I/A Series® Pressure Transmitters

IDP10 Differential Pressure with 1 to 5 V dc Output Signal

Installation, Operation, Calibration, Configuration, and Maintenance



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1. Introduction

General Description

The IDP10-V Differential Pressure Transmitters measure the difference between two pressures applied to opposite sides of a silicon strain gauge microsensor within the sensor assembly. This microsensor converts differential pressure to a change in resistance. The resistance change is then converted to a 1 to 5 V dc signal proportional to differential pressure or to the square root of differential pressure.

The transmitters are often used for measuring fluid flow across a primary device such as an orifice plate, but can also be used for other types of differential pressure measurements such as liquid level, interface level, or density measurements. For more detailed information on the principle of operation of the transmitter, refer to document TI 037-096.

Reference Documents

Table 1. Reference Documents

Document	Description			
Dimensional Prints	Dimensional Prints			
DP 020-342	Dimensional Print – PSFLT Pressure Seals			
DP 020-343	Dimensional Print – PSFPS and PSFES Pressure Seals			
DP 020-345	Dimensional Print – PSFAR Pressure Seals			
DP 020-347	Dimensional Print – PSTAR Pressure Seals			
DP 020-349	Dimensional Print – PSISR Pressure Seals			
DP 020-351	Dimensional Print – PSSCR Pressure Seals			
DP 020-353	Dimensional Print – PSSCT Pressure Seals			
DP 020-354	Dimensional Print – PSSSR Pressure Seals			
DP 020-355	Dimensional Print – PSSST Pressure Seals			
DP 020-446	Dimensional Print – IDP10, IDP25, and IDP50 Differential Pressure Transmitters			
DP 022-335	Dimensional Print – Model CO Compact Orifice			
Parts Lists				
PL 006-172	Parts List – Model CO Compact Orifice			
PL 009-005	Parts List – IDP10 Differential Pressure Transmitter			
Instructions	Instructions			
MI 020-328	Instruction – Bubble Type Installation for Liquid Level			
MI 020-329	Instruction – High Accuracy Flow Measurement			
MI 020-369	Instruction – Pressure Seals			
MI 020-427	Instruction – Intrinsic Safety Connection Diagrams and Nonincendive Circuits			
MI 022-138	Instruction – Bypass Manifolds - Installation and Maintenance			
MI 022-335	Instruction – Model CO Compact Orifice			

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Table 1. Reference Documents (Continued)

Document	Description			
Technical Informati	Technical Information			
TI 1-50a	Technical Information – Liquid Density Measurement			
TI 001-051	Technical Information – Liquid Interface Measurement			
TI 001-052	Technical Information – Liquid Level Measurement			
TI 37-75b	Technical Information – Transmitter Material Selection Guide			
TI 037-097	Technical Information – Process Sealing of I/A Series Pressure Transmitters for use in Class 1, Zone 0, 1, and 2 Hazardous Locations			

Transmitter Identification

See Figure 1 for transmitter data plate contents. For a complete explanation of the Model Number code, see the parts list. The firmware version is shown on the top line of the display when the transmitter is powered.

Figure 1. Transmitter Identification STYLE MODEL CODE SERIAL NUMBER CALIBRATED RANGE AUXILIARY SPECIFICATION CODE PLANT AND DATE OF MANUFACTURE SUPPLY VOLTAGE MAXIMUM WORKING PRESSURE **CUSTOMER TAG** MODEL REFERENCE CAL. RANGE ORIGIN AUX. SPEC. MWP SUPPLY CUST. TAG

Standard Specifications

Operative Limits

Influence	Operative Limits
Sensor Body Temperature ^(a) Silicone Fill Fluid Fluorinert Fill Fluid pvdf Inserts	-46 and +121°C (-50 and +250°F) -29 and +121°C (-20 and +250°F) -7 and +82°C (20 and 180°F)
Electronics Temperature With LCD Display	-40 and +85°C (-40 and +185°F) ^(b) -40 and +85°C (-40 and +185°F) ^(c)
Relative Humidity	0 and 100%
Supply Voltage	9 and 15.5 V dc
Source Impedance	0 and 2160 ohms
Output Load	1 and 10 megohms
Mounting Position	No Limit
Vibration	6.3 mm (0.25 in) double amplitude from 5 to 15 Hz with aluminum housing and from 5 to 9 Hz with 316 ss housing. 0 to 30 m/s (0 to 3 "g") from 15 to 500 Hz with aluminum housing and 0 to 10 m/s (0 to 1 "g") from 9 to 500 Hz with 316 ss housing.

