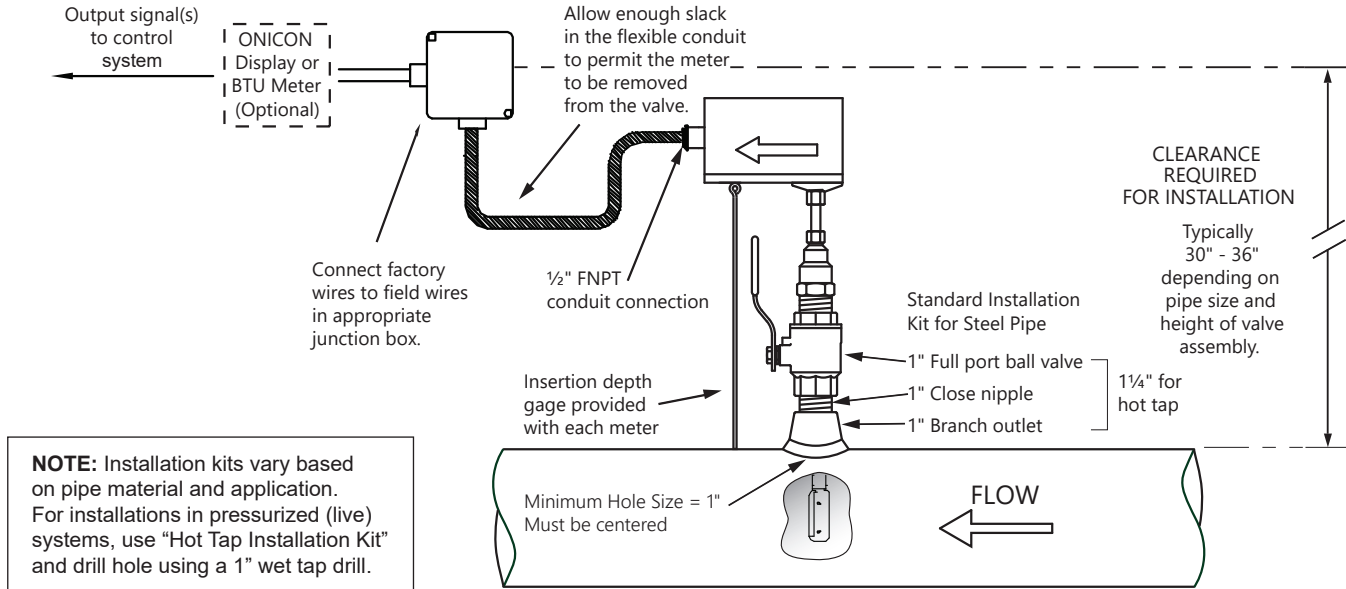
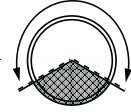
Upstream obstruction	(A) Minimum straight run required upstream of meter location
Single bend preceded by ≥ 9 diameters of straight pipe	10 Diameters
Pipe size reduction / expansion in straight pipe run	10 Diameters
Single bend preceded by ≤ 9 diameters of straight pipe	15 Diameters
Outflowing tee / Pump outflow	20 Diameters
Multiple bends out of plane	30 Diameters
Inflowing tee	30 Diameters
Control / Modulating valve	30 Diameters



TYPICAL METER INSTALLATION

(New construction or scheduled shutdown)

- Install in vertical or horizontal pipe
- For horizontal pipe position meter anywhere in upper 240°



NOTE: Installation kits vary based on pipe material and application. For installations in pressurized (live) systems, use "Hot Tap Installation Kit" and drill hole using a 1" wet tap drill.

METER ORDERING INFORMATION

F-3500 Meter Model Number Codification = F-35AA-BB-CC-DEFG

F-35AA = Insertion Electromagnetic Flow Meter

00 = Insertion electromagnetic flow meter

BB = Outputs

11 = Frequency, isolated analog, scaled pulse and alarm (dry contacts)

12 = Frequency, isolated analog, bi-directional, scaled pulse and alarm (dry contacts)*

CC = Pipe Size Range and Meter Length

A1 = 1.25 - 2.5"

C3 = 3.0 - 10.0"

D4 = 3.0 - 16.0"

E5 = 3.0 - 22.0"

F6 = 3.0 - 72"

D = Process Connection

1 = 1" NPT adapter. 3/8" stem

E = Wetted Material

1 = 316 SS, XAREC, Viton, Temp < 150°F*

2 = 316 SS, XAREC, FKM, Temp ≤ 250°F*

3 = 316 SS, XAREC, EPDM, NSF rated for domestic water

F = Electronics Enclosure

1 = NEMA 4 weathertight enclosure

G = Wiring Connection

1 = 10' PVC jacketed cable, pig tail with 1/2" conduit adapter

*For 3" and larger pipes



Rosemount 8700 Series Magnetic Flowmeter Systems



- Industry leading performance with standard reference accuracy of 0.25% of rate with an optional High Accuracy of 0.15% of rate
- Rosemount 8732 Transmitter - Integral-mount design, backlit display, and explosion-proof housing. Available with HART®, FOUNDATION™ fieldbus, or PROFIBUS PA, Device Diagnostics, and Smart™ Meter Verification to improve reliability and performance
- Rosemount 8712 HART Transmitter - available with Device Diagnostics including Smart Meter Verification to improve reliability and performance. Quick setup with easy-to-use local operator interface
- Rosemount 8712H/8707 High-Signal System - Pulsed DC solutions for the most demanding flow measurement applications
- Rosemount 8705 Flanged sensor - Fully welded sensor for maximum protection
- Rosemount 8711 Wafer sensor - Economical, compact, and lightweight sensor, provided with alignment spacers for easy installation
- Rosemount 8721 Hygienic sensor - Specifically designed for food, beverage, and life sciences applications





Product selection guide

Several sensor types, liner types, electrode materials, electrode types, grounding options, and transmitters are available for the Rosemount 8700 Series Magnetic Flowmeter System to ensure compatibility with virtually any application and installation. See [Table 16](#) for information on liner types, [Table 17](#) for information on electrode materials and electrode types, [Table 18](#) and [Table 19](#) for grounding options and installation, and [Table 1](#) for transmitter selection. Other material options not mentioned here may be available. Contact your local sales representative for alternative material selection. For further guidance on selecting materials, refer to the Magnetic Flowmeter Material Selection Guide located on Rosemount.com (Technical Data Sheet Number 00816-0100-3033). For more information regarding product offering and ordering information, refer to “[Ordering information](#)” on [page 6](#) in this product data sheet.

Table 1. Transmitter selection

Transmitter	General Characteristics
 <p>8732</p>	<ul style="list-style-type: none"> • Ideal for integral mount transmitter installations • HART / Analog, FOUNDATION fieldbus, or PROFIBUS PA fieldbus output available • Advanced Diagnostics available • Optical Switch LOI • Optional DI/DO available (HART only)
 <p>8712</p>	<ul style="list-style-type: none"> • Remote mount transmitter • Easy to use LOI with dedicated configuration buttons • Advanced Diagnostics available • Perfect for wall or panel mount
 <p>8712H</p>	<ul style="list-style-type: none"> • Remote mount transmitter • High-Signal Pulsed DC for use with the High-Signal 8707 Sensor • Ideal for high solid applications - mining/pulp stock/other slurries • 120 VAC power only • Not CE Marked

Table 2. Sensor selection

Sensor	General Characteristics
 <p>8705</p>	<ul style="list-style-type: none"> • Standard Process Sensor • Flanged Process Connections • Welded, sealed coil housing • 1/2-in. (15mm) to 36-in. (900mm) • Pulse DC Technology • Standard, grounding, and bullet-nose electrodes available
 <p>8707</p>	<ul style="list-style-type: none"> • High Signal Sensor • Flanged Process System Sensor • Welded, sealed coil housing • 3-in. (80mm) to 36-in. (900mm) • High current pulsed DC technology ideal for high solids or slurry applications • Standard, grounding, and bullet-nose electrodes available
 <p>8711</p>	<ul style="list-style-type: none"> • Wafer (flangeless) design • Economical, compact, and lightweight alternative to flanged sensors • 0.15-in. (4mm) to 8-in. (200mm) • Pulsed DC technology • Standard, grounding, and bullet-nose electrodes available
 <p>8721</p>	<ul style="list-style-type: none"> • Hygienic sensor • Designed for food, beverage, and pharmaceutical applications • 3-A and EHEDG certified • 1/2-in. (15mm) to 4-in. (100mm) • Pulsed DC technology • Variety of industry standard process connections • Suitable for CIP/SIP

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Magmeter diagnostics



Rosemount Mag Diagnostics Power PlantWeb to Reduce Cost & Improve Output by Enabling New Practices
 Rosemount Magmeters provide device diagnostics that powers PlantWeb and informs the user of abnormal situations throughout the life of the meter - from Installation to Maintenance and Meter Verification. With Rosemount Magmeter diagnostics enabled, users can change their practices to improve plant availability and throughput, and reduce costs through simplified installation, maintenance and troubleshooting.

Diagnostics	Mag user practice	8732	8712	8712H
Basic				
Empty Pipe	Process Management	•	•	•
Electronics Temperature	Maintenance	•	•	
Coil Fault	Maintenance	•	•	•
Transmitter Faults	Maintenance	•	•	•
Reverse Flow	Process Management	•	•	•
Advanced (Suite 1)		DA1 / D01	DA1	N/A
High Process Noise	Process Management	•	•	
Grounding/Wiring Fault	Installation	•	•	
Advanced (Suite 2)		DA2 / D02	DA2	N/A
Smart Meter Verification	Meter Verification	•	•	
4-20 mA Loop Verification	Maintenance	•		

Options for accessing diagnostics

Rosemount Magmeter Diagnostics can be accessed through the Local Operator Interface (LOI)⁽¹⁾, the 475 Field Communicator, and AMS™ Suite: Intelligent Device Manager. Contact your local Rosemount representative to activate diagnostics or for diagnostic availability on existing transmitters.

Access diagnostics through the LOI for quicker installation, maintenance, and meter verification

Rosemount Magmeter Diagnostics are available through the LOI to make maintenance of every magmeter easier.

Access diagnostics through AMS Intelligent Device Manager for the ultimate value

The value of the diagnostics increases significantly when AMS is used. Now the user gets a simplified screen flow and procedures for how to respond to the diagnostic messages.

(1) A Local Operator Interface (LOI) is not available on FOUNDATION fieldbus transmitters.

Magnetic flowmeter sizing

Flowmeter sizing

Because of its effect on flow velocity, sensor size is an important consideration. It may be necessary to select a magnetic flowmeter that is larger or smaller than the adjacent piping to ensure the fluid velocity is in the specified measuring range of the sensor. Suggested guidelines and examples for sizing normal velocities in different applications are listed in [Table 3](#), [Table 4](#), and [Table 5](#). Operation outside these guidelines may also give acceptable performance.

Table 3. Sizing guidelines

Application	Velocity range (ft/s)	Velocity range (m/s)
Normal Service	0–39	0–12
Preferred Service	2–20	0.6–6.1
Abrasive Slurries	3–10	0.9–3.1
Non-Abrasive Slurries	5–15	1.5–4.6

To convert flow rate to velocity, use the appropriate factor listed in [Table 4](#) and the following equation:

$$\text{Velocity} = \frac{\text{Flow Rate}}{\text{Factor}}$$

Example: SI units
Magmeter Size: 100 mm (factor from Table 4 = 492.78) Normal Flow Rate: 800 L/min $\text{Velocity} = \frac{800 \text{ (L/min)}}{492.78}$
Velocity = 1.62 m/s

Example: English units
Magmeter Size: 4 in. (factor from Table 4 = 39.679) Normal Flow Rate: 300 GPM $\text{Velocity} = \frac{300 \text{ (gpm)}}{39.679}$
Velocity = 7.56 ft/s

Table 4. Line size vs. Conversion factor

Nominal line size inches (mm)	Gallons per minute factor	Liters per minute factor
0.15 (4)	0.055	0.684
0.30 (8)	0.220	2.736
½ (15)	0.947	11.762
1 (25)	2.694	33.455
1½ (40)	6.345	78.806
2 (50)	10.459	129.89
2½ (65)	14.923	185.33
3 (80)	23.042	286.17
4 (100)	39.679	492.78
5 (125)	62.356	774.42
6 (150)	90.048	1,118.3
8 (200)	155.93	1,936.5
10 (250)	245.78	3,052.4
12 (300)	352.51	4,378.0
14 (350)	421.70	5,237.3
16 (400)	550.80	6,840.6
18 (450)	697.19	8,658.6
20 (500)	866.51	10,761
24 (600)	1,253.2	15,564
30 (750)	2006.0	24,913
36 (900)	2,935.0	36,451
40 (1000)	3,652.1	45,357
42 (1050)	4,115.1	51,107
48 (1200)	5,407.6	67,159

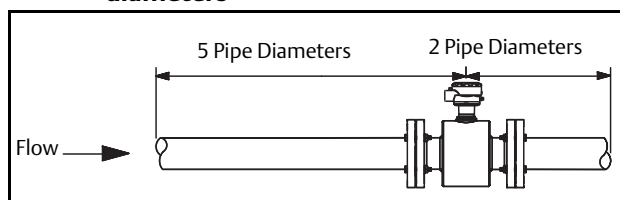
Table 5. Line size vs. velocity/rate

Nominal line size in Inches (mm)	Minimum/maximum flow rate							
	Gallons per minute				Liters per minute			
	at 0.04 ft/s (low-flow cutoff)	at 1 ft/s (min range setting)	at 3 ft/s	at 39.37 ft/s (max range setting)	at 0.012 m/s (low-flow cutoff)	at 0.3 m/s (min range setting)	at 1 m/s	at 12 m/s (max range setting)
0.15 (4)	0.002	0.055	0.165	2.168	0.008	0.205	0.684	8.209
0.30 (8)	0.009	0.220	0.661	8.674	0.033	0.821	2.736	32.83
1/2 (15)	0.038	0.947	2.841	37.287	0.141	3.529	11.76	141.15
1 (25)	0.108	2.694	8.081	106.05	0.401	10.04	33.45	401.46
1 1/2 (40)	0.254	6.345	19.04	249.82	0.946	23.64	78.81	945.67
2 (50)	0.418	10.459	31.38	411.77	1.559	38.97	129.89	1,558.7
2 1/2 (65)	0.597	14.923	44.77	587.51	2.224	55.60	185.33	2,224.0
3 (80)	0.922	23.042	69.13	907.17	3.434	85.85	286.17	3,434.0
4 (100)	1.587	39.679	119.04	1,562.2	5.913	147.84	492.78	5,913.4
5 (125)	2.494	62.356	187.07	2,454.9	9.293	232.33	774.42	9,293.0
6 (150)	3.602	90.048	270.14	3,545.2	13.42	335.50	1,118.3	13,420
8 (200)	6.237	155.93	467.79	6,138.9	23.24	580.96	1,936.5	23,238
10 (250)	9.831	245.78	737.34	9,676.3	36.63	915.73	3,052.4	36,629
12 (300)	14.10	352.51	1,057.5	13,878	52.54	1,313.4	4,378.0	52,535
14 (350)	16.87	421.71	1,265.1	16,603	62.85	1,571.2	5,237.3	62,848
16 (400)	22.03	550.80	1,652.4	21,685	82.09	2,052.2	6,840.6	82,087
18 (450)	27.89	697.19	2,091.6	27,448	103.90	2,597.6	8,658.6	103,903
20 (500)	34.66	866.51	2,599.5	34,114	129.14	3,228.4	10,761	129,137
24 (600)	50.13	1,253.2	3,759.6	49,339	186.77	4,669.2	15,564	186,769
30 (750)	80.24	2,006.0	6,018.0	78,976	298.96	7,474.0	24,913	298,959
36 (900)	117.40	2,935.0	8,805.1	115,553	437.42	10,935	36,451	437,416
40 (1000)	146.09	3,652.1	10,956	143,785	544.29	13,607	45,357	544,286
42 (1050)	164.60	4,115.1	12,345	162,011	613.28	15,332	51,107	613,278
48 (1200)	216.30	5,407.6	16,223	212,898	805.91	20,148	67,159	805,908

Upstream/downstream piping length

To ensure specification accuracy over widely varying process conditions, install the sensor with a minimum of five straight pipe diameters upstream and two straight pipe diameters downstream from the electrode plane. See [Figure 1](#). This procedure should adequately allow for disturbances created by elbows, valves, and reducers.

Figure 1. Upstream and downstream straight pipe diameters



Installations with reduced straight runs are possible. In reduced straight run installations, performance may shift. Reported flow rates will still be highly repeatable.

Sensor grounding

A reliable ground path is required between the sensor and the process fluid. Optional grounding rings, process reference electrode, and lining protectors are available with 8700 Series sensors to ensure proper grounding. See [Table 6](#) and [Table 19](#).

Ordering information



Rosemount 8732

The Rosemount 8732 transmitter has multiple diagnostic suites available. Best in class performance coupled with advanced diagnostics provides unparalleled process management capabilities. With an optional backlit 2 line by 16 character display/local operator interface, the transmitter can be configured by optical switches to simplify adjustments in hazardous environments without removing the cover.



Rosemount 8712

The remote mount 8712 transmitter brings diagnostics to any HART/ 4-20 mA system that can change how magmeters are installed, maintained, and verified. The Rosemount 8712 also features an easy-to-use 2 line by 20 character operator interface, with quick access to all diagnostic information, and instant access to basic configuration setup through dedicated keys.

Table 6. Rosemount 8732/8712 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Model	Product description	8732	8712	
8732E	Magnetic Flowmeter Transmitter	•		
8712E	Remote Mount Transmitter		•	
Transmitter style				
Standard				
S	Revision 3 - "S" Electronics	•	•	★
Transmitter mount				
Standard				
T	Integral Mount	•		★
R	Remote Mount for 2 in. pipe or panel ⁽¹⁾	•	•	★
Transmitter power supply				
Standard				
1	AC Power Supply (90 to 250 V AC, 50-60Hz)	•	•	★
2	DC Power Supply (12 to 42 V DC)	•	•	★
Outputs				
Standard				
A	4-20 mA Digital Electronics (HART Protocol)	•	•	★
F	FOUNDATION fieldbus digital electronics with FISCO Intrinsically Safe Output	•		★
P	PROFIBUS PA fieldbus digital electronics with FISCO Intrinsically Safe Output	•		★

Table 6. Rosemount 8732/8712 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Transmitter conduit entries		8732	8712	
8732 = 2 conduit ports / 8712 = 4 conduit ports				
Standard				Standard
1	1/2- 14 NPT, Standard Conduits	•	•	★
Expanded				
2	CM20, Conduit Adapters	•	•	
3	PG 13.5, Conduit Adapters	•	•	
8732 = 3 conduit ports / 8712 = NA				
Standard				Standard
4	1/2- 14 NPT, Additional Conduit	•		★
Expanded				
5	CM20, Additional Conduit Adapters	•		
6	PG 13.5, Additional Conduit Adapters	•		
Safety approvals				
FM & CSA				
Standard				Standard
NH	FM and CSA Ordinary Locations/General Purpose Shock and Fire Hazard Approval	•	•	★
N0	FM Class I Div 2 for Non-Flammable Fluids; CSA Class I Div 2 for Non-Flammable Fluids	•	•	★
N5	FM Class I Div 2 for Flammable Fluids	•	•	★
E5	FM Class I Div 1, Explosion-Proof	•		★
ATEX				
Standard				Standard
ED	ATEX Flameproof Ex de IIB T6, and ATEX Dust Approval; Ex de [ia] IIB T6 with IS outputs	•		★
ND	ATEX Dust	•		★
Expanded				
E1	ATEX Flameproof Ex de IIC T6, and ATEX Dust Approval; Ex de [ia] IIC T6 with IS outputs	•		
N1	ATEX Type n	•	•	
IECEX				
Standard				Standard
EF	IECEX Flameproof Ex de IIB T6 Gb and IECEX Dust Approval; Ex de [ia IIC Ga] IIB T6 Gb with IS Output	•		★
NF	IECEX Dust	•		★
Expanded				
E7	IECEX Flameproof Ex de IIC T6 Gb and IECEX Dust Approval; Ex de [ia Ga] IIC T6 Gb with IS output	•		
N7	IECEX Type n	•	•	
NEPSI and CMC (China)				
Standard				Standard
EP	NEPSI Flameproof Ex de IIB T6; Ex de [ia] IIB T6 with IS output	•		★
Expanded				
E3	NEPSI Flameproof Ex de IIC T6; Ex de [ia] IIC T6 with IS output	•		

Table 6. Rosemount 8732/8712 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Hazardous area classification continued		8732	8712	
INMETRO (Brazil)				
Standard				
EB	INMETRO Flameproof Ex de IIB T6; Ex de [ia] IIB T6 with IS outputs	•		★
Expanded				
E2	INMETRO Flameproof Ex de IIC T6; Ex de [ia] IIC T6 with IS outputs	•		
GOST (Russia)				
Standard				
EM	GOST Flameproof Ex de IIB T6; Ex de [ia] IIB T6 with IS outputs	•		★
Expanded				
E8	GOST Flameproof Ex de IIC T6; Ex de [ia] IIC T6 with IS outputs	•		

Options (include with selected model number)

PlantWeb product/process diagnostics				
Standard				
DA1	Magmeter HART Diagnostic Suite 1: High Process Noise Detection and Ground/Wiring Fault Detection	•	•	★
DA2	Magmeter HART Diagnostic Suite 2: Smart Meter Verification	•	•	★
D01	Magmeter digital fieldbus Diagnostic Suite 1: High Process Noise and Ground/Wiring Fault Detection	•		★
D02	Magmeter digital fieldbus Diagnostic Suite 2: Smart Meter Verification	•		★
Discrete input/discrete output				
Standard				
AX	Two Discrete Channels (DI/DO 1, DO 2), see page 32 for more details ⁽²⁾	•	•	★
Display options				
Standard				
M4	Local Operator Interface (HART and PROFIBUS PA only)	•	•	★
M5	LCD Display only (HART and FOUNDATION fieldbus only)	•		★
Other options				
C1	Custom Configuration (Completed CDS required with order)	•	•	
D1	High Accuracy Calibration (0.15% of rate for matched sensor and transmitter) ⁽³⁾	•	•	
DT	Heavy Duty Tagging	•	•	
SH	316/316L SST Electronics Housing, Remote Mount Only	•		
B6	316L Stainless Steel 4-bolt Kit for 2-in. Remote Pipe Mount	•	•	
Conduit electrical connectors				
Expanded				
GE	M12, 4-Pin, Male Connector (Eurofast)	•	•	
GM	A Size Mini, 4-Pin, Male Connector (Minifast)	•	•	
GT	A Size, Spade Terminal Mini, 5-pin, Male Connector (Minifast)		•	
Product certifications				
WC	OIML R49 Water Custody Transfer Certificate	•		
FP	FM Fire Pump Approved	•		
Paint options				
V2	Offshore/Near Shore Marine Paint 3 layer epoxy	•		
Certificates				
Q4	Inspection certificate; calibration data, per ISO 10474 3.1B / EN 10204 3.1	•	•	

Table 6. Rosemount 8732/8712 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Quick Installation Guide (QIG) language options (default is English)		8732	8712	
Expanded				
YA	Danish	•	•	
YB	Hungarian	•	•	
YC	Czech	•	•	
YD	Dutch	•	•	
YE	Bulgarian	•	•	
YF	French	•	•	
YG	German	•	•	
YH	Finnish	•	•	
YI	Italian	•	•	
YJ	Japanese	•		
YL	Polish	•	•	
YM	Mandarin	•	•	
YN	Norwegian	•	•	
YP	Portuguese	•	•	
YS	Spanish	•	•	
YR	Russian	•		
YW	Swedish	•	•	
Typical model number: 8732 S T 1 A 1 N0 DA1 DA2 M4				

- (1) 8712ESR - standard qty (2) Zn Plated CS U-Bolts.
- (2) Requires an additional conduit entry code 4, 5, or 6.
- (3) D1 Option Code must be ordered with sensor and transmitter.



Rosemount 8712H high-signal magmeter system

The 8707 High-Signal Sensor, used in conjunction with the 8712H High-Signal Transmitter, forms the Rosemount High-Signal Magnetic Flowmeter System. This system provides stable flow measurement in the most difficult high-noise applications while maintaining the benefits of DC technology. The increased signal strength of the high-signal system is made possible through a combination of sensor coil design that incorporates the most advanced materials and an extremely efficient and innovative coil drive circuit. The increased signal strength of the Rosemount high-signal system, coupled with advanced signal processing and superior filtering techniques, provide the solution to demanding flow measurement applications. The high-signal magmeter system is not available with CE mark.

Table 7. Rosemount 8712H ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product description	
8712H	High-Signal Magnetic Flowmeter Transmitter (For use with 8707 High-Signal Sensor only.)	
Transmitter style		
Standard		Standard
R	Remote Mount for 2-in. pipe or panel	★
Power supply voltage		
Standard		Standard
12	120 V AC, 50–60 Hz	★
Hazardous area classification		
Standard		Standard
NH	FM and CSA Ordinary Locations/General Purpose Shock and Fire Hazard Approval	★
N0	FM Class I, Division 2 Approval for Non-Flammable Fluids CSA Class I, Division 2 Approval for Non-Flammable Fluids	★

Options (include with selected model number)

Standard		Standard
M4	Local Operator Interface (LOI)	★
Expanded		
B6	316L Stainless Steel 4-bolt Kit for 2-in. Pipe Mount	
C1	Custom Configuration (Completed CDS required with order)	
D1	High Accuracy Calibration [0.25% of rate from 3 to 30 ft/s (0.9 to 10 m/s)] matched sensor and transmitter system ⁽¹⁾	
J1	CM20 Conduit Adapters	
J2	PG 13.5 Conduit Adapters	

Table 7. Rosemount 8712H ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Quick Installation Guide (QIG) language options (default is English)	
Expanded	
YA	Danish
YD	Dutch
YF	French
YG	German
YH	Finnish
YI	Italian
YN	Norwegian
YP	Portuguese
YS	Spanish
YW	Swedish
Typical model number: 8712H R 12 N 0 M 4	

(1) D1 Option Code must be selected for both sensor and transmitter.



Rosemount 8705 / 8707 flanged sensors

All flanged sensors are fabricated from stainless and carbon steel and welded to provide a hermetic seal that protects against moisture and other contaminants. Sizes range from 1/2-in. (15 mm) to 36-in. (900 mm). The sealed housing ensures maximum sensor reliability by protecting all internal components and wiring from the most hostile environments.

Table 8. Rosemount flanged sensor ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Code	Product description	
8705	Magnetic Flowmeter Sensor	
8707	High-Signal Magnetic Flowmeter Sensor ⁽¹⁾	
Lining material		
Standard		Standard
T	PTFE ⁽²⁾	★
P	Polyurethane ⁽³⁾	★
N	Neoprene ⁽³⁾	★
Expanded		
A	PFA ⁽⁴⁾	
F	ETFE ⁽⁵⁾	
L	Linatex ⁽³⁾	
D	Extreme Service Polyurethane (Adiprene) ⁽⁶⁾	
K	Extreme Service PFA	
Electrode material		
Standard		Standard
S	316L Stainless Steel	★
H	Nickel Alloy 276 (UNS N10276)	★
Expanded		
T	Tantalum	
P	80% Platinum - 20% Iridium	
N	Titanium	
V	Flat Head Tungsten-Carbide Coated 316L SST	
W	Tungsten-Carbide Coated 316L SST	
Electrode type		
Standard		Standard
A	2 Measurement Electrodes	★
E	2 Measurement Electrodes plus 1 Reference Electrode	★
Expanded⁽⁷⁾		
B	2 Bulletnose Measurement Electrodes	
F	2 Bulletnose Measurement Electrodes plus 1 Bulletnose Reference Electrode	

Table 8. Rosemount flanged sensor ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Line size		Lining material (from page 12)						
		PTFE code T	Poly code P	Neoprene code N	PFA code A	ETFE code F	Adiprene code D	Linatex code L
005	1/2-in. (15 mm) (8705 only)	•	NA	NA	•	•	NA	NA
010	1-in. (25 mm) (8705 only)	•	•	•	•	•	NA	•
015	1 1/2-in. (40 mm) (8705 only)	•	•	•	•	•	•	•
020	2-in. (50 mm) (8705 only)	•	•	•	•	•	•	•
025	2 1/2-in (65mm) (8705 only)	•	NA	•	NA	NA	NA	NA
030	3-in. (80 mm)	•	•	•	•	•	•	•
040	4-in. (100 mm)	•	•	•	•	•	•	•
050	5-in (125mm) (8705 only)	•	NA	•	NA	NA	NA	NA
060	6-in. (150 mm)	•	•	•	•	•	•	•
080	8-in. (200 mm)	•	•	•	•	•	•	•
100	10-in. (250 mm)	•	•	•	•	•	•	•
120	12-in. (300 mm)	•	•	•	•	•	•	•
140	14-in. (350 mm)	•	•	•	•	•	•	•
160	16-in. (400 mm)	•	•	•	NA	•	•	•
180	18-in. (450 mm)	•	•	•	NA	NA	•	•
200	20-in. (500 mm)	•	•	•	NA	NA	•	•
240	24-in. (600 mm)	•	•	•	NA	NA	•	•
300	30-in. (750 mm)	•	•	•	NA	NA	•	•
360	36-in. (900 mm)	•	•	•	NA	NA	•	•
Flange material and style ⁽⁸⁾		Availability						
C	Carbon Steel Raised Face Slip-On	Refer to Table 9 for availability of Slip-On flanges						
S	Stainless Steel (304/304L) Raised Face Slip-On							
P	Stainless Steel (316/316L) Raised Face Slip-On							
F	Carbon Steel Flat Faced Slip-On ⁽⁹⁾							
G	Stainless Steel (304/304L) Flat Faced Slip-On ⁽⁹⁾							
H	Stainless Steel (316/316L) Flat Faced Slip-On ⁽⁹⁾							
D	Carbon Steel Raised Face Weld Neck	Refer to Table 10 for availability of Weld Neck flanges						
T	Stainless Steel (304/304L) Raised Face Weld Neck							
R	Stainless Steel (316/316L) Raised Face Weld Neck							
J	Carbon Steel Ring Type Joint (RTJ) Weld Neck ⁽¹⁰⁾							
K	Stainless Steel (304/304L) Ring Type Joint (RTJ) Weld Neck ⁽¹⁰⁾							
L	Stainless Steel (316/316L) Ring Type Joint (RTJ) Weld Neck ⁽¹⁰⁾							
Flange type and rating ⁽⁸⁾								
1	ASME B16.5 Class 150 (30-in. and 36-in. AWWA C207 Class D Flat Face)							
2	MSS SP44 Class 150 (30-in. and 36-in. line sizes only)							
3	ASME B16.5 Class 300/MSS-SP44 Class 300 (30-in only)							
6	ASME B16.5 Class 600 (Maximum Pressure: 1000 psig)							
7	ASME B16.5 Class 600							
9	ASME B16.5 Class 900 ⁽¹¹⁾							
M	ASME B16.5 Class 1500 ⁽¹²⁾							
N	ASME B16.5 Class 2500 ⁽¹²⁾							
D	EN1092-1 PN10							
E	EN1092-1 PN16							
F	EN1092-1 PN25							
H	EN1092-1 PN40							

Table 8. Rosemount flanged sensor ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Flange type and rating ⁽⁸⁾				
K	AS2129 Table D ⁽¹³⁾			
L	AS2129 Table E ⁽¹³⁾			
P	JIS B 2220, 10K ⁽¹⁴⁾			
R	JIS B 2220, 20K ⁽¹⁴⁾			
T	JIS B 2220, 40K ⁽¹⁵⁾			
U	AS4087, PN16 ⁽¹⁶⁾			
W	AS4087, PN21 ⁽¹⁶⁾			
Y	AS4087, PN35 ⁽¹⁶⁾			
Electrode housing configuration				
Standard				Standard
W0	Sealed, Welded Housing			★
Expanded				
W1	Sealed, Welded Housing with Pressure Relief			
W3	Sealed, Welded Housing with Separate Electrode Compartments ⁽¹⁷⁾			
Safety approvals		8705	8707	
FM & CSA				
Standard				Standard
NH	FM and CSA Ordinary Locations/General Purpose Shock and Fire Hazard Approval	•	•	★
N0	FM Class I Div 2 for Non-Flammable Fluids; CSA Class I Div 2 for Non-Flammable Fluids Dust ignition proof	•	•	★
N5	FM Class I Div 2 for Flammable Fluids; Dust ignition proof	•		★
E5	FM Class I Div 1, Explosion Proof; Dust ignition proof ⁽¹⁸⁾	•		
ATEX				
Standard				Standard
N1	ATEX Type n	•		★
E1	ATEX EEx e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes) integral mount with 8732 only	•		
KD	ATEX EEx e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes)	•		★
ND	ATEX Dust	•		
IECEX				
Standard				Standard
NF	IECEX Dust	•		★
N7	IECEX Type n	•		★
NEPSI and CMC (China)				
E3	NEPSI Ex e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes) integral mount with 8732 only	•		
EP	NEPSI Ex e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes)	•		
INMETRO (Brazil)				
E2	INMETRO Ex e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes) integral mount with 8732 only	•		
EB	INMETRO Ex e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes)			
GOST (Russia)				
E8	GOST Ex e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes) integral mount with 8732 only	•		
EM	GOST Ex e ia IIC T3..T6, Increased Safety Approval (with I.S. electrodes)	•		

Table 8. Rosemount flanged sensor ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Options (Include with selected model number)

Certifications		8705	8707	
Expanded				
CR	Canadian Registration Number (CRN) certification ⁽¹⁹⁾	•	•	
PD	European Pressure Equipment Directive Certification (PED, per 97/23/EC)	•		
DW	NSF Drinking Water Certification ⁽²⁰⁾	•	•	
FP	FM Fire Pump Approval	•		
WC	OIML R49 Water Custody Transfer Certificate	•		
Optional grounding rings⁽²¹⁾		8705	8707	
Standard				Standard
G1	(2) 316L SST Ground Rings	•	•	★
G5	(1) 316L SST Ground Ring	•	•	★
Expanded				
G2	(2) Nickel Alloy 276 (UNS N10276) Ground Rings	•	•	
G3	(2) Titanium Ground Rings	•	•	
G4	(2) Tantalum Ground Rings	•	•	
G6	(1) Nickel Alloy 276 (UNS N10276) Ground Ring	•	•	
G7	(1) Titanium Ground Ring	•	•	
G8	(1) Tantalum Ground Ring	•	•	
Optional lining protectors⁽²¹⁾				
Standard				Standard
L1	(2) 316L SST Lining Protectors	•	•	★
L5	(1) 316L SST Lining Protector			★
Expanded				
L2	(2) Nickel Alloy 276 (UNS N10276) Lining Protectors	•	•	
L3	(2) Titanium Lining Protectors	•	•	
L6	(1) Nickel Alloy 276 (UNS N10276) Lining Protector	•	•	
L7	(1) Titanium Lining Protector	•	•	
Other options		8705	8707	
Standard				Standard
B3	Integral Mount with 8732 E Series Transmitter	•		★
Expanded				
D1	High Accuracy Calibration (0.15% of rate for matched sensor and transmitter) (0.25% of rate for matched 8707 and 8712H) ⁽²²⁾	•	•	
D2	Dual Calibration Number		•	
DT	Heavy Duty Tagging	•	•	
H1	Lay-length matching 8701 using spool piece ⁽²³⁾	•	•	
H2	Lay-length matching 8701 ⁽²⁴⁾	•	•	
J1	CM 20 Conduit Adapter	•	•	
J2	PG 13.5 Conduit Adapter	•	•	
P05	5 Point Verification	•	•	
P10	10 Point Verification	•	•	
SC	304 SST Junction Box, fully welded to housing	•	•	
SH	316 SST Coil Housing and Remote Junction Box	•	•	
TA	High Temperature Permeable Fluid Option (Contains vent holes provided for permeable fluids such as nitric acid, hydrofluoric acid, or sodium hydroxide at high temperatures) No CRN, No PED ⁽²⁵⁾		•	

Table 8. Rosemount flanged sensor ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Paint Options				
V1	Coal Tar Paint (Submersible/Direct Burial)		•	
V2	Offshore/ Near Shore Marine Paint 3 layer epoxy		•	•
Submergence protection (with IP68 conduit connector)				
R05	Potted Junction Box with 50 feet of Combo Cable		•	
R10	Potted Junction Box with 100 feet of Combo Cable		•	
R15	Potted Junction Box with 150 feet of Combo Cable		•	
R20	Potted Junction Box with 200 feet of Combo Cable		•	
R25	Potted Junction Box with 250 feet of Combo Cable		•	
R30	Potted Junction Box with 300 feet of Combo Cable		•	
Rxx	Potted Junction Box with `xx` feet of Combo Cable `XX` not to exceed 30 which equates to 300 feet		•	
Certificates		8705	8707	
Q4	Calibration Certificate per ISO 10474 3.1B/ EN 10204 3.1	•	•	
Q8	Material Traceability per ISO 10474 3.1B / EN 10204 3.1	•	•	
Q9	Material Traceability Electrode only per ISO 10474 3.1B / EN 10204 3.1	•	•	
Q66	Welding Procedure Qualification Record Documentation	•	•	
Q67	Welding Performance Qualification Record Documentation	•	•	
Q68	Welding Procedure Specification Documentation	•	•	
Q70	Weld Examination Inspection Certificate, ISO 10474 3.1B	•	•	
Q76	Positive Material Identification (PMI) on flanges and pipe, per ASTM E1476-97	•	•	
Typical model number: 8705 T SA 040 C1 W0 N0				

- (1) The high-signal magmeter system is not currently available with CE mark.
- (2) Available in 1/2-in. to 36-in. line sizes ASME Class 150, ASME Class 300, and EN 1092-1 Flanges. Available in 1-in. to 8-in. ASME Class 600 Derated only.
- (3) Available in 1-in. to 24-in. line sizes ASME Class 150, ASME Class 300, and EN 1092-1 Flanges. Available in 30-in. and 36-in. AWWA Class D and ASME Class 150. Available in 1-in. to 24-in. ASME Class 600 full rated. Available in 1 to 12 in. ASME Class 900, ANSI 1500, and ASME Class 2500.
- (4) Available in 1/2-in. to 12-in. line sizes ASME Class 150, ASME Class 300, and EN 1092-1 Flanges. Available in 14-in. ASME Class 150 only; Not available with electrode housing code M2 or M4.
- (5) Available in 1/2-in. to 14-in. line sizes ASME Class 150, ASME Class 300, and EN 1092-1 Flanges; Available in 16-in. ASME Class 150 only. Available in 1-in. to 10-in. ASME Class 600 Derated only.
- (6) Available in line sizes 2-in. to 36-in; Consult Rosemount Sales Team for flange availability.
- (7) Available in 316L (S) and Nickel Alloy 276 (H) only; 316L (S) and Nickel Alloy 276 (H) only; Not available in 1/2-in.
- (8) Refer to Table 9 and Table 10 for Standard vs. Expanded flange offering.
- (9) Flat-faced flanges are manufactured with full-face liners; Available liners Neoprene and Linatex only.
- (10) Available flange rating ASME Class 1500 and ASME Class 2500 only.
- (11) Not available with lining protectors.
- (12) Available liners: Poly (P), Extreme Service Polyurethane (D), Neoprene (N) or Linatex (L); Available line sizes 1 1/2-in. to 12-in. for ASME Class 1500; 1 1/2-in. to 6-in. for ASME Class 2500; Not available with ground rings or lining protectors.
- (13) Not available with PFA (A) liner; Not available with lining protectors.
- (14) Available line sizes 1/2-in. to 24-in.; Not available with lining protectors.
- (15) Available line sizes 1/2-in. to 16-in.; Not available with lining protectors.
- (16) Available in 2-in. to 4-in. and 6-in. to 24-in. line sizes; Not available with lining protectors.
- (17) Available in 3-in. and larger meters for the 8705. Available in 8-in. and larger meters for 8707.
- (18) Available line sizes 1/2-in. to 8-in. (15 mm to 200 mm).

- (19) CRN Approval covers Alberta and Ontario as a standard. Consult Rosemount sales team for availability of other provinces.
- (20) Available liners PTFE (T) all line sizes or Polyurethane (P) 4-in. or larger; Electrode materials 316L SST (S) or Ni-Alloy 276 (H).
- (21) Grounding Rings and Lining Protectors provide the same fluid grounding function.
- (22) D1 transmitter must be ordered with D1 sensor at the same time.
- (23) Available in sensor line sizes 1/2-in. to 16-in. (15 mm to 400 mm).
- (24) Available in sensor line sizes 1/2-in. to 16-in. (15 mm to 400 mm).
- (25) Contains vent holes provided for highly permeable fluids such as nitric acid, hydrofluoric acid, or sodium hydroxide at high temperatures.

Table 9. Availability of slip-on flanges vs. flange type and rating. The starred (★) options should be selected for best delivery.

Line size (in) flange type-rating	1/2	1	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24	30 ⁽¹⁾⁽²⁾	36 ⁽¹⁾
C1 or F1	★	★	★	★	★	★	★	★	★	★	★	★							
C2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
C3 or F3	★	★	★	★	★	★	★	★	★	★	★	★							NA
C6													NA	NA	NA	NA	NA	NA	NA
C7	NA												NA	NA	NA	NA	NA	NA	NA
C9	NA												NA	NA	NA	NA	NA	NA	NA
CD or FD	NA	NA	NA	NA	NA	NA	NA	NA	NA	★	★							NA	NA
CE or FE	NA	NA	NA	NA	NA	NA	★	★	★	★	★							NA	NA
CF or FF	NA	NA	NA	NA	NA	NA	NA	NA	NA									NA	NA
CH or FH	★	★	★	★	★	★	★	★	★	★	★							NA	NA
CK																			
CL																			
CP																		NA	NA
CR																		NA	NA
CT														NA	NA	NA	NA	NA	NA
CU	NA	NA	NA																
CW	NA	NA	NA																
CY	NA	NA	NA																
S1 or G1	★	★	★	★		★	★		★	★	★								
S2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
S3 or G3																			NA
S6													NA	NA	NA	NA	NA	NA	NA
S7													NA	NA	NA	NA	NA	NA	NA
S9	NA												NA	NA	NA	NA	NA	NA	NA
SD or GD	NA	NA	NA	NA	NA	NA	NA	NA	NA									NA	NA
SE or GE	NA	NA	NA	NA	NA	NA	★		★	★	★	★						NA	NA
SF or GF	NA	NA	NA	NA	NA	NA	NA	NA	NA									NA	NA
SH or GH	★	★	★	★		★	★		★	★	★							NA	NA
SK																			
SL																			
SP																		NA	NA
SR																		NA	NA
ST															NA	NA	NA	NA	NA
SU	NA	NA	NA																
SW	NA	NA	NA																
SY	NA	NA	NA																
P1 or H1																			
P2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
P3 or H3																			NA
P6													NA	NA	NA	NA	NA	NA	NA
P7													NA	NA	NA	NA	NA	NA	NA
P9	NA												NA	NA	NA	NA	NA	NA	NA
PD or HD	NA	NA	NA	NA	NA	NA	NA	NA	NA									NA	NA
PE or HE	NA	NA	NA	NA	NA	NA												NA	NA
PF or HF	NA	NA	NA	NA	NA	NA	NA	NA	NA									NA	NA
PH or HH																		NA	NA
PK																			
PL																			
PP																			NA
PR																			NA
PT															NA	NA	NA	NA	NA
PU	NA	NA	NA																
PW	NA	NA	NA																
PY	NA	NA	NA																

(1) AWWA C207 Class D Flat Face Flange for option C1 only.

(2) MMS-SP44 Class 300 Flanges for option C3.

Table 10. Availability of weld neck flanges vs. flange type and rating

Line size (in) flange type-rating	1/2	1	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24	30 ⁽¹⁾⁽²⁾	36 ⁽²⁾
D1					NA			NA											
D3					NA			NA											
D6	NA										NA	NA	NA	NA	NA	NA	NA	NA	NA
D7					NA			NA					NA	NA	NA	NA	NA	NA	NA
D9	NA	NA	NA	NA	NA	NA	NA	NA	NA									NA	NA
DM	NA	NA			NA			NA					NA	NA	NA	NA	NA	NA	NA
DN	NA	NA			NA			NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
T1					NA			NA											
T3					NA			NA											
T6	NA										NA	NA	NA	NA	NA	NA	NA	NA	NA
T7					NA			NA					NA	NA	NA	NA	NA	NA	NA
T9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA								NA	NA
TM	NA	NA			NA			NA					NA	NA	NA	NA	NA	NA	NA
TN	NA	NA			NA			NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
R1					NA			NA											
R3					NA			NA											
R6	NA										NA	NA	NA	NA	NA	NA	NA	NA	NA
R7					NA			NA					NA	NA	NA	NA	NA	NA	NA
R9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA								NA	NA
RM	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
RN	NA	NA			NA			NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J7	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
J9	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
JM	NA	NA			NA			NA					NA	NA	NA	NA	NA	NA	NA
JN	NA	NA			NA			NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
K7	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
K9	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
KM	NA	NA			NA			NA					NA	NA	NA	NA	NA	NA	NA
KN	NA	NA			NA			NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
L7	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
L9	NA				NA			NA					NA	NA	NA	NA	NA	NA	NA
LM	NA	NA			NA			NA					NA	NA	NA	NA	NA	NA	NA
LN	NA	NA			NA			NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

(1) MMS-SP44 Class 300 Flanges for option C3.

(2) AWWA C207 Class D Flat Face Flange for option C1 only.



Rosemount 8711 wafer sensors

The flangeless design of the 8711 wafer sensor makes it an economical, compact, and lightweight alternative to flanged magnetic flowmeters. Alignment spacers are provided with every 8711 which help center the sensor in the process line and makes installation easier.

Table 11. Rosemount 8711 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product description	
8711	Magnetic Flowmeter Wafer Sensor	
Lining material		
Standard		Standard
S	PTFE ⁽¹⁾	★
Expanded		
A	PFA ⁽²⁾	
T	ETFE ⁽¹⁾	
Electrode material		
Standard		Standard
S	316L Stainless Steel	★
H	Nickel Alloy 276 (UNS N10276)	★
Expanded		
N	Titanium	
T	Tantalum	
P	80% Platinum - 20% Iridium	
Electrode type		
Standard		Standard
A	2 Measurement Electrodes	★
E	2 Measurement Electrodes plus 1 Reference Electrode	★
Expanded⁽³⁾		
B	2 Bulletnose Measurement Electrodes	
F	2 Bulletnose Measurement Electrodes plus 1 Reference Bulletnose Electrode	
Line size		
Standard		Standard
005	½-in. (15 mm)	★
010	1-in. (25 mm)	★
015	1½-in. (40mm)	★
020	2-in. (50mm)	★
030	3-in. (80 mm)	★
040	4-in. (100 mm)	★
060	6-in. (150 mm)	★
080	8-in. (200 mm)	★
Expanded		
15F	0.15-in. (4 mm) liner material PFA only ⁽⁴⁾	
30F	0.30-in. (8 mm) liner material PFA only ⁽⁴⁾	

Table 11. Rosemount 8711 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Transmitter mounting configuration		
Standard		Standard
R	Remote	★
U	Integral, mounted to Rosemount 8732 Transmitter	★
Mating pipe flange pressure rating		
Includes three alignment spacers (where applicable)		
Standard		Standard
1	ASME Class 150	★
3	ASME Class 300	★
D	EN1092-1 PN10	★
E	EN1092-1 PN16	★
F	EN1092-1 PN25	★
H	EN1092-1 PN40	★
P	JIS B2220 10K	★
R	JIS B2220 20K	★
U	AS4087 PN16	★
W	AS4087 PN21	★
Y	AS4087 PN35	★
Hazardous area classification⁽⁵⁾		
FM & CSA		
Standard		Standard
NH	FM and CSA Ordinary Locations/General Purpose Shock and Fire Hazard Approval	★
N0	FM Class I Div 2 for Non-Flammable Fluids; CSA Class I Div 2 for Non-Flammable Fluids	★
N5	FM Class I Div 2 for Flammable Fluids	★
E5	FM Class I Div 1, Explosion Proof	★
ATEX		
Standard		Standard
KD	ATEX EEx e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes)	★
N1	ATEX Type n	★
ND	ATEX Dust	★
E1	ATEX EEx e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes), integral mount with 8732 only	
IECEX		
NF	IECEX Dust	
NEPSI and CMC (China)		
E3	NEPSI Ex e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes), integral mount with 8732 only	
EP	NEPSI Ex e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes)	
INMETRO (Brazil)		
E2	INMETRO Ex e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes), integral mount with 8732 only	
EB	INMETRO Ex e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes)	
GOST (Russia)		
E8	GOST Ex e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes), integral mount with 8732 only	
EM	GOST Ex e ia IIC T3... T6, Increased Safety Approval (with I.S. electrodes)	

Table 11. Rosemount 8711 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Options (include with selected model number)

Certifications		
Expanded		
PD	Pressure Equipment Directive Certification (PED, per 97/23/EC)	
DW	NSF Drinking Water Certification ⁽⁶⁾	
FP	FM Fire Pump Approval	
WC	OIML R49 Water Custody Transfer Certificate	
Optional grounding rings		
Standard		Standard
G1	(2) 316L SST Ground Rings	★
G5	(1) 316L SST Ground Ring	★
Expanded		
G2	(2) Nickel Alloy 276 (UNS N10276) Ground Rings	
G3	(2) Titanium Ground Rings	
G4	(2) Tantalum Ground Rings	
G6	(1) Nickel Alloy 276 (UNS N10276) Ground Ring	
G7	(1) Titanium Ground Ring	
G8	(1) Tantalum Ground Ring	
Other options		
Expanded		
Mounting kit		
MK2	Mounting Studs and Nuts	
Paint options		
V2	Offshore/ Near Shore Marine Paint 3 layer epoxy	
Certificates		
Q4	Calibration Certificate per ISO 10474 3.1B / EN 10204 3.1	
Q8	Material Traceability per ISO 10474 3.1B / EN 10204 3.1	
Q9	Material Traceability Electrode only per ISO 10474 3.1B / EN 10204 3.1 3.1B	
Q66	Welding Procedure Qualification Record Documentation ⁽⁷⁾	
Q67	Welding Performance Qualification Record Documentation ⁽⁷⁾	
Q68	Welding Procedure Specification Documentation ⁽⁷⁾	
Q70	Weld Examination Inspection Certificate, ISO 10474 3.1B ⁽⁷⁾	
Q76	Positive Material Identification (PMI) on flanges and pipe, per ASTM E1476-97 ⁽⁷⁾	
DT	Heavy Duty Tagging	
D1	High Accuracy Calibration (0.15% of rate for matched sensor and transmitter) ⁽⁸⁾	
Typical model number: 8711 TSA 020 R 5 N0		

- (1) Not available with 0.15-in. and 0.30-in. (4 mm and 8 mm) line sizes.
- (2) Available with 0.15-in. and 0.30-in. (4 mm and 8 mm) line sizes only.
- (3) Bullet nose electrodes are available in 1-in. to 8-in. (25 mm to 200 mm).
- (4) This line size mounts between ASME 1/2-in flanges
- (5) Add option "Q7" to the model number to receive a copy of the agency approval certificate.
- (6) Available liner PTFE (T) 1/2-in to 8-in. (15 mm to 200 mm); Electrode materials 316L SST (S) or Ni-Alloy 276 (H).
- (7) 6-in. and 8-in. (150 mm and 200 mm) line sizes only.
- (8) D1 Option Code must be ordered with sensor and transmitter.



