Model IDP10S Differential Pressure Transmitter with HART® Communication Protocol

IDP10S
LOW PROFILE
STRUCTURE LP1

IDP10S
TRADITIONAL
STRUCTURE

IDP10S
LOW PROFILE
STRUCTURE LP2

The Foxboro® Pressure S Series Model IDP10S transmitter is an intelligent, two-wire d/p Cell® transmitter that provides precise, reliable measurement of differential pressure, and transmits a 4 to 20 mA output signal with a superimposed HART® digital signal for remote configuration and monitoring.

FEATURES

- Unique patented FoxCal™ feature enables using multiple factory preset calibrated ranges that provide up to 30:1 turndown capability and maintain published accuracy without the need for field calibration.
- Time in Service meter features cumulative power-up time and time powered since last user reset.
- Field-proven piezoresistive silicon microsensors.
- Simple, elegant sensor packaging with very few parts; achieves exceptionally high reliability.
- Durable aluminum or 316 ss housing options available; both meet NEMA 4X and IEC IP66/68 ratings.
- Support for HART 6 communication protocol in single loop or multidrop mode.
- Remote configuration capability via a HART communicator or PC-based configurator; local configuration capability via an optional LCD display with on-board pushbuttons.
- User-entered cutoff point from 0 to 20% of maximum flow.
- Available with traditional or low profile structures.
- Can be provided as a sealed measurement system with numerous configurations of direct connect or capillary connected seals available.
- Optional mounting bracket sets allow pipe, surface, or manifold mounting of transmitter.
- Industry standard 316L ss, Co-Ni-Cr, nickel alloy(1), Monel™, or Tantalum sensor materials, depending on transmitter structure.

1. Equivalent to Hastelloy® C. Hastelloy is a registered trademark of Haynes International, Inc.

- CE Marked; complies with applicable EMC, ATEX, and PED European Directives.
- Multi-marking is available for FM, CSA, and ATEX intrinsically safe installations. The user determines and permanently marks on the data plate the certification to be applied.
- Complies with NAMUR NE 21 interference immunity requirement, and NAMUR NE 43 for analog output overrange and underrange annunciations
- Complies with Electromagnetic Compatibility Requirements of European EMC Directive 2004/108/EC by conforming to the following EN and IEC Standards: EN 61326-1, and IEC 61000-4-2 through 61000-4-6.
- Designed for hazardous area installations. Versions available to meet agency flameproof and zone requirements.
- Dual Seal certified by CSA to meet ANSI/ISA 12.27.01-2003 requirements.
- Standard 5-year warranty.

HART COMMUNICATION PROTOCOL

4 to 20 mA with HART 6 communications allows direct analog connection to common receivers while still providing full digital communications using a HART communicator, PC-based configurator, or optional LCD display.

Measurements and diagnostics are available from the HART communicator connected to the two-wire loop carrying the 4 to 20 mA measurement signal by using a bidirectional digital signal superimposed on the 4 to 20 mA current signal.

Multiple measurements are transmitted digitally, including not only the primary measurement in either pressure or flow units, but also the electronics and sensor temperatures which can be used to monitor external heat tracing equipment. Complete transmitter diagnostics are also communicated.

Configuration and reranging can be accomplished with a HART communicator, PC-based configurator, or the optional LCD display with pushbuttons.

TIME IN SERVICE METER

Similar to how an odometer allows an automobile owner to track the total number of miles driven and a trip odometer tracks the number of miles driven since a user-defined starting point, the IDP10S transmitter allows you to keep track of the number of days the transmitter has been in service. The Time In Service meter tracks both the total number of days the transmitter has been powered up in the field over its lifetime (total days), and also tracks the number of days the transmitter has been powered up since the last Time in Service meter reset (user days). You can reset the user days value to zero using a HART communicator, a PC-based configurator, or the optional local display, but you cannot reset the lifetime service parameter.

HIGH ACCURACY AND PERFORMANCE

Transmitters are accurate to ±0.05% of calibrated span in the digital linear mode, and ±0.060% of calibrated span in the 4 to 20 mA linear mode. This accuracy is maintained for a span adjustment turndown range of up to 30:1 for transmitters with Span Codes D and E, 20:1 for transmitters with Span Code C, and 10:1 for transmitters with Span Code B. See Figure 1 and Table 10. The IDP10S transmitter also provides excellent ambient temperature compensation via microprocessor-based correction.

WIDE MEASUREMENT RANGE WITH A MINIMUM OF SENSORS

Four d/p range sensors provide measurement spans from 0.12 to 21000 kPa (0.018 to 3000 psi). The high turndown capability of the transmitter means that nearly all d/p applications can be satisfied with only these four ranges, greatly simplifying your spare transmitter and spare parts requirements.

The turndown ratio for span adjustment is up to 400:1 for B and C range transmitters. This means, for example, that the IDP10S transmitter with its 200 inH_2O URL sensor can be set to provide a 4 to 20 mA output for any range between 0 to 0.5 and 0 to 200 inH_2O.

Figure 1. Reference Accuracy versus Span

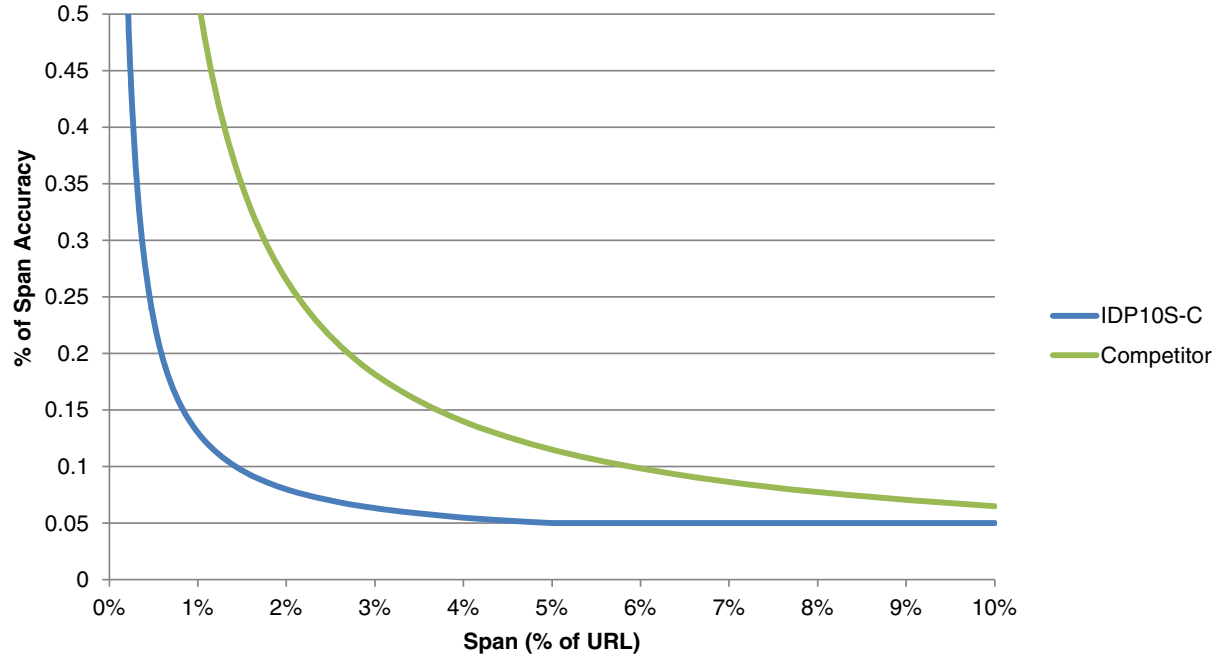
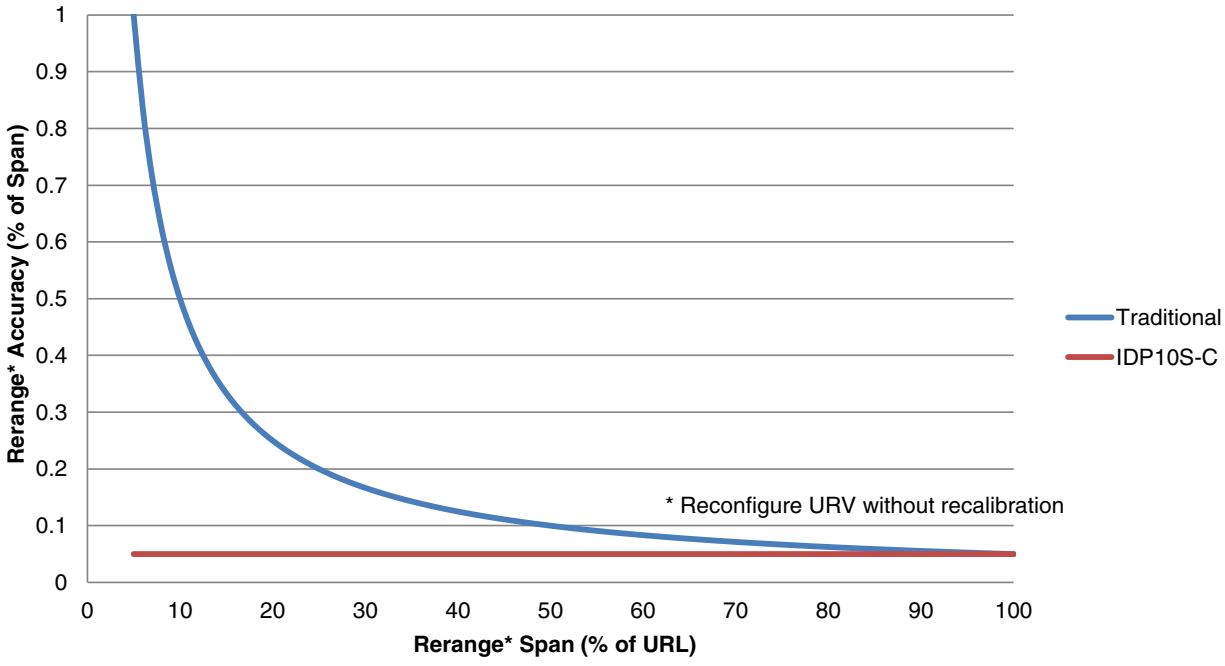


Figure 2. Rerange Accuracy of Transmitters with FoxCal Multiple Calibration



PATENTED FoxCal™ TECHNOLOGY

The Foxboro S Series differential pressure transmitter offers the FoxCal™ multiple calibration feature, which is unique patented technology that eliminates the need for a traditional single span calibration at an application-specific pressure range. A transmitter with FoxCal enabled uses multiple calibrated ranges that are stored in on-board memory. The calibrated ranges are preset in the factory and cover the full pressure range of the transmitter. During operation, a real-time, seamless transition from one calibrated range to another maintains digital accuracy as a percent of reading from 3% to 100% of the upper range limit (URL). See Figure 2.

Factory calibration and field calibration for specific applications are not required for zero-based ranges up to 30:1 turndown. You can simply configure or Rerange the upper range value (URV) without performing a recalibration at the URV. You will only need to perform a zero adjustment after installation to obtain performance to the specified reference accuracy.

OPTIONAL CALIBRATION CERTIFICATE

Optionally, you can request a calibration certificate with your IDP10S transmitter, which provides verification that the transmitter meets the reference accuracy specification within a user specified range.

For transmitters shipped with the FoxCal feature enabled and the Calibration Certificate option selected, the transmitters are not recalibrated to the user specified range. The LRV and URV points are configured (Reranged) to the user specified values and the accuracy is verified over that specific range.

CUSTOM FACTORY CALIBRATION

A custom two-point factory calibration is also available as a model code option. This option is useful if your application requires non-zero based ranges with greater than 10:1 turndown, zero-based ranges with greater than 30:1 turndown, or when mandated by a specific requirement. When a transmitter is shipped with the custom factory calibration option, the FoxCal multiple calibration feature is automatically disabled and a traditional two-point calibration is performed.

OPTIONAL LCD DIGITAL DISPLAY

A two-line digital display (Figure 23) with on-board pushbuttons is available to display the measurement with a choice of units. The pushbuttons allow zero and span adjustments, as well as local configuration without the need for a HART Communicator or PC-based configurator.

MULTIDROP COMMUNICATIONS

Either a point-to-point (Figure 21) or multidrop topology (Figure 22) is permitted. Multidrop communication is the connection of several transmitters to a single communications line. Communication between the host computer and transmitter takes place digitally, with the analog output of the transmitter fixed. With HART communication protocol, up to fifteen transmitters can be connected on a single twisted pair of wires or over leased telephone lines.

SENSOR CORROSION PROTECTION

For traditional structure, choice of 316L ss, Co-Ni-Cr, nickel alloy(2), Monel, gold-plated 316L ss, and tantalum materials. High corrosion resistance of Co-Ni-Cr (TI 037-078) means long service life in many difficult applications without the extra cost for exotic materials. See TI 037-75b for process applicability with Co-Ni-Cr and other process wetted materials.

For low profile structures LP1 and LP2, 316L ss and nickel alloy(2) are offered as sensor materials.

Refer to "Transmitter Structures" on page 6 for description and application of traditional and low profile (LP1 and LP2) structures.

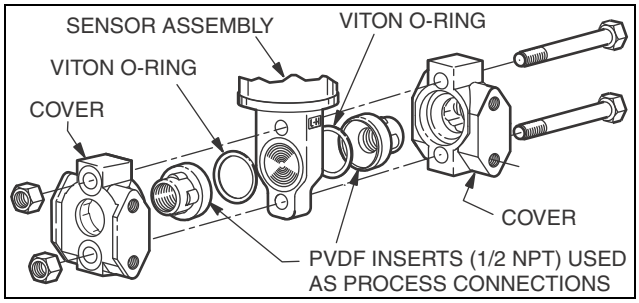
OPTIONAL MOUNTING BRACKET SETS

In addition to the standard style mounting bracket sets optionally offered with these transmitters, a unique universal style mounting bracket has been developed to allow wide flexibility in transmitter mounting configurations consistent with installation requirements. All mounting bracket sets allow mounting to a surface, pipe, or manifold. Refer to "Dimensions – Nominal" on page 33.