- (a) Refer to MI 020-369 for temperature limits with pressure seals.
- (b) -40 and +75 $^{\circ}$ C (-40 and +167 $^{\circ}$ F) for IAP10, IGP10, IGP25, and IGP50 with flameproof classification.
- (c) Display updates are slowed and readability decreased below temperatures of -20 °C (-4°F).

Span and Range Limits

Span Limit Code	Span Limits ΔP	Range Limits $\Delta P^{(a)}$	
A ^(b)	0.12 and 7.5 kPa 0.5 and 30 inH ₂ 0 12 and 750 mmH ₂ 0	-7.5 and +7.5 kPa -30 and +30 inH ₂ 0 -750 and +750 mmH ₂ 0	
В	0.87 and 50 kPa 3.5 and 200 inH ₂ 0 87 and 5000 mmH ₂ 0	-50 and +50 kPa -200 and +200 inH ₂ 0 -5000 and +5000 mmH ₂ 0	
С	7.0 and 210 kPa 28 and 840 inH ₂ 0 2.3 and 69 ftH ₂ 0	-210 and +210 kPa -840 and +840 inH ₂ 0 -69 and +69 ftH ₂ 0	
D	0.07 and 2.1 MPa 10 and 300 psi 23 and 690 ftH ₂ 0	10 and 300 psi -30 and +300 psi	
E	0.7 and 21 MPa 100 and 3000 psi	-0.21 and +21 MPa -30 and +3000 psi	

⁽a) Negative values of differential pressure indicate a higher pressure on the **low side** of the sensor. Positive values indicate a higher pressure on the **high side** of the sensor.

⁽b) Span Limit Code "A" not available with pressure seals.

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Maximum Static, Overrange, and Proof Pressure

Transmitter Configuration	Maximum Static and Overrange Pressure Rating ^(a,e,f)		Proof Pressure Rating ^(b)	
Transmitter Configuration (Bolting Material) ^(C)	MPa	Psi	MPa	Psi
Standard (B7 steel), Option "-B2" (17-4 PH ss), Option "-D3" or "-D7"	25	3625	100	14500
Option "B1" (316 ss) or Option "-D5"	15	2175	60	8700
Option "B3" (B7M)	20	2900	70	11150
Option "-D1"	16	2320	64	9280
Option "-D2", "-D4", "-D6", or "-D8"	10	1500	40	6000
Option "-D9" (17-4 PH ss)	40	5800	100	14500

- (a) Either side can be at higher pressure during overrange.
- (b) Meets ANSI/ISA Standard S82.03-1988.
- (c) -D1 = DIN Single ended process cover with M10 B7 bolting.

 - -D2 = DIN Double ended process cover with M10 B7 bolting.
 -D3 = DIN Single ended process cover with 7/16 in B7 bolting.
 -D4 = DIN Double ended process cover with 7/16 in B7 bolting.
 -D5 = DIN Single ended process cover with 7/16 in 316 ss bolting.
 - -D6 = DIN Double ended process cover with 7/16 in 316 ss bolting.
 - -D7 = DIN Single ended process cover with 7/16 in 17-4 ss bolting.
 - -D8 = DIN Double ended process cover with 7/16 in 17-4 ss bolting.
 - -D9 = DIN Single ended process cover with 7/16 in 17-4 ss bolting.
- (d) Limited to operating temperatures ranging from 0 to 60°C (32 to 140°F).
- (e) When Structure Codes 78/79 are used (pvdf inserts in the Hi and Lo side process covers), the maximum overrange is 2.1 MPa (300 psi) and temperature limits are -7 and +82°C (20 and 180°F).
- (f) Static pressure rating of 40 MPa (5800 psi) with Option Code -Y.

— NOTE -

Static pressure zero shift for all calibrated spans can be eliminated by readjusting the zero output at nominal operating static pressure.

A CAUTION

- 1. Exceeding the maximum overrange pressure can cause damage to the transmitter degrading its performance.
- 2. The transmitter could be nonfunctional after application of the proof pressure.

Elevated Zero and Suppressed Zero

For applications requiring an elevated or suppressed zero, the maximum span and the upper and lower range limits of the transmitter can not be exceeded.

Sensor Fill Fluid

Silicone Oil (DC 200) or Fluorinert (FC-43)

Minimum Allowable Absolute Pressure vs. Process Temperature

With Silicone Fill Fluid: At full vacuum: Up to 121°C (250°F)

With Fluorinert Fill Fluid: Refer to Figure 2.