Rosemount 8721 hygienic sensors

The 8721 hygienic sensor is specifically designed for the demanding applications in food, beverage, and life sciences. The robust, all-welded, full diameter sensor is constructed of FDA approved materials and is authorized to display the 3-A Symbol (Authorization #1222) is certified by EHEDG (#C03-5229) and is approved for use in FDA Grade A milk meter based timing loops (M-b 350). Sizes range from 1/2-in. (15mm) to 4-in. (100mm) and are available in a variety of industry standard process connections.

Table 12. Rosemount 8721 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	Product description	
8721	Hygienic Magnetic Flowmeter Sensor	
Lining material		
Standard		Standard
A	PFA	★
Electrode material		
Standard		Standard
S	316L SST (standard)	★
Expanded		
H	Nickel Alloy 276 (UNS N10276)	
P	80% Platinum-20% Iridium	
Electrode construction		
Standard		Standard
A	Standard measurement electrodes	★
Line Sizes		
Standard		Standard
005	1/2-in. (15 mm)	★
010	1-in. (25 mm)	★
015	1 1/2-in. (40 mm)	★
020	2-in. (50 mm)	★
025	2 1/2-in. (65 mm)	★
030	3-in. (80 mm)	★
040	4-in. (100 mm)	★
Transmitter mounting configuration		
Standard		Standard
R	Remote, for use with 8712, or remote version of 8732 transmitter	★
U	Integral, mounted to 8732 transmitter	★
X	Sensor only (does not include terminal junction box)	★

Table 12. Rosemount 8721 ordering information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Process connection type		
Standard		Standard
A	Tri-Clamp ⁽¹⁾	★
B	IDF Sanitary screw type ⁽²⁾	★
Expanded		
C	ANSI Weld Nipple ⁽²⁾	
D	DIN 11851 (Imperial)	
E	DIN 11851 (Metric)	
F	DIN 11864-1 form A	
G	DIN 11864-2 form A	
H	SMS Connection	
J	Cherry-Burrell I-Line	
K	DIN 11850 Weld Nipple	
Process gasket material		
Standard		Standard
1	Silicone gasket seal	★
2	EPDM	★
Expanded		
4	Viton	
8	EPDM Compression - limiting ⁽³⁾	
9	Viton Compression - limiting ⁽³⁾	
X	No gasket (User supplied; only applicable with Process Connection B)	
Product certifications		
Standard		Standard
N0	FM / CSA General Purpose / Ordinary Location, CE Marking; 3-A; EHEDG Type EL	★
Options (include with selected model number)		
Expanded		
AH	Electropolished process connection surface finish < 15µinch Ra (0.38µm Ra)	
D1	High Accuracy Calibration [0.25% of rate from 3-30 ft/s (0.9-10 m/s)] matched sensor and transmitter system ⁽⁴⁾	
D3	High Velocity Meter Verification. Calibration verified at 1, 3, 10 and 20 ft/sec (0.3, 1, 3, and 6 m/s)	
HP	Process Data PD340 (Alfa-Laval PD340) 250mm lay length and Tri-Clamp process connections	
J1	CM20 Conduit Adapter (Applies to Transmitter Mount Option "R" only)	
J2	PG13.5 Conduit Adapter (Applies to Transmitter Mount Option "R" only)	
Q4	Calibration Certificate per ISO 10474 3.1B/ EN 10204 3.1	
Q8	Material Traceability Certificate per ISO 10474 3.1B / EN 10204 3.1(product contact surfaces)	
SJ	304 Stainless Steel terminal junction box (Remote configuration only)	
Typical model number: 8721 A S A 020 U A 1 N0		

(1) Tri-Clamp specification per BPE.

(2) IDF Specification per BS4825 Part 4.

(3) EHEDG Document 8 requires mechanical compression limiting, provided by Compression - limiting gaskets for line sizes 1-in. to 4-in. only.

(4) D1 transmitter must be ordered with D1 sensor at the same time.



Rosemount 8714D

The Rosemount 8714D Magnetic Flowmeter Simulator attaches to an 8712, or 8732 transmitter’s sensor connections to ensure traceability to NIST standards and long-term accuracy of the flowmeter system. The 8714D is not compatible with the 8712H High-Signal transmitter

Table 13. Rosemount 8714 ordering information

Model	Description
8714DQ4	Magnetic Flowmeter Simulator - Reference Calibration Standard

Tagging styles

Name Plate

1 Line - 30 Characters

Wire-on

5 Lines - 30 Characters per line

Ordering procedure

To order, select the desired sensor and/or transmitter by specifying model codes from the ordering table.

For remote transmitter applications, note the cable specification requirements.

Sensors and transmitters must be selected from Product Data Sheet 00813-0100-4727.

Standard configuration

Unless the Configuration Data Sheet is completed, the transmitter will be shipped as follows:

Engineering Units:	ft/sec
4 mA (1 V DC):	0
20 mA (5 V DC):	30
Sensor Size:	3-in.
Empty Pipe:	On
Sensor Calibration Number:	1000005010000000

Integrally Mounted Rosemount 8732 Transmitters are factory configured with the attached sensor size and appropriate calibration number.

Cable requirements for remote transmitters

Description	Length	P/N
Electrode Cable (20 AWG) Belden 8762, Alpha 2411 equivalent	ft m	08712-0061-0001 08712-0061-2003
Coil Drive Cable (14 AWG) Belden 8720, Alpha 2442 equivalent	ft m	08712-0060-0001 08712-0060-2003
Combination Cable Electrode Cable (20AWG) and Coil Drive Cable (18 AWG) ⁽¹⁾	ft m	08732-0753-1003 08732-0753-2004

(1) Combination signal and coil drive cable is not recommended for high-signal magmeter system.

Remote transmitter installations require equal lengths of electrode and coil drive cables. Integrally mounted transmitters are factory wired and do not require interconnecting cables.

Individual cable lengths from 5 to 1000 ft. (1.5 to 300 m) may be specified. Cable longer than 100 ft. (30 m) is not recommended for high-signal systems. Combination signal and coil drive cable should be limited to less than 330 ft (100 m). All cables will be shipped with the sensor.




Custom configuration (Option Code C1)

If Option Code C1 is ordered, the Configuration Data Sheet (CDS) must be submitted at the time of order.

Product specifications





Listed below are tables that outline some of the basic performance, physical, and functional specifications of the Rosemount 8700 Series Magnetic Flowmeter products. [Table 14](#) provides an overview of the Rosemount 8700 Series Transmitter products. [Table 15](#) provides an overview of the Rosemount 8700 Series Sensor products.

Table 14. Rosemount 8700 series transmitter specifications

	Model	Base accuracy ⁽¹⁾	Mounting	Power supply	User interface	Communication protocol	Diagnostics	Sensor compatibility	Detailed specifications	Ordering information
	8732	0.25% Standard 0.15% High Accuracy Option	Integral or Remote	Global AC or DC	4 Optical Switch LOI Display Only	HART PROFIBUS PA fieldbus HART & FOUNDATION fieldbus	Basic plus DA1 and DA2 Suite Basic plus D01 and D02 Suite	All Rosemount plus other manufacturers	page 30	page 6
	8712	0.25% Standard 0.15% High Accuracy Option	Remote	Global AC or DC	Dedicated 15 Button LOI	HART	Basic plus Optional DA1 and DA2 Suite	All Rosemount plus other manufacturers	page 30	page 6
	8712H	0.5% Standard 0.25% High Accuracy Option	Remote	120 V AC	Dedicated 15 Button LOI	HART	Basic	8707 Only	page 37	page 10

(1) For complete accuracy specifications, please refer to the transmitter detailed specifications.

Table 15. Rosemount 8700 series sensor specifications

	Model	Style	Base accuracy ⁽¹⁾	Line sizes	Coil drive power	Design features	Detailed specifications	Ordering information
	8705	Flanged	0.25% Standard 0.15% High Accuracy Option	1/2-in. to 36-in. (15 mm to 900 mm)	Pulsed DC	Standard Process Design	page 40	page 12
	8707	High-Signal (Flanged)	0.5% Standard 0.25% High Accuracy Option	3-in. to 36-in. (15 mm to 900 mm)	High-Signal Pulsed DC	Superior Signal Stability for High Solids and Slurry Applications	page 40	page 12
	8711	Wafer	0.25% Standard 0.15% High Accuracy Option	0.15-in. to 8-in. (4 mm to 200 mm)	Pulsed DC	Compact, Light Weight	page 43	page 20
	8721	Hygienic	0.5% Standard 0.25% High Accuracy Option	1/2-in. to 4-in. (15 mm to 100 mm)	Pulsed DC	3-A and EHEDG CIP/SIP	page 45	page 23

(1) For complete accuracy specifications, please refer to the sensor detailed specifications.

Table 16. Lining material selection






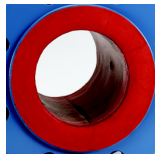

	Liner material	General characteristics
	<p>PFA</p> 	<ul style="list-style-type: none"> • Best chemical resistance • Better abrasion resistance than PTFE • Best high temperature capabilities • -20 to 350 °F (-29 to 177 °C)
	<p>PTFE</p> 	<ul style="list-style-type: none"> • Highly chemical resistant • Excellent high temperature capabilities • -20 to 350 °F (-29 to 177 °C)
	<p>ETFE</p> 	<ul style="list-style-type: none"> • Excellent chemical resistance • Better abrasion resistance than PTFE • -20 to 300 °F (-29 to 149 °C)
	<p>Polyurethane</p> 	<ul style="list-style-type: none"> • Excellent abrasion resistance for slurries with small and medium particles • Limited chemical resistance • 0 to 140 °F (-18 to 60 °C) • Typically applied in clean water
	<p>Neoprene</p> 	<ul style="list-style-type: none"> • Very good abrasion resistance for small and medium particles • Better chemical resistance than polyurethane • 0 to 176 °F (-18 to 80 °C) • Typically applied in water with chemicals, and sea water
	<p>Linatex Rubber</p> 	<ul style="list-style-type: none"> • Very good abrasion resistance for large particles • Limited chemical resistance especially in acids • Softer material than polyurethane and neoprene • 0 to 158 °F (-18 to 70 °C) • Typically applied in mining slurries
	<p>Extreme Service Polyurethane</p> 	<ul style="list-style-type: none"> • Ideal for applications with high salinity and / or hydrocarbon carryover • Excellent abrasion resistance • 0 to 200 °F (-18 to 93 °C) • Typically used for Water Injection, Recovered Water, and Coal Gasification Slurries

Table 17. Electrode selection

Electrode material	General characteristics
316L Stainless Steel	• Good corrosion resistance
	• Good abrasion resistance
	• Not recommended for sulfuric or hydrochloric acids
Nickel Alloy 276 (UNS N10276)	• Better corrosion resistance
	• High strength
	• Good in slurry applications
	• Effective in oxidizing fluids
Tantalum	• Excellent corrosion resistance
	• Not recommended for hydrofluoric acid, fluorosilic acid, or sodium hydroxide
80% Platinum 20% Iridium	• Best chemical resistance
	• Expensive material
	• not recommended for aquaregia
Titanium	• Better chemical resistance
	• Better abrasion resistance
	• Good for sea water applications
	• Not recommended for hydrofluoric or sulfuric acid
Tungsten Carbide	• Limited chemical resistance
	• Best abrasion resistance
	• High concentration slurries
	• Preferred electrode for Oil and Gas fracturing applications
Electrode type	General characteristics
Standard Measurement	• Lowest cost
	• Good for most applications
Standard Measurement + Reference electrode (Also see Table 18 and Table 19 for grounding options and installation)	• Low cost grounding option especially for large line sizes
	• Minimum conductivity of 100 microsiemens/cm
	• Not recommended for electrolysis or galvanic corrosion applications
Bulletnose	• Slightly more expensive
	• Best option for coating processes

Table 18. Process reference options

Grounding options	General characteristics
No Grounding Options (grounding straps)	• Acceptable for conductive unlined pipe
	• Grounding straps provided at no cost
Reference Electrode	• Same material as measurement electrodes
	• Sufficient grounding option when process fluid conductivity is greater than 100 microsiemens/cm
	• Not recommended in electrolysis applications, galvanic corrosion applications, or applications where the electrodes may coat.
Grounding Rings	• Low conductivity process fluids
	• Cathodic or electrolysis applications that may have stray currents in or around the process
	• Variety of materials for process fluid compatibility
Lining Protectors	• Protect upstream edge of sensor from abrasive fluids
	• Permanently installed on sensor
	• Protect liner material from over torquing of flange bolts
	• Provide ground path and eliminate need for grounding rings or reference electrode

Table 19. Process reference installation

Type of pipe	Grounding straps	Grounding rings	Reference electrode	Lining protectors
Conductive unlined pipe	Acceptable	Not Required	Not Required	Not Required
Conductive lined pipe	Not Acceptable	Acceptable	Acceptable	Acceptable
Non-conductive pipe	Not Acceptable	Acceptable	Not Acceptable	Acceptable

Rosemount E-Series transmitter specifications



Functional specifications

Sensor compatibility

Compatible with Rosemount 8705, 8711, 8721, and 570TM sensors. Compatible with Rosemount 8707 sensor with D2 Dual calibration option. Compatible with AC and DC powered sensors of other manufacturers.

Transmitter coil drive current

500 mA

Flow rate range

Capable of processing signals from fluids that are traveling between 0.04 and 39 ft/s (0.01 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/s).

Conductivity limits

Process liquid must have a conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater.

Power supply

90-250 VAC, 50-60 Hz or 12-42 VDC

Line power fuses

90-250 VAC systems

2 amp, Quick-acting Bussman AGC2 or equivalent

12-42 VDC systems

3 amp, Quick-acting Bussman AGC3 or equivalent

Power consumption

15 watts maximum - DC

40 VA maximum - AC

Switch-on current

AC: Maximum 35.7 A (< 5 ms) at 250 VAC

DC: Maximum 42 A (< 5 ms) at 42 VDC

AC power supply requirements

Units powered by 90-250 VAC have the following power requirements.

Figure 2. AC current requirements

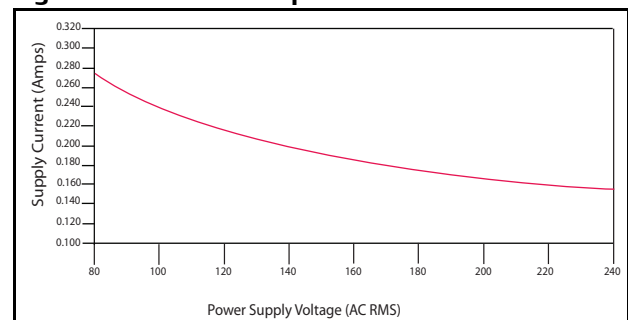
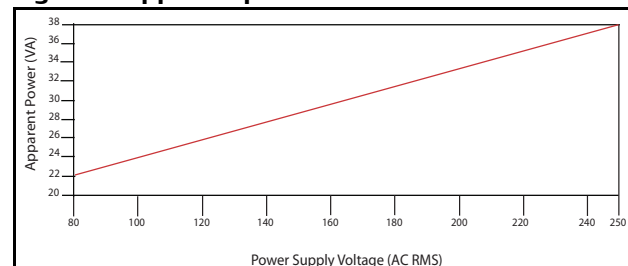


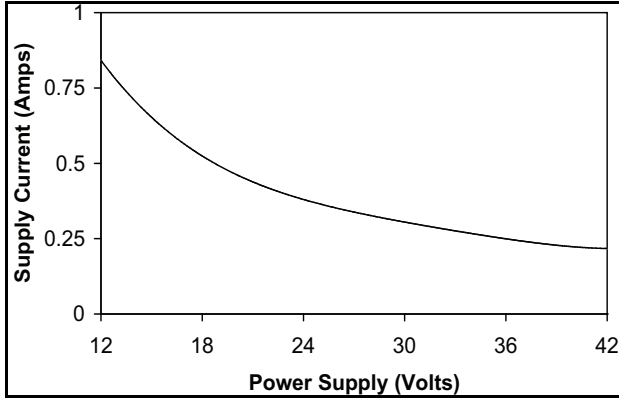
Figure 3. Apparent power



DC supply current requirements

Units powered by 12 VDC power supply may draw up to 1amp of current steady state.

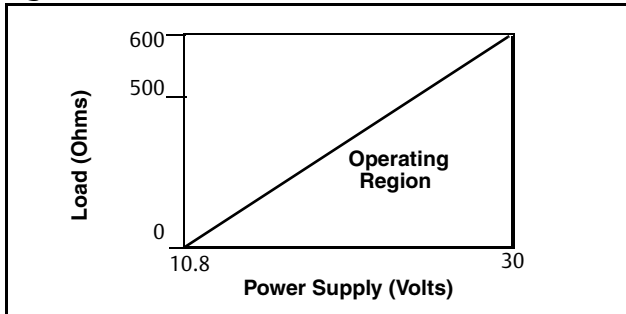
Figure 4. DC current requirements



DC load limitations (Analog output)

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

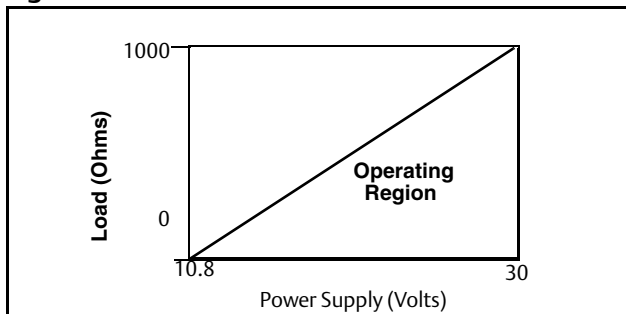
Figure 5. 8732 DC load limitations



$$R_{max} = 31.25 (V_{ps} - 10.8)$$

V_{ps} = Power Supply Voltage (Volts)
 R_{max} = Maximum Loop Resistance (Ohms)

Figure 6. 8712 DC load limitations



$$R_{max} = 52.08 (V_{ps} - 10.8)$$

V_{ps} = Power Supply Voltage (Volts)
 R_{max} = Maximum Loop Resistance (Ohms)

Note

HART Communication requires a minimum loop resistance of 250 ohms.

8732 ambient temperature limits

Operating

- 58 to 165 °F (-50 to 74 °C) without local operator interface
- 4 to 140 °F (-20 to 60 °C) with local operator interface

Storage

- 40 to 185 °F (-40 to 85 °C) without local operator interface
- 22 to 176 °F (-30 to 80 °C) with local operator interface

8732 humidity limits

0-95% RH to 140 °F (60 °C)

8712 ambient temperature limits

Operating

- 40 to 165 °F (-40 to 74 °C) without local operator interface
- 20 to 140 °F (-29 to 60 °C) with local operator interface

Storage

- 40 to 176 °F (-40 to 80 °C) with and without local operator interface

8712 humidity limits

0-95% RH to 120 °F (49 °C), decreases linearly to 10% RH at 130 °F (54 °C)

Altitude

2000 meters maximum

Enclosure rating

Type 4X, IEC 60529, IP66 (transmitter)

Transient protection rating

Built in transient protection that conforms to:

IEC 61000-4-4 for burst currents

IEC 61000-4-5 for surge currents.

IEC 611185-2.2000, Class 3 up to 2 kV and up to 2 kA protection.

Turn-on time

5 minutes to rated accuracy from power up; 5 seconds from power interruption

Start-up time

50 ms from zero flow

Low Flow cut-off

Adjustable between 0.01 and 38.37 ft/s (0.003 and 11.7 m/s). Below selected value, output is driven to the zero flow rate signal level.

Overrange capability

Signal output will remain linear until 110% of upper range value or 44 ft/s (13 m/s). The signal output will remain constant above these values. Out of range message displayed on LOI and the Field Communicator.

Damping

Adjustable between 0 and 256 seconds

E-Series advanced diagnostics capabilities**Basic**

- Self test
- Transmitter faults
- Analog output test
- Pulse output test
- Tunable empty pipe
- Reverse flow
- Coil circuit fault
- Electronics temperature

Process diagnostics (DA1/D01)

- Ground/wiring fault
- High process noise

Smart meter verification (DA2/D02)

- Smart Meter Verification
- 4-20 mA loop verification⁽¹⁾

Output signals**8732 HART / Pulse specifications****Analog output adjustment⁽²⁾**

4–20 mA, switch-selectable as internally or externally powered 10.8 to 30 VDC; 0 to 600 Ω load.

Engineering units—lower and upper range values are user-selectable.

Output automatically scaled to provide 4 mA at lower range value and 20 mA at upper range value. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications, digital flow signal, superimposed on 4–20 mA signal, available for control system interface. 250 Ω required for HART communications.

Scalable frequency adjustment⁽²⁾

0-10,000 Hz, switch-selectable as internally or externally powered 10 to 24 VDC, transistor switch closure up to 5.75 w. Pulse value can be set to equal desired volume in selected engineering units. Pulse width adjustable from 0.1 to 650 ms.

8712 HART / Pulse specifications**Analog output adjustment⁽³⁾**

4–20 mA, switch-selectable as internally or externally powered 10.8 to 30 V DC; 0 to 1000 Ω load.

Engineering units—lower and upper range values are user-selectable.

Output automatically scaled to provide 4 mA at lower range value and 20 mA at upper range value. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications, digital flow signal, superimposed on 4–20 mA signal, available for control system interface. 250 Ω required for HART communications.

Scalable frequency adjustment⁽²⁾

0-10,000 Hz, externally powered 5 to 24 V DC, transistor switch closure up to 2 W for frequencies up to 4,000 Hz and 5 V DC at 0.1 W at maximum frequency of 10,000 Hz. Pulse value can be set to equal desired volume in selected engineering units. Pulse width adjustable from 1.5 to 500 msec, below 1.5 msec pulse width automatically switches to 50% duty cycle.

Optional discrete output function (AX option)

Externally powered at 5 to 24 V DC, transistor switch closure up to indicate either:

Reverse flow:

Activates switch closure output when reverse flow is detected. The reverse flow rate is displayed.

Zero flow:

Activates switch closure output when flow goes to 0 ft/s.

Empty pipe:

Activates switch closure output when an empty pipe condition is detected.

(1) Only available on the 8732 with HART outputs.

(2) For transmitters with intrinsically safe outputs, power must be supplied externally.

(3) For transmitters with intrinsically safe outputs, power must be supplied externally.

Transmitter faults:

Activates switch closure output when a transmitter fault is detected.

Flow limits (2):

Activates switch closure output when the transmitter measures a flow rate that meets the conditions established for this alert. There are two independent flow limit alerts that can be configured as discrete outputs.

Totalizer limit:

Activates switch closure output when the transmitter measures a total flow that meets the conditions established for this alert.

Diagnostic status:

Activates switch closure output when the transmitter detects a condition that meets the configured criteria of this output.

Optional discrete input function (AX option)

Externally powered at 5 to 24 V DC, transistor switch closure up to indicate either:

Net total reset:

Resets the net totalizer value to zero.

Positive zero return (PZR):

Forces outputs of the transmitter to zero flow.

Output testing**Analog output test**

Transmitter may be commanded to supply a specified current between 3.5 and 23 mA.

Pulse output test

Transmitter may be commanded to supply a specified frequency between 1 and 10,000 Hz.

Security lockout

Security lockout switch on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change.

8732 LOI lockout

All optical switches on the display can be locked locally from the display layout configuration screen by holding the upper right optical switch for 10 seconds. The display can be reactivated holding the same switch for 10 seconds.

FOUNDATION fieldbus digital output specifications**Output signal**

Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02

Schedule entries

Seven (7)

Links

Twenty (20)

Virtual communications relationships (VCRs)

One (1) predefined (F6, F7) Nineteen (19) configurable

(see [Table 1](#))

Block	Execution time (milliseconds)
Resource (RB)	—
Transducer (TB)	—
Analog Input (AI)	10
Proportional/Integral/ Derivative (PID)	10
Integrator (INT)	10
Arithmetic (AR)	10

FOUNDATION fieldbus electrical specifications

- Voltage Requirement = 9 to 32 VDC
- Polarity Insensitive
- Current Draw = 18mA

FOUNDATION fieldbus function blocks**Transducer block**

The transducer block calculates flow from the measured induced voltage. The calculation includes information related to the calibration number, line size, and diagnostics.

Resource block

The resource block contains physical transmitter information, including available memory, manufacturer identification, device type, software tag, and unique identification.

Backup link active scheduler (LAS)

The transmitter is classified as a device link master. A device link master can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment.

The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

Diagnostics

The transmitter automatically performs continuous self-diagnostics. The user can perform on-line testing of the transmitter digital signal. Advanced simulation diagnostics are available. This enables remote verification of the electronics via a flow signal generator built into the electronics. The sensor strength value can be used to view the process flow signal and provide information regarding filter settings.

Analog input

The AI function block processes the measurement and makes it available to other function blocks. The AI function block also allows filtering, alarming, and engineering unit changes.

The 8732 Transmitter with FOUNDATION fieldbus comes standard with one AI function block for flow.

Arithmetic block

Provides predefined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Proportional/integral/derivative

The optional PID function block provides a sophisticated implementation of the universal PID algorithm. The PID function block features input for feed forward control, alarms on the process variable, and control deviation. The PID type (series or Instrument Society of America [ISA]) is user-selectable on the derivative filter.

Integrator

The standard integrator block is available for totalization of flow.

Reverse flow

Detects and reports reverse flow

Software lockout

A write-lock switch and software lockout are provided in the resource function block.

PROFIBUS PA fieldbus digital output specifications

Output signal

Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02.

Profile version

3.01

Identification number

Generic: 0x9740

Manufacturer Specific: 0x0C15

PROFIBUS PA function blocks

Resource block

The Resource Block contains physical transmitter information, including available memory, manufacturer identification, device type, software tag, and unique identification.

Transducer block

The transducer block calculates flow from the measured induced voltage and provides the PV Variable input to the AI Block. The calculation includes information related to the calibration number, line size, and diagnostics.

Diagnostics

The transmitter automatically performs continuous self-diagnostics. The user can perform on-line testing of the transmitter digital signal. In addition advanced diagnostic capabilities are also available to give better insight to meter performance and process information.

Analog Input block

The AI function block processes the measurement and makes it available to the Host system. The AI function block also allows filtering, alarming, and engineering unit changes. The 8732 Transmitter with PROFIBUS PA digital fieldbus comes standard with one AI function block flow.

Totalizer block (3 blocks)

The Totalizer function block allows for totalization of the flow signal. The 8732 Transmitter with PROFIBUS PA digital fieldbus comes with 3 independent totalizer blocks. Each totalized value can be displayed on the Local Operator Interface of the device in addition to the Primary Variable. The non-volatile totalizers can be configured to measure gross, net, forward, and reverse totals.

Sensor compensation

Rosemount sensors are flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.

8732 transmitters and other manufacturers' sensors can be calibrated at known process conditions or at the Rosemount NIST-Traceable Flow Facility. Transmitters calibrated on site require a two-step procedure to match a known flow rate. This procedure can be found in the Operations Manual:

Performance specifications

(System specifications are given using the frequency output and with the unit at reference conditions.)

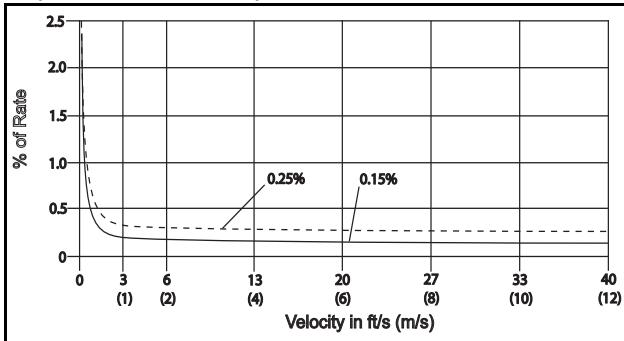
Accuracy

Includes the combined effects of linearity, hysteresis, repeatability, and calibration uncertainty.

Rosemount 8705/8707 sensor:

Standard system accuracy is $\pm 0.25\%$ of rate ± 1.0 mm/sec from 0.04 to 6 ft/s (0.01 to 2 m/s); above 6 ft/s (2 m/s), the system has an accuracy of $\pm 0.25\%$ of rate ± 1.5 mm/sec.

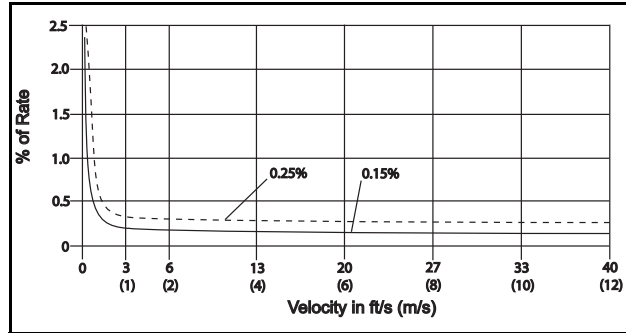
Optional high accuracy is $\pm 0.15\%$ of rate ± 1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of $\pm 0.18\%$ of rate.⁽¹⁾



Rosemount 8711 sensor:

Standard system accuracy is $\pm 0.25\%$ of rate ± 2.0 mm/sec from 0.04 to 39 ft/s (0.01 to 12 m/s).

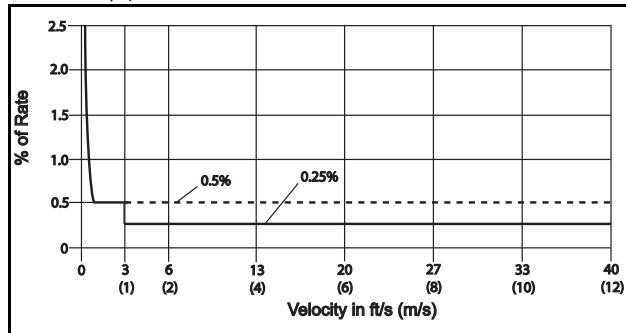
Optional high accuracy is $\pm 0.15\%$ of rate ± 1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of $\pm 0.18\%$ of rate.



Rosemount 8721 sensor:

Standard system accuracy is $\pm 0.5\%$ of rate from 1 to 39 ft/s (0.3 to 12 m/s); between 0.04 and 1.0 ft/s (0.01 and 0.3 m/s), the system has an accuracy of ± 0.005 ft/s (0.0015 m/s).

Optional high accuracy is $\pm 0.25\%$ of rate from 3 to 39 ft/s (1 to 12 m/s).



Other manufacturers' sensors:

When calibrated in the Rosemount Flow Facility, system accuracies as good as 0.5% of rate can be attained.

There is no accuracy specification for other manufacturers' sensors calibrated in the process line.

(1) For Sensor sizes greater than 12 in. (300 mm) the high accuracy is $\pm 0.25\%$ of rate from 3 to 39 ft/sec (1 to 12 m/sec).

Analog output effect

Analog output has the same accuracy as frequency output plus an additional $\pm 4\mu\text{A}$.

Repeatability

$\pm 0.1\%$ of reading

Response time (analog output)

50 ms max response time to step change in input

Stability

$\pm 0.1\%$ of rate over six months

Ambient temperature effect

$\pm 0.25\%$ change over operating temperature range

EMC compliance

Requires Combo Cable to meet EN61326-1: 2006 (Industrial) electromagnetic compatibility (EMC) for process and laboratory apparatus.

8732 Physical specifications**Materials of construction****Standard housing**

Low copper aluminum
Type 4X and IEC 60529 IP66

Optional housing

316/316L unpainted, option code SH
Type 4X and IEC 60529 IP66

Paint

Polyurethane

Cover gasket

Buna-N

Electrical connections

Two $1/2$ -14 NPT connections provided on the transmitter housing (optional third connection available). PG13.5 and CM20 adapters are available. Screw terminals provided for all connections. Power wiring connected to transmitter only. Integrally mounted transmitters are factory wired to the sensor.

Vibration rating

3G per IEC 61298

Transmitter weight

Approximately 7 lbs. (3.2 kg). Add 1 pound (0.5 kg) for Option Code M4/M5.

8712 Physical specifications**Materials of construction****Housing**

Low-copper aluminum, Type 4X and IEC 60529 IP66

Paint

Polyurethane

Cover gasket

Silicone Rubber

Electrical connections

Four $1/2$ -14 NPT connections provided on the base of the transmitter. Screw terminals provided for all of the connections. Power wiring connected to the transmitter only. Remote mounted transmitters require only a single conduit connection to the sensor.

Transmitter weight

Transmitter approximately 9 lbs. (4 kg). Add 1 lb (0.5 kg) for local operator interface.



Rosemount 8712H transmitter specifications

Functional specifications

Sensor compatibility

Compatible with 8707 High-Signal sensor only.

Sensor coil resistance

12 Ω maximum

Transmitter coil drive current

5 A

Flow rate range

Capable of processing signals from fluids that are traveling between 0.04 and 30 ft/s (0.01 to 10 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between -30 and 30 ft/s (-10 to 10 m/s).

Conductivity limits

Process liquid must have a conductivity of 50 microsiemens/cm (50 micromhos/cm). Excludes the effect of interconnecting cable length in remote mount transmitter installations.

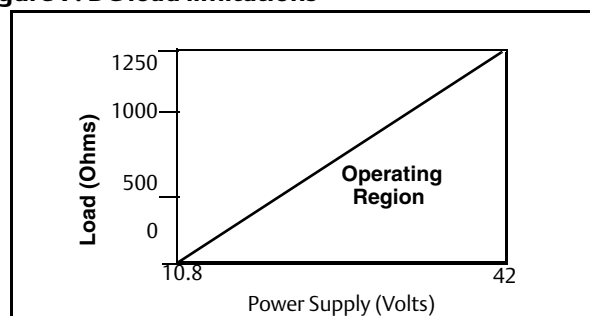
Power supply

120 V AC, 50–60 Hz

DC load limitations (analog output)

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

Figure 7. DC load limitations



$$R_{\max} = 41.7(V_{\text{ps}} - 10.8)$$

V_{ps} = Power Supply Voltage (Volts)
 R_{\max} = Maximum Loop Resistance (Ohms)

Note

HART Communication requires a minimum loop resistance of 250 ohms.

Power consumption

300 watts maximum

Ambient temperature limits

Operating

-20 to 130 °F (-29 to 54 °C)

Storage

-40 to 176 °F (-40 to 80 °C)

Humidity limits

0–95% RH at 120 °F (49 °C), decreases linearly to 10% RH at 130 °F (54 °C)

Enclosure ratings

Type 4X, IP66

Output signals

Analog output adjustment

4–20 mA, switch-selectable as internally or externally powered 5 to 30 VDC; 0 to 1000 Ω load.

Engineering units—lower and upper range values are user-selectable.

Output automatically scaled to provide 4 mA at lower range value and 20 mA at upper range value.

Full scale continuously adjustable between -30 and 30 ft/s (-10 to 10 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications, digital flow signal, superimposed on 4–20 mA signal, available for control system interface. 250 Ω required for HART communications.

Scalable frequency adjustment

0–1000 Hz, externally powered at 5 to 24 V DC, transistor switch closure up to 5.75 W. Pulse value can be set to equal desired volume in selected engineering units. Pulse width adjustable from 0.5 to 100 ms. Local operator interface automatically calculates and displays maximum allowable output frequency.

Auxiliary functions

Externally powered at 5 to 24 V DC, transistor switch closure up to 3 W to indicate either:

Reverse flow:

Activates switch closure output when reverse flow is detected. The reverse flow rate is displayed.

Zero flow:

Activates switch closure output when flow goes to 0 ft/s.

Positive Zero Return (PZR)⁽¹⁾

Forces outputs of the transmitter to the zero flow rate signal level. Activated by applying a contact closure.

Security lockout

Security lockout jumper on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change.

Output testing**Analog output test**

Transmitter may be commanded to supply a specified current between 3.75 and 23.25 mA

Pulse output test

Transmitter may be commanded to supply a specified frequency between 1 and 1000 Hz

Turn-on time

30 minutes to rated accuracy from power up, 5 seconds from power interruption

Start-up time

0.2 seconds from zero flow

Low Flow cut-off

Adjustable between 0.04 and 1.0 ft/s (0.012 to 0.304 m/s). Below selected value, output is driven to the zero flow rate signal level.

Overrange capability

Signal output will remain linear until 110% of upper range value. The signal output will remain constant above these values. Out of range message displayed on LOI and the Field Communicator.

Damping

Adjustable between 0.2 and 256 seconds

Sensor compensation

Rosemount sensors are flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in accuracy.

(1) PZR is internally powered on the 8712H transmitter.

Performance specifications

(System specifications are given using the frequency output and with the unit at referenced conditions.)

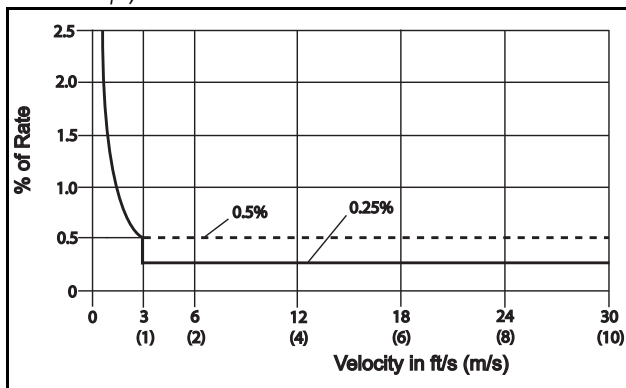
Accuracy

Includes the combined effects of linearity, hysteresis, repeatability, and calibration uncertainty.

Rosemount high signal flowmeter system

System accuracy is $\pm 0.5\%$ of rate from 3 to 30 ft/s (1 to 10 m/s); between 0.04 and 3.0 ft/s (0.01 and 0.3 m/s), the system has an accuracy of ± 0.015 ft/s (0.005 m/s).

Optional high accuracy is $\pm 0.25\%$ of rate from 3 to 30 ft/s (1 to 10 m/s).



Total System Performance 1.6%

Analog output effect

Analog output has the same accuracy as frequency output plus an additional 0.1% of span.

Repeatability

$\pm 0.1\%$ of reading

Response time

0.2 seconds maximum response to step change in input

Stability

$\pm 0.1\%$ of rate over six months

Ambient temperature effect

$\pm 1\%$ per 100 °F (57 °C)

Physical specifications

Materials of construction

Housing

Low-copper aluminum, Type 4X and IEC 60529 IP66

Paint

Polyurethane

Cover gasket

Silicone Rubber

Electrical connections

Four $1/2$ -14 NPT connections provided on the base of the transmitter. Screw terminals provided for all of the connections. Power wiring connected to the transmitter only. Remote mounted transmitters require only a single conduit connection to the sensor.

Line power fuses

5 amp, Quick-acting Bussman AGC5 or equivalent.

Transmitter weight

Transmitter approximately 9 lb (4 kg). Add 1 lb (0.5 kg) for local operator interface.



Rosemount 8705 / 8707 flanged sensor specifications

Functional specifications

Service

Conductive liquids and slurries

Line sizes

1/2-in. to 36-in. (15 mm to 900 mm) for Rosemount 8705

3-in. to 36-in. (80 mm to 600 mm) for Rosemount 8707

Sensor coil resistance

8705: 7 - 16 Ω

8707: 1.5 - 10 Ω

Interchangeability

Rosemount 8705 Sensors are interchangeable with 8732, and 8712 Transmitters. Rosemount 8707 High-Signal Sensors are interchangeable with 8732, 8712, and 8712H High-Signal Transmitters. System accuracy is maintained regardless of line size or optional features. Each sensor nameplate has a sixteen-digit calibration number that can be entered into a transmitter through the Local Operator Interface (LOI) or the Field Communicator. In a FOUNDATION fieldbus environment, the 8732 can be configured using the DeltaV™ fieldbus configuration tool or another FOUNDATION fieldbus configuration device. No further calibration is necessary.

Upper range limit

39.37 ft/s (12 m/s)

Process temperature limits

PTFE Lining

-20 to 350 °F (-29 to 177 °C)

ETFE Lining

-20 to 300 °F (-29 to 149 °C)

PFA Lining

-20 to 350 °F (-29 to 177 °C)

Polyurethane Lining

0 to 140 °F (-18 to 60 °C)

Neoprene Lining

0 to 176 °F (-18 to 80 °C)

Linatex lining

0 to 158 °F (-18 to 70 °C)

Extreme service polyurethane lining

0 to 200 °F (-18 to 93 °C)

Extreme service PFA lining

-20 to 350 °F (-29 to 177 °C)

Ambient temperature limits

-20 to 150 °F (-29 to 65 °C)

Pressure limits

See [Table 20](#), [Table 21](#) and [Table 22](#)

Vacuum limits

PTFE lining

Full vacuum to 350 °F (177 °C) through 4-in. (100 mm) line sizes. Consult factory for vacuum applications with line sizes of 6 inches (150 mm) or larger.

All other standard sensor lining materials

Full vacuum to maximum material temperature limits for all available line sizes.

Submergence protection⁽¹⁾

IP68. Continuous submergence to 30 ft. (10 m). Requires conduit entries of the sensor remote junction box be properly sealed to prevent water ingress. This requires the user to install sealed IP68 approved cable glands, conduit connections, or conduit plugs. For more details on proper installation techniques for an IP68 / submersible application, reference Rosemount Technical Document 00840-0100-4750 available on www.Rosemount.com.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater for 8705. Process liquid must have a conductivity of 50 microsiemens/cm (50 micromhos/cm) for 8707 when used with 8712H, 5 microsiemens/cm when used with other transmitters.

(1) Available for Rosemount 8705 Sensors only.

Table 20. Temperature vs. pressure limits⁽¹⁾

Sensor temperature vs. pressure limits for ASME B16.5 Class Flanges (1/2-in. to 36-in. line sizes) ⁽²⁾					
Flange material	Flange rating	Pressure			
		@ -20 to 100 °F (-29 to 38 °C)	@ 200 °F (93 °C)	@ 300 °F (149 °C)	@ 350 °F (177 °C)
Carbon Steel	Class 150	285 psi	260 psi	230 psi	215 psi
	Class 300	740 psi	675 psi	655 psi	645 psi
	Class 600 ⁽³⁾	1000 psi	800 psi	700 psi	650 psi
	Class 600 ⁽⁴⁾	1480 psi	1350 psi	1315 psi	1292 psi
	Class 900	2220 psi	2025 psi	1970 psi	1935 psi
	Class 1500	3705 psi	3375 psi	3280 psi	3225 psi
	Class 2500	6170 psi	5625 psi	5470 psi	5375 psi
304 Stainless Steel	Class 150	275 psi	235 psi	205 psi	190 psi
	Class 300	720 psi	600 psi	530 psi	500 psi
	Class 600 ⁽⁵⁾	1000 psi	800 psi	700 psi	650 psi
	Class 600 ⁽⁶⁾	1440 psi	1200 psi	1055 psi	997 psi
	Class 900	2160 psi	1800 psi	1585 psi	1497 psi
	Class 1500	3600 psi	3000 psi	2640 psi	2495 psi
	Class 2500	6000 psi	5000 psi	4400 psi	4160 psi

(1) Liner temperature limits must also be considered. Polyurethane, Linatex, and Neoprene have temperature limits of 140 °F (60 °C), 158 °F (70 °C), and 176 °F (80 °C)

(2) 30-in. and 36-in. AWWA C207 Class D rated to 150 psi at atmospheric temperature.

(3) Option Code C6.

(4) Option Code C7.

(5) Option Code S6.

(6) Option Code S7.

Table 21. Temperature vs. pressure limits⁽¹⁾

Sensor temperature vs. pressure limits for AS2129 Table D and E Flanges (4-in. to 24-in. line sizes)					
Flange Material	Flange Rating	Pressure			
		@ -200 to 50 °C (-320 to 122 °F)	@ 100 °C (212 °F)	@ 150 °C (302 °F)	@ 200 °C (392 °F)
Carbon Steel	D	101.6 psi	101.6 psi	101.6 psi	94.3 psi
	E	203.1 psi	203.1 psi	203.1 psi	188.6 psi

(1) Liner temperature limits must also be considered. Polyurethane, Linatex, and Neoprene have temperature limits of 140 °F (60 °C), 158 °F (70 °C), and 176 °F (80 °C)

Table 22. Temperature vs. pressure limits⁽¹⁾

Sensor temperature vs. pressure limits for EN 1092-1 Flanges (15 mm to 600 mm line sizes)					
Flange material	Flange rating	Pressure			
		@ -196 to 50 °C (-320 to 122 °F)	@ 100 °C (212 °F)	@ 150 °C (302 °F)	@ 175 °C (347 °F)
Carbon Steel	PN 10	10 bar	10 bar	9.7 bar	9.5 bar
	PN 16	16 bar	16 bar	15.6 bar	15.3 bar
	PN 25	25 bar	25 bar	24.4 bar	24.0 bar
	PN 40	40 bar	40 bar	39.1 bar	38.5 bar
304 Stainless Steel	PN 10	9.1 bar	7.5 bar	6.8 bar	6.5 bar
	PN 16	14.7 bar	12.1 bar	11.0 bar	10.6 bar
	PN 25	23 bar	18.9 bar	17.2 bar	16.6 bar
	PN 40	36.8 bar	30.3 bar	27.5 bar	26.5 bar

(1) Liner temperature limits must also be considered. Polyurethane, Linatex, and Neoprene have temperature limits of 140 °F, 158 °F, and 176 °F, respectively.

Physical specifications

Non-wetted materials

Sensor pipe

Type 304/304L SST or Type 316/316L SST

Flanges

Carbon steel, Type 304/304L SST, or Type 316/316L SST

Coil housing

Rolled carbon steel

Optional coil housing

316/316L unpainted, option code SH

Paint

Polyurethane

Process wetted materials

Lining

PFA, PTFE, ETFE, Polyurethane, Neoprene, Linatex, Extreme Service Polyurethane

Electrodes

316L SST, Nickel Alloy 276 (UNS N10276), Tantalum, 80% Platinum-20% Iridium, Titanium

Flat-faced flanges

Flat-faced flanges are manufactured with full-face liners. Available in Neoprene and Linatex only.

Process connections

ASME B16.5

1/2-in. to 24-in. (Class 150)

1/2-in. to 24-in. (Class 300)

1/2-in. to 24-in. (Class 600)⁽¹⁾

1-in. to 12-in. (Class 900)⁽²⁾

1 1/2-in. to 12-in. (Class 1500)⁽²⁾

1 1/2-in. to 6-in. (Class 2500)⁽²⁾

AWWA C207 Class D

30-in. and 36-in.