PROCESS CONNECTORS

Removable, gasketed process connectors allow a wide range of selections, including 1/4 NPT, 1/2 NPT, Rc 1/4, Rc 1/2, and weld neck connections. For highly corrosive chemical processes when a traditional structure is used (see "Transmitter Structures" on page 6), two 1/2 NPT PVDF inserts (Figure 3) are installed in both 316 ss covers and are used as the process connectors. In these applications, tantalum is used as the sensor diaphragm material.

Figure 3. Bottomworks Shown with 1/2 NPT PVDF Inserts Installed in HI- and LO-Side Covers with Traditional Structure



EASE OF INSTALLATION

Rotatable Topworks allows transmitter installation in tight places, allows display to be positioned in preferred direction, and eases field retrofit.

Two Conduit Entrances offer a choice of entry positions for ease of installation and self-draining of condensation regardless of mounting position and topworks rotation.

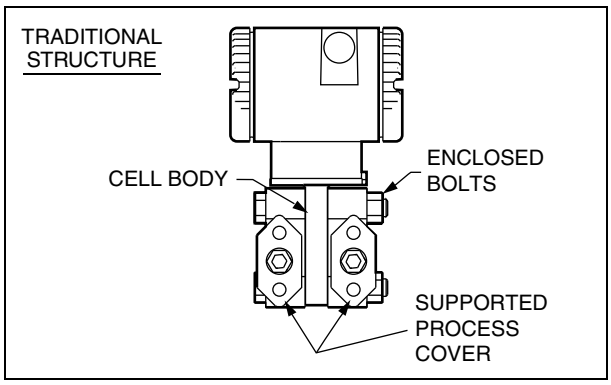
Wiring Guides and Terminations provide ease of wire entry and support, plenty of space to work and store excess wire, and large, rugged screw terminals for easy wire termination.

2. Equivalent to Hastelloy® C.

UNIQUE PROCESS COVER AND CELL BODY DESIGN

Biplanar Construction (Figure 4) maintains the traditional horizontal process connections and vertical mounting by providing a cell body contained between two process covers, while still achieving light weight, small size, and high standard static pressure rating of 25 MPa (3626 psi). This provides easy retrofit of any conventional differential pressure transmitter, and also is easily mounted in the horizontal position with vertical process connections, when required.

Figure 4. Biplanar Construction Shown with Traditional Horizontal Process Connections



Process Covers (Figure 4) are fully supported by the cell body over their entire height. This prevents bending and results in a highly reliable seal. Also, this provides dimensional stability to the process covers, ensuring that they will always mate properly with 3-valve bypass manifolds.

Process Cover Bolts (Figure 4) are enclosed to minimize corrosion and to minimize early elongation with rapid temperature increases. The design makes it less likely for the transmitter to release process liquid during a fire.

Process Cover Gaskets are PTFE as standard; PTFE provides nearly universal corrosion resistance, and eliminates the need to select and stock various elastomers to assure process compatibility.

Light Weight provides ease of handling, installation, and direct mounting without requiring costly pipe stands.

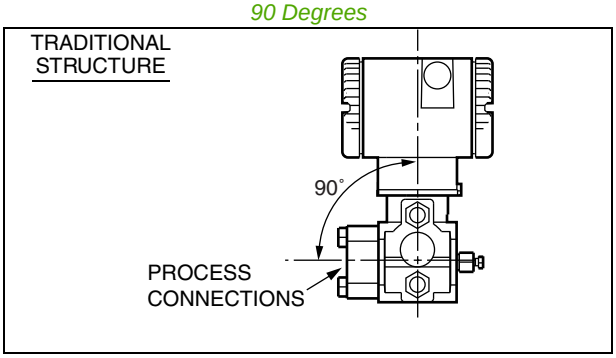
TRANSMITTER STRUCTURES

Traditional and low profile structures (LP1 and LP2) are offered to accommodate and to provide flexibility in transmitter installations.

Traditional Structure

The traditional structure (Figure 5) utilizes the right angle design common to most DP transmitters in use throughout the world. Process connections are oriented 90 degrees from the transmitter centerline. This traditional structure makes it easy to retrofit any transmitters of similar design.

Figure 5. Vertical Mounting Showing Process Connections at 90 Degrees



Sensor cavity venting and draining is provided for both vertical and horizontal transmitter installation, using innovative tangential connections to the sensor cavity (Figures 6 and 7). Optional side vents are offered for sensor cavity venting in the upright position (Figure 8).

Figure 6. Vertical Mounting - Cavity Draining

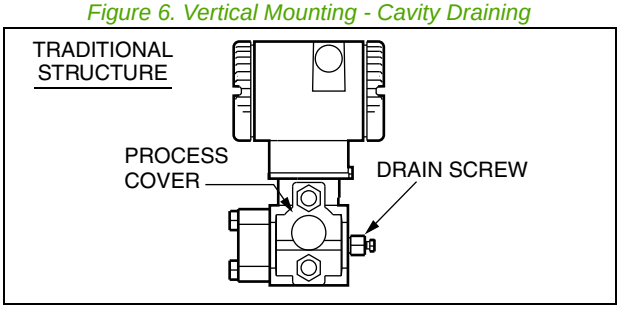


Figure 7. Horizontal Mounting - Cavity Venting, and Self-Draining into Process Line

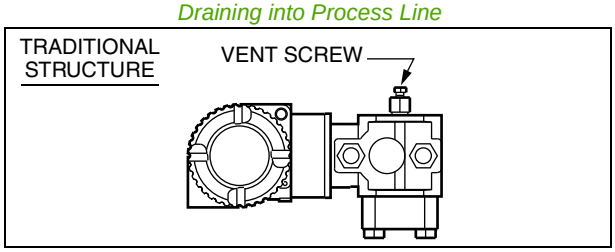
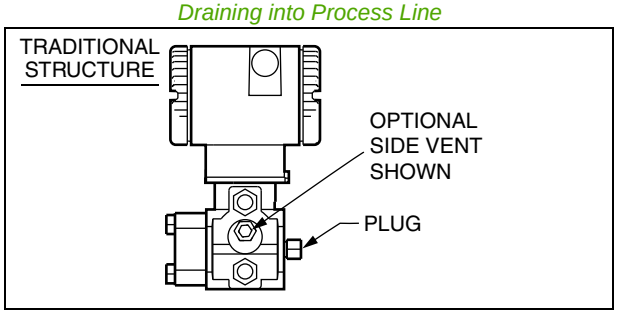


Figure 8. Vertical Mounting - Cavity Venting, and Self-Draining into Process Line



Low Profile Structures

The low profile structures utilize an in-line design, placing the process connections in line with the transmitter centerline (Figures 9 and 10). This allows mounting of the transmitter in the upright position with the process connections facing downward, for connection to vertical process piping or for mounting directly to a three- or five-valve manifold.

Figure 9. Low Profile Structure - LP1 Shown

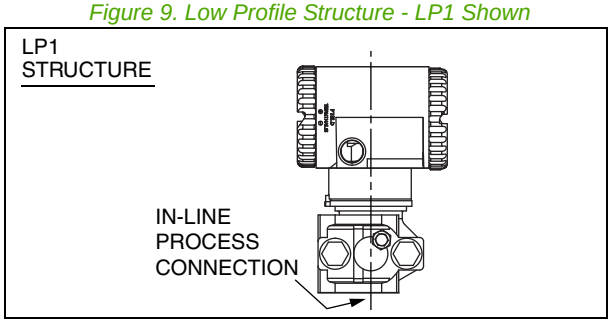
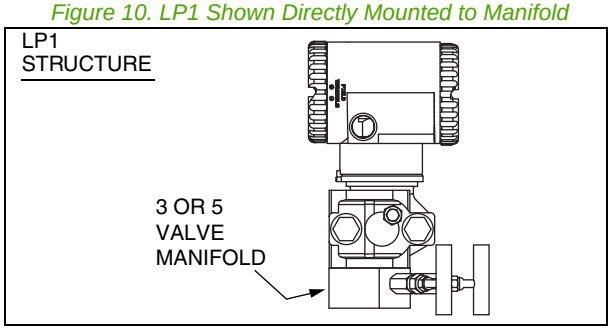


Figure 10. LP1 Shown Directly Mounted to Manifold



The low profile structures provide a mounting style similar to that used by competitive Coplanar™ transmitters. This makes it easy to select Foxboro transmitters for both retrofit and new applications where this type of installation is desired.

Transmitters with the low profile structure can be attached directly to existing, installed Coplanar manifolds, such as the Rosemount Model 305RC or Anderson Greenwood Models MB3, MB5G, and MB5P, by using an optional adapter plate (Figure 11). Also, when assembled to the same process piping or manifold as a Coplanar transmitter, one of the electrical conduit connections is located within ± one inch of the similar conduit connection on the competitive transmitter, assuring ease of retrofit or conformance with installation design drawings.

All parts making up the low profile versions are identical to the parts in the traditional version except for the process covers and the external shape of the sensor cell body.

For convenience, two types of low profile structures are offered, type LP1 and LP2. The process covers are the only transmitter parts that differ between structure types LP1 and LP2.

Low Profile Structure LP1 – Direct Mount

Low Profile Structure LP1 is a compact, inexpensive, lightweight design for direct mounting to a separately mounted manifold or process piping. These transmitters are not typically bracket-mounted.

They are supplied as standard with a single vent/drain screw in the side of each process cover. In conjunction with the standard tangential venting and draining design, they are suitable for mounting either vertically (Figure 11) or horizontally, and are suitable for nearly all applications, including liquids, gases, and steam. For horizontal installation, they can simply be “turned over” (rotated 180 degrees - Figures 13 and 14) to orient the high and low pressure sides in the preferred locations. There is no need to unbolt process covers. The topworks housing can also be rotated, as shown, to orient the conduit connections in the desired position.

In the vertical, upright position, they are also self-draining and are ideal for gas flow rate service, when directly mounted to a manifold located above the horizontal pipeline. The vent screw can be omitted for this or other applications, if desired.

Figure 11. LP1 Shown Mounted to a Coplanar Manifold using an Optional Intermediate Adapter Plate

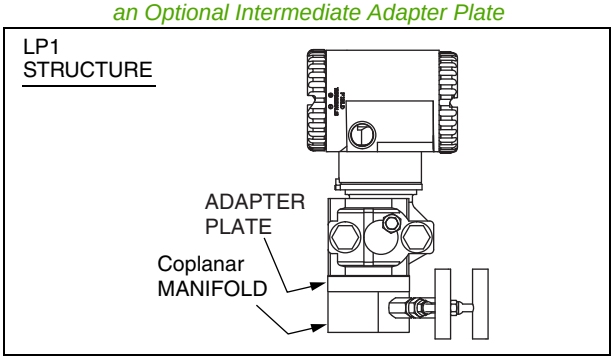


Figure 12. Upright Mounting

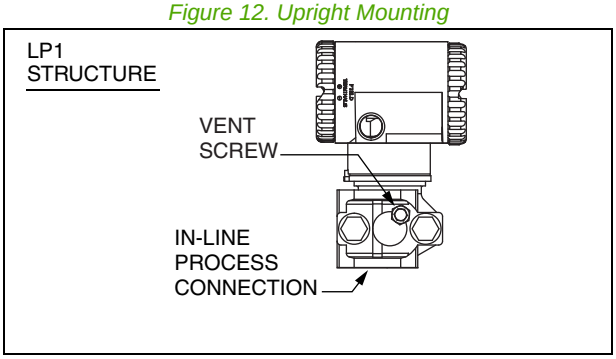


Figure 13. Horizontal Mounting with Vent Screw

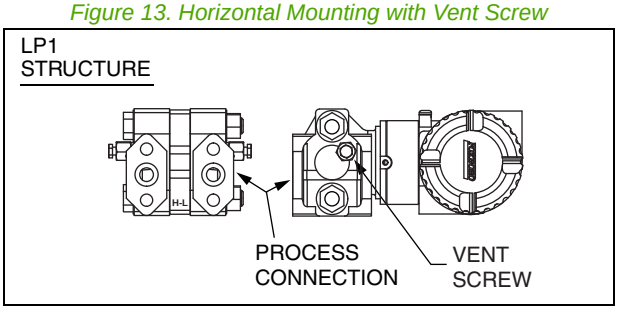
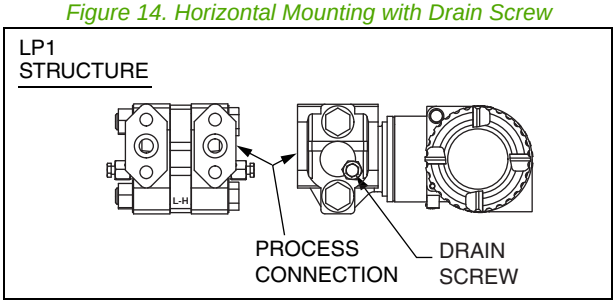


Figure 14. Horizontal Mounting with Drain Screw



Low Profile Structure LP2 - Bracket or Direct Mount

Low Profile Structure LP2 is a universal design for either bracket or direct mounting. Drilled and tapped mounting holes facilitate mounting to either new or existing Foxboro brackets (Options -M1, -M2, and -M3), as well as standard brackets supplied with existing Coplanar transmitters. See Figure 15 and Figure 16.

These transmitters can also be directly mounted to manifolds or process piping and are available with the same optional adapter used with low profile structure LP1 to fit existing Coplanar manifolds (Figure 17).

For extra convenience, they use a full-featured vent and drain design, with separate vent and drain screws positioned in each cover for complete venting or draining directly from the sensor cavity. They are normally recommended for upright, vertical installation.