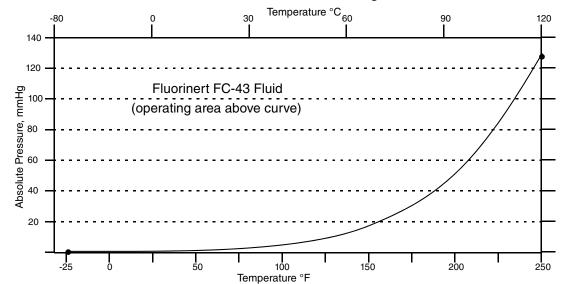


Figure 2. Minimum Allowable Absolute Pressure vs. Process Temperature with Fluorinert Fill Fluid

Mounting Position

The transmitter can be mounted in any orientation. It can be supported by the process piping. It can also be mounted directly to a vertical or horizontal pipe or surface mounted using an optional mounting bracket. The housing can be rotated up to one full turn to any desired position for access to adjustments, display, or conduit connections. See "Positioning the Housing" on page 31. The display (if present) can also be rotated in the housing to any of four different positions at 90° increments. See "Positioning the Display" on page 31.

— NOTE

Position effect zero shift for all calibrated spans can be eliminated by readjusting zero output after installation.

Approximate Mass

Without Process Connectors	3.5 kg (7.8 lb)
With Process Connectors	4.2 kg (9.2 lb)
With Optional 316 ss Housing	Add 1.1 kg (2.4 lb)
With Pressure Seals	Varies with seal used

Process Connections

IDP10 transmitters are connected to the process via a 1/4 NPT thread or any one of a number of optional process connectors.

Process Wetted Materials

Diaphragm: 316L ss, Co-Ni-Cr, Hastelloy C, Monel, gold plated 316L ss, or tantalum Covers and Process Connections: 316 ss, carbon steel, Hastelloy C, Monel, or pvdf inserts Pressure Seals: Refer to MI 020-369

Process Pressure and Temperature Limits for Pressure Seals

Refer to MI 020-369

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Electrical Connections

Field wires enter through 1/2 NPT, PG 13.5, or M20 threaded entrances on either side of the electronics housing. Leads terminate under screw terminals and washers on the terminal block in the field terminal compartment. To maintain RFI/EMI, environmental, and explosion proof ratings, unused conduit connection must be plugged with metal plug (provided), inserted to five full threads for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections.

Field Wiring Reversal

Accidental reversal of field wiring will not damage the transmitter, provided the current is limited to 1 A or less by active current limiting or loop resistance. Sustained currents of 1 A will not damage the electronics module or sensor but could damage the terminal block assembly and external instruments in the loop.

Adjustable Damping

The transmitter response time is normally 1.0 second or the electronically adjustable setting of 0.00 (none), 2, 4, or 8, seconds, whichever is greater, for a 90% recovery from an 80% input step as defined in ANSI/ISA S51.1.

Output Signal

1 to 5 V dc linear, or 1 to 5 V dc square root, software selectable, locally configurable using pushbuttons on the transmitter.

— NOTE

Only 1 to 5 V dc linear output on absolute pressure, gauge pressure, and flange level transmitters.

Span Adjustments

Adjustable at the transmitter using the local display.

Powerup Time

Less than 2.0 seconds for output to reach the first valid measurement, then at the electronic damping rate to reach the final measured variable value.

Supply Current

Power supply must be capable of providing at least 3 mA current.

Electrical Ground Connections

The transmitter is equipped with an internal ground connection within the field wiring compartment and an external ground connection at the base of the electronics housing. To minimize galvanic corrosion, place the wire lead or terminal between the captive washer and loose washer on the external ground screw. If shielded cable is used, earth (ground) the shield at the field enclosure **only**. Do **not** ground the shield at the transmitter.

Product Safety Specifications

A DANGER

To prevent possible explosions and to maintain flameproof, explosionproof, and dustignitionproof protection, observe applicable wiring practices. Plug unused conduit opening with the provided metal pipe plug. Both plug and conduit must engage a minimum of five full threads for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections.

WARNING

To maintain IEC IP66 and NEMA Type 4X protection, the unused conduit opening must be plugged with the metal plug provided. Use a suitable thread sealant on both conduit connections. In addition, the threaded housing covers must be installed. Turn covers to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal.

— NOTE —

- 1. These transmitters have been designed to meet the electrical safety description listed in Table 2. For detailed information or status of testing laboratory approvals/certifications, contact Global Customer Support.
- 2. Wiring restrictions required to maintain electrical certification of the transmitter are provided in "Wiring" on page 33.