MSS SP44 (ASME B16.47)

30-in. to 36-in. (Class 150)

30-in. only (Class 300)

EN 1092-1

PN10: 8-in. to 36-in. (200 mm to 900mm)

PN16: 4-in. to 36-in. (100 mm to 900mm)

PN 25: 8-in. to 36-in. (200 mm to 900mm)

PN40: 1/2-in. to 36-in. (15 mm to 900mm)

AS2129 Table D and E

1/2-in. to 36-in. (15 mm to 900 mm)

AS4087

2-in. to 24-in. (50 mm to 600 mm) (PN16, PN21, PN35)

JIS B2220

1/2-in. to 8-in. (15 mm to 200 mm) (10K, 20K, 40K)

Electrical connections

Two 1/2-14 NPT connections with number 8 screw terminals are provided in the terminal enclosure for electrical wiring.

Reference electrode

An optional reference electrode can be installed similarly to the measurement electrodes through the sensor lining on 8705 sensors. It is available in all electrode materials.

Grounding rings - (optional)

Optional grounding rings can be installed between the flange and the sensor face on both ends of the sensor. Single ground rings can be installed on either end of the sensor. They have an I.D. slightly larger than the sensor I.D. and an external tab to attach ground wiring. Grounding rings are available in 316L SST, Nickel Alloy 276 (UNS N10276), titanium, and tantalum.

Lining protectors - (optional)

Optional lining protectors can be installed between the flange and the sensor face on both ends of the sensor. The leading edge of lining material is protected by the lining protector; lining protectors cannot be removed once they are installed. Lining protectors are available in 316L SST, Nickel Alloy 276 (UNS N10276), and titanium.

Dimensions

See [Figure 10](#) and [Table 34](#).

Weight

See dimensional tables starting with [Table 31](#).

(1) For PTFE and ETFE, maximum working pressure is derated to 1000 psig.

(2) For Class 900 and higher flange ratings, liner selection is limited to resilient liners.



Rosemount 8711 wafer sensor specifications

Specifications

Functional specifications

Service

Conductive liquids and slurries

Line sizes

0.15-in. to 8-in. (4 mm to 200 mm)

Sensor coil resistance

8711: 10 - 18 Ω

Interchangeability

Rosemount 8711 Sensors are interchangeable with 8732 and 8712 Transmitters. System accuracy is maintained regardless of line size or optional features. Each sensor nameplate has a sixteen-digit calibration number that can be entered into a transmitter through the Local Operator Interface (LOI) or the Field Communicator. In a digital fieldbus environment, the 8732 can be configured using any compatible digital fieldbus configuration tool. No further calibration is necessary.

Upper range limit

39.37 ft/s (12 m/s)

Process temperature limits

ETFE lining

-20 to 300 °F (-29 to 149 °C)

PTFE lining

-20 to 350 °F (-29 to 177 °C)

PFA Lining

-20 to 200 °F (-29 to 93 °C)

Ambient temperature limits

-20 to 150 °F (-29 to 65 °C)

Maximum safe working pressure at 100 °F (38 °C)

ETFE lining

Full vacuum to 740 psi (5.1 MPa)

PTFE lining

Full vacuum through 4-in. (100 mm) line sizes. Consult factory for vacuum applications with line sizes of 6-in. (1450 mm) or larger.

PFA lining

Full vacuum to 285 psi (1.96 MPa)

Conductivity limits

Process liquid must have a minimum conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater for 8711.

Physical specifications

Non-wetted materials

Sensor body

303 SST
CF3M or CF8M
Type 304/304L

Coil housing

Rolled carbon steel
Cast carbon steel

Paint

Polyurethane

Process-wetted materials

Lining

ETFE, PTFE and PFA

Electrodes

316L SST, Nickel Alloy 276 (UNS N10276), Tantalum, 80% Platinum—20% Iridium, Titanium

Process connections

Mounts between these flange configurations

ASME B16.5: Class 150, 300
EN 1092-1: PN10, PN16, PN25, PN40

JIS B2220: 10K, 20K,
AS4087: PN16, PN21, PN35

Studs, nuts, and washers⁽¹⁾*ASME B16.5*

0.15-in. to 1-in. (4 mm to 25 mm):

316 SST, ASTM A193, Grade B8M, Class 1 threaded mounting studs; ASTM A194, Grade 8M heavy hex nuts; SAE per ANSI B18.2.1, Type A, Series N flat washers.

1¹/₂-in. to 8-in. (40 mm to 200 mm):

CS, ASTM A193, Grade B7, Class 1 threaded mounting studs; ASTM A194, Grade 2H heavy hex nuts; SAE per ANSI B18.2.1, Type A, Series N flat washers; all items clear, chromate zinc-plated.

EN 1092-1

4 mm to 25 mm (0.15-in. to 1-in.):

316 SST ASTM A193, Grade B8M Class 1 threaded mounting studs; ASTM A194, Grade 8M, DIN 934 H=D, metric heavy hex nuts; 316 SST, A4, DIN 125 flat washers.

40 mm to 200 mm (1¹/₂-in. to 8-in.):

CS, ASTM A193, Grade B7 threaded mounting studs; ASTM A194, Grade 2H, DIN 934 H=D, metric heavy hex nuts; CS, DIN 125 flat washers; all items yellow zinc-plated.

Electrical connections

Two 1/2–14 NPT connections with number 8 screw terminals are provided in the terminal enclosure for electrical wiring.

Reference electrode

An optional reference electrode can be installed similarly to the measurement electrodes through the sensor lining. It is available in all electrode materials.

Grounding rings

Optional grounding rings can be installed between the flange and the sensor face on both ends of the sensor. They have an I.D. slightly smaller than the sensor I.D. and an external tab to attach ground wiring. Grounding rings are available in 316L SST, Nickel Alloy 276 (UNS N10276), titanium, and tantalum.

Dimensions and weight

See [Figure 17](#), [Figure 24](#), and [Table 23](#).

(1) 0.15 and 0.30 in. (4 and 80 mm) sensors mount between 1/2-in. flange.



Rosemount 8721 sanitary sensor specifications

Functional specifications

Service

Conductive liquids and slurries

Line sizes

1/2-in. to 4-in. (15 mm to 100 mm)

Sensor compatibility and interchangeability

The Rosemount 8721 Sensors are interchangeable with Rosemount 8732 and 8712 transmitters. System accuracy is maintained regardless of line size or optional features.

Each sensor label has a 16 digit calibration number that can be entered into the transmitter through the Local Operator Interface (LOI) or the Field Communicator. In a digital fieldbus environment, the 8732 can be configured using compatible digital fieldbus configuration tool. No further calibration is necessary.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microsiemens/cm (5 micromhos/cm) or greater. Excludes the effect of interconnecting cable length in remote mount transmitter installations.

Sensor coil resistance

5Ω to 10Ω (line size dependent)

Flow rate range

Capable of processing signals from fluids that are traveling between 0.04 and 39 ft/s (0.01 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/s).

Sensor ambient temperature limits

14 to 140 °F (-15 to 60 °C)

Process temperature limits

PFA lining

-20 to 350 °F (-29 to 177 °C)

Pressure limits

Line size	Max working pressure	CE Mark max. working pressure
1/2 (15)	300 psi (20.7 bar)	300 psi (20.7 bar)
1 (25)	300 psi (20.7 bar)	300 psi (20.7 bar)
1 1/2 (40)	300 psi (20.7 bar)	300 psi (20.7 bar)
2 (50)	300 psi (20.7 bar)	300 psi (20.7 bar)
2 1/2 (65)	300 psi (20.7 bar)	240 psi (16.5 bar)
3 (80)	300 psi (20.7 bar)	198 psi (13.7 bar)
4 (100)	210 psi (14.5 bar)	148 psi (10.2 bar)

Vacuum limits

Full vacuum at maximum lining material temperature; consult factory.

Submergence protection (sensor)

IP68. Continuous submergence to 30 ft. (10 m). Requires conduit entries of the sensor remote junction box be properly sealed to prevent water ingress. This requires the use of sealed IP68 approved cable glands, conduit connections, or conduit plugs. For more details on proper installation techniques for an IP 68/submersible application, reference Rosemount Technical Document 00840-0100-4750 available on www.rosemount.com.

Physical specifications

Mounting

Integrally mounted transmitters are factory-wired and do not require interconnecting cables. The transmitter can rotate in 90° increments. Remote mounted transmitters require only a single conduit connection to the sensor.

Non-wetted materials

Sensor

304 Stainless Steel (wrapper), 304 Stainless Steel (pipe)

Terminal junction box

Cast aluminum, polyurethane coated

Optional: 304 Stainless Steel

Paint

Polyurethane

Weight

Table 23. 8721 Sensor weight

Line size	Sensor only	008721-0350 Tri-clamp fitting (each)
1/2	4.84 lbs (2.20 kg)	0.58 lbs (0.263 kg)
1.0	4.52 lbs (2.05 kg)	0.68 lbs (0.309 kg)
1 1/2	5.52 lbs (2.51 kg)	0.88 lbs (0.400 kg)
2.0	6.78 lbs (3.08 kg)	1.30 lbs (0.591 kg)
2 1/2	8.79 lbs (4.00 kg)	1.66 lbs (0.727 kg)
3.0	13.26 lbs (6.03 kg)	2.22 lbs (1.01 kg)
4.0	21.04 lbs (9.56 kg)	3.28 lbs (1.49 kg)

Aluminum remote junction box

Approximately 1 lb. (0.45 kg)

SST remote junction box

Approximately 2.5 lbs. (1.13 kg)

Process wetted materials (sensor)

Liner

PFA with Ra < 32µ in. (0.81 µm)

Electrodes

316L SST with Ra < 15µ in. (0.38 µm)

Nickel Alloy 276 (UNS N10276) with Ra < 15µ in. (0.38 µm)

80% Platinum-20% Iridium with Ra < 15µ in. (0.38 µm)

Process connections

The Rosemount 8721 Sanitary Sensor is designed using a standard IDF fitting as the basis for providing a flexible, hygienic interface for a variety of process connections. The Rosemount 8721 Sensor has the threaded or “male” end of the IDF fitting on the ends of the base sensor. The sensor can be directly connected with user supplied IDF fittings and gaskets. If other process connections are needed, the IDF fittings and gaskets can be provided and welded directly into the sanitary process tubing, or can be supplied with adapters to standard Tri-Clamp® process connections. All connections are PED compliant for group 2 fluids.

Tri-clamp sanitary coupling

IDF Sanitary Coupling (screw type)

IDF specification per BS4825 part 4

ANSI Weld Nipple

DIN 11850 Weld Nipple

DIN 11851 (imperial and metric)

DIN 11864-1 form A

DIN 11864-2 form A

SMS 1145

Cherry-Burrell I-Line

Process connection material

316L Stainless Steel with Ra < 32µ in. (0.81µm)

Optional Electro-polished Surface Finish with Ra < 15µ in.

(0.38µ m)

Process connection gasket material

Silicone

EPDM

Viton

Electrical connections

Two 1/2–14 NPT connections with number 8 screw terminals are provided in the terminal enclosure for electrical wiring.

Sensor dimensions

Refer to [Figure 17](#).

Product certifications

Approved manufacturing locations

Rosemount Inc. — Eden Prairie, Minnesota, USA

Fisher-Rosemount Tecnologias de Flujo, S.A. de C.V. —
Chihuahua Mexico

Emerson Process Management Flow — Ede, The Netherlands

Asia Flow Technology Center — Nanjing, China

European directive information

The EC declaration of conformity for all applicable European directives for this product can be found on our website at www.rosemount.com. A hard copy may be obtained by contacting your local sales office.

ATEX directive

Rosemount Inc. complies with the ATEX Directive.

Type n protection type in accordance with EN50 021



- Closing of entries in the device must be carried out using the appropriate EEx e or EEx n metal cable gland and metal blanking plug or any appropriate ATEX approved cable gland and blanking plug with IP66 rating certified by an EU approved certification body.

For Rosemount 8732 transmitters:

Complies with Essential Health and Safety Requirements:

EN 60079-0: 2006

EN 60079-1: 2007

EN 60079-7: 2007

EN 60079-11: 2007

EN 60079-15: 2005

EN 61241-0: 2004

EN 61241-1: 2006

For Rosemount 8712 transmitters:

Complies with Essential Health and Safety Requirements:

EN 60079-15: 2003

For Rosemount 8700 Series Sensors:

Complies with Essential Health and Safety Requirements:

EN 61241-0: 2006

EN 61241-1: 2004

European Pressure Equipment Directive (PED) (97/23/EC)

Rosemount 8705 and 8707 Magnetic Flowmeter Sensors in line size and flange combinations:

Line Size: 1 1/2 in. to 24-in. with all (excluded 2 1/2-ft. and 5-ft.) EN 1092-1 flanges and ASME Class 150 and ASME Class 300 flanges. Also available with ASME Class 600 flanges in limited line sizes.

Line Size: 30-in. and 36-in. with AWWA Class D Certificate of Assessment - EC No. PED-H-100 Module H Conformity Assessment

Rosemount 8711 Magnetic Flowmeter Sensors line sizes: 1 1/2-in., 2-in., 3-in., 4-in., 6-in., and 8-in.

Certificate of Assessment - EC No. PED-H-100 Module H Conformity Assessment

Rosemount 8721 Sanitary Magmeter Sensors in line sizes of 1 1/2-in. and larger:

Module A Conformity Assessment

All other Rosemount 8705/8707/8711/8721 Sensors — in line sizes of 1-in. and less: sound engineering practice

Sensors that are SEP are outside the scope of PED and cannot be marked for compliance with PED.

Mandatory CE-marking for sensors in accordance with Article 15 of the PED can be found on the sensor body (CE 0575).

Sensor category I is assessed for conformity per module A procedures.

Sensor categories II – III, use module H for conformity assessment procedures.

Electro Magnetic Compatibility (EMC) (2004/108/EC)

Model 8732 and 8712 EN 61326: 2006

Installed signal wiring should not be run together and should not be in the same cable tray as AC power wiring.

Device must be properly grounded or earthed according to local electric codes.

Rosemount combination cable model number 08732-0753-1003 (ft) or 08732-0753-2004 (m) is required to be used to meet EMC requirements.

Low voltage directive (2006/95/EC)

Model 8732 and 8712 - EN 61010 -1: 2001

Other important guidelines

Only use new, original parts.

To prevent the process medium escaping, do not unscrew or remove process flange bolts, adapter bolts or bleed screws during operation.

Maintenance shall only be done by qualified personnel.

CE Marking

Compliance with all applicable European Union Directives.
(Note: CE Marking is not available on Rosemount 8712H).

IECEX Certificates

C-Tick Marking

Rosemount Inc. complies with the following IEC Requirements.

For Rosemount 8732 transmitters:

IEC 60079-0: 2004
IEC 60079-0: 2007
IEC 60079-1: 2007
IEC 60079-11: 2006
IEC 60079-15: 2005
IEC 60079-7: 2006
IEC 61241-0: 2004
IEC 61241-1: 2004

For Rosemount 8712 transmitters:

IEC 60079-0: 2004
IEC 60079-15: 2005-03

Safety approval offering

The Rosemount 8700 Series Magnetic Flowmeters offer many different hazardous locations certifications. The table below provides an overview of the available hazardous area approval options. Equivalent hazardous locations certifications for sensor and transmitter must match in integrally mounted magnetic flowmeter systems. Remote mounted magnetic flowmeter systems do not require matched hazardous location certifications. For complete information about the hazardous area approval codes listed, see [Safety approval certifications](#) starting on [page 53](#).

Table 24. Factory Mutual (FM) approvals offering

Transmitter	8732			8712 ⁽¹⁾			8712H ⁽¹⁾
Sensor	8705	8707	8711	8705	8707	8711	8707
Safety approval code							
Ordinary Locations							
Transmitter	NH	NH	NH	NH	NH	NH	NH
Sensor	NH	NH	NH	NH	NH	NH	NH
Suitable for Class I, Division 1							
Explosion-Proof							
Trans: Groups C, D T6	E5 ⁽²⁾	-	E5	-	-	-	-
Sensor: Groups C, D T6	E5 ⁽²⁾	-	E5	-	-	-	-
Explosion-Proof with Intrinsically Safe Output							
Trans: Groups C, D T6	E5 ⁽²⁾⁽³⁾	-	E5 ⁽³⁾	-	-	-	-
Sensor: Groups C, D T6	E5 ⁽²⁾	-	E5	-	-	-	-
Suitable for Class I, Division 2							
Non-Flammable Fluids							
Trans: Groups A,B,C,D T4	N0	N0	N0	N0	N0	N0	N0
Sensor: Groups A,B,C,D T5	N0	N0 ⁽⁴⁾	N0	N0	N0 ⁽⁴⁾	N0	N0 ⁽⁴⁾
Flammable Fluids							
Trans: Groups A,B,C,D T4	N5	N5	N5	N5	N5	N5	N5
Sensor: Groups A,B,C,D T5	N5	N5 ⁽⁴⁾	N5	N5	N5 ⁽⁴⁾	N5	N5 ⁽⁴⁾
Non-Flammable Fluids with Intrinsically Safe Output							
Trans: Groups A,B,C,D T4	N0 ⁽³⁾	N0 ⁽³⁾	N0 ⁽³⁾	-	-	-	-
Sensor: Groups A,B,C,D T5	N0	N0 ⁽⁴⁾	N0	-	-	-	-
Other certifications							
Product certification code⁽⁵⁾							
Canadian Registration Number (CRN)	CR	CR	Standard	CR	CR	Standard	CR
European Pressure Equipment Directive (PED)	PD	-	PD	PD	-	PD	-
NSF 61 Drinking Water	DW	-	DW	DW	-	DW	-

(1) Remote Transmitter Only.

(2) Available in line sizes 1/2-in. to 8-in. (15 mm to 200 mm) only.

(3) For I.S. Output, code F or P must be ordered.

(4) 8707 Sensor has Temp Code - T3C.

(5) Product Certification Codes are added to the Sensor model number only.

Table 25. Canadian Standards Association (CSA) approvals offering

Transmitter	8732			8712 ⁽¹⁾			8712H ⁽¹⁾
Sensor	8705	8707	8711	8705	8707	8711	8707
Safety approval code							
Ordinary Locations							
Transmitter	NH	-	NH	NH	-	NH	-
Sensor	NH	-	NH	NH	-	NH	-
Suitable for Class I, Division 2							
Non-Flammable Fluids							
Trans: Groups A,B,C,D T4	N0	N0	N0	N0	N0	N0	N0
Sensor: Groups A,B,C,D T5	N0	N0 ⁽²⁾	N0	N0	N0 ⁽²⁾	N0	N0 ⁽²⁾
Other certifications	Product certification code⁽³⁾						
Canadian Registration Number (CRN)	CR	CR	Standard	CR	CR	Standard	CR
European Pressure Equipment Directive (PED)	PD	-	PD	PD	-	PD	-
NSF 61 Drinking Water	DW	-	DW	DW	-	DW	-

(1) Remote Transmitter Only.

(2) 8707 Sensor has Temp Code - T3C.

(3) Product Certification Codes are added to the Sensor model number only.

Table 26. ATEX approvals offering

Transmitter	8732		8712 ⁽¹⁾	
Sensor	8705	8711	8705	8711
Safety approval code				
Non-hazardous				
Trans: LVD and EMC	NH	NH	NH	NH
Sensor: LVD and EMC	NH	NH	NH	NH
Equipment Category 2				
Gas Group IIB				
Trans: Ex d IIB T6	ED	ED	-	-
Sensor: Ex e ia IIC T3...T6	KD ⁽²⁾	KD ⁽²⁾	-	-
Gas Group IIC				
Trans: Ex d IIC T6	E1	E1	-	-
Sensor: EEx e ia IIC T3...T6	E1	E1	-	-
Gas Group IIB with intrinsically safe output				
Trans: Ex de [ia] IIB T6	ED ⁽³⁾	ED ⁽³⁾	-	-
Sensor: EEx e ia IIC T3...T6	KD ⁽²⁾	KD ⁽²⁾	-	-
Gas Group IIC with intrinsically safe output				
Trans: Ex de [ia] IIC T6	E1 ⁽³⁾	E1 ⁽³⁾	-	-
Sensor: EEx e ia IIC T3...T6	E1	E1	-	-
Equipment Category 3				
Gas Group IIC				
Trans: Ex nA nL IIC T4	N1	N1	N1	N1
Sensor: Ex nA [L] IIC T3...T6	N1	N1	N1	N1
Equipment Category 1 - Dust Environment				
Dust environment only				
Trans: Dust	ND	ND	-	-
Sensor: Dust	ND	ND	-	-
Other certifications				
Product certification code⁽⁴⁾				
Canadian Registration Number (CRN)	CR	Standard	CR	Standard
European Pressure Equipment Directive (PED)	PD	PD	PD	PD
NSF 61 Drinking Water	DW	DW	DW	DW

(1) Remote Transmitter Only.

(2) With integral mount transmitter, approval is valid for Gas Group IIB.

(3) For I.S. Output, Code F or P must be ordered.

(4) Product Certification Codes are added to the Sensor model number only.

Table 27. IECEx approvals offering

Transmitter	8732 ⁽¹⁾		8712	
Sensor	8705	8711	8705	8711
Safety approval code				
Non-hazardous				
Trans: Low Voltage and EMC	NH	NH	NH	NH
Sensor: Low Voltage and EMC	NH	NH	NH	NH
Suitable for Zone 1				
Gas Group IIB				
Trans: Ex d IIB T6	EF	EF		
Gas Group IIC				
Trans: Ex d IIC T6	E7	E7		
Gas Group IIB with intrinsically safe output				
Trans: Ex de [ia] IIB T6	EF ⁽²⁾	EF ⁽³⁾		
Gas Group IIC with intrinsically safe output				
Trans: Ex de [ia] IIC T6	E1 ⁽³⁾	E1 ⁽³⁾		
Suitable for Zone 2				
Gas Group IIC				
Trans: Ex nA nL IIC T4	N7	N7	N7	N7
Suitable for Zone 20				
Dust Environment Only				
Trans: Dust	NF	NF		
Other certifications	Product certification code⁽³⁾		Product certification code⁽⁴⁾	
Canadian Registration Number (CRN)	CR	Standard	CR	Standard
European Pressure Equipment Directive (PED)	PD	PD	PD	PD
NSF 61 Drinking Water	DW	DW	DW	DW

(1) Available in remote mount configuration only. Requires equivalent ATEX approval on the sensor.

(2) For I.S. Output, Code F or P must be ordered.

(3) Product Certification Codes are added to the Sensor model number only.

(4) Product Certification Codes are added to the Sensor model number only.

Safety approval certifications

Equivalent Hazardous Location Certifications for sensor and transmitter must match in integrally-mounted magnetic flowmeter systems. Remote-mounted systems do not require matched hazardous location certification option codes.

8712 and 8732 transmitter approval information

North American certifications

Factory Mutual (FM)

Note

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

Reference Rosemount Control Drawing 08732-1061
Lower ambient temperature of 8712 with LOI: -29 °C
Lower ambient temperature of 8732 with LOI: -20 °C

NH FM Ordinary Locations

General Purpose Fire and Shock

8712 (-40 °C ≤ Ta ≤ +40 °C)

8732 (-50 °C ≤ Ta ≤ +60 °C)

Enclosure Type 4X, IP66

N0 Non-incendive for Class I, Division 2

Groups A, B, C, D: T4

Dust-Ignition Proof Class II/III, Division 1

Groups E, F and G: T5

8712 (-40 °C ≤ Ta ≤ +40 °C)

8732 (-50 °C ≤ Ta ≤ +60 °C)

Enclosure Type 4X, IP66

N5 Non-incendive for Class I, Division 2

Groups A, B, C, D: T4

Dust-Ignition Proof Class II/III, Division 1

Groups E, F and G: T5

8712 (-40 °C ≤ Ta ≤ +40 °C)

8732 (-50 °C ≤ Ta ≤ +60 °C)

Enclosure Type 4X, IP66

Requires sensors with N5 Approval

E5 Explosion proof for Class I, Division 1

Groups C and D: T6; Factory Sealed

Non-Incendive for Class I, Division 2,

Groups A, B, C, and D: T4

Dust-Ignition Proof Class II/III, Division 1

Groups E, F and G: T5

8712 (-40 °C ≤ Ta ≤ +40 °C)

8732 (-50 °C ≤ Ta ≤ +60 °C)

Enclosure Type 4X, IP66

Canadian Standards Association (CSA)

Note

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

Reference Rosemount Control Drawing 08732-1062

Lower ambient temperature of 8712 with LOI: -29 °C

Lower ambient temperature of 8732 with LOI: -20 °C

NH CSA Ordinary Locations

General Purpose Fire and Shock

8712 (-40 °C ≤ Ta ≤ +40 °C)

8732 (-50 °C ≤ Ta ≤ +60 °C)

N0 Non-incendive for Class I, Division 2

Groups A, B, C, and D: T4

Dust-Ignition Proof Class II/III, Division 1

Groups E, F and G: T5

8712 (-40 °C ≤ Ta ≤ +40 °C)

8732 (-50 °C ≤ Ta ≤ +60 °C)

Enclosure Type 4X, IP66

European certifications

ATEX

Note

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

E1 ATEX Flameproof

8732 - Certificate No.: KEMA 07ATEX0073 X

⊕ II 2G Ex de IIC T6 or

with I.S. outputs

⊕ II 2 (1)G Ex de [ia] IIC T6

without LOI (-50 °C ≤ Ta ≤ +60 °C)

with LOI (-20 °C ≤ Ta ≤ +60 °C)

V_{max} = 250 V AC or 42 V DC

⊕ 0575

ED ATEX Flameproof

8732 - Certificate No.: KEMA 07ATEX0073 X

⊕ II 2G Ex de IIB or

with I.S. outputs

⊕ II 2 (1) G Ex de [ia] IIB T6

without LOI (-50 °C ≤ Ta ≤ +60 °C)

with LOI (-20 °C ≤ Ta ≤ +60 °C)

V_{max} = 250 V AC or 42 V DC

⊕ 0575

ND ATEX Dust

8732 - Certificate No.: KEMA 07ATEX0073 X
 Ⓢ II 1D tD A20 IP66 T100 °C or with I.S. outputs
 Ⓢ II (1) G [Ex ia] II C
 without LOI (-50 °C ≤ Ta ≤ + 60 °C)
 with LOI (-20 °C ≤ Ta ≤ + 60 °C)
 V_{max} = 250 V AC or 42 V DC
 c€ 0575

Special conditions for safe use (KEMA 07ATEX0073 X):

If the Rosemount 8732 Flow Transmitter is used integrally with the Rosemount 8705 or 8711 Sensors, it shall be assured that the mechanical contact areas of the Sensor and Flow Transmitter comply with the requirements for flat joints according to standard EN/IEC 60079-1 clause 5.2.

The relation between ambient temperature, process temperature, and temperature class is to be taken from the table under (15 - description) above. (see [Table 29](#))

The electrical data is to be taken from the summary under (15 - electrical data) above. (see [Table 28](#))

If the Rosemount 8732 Flow Transmitter is used integrally with the Junction Box, it shall be assured that the mechanical contact areas of the Junction Box and Flow Transmitter comply with the requirements for flanged joints. Contact Rosemount Inc. for requirements and dimensions of Flanged Joints.

INSTALLATION INSTRUCTIONS:

The cable and conduit entry devices and blanking elements shall be of a certified flameproof type, suitable for the conditions of use and correctly installed. With the use of conduit, a certified stopping box shall be provided immediately to the entrance of the enclosure.

The cable and conduit entry devices and the closing elements shall be of a certified increased safety type, suitable for the conditions of use and correctly installed.

At ambient temperatures above 50 °C, the flow meter shall be used with heat resistant cables with a temperature rating of at least 90 °C.

A Junction Box in type of explosion protection increased safety "e" may be attached to the base of the Rosemount 8732 Flow Transmitter, permitting remote mounting of the Rosemount 8705 and 8711 Sensors.

The Junction Box is classified as II 2 G Ex e IIB T6 and certified under KEMA 07ATEX0073 X and KEMA 03ATEX2052X.

N1 ATEX Type n

8712 - ATEX Certificate No: BASEEFA 05ATEX0170X
 Ⓢ II 3G EEx nA nL IIC T4 (Ta = -40 °C ≤ Ta ≤ + 60 °C)
 V_{max} = 42 V DC
 c€ 0575

8732 - Certificate No: Baseefa 07ATEX0230X

Ⓢ II 3G Ex nA nL IIC T4 (HART)
 Ⓢ II 3(1)G Ex nA nL [ia] IIC T4 (Digital Fieldbus)
 without LOI (-50 °C ≤ Ta ≤ + 60 °C)
 with LOI (-20 °C ≤ Ta ≤ + 60 °C)
 V_{max} = 42 V DC
 IP 66
 c€ 0575

Special conditions for safe use (x):

The apparatus is not capable of withstanding the 500V insulation test required by Clause 6.8.1 of EN 60079-15: 2005. This must be taken into account when installing the apparatus.

International certifications

IECEX

Note

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

E7 IECEx Flameproof

8732 - Certificate No.: KEM 07.0038X
 Ex de IIC T6 Gb or Ex de [ia Ga] IIC T6
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

EF IECEx Flameproof

8732 - Certificate No.: KEM 07.0038X
 Ex de IIB T6 Gb or Ex de [ia IIC Ga] IIB T6
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

NF IECEx Dust

8732 - Certificate No.: KEM 07.0038X
 Ex tD A20 IP66 T 100 °C
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

Special conditions for safe use (KEM 07.0038X):

If the Rosemount 8732 Flow Transmitter is used integrally with the Rosemount 8705 or 8711 Sensors, it shall be assured that the mechanical contact areas of the Sensor and Flow Transmitter comply with the requirements for flat joints according to standard EN/IEC 60079-1 clause 5.2.

The relation between ambient temperature, process temperature, and temperature class is to be taken from the table under (15 - description) above. (see [Table 29](#))

The electrical data is to be taken from the summary under (15 - electrical data) above. (see [Table 28](#))

If the Rosemount 8732 Flow Transmitter is used integrally with the Junction Box, it shall be assured that the mechanical contact areas of the Junction Box and Flow Transmitter comply with the requirements for flanged joints according to standard EN/IEC 60079-1 clause 5.2.

INSTALLATION INSTRUCTIONS:

The cable and conduit entry devices and blanking elements shall be of a certified flameproof type, suitable for the conditions of use and correctly installed. With the use of conduit, a certified stopping box shall be provided immediately to the entrance of the enclosure.

N7 IECEx Type n

8712 -Certificate No: IECEx BAS 07.0062X
 Ex nA nL IIC T4
 with FISCO / FNICO output
 Ex nA nL [ia] IIC T4
 V_{max} = 42 V DC

8732 HART
 Certificate No: IECEx BAS 07.0062X
 Ex nA nL IIC T4
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

8732 digital fieldbus
 Certificate No: IECEx BAS 07.0062X
 Ex nA nL [ia] IIC T4 (-50 ≤ Ta ≤ +60 °C)
 with LOI (-20 ≤ Ta ≤ +60 °C)
 Vmax = 42 V DC

Special conditions for safe use (x):

The apparatus is not capable of withstanding the 500V insulation test required by Clause 6.8.1 of EN 60079-15: 2005. This must be taken into account when installing the apparatus.

NEPSI - China

Note

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

E3 NEPSI Flameproof

8732 - Certificate No.: GYJ12.1495X
 Ex de IIC T6 Gb or Ex de [ia Ga] IIC T6 Gb
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

EP NEPSI Flameproof

8732 - Certificate No.: GYJ12.1495X
 Ex de IIB T6 Gb or Ex de [ia Ga] IIB T6 Gb
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

INMETRO - Brazil**Note**

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

E2 INMETRO Flameproof

8732 - Certificate No.: NCC 12.1177 X
 Ex de IIC T6 Gb IP66 or
 Ex de [ia IIC Ga] IIC T6 Gb IP66
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

EB INMETRO Flameproof

8732 - Certificate No.: NCC 12.1177 X
 Ex de IIB T6 Gb IP66 or
 Ex de [ia IIC Ga] IIB T6 Gb IP66
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 V_{max} = 250 V AC or 42 V DC

Special conditions for safe use:

If the equipment needs maintenance, the company Emerson Process Management Brazil should be contacted for information about flameproof seals.

The integral assembly of the 8732 flow transmitter with 8711 or 8705 sensor is allowed only for processes where the maximum ambient temperature is 60 °C. For processes where the ambient temperature is above 60 °C, the assembly of the 8732 flow transmitter must be remote.

GOST - Russia**Note**

For intrinsically safe (IS) outputs on the 8732 output option code F or P must be selected.

E8 GOST Flameproof

Certificate No.: 0558689
 Ex de IIC or Ex de [ia] IIC T6
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 IP67

EM GOST Flameproof

Certificate No.: 0558689
 Ex de IIB or Ex de [ia] IIB T6
 without LOI (-50 °C ≤ Ta ≤ +60 °C)
 with LOI (-20 °C ≤ Ta ≤ +60 °C)
 IP67

8705, 8707, 8711, and 8721 sensor approval information**North American certifications****Factory Mutual (FM)****NH FM Ordinary Locations**

8705, 8711 (-50 °C ≤ Ta ≤ +60 °C)
 Enclosure Type 4X, IP66/IP68

N0 Non-Incendive for Class I, Division 2

Groups A, B, C, and D; T5 (8705/8711), T3C (8707)
 For use with non-flammable fluids
 Dust-Ignition Proof Class II/III, Division 1
 Groups E, F and G; T6 (8705/8711) T3C (8707)
 8705, 8707, 8711 (-50 °C ≤ Ta ≤ +60 °C)
 Enclosure Type 4X, IP66/IP68

N0 8721 Hygienic Sensor

Factory Mutual (FM) Ordinary Location;
 CE Marking; 3-A Symbol Authorization #1222;
 EHEDG Type EL

N5 Non-Incendive for Class I, Division 2

Groups A, B, C, and D; T5 (8705/8711)
 With Intrinsically Safe electrodes
 For use with flammable fluids Class II/III Division 1
 Groups A, B, C, D, E, F, and G
 Dust-Ignition Proof Class II/III, Division 1,
 Groups E, F, G; T5 (8705/8711)
 8705, 8711 (-50 °C ≤ Ta ≤ +60 °C)
 Enclosure Type 4X, IP66/IP68

E5 Explosion-Proof for Class I, Division 1

Groups C and D; T6 (8705/8711)
 With Intrinsically Safe electrodes
 Class I Division 1, Groups A, B, C, and D
 Dust-Ignition Proof Class II/III, Division 1
 Groups E, F, and G; T6 (8705/8711)
 Non-Incendive for Class I, Division 2
 Groups A, B, C, and D; T6 (8705/8711)
 8705, 8711 (-50 °C ≤ Ta ≤ +60 °C)
 Enclosure Type 4X, IP66/IP68

Canadian Standards Association (CSA)**N0 Non-Incendive for Class I, Division 2**

Groups A, B, C, and D; T5 (8705/8711), T3 (8707)
 For use with non-flammable fluids
 Dust-Ignition Proof Class II/III, Division 1
 Groups E, F, and G; T6 (8705/8711), T3C (8707)
 8705, 8707, 8711 (-50 °C ≤ Ta ≤ +60 °C)
 Enclosure Type 4X, IP66/IP68

N0 8721 Hygienic Sensor

Canadian Standards Association (CSA) Ordinary Location;
 CE Marking; 3-A Symbol Authorization #1222;
 EHEDG Type EL

European certifications**ATEX****ND ATEX Dust**

Certificate No.: KEMA 06ATEX0006
 Ⓢ II 1D Ex tD A20 IP6x T105 °C (-50 ≤ Ta ≤ +65 °C)
 CE 0575

INSTALLATION INSTRUCTIONS:

The cable and conduit entry devices and blanking elements shall be of a certified IP6x type, suitable for the conditions of use and correctly installed. At maximum ambient temperatures or at process temperatures above 60 °C heat resistant cables with a temperature rating of at least 90 °C shall be used.

N1 ATEX Type n

Certificate No: KEMA02ATEX1302X
 Ⓢ II 3G
 EEx nA [L] IIC T3... T6 (-20 ≤ Ta ≤ +65 °C)

Special conditions for safe use (x):

The relation between ambient temperature, process temperature and temperature class is to be taken from [Table 30](#). The electrical data is to be taken from the summary in [Table 28](#).

E1/KD ATEX Increased Safety with IS Electrodes

Certificate No: KEMA03ATEX2052X
 Ⓢ II 1/2G
 EEx e ia IIC T3... T6 (-20 ≤ Ta ≤ +60 °C) (see [Table 29](#))
 CE 0575
 V_{max} = 40 V

Special conditions for safe use (x):

The relation between ambient temperature, process temperature and temperature class is to be taken from [Table 29](#). The electrical data is to be taken from the summary in [Table 28](#).

INSTALLATION INSTRUCTIONS:

At ambient temperature above 50 °C, the flowmeter shall be used with heat resistant cables with a temperature rating of at least 90 °C.

A fuse with a rating of maximum 0,7 A according to IEC 60127-1 shall be included in the coil excitation circuit if the sensors are used with other flow transmitters (e.g. Rosemount 8712).

International certifications**IECEX****NF IECEx Dust**

Certificate Number: IECEx KEM 09.0078
 Ex tD A20 IP6x T105 °C (-50 ≤ Ta ≤ +65 °C)

N7 IECEx Type n

Certificate Number: IECEx DEK 11.0094X
 Ex nA nL IIC T3...T5 Gc

INSTALLATION INSTRUCTIONS:

The cable and conduit entry devices and blanking elements shall be of a certified IP6x type, suitable for the conditions of use and correctly installed. At maximum ambient temperatures or at process temperatures above 60 °C heat resistant cables with a temperature rating of at least 90 °C shall be used.

NEPSI - China**E3 / EP NEPSI Increased Safety with IS Electrodes**

Certificate No: GYJ12.1497 X
 Ex e ia IIC T3... T6 (Ta = -20 +60 °C) (see [Table 29](#))
 V_{max} = 40 V

INMETRO - Brazil**E2 / EB INMETRO Increased Safety with IS Electrodes**

Certificate No: NCC 12.1174 X
 Ex e ia IIC T3... T6 (Ta = -20 ≤ Ta ≤ +60 °C)
 (see [Table 29](#))
 V_{max} = 40 V

GOST - Russia**E8 / EM GOST Increased Safety with IS Electrodes**

Certificate No: N0558689
 Ex e ia IIC T3... T6 (Ta = -20 ≤ Ta ≤ +60 °C)
 (see [Table 29](#))
 V_{max} = 40 V

Table 28. Electrical data

Rosemount 8732 Flow Transmitter	
Power supply:	250 V AC, 1 A or 42 V DC, 1 A, 20 W maximum
Pulsed output circuit:	30 V DC (pulsed), 0,25 A, 7,5 W maximum
4-20 mA output circuit:	30 V DC, 30 mA, 900 mW maximum
Rosemount 8705 and 8711 Sensors	
Coil excitation circuit:	40 V 0,5 A, 20 W maximum
Electrode circuit:	in type of explosion protection intrinsic safety EEx ia IIC, $U_i = 5$ V, $I_i = 0.2$ mA, $P_i = 1$ mW, $U_m = 250$ V

Table 29. Relation between ambient temperature, process temperature, and temperature class⁽¹⁾

Meter size (inches)	Maximum ambient temperature	Maximum process temperature	Temperature class
1/2	149 °F (65 °C)	239 °F (115 °C)	T3
1	149 °F (65 °C)	248 °F (120 °C)	T3
1	95 °F (35 °C)	95 °F (35 °C)	T4
1 1/2	149 °F (65 °C)	257 °F (125 °C)	T3
1 1/2	122 °F (50 °C)	140 °F (60 °C)	T4
2	149 °F (65 °C)	257 °F (125 °C)	T3
2	149 °F (65 °C)	167 °F (75 °C)	T4
2	104 °F (40 °C)	104 °F (40 °C)	T5
3 - 4	149 °F (65 °C)	266 °F (130 °C)	T3
3 - 4	149 °F (65 °C)	194 °F (90 °C)	T4
3 - 4	131 °F (55 °C)	131 °F (55 °C)	T5
3 - 4	104 °F (40 °C)	104 °F (40 °C)	T6
6	149 °F (65 °C)	275 °F (135 °C)	T3
6	149 °F (65 °C)	230 °F (110 °C)	T4
6	149 °F (65 °C)	167 °F (75 °C)	T5
6	140 °F (60 °C)	140 °F (60 °C)	T6
8-60	149 °F (65 °C)	284 °F (140 °C)	T3
8-60	149 °F (65 °C)	239 °F (115 °C)	T4
8-60	149 °F (65 °C)	176 °F (80 °C)	T5
8-60	149 °F (65 °C)	149 °F (65 °C)	T6

(1) This table is applicable for the E1 and KD approval codes only.

Table 30. Relation between the maximum ambient temperature, the maximum process temperature, and the temperature class⁽¹⁾.

Maximum ambient temperature	Maximum process temperature °F (°C) per temperature class			
	T3	T4	T5	T6
1/2-in. sensor size				
149 °F (65 °C)	296.6 °F (147 °C)	138.8 °F (59 °C)	53.6 °F (12 °C)	17.6 °F (-8 °C)
140 °F (60 °C)	309.2 °F (154 °C)	150.8 °F (66 °C)	66.2 °F (19 °C)	28.4 °F (-2 °C)
131 °F (55 °C)	321.8 °F (161 °C)	163.4 °F (73 °C)	78.8 °F (26 °C)	41 °F (5 °C)
122 °F (50 °C)	334.4 °F (168 °C)	176 °F (80 °C)	86.6 °F (32 °C)	53.6 °F (12 °C)
113 °F (45 °C)	347 °F (175 °C)	188.6 °F (87 °C)	102.2 °F (39 °C)	66.2 °F (19 °C)
104 °F (40 °C)	350.6 °F (177 °C)	199.4 °F (93 °C)	114.8 °F (46 °C)	78.8 °F (26 °C)
95 °F (35 °C)	350.6 °F (177 °C)	212 °F (100 °C)	127.4 °F (53 °C)	89.6 °F (32 °C)
86 °F (30 °C)	350.6 °F (177 °C)	224.6 °F (107 °C)	138.2 °F (59 °C)	102.2 °F (39 °C)
77 °F (25 °C)	350.6 °F (177 °C)	237.2 °F (114 °C)	150.8 °F (66 °C)	114.8 °F (46 °C)
68 °F (20 °C)	350.6 °F (177 °C)	248 °F (120 °C)	163.4 °F (73 °C)	127.4 °F (53 °C)
1-in. sensor size				
149 °F (65 °C)	318.2 °F (159 °C)	158 °F (70 °C)	71.6 °F (22 °C)	33.8 °F (1 °C)
140 °F (60 °C)	330.8 °F (166 °C)	170.6 °F (77 °C)	84.2 °F (29 °C)	46.4 °F (8 °C)
131 °F (55 °C)	343.4 °F (173 °C)	183.2 °F (84 °C)	96.8 °F (36 °C)	59 °F (15 °C)
122 °F (50 °C)	350.6 °F (177 °C)	195.8 °F (91 °C)	109.4 °F (43 °C)	71.6 °F (22 °C)
113 °F (45 °C)	350.6 °F (177 °C)	206.6 °F (97 °C)	122 °F (50 °C)	84.2 °F (29 °C)
104 °F (40 °C)	350.6 °F (177 °C)	219.2 °F (104 °C)	134.6 °F (57 °C)	96.8 °F (36 °C)
95 °F (35 °C)	350.6 °F (177 °C)	231.8 °F (111 °C)	145.4 °F (63 °C)	109.4 °F (43 °C)
86 °F (30 °C)	350.6 °F (177 °C)	244.4 °F (118 °C)	158 °F (70 °C)	122 °F (50 °C)
77 °F (25 °C)	350.6 °F (177 °C)	257 °F (125 °C)	170.6 °F (77 °C)	135 °F (57 °C)
68 °F (20 °C)	350.6 °F (177 °C)	269.6 °F (132 °C)	183.2 °F (84 °C)	145.4 °F (63 °C)
1 1/2-in. sensor size				
149 °F (65 °C)	296.6 °F (147 °C)	159.8 °F (71 °C)	87.8 °F (31 °C)	55.4 °F (13 °C)
140 °F (60 °C)	307.4 °F (153 °C)	170.6 °F (77 °C)	96.8 °F (36 °C)	66.2 °F (19 °C)
131 °F (55 °C)	318.2 °F (159 °C)	181.4 °F (83 °C)	107.6 °F (42 °C)	77 °F (25 °C)
122 °F (50 °C)	329 °F (165 °C)	192.2 °F (89 °C)	118.4 °F (48 °C)	87.8 °F (31 °C)
113 °F (45 °C)	339.8 °F (171 °C)	203 °F (95 °C)	129.2 °F (54 °C)	96.8 °F (36 °C)
104 °F (40 °C)	350.6 °F (177 °C)	213.8 °F (101 °C)	140 °F (60 °C)	107.6 °F (42 °C)
95 °F (35 °C)	350.6 °F (177 °C)	222.8 °F (106 °C)	150.8 °F (66 °C)	118.4 °F (48 °C)
86 °F (30 °C)	350.6 °F (177 °C)	233.6 °F (112 °C)	159.8 °F (71 °C)	129.2 °F (54 °C)
77 °F (25 °C)	350.6 °F (177 °C)	244.4 °F (118 °C)	170.6 °F (77 °C)	140 °F (60 °C)
68 °F (20 °C)	350.6 °F (177 °C)	255.2 °F (124 °C)	181.4 °F (83 °C)	150.8 °F (66 °C)

Table 30. Relation between the maximum ambient temperature, the maximum process temperature, and the temperature class⁽¹⁾.

Maximum ambient temperature	Maximum process temperature °F (°C) per temperature class			
	T3	T4	T5	T6
2-in. sensor size				
149 °F (65 °C)	289.4 °F (143 °C)	163.4 °F (73 °C)	95 °F (35 °C)	66.2 °F (19 °C)
140 °F (60 °C)	300.2 °F (149 °C)	172.4 °F (78 °C)	104 °F (40 °C)	75.2 °F (24 °C)
131 °F (55 °C)	309.2 °F (154 °C)	183.2 °F (84 °C)	114.8 °F (46 °C)	84.2 °F (29 °C)
122 °F (50 °C)	318.2 °F (159 °C)	192.2 °F (89 °C)	123.8 °F (51 °C)	95 °F (35 °C)
113 °F (45 °C)	329 °F (165 °C)	201.2 °F (94 °C)	134.6 °F (57 °C)	104 °F (40 °C)
104 °F (40 °C)	338 °F (170 °C)	212 °F (100 °C)	143.6 °F (62 °C)	114.8 °F (46 °C)
95 °F (35 °C)	348.8 °F (176 °C)	221 °F (105 °C)	152.6 °F (67 °C)	123.8 °F (51 °C)
86 °F (30 °C)	350.6 °F (177 °C)	231.8 °F (111 °C)	163.4 °F (73 °C)	134.6 °F (57 °C)
77 °F (25 °C)	350.6 °F (177 °C)	240.8 °F (116 °C)	172.41 °F (78 °C)	143.6 °F (62 °C)
68 °F (20 °C)	350.6 °F (177 °C)	251.6 °F (122 °C)	183.2 °F (84 °C)	152.6 °F (67 °C)
3-in. to 60-in. sensor size				
149 °F (65 °C)	350.6 °F (177 °C)	210.2 °F (99 °C)	116.6 °F (47 °C)	75.2 °F (24 °C)
140 °F (60 °C)	350.6 °F (177 °C)	222.8 °F (106 °C)	129.2 °F (54 °C)	89.6 °F (32 °C)
131 °F (55 °C)	350.6 °F (177 °C)	237.2 °F (114 °C)	143.6 °F (62 °C)	102.2 °F (39 °C)
122 °F (50 °C)	350.6 °F (177 °C)	249.8 °F (121 °C)	156.2 °F (69 °C)	116.6 °F (47 °C)
113 °F (45 °C)	350.6 °F (177 °C)	264.2 °F (129 °C)	170.6 °F (77 °C)	129.2 °F (54 °C)
104 °F (40 °C)	350.6 °F (177 °C)	266 °F (130 °C)	183.2 °F (84 °C)	143.6 °F (62 °C)
95 °F (35 °C)	350.6 °F (177 °C)	266 °F (130 °C)	197.6 °F (92 °C)	156.2 °F (69 °C)
86 °F (30 °C)	350.6 °F (177 °C)	266 °F (130 °C)	203 °F (95 °C)	170.6 °F (77 °C)
77 °F (25 °C)	350.6 °F (177 °C)	266 °F (130 °C)	203 °F (95 °C)	176 °F (80 °C)
68 °F (20 °C)	350.6 °F (177 °C)	266 °F (130 °C)	203 °F (95 °C)	176 °F (80 °C)

(1) This table is applicable for N1 option codes only.