Figure 15. Shown on Foxboro Universal Bracket

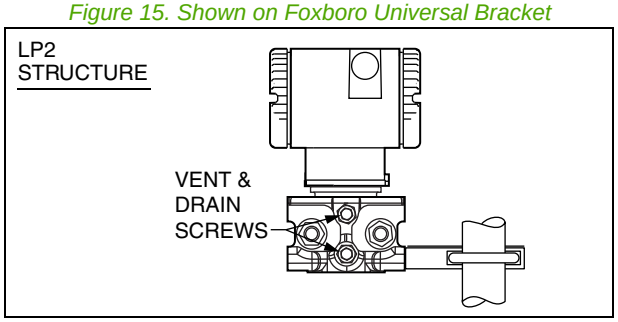


Figure 16. Shown on Coplanar Bracket

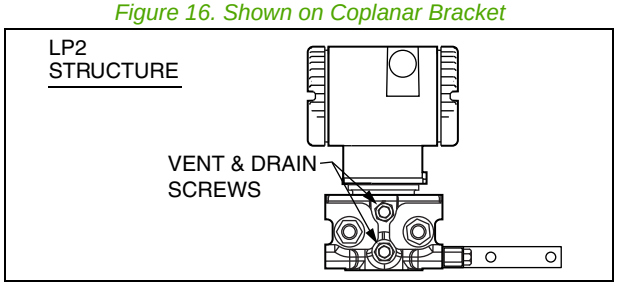
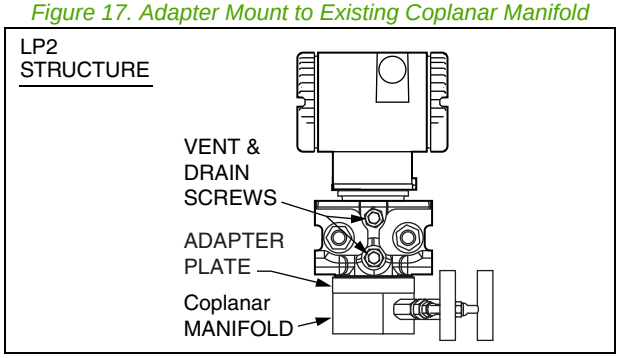


Figure 17. Adapter Mount to Existing Coplanar Manifold



PRESSURE SEALS

Pressure seals are used with transmitters having a traditional structure (see “Transmitter Structures” on page 6) when it is necessary to keep the transmitter isolated from the process. A sealed system is used for a process fluid that may be corrosive, viscous, subject to temperature extremes, toxic, sanitary, or tend to collect and solidify.

Table 1 lists the various pressure seals that can be used with an IDP10S transmitter. To order a transmitter with seals, both a Transmitter Model Number and Seal Model Number are required. For a complete listing of pressure seal models and specifications, see PSS 2A-1Z11 A. Also see Figure 18 for typical pressure seal configurations.

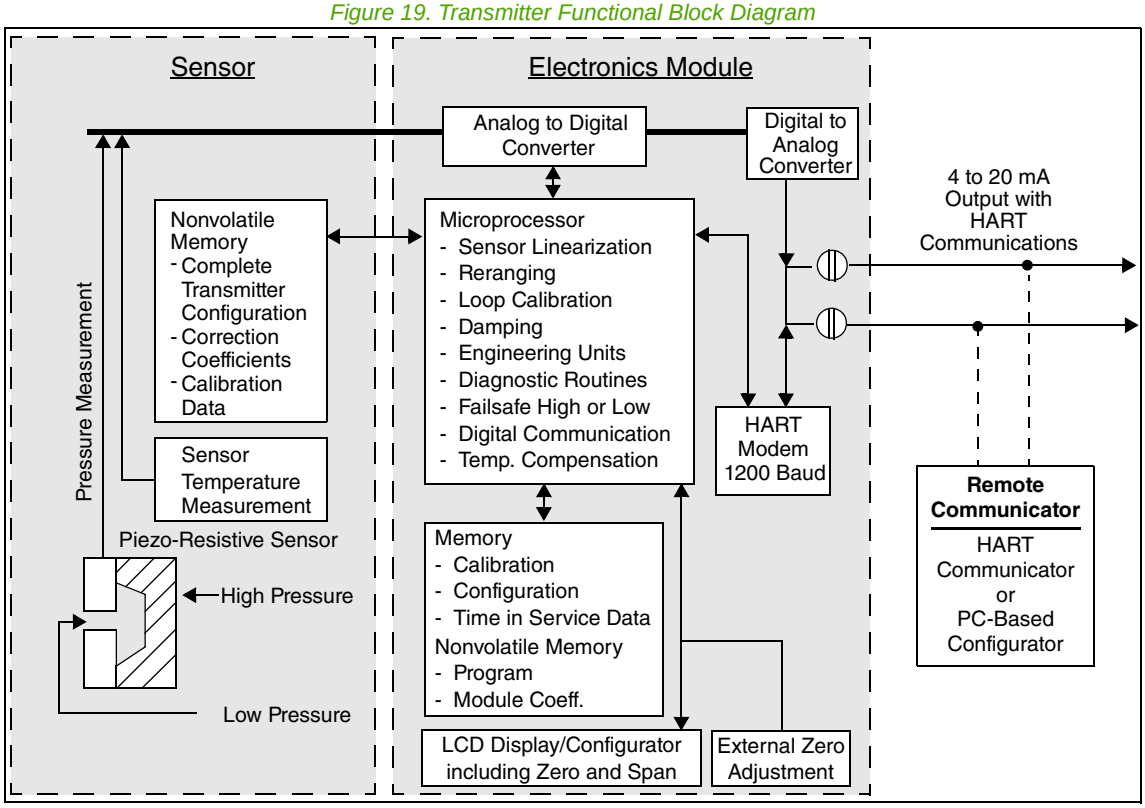
Table 1. Pressure Seals Used with IDP10S Transmitters

Seal Model	Seal Description	Process Connections
Direct Connect Pressure Seal Assemblies		
PSFLT	Flanged, Direct Connect (Flanged Level), Flush or Extended Diaphragm	ANSI Class 150/300/600 flanges and BS/DIN PN 10/40, 10/16, 25/40 flanges
PSSCT	Sanitary, Direct Connect (Level Seal), Flush Diaphragm	Process Connection to Sanitary Piping with 2- or 3-inch Tri-Clamp
PSSST	Sanitary, Direct Connect (Level Seal), Extended Diaphragm	Process Connection to 2-in Mini Spud or 4-in Standard Spud; Tri-Clamp
Remote Mount, Capillary-Connected Pressure Seal Assemblies		
PSFPS	Flanged, Remote Mount, Flush Diaphragm	ANSI Class 150/300/600 flanges and BS/DIN PN 10/40 flanges
PSFES	Flanged, Remote Mount, Extended Diaphragm	ANSI Class 150/300/600 flanges and BS/DIN PN 10/40, 10/16, 25/40 flanges
PSFAR	Flanged, Remote Mount, Recessed Diaphragm	ANSI Class 150/300/600/1500 flanges
PSTAR	Threaded, Remote Mount, Recessed Diaphragm	1/4, 1/2, 3/4, 1, or 1 1/2 NPT internal thread
PSISR	In-Line Saddle Weld, Remote Mount, Recessed Diaphragm	Lower housing of seal is in-line saddle welded to nominal 3- or 4-inch (and larger) Pipe
PSSCR	Sanitary, Remote Mount, Flush Diaphragm	Process Connection secured with a Tri-Clamp to a 2- or 3-inch pipe
PSSSR	Sanitary, Remote Mount, Extended Diaphragm	Process Connection to 2-in Mini Spud or 4-in Standard Spud; Tri-Clamp

Figure 18. Typical Pressure Seals used with IDP10S Transmitters

TRANSMITTER FUNCTIONAL BLOCK DIAGRAM

Figure 19. Transmitter Functional Block Diagram



FUNCTIONAL SPECIFICATIONS

Table 2. Span Limits for IDP10S Transmitters

Span Code	kPa	psi	mbar	bar	inH_2O (a)
B	0.12 and 50	0.02 and 7.21	1.2 and 497	0.0012 and 0.5	0.5 and 200
C	0.62 and 249	0.09 and 36.06	6.22 and 2,486	0.006 and 2.5	2.5 and 1,000
D	26 and 2,068	3.75 and 300	259 and 20,684	0.26 and 21	104 and 8,319
E (b)	259 and 20,684	37.5 and 3,000	2,586 and 206,843	2.6 and 207	1,040 and 83,189

a. Represents inches of water at 68°F.

b. When certain options are specified, the upper span and range limits are reduced as shown in Table 4.Span Limit Code E is not available with Structure Codes 78 and 79 (PVDF inserts in HI-side cover).

Table 3. Range Limits for IDP10S Transmitters (a)

Span Code	kPa	MPa	psi	inH_2O (b)
B	-50 and +50	-0.05 and +0.05	-7.21 and +7.21	-200 and +200
C	-249 and +249	-0.25 and +0.25	-36.06 and +36.06	-1000 and +1,000
D	-207 and +2,068	-0.21 and +2.1	-30 and +300	-832 and +8,319
E (c)	0 and 20,684	0 and 21	0 and 3000	0 and 83,189

a. Positive values indicate HI side of sensor at the high pressure, and negative values indicate LO side of sensor at the high pressure.

b. Represents inches of water at 68°F.

c. When certain options are specified, the upper span and range limits are reduced as shown in Table 4.

Table 4. Impact of Certain Options on Span and Range Limits (a)

Option	Description (Also see Model Code)	Span and Range Limits Derated to:
-B3	B7M Bolts and Nuts (NACE)	20 MPa (2900 psi, 200 bar)
-D1	DIN Construction	16 MPa (2320 psi, 160 bar)
-D5 or -B1	DIN Construction or 316 ss Bolting	15 MPa (2175 psi, 150 bar)
-D2, -D4, -D6, or -D8 (a)	DIN Construction	10 MPa (1500 psi, 100 bar) (a)

a. Refer to “Model Code” on page 26 for application and restrictions related to the items listed in the table.

Table 5. Maximum Static and Proof Pressure Ratings for IDP10S Transmitters (a)

Transmitter Configuration (See Model Code for Description of Options)	Static Pressure Rating		Proof Pressure Rating (b)	
	MPa	psi	MPa	psi
With Option -D9 or -Y	40	5800	100	14500
Standard or with Option -B2, -D3, -D7, -P3, -P7	25	3626	100	14500
With Option -B3, -P4, -P8	20	2900	700	11150
With Option -D1	16	2320	64	9280
With Option -B1, -D5, -P2, -P6	15	2175	60	8700
With Option -D2, -D4, -D6, or -D8	10	1500	40	6000
With Structure Codes 78 and 79 (PVDF insert)	2.1	300	8.4	1200

a. Refer to “Model Code” on page 26 for application and restrictions related to the items listed in the table.

b. Proof pressure ratings meet ANSI/ISA Standard S82.03-1988. Unit may become nonfunctional after application of proof pressure.

Output Signal and Configuration

Output is 4 to 20 mA with HART communications. When configured for multidrop applications, the mA signal is fixed at 4 mA to provide power to the device. Configurable using a HART communicator, PC-based configurator, or optional LCD display with on-board pushbuttons.

Electronics and Sensor Temperatures

Electronics and sensor temperatures are readable from the HART communicator, PC-based configurator, or optional LCD display with on-board pushbuttons. This measurement corresponds to the transmitter temperature at the sensor and electronic module; it is not necessarily the process temperature.

Field Wiring Reversal

No transmitter damage.

Suppressed Zero and Elevated Zero

Suppressed or elevated zero ranges are acceptable as long as the Span and Range Limits are not exceeded. See Table 3 and Table 2.

Zero and Span Adjustments

Zero and span adjustments can be initiated from the HART communicator, PC-based configurator, or optional LCD display with on-board pushbuttons.

Zeroing for Nonzero-Based Ranges

Dual Function Zeroing allows zeroing with the transmitter open to atmosphere, even when there is a nonzero-based range. This greatly simplifies position effect zeroing on many pressure and level applications. It applies to optional LCD display with on-board pushbuttons and optional External Zero Adjustment.

Current Outputs for Overrange, Fail, and Offline Conditions

OFFLINE	User configurable between 4 and 20 mA
SENSOR FAILURE	User configurable to Fail LO or Fail HI
FAIL LO	3.60 mA
UNDERRANGE	3.80 mA
OVERRANGE	20.50 mA
FAIL HI	21.00 mA

Write Protect Jumper

The transmitter has a write protect jumper that can be positioned to lock out all configurators from making transmitter database changes. This makes the transmitter suitable for Safety Shutdown System Applications that require this feature.

Square Root Low Flow Cutoff

The square root low flow cutoff (LFCI) is configurable using a HART communicator, PC-based configurator, or optional display. The square root low flow cutoff can be set to:

- Cutoff to zero at any flow rate between 0 and 20% of maximum flow
- Cutoff to zero at flows <10% of maximum flow (1% of maximum differential pressure)
- Active point-to-point line between zero and 20% of maximum flow (4% of maximum differential pressure).

Adjustable Damping

Damping is user-selectable to values of 0, 0.25, 0.5, 1, 2, 4, 8, 16, or 32 seconds.

NOTE

Selecting “DAMP 0” in the damping menu will give the fastest response. For optimal performance, “DAMP 0” is not recommended with turndown ranges exceeding 20:1.

Transmitter Response Time

Response time is defined as the time for the transmitter output to reach 63.2% of a process pressure change.