Table 2. Electrical Safety Specifications

Agency Certification, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX flameproof: II 2 GD EEx d IIC, Zone 1.	KEMA 00ATEX2019X Temperature Class T6, T85°C, Ta = -40 to +80°C	D
CSA intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1. Also, Zone certified intrinsically safe Ex ia IIC and energy limited Ex nA II.	Connect per MI 020-427. Temperature Class T6 at 40°C (104°F), and T4A at 85°C (185°F) maximum ambient. Temperature Class T4 at 40°C (104°F), and T3 at 85°C (185°F) maximum ambient.	
CSA explosionproof for Class I, Division 1, Groups B, C, and D; dust-ignitionproof for Class II, Division 1, Groups E, F, and G; Class III, Division 1.	Maximum Ambient Temperature 85°C	С
CSA for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2.	Temperature Class T6 at 40 °C (104°F) and T4A at 85 °C (185°F) maximum ambient.	
CSA field device zone certified flameproof Ex d IIC. Also, all certifications of Code C above.	Maximum Ambient Temperature 85°C (185°F).	В
EAC flameproof 1Ex d IIC Gb	T6 (-40/50°C ≤ Ta ≤ +75°C)	6
EAC flameproof Ex tb IIIC Db	T85°C -40/-50°C ≤ Ta ≤ +80°C	6
EAC flameproof Ex tc IIIC Dc	T85°C -40°C ≤ Ta ≤ +80°C	6
FM intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1. Also, Zone certified intrinsically safe AEx ia IIC.	Connect per MI 020-427. Temperature Class T4A at 40 °C (104°F), and T4 at 85 °C (185°F) maximum ambient. Temperature Class T4 at 85 °C (185°F) maximum ambient.	
FM explosionproof for Class I, Division 1, Groups B, C, and D; dust-ignitionproof for Class II, Division 1, Groups E, F, and G; Class III, Division 1.	Temperature Class T6 at 80°C (176°F) and T5 at 85°C (185°F) maximum ambient.	F
FM nonincendive for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2.	Temperature Class T4A at 40 °C (104°F) and T4 at 85 °C (185°F) maximum ambient.	
FM field device zone certified flameproof AEx d IIC. Also, all certifications of Code F above.	Temperature Class T6 at 75°C (167°F) maximum ambient.	G
IECEx flameproof: Ex d IIC	IECEx FMG 06.0007X, Ex d IIC T6 Ta=80°C, T5 Ta=85°C Ambient Temperature -20 to +85°C	V
INMETRO flameproof Ex d IIC Gb	T6 (Ta=80°C IP66) T5 (Ta=85°C IP66)	2
KOSHA flameproof Ex d IIC	$T_{amb} = -50^{\circ}C - +80^{\circ}C$	3

ATEX and IECEx Warnings

Do not open while circuits are alive.

ATEX Compliance Documents

EN 50014: 1997 EN 50018: 1994

IECEx Compliance Documents

IEC 60079-0 (Edition 4.0): 2004 IEC 60079-1 (Edition 5): 2003 MI IDP10-V – October 2016 1. Introduction

2. Installation

A CAUTION

To avoid damage to the transmitter sensor, do not use any impact devices, such as an impact wrench or stamping device, on the transmitter.

- NOTE

- 1. The transmitter should be mounted so that any moisture condensing or draining into the field wiring compartment can exit through one of the two threaded conduit connections.
- 2. Use a suitable thread sealant on all connections.

Transmitter Mounting

The IDP Series differential pressure transmitter can be supported by the process piping or mounted to a vertical or horizontal pipe or surface using the optional mounting bracket. See figures below. For dimensional information, refer to DP 020-446.

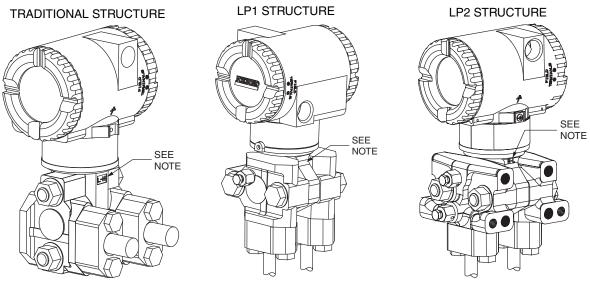
- NOTE

- 1. If the transmitter is not installed in the vertical position, readjust the zero output to eliminate the position zero effect.
- 2. When structure codes 78/79 are used (pvdf inserts) with the IDP10 transmitters, the process connection must be made directly to the pvdf inserts in the high and low side process covers.

Process Mounting

With process mounting, the transmitter mounted to and supported by the process piping.