Dimensional drawings

Figure 8. Rosemount 8732 Transmitter

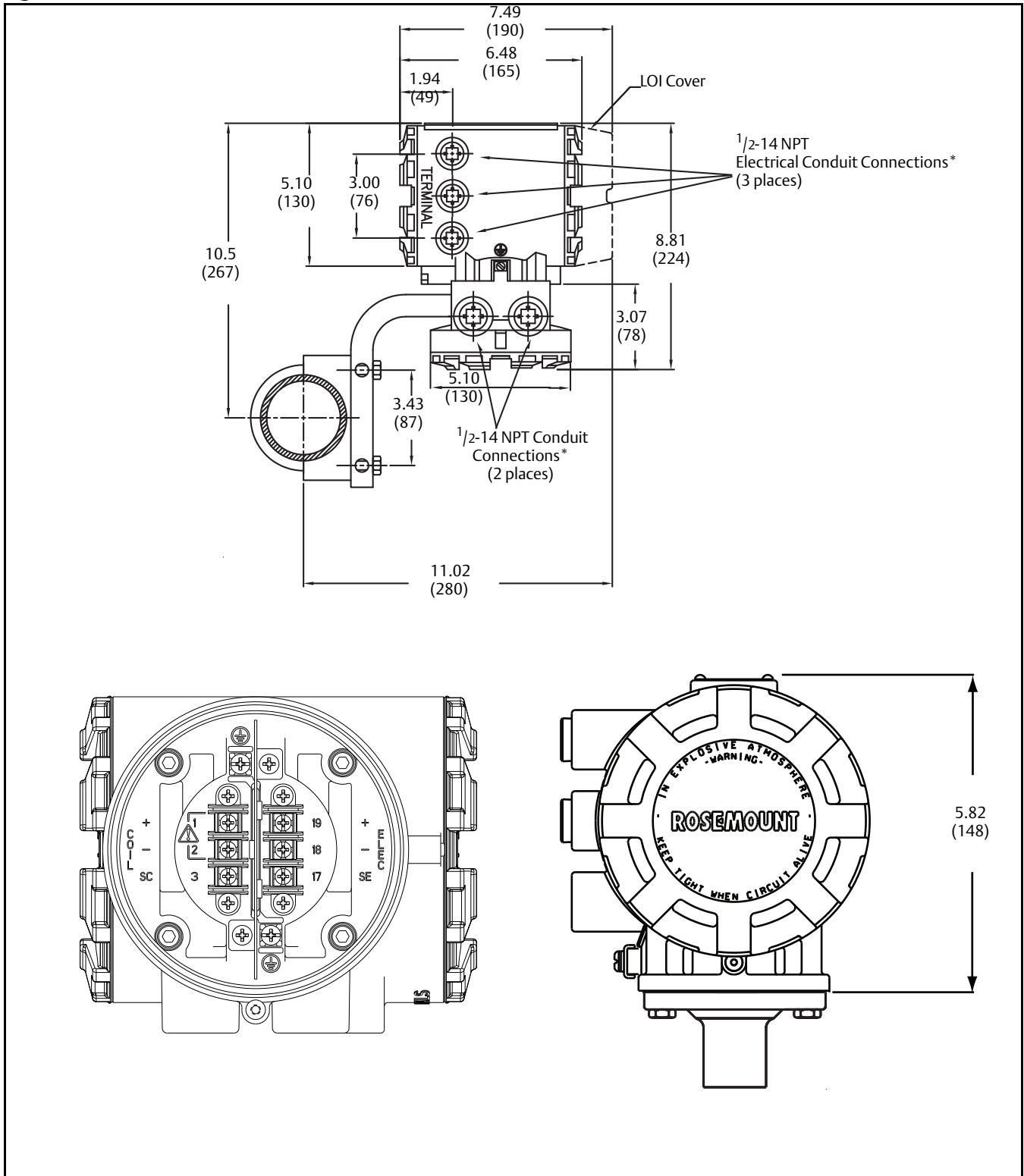


Figure 9. Rosemount 8712/8712H Transmitter

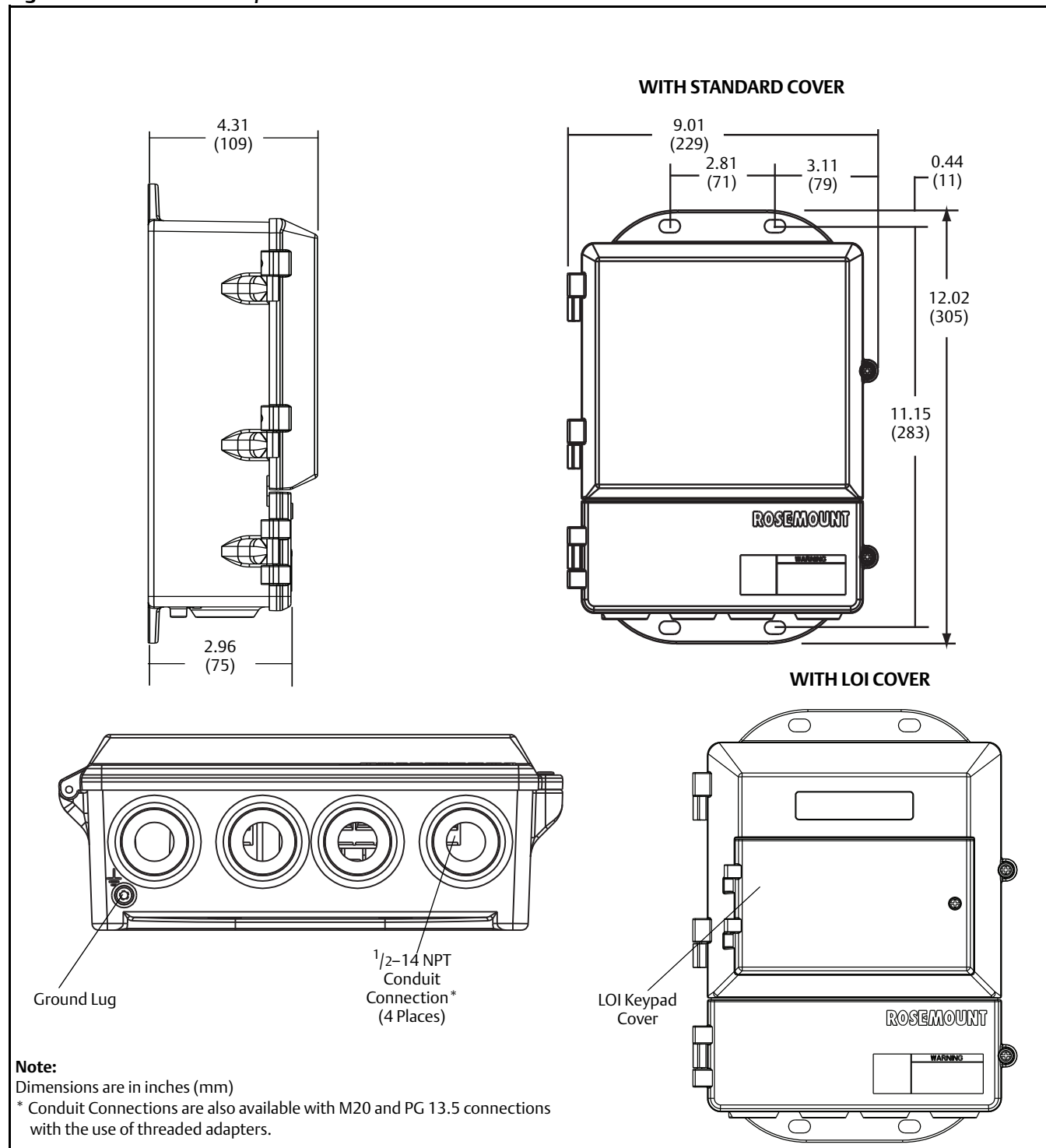


Figure 10. 1/2-in. to 2 1/2-in. (DN15 mm to 65 mm) slip-on flanges - low pressure ($P \leq$ Class 300)

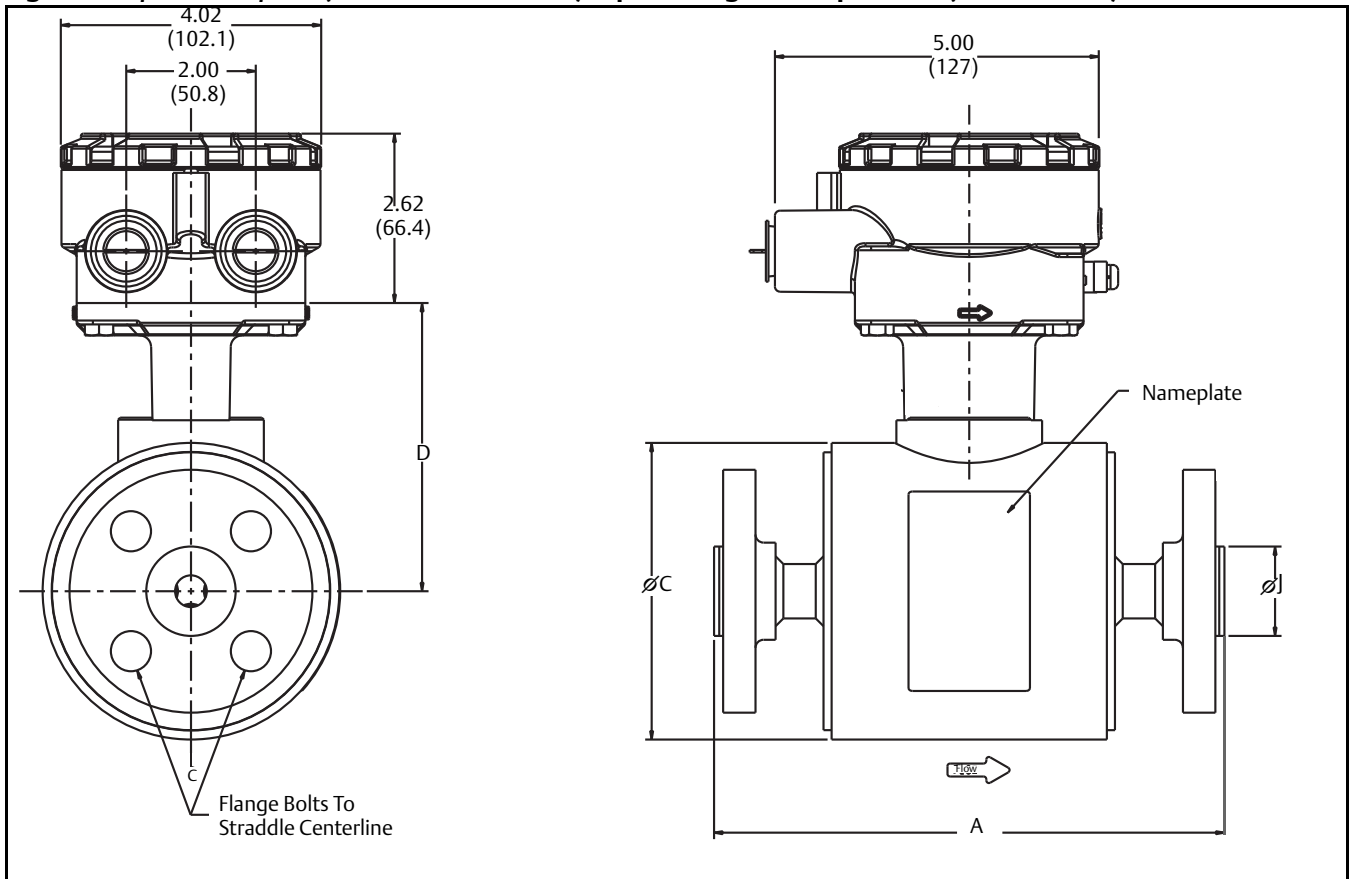


Table 31. 1/2-in. to 2 1/2-in. slip-on flanges (inches)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Tube weight (lbs)
	Dim "A" PTFE	Dim "A" ETFE	Dim "A" Neoprene	Dim "A" Linatex	Dim "A" Poly	Dim "A" PFA				
1/2 (15) ASME - 150#	7.88	7.88	7.88	7.98	7.88	7.88	4.50	4.41	1.38	9
1/2 (15) ASME - 300#	7.88	7.88	7.88	7.98	7.88	7.88	4.50	4.41	1.38	10
1/2 (15) EN 1092-1 - PN40	7.88	7.88	7.88	7.98	7.88	7.88	4.50	4.41	1.77	10
1/2 (15) AS2129 TABLE D	7.88		7.88	7.98	7.88		4.50	4.41	1.85	8
1/2 (15) AS2129 TABLE E	7.88		7.88	7.98	7.88		4.50	4.41	1.85	8
1/2 (15) JIS B2220 - 10K,	7.90		7.88	7.98	7.88		4.50	4.41	1.77	10
1/2 (15) JIS B2220 - 20K	7.90		7.88	7.98	7.88		4.50	4.41	1.77	10
1/2 (15) JIS B2220 - 40K	8.40		8.38	8.48	8.38		4.50	4.41	1.77	13
1 (25) ASME - 150#	7.88	7.88	7.88	7.97	7.88	7.88	4.50	4.41	2.00	11
1 (25) ASME - 300#	7.88	7.88	7.88	7.97	7.88	7.88	4.50	4.41	2.00	14
1 (25) EN 1092-1 - PN40	7.88	7.88	7.88	7.97	7.88	7.88	4.50	4.41	2.68	14
1 (25) AS2129 TABLE D	7.88	7.88	7.88	7.97	7.88		4.50	4.41	2.56	10
1 (25) AS2129. TABLE E	7.88	7.88	7.88	7.97	7.88		4.50	4.41	2.48	10
1 (25) JIS B2220 - 10K	7.91		7.88	7.97	7.88		4.50	4.41	2.64	13
1 (25) JIS B2220 - 20K	7.91		7.88	7.97	7.88		4.50	4.41	2.64	14
1 (25) JIS B2220 - 40K	8.65		8.67	8.76	8.67		4.50	4.41	2.76	17
1 1/2 (40) ASME - 150#	7.87	7.87	7.85	7.95	7.87	7.87	5.21	4.82	2.88	15
1 1/2 (40) ASME - 300#	7.87	7.87	7.85	7.95	7.87	7.87	5.21	4.82	2.88	21
1 1/2 (40) EN 1092-1 - PN40	7.87	7.87	7.85	7.95	7.87	7.87	5.21	4.82	3.46	19
1 1/2 (40) AS2129 TABLE D	7.87		7.85	7.95	7.87		5.21	4.82	3.07	12
1 1/2 (40) AS2129 TABLE E	7.87		7.85	7.95	7.87		5.21	4.82	3.07	13
1 1/2 (40) JIS B2220 - 10K	7.92		7.85	7.95	7.87		5.21	4.82	3.19	16
1 1/2 (40) JIS B2220 - 20K	7.92		7.85	7.95	7.87		5.21	4.82	3.19	17
1 1/2 (40) JIS B2220 -40K	8.69		8.62	8.72	8.63		5.21	4.82	3.54	24
2 (50) ASME - 150#	7.87	7.87	7.82	7.92	7.87	7.87	5.21	4.82	3.62	20
2 (50) ASME - 300#	7.87	7.87	7.82	7.92	7.87	7.87	5.21	4.82	3.62	23
2 (50) EN 1092-1 - PN40	7.87	7.87	7.82	7.92	7.87	7.87	5.21	4.82	4.02	23
2 (50) AS2129 TABLE D	7.87		7.82	7.92	7.87		5.21	4.82	3.54	14
2 (50) AS2129 TABLE E	7.87		7.82	7.92	7.87		5.21	4.82	3.54	15
2 (50) JIS B2220 - 10K	7.89		7.82	7.92	7.87		5.21	4.82	3.78	18
2 (50) JIS B2220 - 20K	7.89		7.82	7.92	7.87		5.21	4.82	3.78	19
2 (50) JIS B2220 - 40K	8.81		8.84	8.84	8.78		5.21	4.82	4.13	27
2 (50) AS4087 PN16	7.87		7.80	7.900	7.87		5.21	4.82	3.54	16
2 (50) AS4087 PN21	7.87		7.80	7.900	7.87		5.21	4.82	4.06	34
2 (50) AS4087 PN35	7.87		7.80	7.900	7.87		5.21	4.82	4.06	96
2 1/2 (65) ASME - 150#	7.82		7.76				6.31	5.37	4.12	27
2 1/2 (65) ASME - 300#	7.82		7.76				6.31	5.37	4.12	32
2 1/2 (65) EN 1092-1 - PN16	7.82		7.76				6.31	5.37	4.80	27
2 1/2 (65) EN 1092-1 - PN40	7.82		7.76				6.31	5.37	4.80	31
2 1/2 (65) AS2129 TABLE D	7.82		7.76				6.31	5.37	4.06	17
2 1/2 (65) AS2129 TABLE E	7.82		7.76				6.31	5.37	4.06	19
2 1/2 (65) JIS B2220 - 10K	7.82		7.76				6.31	5.37	4.57	25
2 1/2 (65) JIS B2220 - 20K	7.82		7.76				6.31	5.37	4.57	26
2 1/2 (65) JIS B2220 - 40K	7.82		7.76				6.31	5.37	5.12	40
2 1/2 (65) AS4087 PN16	7.82		7.76				6.31	5.37	4.06	18
2 1/2 (65) AS4087 PN21	7.82		7.76				6.31	5.37	4.80	24
2 1/2 (65) AS4087 PN35	7.82		7.76				6.31	5.37	4.80	27

Table 32. DN15 mm to 65 mm Slip-on flanges (mm)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Flow tube weight (Lbs)
	Dim "A" PTFE	Dim "A" ETFE	Dim "A" Neoprene	Dim "A" Linatex	Dim "A" Poly	Dim "A" PFA				
1/2 (15) ASME - 150#	200	200	200	203	200	200	114	112	35	4.0
1/2 (15) ASME - 300#	200	200	200	203	200	200	114	112	35	4.5
1/2 (15) EN 1092-1 - PN40	200	200	200	203	200	200	114	112	45	4.7
1/2 (15) AS2129 TABLE D	200		200	203	200		114	112	47	3.7
1/2 (15) AS2129 TABLE E	200		200	203	200		114	112	47	3.8
1/2 (15) JIS B2220 - 10K	201		200	203	200		114	112	45	4.4
1/2 (15) JIS B2220 - 20K	201		200	203	200		114	112	45	4.6
1/2 (15) JIS B2220 - 40K	213		213	213	213		114	112	45	6.1
1 (25) ASME - 150#	200	200	200	202	200	200	114	112	51	5.1
1 (25) ASME - 300#	200	200	200	202	200	200	114	112	51	6.3
1 (25) EN 1092-1 - PN40	200	200	200	202	200	200	114	112	68	6.3
1 (25) AS2129 TABLE D	200	200	200	202	200		114	112	65	4.4
1 (25) AS2129 TABLE E	200	200	200	202	200		114	112	63	4.7
1 (25) JIS B2220 - 10K	201		200	202	200		114	112	67	5.9
1 (25) JIS B2220 - 20K	201		200	202	200		114	112	67	6.3
1 (25) JIS B2220 - 40K	220		220	223	220		114	112	70	7.8
1 1/2 (40) ASME - 150#	200	200	199	202	200	200	132	122	73	6.9
1 1/2 (40) ASME - 300#	200	200	199	202	200	200	132	122	73	9.3
1 1/2 (40) EN 1092-1 - PN40	200	200	199	202	200	200	132	122	88	8.8
1 1/2 (40) AS2129 TABLE D	200		199	202	200		132	122	78	5.5
1 1/2 (40) AS2129 TABLE E	200		199	202	200		132	122	78	6.0
1 1/2 (40) JIS B2220 - 10K	201		199	202	200		132	122	81	7.4
1 1/2 (40) JIS B2220 - 20K	201		199	202	200		132	122	81	7.8
1 1/2 (40) JIS B2220 - 40K	201		219	221	219		132	122	90	11.1
2 (50) ASME - 150#	200	200	199	201	200	200	132	122	92	8.9
2 (50) ASME - 300#	200	200	199	201	200	200	132	122	92	10.5
2 (50) EN 1092-1 - PN40	200	200	199	201	200	200	132	122	102	10.6
2 (50) AS2129 TABLE D	200		199	201	200		132	122	90	6.4
2 (50) AS2129 TABLE E	200		199	201	200		132	122	90	6.9
2 (50) JIS B2220 - 10K	200		199	201	200		132	122	96	8.4
2 (50) JIS B2220 - 20K	200		199	201	200		132	122	96	8.7
2 (50) JIS B2220 - 40K	224		222	224	223		132	122	105	12.3
2 (50) AS4087 PN16	200		200	200	200		132	122	90	7
2 (50) AS4087 PN21	201		200	200	200		132	122	103	15
2 (50) AS4087 PN35	202		200	200	200		132	122	103	15
2 1/2 (65) ASME - 150#	199		197				160	136	105	12.4
2 1/2 (65) ASME - 300#	199		197				160	136	105	14.6
2 1/2 (65) EN 1092-1 - PN16	199		197				160	136	122	12.4
2 1/2 (65) EN 1092-1 - PN40	199		197				160	136	122	13.9
2 1/2 (65) AS2129 TABLE D	199		197				160	136	103	7.9
2 1/2 (65) AS2129 TABLE E	199		197				160	136	103	8.4
2 1/2 (65) JIS B2220 - 10K	199		197				160	136	116	11.2
2 1/2 (65) JIS B2220 - 20K	199		197				160	136	116	11.7
2 1/2 (65) JIS B2220 - 40K	199		197				160	136	130	18.3
2 1/2 (65) AS4087 PN16	199		197				160	136	103	8.3
2 1/2 (65) AS4087 PN21	199		197				160	136	122	10.9
2 1/2 (65) AS4087 PN35	199		197				160	136	122	12.2

Figure 11. 3-in. to 36-in. (DN80 mm to 900 mm) slip-on flanges -low pressure ($P \leq$ Class 300)

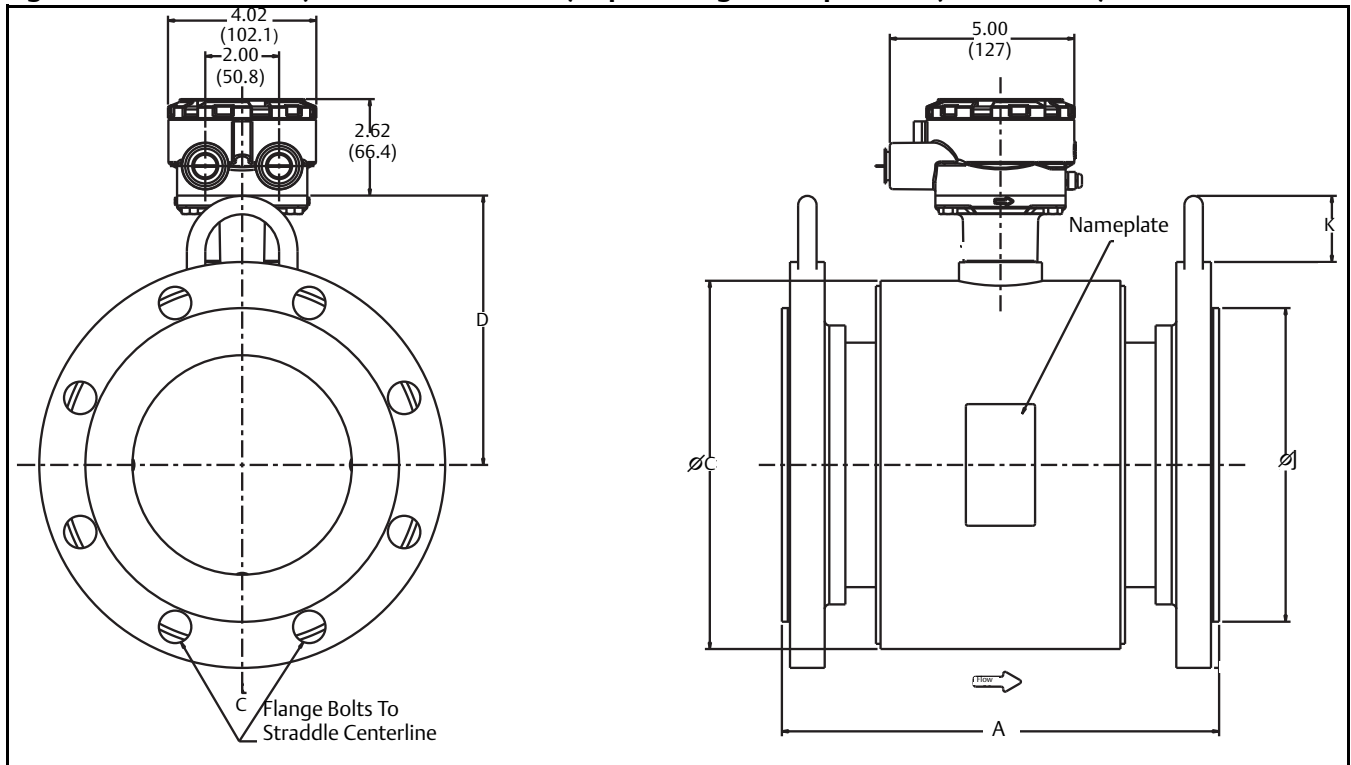


Table 33. 3-in. to 36-in. slip-on flanges (inches)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (Lbs)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly	DIM "A" PFA					
3 (80) ASME - 150#	7.87	7.87	7.75	7.84	7.87	7.83	7.21	5.82	5.00	1.70	34
3 (80) ASME - 300#	8.63	8.63	8.51	8.60	8.63	8.60	7.21	5.82	5.00	1.70	43
3 (80) EN 1092-1 - PN40	7.87	7.87	7.75	7.84	7.87	7.87	7.21	5.82	5.43	1.70	38
3 (80) AS2129 TABLE D	7.87		7.75	7.84	7.87		7.21	5.82	4.80	1.70	24
3 (80) AS2129 TABLE E	7.87		7.75	7.84	7.87		7.21	5.82	4.80	1.70	24
3 (80) JIS B2220 - 10K	7.91		7.75	7.84	7.87		7.21	5.82	4.96	1.70	28
3 (80) JIS B2220 - 20K	7.91		7.75	7.84	7.87		7.21	5.82	5.20	1.70	34
3 (80) JIS B2220 - 40K	12.40		12.29	12.39	12.40		7.21	5.82	55.1	1.70	52
3 (80) AS4087 PN16	7.87		7.75	7.84	7.87		7.21	5.82	4.80	1.70	20
3 (80) AS4087 PN21	7.87		7.75	7.84	7.87		7.21	5.82	5.55	1.70	56
3 (80) AS4087 PN35	7.87		7.75	7.84	7.87		7.21	5.82	5.55	1.70	109
4 (100) ASME - 150#	9.84	9.84	9.69	9.78	9.84	9.84	7.91	6.17	6.19	1.70	45
4 (100) ASME - 300#	10.88	10.88	10.73	10.82	10.88	10.88	7.91	6.17	6.19	1.70	65
4 (100) EN 1092-1 - PN16	9.84	9.84	9.69	9.78	9.81	9.81	7.91	6.17	6.22	1.70	41
4 (100) EN 1092-1 - PN40	9.84	9.84	9.69	9.78	9.81	9.81	7.91	6.17	6.38	1.70	49
4 (100) AS2129 TABLE D	9.84	9.84	9.69	9.78	9.84		7.91	6.17	6.06	1.70	31
4 (100) AS2129 TABLE E	9.84	9.84	9.69	9.78	9.84		7.91	6.17	6.06	1.70	33
4 (100) JIS B2220 - 10K	9.84		9.69	9.78	9.84		7.91	6.17	5.95	1.70	35
4 (100) JIS B2220 - 20K	9.84		9.69	9.78	9.84		7.91	6.17	6.30	1.70	44
4 (100) JIS B2220 - 40K	12.83		12.70	12.79	12.83		7.91	6.17	6.50	1.70	75
4 (100) AS4087 PN16	9.84		9.69	9.78	9.84		7.91	6.17	6.06	1.70	28
4 (100) AS4087 PN21	9.84		9.69	9.78	9.84		7.91	6.17	6.57	1.70	68
4 (100) AS4087 PN35	9.84		9.69	9.78	9.84		7.91	6.17	6.57	1.70	119
5 (125) ASME - 150#	9.79		9.71				9.61	7.02	7.31	1.70	54
5 (125) ASME - 300#	10.94		10.86				9.61	7.02	7.31	1.70	89
5 (125) EN 1092-1 - PN16	9.79		9.50				9.61	7.02	7.40	1.70	55
5 (125) EN 1092-1 - PN40	9.79		9.71				9.61	7.02	7.40	1.70	65
5 (125) AS2129 TABLE D	9.79		9.71				9.61	7.02	7.32	1.70	43
5 (125) AS2129 TABLE E	9.79		9.71				9.61	7.02	7.32	1.70	44
5 (125) JIS B2220 - 10K	9.79		9.71				9.61	7.02	7.17	1.70	49
5 (125) JIS B2220 - 20K	9.79		9.71				9.61	7.02	7.68	1.70	64
5 (125) JIS B2220 - 40K	10.94		10.86				9.61	7.02	7.87	1.70	112
5 (125) AS4087 PN16											
5 (125) AS4087 PN21											
5 (125) AS4087 PN35											
6 (150) ASME - 150#	11.81	11.75	11.61	11.71	11.73	11.81	9.98	7.30	8.50	1.70	68
6 (150) ASME - 300#	13.06	13.02	12.88	12.97	13.00	13.06	9.98	7.30	8.50	1.70	117
6 (150) EN 1092-1 - PN16	11.81	11.81	11.61	11.71	11.73	11.81	9.98	7.30	8.35	1.70	67
6 (150) EN 1092-1 - PN25	11.81	11.81	11.66	11.75	11.78	11.81	9.98	7.30	8.58	1.70	83
6 (150) EN 1092-1 - PN40	13.06	13.06	12.88	12.97	13.00	13.06	9.98	7.30	8.58	1.70	95
6 (150) AS2129 TABLE D	11.81		11.61	11.71	11.73		9.98	7.30	8.31	1.70	52
6 (150) AS2129 TABLE E	11.81		11.61	11.71	11.73		9.98	7.30	8.15	1.70	57
6 (150) JIS B2220 - 10K	11.81		11.61	11.71	11.73		9.98	7.30	8.35	1.70	64
6 (150) JIS B2220 - 20K	11.81		11.61	11.71	11.73		9.98	7.30	9.06	1.70	83
6 (150) JIS B2220 - 40K	14.23		14.05	14.14	14.17		9.98	7.30	9.45	1.70	161
6 (150) AS4087 PN16	11.81		11.61	11.71	11.73		9.98	7.30	8.31	1.70	46
6 (150) AS4087 PN21	11.81		11.61	11.71	11.73		9.98	7.30	9.13	1.70	98
6 (150) AS4087 PN35	11.81		11.61	11.71	11.73		9.98	7.30	9.13	1.70	186

Table 33. 3-in. to 36-in. slip-on flanges (inches)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (lbs)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly"	DIM "A" PFA					
8 (200) ASME - 150#	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.62	1.70	105
8 (200) ASME - 300#	15.60	15.54	15.42	15.51	15.54	15.60	11.92	8.27	10.62	1.70	183
8 (200) EN 1092-1 - PN10	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.55	1.70	97
8 (200) EN 1092-1 - PN16	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.55	1.70	96
8 (200) EN 1092-1 - PN25	13.78	13.69	13.53	13.63	13.65	13.78	11.92	8.27	10.94	1.70	120
8 (200) EN 1092-1 - PN40	15.60	15.54	15.42	15.51	15.54	15.60	11.92	8.27	11.22	1.70	158
8 (200) AS2129 TABLE D	13.78		13.53	13.63	13.65		11.92	8.27	10.55	1.70	77
8 (200) AS2129 TABLE E	13.78		13.53	13.63	13.65		11.92	8.27	10.39	1.70	86
8 (200) JIS B2220 - 10K	13.90		13.53	13.63	13.65		11.92	8.27	10.32	1.70	81
8 (200) JIS B2220 - 20K	15.60		15.42	15.51	15.54		11.92	8.27	10.83	1.70	134
8 (200) JIS B2220 - 40K	16.72		16.54	16.63	16.66		11.92	8.27	11.42	1.70	232
8 (200) AS4087 PN16	13.78		13.53	13.63	13.65		11.92	8.27	10.55	1.70	73
8 (200) AS4087 PN21	13.78		13.53	13.63	13.65		11.92	8.27	11.65	1.70	136
8 (200) AS4087 PN35	15.60		15.42	15.51	15.54		11.92	8.27	10.24	1.70	241
10 (250) ASME - 150#	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	12.75	2.00	152
10 (250) ASME - 300#	17.13	17.08	16.86	16.95	16.95	17.13	14.64	9.69	12.75	2.00	267
10 (250) EN 1092-1 - PN10	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	12.60	2.00	134
10 (250) EN 1092-1 - PN16	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	12.60	2.00	138
10 (250) EN 1092-1 - PN25	15.00	14.85	14.63	14.73	14.75	15.00	14.64	9.69	13.19	2.00	174
10 (250) EN 1092-1 - PN40	17.13		16.86	16.95	16.98	17.13	14.64	9.69	13.58	2.00	244
10 (250) AS2129 TABLE D	15.00		14.63	14.73	14.75		14.64	9.69	12.91	2.00	122
10 (250) AS2129 TABLE E	15.00		14.63	14.73	14.75		14.64	9.69	12.91	2.00	137
10 (250) JIS B2220 - 10K	15.00		14.63	14.73	14.75		14.64	9.69	12.76	1.70	129
10 (250) JIS B2220 - 20K	17.13		16.86	16.95	16.98		14.64	9.69	13.58	3.13	218
10 (250) JIS B2220 - 40K	19.54		19.34	19.43	19.46		14.64	9.69	13.98	2.00	382
10 (250) AS4087 PN16	15.00		14.63	14.73	14.75		14.64	9.69	12.91	2.00	96
10 (250) AS4087 PN21	15.00		14.63	14.73	14.75		14.64	9.69	13.74	2.00	176
10 (250) AS4087 PN35	17.13		16.86	16.95	16.98		14.64	9.69	12.24	2.00	299
12 (300) ASME - 150#	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	15.00	2.00	231
12 (300) ASME - 300 #	20.14	20.02	19.80	19.89	19.92	20.14	16.80	10.77	15.00	2.00	387
12 (300) EN 1092-1 PN10	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	14.57	2.00	178
12 (300) EN 1092-1 PN10	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	14.88	2.00	192
12 (300) EN 1092-1 PN25	18.01	17.90	17.68	17.78	17.80	18.00	16.80	10.77	15.55	2.00	242
12 (300) EN 1092-1 PN40	20.14		19.80	19.89	19.92	20.14	16.80	10.77	16.14	2.00	351
12 (300) AS2129 TABLE D	18.01		17.68	17.78	17.80		16.80	10.77	14.88	2.00	172
12 (300) AS2129 TABLE E	18.01		17.68	17.78	17.80		16.80	10.77	14.72	2.00	185
12 (300) JIS B2220 - 10K	18.01		17.68	17.78	17.80		16.80	10.77	14.49	2.00	166
12 (300) JIS B2220 - 20K	20.14		19.80	19.89	19.92		16.80	10.77	15.55	2.00	285
12 (300) JIS B2220 - 40K	22.08		21.88	21.98	22.00		16.80	10.77	16.14	2.00	546
12 (300) AS4087 PN16	18.01		17.68	17.78	17.80		16.80	10.77	14.88	2.00	138
12 (300) AS4087 PN21	18.01		17.68	17.78	17.80		16.80	10.77	15.98	2.00	225
12 (300) AS4087 PN35	20.14		19.80	19.89	19.92		16.80	10.77	14.25	2.00	370
14 (350) ASME - 150#	20.91	20.93	20.71	20.80	20.83	21.00	18.92	11.83	16.25	2.00	300
14 (350) ASME - 300#	23.16	23.18	22.96	23.05	23.08		18.92	11.83	16.25	2.00	517
14 (350) EN 1092-1 - PN10	20.91	20.93	20.71	20.80	20.83	21.00	18.92	11.83	16.93	2.00	252
14 (350) EN 1092-1 - PN16	20.91		20.71	20.80	20.83	21.00	18.92	11.83	17.24	2.00	276
14 (350) EN 1092-1 - PN25	20.91		20.71	20.80	20.83		18.92	11.83	17.72	2.00	359
14 (350) EN 1092-1 - PN40	23.16		22.96	23.05	23.08		18.92	11.83	18.31	2.00	480
14 (350) AS2129 TABLE D	20.91		20.71	20.80	20.83		18.92	11.83	17.24	2.00	230
14 (350) AS2129 TABLE E	20.91		20.71	20.80	20.83		18.92	11.83	17.24	2.00	257

Table 33. 3-in. to 36-in. slip-on flanges (inches)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (lbs)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly"	DIM "A" PFA					
14 (350) JIS B2220 - 10K	20.91		20.71	20.80	20.83		18.92	11.83	16.26	2.00	221
14 (350) JIS B2220 - 20K	23.16		22.96	23.05	23.08		18.92	11.83	17.32	2.00	385
14 (350) JIS B2220 - 40K	25.74		25.54	25.64	25.66		18.92	11.83	17.91	2.00	702
14 (350) AS4087 PN16	20.91		20.71	20.80	20.83		18.92	11.83	17.24	2.00	219
14 (350) AS4087 PN21	20.91		20.71	20.80	20.83		18.92	11.83	18.07	2.00	294
14 (350) AS4087 PN35	23.16		22.96	23.05	23.08		18.92	11.83	16.50	2.00	497
16 (400) ASME - 150#	23.88	23.90	23.68	23.77	23.80		20.94	12.84	18.50	3.13	388
16 (400) ASME - 300#	26.13		25.93	26.02	26.05		20.94	12.84	18.50	3.13	705
16 (400) EN 1092-1 - PN10	23.88	23.90	23.68	23.77	23.80		20.94	12.84	18.98	3.13	318
16 (400) EN 1092-1 - PN16	23.88	23.90	23.68	23.77	23.80		20.94	12.84	19.28	3.13	354
16 (400) EN 1092-1 - PN25	26.13		25.93	26.02	26.05		20.94	12.84	19.88	3.13	581
16 (400) EN 1092-1 - PN40	26.13		25.93	26.02	23.80		20.94	12.84	21.06	3.13	696
16 (400) AS2129 TABLE D	23.88		23.68	23.77	23.80		20.94	12.84	19.25	3.13	283
16 (400) AS2129 TABLE E	23.88		23.68	23.77	23.80		20.94	12.84	19.25	3.13	327
16 (350) JIS B2220 - 10K	23.88		23.68	23.77	23.80		20.94	12.84	18.70	3.13	296
16 (350) JIS B2220 - 20K	26.13		25.93	26.02	26.05		20.94	12.84	19.49	3.13	561
16 (350) JIS B2220 - 40K	29.24		29.04	29.14	28.91		20.94	12.84	20.28	3.13	961
16 (400) AS4087 PN16	23.88		23.68	23.77	23.80		20.94	12.84	19.25	3.13	292
16 (400) AS4087 PN21	23.88		23.68	23.77	23.80		20.94	12.84	20.31	3.13	387
16 (400) AS4087 PN35	26.13		25.93	26.02	26.05		20.94	12.84	19.02	3.13	631
18 (450) ASME - 150#	26.85		26.65	26.74	26.77		23.46	14.10	21.00	3.13	451
18 (450) ASME - 300#	29.97		29.77	29.86	29.89		23.46	14.10	21.00	3.13	907
18 (450) EN 1092-1 - PN10	26.85		26.65	26.74	26.77		23.46	14.10	20.94	3.13	381
18 (450) EN 1092-1 - PN16	26.85		26.65	26.74	26.77		23.46	14.10	21.65	3.13	434
18 (450) EN 1092-1 - PN25	29.97		29.77	29.86	29.89		23.46	14.10	21.85	3.13	744
18 (450) EN 1092-1 - PN40	29.97		26.65	29.86	29.89		23.46	14.10	22.05	3.13	817
18 (450) AS2129 TABLE D	26.85		26.65	26.74	26.77		23.46	14.10	20.94	3.13	356
18 (450) AS2129 TABLE E	26.85		26.65	26.74	26.77		23.46	14.10	21.73	3.13	414
18 (450) JIS B2220 - 10K	26.85		26.65	26.74	26.77		23.46	14.10	20.87	3.13	373
18 (450) JIS B2220 - 20K	29.97		29.77	29.86	29.89		23.46	14.10	22.05	3.13	751
18 (450) AS4087 PN16	26.85		26.65	26.74	26.77		23.46	14.10	21.73	3.13	323
18 (450) AS4087 PN21	26.85		26.65	26.74	26.77		23.46	14.10	22.48	3.13	453
18 (450) AS4087 PN35	29.97		29.77	29.86	29.89		23.46	14.10	20.98	3.13	917
20 (500) ASME - 150#	29.78		29.58	29.67	29.70		25.48	15.11	23.00	3.13	569
20 (500) ASME - 300#	33.04		32.84	32.93	32.96		25.48	15.11	23.00	3.13	1127
20 (500) EN 1092-1 - PN10	29.78		29.58	29.67	29.70		25.48	15.11	23.03	3.13	473
20 (500) EN 1092-1 - PN16	29.78		29.58	29.67	29.70		25.48	15.11	24.02	3.13	567
20 (500) EN 1092-1 - PN25	33.04		32.84	32.93	32.96		25.48	15.11	24.21	3.13	932
20 (500) EN 1092-1 - PN40	33.04		32.84	32.93	32.96		25.48	15.11	24.21	3.13	1013
20 (500) AS2129 TABLE D	29.78		29.58	29.67	29.70		25.48	15.11	23.98	3.13	471
20 (500) AS2129 TABLE E	29.78		29.58	29.67	29.70		25.48	15.11	23.98	3.13	528
20 (500) JIS B2220 - 10K	29.78		29.58	29.67	29.70		25.48	15.11	23.03	3.13	453
20 (500) JIS B2220 - 20K	33.04		32.84	32.93	32.96		25.48	15.11	24.21	3.13	919
20 (500) AS4087 PN16	29.78		29.58	29.67	29.70		25.48	15.11	23.98	3.13	453
20 (500) AS4087 PN21	29.78		29.58	29.67	29.70		25.48	15.11	24.96	3.13	627
20 (500) AS4087 PN35	33.04		32.84	32.93	32.96		25.48	15.11	23.50	3.13	1074

Table 33. 3-in. to 36-in. slip-on flanges (inches)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (lbs)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly"	DIM "A" PFA					
24 (600) ASME - 150#	35.75		35.55	35.64	35.67		30.03	17.39	27.25	3.13	828
24 (600) ASME - 300#	39.38		39.18	39.28	39.30		30.03	17.39	27.25	3.13	1729
24 (600) EN 1092-1 - PN10	35.75		35.55	35.64	35.67		30.03	17.39	26.97	3.13	661
24 (600) EN 1092-1 - PN16	35.75		35.55	35.64	35.67		30.03	17.39	28.54	3.13	832
24 (600) EN 1092-1 - PN25	39.38		39.18	39.27	39.30		30.03	17.39	28.35	3.13	1352
24 (600) EN 1092-1 - PN40	39.38		39.18	39.27	39.30		30.03	17.39	28.94	3.13	1628
24 (600) AS2129 TABLE D	35.75		35.55	35.64	35.67		30.03	17.39	28.35	3.13	693
24 (600) AS2129 TABLE E	35.75		35.55	35.64	35.67		30.03	17.39	28.23	3.13	815
24 (600) JIS B2220 - 10K	35.75		35.55	35.64	35.67		30.03	17.39	27.17	3.13	659
24 (600) JIS B2220 - 20K	39.38		39.18	39.27	39.30		30.03	17.39	28.35	3.13	1353
24 (600) AS4087 PN16	35.75		35.55	35.64	35.67		30.03	17.39	28.35	3.13	709
24 (600) AS4087 PN21	39.38		39.18	39.27	39.30		30.03	17.39	29.09	3.13	1293
24 (600) AS4087 PN35	39.38		39.18	39.27	39.30		30.03	17.39	27.52	3.13	1528
30 (750) AWWA CLASS D	37.00		36.80	36.89	37.04		35.50	20.13	33.75	3.13	897
30 (750) MSS SP44 - 150#	41.56		41.36	41.45	41.48		35.50	20.13	33.75	3.13	1562
30 (750) MSS SP44 - 300#	47.25		47.05	47.14	47.17		35.50	20.13	33.75	3.13	2951
30 (750) AS2129 TABLE D	37.00		36.80	36.89	37.04		35.50	20.13	34.96	3.13	1037
30 (750) AS2129 TABLE E	41.56		41.36	41.45	41.48		35.50	20.13	33.75	3.13	1275
30 (750) AS4087 PN16	37.00		36.80	36.89	36.92		35.50	20.13	34.96	3.13	1083
30 (750) AS4087 PN21	41.56		41.36	41.45	41.48		35.50	20.13	3.00	3.13	1071
30 (750) AS4087 PN35	47.25		47.05	47.14	47.17		35.50	20.13	35.35	3.13	2452
36 (900) AWWA CLASS D	40.63		40.43	40.52	40.67		43.37	24.00	40.25	3.13	1267
36 (900) MSS SP44 - 150#	47.25		47.05	47.14	47.17		43.37	24.00	40.25	3.13	2551
36 (900) MSS SP44 - 300#	53.17		52.97	53.06	53.09		43.37	24.00	40.25	3.13	4584
36 (900) AS2129 TABLE D	40.63		40.43	40.52	40.67		43.37	24.00	41.34	3.13	1515
36 (900) AS2129 TABLE E	47.25		47.05	47.14	47.17		43.37	24.00	41.34	3.13	2106
36 (900) AS4087 PN16	40.63		40.43	40.52	40.55		43.37	24.00	41.34	3.13	1559
36 (900) AS4087 PN21	47.25		47.05	47.14	47.17		43.37	24.00	41.73	3.13	2061
36 (900) AS4087 PN35	53.17		52.97	53.06	53.09		43.37	24.00	40.55	3.13	3701

Table 34. DN80 mm to 900 mm slip-on flanges (mm)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (Kg)
	Dim "A" PTFE	Dim "A" ETFE	Dim "A" Neoprene	Dim "A" Linatex	Dim "A" Poly	Dim "A" PFA					
3 (80) ASME - 150#	200	200	197	199	200	200	183	148	127	43	15
3 (80) ASME - 300#	219	219	217	219	219	219	183	148	127	43	19
3 (80) EN 1092-1 - PN40	200	200	197	199	200	200	183	148	138	43	17
3 (80) AS2129 TABLE D	200		197	199	200		183	148	122	43	11
3 (80) AS2129 TABLE E	200		197	199	200		183	148	122	43	11
3 (80) JIS B2220 - 10K	200		197	199	200		183	148	126	43	13
3 (80) JIS B2220 - 20K	200		197	199	200		183	148	132	43	16
3 (80) JIS B2220 - 40K	315		312	315	315		183	148	140	43	24
3 (80) AS4087 PN16	200		197	199	200		183	148	122	43	9
3 (80) AS4087 PN21	200		197	199	200		183	148	141	43	25
3 (80) AS4087 PN35	200		197	199	200		183	148	141	43	49
4 (100) ASME - 150#	250	250	246	249	250		201	157	157	43	20
4 (100) ASME - 300#	276	276	273	275	276		201	157	157	43	29
4 (100) EN 1092-1 - PN16	250	250	246	249	250		201	157	158	43	19
4 (100) EN 1092-1 - PN40	250	250	246	249	250		201	157	162	43	22
4 (100) AS2129 TABLE D	250	250	246	249	250		201	157	157	43	14
4 (100) AS2129 TABLE E	250	250	246	249	250		201	157	157	43	15
4 (100) JIS B2220 - 10K	250		246	249	250		201	157	151	43	16
4 (100) JIS B2220 - 20K	250		246	249	250		201	157	160	43	20
4 (100) JIS B2220 - 40K	326		323	325	326		201	157	165	43	34
4 (100) AS4087 PN16	250		246	249	250		201	157	154	43	13
4 (100) AS4087 PN21	250		246	249	250		201	157	167	43	31
4 (100) AS4087 PN35	250		246	249	250		201	157	167	43	54
5 (125) ASME - 150#	249		247				244	178	186	43	24
5 (125) ASME - 300#	278		276				244	178	186	43	40
5 (125) EN 1092-1 - PN16	249		247				244	178	188	43	25
5 (125) EN 1092-1 - PN40	249		247				244	178	188	43	29
5 (125) AS2129 TABLE D	249		247				244	178	186	43	20
5 (125) AS2129 TABLE E	249		247				244	178	186	43	20
5 (125) JIS B2220 - 10K	249		247				244	178	182	43	22
5 (125) JIS B2220 - 20K	249		247				244	178	195	43	29
5 (125) JIS B2220 - 40K	278		276				244	178	200	43	51
5 (125) AS4087 PN16											
5 (125) AS4087 PN21											
5 (125) AS4087 PN35											
6 (150) ASME - 150#	300	298	295	297	298	300	253	185	216	43	31
6 (150) ASME - 300#	332	331	327	330	330	332	253	185	216	43	53
6 (150) EN 1092-1 PN16	300	298	295	297	298	300	253	185	212	43	31
6 (150) EN 1092-1 PN25	300	300	296	299	299	301	253	185	218	43	38
6 (150) EN 1092-1 PN40	332	331	327	330	330	332	253	185	218	43	43
6 (150) AS2129 TABLE D	300		295	297	298		253	185	211	43	24
6 (150) AS2129 TABLE E	300		295	297	298		253	185	207	43	26
6 (150) JIS B2220 - 10K	300		295	297	298		253	185	212	43	29
6 (150) JIS B2220 - 20K	300		295	297	298		253	185	230	43	37
6 (150) JIS B2220 - 40K	361		357	359	360		253	185	240	43	73
6 (150) AS4087 PN16	300		295	297	298		253	185	211	43	21
6 (150) AS4087 PN21	300		295	297	298		253	185	232	43	45
6 (150) AS4087 PN35	300		295	297	298		253	185	232	43	84