Typical Response Time (including maximum dead time of 50 ms): 125 ms(3)

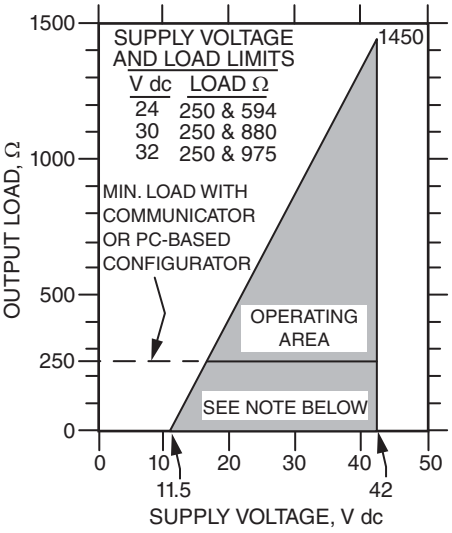
Minimum Allowable Absolute Pressure vs. Transmitter Temperature

- With Silicone Fill Fluid at Full vacuum: up to 121°C (250°F)

Supply Voltage Requirements and External Loop Load Limitations

Minimum voltage shown in Figure 20 is 11.5 V dc. This value can be reduced to 11 V dc by using a plug-in jumper across the test receptacles in the field wiring compartment terminal block shown in Figure 24.

Figure 20. 4 to 20 mA Output, Supply Voltage vs. Output Load



NOTE

Transmitter will function with an output load < 250 Ω provided that a HART Communicator or PC-based Configurator is not connected to it. Use of a HART Communicator or PC-based Configurator requires 250 Ω minimum load.

Configuration and Calibration Data and Electronics Upgradeability

All factory characterization data and user configuration and calibration data are stored in the sensor, as shown in the transmitter block diagram, Figure 19.

3. Reference conditions: Damping set to 0, low side at constant vent, 75 ± 3°F (Span Codes D and E have a maximum 50 psi step)

Communications

Transmitter communication is configurable for either analog (4 to 20 mA) or multidrop (fixed current) mode. Digital communications is provided in both modes based upon the FSK (Frequency Shift Keying) technique which alternately superimposes one of two different frequencies on the uninterrupted current carried by the two signal/power wires.

Analog Mode (4 to 20 mA)

The output signal is updated multiple times per second. Digital communications between the transmitter and HART Communicator or PC-based configurator is rated for distances up to 3,050 m (10,000 ft). The communications rate is 1200 baud and requires a minimum loop load of 250 ohms. See Figure 21.

Multidrop Mode (Fixed Current)

This mode supports communications with up to 15 transmitters on a single pair of signal/power wires. The digital output signal is updated 4 times per second and carries pressure measurement and sensor/electronics temperatures (internal recalculation rate for temperature is once per second). Communication between the transmitter and the system, or between the transmitter and HART communicator or configurator, is rated for distances up to 1525 m (5000 ft). The digital communications rate is 1200 baud and requires a minimum loop load of 250 ohms. See Figure 22.

Figure 21. 4 to 20 mA Output Block Diagram

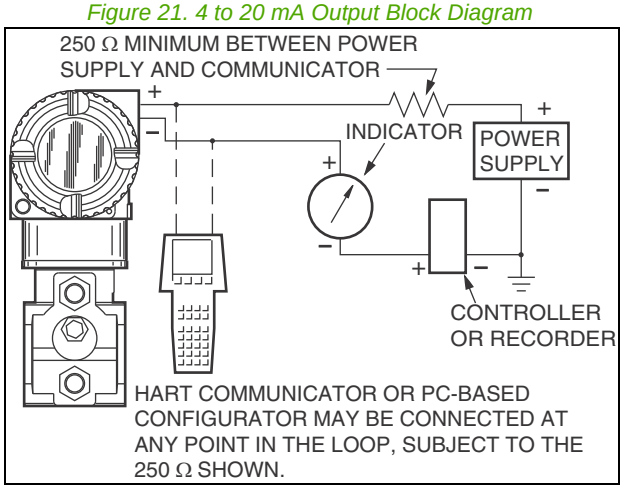
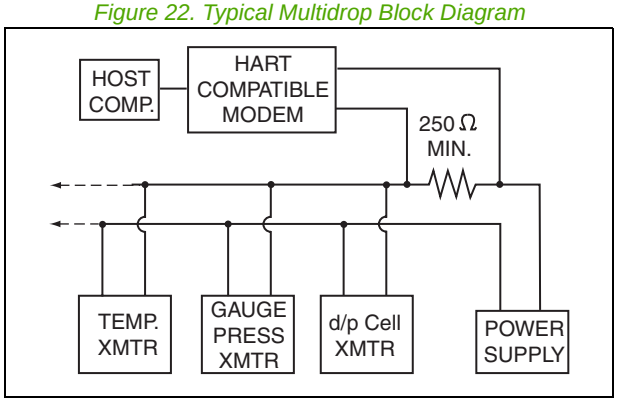


Figure 22. Typical Multidrop Block Diagram



Remote Communications

The HART communicator or PC-based configurator has full access to all of the "Display" and "Display and Reconfigure" items listed below. It may be connected to the communications wiring loop and does not disturb the mA current signal. Plug-in connection points are provided on the transmitter terminal block.

The following information can be continuously displayed:

- Process Measurement in two formats
- Electronics and Sensor Temperatures
- mA Output
- Total number of days the transmitter has been powered up (not configurable)
- Number of days the transmitter has been powered up since the last Time in Service meter reset.

The following information can be continuously displayed and configured:

- Choice of Pressure and Flow Engineering Units
- Reranging without Pressure
- Zero and Span Calibration
- Linear or Square Root Output
- Electronic Damping
- Temperature Sensor Failure Strategy
- User Damping (Process Noise Damping)
- Failsafe Direction (Fail High or Fail Low)
- Tag, Descriptor, and Message
- Poll Address
- Loop Current Mode (Multidrop mode)
- FoxCal multiple calibration (Enable or Disable)
- External Zero (Enable or Disable)
- Date of Last Calibration
- Number of days the transmitter has been powered up since the last Time in Service meter reset.

Configuration Capability

Calibrated Range

- Input range within span and range limits
- One of pressure units shown in Table 6

Output Measurement #1 – Digital Primary Variable and 4 to 20 mA

- Mode: Linear or Square Root
- Units for Linear mode: one of the pressure units shown in Table 6
- Units for Square Root mode: one of the flow units shown in Table 7

Output Measurement #2 – Digital Secondary Variable

- Mode: Linear or Square Root (independent of Measurement #1)
- Units for Linear mode: one of the pressure units shown in Table 6
- Units for Square Root mode: One of the flow units shown in Table 7

Table 6. Allowable Linear Pressure Units for Calibrated Range (a)

inH_2O ftH_2O mmH_2O mH_2O	psi inHg mmHg –	Pa kPa MPa –	atm bar mbar –	g/cm^2 torr kg/cm^2 –

a. See Optional Display for percent (%) display.

Table 7. Allowable Square Root (Flow) Units

% flow l/s l/m l/h Ml/d	gal/s gal/m gal/h gal/d Mgal/d	m^3/s m^3/m m^3/h Nm^3/h Sm^3/h Am^3/h m^3/d	ft^3/s ft^3/m ft^3/h ft^3/d	Igal/s Igal/m Igal/h Igal/d	bbl/s bbl/m bbl/h bbl/d lb/h kg/h t/h MMSCFD

Optional Custom Factory Calibration (Option -C1)

If you want to override the default FoxCal multiple calibration behavior, specify Option -C1 to replace FoxCal with a custom 2-point calibration. Be sure to indicate the calibration range required in the sales order. Refer to Table 8.

Optional Full Factory Configuration (Option -C2)

For the transmitter to be custom configured by the factory, you must fill out a data form. If this option is not selected, a standard (default) configuration will be provided. Refer to Table 9.

NOTE

Any of the configurable parameters in Table 8 or Table 9 can easily be changed using the HART communicator or PC-based configurator.

Table 8. Example of Custom Factory Calibration Option -C1

Parameter	Standard (Default) Configuration	Example of Option -C1
Calibrated Range		
Pressure EGU	Per sales order (a)	inH_2O
LRV	Per sales order (b)	0
URV	Per sales order (c)	100
Measurement #1		
Linear (Pressure) or Square Root (Flow)	Linear	Square Root
Pressure/Flow EGU	Per sales order (c)	gal/m
Range	Per sales order (c)	0 to 500 gal/m
Output	4 to 20 mA (d)	4 to 20 mA (d)
Measurement #2		
Linear (Pressure) or Square Root (Flow)	Linear	Linear
Pressure/Flow EGU	Per sales order (c)	inH_2O
Range	Per sales order (c)	0 to 100

a. Units from Table 6. If not specified, factory default calibration is zero to maximum span; default units vary by sensor code.

b. Within Span and Range Limits for selected sensor code.

c. Same as Calibrated Range.

d. Fixed current is used for multidrop applications.

Table 9. Example of Custom Full Factory Configuration Option -C2

Parameter	Default (Standard) Configuration	Example of Option -C2
Tagging Info.		
Tag (8 character maximum)	TAG	FT103A
Long Tag (32 character maximum)	TAG	FT103A
Descriptor (16 character maximum)	TAG NAME	FEEDWATER
Message (32 character maximum)	LOCATION	BUILDING 2
HART Poll Address (0 to 63)	0	0
Loop Current Mode	Enabled	Disabled (a)
Calibrated Range		
Pressure EGU	Per sales order (b)	inH_2O
LRV	FoxCal or custom cal. LRV per sales order (c)	0
URV	FoxCal or custom cal. URV per sales order (d)	100
Measurement #1		
Linear (Pressure) or Square Root (Flow)	Linear	Square Root
Pressure/Flow EGU	Per sales order (d)	gal/m
Range	Per sales order (d)	0-500 gal/m
Output	4 to 20 mA (e)	4 to 20 mA (e)
Measurement #2		
Linear (Pressure) or Square Root (Flow)	Linear	Linear
Pressure/Flow EGU	Per sales order (d)	inH_2O
Range	Per sales order (d)	0-100
Other		
Electronic Damping	0.25 s	0.5 s
Failsafe Direction	Upscale	Downscale
Failure Strategy	Continue	Failsafe
Ext. Zero Option	Enabled	Disabled

a. For multidrop configurations, the loop current mode is set to “fixed” or “disabled”, and the milliamp output is locked at a fixed value of 4.0 mA. For traditional point-to-point configurations, loop current mode is set to “active” or “enabled”.

b. Units from Table 6. If not specified, factory default calibration is zero to maximum span; default units vary by sensor code.

c. Within Span and Range Limits for selected sensor code.

d. Same as Calibrated Range.

e. Fixed current is used for multidrop applications.

Optional LCD Digital Display

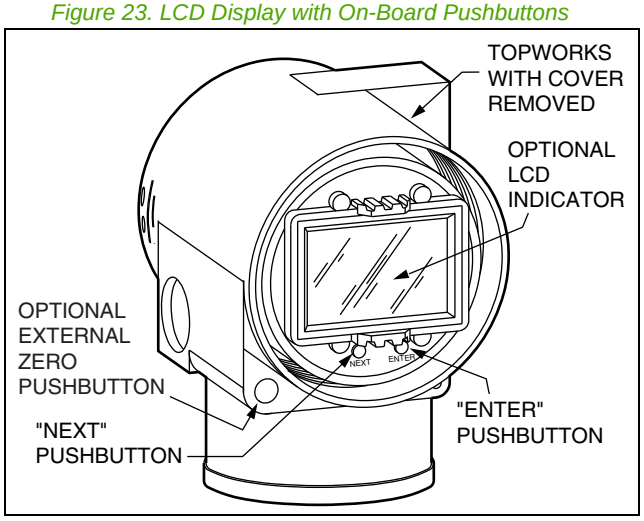
The following information appears on the optional digital display:

- Two Lines: Five numeric characters on the top line (four when a minus sign is needed); and seven alphanumeric characters on the bottom line.
- Measurement readout: The value appears on the top and a units label appears on the bottom.
- Configuration and calibration prompts.

The optional display also contains two pushbuttons that provide the following configuration and calibration functions:

- Zero and Span settings, noninteractive to automatically set output to either 4 mA or 20 mA using the “NEXT” and “ENTER” pushbuttons.
- 4 and 20 mA Jog Settings, allowing you to easily increment the mA output signal up or down in fine steps to match a value shown on an external calibrator.
- Linear or Square Root output
- User-entered cutoff point from 0 to 20% of maximum flow.
- Forward or Reverse output
- Damping adjustment
- Enable/disable optional External Zero
- Temperature Sensor Failure Strategy
- Failsafe Action (High or Low)
- Units Label (bottom line of display)
- Settable Lower and Upper Range Values for Transmission and Display (Top Line)
- Reranging without Pressure
- Percent (%) Output

Figure 23. LCD Display with On-Board Pushbuttons



Optional External Zero Adjustment

An external pushbutton (Figure 23) mechanism is isolated from the electronics compartment and magnetically activates an internal switch through the housing. This eliminates a potential leak path for moisture or contaminants to get into the electronics compartment. This zero adjustment can be disabled by a configuration selection.