Figure 3. Typical Mounting of an IDP10 Transmitter Supported by Process Piping

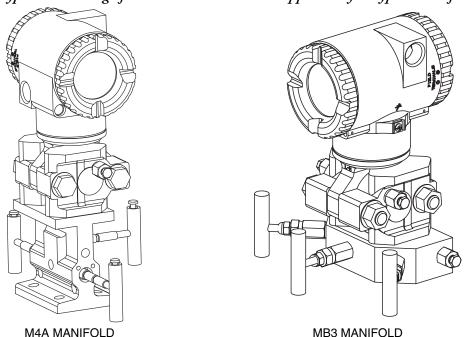


NOTE: MARK INDICATING LOW AND HIGH PRESSURE SIDE OF TRANSMITTER

Manifold Mounted Transmitter

With manifold mounting, the transmitter is mounted to and supported by a bypass manifold. The bypass manifold can be mounted to a DN50 or 2 inch pipe with an optional mounting bracket. See MI 022-138.

Figure 4. Typical Mounting of an IDP10 Transmitter Supported by a Bypass Manifold



Transmitter Mounted on a Coplanar™ Manifold

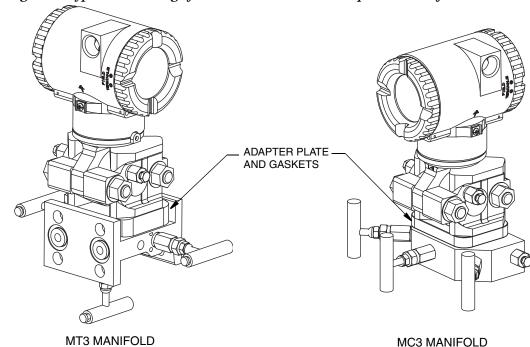


Figure 5. Typical Mounting of IDP10 Transmitter on Coplanar Manifold

Pipe or Surface Mounting

To mount the transmitter to a pipe or surface, use the Standard Mounting Bracket Set (Model Code Option -M1 or M2) or Universal Bracket Mounting Set (Model Code Option -M3).

Standard Mounting Bracket

The transmitter (with either traditional or LP2 low-profile structures) can be mounted to a vertical or horizontal, DN 50 or 2-in pipe using a standard bracket. See Figures 6 and 7 for details of a standard bracket and examples of different mounting situations. Secure the mounting bracket to the transmitter using the four screws provided. Mount the bracket to the pipe. To mount to a horizontal pipe, turn the U-bolt 90° from the position shown. The mounting bracket can also be used for wall mounting by securing the bracket to a wall using the U-bolt mounting holes.

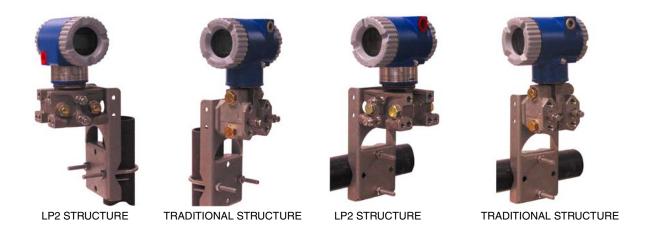
APPROXIMATELY 3 IN CLEARANCE REQUIRED FOR ACCESS TO MOUNTING BOLTS AND VENT SCREW.

FOR SURFACE MOUNTING, REPLACE U-BOLT WITH TWO 0.375 IN DIAMETER BOLTS OF SUFFICIENT LENGTH TO PASS THROUGH BRACKET AND SURFACE

VERTICAL DN 50 OR 2 IN PIPE SHOWN. ROTATE U-BOLT 90° FOR MOUNTING TO HORIZONTAL PIPE

Figure 6. Pipe or Surface Mounted Transmitter Using a Standard Bracket

Figure 7. Examples of Mounting With a Standard Bracket



Universal Mounting Bracket

The transmitter (with either traditional or LP2 low-profile structure) can be mounted in a myriad of positions to a vertical or horizontal, DN 50 or 2-in pipe using a universal bracket. See the following figures for details of a universal bracket and examples of different mounting situations. Secure the mounting bracket to the transmitter using the two long or four short screws provided. Mount the bracket to the pipe. The mounting bracket can also be used for wall mounting by securing the bracket to a wall using the U-bolt mounting holes.