Table 34. DN80 mm to 900 mm slip-on flanges (mm)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (Kg)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly	DIM "A" PFA					
8 (200) ASME - 150#	350	348	344	346	347	350	303	210	270	43	48
8 (200) ASME - 300#	396	395	392	394	395	396	303	210	270	43	83
8 (200) EN 1092-1 PN10	350	348	344	346	347	350	303	210	268	43	44
8 (200) EN 1092-1 PN16	350	348	344	346	347	350	303	210	268	43	43
8 (200) EN 1092-1 PN25	350	348	344	346	347	350	303	210	278	43	54
8 (200) EN 1092-1 PN40	396	395	392	394	395	396	303	210	285	43	72
8 (200) AS2129 TABLE D	350		344	346	347		303	210	268	43	35
8 (200) AS2129 TABLE E	350		344	346	347		303	210	264	43	39
8 (200) JIS B2220 - 10K	353		344	346	347		303	210	262	43	37
8 (200) JIS B2220 - 20K	396		392	394	395		303	210	275	43	61
8 (200) JIS B2220 - 40K	425		420	422	423		303	210	290	43	105
8 (200) AS4087 PN16	350		344	346	347		303	210	268	43	33
8 (200) AS4087 PN21	350		344	346	347		303	210	296	43	62
8 (200) AS4087 PN35	396		392	394	395		303	210	260	43	109
10 (250) ASME - 150#	381	377	372	374	375	381	372	246	324	51	69
10 (250) ASME - 300#	435	434	428	431	431	435	372	246	324	51	121
10 (250) EN 1092-1 PN10	381	377	372	374	375	381	372	246	320	51	61
10 (250) EN 1092-1 PN16	381	377	372	374	375	381	372	246	320	51	63
10 (250) EN 1092-1 PN25	381	377	372	374	375	381	372	246	335	51	79
10 (250) EN 1092-1 PN40	435		428	431	431	435	372	246	345	51	111
10 (250) AS2129 TABLE D	381		372	374	375		372	246	328	51	56
10 (250) AS2129 TABLE E	381		372	374	375		372	246	328	51	62
10 (250) JIS B2220 - 10K	381		372	374	375		372	246	324	43	58
10 (250) JIS B2220 - 20K	435		428	431	431		372	246	345	80	99
10 (250) JIS B2220 - 40K	496		491	494	494		372	246	355	51	173
10 (250) AS4087 PN16	381		372	374	375		372	246	328	51	44
10 (250) AS4087 PN21	381		372	374	375		372	246	349	51	80
10 (250) AS4087 PN35	435		428	431	431		372	246	311	51	136
12 (300) ASME - 150#	458	455	449	452	452	457	427	274	381	51	105
12 (300) ASME - 300#	512	508	503	505	506	512	427	274	381	51	175
12 (300) EN 1092-1 PN10	458	455	449	452	452	457	427	274	370	51	81
12 (300) EN 1092-1 PN16	458	455	449	452	452	457	427	274	378	51	87
12 (300) EN 1092-1 PN25	458	455	449	452	452	457	427	274	395	51	110
12 (300) EN 1092-1 PN40	512		503	505	506	512	427	274	410	51	159
12 (300) AS2129 TABLE D	458		449	452	452		427	274	378	51	78
12 (300) AS2129 TABLE E	458		449	452	452		427	274	374	51	84
12 (300) JIS B2220 - 10K	458		449	452	452		427	274	368	51	75
12 (300) JIS B2220 - 20K	512		503	505	506		427	274	395	51	129
12 (300) JIS B2220 - 40K	561		556	558	559		427	274	410	51	248
12 (300) AS4087 PN16	458		449	452	452		427	274	378	51	63
12 (300) AS4087 PN21	458		449	452	452		427	274	406	51	102
12 (300) AS4087 PN35	512		503	505	506		427	274	362	51	168
14 (350) ASME - 150#	531	532	526	528	529	533	481	300	413	51	136
14 (350) ASME - 300#	588	589	583	586	586		481	300	413	51	234
14 (350) EN 1092-1 PN10	531	532	526	528	529	533	481	300	430	51	114

Table 34. DN80 mm to 900 mm slip-on flanges (mm)

Size, description	Overall Length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (Kg)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly	DIM "A" PFA					
14 (350) EN 1092-1 PN16	531		526	528	529	533	481	300	438	51	125
14 (350) EN 1092-1 PN2	531		526	528	529		481	300	450	51	163
14 (350) EN 1092-1 PN40	588		583	586	586		481	300	465	51	218
14 (350) AS2129 TABLE D	531		526	528	529		481	300	438	51	104
14 (350) AS2129 TABLE E	531		526	528	529		481	300	438	51	116
14 (350) JIS B2220 - 10K	531		526	528	529		481	300	413	51	100
14 (350) JIS B2220 - 20K	588		583	586	586		481	300	440	80	175
14 (350) JIS B2220 - 40K	654		649	651	652		481	300	455	51	318
14 (350) AS4087 PN16	531		526	528	529		481	300	438	51	99
14 (350) AS4087 PN21	531		526	528	529		481	300	459	51	133
14 (350) AS4087 PN35	588		583	586	586		481	300	419	51	226
16 (400) ASME - 150#	607	607	601	604	604		532	326	470	80	176
16 (400) ASME - 300#	664		659	661	662		532	326	470	80	320
16 (400) EN 1092-1 PN10	607	607	601	604	604		532	326	482	80	144
16 (400) EN 1092-1 PN16	607	607	601	604	604		532	326	490	80	161
16 (400) EN 1092-1 PN25	664		659	661	662		532	326	505	80	264
16 (400) EN 1092-1 PN40	664		659	661	662		532	326	535	80	316
16 (400) AS2129 TABLE D	607		601	604	604		532	326	489	80	129
16 (400) AS2129 TABLE E	607		601	604	604		532	326	489	80	148
16 (400) JIS B2220 - 10K	607		601	604	604		532	326	475	51	134
16 (400) JIS B2220 - 20K	664		659	661	662		532	326	495	80	254
16 (400) JIS B2220 - 40K	743		738	740	741		532	326	515	80	436
16 (400) AS4087 PN16	607		601	604	604		532	326	489	80	119
16 (400) AS4087 PN21	607		601	604	604		532	326	516	80	175
16 (400) AS4087 PN35	664		659	661	662		532	326	483	80	286
18 (450) ASME - 150#	682		677	679	680		596	358	533	80	205
18 (450) ASME - 300#	761		756	758	759		596	358	533	80	411
18 (450) EN 1092-1 PN10	682		677	679	680		596	358	532	80	173
18 (450) EN 1092-1 PN16	682		677	679	680		596	358	550	80	197
18 (450) EN 1092-1 PN25	761		756	758	759		596	358	555	80	338
18 (450) EN 1092-1 PN40	761		756	758	759		596	358	560	80	371
18 (450) AS2129 TABLE D	682		677	679	680		596	358	532	80	161
18 (450) AS2129 TABLE E	682		677	679	680		596	358	552	80	188
18 (450) JIS B2220 - 10K	682		677	679	680		596	358	530	80	169
18 (450) JIS B2220 - 20K	761		756	758	759		596	358	560	80	340
18 (450) AS4087 PN16	682		677	679	680		596	358	552	80	146
18 (450) AS4087 PN21	682		677	679	680		596	358	571	80	205
18 (450) AS4087 PN35	761		756	758	759		596	358	533	80	416
20 (500) ASME - 150#	756		751	754	754		647	384	584	80	258
20 (500) ASME - 300#	839		834	836	837		647	384	584	80	511
20 (500) EN 1092-1 PN10	756		751	754	754		647	384	585	80	215
20 (500) EN 1092-1 PN16	756		751	754	754		647	384	610	80	257
20 (500) EN 1092-1 PN25	839		834	836	837		647	384	615	80	423
20 (500) EN 1092-1 PN40	839		834	836	837		647	384	615	80	459
20 (500) AS2129 TABLE D	756		751	754	754		647	384	609	80	214
20 (500) AS2129 TABLE E	756		751	754	754		647	384	609	80	239
20 (500) JIS B2220 - 10K	756		751	754	754		647	384	585	80	206

Table 34. DN80 mm to 900 mm Slip-on flanges (mm)

Size, description	Overall length						Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Tube weight (Kg)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly	DIM "A" PFA					
20 (500) JIS B2220 - 20K	839		834	836	837		647	384	615	80	417
20 (500) AS4087 PN16	756		751	754	754		647	384	609	80	205
20 (500) AS4087 PN21	756		751	754	754		647	384	634	80	285
20 (500) AS4087 PN35	839		834	836	837		647	384	597	80	487
24 (600) ASME - 150#	908		903	905	906		763	442	692	80	375
24 (600) ASME - 300#	1000		995	997	998		763	442	692	80	784
24 (600) EN 1092-1 PN10	908		903	905	906		763	442	685	80	300
24 (600) EN 1092-1 PN16	908		903	905	906		763	442	725	80	377
24 (600) EN 1092-1 PN25	1000		995	997	998		763	442	720	80	613
24 (600) EN 1092-1 PN40	1000		995	997	998		763	442	735	80	738
24 (600) AS2129 TABLE D	908		903	905	906		763	442	720	80	314
24 (600) AS2129 TABLE E	908		903	905	906		763	442	717	80	370
24 (600) JIS B2220 - 10K	908		903	905	906		763	442	690	80	299
24 (600) JIS B2220 - 20K	1000		995	997	998		763	442	720	80	614
24 (600) AS4087 PN16	908		903	905	906		763	442	720	80	322
24 (600) AS4087 PN21	1000		995	997	998		763	442	739	80	587
24 (600) AS4087 PN35	1000		995	997	998		763	442	699	80	693
30 (750) AWWA CLASS D	940		935	937	941		902	511	857	80	407
30 (750) MSS SP44 - 150#	1056		1050	1053	1053		902	511	857	80	708
30 (750) MSS SP44 - 300#	1200		1195	1197	1198		902	511	857	80	1338
30 (750) AS2129 TABLE D	940		935	937	941		902	511	888	80	470
30 (750) AS2129 TABLE E	1056		1050	1053	1053		902	511	857	80	578
30 (750) AS4087 PN16	940		935	937	938		902	511	888	80	491
30 (750) AS4087 PN21	1056		1050	1053	1053		902	511	76	80	486
30 (750) AS4087 PN35	1200		1195	1197	1198		902	511	898	80	1112
36 (900) AWWA CLASS D	1032		1027	1029	1033		1102	610	1022	80	575
36 (900) MSS SP44 - 150#	1200		1195	1197	1198		1102	610	1022	80	1157
36 (900) MSS SP44 - 300#	1351		1345	1348	1348		1102	610	1022	86	2079
36 (900) AS2129 TABLE D	1032		1027	1029	1033		1102	610	1050	80	687
36 (900) AS2129 TABLE E	1200		1195	1197	1198		1102	610	1050	80	955
36 (900) AS4087 PN16	1032		1027	1029	1030		1102	610	1050	80	707
36 (900) AS4087 PN21	1200		1195	1197	1198		1102	610	1060	80	935
36 (900) AS4087 PN35	1351		1345	1348	1348		1102	610	1030	86	1679

Figure 12. 1/2-in. to 36-in. (DN15 mm to 900 mm) with W3 option

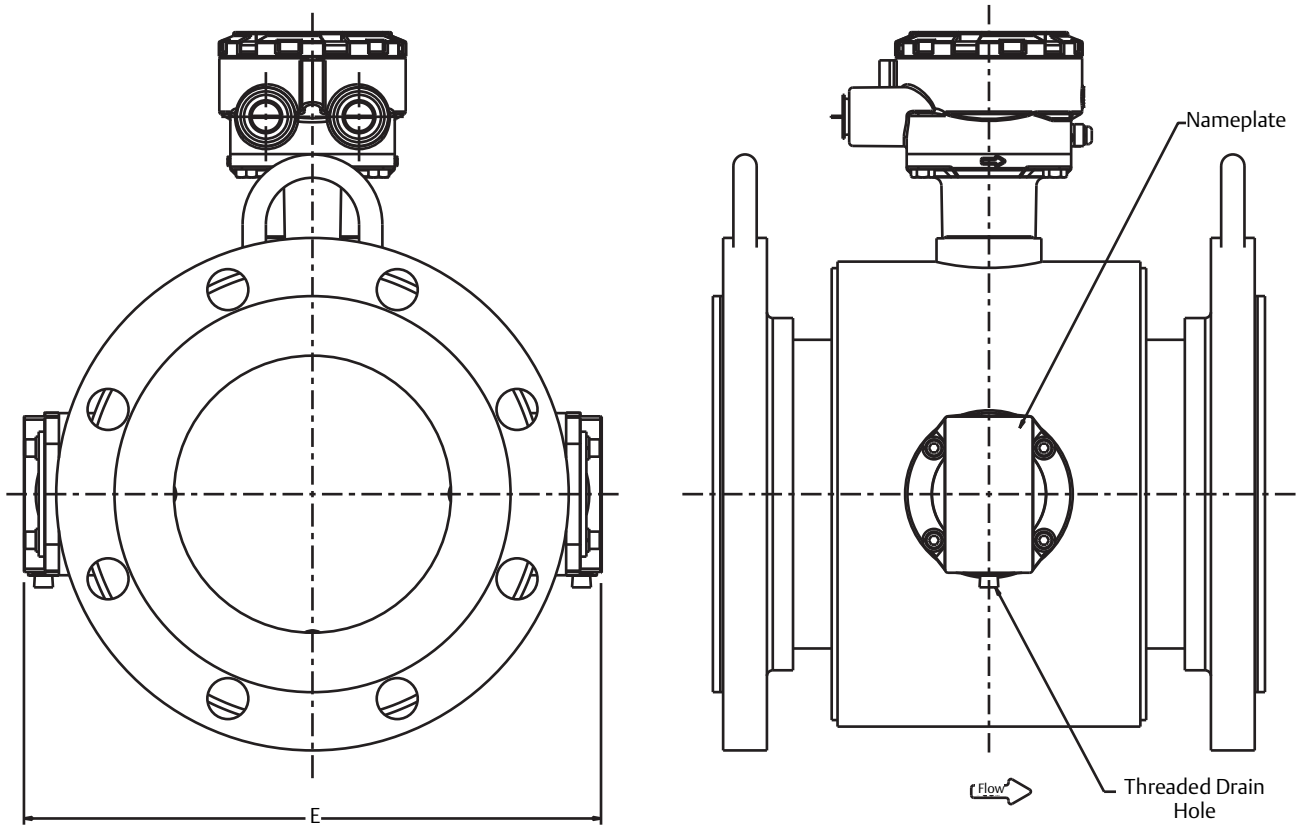


Table 35. Body width with electrode access (W3)

Size -- in (mm) all flanges	Body width with W3 DIM "E" (in.)	Body width with W3 DIM "E" (mm)
1/2 (15)	6.22	158
1 (25)	6.68	170
1 1/2 (40)	7.47	190
2 (50)	7.47	190
3 (80)	9.45	240
4 (100)	10.15	258
6 (150)	12.34	313
8 (200)	14.28	363
10 (250)	17.00	432
12 (300)	19.15	486
14 (350)	21.28	541
16 (400)	23.30	592
18 (450)	25.82	656
20 (500)	27.84	707
24 (600)	32.39	823
30 (750)	38.04	966
36 (900)	45.91	1166

Figure 13. Lining protector / grounding ring assembly

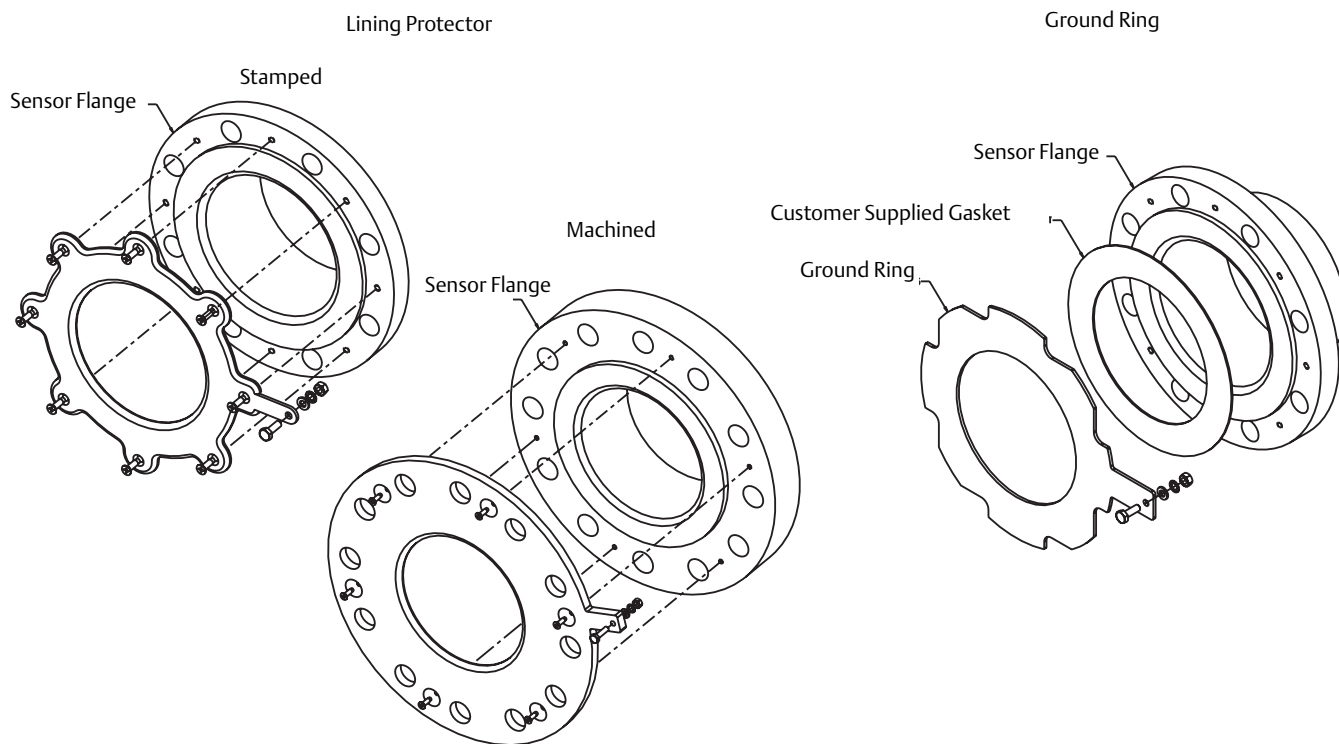


Table 36. Lay length adjustments for 316SST and Ni-Alloy C-276⁽¹⁾

	Line size	Quantity (1)	Quantity (2)
Ground ring (inches)	1/2-in. to 12-in.	0.12	0.25
	14-in. +	0.25	0.50
Lining protector			
ASME (inches)	1/2-in. to 10-in.	0.12	0.25
	12-in. to 24-in.	0.30	0.60
	30-in.	0.38	0.75
	36-in.	0.50	1.00
EN 1092-1 (mm)	15 mm to 200mm	3.1	6.3
	250 mm	9.6	19.0
	300 mm	12.7	25.4
	350 mm to 600 mm	7.6	15.2
	750 mm	7.6	19.0
	900 mm	12.7	25.4

(1) Additional length does not include customer supplied gasket thickness.

Figure 14. 1/2-in. to 24-in. (DN15 mm to 600 mm) with slip-on flanges - high pressure meters (Class 600 - 900)

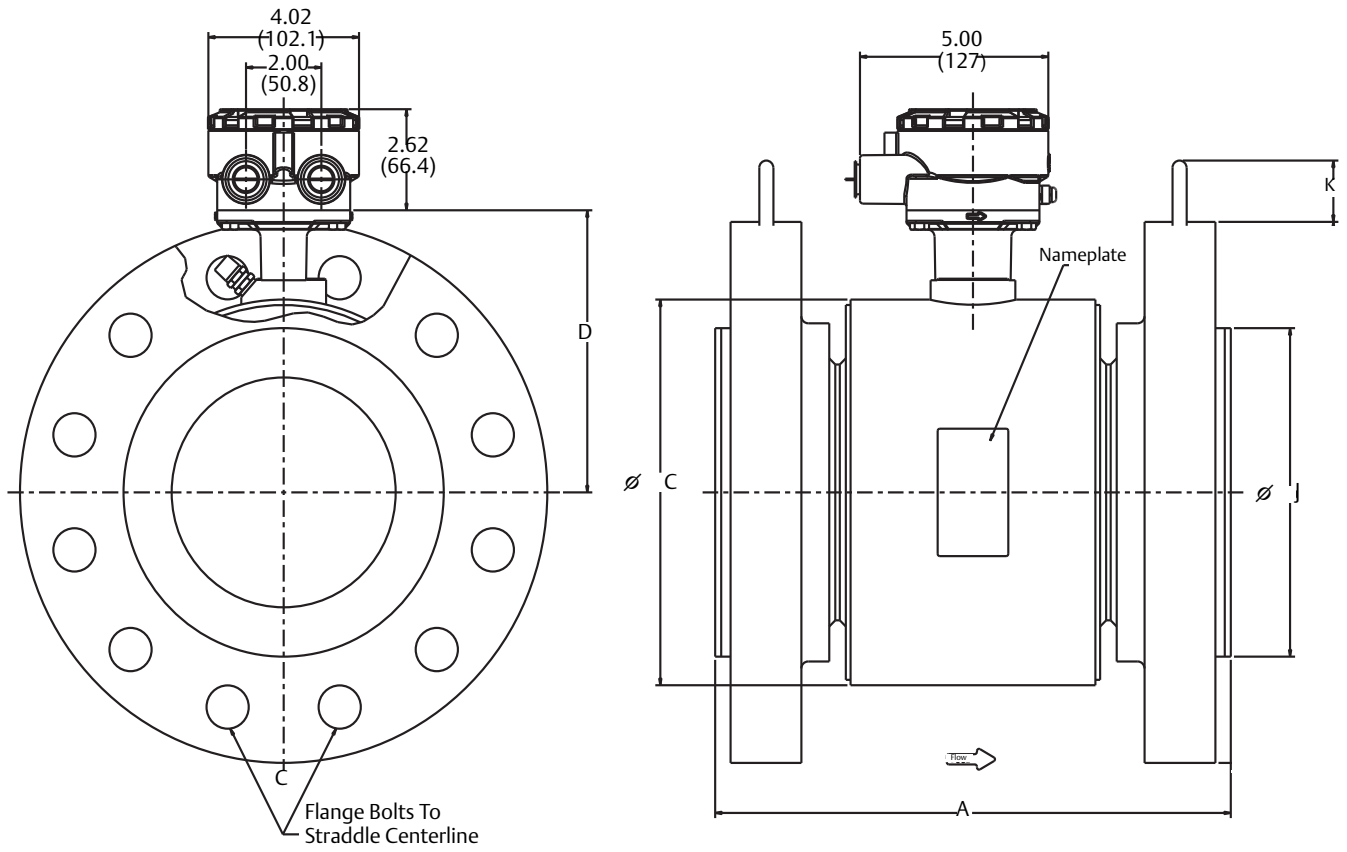


Table 37. 1/2-in. to 24-in. with slip-on flanges (inches) high pressure (Class 600 - 900)

Size, description	Overall length					Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on Face DIM "J"	Lift ring height DIM "K"	Tube weight (lbs)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly					
1/2 (15) ASME - 600# DERAT. SO / RF	8.38	8.38	8.38	8.48	8.38	4.50	4.41	1.38		10
1 (25) ASME - 600# DERAT. SO / RF	8.67	8.67	8.67	8.76	8.67	4.50	4.41	2.00		15
1 (25) ASME - 600# FULL, SO / RF			8.53	8.53	8.53	4.50	4.41	1.63		15
1 (25) ASME - 900# SO / RF			9.49	9.49	9.49	4.50	4.41	1.63	1.70	24
1 1/2 (40) ASME - 600# DERAT. SO / RF	8.63	8.63	8.62	8.72	8.63	5.21	4.82	2.88		23
1 1/2 (40) ASME - 600# FULL, SO / RF			8.49	8.49	8.49	5.21	4.82	2.50		23
1 1/2 (40) ASME - 900# SO / RF			9.49	9.49	9.49	5.21	4.82	2.50	1.70	34
2 (50) ASME - 600# DERAT. SO / RF	8.78	8.78	8.74	8.84	8.78	5.21	4.82	3.62		28
2 (50) ASME - 600# FULL, SO / RF			8.61	8.61	8.61	5.21	4.82	3.25		27
2 (50) ASME - 900# SO / RF			10.23	10.23	10.23	5.21	4.82	3.25	1.70	57
2 1/2 (65) ASME - 600 DERAT., SO / RF	8.86		8.80			6.31	5.37	4.12		40
2 1/2 (65) ASME - 600 FULL, SO / RF			8.61			6.31	5.37	3.75		41
2 1/2 (65) ASME - 900, SO / RF			10.23			6.31	5.37	3.75	1.70	82
3 (80) ASME - 600# DERAT. SO / RF	12.40	12.40	12.30	12.40	12.40	7.21	5.82	5.00	1.70	53
3 (80) ASME - 600# FULL, SO / RF			12.17	12.17	12.17	7.21	5.82	4.63	1.70	53
3 (80) ASME - 900# SO / RF			12.79	12.79	12.79	7.21	5.82	4.63	1.70	74
4 (100) ASME - 600# DERAT. SO / RF	12.83	12.83	12.73	12.83	12.83	7.91	6.17	6.19	1.70	94
4 (100) ASME - 600# FULL, SO / RF			12.60	12.60	12.65	7.91	6.17	5.81	1.70	93
4 (100) ASME - 900# SO / RF			13.86	13.86	13.89	7.91	6.17	5.81	2.00	123
5 (125) ASME - 600# DERAT. SO / RF	12.89		12.81			9.61	7.02	7.31	1.70	157
5 (125) ASME - 600# FULL, SO / RF			12.60			9.61	7.02	6.91	1.70	156
5 (125) ASME - 900# SO / RF			13.86			9.61	7.02	6.91	1.70	201
6 (150) ASME - 600# DERAT., / RF	14.23	14.23	14.09	14.19	14.21	9.98	7.30	8.50	1.70	178
6 (150) ASME - 600# FULL, SO / RF			13.96	13.96	13.96	9.98	7.30	8.00	1.70	189
6 (150) ASME - 900# SO / RF			17.55	17.55	17.55	9.98	7.30	8.00	2.00	254
8 (200) ASME - 600# DERAT. SO / RF	16.72	16.70	16.57	16.57	16.69	11.92	8.27	10.62	1.70	272
8 (200) ASME - 600# FULL, SO / RF			16.44	16.44	16.44	11.92	8.27	10.00	1.70	292
8 (200) ASME - 900# SO / RF			20.58	20.58	20.58	11.92	8.27	10.00	3.13	444
10 (250) ASME - 600# DERAT. SO / RF	19.54	19.40	19.18	19.28	19.30	14.64	9.69	12.75	2.00	462
10 (250) ASME - 600# FULL, SO / RF			19.05	19.05	19.05	14.64	9.69	12.00	2.00	476
10 (250) ASME - 900# SO / RF			21.54	21.54	21.54	14.64	9.69	12.00	3.13	650
12 (300) ASME - 600# DERAT., SO / RF	22.08	22.10	21.88	21.98	21.77	16.80	10.77	15.00	2.00	623
12 (300) ASME - 900# FULL, SO / RF			21.75	21.75	21.75	16.80	10.77	14.00	2.00	620
12 (300) ASME - 900# SO / RF			25.15	25.15	25.15	16.80	10.77	14.00	2.00	907
14 (350) ASME - 600# DERAT., SO / RF	25.74					18.92	11.83	16.25	2.00	773
14 (350) ASME - 600# FULL, SO / RF			25.41	25.41	25.41	18.92	11.83	15.25	2.00	771
16 (400) ASME - 600# DERAT., SO / RF	29.24					20.94	12.84	18.50	3.13	1102
16 (400) ASME - 600# FULL, SO / RF			28.91	28.91	28.91	20.94	12.84	17.50	3.13	1100
18 (450) ASME - 600# DERAT., SO / RF	32.72					23.46	14.10	21.00	3.13	1407
18 (450) ASME - 600# FULL, SO / RF			32.39	32.39	32.39	23.46	14.10	20.00	3.13	1405
20 (500) ASME - 600# DERAT., SO / RF	36.85					25.48	15.11	23.00	3.13	1824
20 (500) ASME - 600# FULL, SO / RF			36.52	36.52	36.52	25.48	15.11	22.00	3.13	1822
24 (600) ASME - 600# DERAT., SO / RF	41.35					30.03	17.39	27.25	3.13	2690
24 (600) ASME - 600# FULL, SO / RF			41.02	41.02	41.02	30.03	17.39	26.00	3.13	2692

Table 38. DN 15 mm to 600 mm with slip-on flanges (mm) high pressure (Class 600 - 900)

Size, description	Overall length					Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Sensor weight (Kg)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly					
1/2 (15) ASME - 600# DERAT. SO / RF	213	213	213	215	213	114	112	35		5
1 (25) ASME - 600# DERAT. SO / RF	220	220	220	223	220	114	112	51		7
1 (25) ASME - 600# FULL, SO / RF			217	217	217	114	112	41		7
1 (25) ASME - 900# SO / RF			241	241	241	114	112	41		11
1 1/2 (40) ASME - 600# DERAT. SO / RF	219	219	219	221	219	132	122	73		11
1 1/2 (40) ASME - 600# FULL, SO / RF			216	216	216	132	122	64		11
1 1/2 (40) ASME - 900# SO / RF			241	241	241	132	122	64	43	16
2 (50) ASME - 600# DERAT. SO / RF	223	223	222	224	223	132	122	92		13
2 (50) ASME - 600# FULL, SO / RF			219	219	219	132	122	83		12
2 (50) ASME - 900# SO / RF			260	260	260	132	122	83	43	26
2 1/2 (65) ASME - 600# DERAT. SO / RF	225		224			160	136	105		18
2 1/2 (65) ASME - 600# FULL, SO / RF			219			160	136	95		19
2 1/2 (65) ASME - 900# SO / RF			260			160	136	95	43	37
3 (80) ASME - 600# DERAT. SO / RF	315	315	312	315	315	183	148	127	43	24
3 (80) ASME - 600# FULL, SO / RF			309	309	309	183	148	118	43	24
3 (80) ASME - 900# SO / RF			325	325	325	183	148	118	43	34
4 (100) ASME - 600# DERAT. SO / RF	326	326	323	326	326	201	157	157	43	24
4 (100) ASME - 600# FULL, SO / RF			320	320	320	201	157	148	43	24
4 (100) ASME - 900# SO / RF			352	352	352	201	157	148	43	24
5 (125) ASME - 600# DERAT. SO / RF	327		325			244	178	186	43	71
5 (125) ASME - 600# FULL, SO / RF			320			244	178	176	43	71
5 (125) ASME - 900# SO / RF			352			244	178	176	43	71
6 (150) ASME - 600# DERAT. SO / RF	361	361	358	360	361	253	185	216	43	81
6 (150) ASME - 600# FULL, SO / RF			354	354	354	253	185	203	43	86
6 (150) ASME - 900# SO / RF			446	446	446	253	185	203	51	115
8 (200) ASME - 600# DERAT. SO / RF	425	424	421	423	424	303	210	270	43	123
8 (200) ASME - 600# FULL, SO / RF			417	417	424	303	210	254	43	132
8 (200) ASME - 900# SO / RF			523	523	529	303	210	254	80	202
10 (250) ASME - 600# DERAT. SO / RF	496	493	487	490	490	372	246	324	51	210
10 (250) ASME - 600# FULL, SO / RF			484	484	484	372	246	305	51	216
10 (250) ASME - 900# SO / RF			547	547	547	372	246	305	80	295
12 (300) ASME - 600# DERAT., SO / RF	561	561	556	558	553	427	274	381	51	283
12 (300) ASME - 600# FULL, SO / RF			552	552	552	427	274	356	51	281
12 (300) ASME - 900# SO / RF			639	639	639	427	274	356	80	412
14 (350) ASME - 600# DERAT. SO / RF	654					481	300	413	51	351
14 (350) ASME - 600# FULL, SO / RF			645	645	645	481	300	387	51	350
16 (400) ASME - 600# DERAT., SO / RF	743					532	326	470	80	500
16 (400) ASME - 600# FULL, SO / RF			734	734	734	532	326	445	80	499
18 (450) ASME - 600# DERAT., SO / RF	831					596	358	533	80	827
18 (450) ASME - 600# FULL, SO / RF			823	823	823	596	384	508	80	826
20 (500) ASME - 600# DERAT., SO / RF	936					647	384	584	80	1220
20 (500) ASME - 600# FULL, SO / RF			928	928	928	647	384	559	80	1221
24 (600) ASME - 600# DERAT., SO / RF	1050					763	442	692	80	1220
24 (600) ASME - 600# FULL, SO / RF			1042	1042	1042	763	442	660	80	1221

Figure 15. 1-in. to 24-in. weld neck flanges - high pressure meters (Class 600 - 2500)

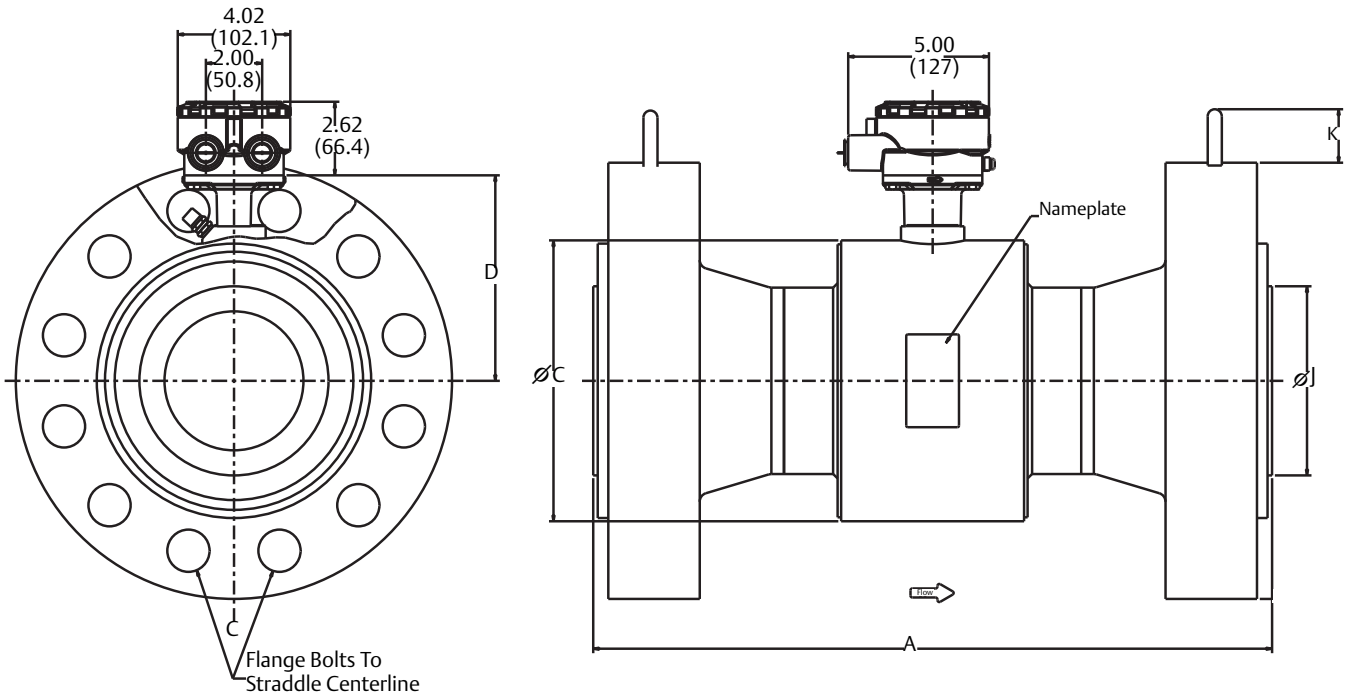


Table 39. 1-in. to 4-in. weld neck flanges inches (mm)

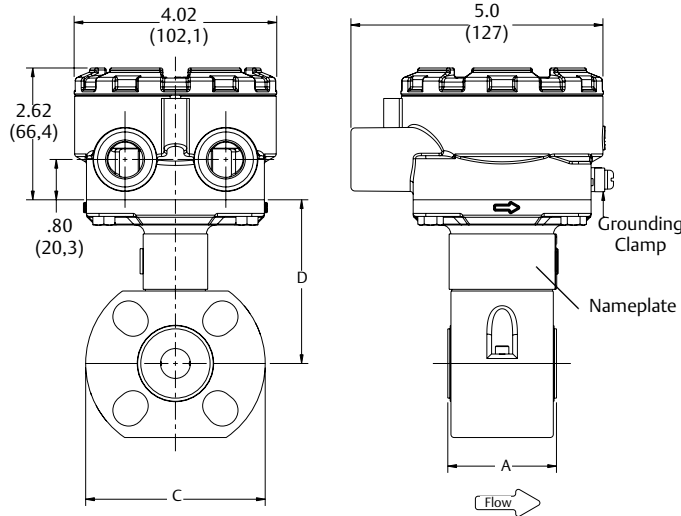
Size, description	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly	Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Sensor weight in lbs. (kg)
1 (25) ASME - 1500# WN / RF	12.87 (327)	12.87 (327)	12.87 (327)	4.5 (114)	4.41 (112)	1.63 (41)	1.70 (43)	25 (11.5)
1 1/2 (40) ASME - 600# WN / RF	11.56 (294)	11.56 (294)	11.56 (294)	5.21 (132)	4.82 (122)	2.50 (64)		26 (12.0)
1 1/2 (40) ASME - 1500# WN / RF	13.09 (332)	13.09 (332)	13.09 (332)	5.21 (132)	4.82 (122)	2.50 (64)	1.70 (43)	39 (17.5)
1 1/2 (40) ASME - 2500# WN / RF	15.51 (394)	15.51 (394)	15.51 (394)	5.21 (132)	4.82 (122)	2.38 (60)	1.70 (43)	66 (30.1)
1 1/2 (40) ASME - 1500# WN / RTJ	13.12 (333)	13.12 (333)	13.12 (333)	5.21 (132)	4.82 (122)	1.92 (49)	1.70 (43)	39 (17.6)
1 1/2 (40) ASME - 2500# WN / RTJ	15.66 (398)	15.66 (398)	15.66 (398)	5.21 (132)	4.82 (122)	1.84 (47)	1.70 (43)	68 (30.8)
2 (50) ASME - 600# FULL, WN / RTJ	11.99 (301)	11.99 (301)	11.99 (301)	5.21 (132)	4.82 (122)	3.25 (124)		32 (14.4)
2 (50) ASME - 1500# WN / RF	14.82 (376)	14.82 (376)	14.82 (376)	5.21 (132)	4.82 (122)	3.25 (83)	1.70 (43)	69 (31.4)
2 (50) ASME - 2500# WN / RF	16.86 (428)	16.86 (428)	16.86 (428)	5.21 (132)	4.82 (122)	3.12 (79)	1.70 (43)	69 (43.4)
2 (50) ASME - 1500# WN / RTJ	14.92 (379)	14.92 (379)	14.92 (379)	5.21 (132)	4.82 (122)	2.34 (60)	1.70 (43)	70 (31.9)
2 (50) ASME - 2500# WN / RTJ	17.01 (432)	17.01 (432)	17.01 (432)	5.21 (132)	4.82 (122)	2.59 (66)	1.70 (43)	98 (44.3)
3 (80) ASME - 600# FULL, WN / RF	12.78 (325)	12.78 (325)	12.78 (325)	7.21 (183)	5.82 (148)	4.63 (168)	1.70 (43)	59 (26.8)
3 (80) ASME - 1500# WN / RF	16.27 (413)	16.27 (413)	16.27 (413)	7.21 (183)	5.82 (148)	4.33 (105)	1.70 (43)	125 (56.5)
3 (80) ASME - 2500# WN / RF	20.42 (519)	20.42 (519)	20.42 (519)	7.21 (183)	5.82 (148)	4.15 (105)	1.70 (43)	211 (95.6)
3 (80) ASME - 1500# WN / RTJ	16.42 (417)	16.42 (417)	16.42 (417)	7.21 (183)	5.82 (148)	3.97 (101)	1.70 (43)	127 (57.8)
3 (80) ASME - 2500# WN / RTJ	20.70 (526)	20.70 (526)	20.70 (526)	7.21 (183)	5.82 (148)	3.41 (87)	1.70 (43)	214 (97.2)
4 (100) ASME - 600# FULL, WN / RF	15.57(396)	15.57(396)	15.57(396)	7.91 (201)	6.17 (157)	5.81 (148)	1.70 (43)	108 (49.1)
4 (100) ASME - 1500# WN / RF	18.18 (462)	18.18 (462)	18.18 (462)	7.91 (201)	6.17 (157)	5.71 (145)	2.00 (51)	188 (85.2)
4 (100) ASME - 2500# WN / RF	23.71 (602)	23.71 (602)	23.71 (602)	7.91 (201)	6.17 (157)	5.54 (141)	2.00 (51)	331 (150.2)
4 (100) ASME - 1500# WN / RTJ	18.33 (466)	18.33 (466)	18.33 (466)	7.91 (201)	6.17 (157)	5.54 (141)	2.00 (51)	191 (86.7)
4 (100) ASME - 2500# WN / RTJ	24.12 (613)	24.12 (613)	24.12 (613)	7.91 (201)	6.17 (157)	4.38 (111)	2.00 (51)	337 (153.1)

Table 40. 6-in. to 24-in. weld neck flanges inches (mm)

Size, description	DIM "A" Neoprene	DIM "A" Linatex	DIM "A" Poly	Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Lift ring height DIM "K"	Sensor weight in lbs. (kg)
6 (150) AMSE - 600# FULL, WN / RF	18.73 (476)	18.73 (476)	18.73 (476)	9.98 (253)	7.30 (185)	8.00 (203)	1.70 (43)	230 (104.2)
6 (150) AMSE - 900#, WN / RF	20.58 (523)	20.58 (523)	20.58 (523)	9.98 (253)	7.30 (185)	8.00 (203)	2.00 (51)	296 (134.5)
6 (150) AMSE -1500#, WN / RF	23.84 (605)	23.84 (605)	23.84 (605)	9.98 (253)	7.30 (185)	7.70 (196)	2.00 (51)	428 (194.3)
6 (150) AMSE -2500#, WN / RF	31.79 (807)	31.57 (600)	31.57 (600)	9.98 (253)	7.30 (185)	7.30 (185)	2.00 (51)	847 (384.4)
6 (150) AMSE -1500#, WN / RTJ	24.12 (613)	24.12 (613)	24.12 (613)	9.98 (253)	7.30 (185)	6.73 (171)	2.00 (51)	433 (196.5)
6 (150) AMSE -2500#, WN / RTJ	32.32 (821)	32.32 (821)	32.32 (821)	9.98 (253)	7.30 (185)	666 (169)	2.00 (51)	863 (391.6)
8 (200) AMSE - 600# FULL, WN / RF	21.59 (548)	21.59 (548)	21.59 (548)	11.92 (303)	8.27 (210)	10.00 (254)	170 (43)	355 (160.8)
8 (200) AMSE - 900#, WN / RF	24.09 (612)	24.09 (612)	24.09 (612)	11.92 (303)	8.27 (210)	10.00 (254)	3.13 (80)	521 (263.3)
8 (200) AMSE -1500#, WN / RF	28.70 (729)	28.70 (729)	28.70 (729)	11.92 (303)	8.27 (210)	9.76 (248)	3.13 (80)	721 (342.4)
8 (200) AMSE -2500#, WN / RF	36.88 (937)	36.88 (937)	36.88 (937)	11.92 (303)	8.27 (210)	9.20 (234)	3.13 (80)	1352 (613.1)
8 (200) AMSE - 900#, WN / RTJ	24.25 (616)	24.25 (616)	24.25 (616)	11.92 (303)	8.27 (210)	9.13 (232)	3.13 (80)	525 (238.3)
8 (200) AMSE -1500#, WN / RTJ	29.11 (739)	29.11 (739)	29.11 (739)	11.92 (303)	8.27 (210)	8.66(220)	3.13 (80)	767 (347.8)
8 (200) AMSE -2500#, WN / RTJ	37.53 (953)	37.53 (953)	37.53 (953)	11.92 (303)	8.27 (210)	8.28(210)	3.13 (80)	1377 (624.8)
10 (250) AMSE - 600# FULL, WN / RF	23.34 (593)	23.34 (593)	23.34 (593)	14.64 (372)	9.69 (246)	12.00 (305)	2.00 (51)	580 (262.9)
10 (250) AMSE - 900#, WN / RF	26.12 (663)	26.12 (663)	26.12 (663)	14.64 (372)	9.69 (246)	12.00 (305)	3.13 (80)	797 (361.7)
10 (250) AMSE -1500#, WN / RF	32.03 (813)	32.03 (813)	32.03 (813)	14.64 (372)	9.69 (246)	11.50 (292)	3.13 (80)	1317 (597.3)
10 (250) AMSE -2500#, WN / RF	44.95 (1142)	44.95 (1142)	44.95 (1142)	14.64 (372)	9.69 (246)	10.65 (271)	3.13 (80)	2597 (1152.8)
10 (250) AMSE -1500#, WN / RTJ	32.44 (824)	32.44 (824)	32.44 (824)	14.64 (372)	9.69 (246)	10.78 (274)	3.13 (80)	1333 (604.6)
10 (250) AMSE -2500#, WN / RTJ	45.86 (1165)	45.86 (1165)	45.86 (1165)	14.64 (372)	9.69 (246)	9.94 (252)	3.13 (80)	2597 (1178.0)
12 (300) AMSE - 600# FULL, WN / RF	26.59 (675)	26.59 (675)	26.59 (675)	16.50 (419)	10.77 (274)	14.00 (356)	2.00 (51)	759 (344.2)
12 (300) AMSE - 900#, WN / RF	30.33 (770)	30.33 (770)	30.33 (770)	16.50 (419)	10.77 (274)	14.00 (356)	3.13 (80)	1112 (504.5)
12 (300) AMSE -1500#, WN / RF	37.11 (942)	37.11 (942)	37.11 (942)	16.50 (419)	10.77 (274)	13.18 (335)	3.13 (80)	2032 (921.5)
12 (300) AMSE -2500#, WN / RF	51.50 (1308)	51.50 (1308)	51.50 (1308)	16.50 (419)	10.77 (274)	12.20 (310)	3.13 (80)	3860 (1750.8)
12 (300) AMSE -1500#, WN / RTJ	37.76 (959)	37.76 (959)	37.76 (959)	16.50 (419)	10.77 (274)	12.28 (312)	3.13 (80)	2065 (936.6)
12 (300) AMSE -2500#, WN / RTJ	52.41 (1331)	52.41 (1331)	52.41 (1331)	16.50 (419)	10.77 (274)	12.06 (306)	3.13 (80)	3938 (1786.2)
14 (350) AMSE - 600# FULL, WN / RF	29.95 (761)	29.95 (761)	29.95 (761)	18.92 (481)	11.83 (300)	15.25 (387)	2.00 (51)	940 (426.3)
14 (350) AMSE -1500#, WN / RF	40.82 (1037)	40.82 (1037)	40.82 (1037)	18.92 (481)	11.83 (300)	14.06 (357)	3.13 (80)	2662 (1207.4)
16 (400) AMSE - 600# FULL, WN / RF	33.23 (844)	33.23 (844)	33.23 (844)	20.94 (532)	12.84 (326)	17.50 (445)	3.13 (80)	1322 (599.6)
16 (400) AMSE -1500#, WN / RF	43.96 (1116)	43.96 (1116)	43.96 (1116)	20.94 (532)	12.84 (326)	18.50 (470)	3.13 (80)	3485 (1580.7)
18 (450) AMSE - 600# FULL, WN / RF	34.89 (886)	34.89 (886)	34.89 (886)	23.46 (596)	14.10 (358)	20.00 (508)	3.13 (80)	1642 (744.6)
18 (450) AMSE -1500#, WN / RF	46.23 (1174)	46.23 (1174)	46.23 (1174)	23.46 (596)	14.10 (358)	21.00 (533)	3.38 (86)	4416 (2003.0)
20 (500) AMSE - 600# FULL, WN / RF	37.93 (963)	37.93 (963)	37.93 (963)	25.48 (647)	15.11 (384)	22.00 (599)	3.13 (80)	2091 (948.5)
20 (500) AMSE -1500#, WN / RF	50.81 (1290)	50.81 (1290)	50.81 (1290)	25.48 (647)	15.11 (384)	21.10 (536)	3.38 (86)	5478 (2484.9)
24 (600) AMSE - 600# FULL, WN / RF	41.99 (1067)	41.99 (1067)	41.99 (1067)	30.03 (763)	17.39 (442)	26.00 (660)	3.13 (80)	3053 (1384.6)
24 (600) AMSE -1500#, WN / RF	57.94 (1472)	57.94 (1472)	57.94 (1472)	30.03 (763)	17.39 (442)	25.50 (648)	3.38 (86)	8822 (4001.6)

Figure 16. Standard wafer magmeters

Standard Wafer Magmeter
0.15-in. to 1-in.