OPERATING, STORAGE, AND TRANSPORTATION CONDITIONS

Influence	Reference Operating Conditions	Normal Operating Conditions (a) (b)	Operative Limits (a) (b)	Storage and Transportation Limits
Process Temperature With silicone fill fluid	24 ±2°C (75 ±3°F)	-29 to +82°C (-20 to +180°F)	-46 and +121°C (-50 and +250°F)	Not Applicable
Electronics Temperature With LCD display (c)	24 ±2°C (75 ±3°F) 24 ±2°C (75 ±3°F)	-29 to +82°C (-20 to +180°F) -20 to +82°C (-4 to +180°F)	-40 and +85°C (d) (-40 and +185°F) -40 and +85°C (d) (-40 and +185°F)	-54 and +85°C (-65 and +185°F) -54 and +85°C (-65 and +185°F)
Relative Humidity (e)	50 ±10%	0 to 100%	0 and 100%	0 and 100% Noncondensing
Ambient Pressure	860 to 1060 mbar	Atmospheric	Atmospheric	Atmospheric
Supply Voltage - mA Output (f)	30 ±0.5 V dc	11.5 to 42 V dc (g)	11.5 and 42 V dc (g)	Not Applicable
Output Load - mA Output (f)	650 Ω	0 to 1450 Ω	0 and 1450 Ω	Not Applicable
Vibration	1 m/s^2 (0.1 “g”)	With aluminum housing: Per IEC 60770 for “field with high vibration level or pipeline with high vibration level”, 0.42 mm peak to peak displacement from 10 to 60 Hz, 3 “g” constant acceleration input over a frequency range of 60 to 1000 Hz. With 316 ss housing: Per IEC 60770 for “field with general application or pipeline with low vibration level, 0.30 mm peak to peak displacement from 10 to 60 Hz, 2 “g” constant acceleration input over a frequency range of 60 to 1000 Hz.		11 m/s^2 (1.1 “g”) from 2.5 to 5 Hz (in shipping package)
Mounting Position	Upright or Horizontal (h)	Upright or Horizontal (h)	No Limit	Not Applicable

a. Normal Operating Conditions and Operative Limits are defined per ANSI/ISA 51.1-1979 (R1993).

b. When Traditional Structure Codes 78/79 (PVDF inserts in Hi- and Lo-side process covers) are used, maximum overrange is 2.1 MPa (300 psi), and temperature limits are -7 and +82°C (20 and 180°F); when DIN Construction Options D2/D4/D6/D8 are used, temperature limits are 0 and 60°C (32 and 140°F).

c. Although the LCD will not be damaged at any temperature within the “Storage and Transportation Limits”, updates will be slowed and readability decreased at temperatures outside the “Normal Operating Conditions”.

d. Refer to the Electrical Safety Specifications section for a restriction in ambient temperature limits with certain electrical approvals/certifications.

e. With topworks covers on and conduit entrances sealed.

f. Refer to “Supply Voltage Requirements and External Loop Load Limitations” on page 14.

g. Minimum voltage is 11.5 V dc. However, this value can be reduced to 11 V dc by using a plug-in jumper across the test receptacles in the field wiring compartment terminal block shown in Figure 24. Refer to “Supply Voltage Requirements and External Loop Load Limitations” on page 14.

h. Sensor process wetted diaphragms in a vertical plane.

PERFORMANCE SPECIFICATIONS

Zero-Based Calibrations; Cobalt-Nickel-Chromium or Stainless Steel Sensor with Silicone Fluid; Under Reference Operating Conditions unless otherwise Specified
URL = Upper Range Limit

Accuracy (Linearity, Hysteresis, and Repeatability)

Table 10. Accuracy – Linear Output (a)

Span Code	Reference Accuracy (% Span)	Reference Accuracy Turndown Limits (b)	Digital Accuracy for Turndowns greater than Reference Turndown Limits (% Span)	Digital Accuracy at 30:1 Turndown (% Span)	Digital Accuracy at 80:1 Turndown (% Span)
B	0.05	10	±[0.015 + 0.0035 (URL/Span)]%	0.120	0.295
C	0.05	20	±[0.03 + 0.001 (URL/Span)]%	0.060	0.110
D and E	0.05	30	±[0.001667 (URL/Span)]%	0.050	0.133

a. This table is for digital accuracy. Analog accuracy requires adding ±0.01% span.

b. The patented FoxCal multiple calibration technology maintains this accuracy for zero-based spans re-ranged down to these limits without the need for a span point recalibration.

Table 11. Accuracy – Square Root Output

Operating Point, % of Flow Rate Span	Accuracy, % of Flow Rate Span
50% and greater	Accuracy % from Table 10
Less than 50% (to cutoff)	$\frac{\text{(Accuracy \% from Table 10)(50)}}{\text{Operating Point in \% of Flow Rate Span}}$

Stability

Typical long term drift is less than ±0.25% for five years (reference conditions).

Calibration Frequency

The calibration frequency is five years. The five years is derived using the values of allowable error (% span), TPE (% span), performance margin (% span), and stability (% span/month); where:

$$\text{Calibration Frequency} = \frac{\text{Performance Margin}}{\text{Stability}} = \text{Months}$$

Power-up Time

Less than 5 seconds for output to reach first valid measurement.

RFI Effect

The output error is less than 0.1% of span within standard accuracy turn down limits, for radio frequencies from 27 to 1000 MHz and field intensity of 30 V/m when the transmitter is properly installed with shielded conduit and grounding, and housing covers are in place. (Per IEC Std. 61000-4-3.)

Supply Voltage Effect

Output changes less than 0.005% of span for each 1 V change within the specified supply voltage requirements. See Figure 20.

Vibration Effect

With Aluminum Housing

Per IEC 61298-3, Section 7, Table 2 for "field with high vibration level or pipeline with high vibration level": 0.42 mm peak to peak displacement from 10 to 60 Hz, 3 "g" constant acceleration input over a frequency range of 60 to 1000 Hz. Total effect is less than 0.1% of URL per "g".

With Stainless Housing

Per IEC 61298-3, Section 7, Table 2 for "field with general application or pipeline with low vibration level": 0.30 mm peak to peak displacement from 10 to 60 Hz, 2 "g" constant acceleration input over a frequency range of 60 to 1000 Hz. Total effect is less than 0.1% of URL per "g".

Position Effect

The transmitter may be mounted in any position. Any zero effect caused by the mounting position can be eliminated by rezeroing. There is no span effect.

Static Pressure Effect

The zero and span shift for a 1000 psi (7 MPa) change in static pressure is:

Zero Shift(4)

Span Code	Zero Shift-Static Pressure Effect
B	±0.07% URL
C	±0.02% URL
D and E	±0.50% URL (a)

a. Per 3.5 MPa (500 psi) for Span Code D.

Span Shift

±0.15% of reading

Switching and Indirect Lightning Transients

The transmitter can withstand a transient surge up to 2000 V common mode or 1000 V normal mode without permanent damage. The output shift is less than 1.0%. (Per ANSI/IEEE C62.41-1980 and IEC Std. 61000-4-5.)

Ambient Temperature Effect

For all span codes, the total effect for a 28°C (50°F) change within Normal Operating Condition limits is:

±(0.04% URL + 0.050% Span)

NOTE

For additional ambient temperature effect with pressure seals are used, see PSS 2A-1Z11 A.

4. Can be calibrated out by zeroing at nominal line pressure.

PHYSICAL SPECIFICATIONS

Process Cover and Connector Material (Process Wetted)

Carbon Steel, 316 ss, Monel, nickel alloy CW2M[5], or PVDF (Kynar™) inserts in 316 ss covers for transmitter traditional structure; and 316 ss for transmitter low profile structures. For exceptional value and corrosion resistance, 316 ss is the least expensive material.

Process Cover and Process Connection Gaskets

Glass filled PTFE, or Viton™ when Structure Codes 78/79 (PVDF inserts) are used.

Process Cover Bolts and Nuts

ASTM A193, Grade B7 high strength alloy steel for bolts, and ASTM A194 Grade 2H high strength alloy steel for nuts are standard. Options include NACE Class B7M bolting, 17-4 ss bolting, and 316 ss bolting.

Sensor Material (Process Wetted)

Co-Ni-Cr, 316 L ss, Gold-Plated 316L ss, Monel, nickel alloy[6], or tantalum for transmitter traditional structure; and 316L ss or nickel alloy[6] for transmitter low profile structures. For exceptional value and corrosion resistance, 316L ss is the least expensive material. Refer to TI 037-078 and TI 37-75b for information regarding the corrosion resistance of Co-Ni-Cr and other sensor materials.

Sensor Fill Fluid

Silicone Oil

Environmental Protection

The transmitter's enclosure has the weatherproof, dust-tight, and water-tight rating of IP67 as defined by IEC 60529, and provides the environmental and corrosion resistant protection rating of NEMA 4X.

Electronics Housing and Housing Covers

The housing has two compartments to separate the electronics from the field connections. The housing and covers are made from low copper (0.6% maximum) die-cast aluminum alloy with an epoxy finish, or from 316 ss. Buna-N O-ring seals are used to seal the threaded housing covers, housing neck, and terminal block.

Electrical Connections

Field and RTD sensor wires enter through 1/2 NPT or M20 threaded entrances, as specified, on either side of the electronics housing. Wires terminate under screw terminals and washers on terminal block in the field terminal compartment. Unused entrance is plugged to insure moisture and RFI/EMI protection. See Figure 24.

Electronics Module

Printed wiring assemblies are potted or conformally coated for moisture and dust protection.

Mounting Position

The transmitter may be mounted in any orientation.

Approximate Mass (with Process Connectors)

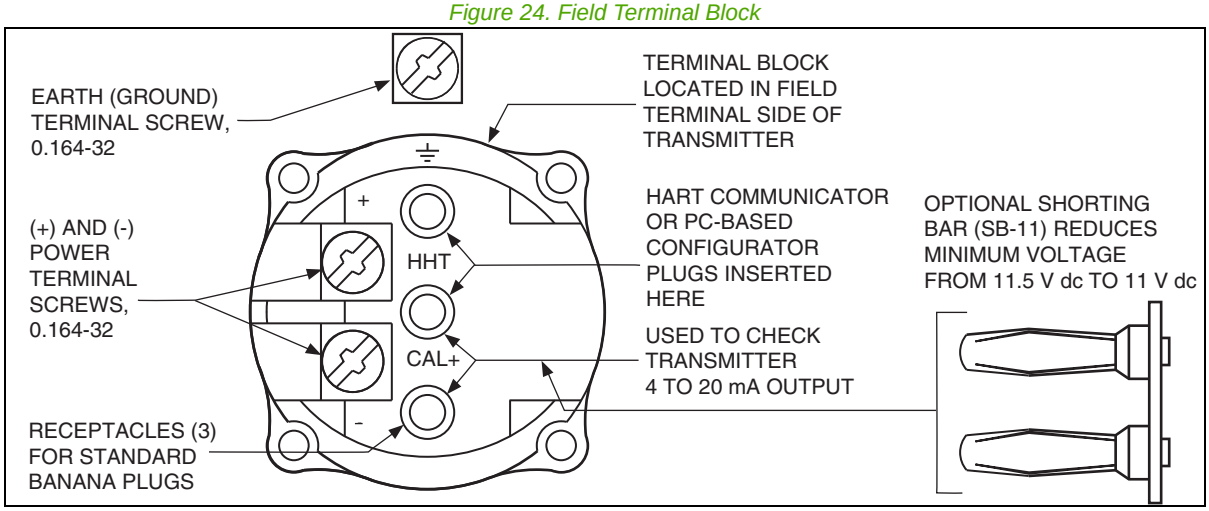
4.2 kg (9.2 lb) – with Traditional Structure
Add 0.1 kg (0.2 lb) – with Low Profile Structure LP1
Add 0.8 kg (1.8 lb) – with Low Profile Structure LP2
Add 1.1 kg (2.4 lb) – with 316 ss Housing
Add 0.2 kg (0.4 lb) – with LCD Display Option

Dimensions

See "Dimensions – Nominal" on page 33 and Dimensional Print DP 020-464.

5. Equivalent to Hastelloy® C-4C.
6. Equivalent to Hastelloy® C-276.

Figure 24. Field Terminal Block



ELECTRICAL SAFETY SPECIFICATIONS

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX intrinsically safe, Ex ia IIC	Temperature Class T4, Ta = -40°C to +80°C	AA
ATEX flameproof, Ex d IIC	Temperature Class T6, T85°C, Ta = -40°C to +75°C	AD
ATEX protection type n, Ex ic IIC or Ex nA	Temperature Class T4, Ta = -40°C to +80°C	AN
ATEX multiple certifications (includes ATEX Codes AA and AN)	Applies to Codes AA and AN	AM (a)
ATEX multiple certifications, ia, d, and n (includes ATEX Codes AA, AD, and AN)	Applies to Codes AA, AN, and AD	AP (a)
INMETRO intrinsically safe, Ex ia IIC	Temperature Class T4, Ta = -40°C to +80°C	BA
INMETRO flameproof, Ex d IIC	Temperature Class T6, T85°C, Ta = -40°C to +75°C	BD
CSA intrinsically safe, Zone certified Ex ia	Temperature Class T4A at 40°C and T3C at 85°C maximum ambient	CA
CSA zone certified flameproof Ex d IIC; also explosionproof and dust-ignition proof	T6, Maximum Ambient Temperature 75°C	CD
CSA non-incendive, Zone certified Ex nA IIC	Temperature Class T4A at 40°C and T3C at 85°C maximum ambient	CN
IECEx intrinsically safe, Ex ia IIC	Temperature Class T4, Ta = -40°C to +80°C	EA
IECEx flameproof, Ex d IIC	Temperature Class T6, Ta = -40°C to +75°C	ED
IECEx protection type n, Ex ic IIC or Ex nA	Temperature Class T4, Ta = -40°C to +80°C	EN
IECEx multiple certifications, ia, ic, nA (includes IECEx Codes EA and EN)	Applies to Codes EA and EN	EM (b)
IECEx multiple certifications, ia, ic, nA, and d (includes IECEx Codes EA, ED, and EN)	Applies to Codes EA, EN, and ED	EP (b)
FM Classes I, II, and III Division 1 intrinsically safe, AEx ia IIC	Temperature Class T4, Ta = -40°C to +80°C	FA

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
FM Classes I, II, and III Division 1 explosion proof, dust-ignition proof, Zone approved AEx d IIC	Temperature Class T6 at 75°C and T5 at 85°C maximum ambient	FD
FM Classes I, II, and III Division 2 non-incendive, Zone approved AEx nA IIC	Temperature Class T4, Ta = -40°C to +80°C	FN
Multi-marked for ATEX, CSA, and FM Intrinsically Safe Applications	Applies to Codes FA, CA and AA	MA (c)
No Certification	Not applicable	ZZ

a. When selecting ATEX Safety Design Code AM or AP, you must permanently mark (check off on rectangular box on data plate) one type of protection only (ia, d, or n). Do not change this mark once it has been applied.

b. When selecting IECEx Safety Design Code EM or EP, you must permanently mark (check off on rectangular box on data plate) one type of protection only (ia, d, or n). Do not change this mark once it has been applied.

c. When selecting Safety Design Code MA, you must permanently mark (check off in rectangular block on data plate) intrinsically safe certifications for ATEX, CSA, or FM, as applicable. Do not change this mark once it has been applied.