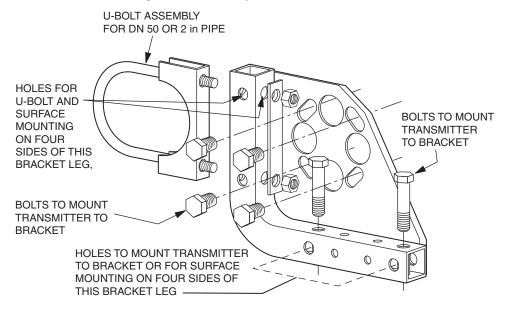


Figure 8. Details of a Universal Bracket

Figure 9. Mounting a Transmitter with Traditional Structure Using a Universal Bracket

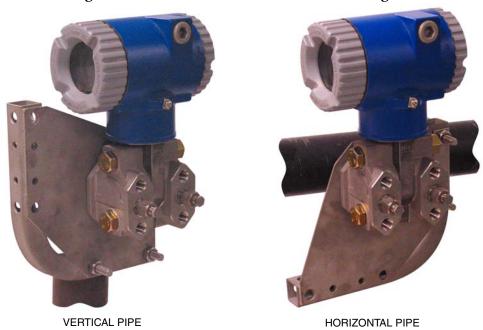


Figure 10. Vertical Pipe Mounting a Transmitter with LP2 Structure Using a Universal Bracket



Figure 11. Horizontal Mounting a Transmitter with LP2 Structure Using a Universal Bracket



Venting and Draining

Traditional Structure

Sensor cavity venting and draining is provided for both vertical and horizontal mounting. For vertical mounted units, draining is via a drain screw and venting is possible with side vents (Option Code -V). For horizontal mounted units, the unit is self draining and venting is via a vent screw.

Figure 12. Vertical Mounting - Cavity Draining

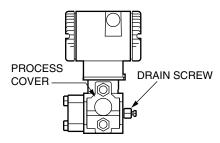


Figure 13. Vertical Mounting - Cavity Venting

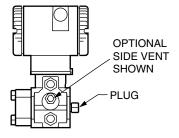
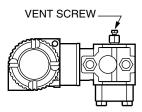


Figure 14. Horizontal Mounting - Cavity Venting



LP1 Low Profile Structure

Sensor cavity venting and draining is provided for both vertical and horizontal mounting. For vertical mounted units, the transmitter is self draining and venting is via a vent screw. For horizontal mounted units, the transmitter can simply be 'turned over' (rotated 180 degrees) to orient the high and low pressure sides in the preferred locations. There is no need to unbolt the process covers. If the transmitter is connected with a length of impulse piping, such piping should slope up to the transmitter for gas applications and down for liquid applications.

Figure 15. Vertical Mounting - Cavity Venting

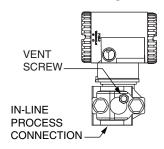
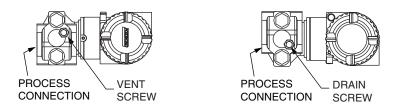


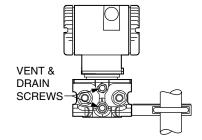
Figure 16. Horizontal Mounting - Cavity Venting and Draining



LP2 Low Profile Structure

The transmitter with LP2 low profile structure had a full-featured vent and drain design with separate vent and drain screws positioned in each cover for complete venting and draining from the sensor cavity.

Figure 17. Cavity Venting and Draining



Installation of Flow Measurement Piping

Figures 18 and 19 show typical installations with horizontal and vertical process pipes.

The transmitters are shown below the level of the pressure connections at the pipe (usual arrangement, except for gas flow without a seal liquid), and with filling tees in the lines to the transmitter (for a seal liquid).

If the process fluid being measured must not come in contact with the transmitter, the transmitter lines must be filled with a suitable seal liquid (see procedure in next section). In such a case, the transmitter must be mounted below the level of the pressure connections at the pipe. With steam flow, the lines are filled with water to protect the transmitter from the hot steam. The seal liquid (or water) is added to the lines through the filling tees. To prevent unequal heads on the transmitter, the tees must be at the same elevation and the transmitter must be mounted vertically (as shown). If a seal liquid is not required, elbows can be used in place of the tees.

Tighten drain plugs and optional vent screws to 20 N·m (15 lb·ft). Tighten the four process connector bolts to a torque of 61 N·m (45 lb·ft).

Note that the low and high pressure sides of the transmitter are identified by an L-H marking on the side of the sensor above the warning label.

With medium viscosity seal liquids and/or long transmitter lines, larger valve sizes should be used.

- NOTE -

- 1. With a **horizontal** line, pressure connections at the pipe should be at the side of the line. However, with gas flow without a seal liquid, connections should be at top of line.
- 2. With a vertical line, flow should be upwards.
- 3. For **liquid** or **steam** flow, the transmitter should be mounted **lower** than the pressure connections at the pipe.
- 4. For **gas** flow **without** a seal liquid, the transmitter should be mounted **above** the pressure connections at the pipe; for **gas** flow **with** a seal liquid, the transmitter should be mounted **below** the pressure connections.
- 5. It is recommended to use snubbers in installations prone to high levels of fluid pulsations.