Standard Wafer Magmeter
1 1/2-in. to 8-in.

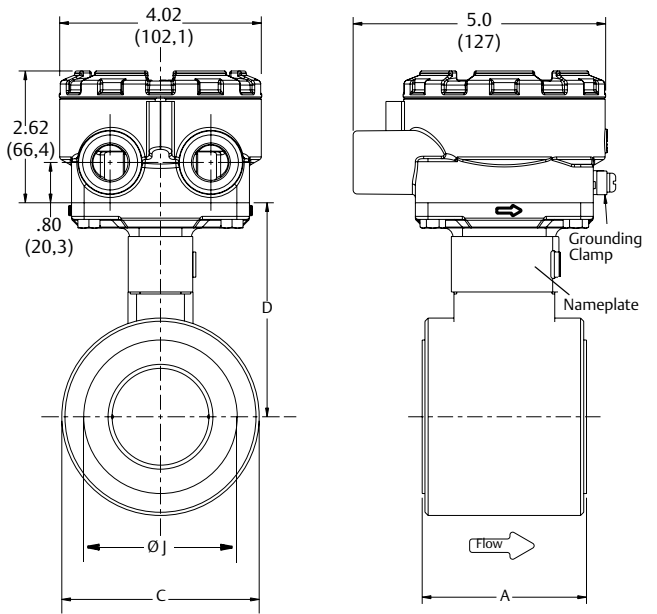


Table 41. 0.15-in. to 8-in. wafer (mm)

Size, description	Overall length			Body Ø DIM "C"	CL to UMB DIM "D"	Liner Ø on face DIM "J"	Sensor weight in lbs. (kg)
	DIM "A" PTFE	DIM "A" ETFE	DIM "A" PFA				
0.15 (4) WAFER UP TO ASME - 150# / EN 1092-1 PN16			2.17 (55)	3.56 (90)	3.25 (83)	1.37 (35)	4 (1.8)
0.30 (8) WAFER UP TO ASME - 150# / EN 1092-1 PN16			2.17 (55)	3.56 (90)	3.25 (83)	1.37 (35)	4 (1.8)
1/2 (15) WAFER UP TO ASME - 300# / EN 1092-1 PN40	2.21 (56)	2.16 (55)		3.56 (90)	3.25 (83)	1.38 (35)	4 (1.8)
1 (25) WAFER UP TO ASME - 300# / EN 1092-1 PN40	2.26 (57)	2.13 (54)		4.50 (114)	3.56 (90)	1.94 (49)	5 (2.3)
1 1/2 (40) WAFER UP TO ASME - 300# / EN 1092-1 PN40	2.88 (73)	2.73 (69)		3.29 (84)	4.00 (102)	2.42 (61)	5 (2.3)
2 (20) WAFER UP TO ASME - 300# / EN 1092-1 PN40	3.32 (84)	3.26 (83)		3.92 (99)	4.23 (107)	3.05 (77)	7 (3.2)
3 (80) WAFER UP TO ASME - 300# / EN 1092-1 PN40	4.82 (122)	4.62 (117)		5.17 (131)	4.87 (124)	4.41 (112)	13 (5.9)
4 (100) WAFER UP TO ASME - 300# / EN 1092-1 PN40	6.03 (153)	5.83 (148)		6.39 (162)	5.50 (140)	5.80 (147)	22 (10.0)
6 (150) WAFER UP TO ASME - 300# / EN 1092-1 PN40	7.08 (180)	6.87 (174)		8.57 (218)	6.22 (158)	7.86 (200)	35 (15.9)
8 (200) WAFER UP TO ASME - 300# / EN 1092-1 PN40	9.06 (230)	8.86 (225)		10.63 (270)	7.25 (184)	9.86 (250)	60 (27.2)

Figure 17. Dimensional drawings of Rosemount 8721 sensors typical of 1-in. to 4-in. (25 mm to 100 mm) line sizes.

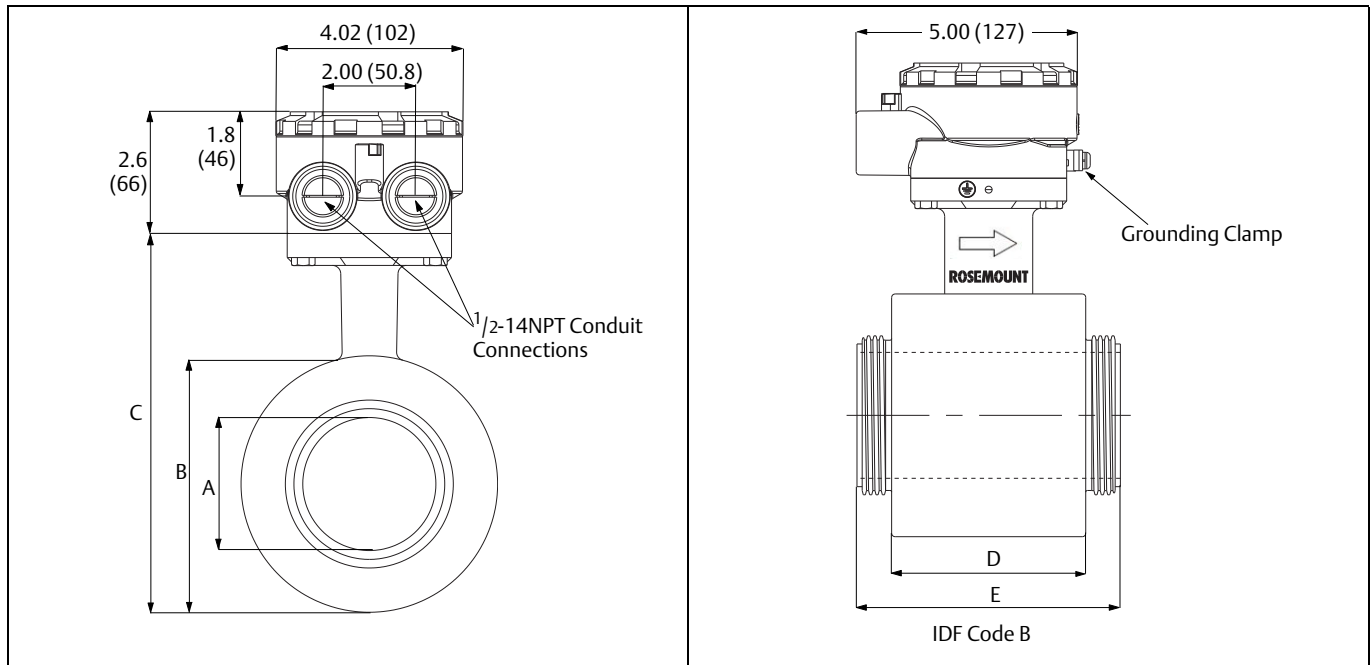


Table 42. Rosemount 8721 dimensions in inches (mm). Refer to Figure 17.

Line size	Sensor dimensions A	Body diameter B	Sensor height C	Body length D	IDF length E
1/2 (15)	0.62 (15.8)	2.87 (73.0)	5.51 (140.0)	2.13 (54.0)	3.66 (93.0)
1 (25)	0.87 (22.2)	2.87 (73.0)	5.51 (140.0)	2.13 (54.0)	3.66 (93.0)
1 1/2 (40)	1.37 (34.9)	3.50 (88.9)	6.14 (155.9)	2.40 (61.0)	3.96 (100.5)
2 (50)	1.87 (47.6)	4.00 (101.5)	6.63 (168.5)	2.83 (72.0)	4.41 (112.0)
2 1/2 (65)	2.38 (60.3)	4.53 (115.0)	7.17 (182.0)	3.58 (91.0)	5.23 (133.0)
3 (80)	2.87 (73.0)	5.57 (141.5)	8.21 (208.5)	4.41 (112.0)	5.98 (152.0)
4 (100)	3.84 (97.6)	6.98 (177.0)	9.61 (244.0)	5.20 (132.0)	6.77 (172.0)

Figure 18. Dimensional drawings of Rosemount 8721 sensors typical of 1-in. to 4-in. (25 mm to 100 mm) line sizes.

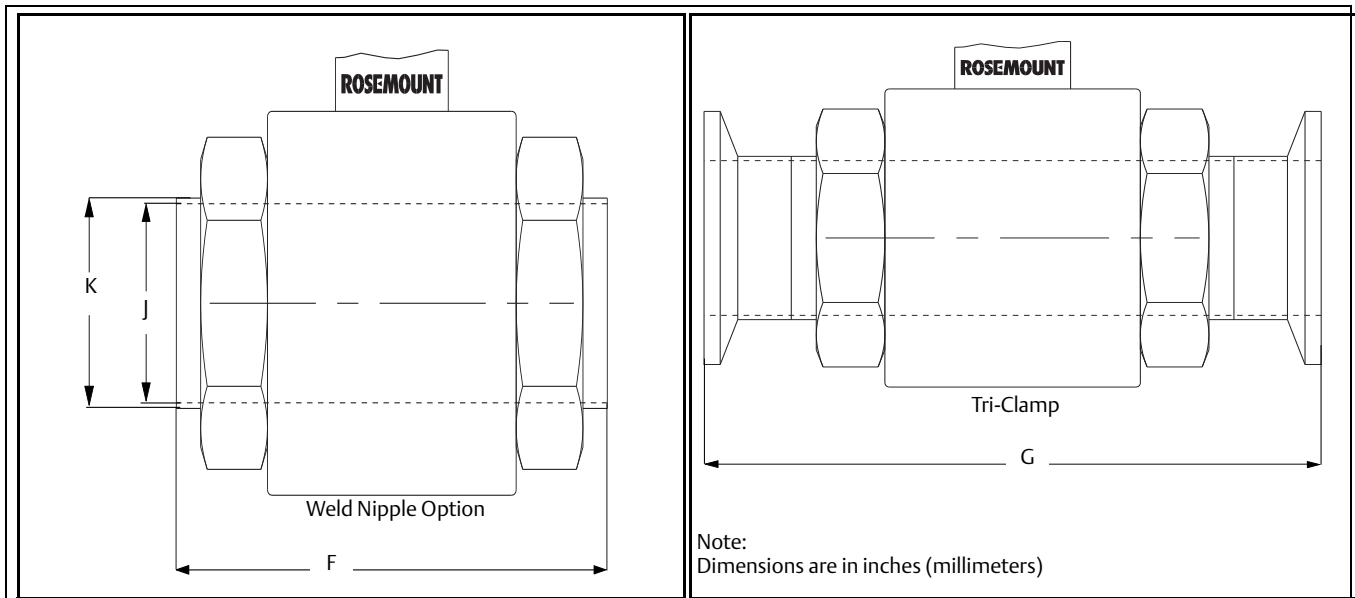


Table 43. Rosemount 8721 process connection lay length in inches (mm). Refer to Figure 18.

Line size	Weld nipple length F	Weld nipple sensor ID J	Weld nipple sensor OD K	Tri clamp length G	HP option length G	DIN 11851 (metric & imp) length G	DIN 11851 (imp) ID J	DIN 11851 (metric) ID J
1/2 (15)	5.61 (142)	0.62 (15.75)	0.75 (19.05)	8.31 (211)	NA	8.33 (211)	0.62 (15.75)	0.79 (19.99)
1 (25)	5.61 (142)	0.87 (22.2)	1.00 (25.65)	7.85 (199)	9.85 (250)	7.89 (200)	0.85 (21.52)	1.02 (26.01)
1 1/2 (40)	5.92 (150)	1.37 (34.9)	1.51 (38.3)	8.17 (207)	9.91 (252)	8.53 (217)	1.37 (34.85)	1.50 (38.00)
2 (50)	6.35 (161)	1.87 (47.6)	2.01 (51.05)	8.60 (218)	9.91 (252)	9.10 (231)	1.87 (47.60)	1.97 (50.01)
2 1/2 (65)	7.18 (182)	2.37 (60.3)	2.51 (63.75)	9.43 (239)	9.91 (252)	10.33 (262)	2.37 (60.30)	2.60 (65.99)
3 (80)	7.93 (201)	2.87 (73.0)	3.01 (76.45)	10.18 (258)	9.91 (252)	11.48 (291)	2.87 (72.97)	3.19 (81.03)
4 (100)	9.46 (240)	3.84 (97.6)	4.01 (101.85)	11.70 (297)	NA	13.72 (349)	3.84 (97.61)	3.94 (100.00)

Line size	DIN 11864-1 length G	DIN 11864-2 length g	SMS 1145 length G	Cherry-Burrell I-line length G
1/2 (15)	NA	NA	NA	NA
1 (25)	8.98 (228.0)	8.86 (225.0)	6.87 (174)	7.17 (182)
1 1/2 (40)	9.72 (247.0)	9.57 (243.0)	7.50 (190)	7.80 (198)
2 (50)	10.16 (258.0)	10.00 (254.0)	7.93 (201)	8.42 (214)
2 1/2 (65)	11.89 (302.0)	11.54 (293.0)	9.07 (230)	9.49 (241)
3 (80)	12.95 (329.0)	12.44 (316.0)	9.82 (249)	10.37 (263)
4 (100)	14.57 (370.0)	14.21 (361.0)	11.67 (296)	12.15 (309)

Figure 19.

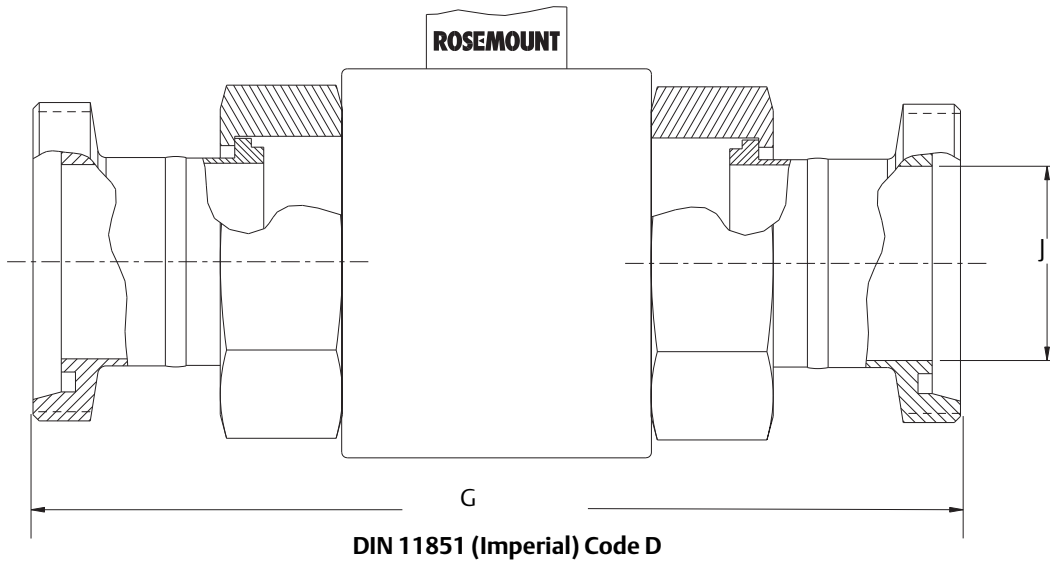


Figure 20.

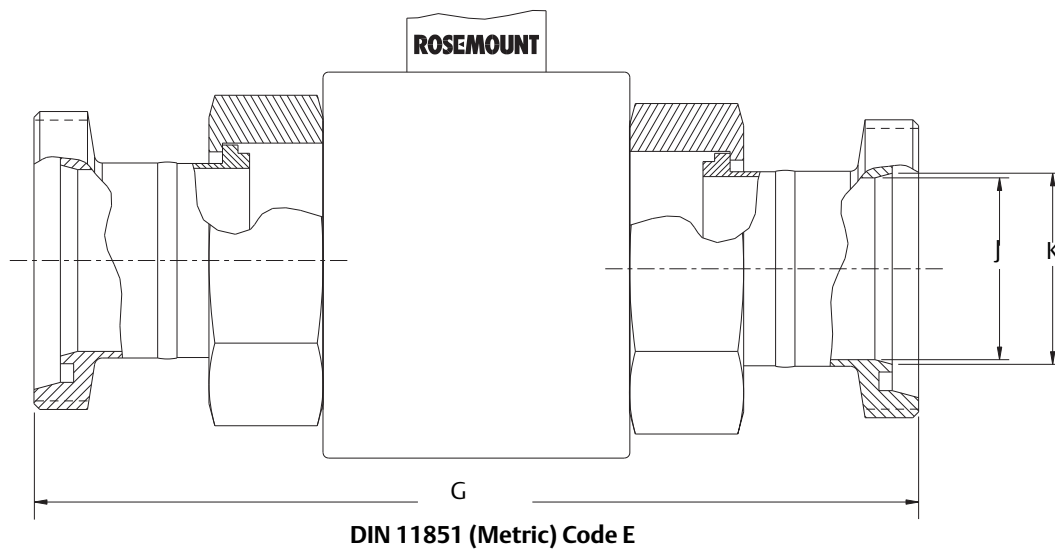


Figure 21.

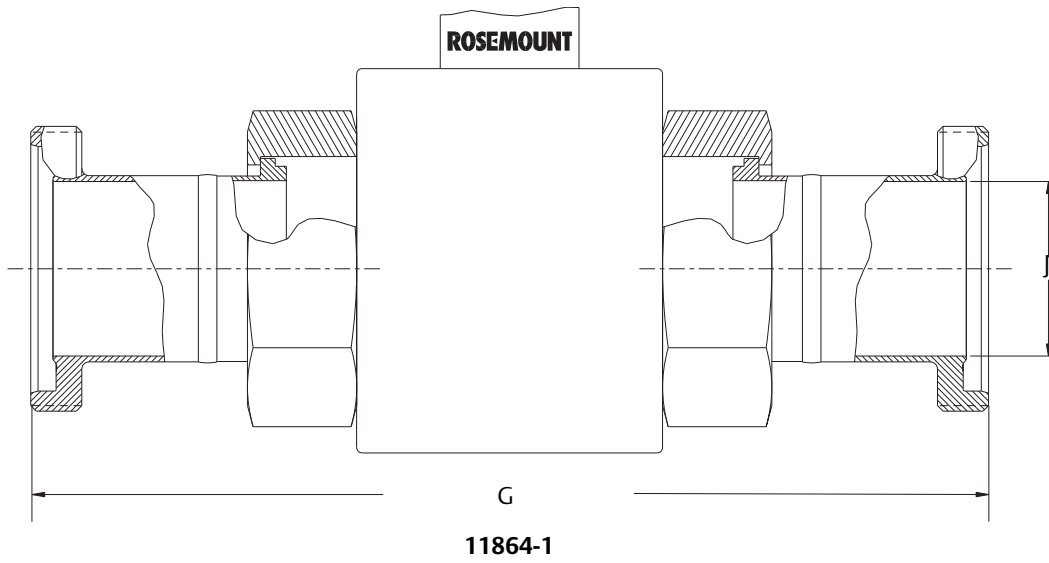


Figure 22.

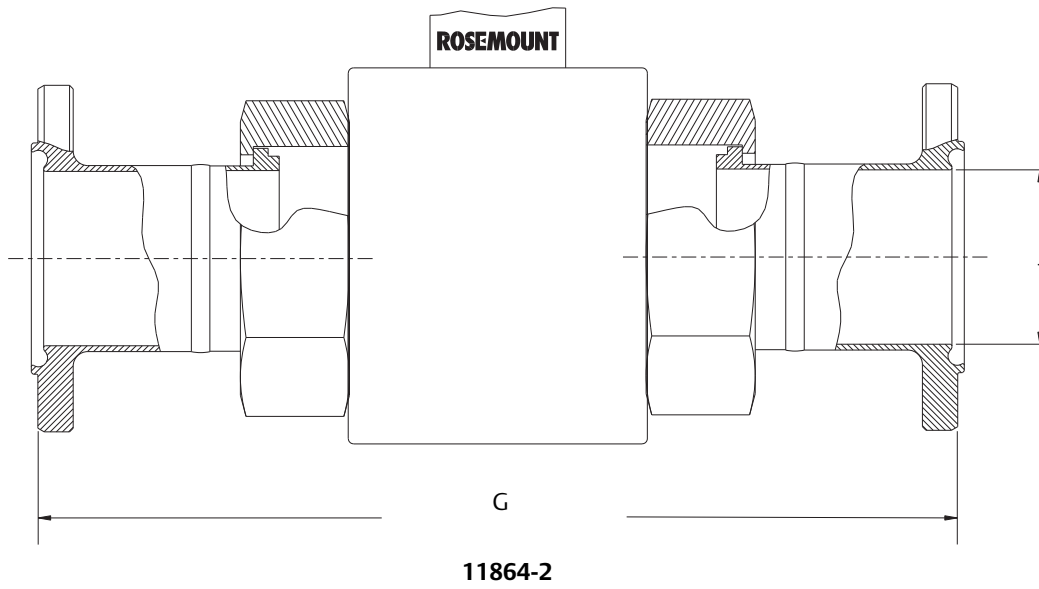
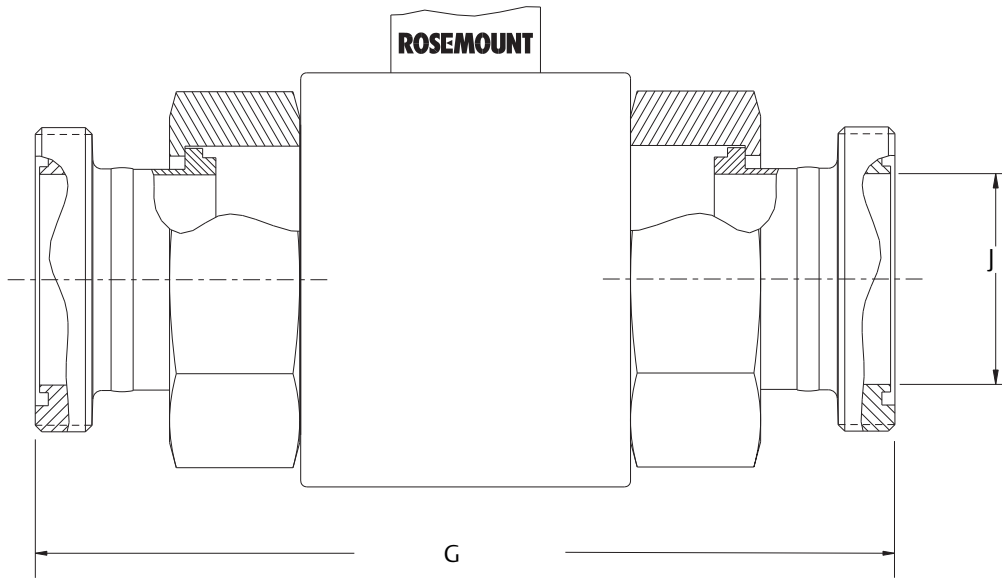
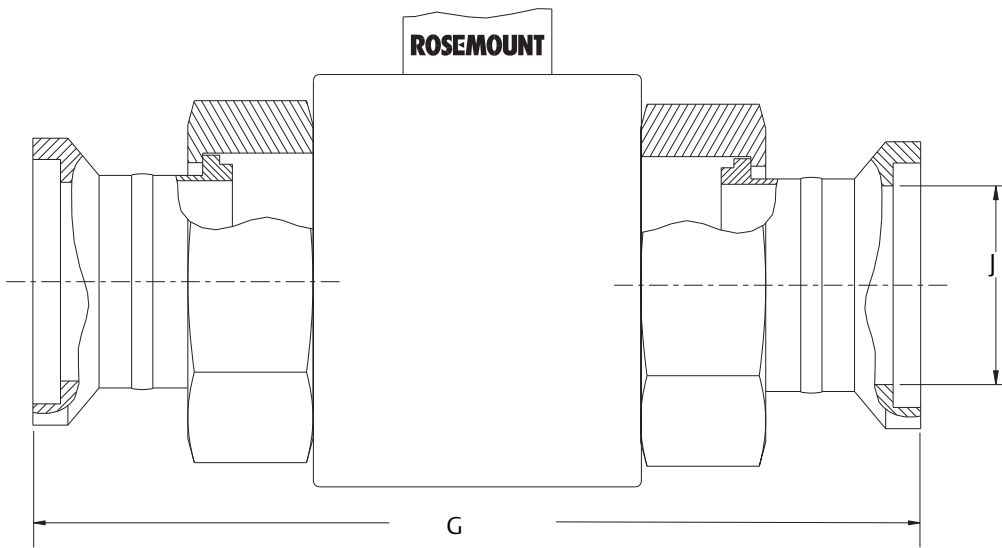


Figure 23.



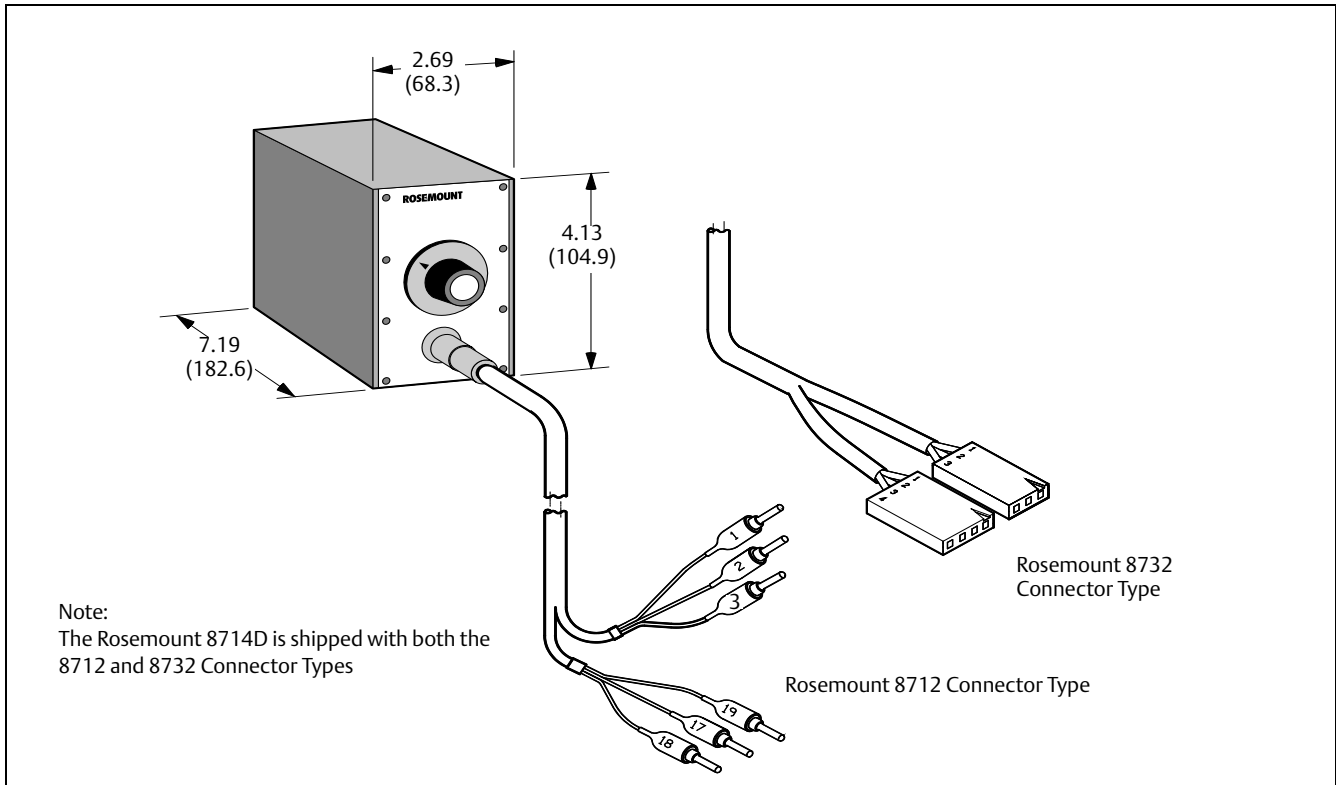
SMS1145 Code H

Figure 24.



Cherry Burrell I-Line Code J

Figure 25. Rosemount 8714D Magnetic Flowmeter Simulator - calibration standard



Emerson Process Management**Rosemount Inc.**

8200 Market Boulevard
Chanhassen, MN 55317 USA
www.rosemount.com
T (USA) +1 800 522 6277
T (International) +1 (303) 527 5200
F +1 (303) 530 8459

Emerson Process Management**Asia Pacific Pte Ltd**

1 Pandan Crescent
Singapore 128461
T +65 6777 8211
F +65 6777 0947
Email: Enquiries@AP.EmersonProcess.com

Emerson Process Management**Flow B.V.**

Neonstraat 1
6718 WX Ede
The Netherlands
T +31 (0) 318 495555
F +31 (0) 318 495556

Emerson Process Management Latin**America**

Multipark Office Center
Turrubares Building, 3rd & 4th floor
Guachipelin de Escazu, Costa Rica
T+(506) 2505-6962
international.mmcam@emersonprocess.com

Emerson FZE

P.O. Box 17033
Jebel Ali Free Zone
Dubai UAE
T +971 4 811 8100
F +971 4 886 5465
FlowCustomerCare.MEA@Emerson.com

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Switches & Pilot Lights

Sockets (for Blade Terminal Models)

Relays	Standard DIN Rail Mount ¹	Finger-safe DIN Rail Mount ¹	Through Panel Mount	PCB Mount
RH1B	SH1B-05	SH1B-05C	SH1B-51	SH1B-62
RH2B	SH2B-05	SH2B-05C	SH2B-51	SH2B-62
RH3B	SH3B-05	SH3B-05C	SH3B-51	SH3B-62
RH4B	SH4B-05	SH4B-05C	SH4B-51	SH4B-62



1. DIN Rail mount socket comes with two horseshoe clips. Do not use unless you plan to insert pullover wire spring. Replacement horseshoe clip part number is Y778-011.

Signaling Lights

Hold Down Springs & Clips

Appearance	Item	Relay	For DIN Mount Socket	For Through Panel & PCB Mount Socket
	Pullover Wire Spring	RH1B	SY2S-02F1 ²	SY4S-51F1
		RH2B	SY4S-02F1 ²	
		RH3B	SH3B-05F1 ²	
		RH4B	SH4B-02F1 ²	
	Leaf Spring (side latch)	RH1B, RH2B, RH3B, RH4B	SFA-202 ³	SFA-302 ³
	Leaf Spring (top latch)	RH1B, RH2B, RH3B, RH4B	SFA-101 ³	SFA-301 ³



2. Must use horseshoe clip when mounting in DIN mount socket. Replacement horseshoe clip part number is Y778-011.
3. Two required per relay.

Relays & Sockets

AC Coil Ratings

Voltage (V)	Rated Current (mA) ±15% at 20°C								Coil Resistance (Ω) ±10% at 20°C				Operation Characteristics (against rated values at 20°C)		
	AC 50Hz				AC 60Hz				SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT							
6	170	240	330	387	150	200	280	330	18.8	9.4	6.4	5.4			
12	86	121	165	196	75	100	140	165	76.8	39.3	25.3	21.2			
24	42	60.5	81	98	37	50	70	83	300	153	103	84.5			
110	9.6	—	18.1	21.6	8.4	—	15.5	18.2	6,950	—	2,200	1,800			
110-120	—	9.4-10.8	—	—	—	8.0-9.2	—	—	—	—	—	—			
120	8.6	—	16.4	19.5	7.5	—	14.2	16.5	8,100	—	10,800	7,360			
220	4.7	—	8.8	10.7	4.1	—	7.7	9.1	25,892	—	10,800	7,360			
220-240	—	4.7-5.4	—	—	—	4.0-4.6	—	—	—	18,820	—	—			
240	4.9	—	8.2	9.8	4.3	—	7.1	8.3	26,710	—	12,100	9,120			

Timers

Contactors

DC Coil Ratings

Voltage (V)	Rated Current (mA) ±15% at 20°C				Coil Resistance (Ω) ±10% at 20°C				Operation Characteristics (against rated values at 20°C)		
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
6	128	150	240	250	47	40	25	24	110%	80% maximum	10% minimum
12	64	75	120	125	188	160	100	96			
24	32	36.9	60	62	750	650	400	388			
48	18	18.5	30	31	2,660	2,600	1,600	1,550			
100-110	—	8.2-9.0	—	—	—	12,250	—	—			
110	8	—	12.8	15	13,800	—	8,600	7,340			



Standard coil voltages are in **BOLD**.

Terminal Blocks

Circuit Breakers

Contact Ratings

Model	Continuous Current	Maximum Contact Capacity				
		Allowable Contact Power		Rated Load		
		Resistive Load	Inductive Load	Voltage (V)	Res. Load	Ind. Load
SPDT	10A	1540VA 300W	990VA 210W	110 AC	10A	7A
				220 AC	7A	4.5A
				30 DC	10A	7A
DPDT 3PDT 4PDT	10A	1650VA 300W	1100VA 225W	110 AC	10A	7.5A
				220 AC	7.5A	5A
				30 DC	10A	7.5A

Note: Inductive load for the rated load — $\cos \phi = 0.3$, L/R = 7 ms

TÜV Ratings

Voltage	RH1	RH2	RH3	RH4
240V AC	10A	10A	7.5A	7.5A
30V DC	10A	10A	10A	10A

AC: $\cos \phi = 1.0$, DC: L/R = 0 ms

UL Ratings

Voltage	Resistive			General Use			Horsepower Rating		
	RH1 RH2	RH3	RH4	RH1 RH2	RH3	RH4	RH1 RH2	RH3	RH4
240V AC	10A	7.5A	7.5A	7A	6.5A	5A	1/3 HP	1/3 HP	—
120V AC	—	10A	10A	—	7.5A	7.5A	1/6 HP	1/6 HP	—
30V DC	10A	10A	—	7A	—	—	—	—	—
28V DC	—	—	10A	—	—	—	—	—	—




CSA Ratings

Voltage	Resistive				General Use				Horsepower Rating
	RH1	RH2	RH3	RH4	RH1	RH2	RH3	RH4	RH1, 2, 3
240V AC	10A	10A	—	7.5A	7A	7A	7A	5A	1/3 HP
120V AC	10A	10A	10A	10A	7.5A	7.5A	—	7.5A	1/6 HP
30V DC	10A	10A	10A	10A	7A	7.5A	—	—	—

Socket Specifications

	Sockets	Terminal	Electrical Rating	Wire Size	Torque	
DIN Rail Mount Sockets	SH1B-05	(Coil) M3 screws (contact) M3.5 screws with captive wire clamp	250V, 10A	Maximum up to 2-#12AWG	5.5 - 9 in•lbs 9 - 11.5 in•lbs	
	SH2B-05 SH3B-05 SH4B-05	M3.5 screws with captive wire clamp	300V, 10A	Maximum up to 2-#12AWG	9 - 11.5 in•lbs	
	Finger-safe DIN Rail Mount	SH1B-05C	(coil) M3 screws (contact) M3.5 screws with captive wire clamp, fingersafe	250V, 10A	Maximum up to 2-#12AWG	5.5 - 9 in•lbs 9 - 11.5 in•lbs
		SH2B-05C SH3B-05C SH4B-05C	M3.5 screws with captive wire clamp, fingersafe	300V, 10A	Maximum up to 2-#12AWG	9 - 11.5 in•lbs
Through Panel Mount Socket	SH1B-51 SH2B-51 SH3B-51 SH4B-51	Solder	300V, 10A	—	—	
PCB Mount Socket	SH1B-62	PCB mount	250V, 10A	—	—	
	SH2B-62 SH3B-62 SH4B-62	PCB mount	300V, 10A	—	—	

Accessories

Item	Appearance	Use with	Part No.	Remarks
Aluminum DIN Rail (1 meter length)		All DIN rail sockets	BNDN1000	The BNDN1000 is designed to accommodate DIN mount sockets. Made of durable extruded aluminum, the BNDN1000 measures 0.413 (10.5mm) in height and 1.37 (35mm) in width (DIN standard). Standard length is 39" (1,000mm).
DIN Rail End Stop		DIN rail	BNL5	9.1 mm wide.
Replacement Hold-Down Spring Anchor		DIN mount sockets and hold down springs.	Y778-011	For use on DIN rail mount socket when using pullover wire hold down spring. 2 pieces included with each socket.

Switches & Pilot Lights

Signaling Lights

Relays & Sockets

Timers

Contactors

Terminal Blocks

Circuit Breakers

Specifications

Contact Material	Silver cadmium oxide	
Contact Resistance ¹	50mΩ maximum	
Minimum Applicable Load	24V DC, 30 mA; 5V DC, 100 mA (reference value)	
Operating Time ²	SPDT DPDT	20ms maximum
	3PDT 4PDT	25ms maximum
Release Time ²	SPDT DPDT	20ms maximum
	3PDT 4PDT	25ms maximum
Power Consumption (approx.)	SPDT	AC: 1.1VA (50Hz), 1VA (60Hz) DC: 0.8W
	DPDT	AC: 1.4VA (50Hz), 1.2VA (60Hz) DC: 0.9W
	3PDT	AC: 2VA (50Hz), 1.7VA (60Hz) DC: 1.5W
	4PDT	AC: 2.5VA (50Hz), 2VA (60Hz) DC: 1.5W
Insulation Resistance	100MΩ minimum (500V DC megger)	
Dielectric Strength ³	SPDT	Between live and dead parts: 2,000V AC, 1 minute Between contact and coil: 2,000V AC, 1 minute Between contacts of the same pole: 1,000V AC, 1 minute
	DPDT 3PDT 4PDT	Between live and dead parts: 2,000V AC, 1 minute Between contact and coil: 2,000V AC, 1 minute Between contacts of different poles: 2,000V AC, 1 minute Between contacts of the same pole: 1,000V AC, 1 minute
Operating Frequency	Electrical:	1,800 operations/hour maximum
	Mechanical:	18,000 operations/hour maximum
Vibration Resistance	Damage limits:	10 to 55Hz, amplitude 0.5 mm
	Operating extremes:	10 to 55Hz, amplitude 0.5 mm
Shock Resistance	Damage limits:	1,000m/s ² (100G)
	Operating extremes:	200m/s ² (20G - SPDT, DPDT) 100m/s ² (10G - 3PDT, 4PDT)
Mechanical Life	50,000,000 operations minimum	
Electrical Life	DPDT	500,000 operations minimum (120V AC, 10A)
	SPDT 3PDT 4PDT	200,000 operations minimum (120V AC, 10A)
Operating Temperature ⁴	SPDT DPDT 3PDT 4PDT	-25 to +70°C (no freezing)
Operating Humidity	45 to 85% RH (no condensation)	
Weight (approx.)	SPDT: 24g, DPDT: 37g, 3PDT: 50g, 4PDT: 74g	



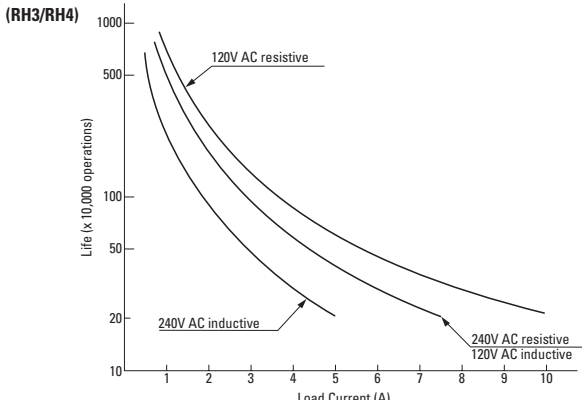
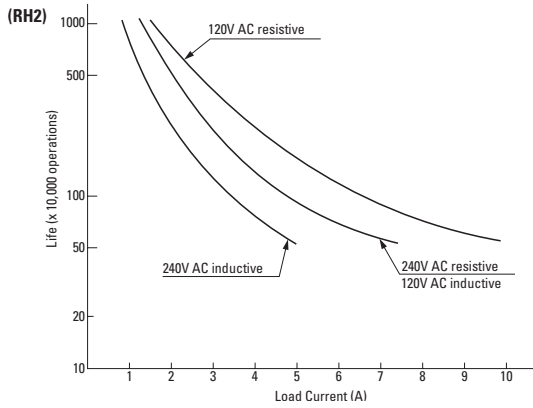
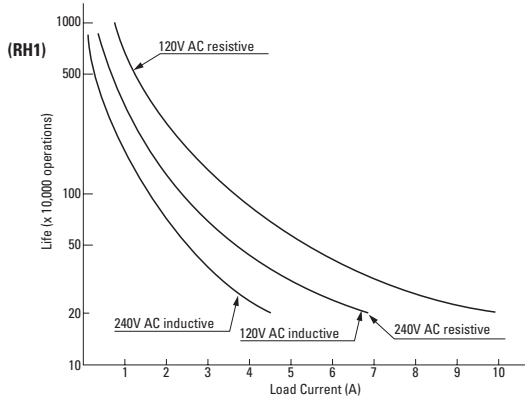
Note: Above values are initial values.

1. Measured using 5V DC, 1A voltage drop method
2. Measured at the rated voltage (at 20°C), excluding contact bouncing
Release time of relays with diode: 40 ms maximum
3. Relays with indicator or diode: 1000V AC, 1 minute
4. For use under different temperature conditions, refer to Continuous Load Current vs. Operating Temperature Curve. The operating temperature range of relays with indicator or diode is -25 to +40°C.

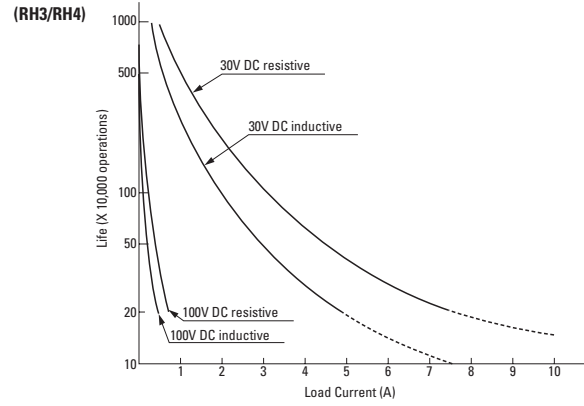
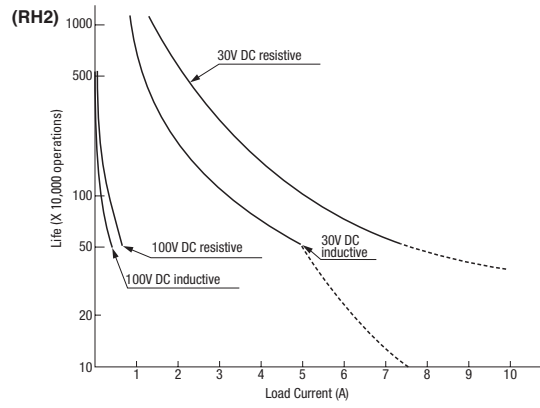
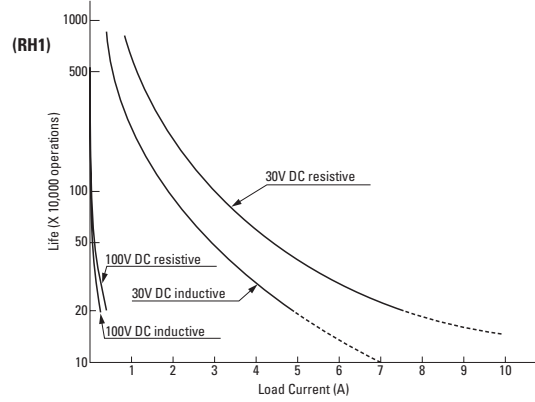
Characteristics (Reference Data)

Electrical Life Curves

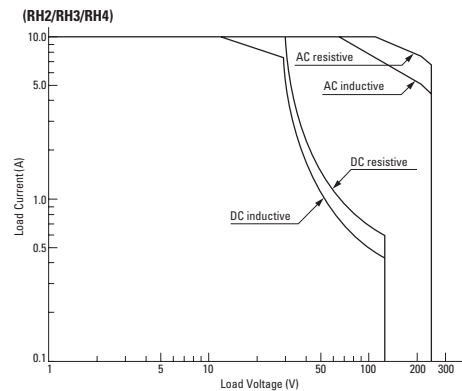
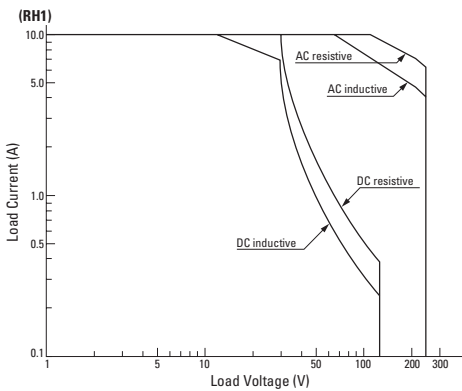
AC Load



DC Load



Maximum Switching Capacity



Switches & Pilot Lights

Signaling Lights

Relays & Sockets

Timers

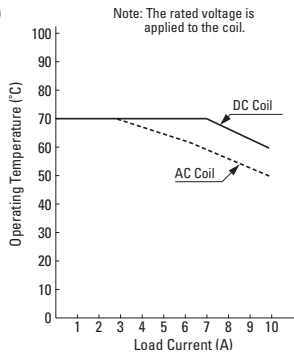
Contactors

Terminal Blocks

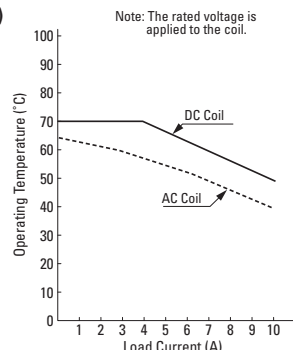
Circuit Breakers

Continuous Load Current vs. Operating Temperature Curve (Basic Type, With Check Button, and Top Bracket Mounting Type)

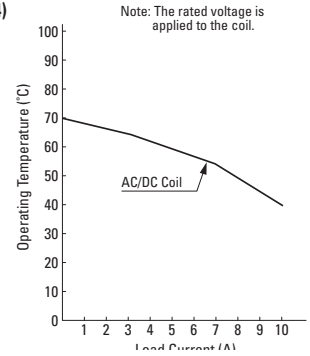
(RH1)



(RH2)

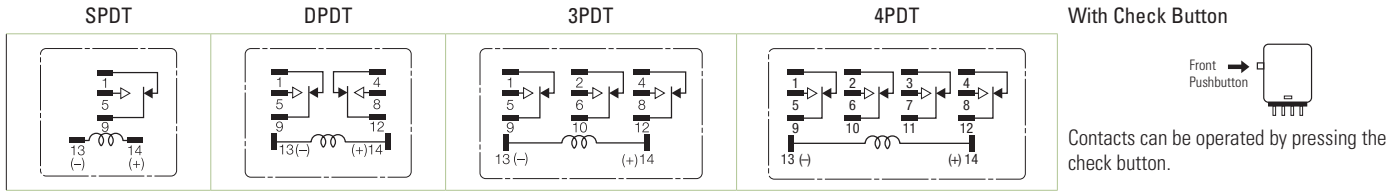


(RH3/RH4)

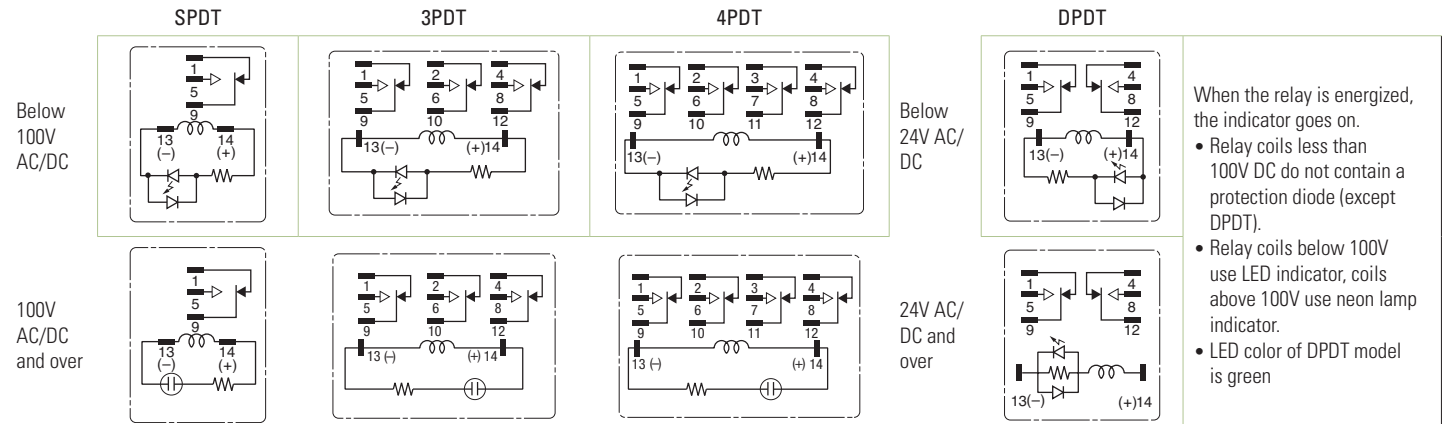


Internal Connection (View from Bottom)