MODEL CODE

Description				Model
Intelligent Differential Pressure Transmitter				IDP10S
Electronics Versions and Output Signal				
HART and 4 to 20 mA				-T
Structure Code - Select from one of the following groups:				
Static Pressure	**Cover Material**	**Sensor Diaphragm Material**	**Sensor Fill Fluid**	
Transmitter with Traditional Structure (a)				
3626 psi	Steel	Co-Ni-Cr	Silicone	10
3626 psi	Steel	Co-Ni-Cr	Inert	11
3626 psi	Steel	316L ss	Silicone	12
3626 psi	Steel	316L ss	Inert	13
3626 psi	Steel	Nickel alloy (b)	Silicone	16
3626 psi	Steel	Nickel alloy (b)	Inert	17
3626 psi	316 ss	Co-Ni-Cr	Silicone	20
3626 psi	316 ss	Co-Ni-Cr	Inert	21
3626 psi	316 ss	316L ss	Silicone	22
3626 psi	316 ss	316L ss	Inert	23
3626 psi	316 ss	Monel	Silicone	24
3626 psi	316 ss	Monel	Inert	25
3626 psi	316 ss	Nickel alloy (b)	Silicone	26
3626 psi	316 ss	Nickel alloy (b)	Inert	27
3626 psi	Monel	Monel	Silicone	34
3626 psi	Monel	Monel	Inert	35
3626 psi	Nickel alloy (b)	Nickel alloy (b)	Silicone	46
3626 psi	Nickel alloy (b)	Nickel alloy (b)	Inert	47
3626 psi	Nickel alloy (b)	Tantalum	Silicone	48
3626 psi	Nickel alloy (b)	Tantalum	Inert	49
300 psi	PVDF Insert (Kynar) (Used with Process Connector Type 7)	Tantalum	Silicone	78 (c)
300 psi	PVDF Insert (Kynar) (Used with Process Connector Type 7)	Tantalum	Inert	79 (c)
Transmitters with Low Profile Structure LP1 Direct Mount (not available with pressure seals) (a)				
3626 psi	316 ss	316L ss	Silicone	LL
3626 psi	316 ss	316L ss	Inert	LM
3626 psi	316 ss	Nickel alloy (b)	Silicone	LC
3626 psi	316 ss	Nickel alloy (b)	Inert	LD
3626 psi	Nickel alloy (b)	Nickel alloy (b)	Silicone	CC
3626 psi	Nickel alloy (b)	Nickel alloy (b)	Inert	CD
Transmitters with Low Profile LP2 Bracket or Direct Mount (not available with pressure seals) (a)				
3626 psi	316 ss	316L ss	Silicone	52
3626 psi	316 ss	316L ss	Inert	53
3626 psi	316 ss	Nickel alloy (b)	Silicone	56
3626 psi	316 ss	Nickel alloy (b)	Inert	57

MODEL CODE (CONTINUED)

Description					Model
Transmitters with Pressure Seals (a) (d)					
HI Side	**LO Side**	**Cover Material**	**Sensor Diaphragm Material**	**Sensor Fill Fluid**	
Prep. for remote seal	Prep. for remote seal	316 ss	316 ss	Silicone	S1
Prep. for remote seal	Prep. for remote seal	316 ss	316 ss	Inert	S2
Prep. for remote seal	1/2 NPT connector	316 ss	316 ss	Silicone	S3
Prep. for remote seal	1/2 NPT connector	316 ss	316 ss	Inert	S4
1/2 NPT connector	Prep. for remote seal	316 ss	316 ss	Silicone	S5
1/2 NPT connector	Prep. for remote seal	316 ss	316 ss	Inert	S6
Direct connect seal	1/2 NPT connector	316 ss	316 ss	Silicone	F1
Direct connect seal	1/2 NPT connector	316 ss	316 ss	Inert	F2
Direct connect seal	Remote seal with capillary	316 ss	316 ss	Silicone	F3
Direct connect seal	Remote seal with capillary	316 ss	316 ss	Inert	F4
Remote seal	Remote seal	316 ss	316 ss	Silicone	SA
Remote seal	Remote seal	316 ss	316 ss	Inert	SB
Remote seal	1/2 NPT connector	316 ss	316 ss	Silicone	SC
Remote seal	1/2 NPT connector	316 ss	316 ss	Inert	SD
1/2 NPT connector	Remote seal	316 ss	316 ss	Silicone	SE
1/2 NPT connector	Remote seal	316 ss	316 ss	Inert	SF
Span Limits (Differential Pressure Units)					
inH_2O (at 68°F)	**kPa**	**mbar**			
0.5 and 200	0.12 and 50	1.2 and 500			B
2.5 and 1000	0.625 and 250	6.25 and 2500			C
psi	**MPa**	**bar**			
3.75 and 300	0.025 and 2.1	0.25 and 21			D
37.5 and 3000	0.25 and 21	2.5 and 210			E (e)
Process Connector Type (material is the same as the process cover material)					
None (select code 0 if a pressure seal is specified; otherwise, select an option from 1 through 7 below)					0
1/4 NPT					1 (f)
1/2 NPT					2 (e)
Rc 1/4					3 (f)
Rc 1/2					4 (e)
1/2 Schedule 80 welding neck					6 (f)
None; PVDF insert tapped for 1/2 NPT/Process inlet located on side of 316 ss process covers					7 (g)
Conduit Connection and Housing Material					
1/2 NPT Conduit Connection, Aluminum Housing					1
1/2 NPT Conduit Connection, 316 ss Housing					3
M20 Conduit Connection, Both Sides, Aluminum Housing					5
M20 Conduit Connection, Both Sides, 316 ss Housing					6

MODEL CODE (CONTINUED)

Description	Model
Electrical Certifications (Also see "Electrical Safety Specifications")	
ATEX intrinsically safe, Ex ia IIC	AA
ATEX flameproof, Ex d IIC	AD
ATEX multiple certifications (includes ATEX Codes AA and AN)	AM
ATEX protection type n, Ex ic IIC or Ex nA	AN
ATEX multiple certifications (includes ATEX Codes AA, AD and AN)	AP
INMETRO intrinsically safe, Ex ia IIC	BA
INMETRO flameproof, Ex d IIC	BD
CSA intrinsically safe, Zone certified Ex ia	CA
CSA zone certified flameproof Ex d IIC; also explosion proof, dust ignition-proof	CD
CSA non-incendive, Zone certified Ex nA IIC	CN
IECEx intrinsically safe, Ex ia IIC	EA
IECEx flameproof, Ex d IIC	ED
IECEx multiple certifications, ia, ic, nA	EM
IECEx protection type n, Ex ic IIC or Ex nA	EN
IECEx multiple certifications, ia, ic, nA, and d	EP
FM Classes I, II, and III Division 1 intrinsically safe, AEx ia IIC	FA
FM Classes I, II, and III Division 1 explosion proof, dust-ignition proof, Zone approved AEx d IIC	FD
FM Classes I, II, and III Division 2 non-incendive, Zone approved AEx nA IIC	FN
Multi-marked for ATEX, CSA, and FM Intrinsically Safe Application	MA
No certification	ZZ
Optional Selections	
Mounting Sets	
Standard Style Painted Steel Bracket with Plated Steel Bolts	-M1
Standard Style Stainless Steel Bracket with Stainless Steel Bolts	-M2
Universal Style Stainless Steel Bracket with Stainless Steel Bolts (not available with Structure Codes LL, LM, LC, or LD)	-M3
Adapter Set for MC Coplanar Manifolds, B7 Bolts (not available with Bolting options -B1, -B2, or -B3) (h)	-P1
Adapter Set for MC Coplanar Manifolds, 316 ss Bolts (requires Bolting option -B1) (h)	-P2
Adapter Set for MC Coplanar Manifolds, 17-4 ss Bolts (requires Bolting option -B2) (h)	-P3
Adapter Set for MC Coplanar Manifolds, B7M Bolts (requires Bolting option -B3) (h)	-P4
Adapter Set for MT3 Coplanar Manifolds, Traditional Flange, B7 Bolts (not available with options -B1, -B2, or -B3) (h)	-P5
Adapter Set for MT3 Coplanar Manifolds, Traditional Flange, 316 ss Bolts (requires Bolting option -B1) (h)	-P6
Adapter Set for MT3 Coplanar Manifolds, Traditional Flange, 17-4 ss Bolts (requires Bolting option -B2) (h)	-P7
Adapter Set for MT3 Coplanar Manifolds, Traditional Flange, B7M Bolts (requires Bolting option -B3) (h)	-P8
Optional Display, Internal Pushbuttons, and Cover	
Digital display, pushbuttons, and window cover	-L1

MODEL CODE (CONTINUED)

Description					Model
Optional DIN 19213 Construction (i)					
Process Cover Type	**Cover Screw Material**	**Connector Screw Size**	**Material**	**Supplied?**	
Single-ended	Steel	M10	–	No (j) (k)	-D1
Double-ended (Blind kidney flange on back)	Steel	M10	Steel	Yes	-D2
Single-ended	Steel	7/16 in	–	No (k)	-D3
Double-ended (Blind kidney flange on back)	Steel	7/16 in	Steel	Yes (j) (l) (m)	-D4
Single-ended	Steel	7/16 in	–	No (j) (k)	-D5
Double-ended (Blind kidney flange on back)	Steel	7/16 in	Steel	Yes (j) (l) (m)	-D6
Single-ended	Steel	7/16 in	–	No(k)	-D7
Double-ended (Blind kidney flange on back)	Steel	7/16 in	Steel	Yes (j) (l) (m)	-D8
Single-ended	Steel	7/16 in	–	No (k)	-D9
Cleaning and Preparation (n)					
Unit Degreased - for Silicone Filled Sensors Only (Not for oxygen, chlorine, or other fluids that may react with silicone)					-X1
Cleaned and Prepared for Oxygen Service (Inert Filled Sensors Only) (Not with carbon steel covers or with silicone filled sensors)					-X2
Cleaned and Prepared for Chlorine Service (Inert Filled Sensors Only) (o)					-X3
Bolting for Process Covers/Connectors (p) (e) (q)					
316 ss Bolts and Nuts (Pressure Derated) (k)					-B1
17-4 ss Bolts and Nuts (o)					-B2
B7-M Bolts and Nuts (NACE) (pressure derated) (k)					-B3
Conduit Thread Adapters (Only available with Electrical Safety Code ZZ)					
Hawke-Type 1/2 NPT Cable Gland for use with Conduit Connection Codes 1 and 3					-A1
M20 Conduit Thread Adapter for use with Conduit Connection Codes 1 and 3					-A3
Custom Configuration					
Custom Factory Calibration (Calibration and Unit Tags Required)					-C1
Full Factory Configuration (Filled Out Configuration Form Required)					-C2
Electronics Housing Features					
External Zero Adjustment					-Z1
Custody Transfer Lock and Seal (r)					-Z2
External Zero Adjustment and Custody Transfer Lock and Seal (s)					-Z3
Ermeto Tubing Connectors (Not available with pressure seals) (e)					
Steel, Connecting 6 mm Tubing to 1/4 NPT Process Connector Only available with Structure Codes 10 to 13; and Process Connector Codes 0 and 1					-E1
Steel, Connecting 12 mm Tubing to 1/2 NPT Process Connector Only available with Structure Codes 10 to 13; and Process Connector Code 2					-E2
316 ss, Connecting 6 mm Tubing to 1/4 NPT Process Connector Only available with Structure Codes 10 to 13 and 20 to 23; and Process Connector Codes 0 and 1					-E3
316 ss, Connecting 12 mm Tubing to 1/2 NPT Process Connector Only available with Structure Codes 10 to 13 and 20 to 23; and Process Connector Code 2					-E4

MODEL CODE (CONTINUED)

Description	Model
Miscellaneous Optional Selections (Specify in any order)	
Supply Vent Screw in side of each process cover (Available only on Traditional Process Cover Structure Codes 22 to 47)	-V
Omit Vent Screw in side of each process cover (Available only on Type LP1 Low Profile Process Cover Structure Codes LL, LM, LC, and LD)	-V1
Supplemental Customer Tag (Stainless Steel Tag wired onto Transmitter)	-T
Static Pressure Rating to 40 MPa (5800 psi); Only with Span Codes B and C Not available with: – Options -B1, -B2, or -B3 – Options -D1 to -D9 – Structure Codes 34, 35, 78, 79, S1 to S6, SA to SF, F1 to F4	-Y
Instruction Book (Common MI, brochure, and full documentation set on DVD is standard)	
Without Instruction Book and DVD; only “Getting Started” brochure is supplied.	-K1
Gaskets	
Metal O-ring for pressure seals in Vacuum Service (t)	-G1
Diaphragm Material	
Gold-plated diaphragm (only offered with Structure Code 22)	-GP
Manifold Configurations	
Manifold mounted to transmitter and pressure tested at 1.5 times the transmitter range or 1.5 times the manifold rating, whichever is less	-H1
Manifold mounted to transmitter and pressure tested; supplied with a certificate of pressure testing	-H2

a. Inert fill fluid is not available at this time.