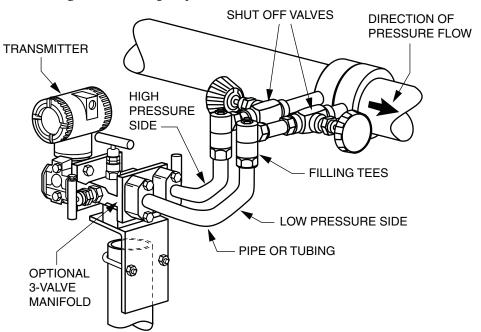


Figure 18. Example of Horizontal Process Line Installation

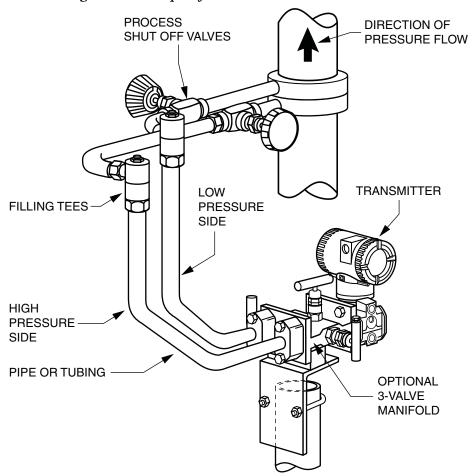


Figure 19. Example of Vertical Process Line Installation

Filling System with Seal Liquid

If the process fluid being measured must not come in contact with the transmitter, the transmitter lines must be filled with a suitable seal liquid. The procedure to do this is as follows:

- 1. If the transmitter is in service, follow the procedure for "Taking a Differential Pressure Transmitter Out of Operation" on page 37.
- 2. Close both process shutoff valves.
- 3. Open all three valves on the 3-valve manifold.
- 4. Partially open the vent screws on the transmitter until all air has been forced out of the transmitter body and lines. Close the vent screws.
- 5. Refill the tee connections. Replace the plugs and close the bypass valve. Check for leaks.
- 6. Follow the procedure for "Putting a Differential Pressure Transmitter Into Operation" on page 37.

A CAUTION

To prevent loss of seal liquid and contamination of process fluid, never open both process shutoff valves and manifold shutoff valves if the bypass valve is open.

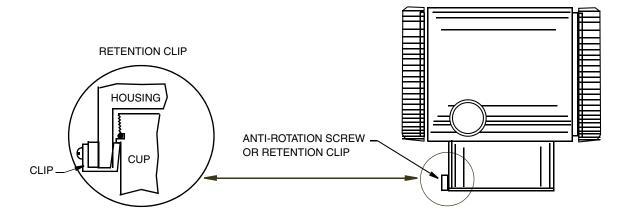
Positioning the Housing

The transmitter housing (topworks) can be rotated up to one full turn in the counterclockwise direction when viewed from above for optimum access to adjustments, display, or conduit connections. Housings have either an anti-rotation screw or a retention clip that prevent the housing from being rotated beyond a safe depth of housing/sensor thread engagement.

A WARNING

If the electronics housing is removed for maintenance, it must be hand tightened to the bottom of the threads, but not over-tightened upon reassembly. See "Removing and Reinstalling the Housing Assembly" on page 60.

Figure 20. Housing Screw or Clip Location



Positioning the Display

The display can be rotated within the housing to any of four positions at 90° increments. To do this, refer to Figure 21 and perform the following:

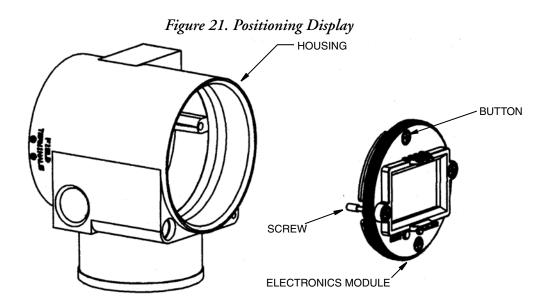
- 1. Turn off power source to the transmitter.
- 2. Screw in the cover lock (if present) and remove the electronics compartment cover by rotating it counterclockwise.
- 3. Remove the electronics module by unscrewing the two screws closest to the sides of the transmitter and pulling out the module.
- 4. If turning the display 180°, turn and return the module to the housing by reversing Step 3.