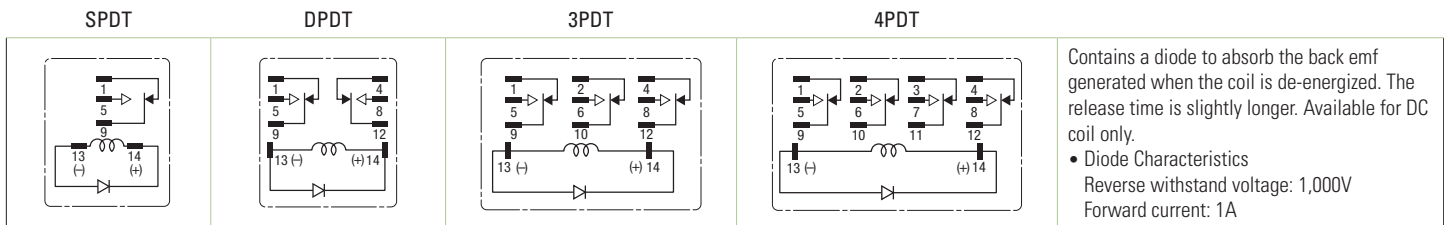
Basic Type



With Indicator (-L type)



With Diode (-D type)



Switches & Pilot Lights

Signaling Lights

Relays & Sockets

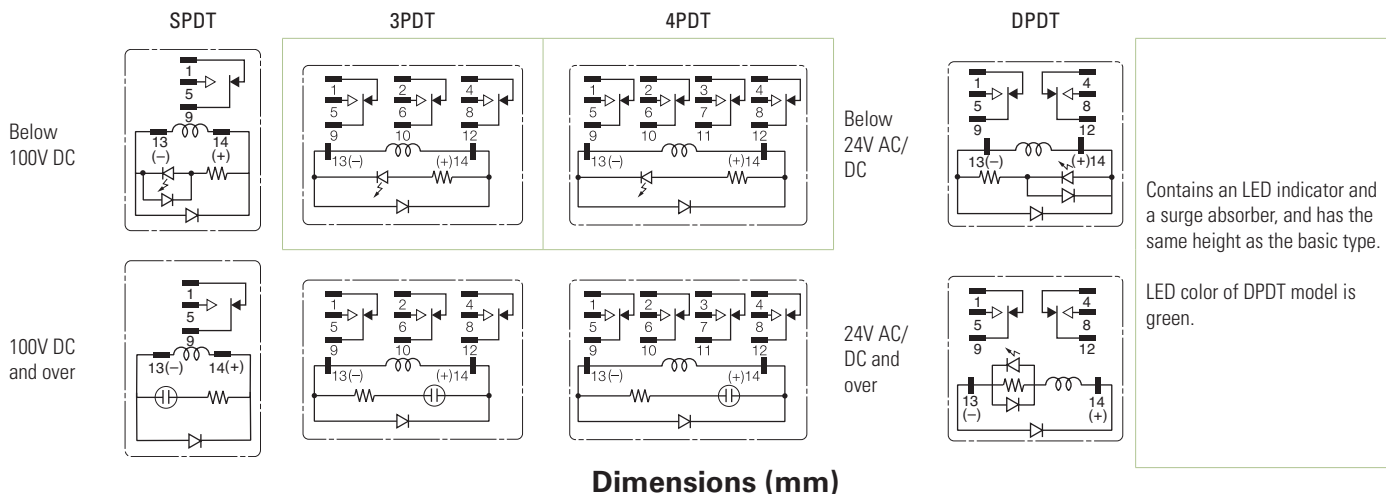
Timers

Contactors

Terminal Blocks

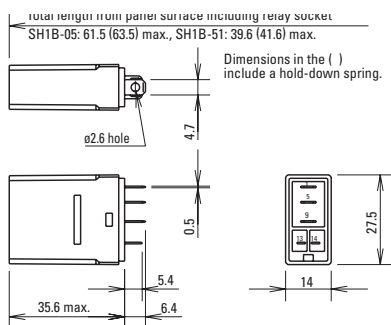
Circuit Breakers

With Indicator LED & Diode (-LD type)

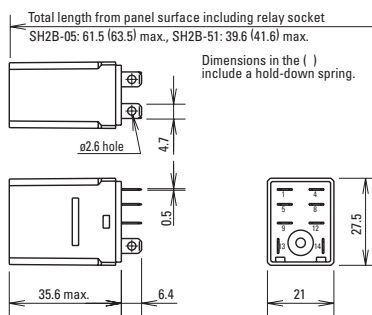


Dimensions (mm)

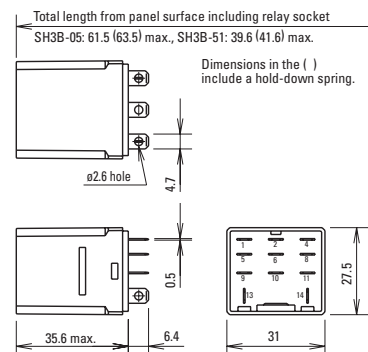
RH1B-U/RH1B-UL/RH1B-UD/RH1B-ULD



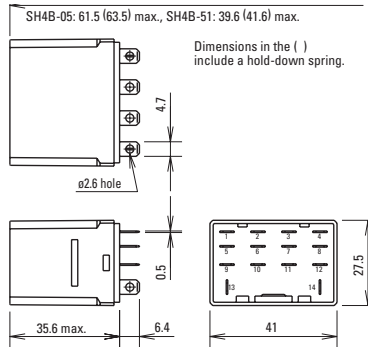
RH2B-U/RH2B-UL/RH2B-UD/RH2B-ULD



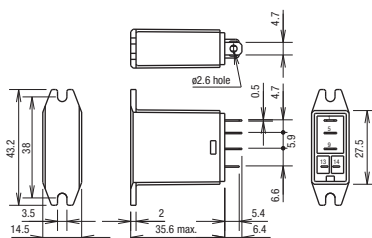
RH3B-U/RH3B-UL/RH3B-UD/RH3B-ULD



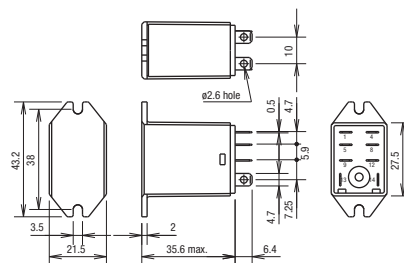
RH4B-U/RH4B-UL/RH4B-UD/RH4B-ULD



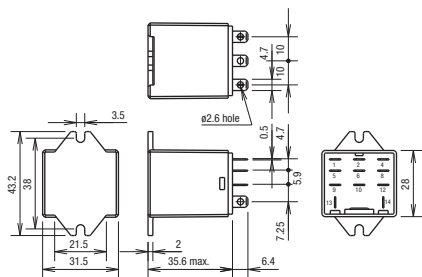
RH1B-UT



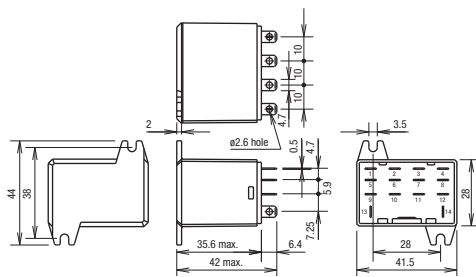
RH2B-UT



RH3B-UT



RH4B-UT



Switches & Pilot Lights

Signaling Lights

Relays & Sockets

Timers

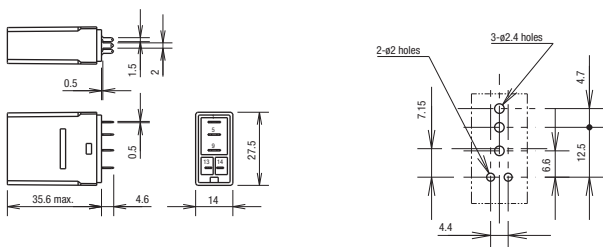
Contactors

Terminal Blocks

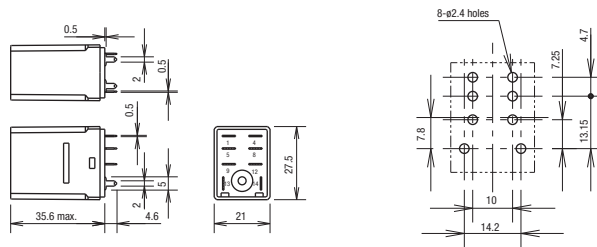
Circuit Breakers

Dimensions con't (mm)

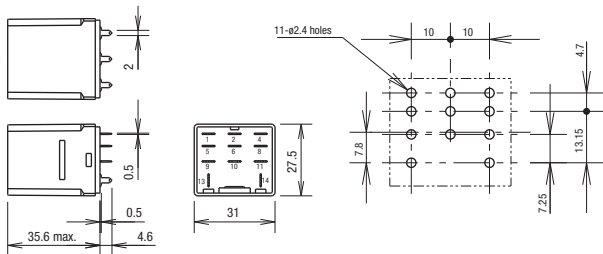
RH1V2-U/RH1V2-UD



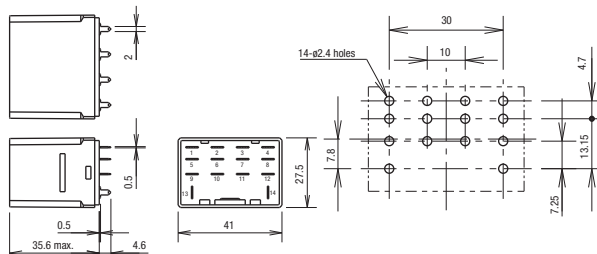
RH2V2-U/RH2V2-UL/RH2V2-UD



RH3V2-U/RH3V2-UL/RH3V2-D

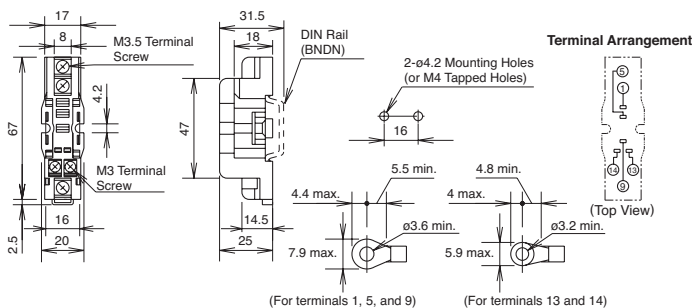


RH4V2-U/RH4V2-UL/RH4V2-UD

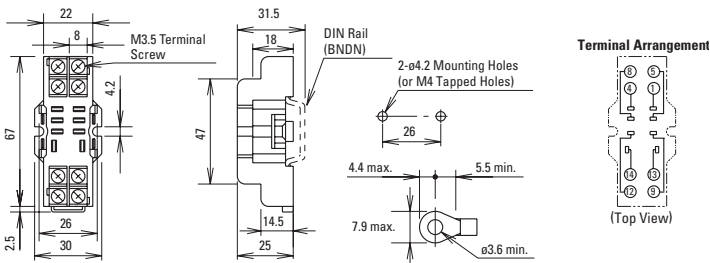


Standard DIN Rail Mount Sockets

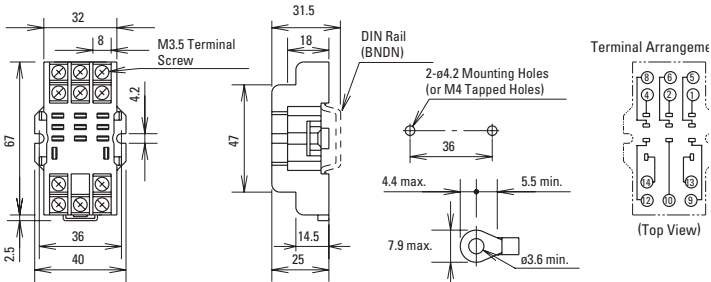
SH1B-05



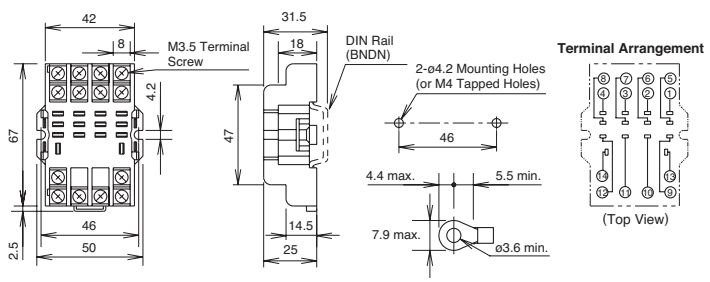
SH2B-05



SH3B-05



SH4B-05



Switches & Pilot Lights

Signaling Lights

Relays & Sockets

Timers

Contactors

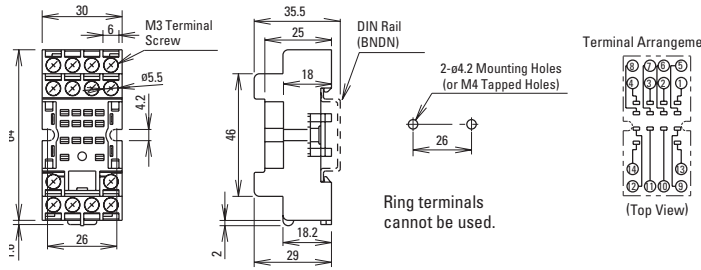
Terminal Blocks

Circuit Breakers

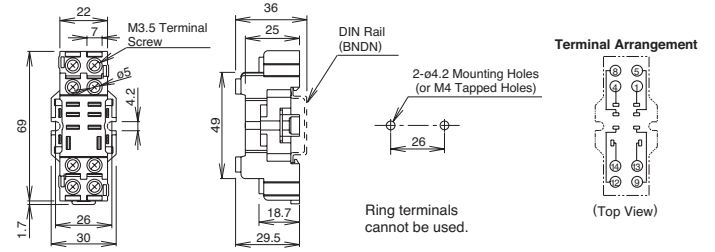
Dimensions con't (mm)

Finger-safe DIN Rail Mount Sockets

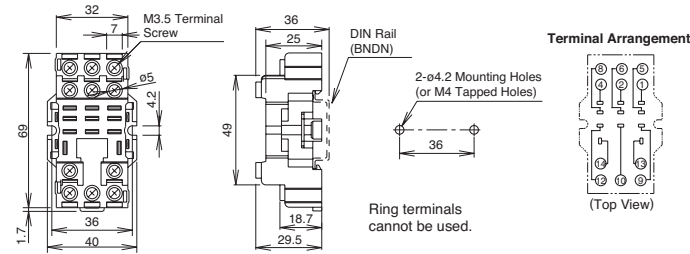
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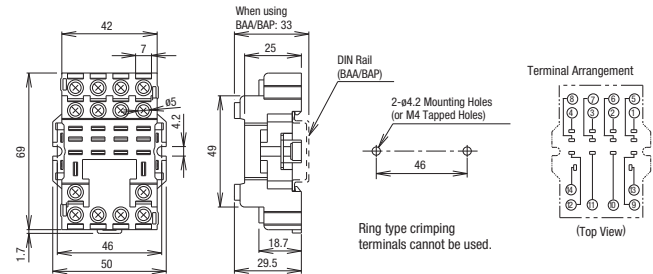
SH2B-05C



SH3B-05C

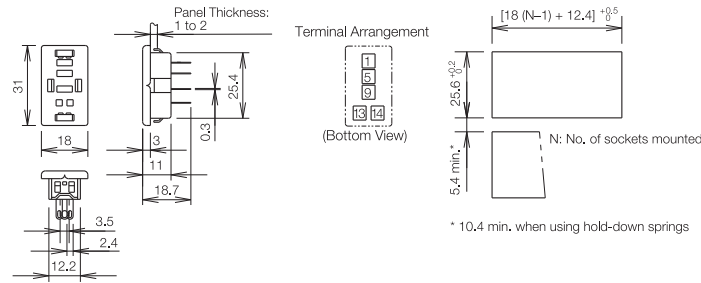


SH4B-05C

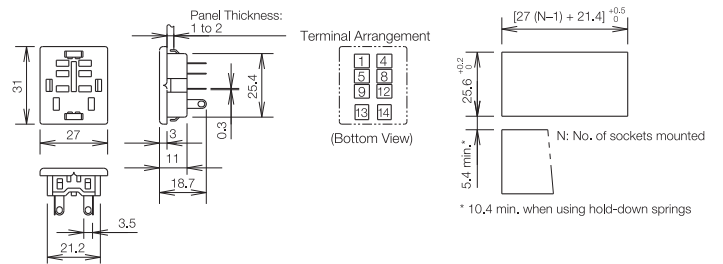


Through Panel Mount Socket

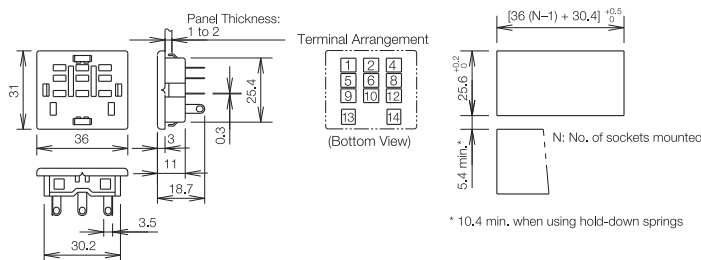
SH1B-51



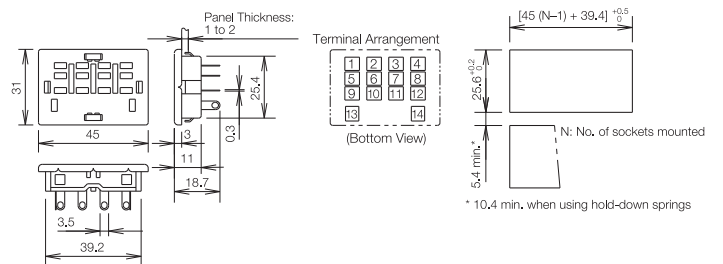
SH2B-51



SH3B-51



SH4B-51



Switches & Pilot Lights
Signaling Lights

Relays & Sockets

Timers

Contactors

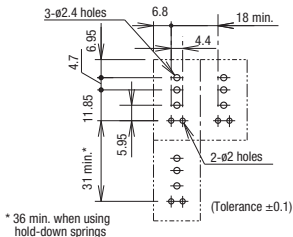
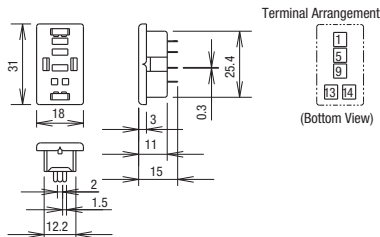
Terminal Blocks

Circuit Breakers

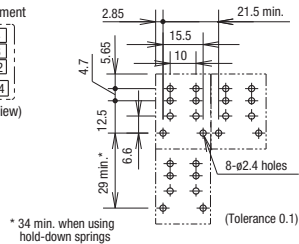
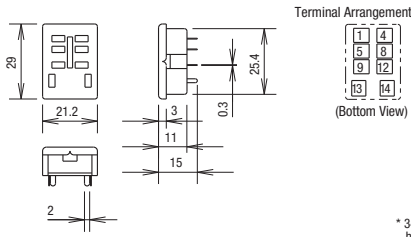
Dimensions con't (mm)

PCB Mount Sockets

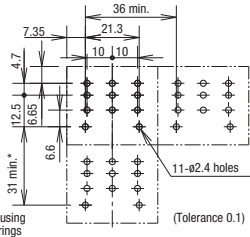
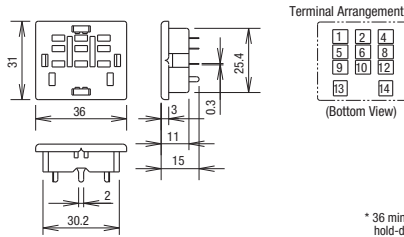
SH1B-62



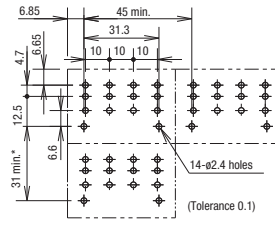
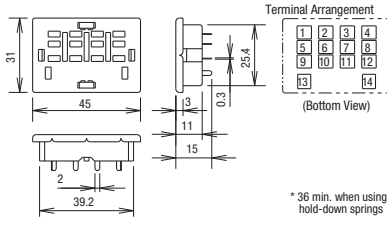
SH2B-62



SH3B-62



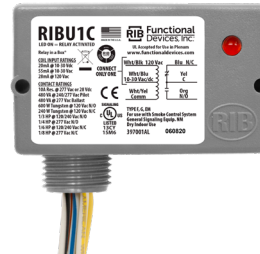
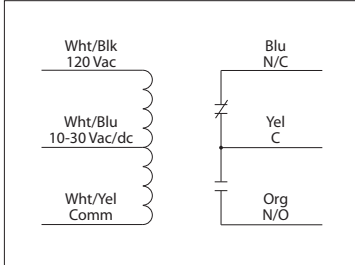
SH4B-62



10 AMP PILOT CONTROL RELAY

RIBU1C

Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil



RIBU1C-RD
• Red housing



RIBU1C-N4
• NEMA 4X housing, UL508 only

SPECIFICATIONS

Relays & Contact Type: One (1) SPDT Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Humidity Range: 5 to 95% (noncondensing)
Operate Time: 20ms
Relay Status: LED On = Activated
Dimensions: 1.70" x 2.80" x 1.50" with .50" NPT nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, C-UL California State Fire Marshal, CE, RoHS
Housing Rating: UL Accepted for Use in Plenum, NEMA 1
Gold Flash: Yes
Override Switch: No

Contact Ratings:
 10 Amp Resistive @ 277 Vac
 10 Amp Resistive @ 28 Vdc
 480 VA Pilot Duty @ 240-277 Vac
 480 VA Ballast @ 277 Vac
Not rated for Electronic Ballast
 600 Watt Tungsten @ 120 Vac (N/O)
 240 Watt Tungsten @ 120 Vac (N/C)
 1/3 HP @ 120-240 Vac (N/O)
 1/6 HP @ 120-240 Vac (N/C)
 1/4 HP @ 277 Vac (N/O)
 1/8 HP @ 277 Vac (N/C)

Coil Current:

33 mA @ 10 Vac	13 mA @ 10 Vdc
35 mA @ 12 Vac	15 mA @ 12 Vdc
46 mA @ 24 Vac	18 mA @ 24 Vdc
55 mA @ 30 Vac	20 mA @ 30 Vdc
28 mA @ 120 Vac	

Coil Voltage Input:
 10-30 Vac/dc ; 120 Vac ; 50-60 Hz
 Drop Out = 2.1 Vac / 2.8 Vdc
 Pull In = 9 Vac / 10 Vdc

Note:
 • Order in bulk by adding "-5PACK", "-10PACK", "-25PACK", or "-100PACK" to end of model number.

TERMS AND CONDITIONS OF SALE

1. OFFER, GOVERNING PROVISIONS AND CANCELLATIONS: This document constitutes an offer or counter-offer by Functional Devices, Inc. or any of its affiliates ("**Seller**") to sell various products as agreed by Seller ("**Products**") to the buyer named on the reverse side of this document or in other applicable print or electronic documentation ("**Buyer**") in accordance with these terms and conditions. This writing is not an acceptance of any offer made by Buyer. This offer or counter-offer is expressly conditioned upon Buyer's assent to these terms and conditions and no others. Buyer is deemed to have assented to these terms and conditions (including Seller's warranty) when the first of the following occurs: A. Buyer signs and delivers to Seller an acknowledgement copy of any of Seller's quotation, order acknowledgement or invoice forms; B. Buyer gives to Seller (orally or in writing) specifications of quantity and/or type, assortments thereof, delivery dates, shipping instructions, instructions to bill, or the like as to all or any part of the Products; C. Buyer receives delivery of any of the Products; or, D. Buyer has otherwise assented to the terms and conditions hereof.

Where an attachment to this Agreement or separate document referencing this Agreement consists of a quotation, the quotation remains open for acceptance for a period of thirty (30) days or such other period as specified in the quotation. Seller hereby rejects any additional or different terms or provisions contained in any purchase order, acknowledgment or other communication heretofore or hereafter received from Buyer. Seller's delivery of Products does not constitute an assent to any terms proposed by Buyer. Except for an officer of Seller, no representative of Seller has any authority to waive, alter, vary, amend, or add to the terms hereof. **THESE TERMS AND CONDITIONS OF SALE CONSTITUTE THE ENTIRE AGREEMENT ("AGREEMENT") BETWEEN SELLER AND BUYER WITH RESPECT TO THE MATTERS ADDRESSED HEREIN.**

2. PRICES: The prices for the Products are based on the terms and conditions herein, including the limitations of liability and warranties, and all such terms and conditions are material to the sale of the Products. In the event Seller fails to provide a price quote and/or terms prior to the acceptance of the order, Buyer will pay Seller's then-current list price for such Products. All quotations and invoices show the net selling price of each item quoted. In the event of a mathematical error, the quoted price per Product governs.

3. TERMS OF PAYMENT: Buyer will pay the fees specified in each invoice provided by Seller in United States Dollars within thirty (30) calendar days after the invoice date unless otherwise agreed to in writing by an authorized representative of Seller. Any amount due under this Agreement that remains unpaid after its due date will bear interest from the date that such payment became delinquent until the date it is paid in full at the lower of 1.5% per month, which equals an annual percentage rate of 18%, or the maximum rate permitted by law. Seller reserves the right to establish, revoke or modify credit terms for Buyer at any time. No discounts are allowed unless otherwise agreed to in writing by an authorized representative of Seller. Buyer will pay any collection fees, legal fees, or court costs incurred by Seller to collect past due amounts. No offsets or setoffs of payments due to Seller hereunder are allowed with respect to any other agreement between the parties. Seller hereby retains a lien on the goods sold for unpaid purchase money as herein provided.

4. TAXES AND OTHER CHARGES: In addition to the prices quoted or invoiced, Buyer will pay any sales tax, excise tax, use tax, value added or consumption tax, customs duty (that is assessed on the delivery of Product(s) to a destination outside of the U.S.A.), fee or charge of any nature whatsoever imposed by any governmental authority on or measured by the transaction between Seller and Buyer. In the event Seller is required to pay any amount, Buyer will reimburse Seller therefore; or provide Seller, at the time the order is submitted, an exemption certificate or other document acceptable to the authority imposing the same. Seller does not accept and will not pay any fines, penalties or chargebacks from Buyer for any reason.

5. DELIVERY, RISK OF LOSS, CLAIMS AND FORCE MAJEURE:

A. All prices quoted for products are Ex-Works (Incoterms 2010) at a shipping facility determined by Seller, unless otherwise noted by Seller ("**Seller's Shipping Facility**"). Risk of loss or damage, and beneficial ownership, of the Products are transferred to Buyer when the Products are made available to Buyer at Seller's Shipping Facility. All delivery dates are approximate.

B. Buyer will only make written claims to Seller for damages, shortages or other delivery errors within seven (7) calendar days after receipt of shipment. All Products received by Buyer, or Buyer's clients, customers, or agents, that are not rejected within such time will be deemed accepted. Failure to provide such written notice constitutes a waiver of all such claims regarding such shipment by Buyer. Buyer will not revoke acceptance.

C. Seller is not liable for any damage as a result of any delay or failure to deliver due to any act of God, act of Buyer, embargo or other governmental act, regulation or request, fire, accident, power outage, strike, civil unrest, weather, slowdown or other labor difficulties, war, riot, act of terrorism, delay in transportation, defaults of common carriers, inability to obtain necessary labor, materials or manufacturing facilities or, without limiting the foregoing, any other delays beyond Seller's control. Buyer's sole and exclusive remedy for any delays or for Seller's inability to deliver Products for any reason, in each case, that persists for more than ninety (90) days, is to cancel the order pursuant to Seller's Order Policies and Guidelines available upon request.

6. WARRANTY; DISCLAIMER. Products are warranted to be free from manufacturing defects under normal use and conditions for five (5) years (the "**Warranty Period**").

The warranty does not apply to: (a) Damage caused by accident, abuse, mishandling, or dropping; (b) Products which have been subjected to unauthorized repair, opened, or taken apart; (c) Products not used in accordance with directions; (d) Damages exceeding the cost of such Product; and (e) Damages caused by lightning, water, or condensation. If warranty service is required during the Warranty Period, and if examination shall disclose to Seller's satisfaction

that such Product was originally defective, then Seller will at its option repair or replace the product without charge upon prepaid delivery of such Product to Seller's facility with proof of date of purchase. Corrections of such defects by repair to or supplying of replacements for defective parts shall constitute fulfillment of all obligations of Seller.

Seller shall not be liable for loss, damage, or expense directly or indirectly caused from the failure of Products to perform as expected.

EXCEPT AS SET FORTH HEREIN, SELLER DISCLAIMS ALL REPRESENTATIONS OR WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE. NO PERSON (INCLUDING ANY AGENT, DEALER OR REPRESENTATIVE OF SELLER) IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY CONCERNING PRODUCTS EXCEPT TO REFER BUYER TO THIS AGREEMENT. BUYER WARRANTS THAT BUYER HAS NOT RELIED ON ANY OTHER WARRANTIES OR REPRESENTATIONS CONCERNING THE PRODUCTS OR THIS AGREEMENT.

For warranty service, call factory for RA number and send such Product prepared with sales receipt to: FUNCTIONAL DEVICES, INC., 101 COMMERCE DRIVE, SHARPSVILLE, IN 46068.

7. LIMITATION OF LIABILITY: SELLER WILL NOT BE LIABLE FOR ANY LOSS OF PROFIT, INTERRUPTION OF BUSINESS OR ANY OTHER SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES SUFFERED OR SUSTAINED BY BUYER FOR ANY REASON. EXCEPT FOR CLAIMS OF DEATH OR PERSONAL INJURY, IN NO EVENT WILL SELLER'S AGGREGATE LIABILITY TO BUYER ARISING UNDER OR IN ANY WAY RELATED TO THIS AGREEMENT FOR ANY REASON (INCLUDING, BUT NOT LIMITED TO, LIABILITY ARISING FROM NEGLIGENCE OR ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE) EXCEED THE TOTAL AMOUNT PAID BY BUYER TO SELLER HEREUNDER FOR ANY PRODUCT GIVING RISE TO A CLAIM UNDER THIS AGREEMENT.

8. RETURNS: Unless otherwise approved by Seller in writing in its sole discretion, except in the case of a non-conforming shipment or a warranty issue, Buyer may not return Products. If Seller approves the return of Products pursuant to the preceding sentence, such returned Products must be returned within ninety (90) days from date of invoice and will be subject to a 25% restocking fee. In the event of a non-conforming shipment or a warranty issue, Buyer may return Products, but only if Buyer first: (a) provides notice to Seller as required in this Agreement, (b) obtains prior authorization from Seller, and (c) all Products or containers for which return is properly authorized have been marked with a return authorization number supplied by Seller. Buyer will make all returns via a traceable form such as Federal Express, UPS or insured mail and in resalable condition. Buyer will pay all return shipping charges and any other charges associated therewith.

9. CANCELLATIONS: Cancellation or deferment of all or part of an order is subject to acceptance by the Seller. If accepted, any reduction in quantity of any item to less than 85% of the original item quantity is subject to a 15% cancellation charge. If an order cancellation is accepted, the Buyer will make delivery and pay for all material manufactured and in stock or in process at time of notice for such order, and for any special materials on orders for which the Seller must take delivery.

10. EXPORTS. Buyer agrees that it will comply with any and all U.S. Export Controls and will not pay for, resell, transfer or knowingly sell Products in violation of U.S. Export Controls. If Buyer resells Products within or exports Products to a country or region which imposes upon Seller and/or Buyer an obligation to fund or undertake reuse, recycling, composting, recovery of Products, or any similar obligation (e.g., the European Union's Waste Electrical and Electronic Equipment Directive, EC 2002/96/EC) (the "**Obligations**"), Buyer shall wholly undertake the Obligations or duties and shall be entirely responsible for all associated costs therewith. Seller shall have no obligation to reimburse Buyer for execution of the Obligations. In the event that Seller is named in a proceeding based upon the Obligations, Buyer shall indemnify, defend and hold Seller harmless from all actions related thereto, including all civil and governmental actions.

11. MISCELLANEOUS. This Agreement is governed by the laws of the State of Indiana, without giving effect to its conflict of laws principles. Buyer hereby irrevocably consents and submits to the exclusive jurisdiction and venue of the state and federal courts in Marion County, Indiana. The United Nations Convention for Contracts for the International Sale of Goods is explicitly excluded. Each provision contained in this Agreement constitutes a separate and distinct provision severable from all other provisions. If any provision (or any part thereof) is unenforceable under or prohibited by any present or future law, then such provision (or part thereof) will be amended, and is hereby amended, so as to be in compliance with such law, while preserving to the maximum extent possible the intent of the original provision. Any provision (or part thereof) that cannot be so amended will be severed from this Agreement; and, all the remaining provisions of this Agreement will remain unimpaired. No modification, addition or deletion, or waiver of any rights under this Agreement is binding on a party unless made in a non-preprinted agreement clearly understood by the parties to be a modification or waiver, and signed by a duly authorized representative of each party.



ADJUSTABLE SET POINT AIR PRESSURE SENSING SWITCH WITH MANUAL RESET

APPLICATION

The **Model AFS-460** is a general purpose proving switch with a **manual reset** feature that requires operator intervention whenever it actuates. It can be used to sense positive, negative, or differential air pressure in HVAC and Energy Management applications that require operator interface.

GENERAL DESCRIPTION & OPERATION

The plated housing contains a diaphragm, a calibration spring and a snap-acting SPST-NC switch with a manual reset button.

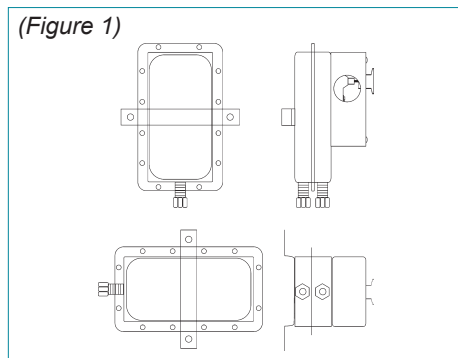
The sample line connections located on each side of the diaphragm accept 1/4" OD rigid or semi-rigid tubing via the integral compression ferrule and nut.

An enclosure cover protects the operator from accidental contact with the live switch terminal screws and the set point adjusting screw. The enclosure cover has a 3/8" opening provided to accept a 1/2" conduit connection.



MOUNTING (SEE FIGURE 1)

Select a mounting location which is free from vibration. The **AFS-460** must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the "up" position. Surface mount via the two 3/16" diameter holes in the integral mounting bracket. The mounting holes are 3-7/8" apart.



AIR SAMPLING CONNECTION (SEE FIGURE 2)

The sample line connections located on each side of the diaphragm accept 1/4" OD rigid or semi-rigid tubing via the integral compression ferrule and nut. However, an optional adapter (P/N 18311) is available for slipping on 1/4" ID flexible tubing. For sample lines up to 10 feet, 1/4" OD tubing is acceptable. For lines up to 20 feet, use 1/4" ID tubing. For lines up to 60 feet, use 1/2" ID tubing.

Locate the sampling probe a minimum of 1-1/2 duct diameters downstream from the air source. Install the sampling probe as close to the center of the airstream as possible. Refer to **Figure 2** to identify the high pressure inlet (**H**) and the low pressure inlet (**L**). Select one of the following five application options, and connect the sample lines as recommended.

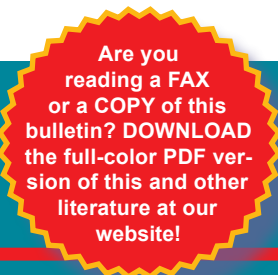
POSITIVE PRESSURE ONLY: Connect the sample line to inlet **H**; inlet **L** remains open to the atmosphere.

NEGATIVE PRESSURE ONLY: Connect the sample line to inlet **L**; inlet **H** remains open to the atmosphere.

TWO NEGATIVE SAMPLES: Connect the higher negative sample to inlet **L**. Connect the lower negative sample to inlet **H**.

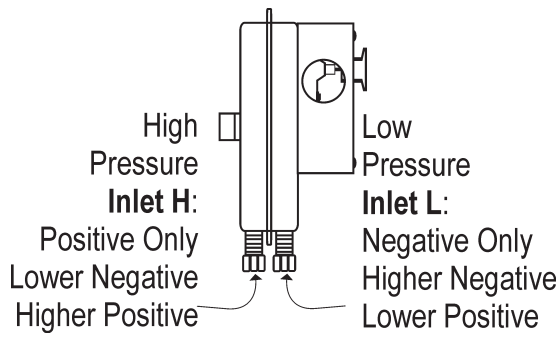
TWO POSITIVE SAMPLES: Connect the higher positive sample to inlet **H**. Connect the lower positive sample to inlet **L**.

ONE POSITIVE AND ONE NEGATIVE SAMPLE: Connect the positive sample to inlet **H**. Connect the negative sample to inlet **L**.

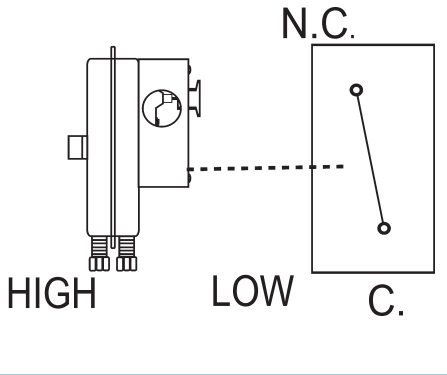


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(Figure 2)



(Figure 3)

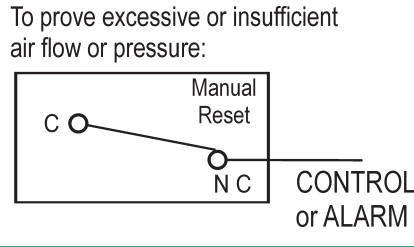


ELECTRICAL CONNECTIONS (SEE FIGURE 3)

Before pressure is applied to the diaphragm, the switch contacts will be in the normally closed (NC) position as shown in Figure 3.

The snap switch has screw top terminals with cup washers. Wire alarm or control application as shown in Figure 4.

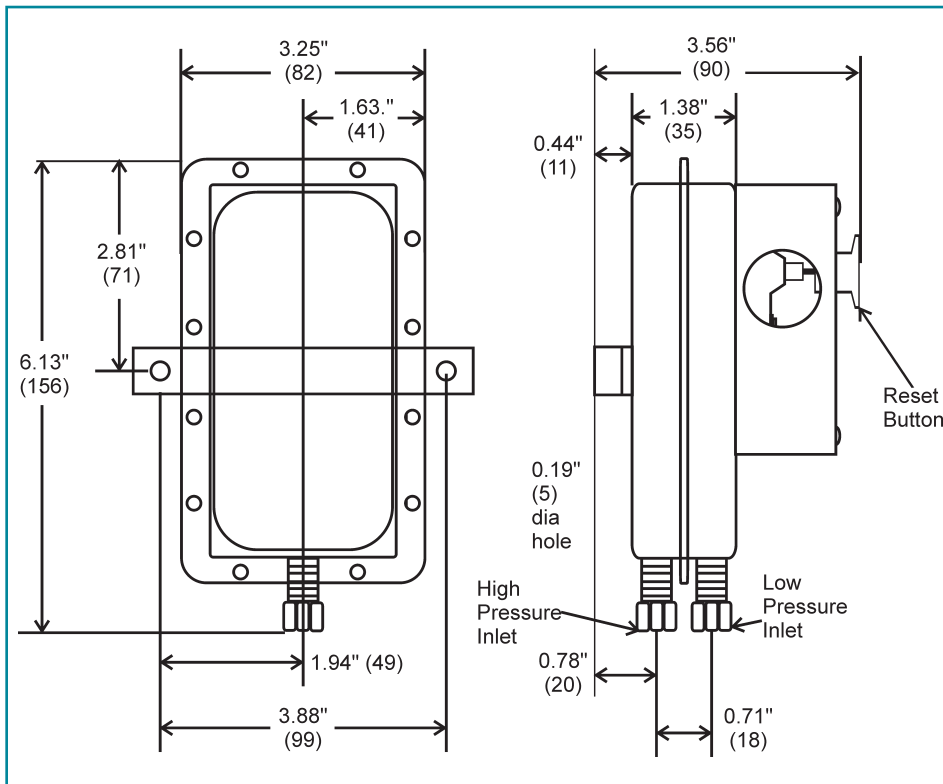
(Figure 4)



FIELD ADJUSTMENT

The adjustment range of an AFS-460 Air Switch is 0.4" ± 0.06" w.c. to 12.0" w.c. To adjust the set point, turn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw four complete turns in a clockwise direction to engage the spring. From this point, the next ten turns will be used for the actual calibration. Each full turn represents approximately 1.16" w.c.

Please note: To properly calibrate an air switch, a digital manometer or other measuring device should be used to confirm the actual set point.



SPECIFICATIONS

MODEL AFS-460 AIR PRESSURE SENSING SWITCH WITH MANUAL RESET FEATURE

Mounting Position:

In order to meet lowest operating specifications, mount with the diaphragm in any vertical plane.

Set Point Range:

0.40 ± 0.06" w.c. to 12.0" w.c.

Field Adjustable

"Operate Range":

0.46" w.c. to 12.0" w.c.

Measured Media:

Air

Maximum Pressure:

½ psi (0.03 bar)

Life:

Exceeds UL-recognized mechanical endurance test of 6,000 cycles minimum at 0.5 psi maximum pressure each cycle and at maximum rated electrical load

Electrical Rating @ 60 Hz.:

15A @ 125, 250, or 277 VAC.

½ A @ 125 VDC, ¼ A @ 250 VDC.

¼ hp @ 125 VAC; ½ hp @ 250 VDC.

Contact Arrangement:

SPST-NC (manual reset)

Electrical Connections:

8-32 screw-top terminals with cup washers

Conduit Connection:

⅞" diameter opening accepts ½" conduit

Sample Line Connectors:

Male, externally threaded ⅞" 24 UNS 2A thread, complete with nut and self-aligning ferrule

Sample Line Connections:

Connectors accept ¼" OD rigid or semi-rigid tubing

Approval and Recognition:

UL, CSA, CE

Shipping Weight:

1.2 lbs.

Accessories:

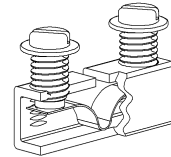
- P/N 18311 Slip-on ¼" OD Tubing Adapter, suitable for slipping on flexible plastic tubing
- Sample line probes
- Orifice plugs (pulsation dampers)

Product Data Sheet



6G38 TSKK C

3/8" Sectional Terminal Block
Channel Mount
40 Amps, 600 Volts (AC/DC)



32 Circuits Per Foot

Copper Wire Only

Wire Range with Wire Binding Screw: #10 - #22 AWG

TSKK: Tubular
Connector with
Wire Protector

Wire Termination Torque: 16 in. lbs

See table below for Wire Classes and torque

Electrical Ratings:

- 40A (Based on NEC Table 310-16, 75°C columns)
- 600 Volts AC/DC (UL 1059 Class C, User Group – General Industrial)
- Short Circuit Current Rating: 10,000A (Default)
- Factory and field wiring

Mechanical Ratings:

- Insulator base temperature: -40°C/F 125°C (257°F)* UL RTI
 - Flammability rating of insulator base: UL 94V-0
 - Touch protection: IP-20 (IEC 60529)
- * Use outside these ratings needs to be judged in the end-use application.

Materials:

- Insulator base: Glass-filled polycarbonate (Gray Thermoplastic)
- Tubular Screw Connector: Copper, tin plated
- Screw, #10-32: Steel, nickel plated
- Wire Protector: Stainless Steel

Agency Approvals:

- UL Recognized, UL 1059 Terminal Block Standard, File No. XCFR2.E62806
- CSA Certified, CSA C22.2 No. 158, File No. LR19766
- CE compliant, IEC 60947-7-1
- RoHS Compliant

Wire Range:

Wire Size	Torque	Copper Wire Stranding Classes - Number of Conductors						
		Solid	Class B	Class C	Class G	Class H	Class I	Class K
10	16 in. lbs	1	1	1			1	1
12	16 in. lbs	1 - 2	1 - 3	1 - 2			1	1
14	16 in. lbs	1 - 2	1 - 3	1 - 3			1 - 2	1 - 2
16	16 in. lbs		1 - 4	1 - 4				1 - 2
18	16 in. lbs		1 - 5	1 - 5				1 - 2
20	16 in. lbs		1 - 5	1 - 5				
22	16 in. lbs		1 - 5	1 - 5				

For information on copper stranded wire classes, please reference:

<http://www.marathonsp.com/CatalogPDFs/Flexible-Stranded-Wire.pdf>

Mounting:

- Channel mountable: #8 (M4) fastener, torque to 15-20 in. lbs.

Standard Pack Qty is 100

Accessories:

- Jumper: J-38



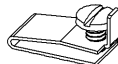
- End section: 6G38 E C



- Marking Strip (1/2" x 2" white): MS 2



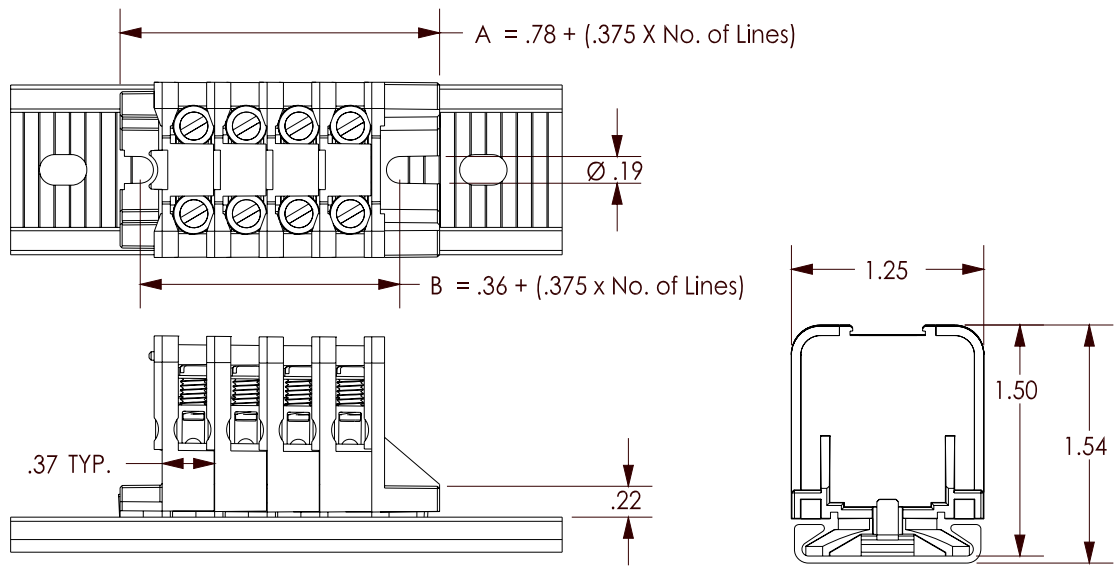
- Mounting Clamp: MC



- Channel: MPC-3 (3 foot channel) or MPC-6 (6 foot channel)



CHANNEL
MOUNT



WWW.MARATHONSP.COM
1-419-352-8441

REMOTE MOUNTING TEMPERATURE SWITCH AND CONTROL



- Increase flexibility with multiple outputs
- Panel or surface mount for trouble-free installation
- External dial provides easy adjustment
- Space saving construction



55 Series

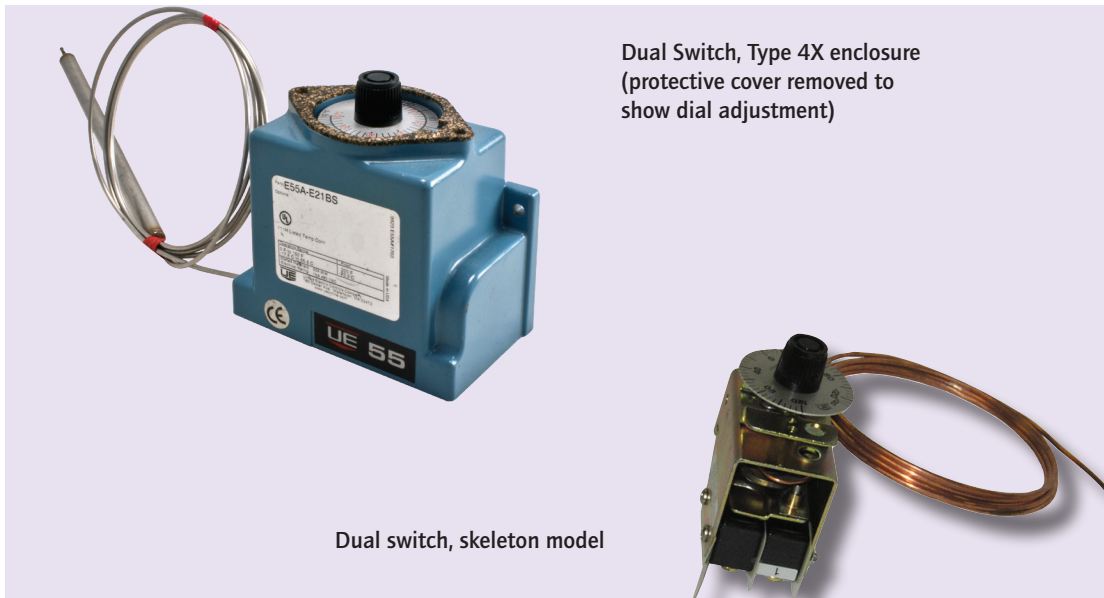
55 Series

OVERVIEW

The E55 Series provides rugged, dependable temperature control for many applications. Available in single or dual output versions, with either an epoxy coated enclosure (designed to meet NEMA Type 4X) or skeleton construction, the E55 combines flexibility with compact size. It has been used in diverse applications such as food service appliances, oven control, and heat tracing.