b. Equivalent to Hastelloy® C-276.

c. Maximum static pressure rating is 2.1 MPa (300 psi); temperature limits are -7 and +82°C (+20 and +180°F).

d. If using a Foxboro model coded pressure seal, you must select both the transmitter and pressure seal model number. Refer to PSS 2A-1Z11 A for the various pressure seal model codes.

e. Not available with Structure Codes 78 and 79.

f. Not available in nickel alloy material (equivalent to Hastelloy C-276).

g. Only available with Structure Codes 78 and 79.

h. Adapter plate options -P1 to -P8 are not available with:
- Pressure Seal Structure Codes
- Process Connector Codes 1-7
- DIN Construction Options -D1, -D2, -D4, -D5, -D6, -D7, -D8, -D9

i. DIN 19213 Construction options can only be used with Process Connector Code 0 and 316 ss covers with no side vents, and require Structure Code 12, 13, 22, or 23. In addition, these options are not available with Structure Codes S1 through S6, SA through SF, F1 through F4, or Options -V or -V1.

j. See “Functional Specifications” on page 12 for pressure deratings when certain DIN 19213 versions or Bolting options -B1 or -B3 are specified.

k. Not available with Low Profile Structure Codes 52 to 57.

l. Temperature limits derated to 0 and 60°C (32 and 140°F); not available with Structure Codes 52 to 57, and LL, LM, LC, or LD.

m. Mounting Bracket Set options are not available.

n. Cleaning and Preparation options are not available with gold plated sensors, pressure seals, or Option -V1.

o. When Chlorine Service Option -X3 is specified, standard bolting is replaced with 17-4 ss bolts and nuts. Therefore, there is no need to specify Bolting Option -B2 when selecting the Chlorine Service Option -X3.

p. Not available with DIN construction options. For stainless steel bolts with DIN construction, specify DIN 19213 Construction options -D5 to -D9 as required.

q. Option -Y is not available with options -B1,-B2,-B3, or Structure Codes 34, 35, 78, 79, S1 to S6, SA to SF, F1 to F4.

r. Not Available with ATEX.

s. Cover lock provided as standard with Electrical Safety Codes AD, AP, CD, FD, ED, EP and BD.

t. Required when pressure seal will be used in vacuum applications. This option substitutes vacuum service metal gasket for standard PTFE process cover gasket.

SUGGESTED RFQ SPECIFICATIONS

The manufacturer shall provide field-mounted differential pressure transmitter(s) featuring remote digital communications capability for measuring differential pressure and transmitting a 4 to 20 mA dc output with a superimposed HART digital signal for use in a standard two-wire dc supply voltage system. They are offered with traditional or low profile structures. Transmitters with a traditional structure can also be provided (as required) with direct connect seals or remote capillary connected seals. The specifications for these transmitters are as follows:

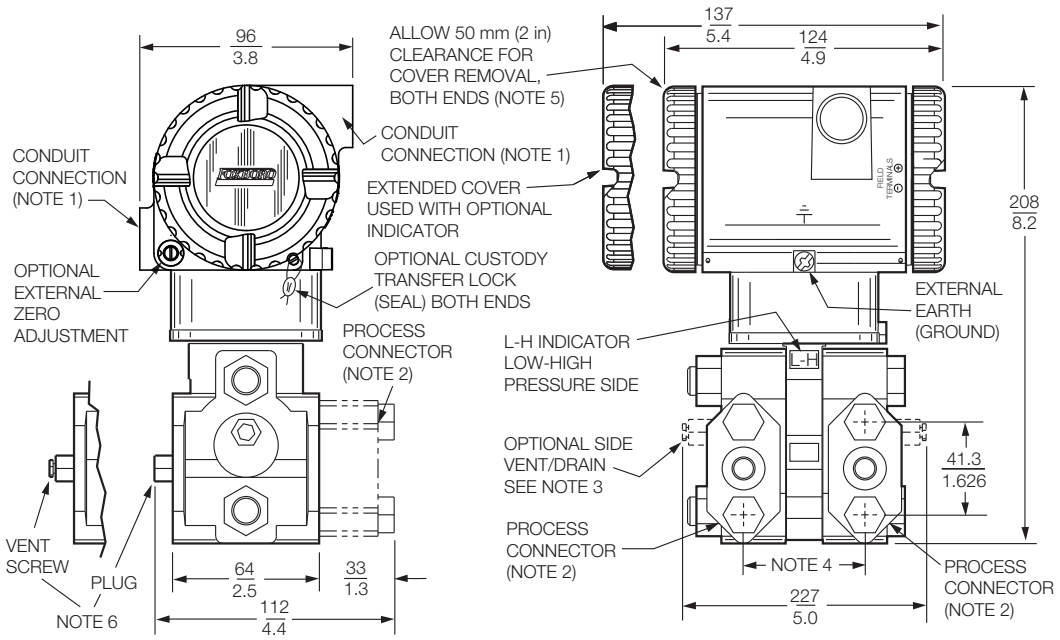
Communication Protocol:	4 to 20 mA dc with HART communication
Remote Communications:	Must not interfere with output
Accuracy:	Digital Output, Linear: ±0.050% of calibrated span 4 to 20 mA Output, Linear: ±0.060% of calibrated span
Damping:	Settable for a range of none to 32 seconds
RFI Protection:	0.1% error between 27 and 1000 MHz at 30 V/m field intensity
Span Limits:	0.5 and 200 inH_2O, 2.5 and 1000 inH_2O, 3.75 and 300 psi, 37.5 and 3000 psi, as specified; or SI and metric equivalents.
Proof Pressure:	14500 psi for standard transmitters
Mounting:	On process piping, on a manifold, or optional mounting bracket
Input Connection:	With process connectors to accept 1/4 NPT, 1/2 NPT, Rc 1/4, Rc 1/2, or 1/2 Schedule 80 welding neck; or 1/2 NPT PVDF inserts installed in 316 ss process covers; or prepared for a direct connect seal; or prepared for a single remote capillary connected seal, or two remote capillary connected seals.
Electronics Housing:	316 ss, or aluminum housing with epoxy finish
Modular Electronics:	Enclosed in a NEMA 4X (IEC IP66) housing sealed with O-rings for protection against moisture or other contaminants. Optional Integral LCD display with on-board configuration pushbuttons.
Process Cover:	Traditional Structures Steel, 316 ss, Monel, nickel alloy, or PVDF insert (a) Low Profile Structures: 316 ss
Sensor Materials:	Traditional Structure: 316L ss, nickel alloy (a) Co-Ni-Cr, Monel, Tantalum, or gold-plated 316L ss Low Profile Structures: 316L ss or nickel alloy (a)
Approvals and Certifications:	Must be suitable for Division 1 hazardous locations, and conform to all applicable European Union Directives. Also versions available to meet Agency flameproof and zone requirements.
Approximate Mass: (with Process Connectors)	4.2 kg (9.2 lb), with Traditional Structures; Add 0.1 kg (0.2 lb) with Low Profile Structure LP1; Add 0.8 kg (1.8 lb) with Low Profile Structure LP2; Add 1.1 kg (2.4 lb) with 316 ss housing; Add 0.2 kg (0.4 lb) with optional LCD display.
Model Code:	Foxboro IDP10S Intelligent d/p Cell Transmitter with HART Communication Protocol, with or without pressure seals, or equivalent.

a. Equivalent to Hastelloy® C.

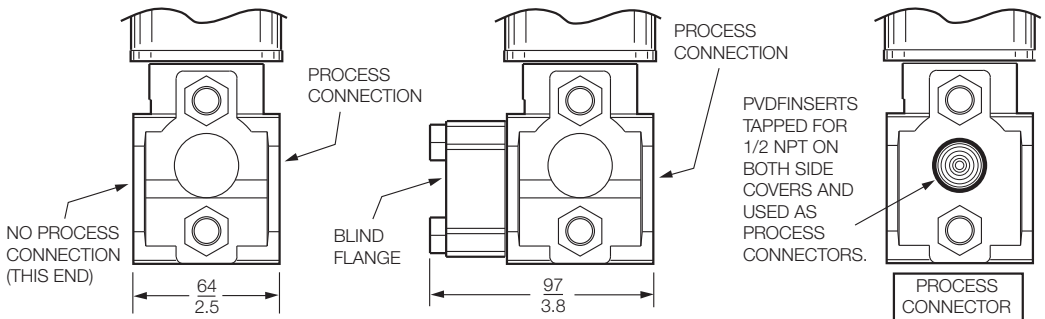
DIMENSIONS – NOMINAL

mm
in

TRANSMITTER WITH TRADITIONAL STRUCTURE

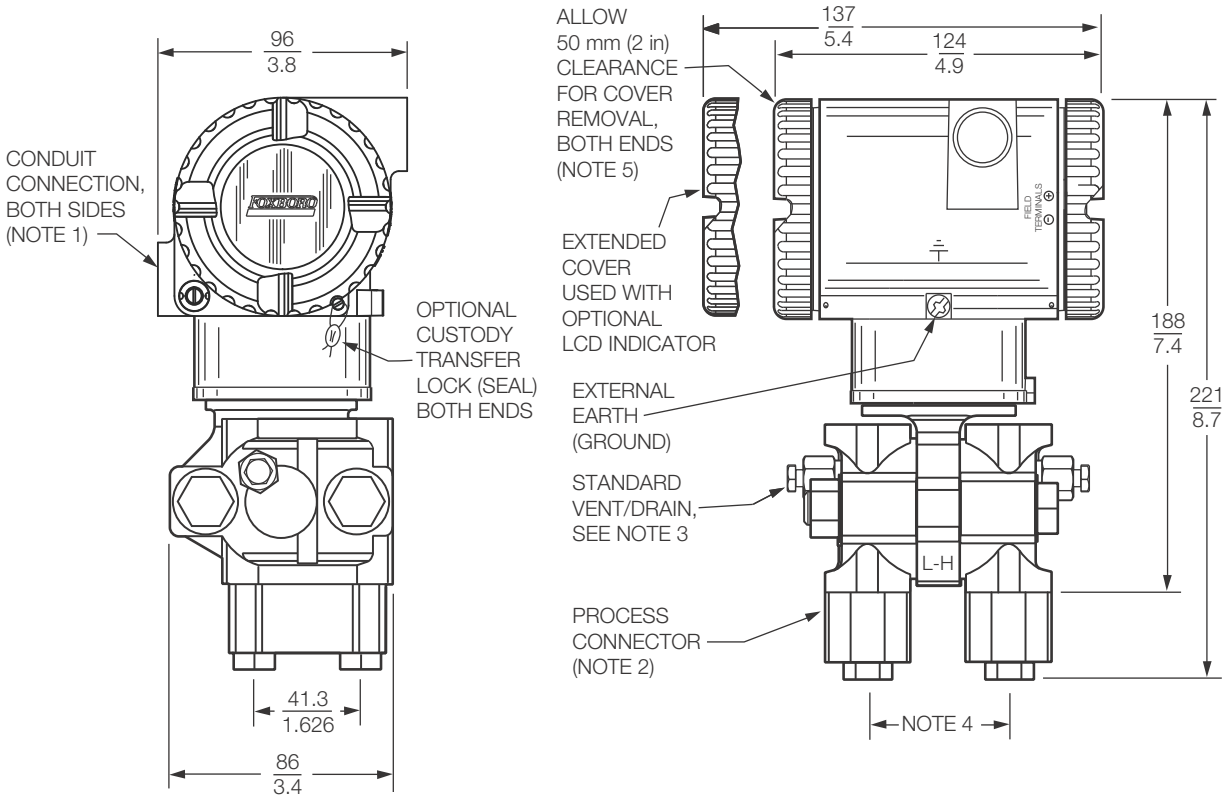


NOTES:
1. CONDUIT CONNECTION 1/2 NPT, BOTH SIDES: PLUG UNUSED CONNECTION WITH METAL PLUG (SUPPLIED).
2. PROCESS CONNECTORS MAY BE REMOVED AND TRANSMITTER MOUNTED DIRECTLY ON A MANIFOLD, OR CONNECTIONS MADE DIRECTLY TO PROCESS COVER USING 1/4 NPT INTERNAL THREAD IN PROCESS COVER.
3. PROCESS COVER CAN BE INVERTED MAKING OPTIONAL SIDE VENTS OR SIDE DRAINS
4. PROCESS CONNECTORS CAN BE INVERTED TO GIVE EITHER 51, 54, OR 57 mm (2.0, 2.125, OR 2.25 in) CENTER-TO-CENTER DISTANCE BETWEEN HIGH AND LOW PRESSURE CONNECTIONS.
5. TOPWORKS CAN BE ROTATED TO ANY POSITION WITHIN ONE TURN COUNTERCLOCKWISE OF THE FULLY TIGHTENED POSITION.
6. PROCESS COVER END PLUGS ARE SUBSTITUTED FOR VENT SCREWS WHEN OPTIONAL SIDE VENTS (NOTE 3) ARE SPECIFIED.