FEATURES

- Single or dual 15 A switch output
- Skeleton or Enclosure construction - designed to meet NEMA Type 4X
- Optional external manual reset
- Compact size
- Copper or stainless steel bulb & capillary



SPECIFICATIONS

AMBIENT TEMPERATURE LIMITS	-40 to 160°F (-40 to 71°C); set point typically shifts less than 1% of range for a 50°F (28°C) ambient temperature change
SET POINT REPEATABILITY	± 1% of adjustable range
SHOCK	Set point repeats after 15 G, 10 millisecond duration
VIBRATION	Set point repeats after 2.5 G, 5-500 Hz
ENCLOSURE CLASSIFICATION	Type E55 & E55A: Designed to meet enclosure type 4X requirements Types E55S & E55AS: Skeleton, open frame construction, not applicable
ENCLOSURE	Die cast aluminum, epoxy powder coated with stainless steel, gasketed adjustment cover (E55 and E55A)
SWITCH OUTPUT	One or two SPDT; dual switch may be separated up to 100% of range; switches may be wired "normally open" or "normally closed"
ELECTRICAL RATING*	15A, 125/250/480 VAC resistive. 22A, 480 VAC for E55-R25HT and E55-L24HT heat trace models. 2A, 24-30 VDC resistive; 1A, 24-30 VDC inductive. 0.5A, 125 VDC resistive. 0.03A, 125 VDC inductive.
ELECTRICAL CONNECTION	1/2" NPT (female) (E55 and E55A)
WEIGHT	Types E55S, E55AS (skeleton): approximately 12 oz.; Types E55, E55A: approximately 1 lb.
BULB AND CAPILLARY	Models E20BC - E23BC: 6 feet copper; Models E20BS - E23BS: 6 feet stainless steel Model R25HT: 10 feet stainless steel Model L24HT: stainless steel, Local sensor, no capillary, for ambient sensing
TEMPERATURE FILL	Non-toxic oil
TEMPERATURE DEADBAND	Typically 1% of range under laboratory conditions (70°F circulating bath at rate of 1/2°F per minute change)

***NOTE:** DC ratings are based on experience - Consult UE for further information

APPROVALS

UE declarations and third-party issued Agency certifications are available for download at www.ueonline.com/prod_approval.html.

UNITED STATES AND CANADA

E55(A) S Models

cULus Listed

cURus Recognized

UL 873, C22.2 no. 24, file #E10667



EUROPE

Low Voltage Directive (LVD) (2006/95/EC)

UEC compliant to LVD

Products rated lower than 50 VAC and 75 VDC are outside of the scope of the LVD



MODEL CHART

Model	Adjustable Set Point Range		Max. Temp.		Dial Div.		Bulb Size
	°F	°C	°F	°C	°F	°C	OD x Length (inches)
Copper bulb & capillary							
E20BC	-130 to 120	-90 to 48.9	170	76.7	10	5	3/8 x 4-1/2
E21BC	0 to 150	-17.8 to 65.6	200	93.3	5	5	3/8 x 7
E22BC	50 to 300	10 to 148.9	350	176.7	10	5	3/8 x 4-1/2
E23BC	150 to 650	65.6 to 343.3	700	371.1	25	10	3/8 x 3-3/4
Stainless steel bulb and capillary							
E20BS [‡]	-130 to 120	-90 to 48.9	170	76.7	10	5	3/8 x 4-3/4
E21BS	0 to 150	-17.8 to 65.6	200	93.3	5	5	3/8 x 7-1/4
E22BS	50 to 300	10 to 148.9	350	176.7	10	5	3/8 x 4-3/4
E23BS	150 to 650	65.6 to 343.3	700	371.1	25	10	3/8 x 4
R25HT ^{‡‡}	25 to 325	-3.9 to 162.8	600	315.6	10	-	1/4 x 7-3/16
L24HT ^{‡‡}	15 to 140	-9.4 to 60	190	87.8	5	-	3/8 x 7

[‡] Not available with Type E55AS

^{‡‡} Not available with Types E55A, E55S, E55AS

HOW TO ORDER

BUILDING A PART NUMBER

Select a **Type**

Refer to the "Type" section below.

Determine type number based on switch output, enclosure, adjustment and reference.

Select a **Model**

Refer to the "Model Charts".

Determine model based on adjustable range, and capillary material.

Select an **Option** (if applicable)

Refer to the "Options" section.

Determine option number based on switch output, optional materials or other product enhancements.

FOR MULTIPLE OPTIONS: Call United Electric Controls.

TYPE

E55	Bulb & capillary; one SPDT output; Epoxy coated enclosure; external adjustment with reference dial, tamper-resistant cover
E55A	Bulb & capillary; two SPDT outputs; Epoxy coated enclosure; external adjustment with reference dial, tamper-resistant cover
E55S	Bulb & capillary; one SPDT output; skeleton construction; external adjustment with reference dial
E55AS	Bulb & capillary; two SPDT outputs; skeleton construction; external adjustment with reference dial

SWITCH OPTIONS*

0500	Close deadband, 5 A, 125/250 VAC resistive. 3 A, 28 VDC; 1 A, 48 VDC; 0.5 A, 125 VDC resistive. NOT AVAILABLE ON MODELS R25HT, L24HT
0140	Gold contacts, 1 A, 125 VAC resistive, NOT AVAILABLE ON MODELS E55-L24HT, E55-R25HT
1530	External manual reset, 15 A 125/250/480 VAC resistive; 0.5 A, 125 VDC; 0.25 A, 250 VDC resistive. Reset on increasing temperature. NOT AVAILABLE ON TYPES E55S, E55AS, & MODELS R25HT, L24HT
2000	20 A 125/250/480 VAC resistive. 0.5 A, 125 VDC; 0.25 A, 250 VDC resistive. NOT AVAILABLE ON MODELS R25HT, L24HT

GENERAL

M020	Pilot light. AVAILABLE HEAT TRACE MODELS R25HT, L24HT ONLY
M201	Factory set one switch; specify increasing or decreasing temperature and set point. NOT AVAILABLE ON TYPES E55A, E55AS
M202	Factory set two switches; specify increasing or decreasing temperature and set point. NOT AVAILABLE ON TYPES E55, E55S
M270	Calibrated dial in Celsius. NOT AVAILABLE ON HEAT TRACE MODELS R25HT, L24HT
M444	Paper ID tag. NOT AVAILABLE ON HEAT TRACE MODELS R25HT, L24HT
M446	Stainless steel ID tag & wire attachment; limited to 2 lines of 25 characters each max.

UNION CONNECTORS**

(Not available on model L24HT or R25HT)

Option	Replacement Number	Description
	<u>Brass</u>	
W027	SD6213-27	1/2" NPT w/ 3/4" bushing
W045	SD6213-45	3/4" NPT
W051	SD6213-51	1/2" NPT
	<u>304 Stainless Steel</u>	
W028	SD6213-28	1/2" NPT w/ 3/4" bushing
W046	SD6213-46	3/4" NPT
W050	SD6213-50	1/2" NPT

THERMOWELLS**

For all bulb & capillary switches, all 1/2" NPT Internal (Not available on models R25HT, L24HT)

	<u>Brass</u>	
W075	SD6225-75	1/2" NPT with 3/4" NPT bushing adapter, 4" BT
W191	SD6225-191	1/2" NPT, 4" BT
W118	SD6225-118	1/2" NPT with 3/4" NPT bushing adapter, 7" BT
W192	SD6225-192	1/2" NPT, 7" BT
	<u>316 Stainless Steel</u>	
W076	SD6225-76	3/4" NPT, 4.5" BT
W193	SD6225-193	1/2" NPT, 4.5" BT
W119	SD6225-119	3/4" NPT, 7.5" BT
W177	SD6225-177	1/2" NPT, 7.5" BT

OPTIONAL LENGTHS:

Optional capillary length to 50' may be available in copper or 304 st/st. Armor or Teflon® capillary protection may be available to lengths less than or equal to capillary length. Consult UE for additional information and availability.

Consult UE regarding repeatability and ambient effects on capillary lengths over 30'.

* All switch options have limited DC capabilities. Consult factory for details.

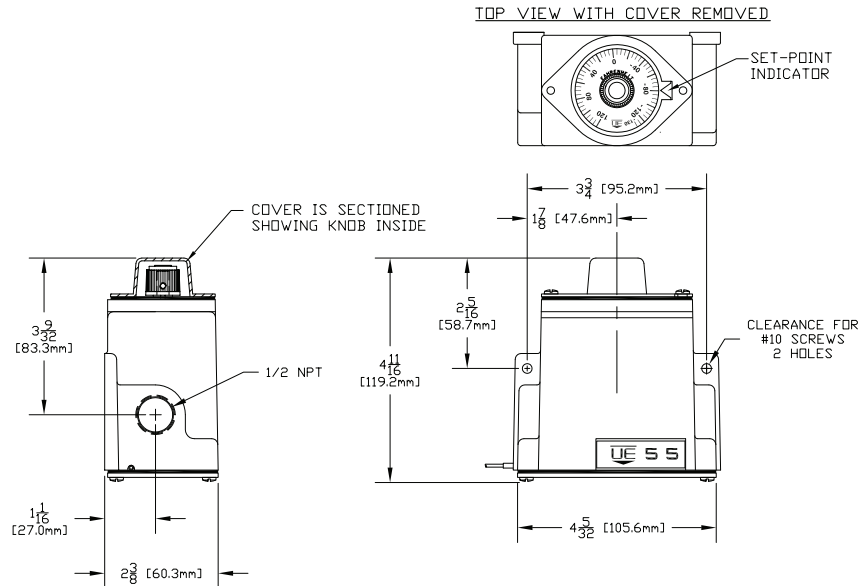
** Dimensional drawings for union connectors and thermowells may be found at www.ueonline.com



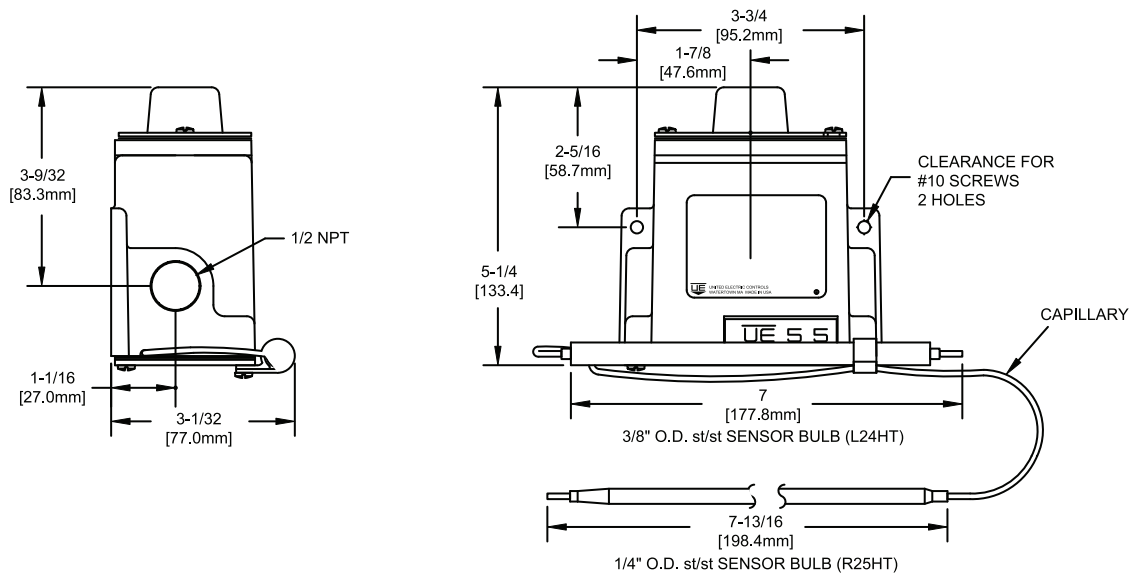
DIMENSIONAL DRAWINGS

(Dimensional drawings for all models may be found at www.ueonline.com)

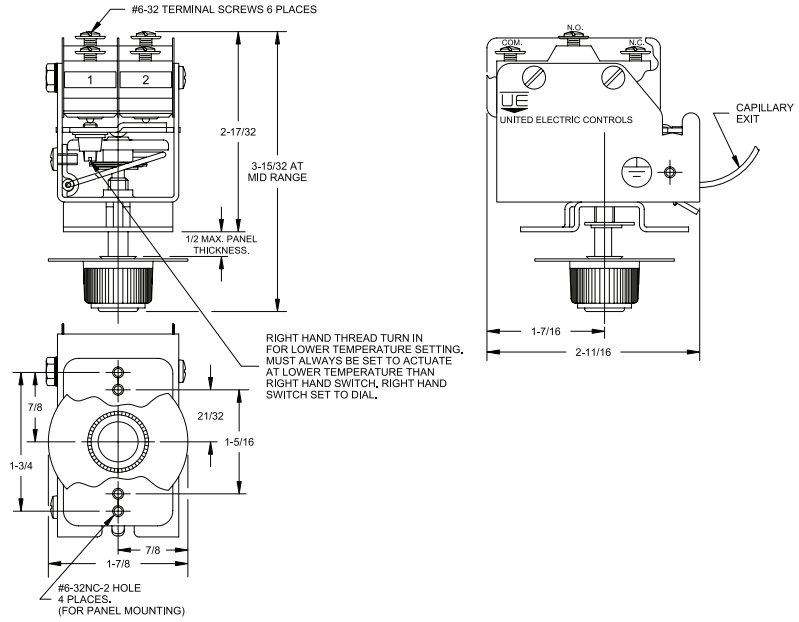
Types E55 / E55A



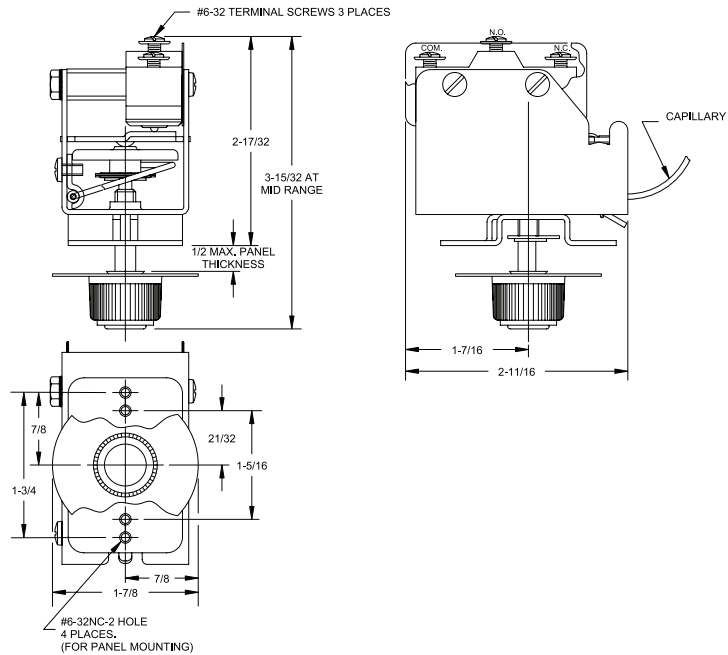
Type E55 Heat Tracing Models



Type E55AS



Type E55S



RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

SELLER'S LIABILITY TO BUYER FOR ANY LOSS OR CLAIM, INCLUDING LIABILITY INCURRED IN CONNECTION WITH (I) BREACH OF ANY WARRANTY WHATSOEVER, EXPRESSED OR IMPLIED, (II) A BREACH OF CONTRACT, (III) A NEGLIGENT ACT OR ACTS (OR NEGLIGENT FAILURE TO ACT) COMMITTED BY SELLER, OR (IV) AN ACT FOR WHICH STRICT LIABILITY WILL BE INPUTTED TO SELLER, IS LIMITED TO THE "LIMITED WARRANTY" OF REPAIR AND/OR REPLACEMENT AS SO STATED IN OUR WARRANTY OF PRODUCT. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL OR OTHER DAMAGES OF A LIKE GENERAL NATURE, INCLUDING, WITHOUT LIMITATION, LOSS OF PROFITS OR PRODUCTION, OR LOSS OR EXPENSES OF ANY NATURE INCURRED BY

FOR A LIST OF OUR INTERNATIONAL AND DOMESTIC
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Power Supplies

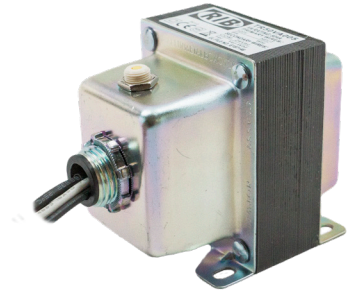
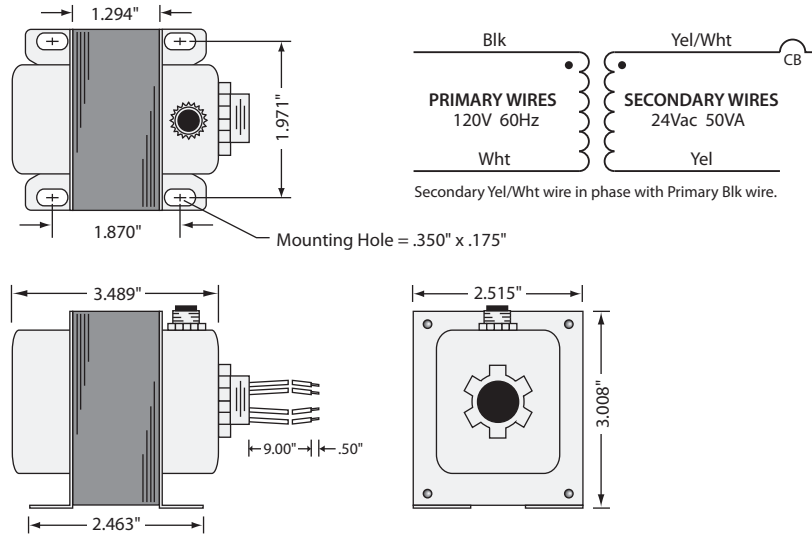
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TRANSFORMER

TR50VA005

Transformer 50 VA, 120 to 24 Vac, Circuit Breaker, Foot and Single Threaded Hub Mount



SPECIFICATIONS

- VA Rating:** 50
- Frequency:** 50/60 Hz
- Mounting:** Foot & Single Threaded Hub
- Over Current Protection:** Circuit Breaker
- Dimensions:** 3.489" x 2.515" x 3.008" (w/ .500" NPT Hub)
- Wire Length:** 9" Typical w/ .5" Strip
- Operating Temperature:** -30 to 140° F
- MTBF:** 100,000 Hours @ 77° F
- Construction:** Split-Bobbin
- Approvals:** Class 2 UL5085-3 Listed, C-UL, CE, RoHS

TERMS AND CONDITIONS OF SALE

1. OFFER, GOVERNING PROVISIONS AND CANCELLATIONS: This document constitutes an offer or counter-offer by Functional Devices, Inc. or any of its affiliates ("**Seller**") to sell various products as agreed by Seller ("**Products**") to the buyer named on the reverse side of this document or in other applicable print or electronic documentation ("**Buyer**") in accordance with these terms and conditions. This writing is not an acceptance of any offer made by Buyer. This offer or counter-offer is expressly conditioned upon Buyer's assent to these terms and conditions and no others. Buyer is deemed to have assented to these terms and conditions (including Seller's warranty) when the first of the following occurs: A. Buyer signs and delivers to Seller an acknowledgement copy of any of Seller's quotation, order acknowledgement or invoice forms; B. Buyer gives to Seller (orally or in writing) specifications of quantity and/or type, assortments thereof, delivery dates, shipping instructions, instructions to bill, or the like as to all or any part of the Products; C. Buyer receives delivery of any of the Products; or, D. Buyer has otherwise assented to the terms and conditions hereof.

Where an attachment to this Agreement or separate document referencing this Agreement consists of a quotation, the quotation remains open for acceptance for a period of thirty (30) days or such other period as specified in the quotation. Seller hereby rejects any additional or different terms or provisions contained in any purchase order, acknowledgment or other communication heretofore or hereafter received from Buyer. Seller's delivery of Products does not constitute an assent to any terms proposed by Buyer. Except for an officer of Seller, no representative of Seller has any authority to waive, alter, vary, amend, or add to the terms hereof. **THESE TERMS AND CONDITIONS OF SALE CONSTITUTE THE ENTIRE AGREEMENT ("AGREEMENT") BETWEEN SELLER AND BUYER WITH RESPECT TO THE MATTERS ADDRESSED HEREIN.**

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4. TAXES AND OTHER CHARGES: In addition to the prices quoted or invoiced, Buyer will pay any sales tax, excise tax, use tax, value added or consumption tax, customs duty (that is assessed on the delivery of Product(s) to a destination outside of the U.S.A.), fee or charge of any nature whatsoever imposed by any governmental authority on or measured by the transaction between Seller and Buyer. In the event Seller is required to pay any amount, Buyer will reimburse Seller therefore; or provide Seller, at the time the order is submitted, an exemption certificate or other document acceptable to the authority imposing the same. Seller does not accept and will not pay any fines, penalties or chargebacks from Buyer for any reason.

5. DELIVERY, RISK OF LOSS, CLAIMS AND FORCE MAJEURE:

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B. Buyer will only make written claims to Seller for damages, shortages or other delivery errors within seven (7) calendar days after receipt of shipment. All Products received by Buyer, or Buyer's clients, customers, or agents, that are not rejected within such time will be deemed accepted. Failure to provide such written notice constitutes a waiver of all such claims regarding such shipment by Buyer. Buyer will not revoke acceptance.

C. Seller is not liable for any damage as a result of any delay or failure to deliver due to any act of God, act of Buyer, embargo or other governmental act, regulation or request, fire, accident, power outage, strike, civil unrest, weather, slowdown or other labor difficulties, war, riot, act of terrorism, delay in transportation, defaults of common carriers, inability to obtain necessary labor, materials or manufacturing facilities or, without limiting the foregoing, any other delays beyond Seller's control. Buyer's sole and exclusive remedy for any delays or for Seller's inability to deliver Products for any reason, in each case, that persists for more than ninety (90) days, is to cancel the order pursuant to Seller's Order Policies and Guidelines available upon request.

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that such Product was originally defective, then Seller will at its option repair or replace the product without charge upon prepaid delivery of such Product to Seller's facility with proof of date of purchase. Corrections of such defects by repair to or supplying of replacements for defective parts shall constitute fulfillment of all obligations of Seller.

Seller shall not be liable for loss, damage, or expense directly or indirectly caused from the failure of Products to perform as expected.

EXCEPT AS SET FORTH HEREIN, SELLER DISCLAIMS ALL REPRESENTATIONS OR WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE. NO PERSON (INCLUDING ANY AGENT, DEALER OR REPRESENTATIVE OF SELLER) IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY CONCERNING PRODUCTS EXCEPT TO REFER BUYER TO THIS AGREEMENT. BUYER WARRANTS THAT BUYER HAS NOT RELIED ON ANY OTHER WARRANTIES OR REPRESENTATIONS CONCERNING THE PRODUCTS OR THIS AGREEMENT.

For warranty service, call factory for RA number and send such Product prepared with sales receipt to: FUNCTIONAL DEVICES, INC., 101 COMMERCE DRIVE, SHARPSVILLE, IN 46068.

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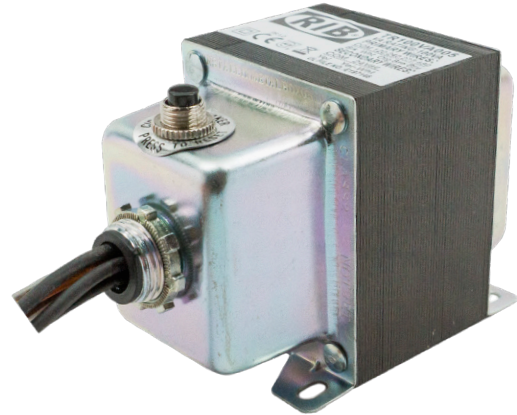
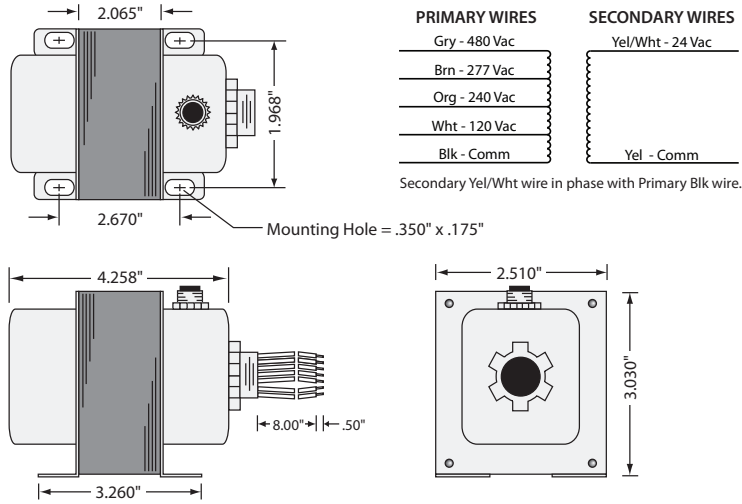
10. EXPORTS. Buyer agrees that it will comply with any and all U.S. Export Controls and will not pay for, resell, transfer or knowingly sell Products in violation of U.S. Export Controls. If Buyer resells Products within or exports Products to a country or region which imposes upon Seller and/or Buyer an obligation to fund or undertake reuse, recycling, composting, recovery of Products, or any similar obligation (e.g., the European Union's Waste Electrical and Electronic Equipment Directive, EC 2002/96/EC) (the "**Obligations**"), Buyer shall wholly undertake the Obligations or duties and shall be entirely responsible for all associated costs therewith. Seller shall have no obligation to reimburse Buyer for execution of the Obligations. In the event that Seller is named in a proceeding based upon the Obligations, Buyer shall indemnify, defend and hold Seller harmless from all actions related thereto, including all civil and governmental actions.

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TRANSFORMER

TR100VA005

Transformer 96 VA, 480/277/240/120 to 24 Vac, Circuit Breaker, Foot and Single Threaded Hub Mount



SPECIFICATIONS

- VA Rating:** 96
- Frequency:** 50/60 Hz
- Mounting:** Foot & Single Threaded Hub
- Over Current Protection:** Circuit Breaker
- Dimensions:** 4.258" x 2.510" x 3.030" (w/ .500" NPT Hub)
- Wire Length:** 8" Typical w/ .5" Strip
- Operating Temperature:** -30 to 140° F
- MTBF:** 100,000 Hours @ 77° F
- Construction:** Split-Bobbin
- Approvals:** Class 2 UL5085-3 Listed, C-UL, CE, RoHS

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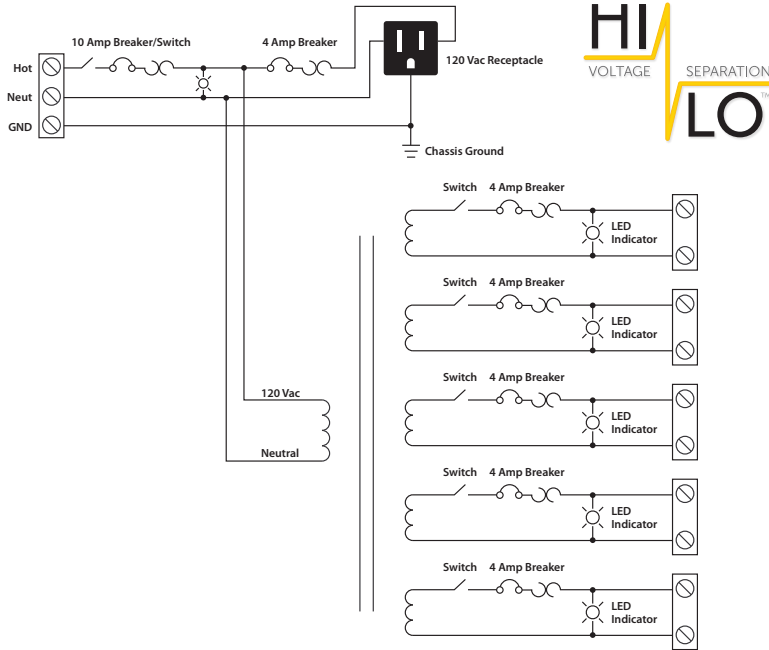
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AC POWER SUPPLY

PSH500AB10-LVC

Enclosed 500VA Power Supply, **High/Low Voltage Separation** with Five 100VA Class 2 Outputs, 120 Vac to 24 Vac with 120 Vac Receptacle



PSH500AB10-LVC
Shown With High Voltage
Cover & Low Voltage
Access Plate



SPECIFICATIONS

Transformer: One (1) 500 VA
Over Current Protection: Circuit Breaker
Primary: 120 Vac
Frequency: 50/60 Hz
Main Breaker ON/OFF: Switch / Breaker (10 Amp)
 (Kills power to entire unit:
 1 Outlet & Transformer)
Approvals: Class 2 (UL Approved UL5085-3),
 UL916, C-UL, CE, RoHS
Dimensions: 12.125" x 12.125" x 6.000"
Housing: NEMA1 Metal Enclosure with
 high/low separation

5 Secondaries:
 24 Vac, with LED Indicators
 4 Amp breaker for each output

24 Vac ON/OFF:
 On / Off Switch & Breaker

Input:
 120 Vac **Finger-Safe Terminals**, 8-18 AWG

Output:
 5 Ungrounded, Isolated, 100 VA Class 2,
 24 Vac Outputs. Removable Terminals
 accept 16-22 AWG wire.

Ambient Temperature Derating:
 4A up to 40° C ; 3A up to 50° C ; 2A up to 55° C
 (When All 5 Outputs Operated Simultaneously)

Standby Wattage:
 48.515 W @ 120 Vac

Full Load Primary Current:
 4.66 A @ 120 Vac

Secondary Output Voltage vs. Load:
 24.0V @ 1 Amp
 23.0V @ 2 Amp
 21.8V @ 3 Amp
 21.1V @ 4 Amp

• When all 5 outputs operated
 simultaneously, at room
 temperature

Notes:
 • 4A (Breaker protected) Convenience
 Receptacle Provided

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C. Seller is not liable for any damage as a result of any delay or failure to deliver due to any act of God, act of Buyer, embargo or other governmental act, regulation or request, fire, accident, power outage, strike, civil unrest, weather, slowdown or other labor difficulties, war, riot, act of terrorism, delay in transportation, defaults of common carriers, inability to obtain necessary labor, materials or manufacturing facilities or, without limiting the foregoing, any other delays beyond Seller's control. Buyer's sole and exclusive remedy for any delays or for Seller's inability to deliver Products for any reason, in each case, that persists for more than ninety (90) days, is to cancel the order pursuant to Seller's Order Policies and Guidelines available upon request.

6. WARRANTY; DISCLAIMER. Products are warranted to be free from manufacturing defects under normal use and conditions for five (5) years (the "**Warranty Period**").

The warranty does not apply to: (a) Damage caused by accident, abuse, mishandling, or dropping; (b) Products which have been subjected to unauthorized repair, opened, or taken apart; (c) Products not used in accordance with directions; (d) Damages exceeding the cost of such Product; and (e) Damages caused by lightning, water, or condensation. If warranty service is required during the Warranty Period, and if examination shall disclose to Seller's satisfaction

that such Product was originally defective, then Seller will at its option repair or replace the product without charge upon prepaid delivery of such Product to Seller's facility with proof of date of purchase. Corrections of such defects by repair to or supplying of replacements for defective parts shall constitute fulfillment of all obligations of Seller.

Seller shall not be liable for loss, damage, or expense directly or indirectly caused from the failure of Products to perform as expected.

EXCEPT AS SET FORTH HEREIN, SELLER DISCLAIMS ALL REPRESENTATIONS OR WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE. NO PERSON (INCLUDING ANY AGENT, DEALER OR REPRESENTATIVE OF SELLER) IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY CONCERNING PRODUCTS EXCEPT TO REFER BUYER TO THIS AGREEMENT. BUYER WARRANTS THAT BUYER HAS NOT RELIED ON ANY OTHER WARRANTIES OR REPRESENTATIONS CONCERNING THE PRODUCTS OR THIS AGREEMENT.

For warranty service, call factory for RA number and send such Product prepared with sales receipt to: FUNCTIONAL DEVICES, INC., 101 COMMERCE DRIVE, SHARPSVILLE, IN 46068.

7. LIMITATION OF LIABILITY: SELLER WILL NOT BE LIABLE FOR ANY LOSS OF PROFIT, INTERRUPTION OF BUSINESS OR ANY OTHER SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES SUFFERED OR SUSTAINED BY BUYER FOR ANY REASON. EXCEPT FOR CLAIMS OF DEATH OR PERSONAL INJURY, IN NO EVENT WILL SELLER'S AGGREGATE LIABILITY TO BUYER ARISING UNDER OR IN ANY WAY RELATED TO THIS AGREEMENT FOR ANY REASON (INCLUDING, BUT NOT LIMITED TO, LIABILITY ARISING FROM NEGLIGENCE OR ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE) EXCEED THE TOTAL AMOUNT PAID BY BUYER TO SELLER HEREUNDER FOR ANY PRODUCT GIVING RISE TO A CLAIM UNDER THIS AGREEMENT.

8. RETURNS: Unless otherwise approved by Seller in writing in its sole discretion, except in the case of a non-conforming shipment or a warranty issue, Buyer may not return Products. If Seller approves the return of Products pursuant to the preceding sentence, such returned Products must be returned within ninety (90) days from date of invoice and will be subject to a 25% restocking fee. In the event of a non-conforming shipment or a warranty issue, Buyer may return Products, but only if Buyer first: (a) provides notice to Seller as required in this Agreement, (b) obtains prior authorization from Seller, and (c) all Products or containers for which return is properly authorized have been marked with a return authorization number supplied by Seller. Buyer will make all returns via a traceable form such as Federal Express, UPS or insured mail and in resalable condition. Buyer will pay all return shipping charges and any other charges associated therewith.

9. CANCELLATIONS: Cancellation or deferment of all or part of an order is subject to acceptance by the Seller. If accepted, any reduction in quantity of any item to less than 85% of the original item quantity is subject to a 15% cancellation charge. If an order cancellation is accepted, the Buyer will make delivery and pay for all material manufactured and in stock or in process at time of notice for such order, and for any special materials on orders for which the Seller must take delivery.

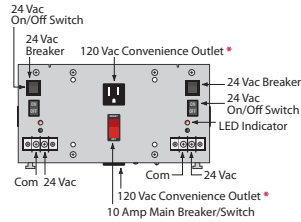
10. EXPORTS. Buyer agrees that it will comply with any and all U.S. Export Controls and will not pay for, resell, transfer or knowingly sell Products in violation of U.S. Export Controls. If Buyer resells Products within or exports Products to a country or region which imposes upon Seller and/or Buyer an obligation to fund or undertake reuse, recycling, composting, recovery of Products, or any similar obligation (e.g., the European Union's Waste Electrical and Electronic Equipment Directive, EC 2002/96/EC) (the "**Obligations**"), Buyer shall wholly undertake the Obligations or duties and shall be entirely responsible for all associated costs therewith. Seller shall have no obligation to reimburse Buyer for execution of the Obligations. In the event that Seller is named in a proceeding based upon the Obligations, Buyer shall indemnify, defend and hold Seller harmless from all actions related thereto, including all civil and governmental actions.

11. MISCELLANEOUS. This Agreement is governed by the laws of the State of Indiana, without giving effect to its conflict of laws principles. Buyer hereby irrevocably consents and submits to the exclusive jurisdiction and venue of the state and federal courts in Marion County, Indiana. The United Nations Convention for Contracts for the International Sale of Goods is explicitly excluded. Each provision contained in this Agreement constitutes a separate and distinct provision severable from all other provisions. If any provision (or any part thereof) is unenforceable under or prohibited by any present or future law, then such provision (or part thereof) will be amended, and is hereby amended, so as to be in compliance with such law, while preserving to the maximum extent possible the intent of the original provision. Any provision (or part thereof) that cannot be so amended will be severed from this Agreement; and, all the remaining provisions of this Agreement will remain unimpaired. No modification, addition or deletion, or waiver of any rights under this Agreement is binding on a party unless made in a non-preprinted agreement clearly understood by the parties to be a modification or waiver, and signed by a duly authorized representative of each party.

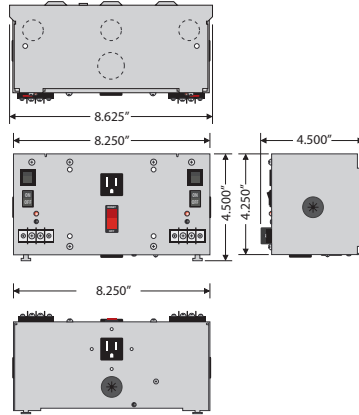
AC POWER SUPPLY

PSH100A100A Series

Enclosed Dual 100 VA Power Supplies, 120 to 24 Vac



* Move internal jumper to "HOT" position if you wish outlets to always be hot otherwise outlets will be switched by main breaker.



PSH100A100A SERIES SELECTION GUIDE

Model #	120 Vac Outlets	Aux Output Wire	Main Breaker on Input Power	Secondary Configuration
PSH100A100A	•			External Terminal Strip
PSH100A100AW	•			Internal Wires
PSH100A100AB10*	•	•	10 Amp Switch / Breaker	External Terminal Strip
PSH100A100AWB10*	•	•	10 Amp Switch / Breaker	Internal Wires

SPECIFICATIONS

Transformer: Two 100 VA Split-Bobbin
Over Current Protection: Circuit Breaker
Frequency: 50/60 Hz
24 Vac ON/OFF: On / Off Switch & Breaker
Main Breaker ON/OFF: Switch / Breaker (10 Amp)
 (Kills power to entire unit: Outlets, Aux. Output, & Transformer)*
Temperature: 40° C
Approvals: Class 2 (UL Approved UL5085-3), UL916, UL508, C-UL, CE, RoHS,
 Special Δ Seismic Certification of Equipment and Components: OSP-0201-10
Dimensions: 4.500" x 8.625" x 4.500"

Input Wires: "B10" Models Only
Input Power Wires
 BLK: 120 Vac
 WHT: Neutral
 GRN: Ground
Outlet Wires
 BLK: 120 Vac
 WHT: Neutral
 GRN: Ground

Output Wires: "B10" Models Only
Auxiliary Output
 BLU: 120 Vac
 "W" Models Only
Transformer Output
 WHT/YEL: 24 Vac
 WHT/BLU: Common

Notes:
 • Output derating may exceed 20% due to elevated ambient temperature or heat buildup in device over time.
 • Design is in accordance with ASCE 7-05 Chapter 13: Δ
www.oshpd.ca.gov/FDD/Pre-Approval/OSP-0201-10.pdf

TERMS AND CONDITIONS OF SALE

1. OFFER, GOVERNING PROVISIONS AND CANCELLATIONS: This document constitutes an offer or counter-offer by Functional Devices, Inc. or any of its affiliates ("**Seller**") to sell various products as agreed by Seller ("**Products**") to the buyer named on the reverse side of this document or in other applicable print or electronic documentation ("**Buyer**") in accordance with these terms and conditions. This writing is not an acceptance of any offer made by Buyer. This offer or counter-offer is expressly conditioned upon Buyer's assent to these terms and conditions and no others. Buyer is deemed to have assented to these terms and conditions (including Seller's warranty) when the first of the following occurs: A. Buyer signs and delivers to Seller an acknowledgement copy of any of Seller's quotation, order acknowledgement or invoice forms; B. Buyer gives to Seller (orally or in writing) specifications of quantity and/or type, assortments thereof, delivery dates, shipping instructions, instructions to bill, or the like as to all or any part of the Products; C. Buyer receives delivery of any of the Products; or, D. Buyer has otherwise assented to the terms and conditions hereof.

Where an attachment to this Agreement or separate document referencing this Agreement consists of a quotation, the quotation remains open for acceptance for a period of thirty (30) days or such other period as specified in the quotation. Seller hereby rejects any additional or different terms or provisions contained in any purchase order, acknowledgment or other communication heretofore or hereafter received from Buyer. Seller's delivery of Products does not constitute an assent to any terms proposed by Buyer. Except for an officer of Seller, no representative of Seller has any authority to waive, alter, vary, amend, or add to the terms hereof. **THESE TERMS AND CONDITIONS OF SALE CONSTITUTE THE ENTIRE AGREEMENT ("AGREEMENT") BETWEEN SELLER AND BUYER WITH RESPECT TO THE MATTERS ADDRESSED HEREIN.**

2. PRICES: The prices for the Products are based on the terms and conditions herein, including the limitations of liability and warranties, and all such terms and conditions are material to the sale of the Products. In the event Seller fails to provide a price quote and/or terms prior to the acceptance of the order, Buyer will pay Seller's then-current list price for such Products. All quotations and invoices show the net selling price of each item quoted. In the event of a mathematical error, the quoted price per Product governs.

3. TERMS OF PAYMENT: Buyer will pay the fees specified in each invoice provided by Seller in United States Dollars within thirty (30) calendar days after the invoice date unless otherwise agreed to in writing by an authorized representative of Seller. Any amount due under this Agreement that remains unpaid after its due date will bear interest from the date that such payment became delinquent until the date it is paid in full at the lower of 1.5% per month, which equals an annual percentage rate of 18%, or the maximum rate permitted by law. Seller reserves the right to establish, revoke or modify credit terms for Buyer at any time. No discounts are allowed unless otherwise agreed to in writing by an authorized representative of Seller. Buyer will pay any collection fees, legal fees, or court costs incurred by Seller to collect past due amounts. No offsets or setoffs of payments due to Seller hereunder are allowed with respect to any other agreement between the parties. Seller hereby retains a lien on the goods sold for unpaid purchase money as herein provided.

4. TAXES AND OTHER CHARGES: In addition to the prices quoted or invoiced, Buyer will pay any sales tax, excise tax, use tax, value added or consumption tax, customs duty (that is assessed on the delivery of Product(s) to a destination outside of the U.S.A.), fee or charge of any nature whatsoever imposed by any governmental authority on or measured by the transaction between Seller and Buyer. In the event Seller is required to pay any amount, Buyer will reimburse Seller therefore; or provide Seller, at the time the order is submitted, an exemption certificate or other document acceptable to the authority imposing the same. Seller does not accept and will not pay any fines, penalties or chargebacks from Buyer for any reason.

5. DELIVERY, RISK OF LOSS, CLAIMS AND FORCE MAJEURE:

A. All prices quoted for products are Ex-Works (Incoterms 2010) at a shipping facility determined by Seller, unless otherwise noted by Seller ("**Seller's Shipping Facility**"). Risk of loss or damage, and beneficial ownership, of the Products are transferred to Buyer when the Products are made available to Buyer at Seller's Shipping Facility. All delivery dates are approximate.

B. Buyer will only make written claims to Seller for damages, shortages or other delivery errors within seven (7) calendar days after receipt of shipment. All Products received by Buyer, or Buyer's clients, customers, or agents, that are not rejected within such time will be deemed accepted. Failure to provide such written notice constitutes a waiver of all such claims regarding such shipment by Buyer. Buyer will not revoke acceptance.

C. Seller is not liable for any damage as a result of any delay or failure to deliver due to any act of God, act of Buyer, embargo or other governmental act, regulation or request, fire, accident, power outage, strike, civil unrest, weather, slowdown or other labor difficulties, war, riot, act of terrorism, delay in transportation, defaults of common carriers, inability to obtain necessary labor, materials or manufacturing facilities or, without limiting the foregoing, any other delays beyond Seller's control. Buyer's sole and exclusive remedy for any delays or for Seller's inability to deliver Products for any reason, in each case, that persists for more than ninety (90) days, is to cancel the order pursuant to Seller's Order Policies and Guidelines available upon request.

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10. EXPORTS. Buyer agrees that it will comply with any and all U.S. Export Controls and will not pay for, resell, transfer or knowingly sell Products in violation of U.S. Export Controls. If Buyer resells Products within or exports Products to a country or region which imposes upon Seller and/or Buyer an obligation to fund or undertake reuse, recycling, composting, recovery of Products, or any similar obligation (e.g., the European Union's Waste Electrical and Electronic Equipment Directive, EC 2002/96/EC) (the "**Obligations**"), Buyer shall wholly undertake the Obligations or duties and shall be entirely responsible for all associated costs therewith. Seller shall have no obligation to reimburse Buyer for execution of the Obligations. In the event that Seller is named in a proceeding based upon the Obligations, Buyer shall indemnify, defend and hold Seller harmless from all actions related thereto, including all civil and governmental actions.

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Uninterruptible Power Supplies

(This page is hyperlinked to the TOC)

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9SX1000
Eaton 9SX online, extended runtime UPS, 1000 VA, 900 W, 5-15P input, Outputs: (6) 5-15R, 9.9"Hx6.3"Wx15.1"D, 30.9 lb., network card optional

General specifications

Product Name
Catalog Number
UPC
Product Length/Depth
Product Height
Product Width
Product Weight
Compliances
Certifications

Battery

Runtime graph

Battery management

Electrical output

Battery replacement
Extended battery capability
Receptacle
Topology
Wattage
VA rating
Output waveform
Voltage
Output power factor
Output nominal voltage
Output frequency
Feed type

Electrical input

Input connection
Input cord length
Input frequency range
Input power factor

Communications

Communication

Expansion slots
User interface

Environmental Additional specifications	<p>Potential free switch contact</p> <p>Temperature range</p> <p>Form factor</p> <p>Construction type</p> <p>Package contents</p> <p>Internal bypass</p>
Warranty and support	<p>Standard factory warranty</p>
Brochures Certification reports Drawings	<p>Extended service plans</p> <p>Eaton 9SX UPS brochure</p> <p>EC DoC Eaton 9SX</p> <p>Eaton 9SX UPS visio stencils</p> <p>9SX1000 UPS 3D technical drawing</p> <p>9SX1000 UPS 2D technical drawing</p>
Product specification guides	<p>Eaton 9SX UPS technical specifications</p> <p>Quick start guide for Eaton 9SX UPS 120V</p>
User guides	<p>models</p>
Date	<p>Eaton 9SX UPS installation and user manual</p> <p>Mon Nov 22 2021</p>

Eaton 9SX UPS

9SX1000

7.43172E+11

15.1 in

9.9 in

6.3 in

30.9 lb

FCC Compliant CE Marked

cULus Listed

View runtime graph

ABM technology (3-stage charging extends battery service life by 50% and provides advance warning for battery replacement)

Hot-swappable internal batteries and extended battery modules (EBMs)

Yes

(6) 5-15R

Online/Double-conversion

900 W

1000 VA

True sine wave

120V

0.9

120V default (100/110/120/125V)

50/60 Hz

1

5-15P

8 ft

60 Hz: 50–70 Hz, 50 Hz: 40–60 Hz

>.99

(1) MiniSlot|(1) USB port|(1) Serial RS-232 port|(1) RPO/ROO/Signal input terminal|(1) mini-terminal block for output relay

(1) Mini-Slot (MS) expansion port. Optional connectivity cards may be ordered separately.|-

Gigabit Web/SNMP card part number:

NETWORK-M2|- Modbus card part number:

MODBUS-MS|- Relay card part number: RELAY-MS

5-button graphical user interface

0° to 40°C (32° to 104°F)

Tower

Free standing model

9SX 1000 VA UPS|Quick start guide|RS-232
serial cable|USB cable

2-YEAR FACTORY WARRANTY|- 2 years|- Parts,
electronics and batteries coverage|- Standard
ground shipping|- Technical support

ADVANCED DEPOT EXCHANGE|-5-year depot
repair: 9SW5Y-1000UC|-Expedited parts
coverage for 5 years|-Parts, electronics and UPS
batteries coverage|-Next business day shipping|-
Technical support| |5-YEAR ON-SITE PLAN:
WFLN75XX-2509UC |- On-site parts and labor
coverage for years 5|- Parts, electronics and UPS
batteries coverage|- 24x7 on-site labor
coverage, next-day response|- Next-day
shipping|- Technical support

Zone Sensors

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