mm
in

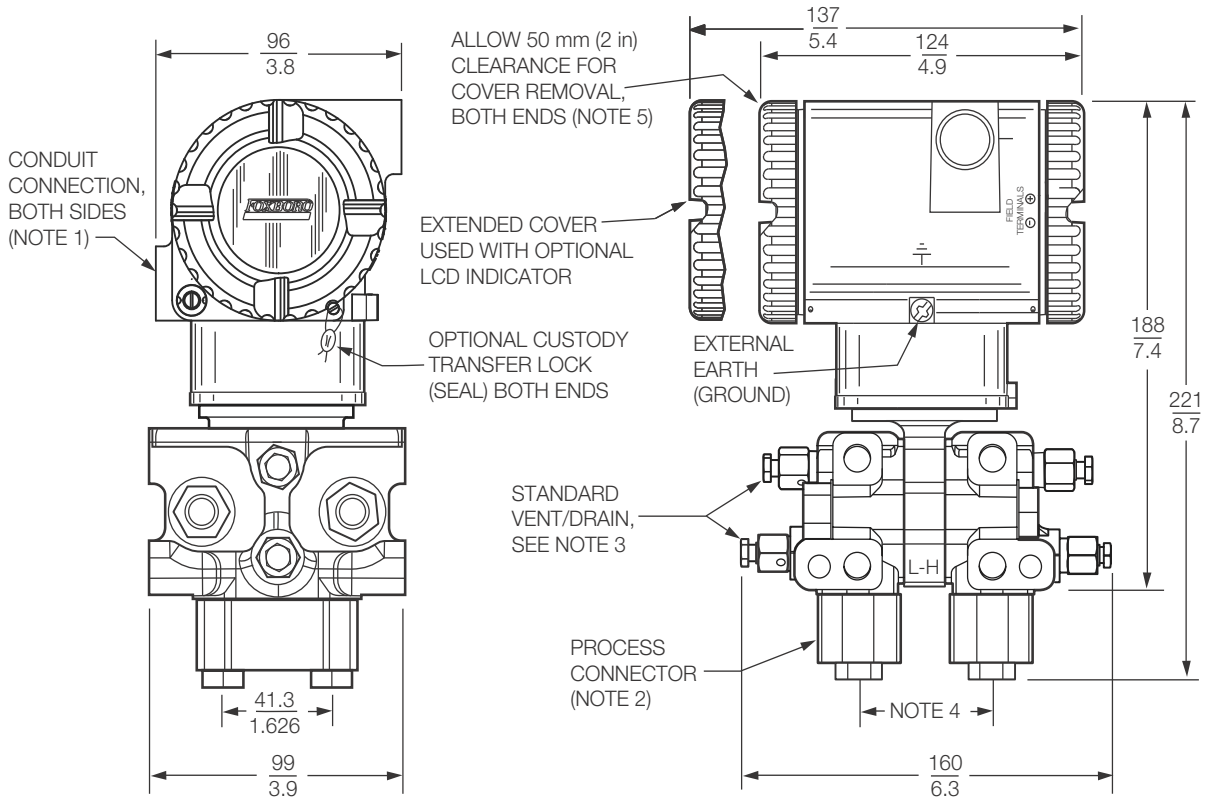
TRANSMITTER WITH LOW PROFILE STRUCTURE LP1



NOTES:
1. CONDUIT CONNECTION 1/2 NPT OR M20, BOTH SIDES: PLUG UNUSED CONNECTION WITH METAL PLUG (SUPPLIED).
2. PROCESS CONNECTORS MAY BE REMOVED AND TRANSMITTER MOUNTED DIRECTLY ON A MANIFOLD, OR CONNECTIONS MADE DIRECTLY TO PROCESS COVER USING 1/4 NPT INTERNAL THREAD IN PROCESS COVER.
3. THE TRANSMITTER'S LOW PROFILE STRUCTURE LP1 IS SHOWN IN THE VERTICALLY UPRIGHT POSITION. NOTE THE LOCATION OF THE STANDARD VENT/DRAIN SCREW. IN THIS CONFIGURATION THE TRANSMITTER CAN BE VENTED OR IS SELF-DRAINING. ALSO RECOMMENDED IS A HORIZONTAL INSTALLATION WHERE THE INSTALLED ORIENTATION CAN BE SET TO ALLOW FOR VENTING OR DRAINING.
4. PROCESS CONNECTORS CAN BE INVERTED TO GIVE EITHER 51, 54, OR 57 mm (2.0, 2.125, OR 2.25 in) CENTER-TO-CENTER DISTANCE BETWEEN HIGH AND LOW PRESSURE CONNECTIONS.
5. TOPWORKS CAN BE ROTATED TO ANY POSITION WITHIN ONE TURN COUNTERCLOCKWISE OF THE FULLY TIGHTENED POSITION.

mm
in

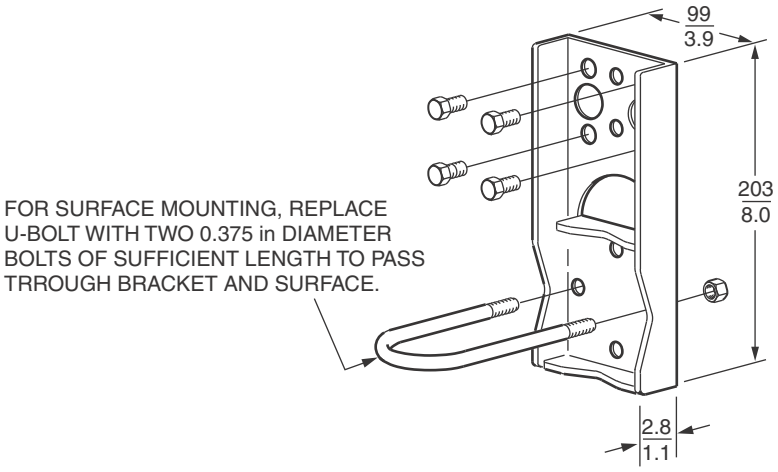
TRANSMITTER WITH LOW PROFILE STRUCTURE LP2



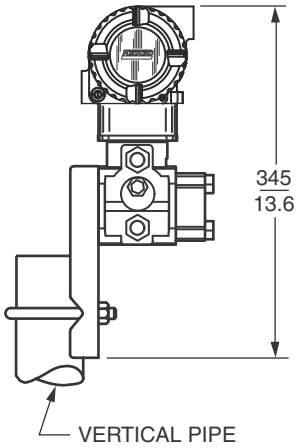
NOTES:
1. CONDUIT CONNECTION 1/2 NPT OR M20, BOTH SIDES: PLUG UNUSED CONNECTION WITH METAL PLUG (SUPPLIED).
2. PROCESS CONNECTORS MAY BE REMOVED AND TRANSMITTER MOUNTED DIRECTLY ON A MANIFOLD, OR CONNECTIONS MADE DIRECTLY TO PROCESS COVER USING 1/4 NPT INTERNAL THREAD IN PROCESS COVER.
3. THE TRANSMITTER'S LOW PROFILE STRUCTURE LP2 IS SHOWN IN THE RECOMMENDED VERTICAL UPRIGHT POSITION. NOTE THE STANDARD VENT OR DRAIN SCREWS. HORIZONTAL INSTALLATIONS ARE NOT RECOMMENDED.
4. PROCESS CONNECTORS CAN BE INVERTED TO GIVE EITHER 51, 54, OR 57 mm (2.0, 2.125, OR 2.25 in) CENTER-TO-CENTER DISTANCE BETWEEN HIGH AND LOW PRESSURE CONNECTIONS.
5. TOPWORKS CAN BE ROTATED TO ANY POSITION WITHIN ONE TURN COUNTERCLOCKWISE OF THE FULLY TIGHTENED POSITION.

mm
in

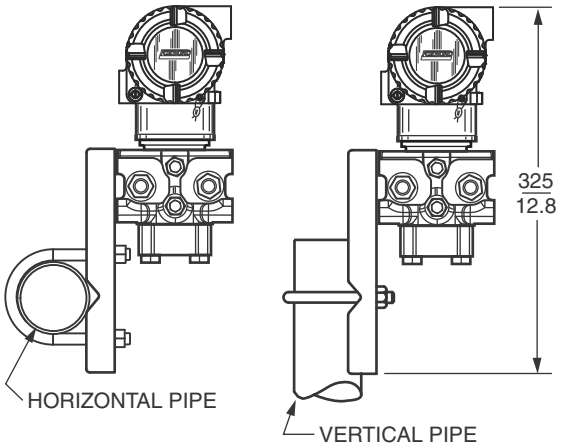
TRANSMITTER WITH STANDARD STYLE MOUNTING BRACKET KIT (OPTIONS -M1 AND -M2)



TRANSMITTER WITH TRADITIONAL STRUCTURE

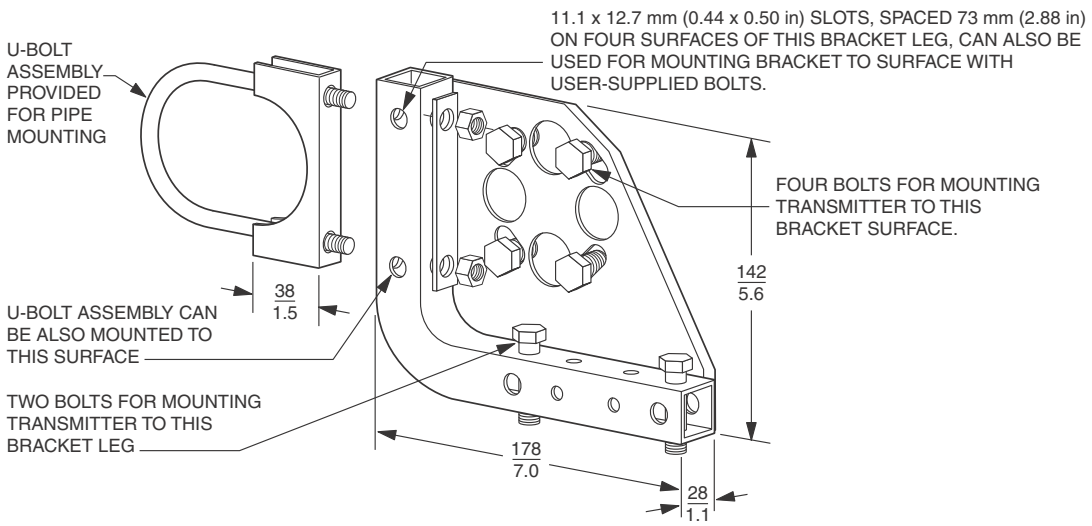


TRANSMITTER WITH LOW PROFILE STRUCTURE LP2

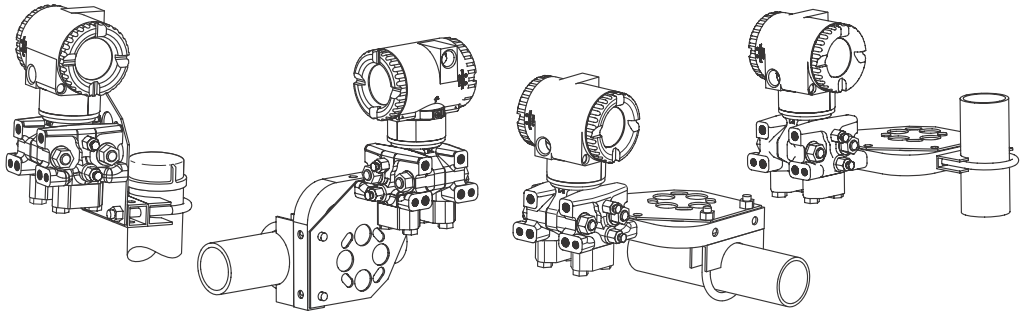


mm
in

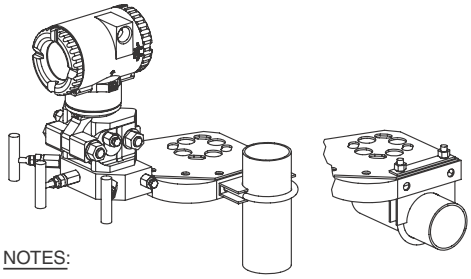
TRANSMITTER WITH UNIVERSAL STYLE MOUNTING BRACKET KIT (OPTION -M3)



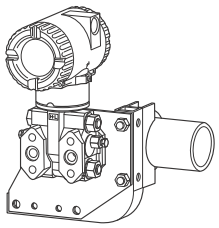
TYPICAL PIPE MOUNTING WITH LOW PROFILE STRUCTURE LP2



TYPICAL PIPE MOUNTING
LOW PROFILE STRUCTURE LP1



TYPICAL PIPE MOUNTING
WITH TRADITIONAL STRUCTURE



NOTES:

1. FOR SURFACE MOUNTING CONFIGURATIONS, USE THE U-BOLT MOUNTING HOLES FOR ATTACHING THE BRACKET TO A SURFACE RATHER THAN TO THE U-BOLT ASSEMBLY. SURFACE MOUNTING BOLTS FOR ATTACHING THE BRACKET TO A SURFACE ARE USER SUPPLIED.
2. REFER TO DIMENSIONAL PRINT DP 020-464 FOR FURTHER IDP10 MOUNTING CONFIGURATIONS, INCLUDING MOUNTING WITH -P SERIES OPTIONAL MOUNTING PLATES.

NOTES

NOTES

ORDERING INSTRUCTIONS

1. Model Number(s) as follows:
   - Transmitter only if pressure seals are not selected
   - Both transmitter and pressure seals if pressure seals are selected with traditional structure. See PSS 2A-1Z11 A.
2. Calibrated Pressure Range (using allowable Pressure Units from the table below):

inH_2O (at 68°F)	inHg	Pa	mbar	psi
ftH_2O	mmHg	kPa	bar	atm
mmH_2O	cmHg	MPa	g/cm^2	kg/cm^2
cmH_2O	dy/cm^2	torr		

3. Configuration Data Form when Factory Calibration Option -C2 is specified.
4. Options and Accessories not in Model Code (see PSS 2A-1Z9 E).
5. User Tag Data - Data Plate; 32 characters maximum. For additional tag data, specify Optional Supplemental Tag -T.
6. User Tag Data - Software (Database); 8 characters maximum (user configured).

OTHER FOXBORO PRODUCTS

The Foxboro product lines offer a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, temperature, positioning, controlling, and recording. For a list of these offerings, visit our web site at:

www.fielddevices.foxboro.com

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United States of America
http://www.invensys.com

Global Customer Support
Inside U.S.: 1-866-746-6477
Outside U.S.: 1-508-549-2424
Website: http://support.ips.invensys.com