- 5. If turning the display 90° in either direction:
 - a. Remove the two (2) plastic buttons (plugs) by pushing them out from the backside of the module.

— NOTE -

Plastic buttons were not provided on some early versions of the electronics module.

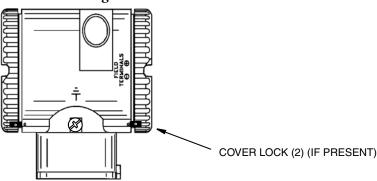
- b. Unscrew the two (2) screws from the module and then rethread them back into the module at 90° from their original position.
- c. Insert the two (2) plastic buttons into the two open screw holes in the module. (To order plastic buttons for earlier versions of the electronics modules or for replacement, see PL 009-005).
- d. Return the module to the housing by reversing Step 3.
- 6. Reinstall the cover onto the housing by rotating it clockwise to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in "Cover Locks" below.
- 7. Restore power to transmitter.



Cover Locks

Electronic housing cover locks, shown in Figure 22, are provided as standard with certain agency certifications and as part of the Custody Transfer Lock and Seal option. To lock the covers, unscrew the locking pin until approximately 6 mm (0.25 in) shows, lining up the hole in the pin with the hole in the housing. Insert the seal wire through the two holes, slide the seal onto the wire ends and crimp the seal.

Figure 22. Cover Lock Location



Wiring

The installation and wiring of your transmitter must conform to local code requirements.

WARNING

ATEX requires that when the equipment is intended to be used in an explosive atmosphere caused by the presence of combustible dust, cable entry devices and blanking elements shall provide a degree of ingress protection of at least IP6X. They shall be suitable for the conditions of use and correctly installed.

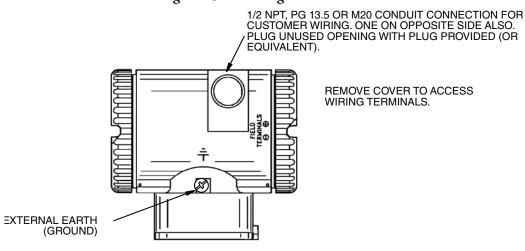
- NOTE -

It is recommended to use transient/surge protection in installations prone to high levels of electrical transients and surges.

Accessing Transmitter Field Terminals

For access to the field terminals, thread the cover lock (if present) into the housing to clear the threaded cover and remove the cover from the field terminals compartment as shown in Figure 23. Note that the embossed letters FIELD TERMINALS identify the proper compartment.

Figure 23. Accessing Field Terminals



POWER CONNECTIONS

OUTPUT VOLTAGE CONNECTIONS

A = POSITIVE

B = NEGATIVE

Figure 24. Identification of Field Terminals

Wiring the Transmitter to a Control Loop

The transmitter is equipped with an internal ground connection within the field wiring compartment and an external ground connection at the base of the electronics housing. To minimize galvanic corrosion, place the wire lead or terminal between the captive washer and loose washer on the external ground screw. If shielded cable is used, earth (ground) the shield at the field enclosure **only**. Do **not** ground the shield at the transmitter.

Power Supply Voltage and Current

The power supply voltage across the transmitter input terminals can be any value between 9 and 15.5 V dc and the power supply must be capable of supplying 3 mA of current under all conditions. Verify that the power supply loop load resistance and source impedance allow at least 9 V dc across the transmitter input terminals with a current draw of 3 mA.

Output Load

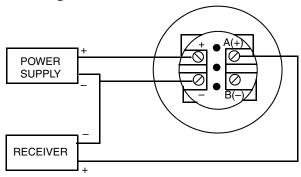
The receiver input impedance can be any value between 1 and 10 M Ω .

Three- or Four-Wire Connections

The transmitter is supplied with a four-wire terminal block with the two negative terminals (- and B) electrically connected internally. This means that the transmitter can be wired with either three wires for wiring economy or four wires for maximum accuracy.

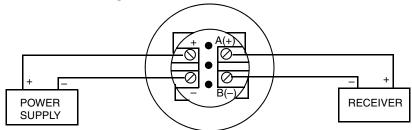
For relatively short wiring runs having low resistance, three-wire connections as shown in Figure 25 can be used to minimize wiring costs. However, a voltage drop in the common lead carrying the power supply current causes an error in the 1 to 5 V dc signal.

Figure 25. Three-Wire Connection



For wiring runs with high resistance due to long lengths or other reasons) or for maximum accuracy, a four-wire connection as shown in Figure 26 can be used to provide input-output isolation. With four-wire configuration, voltage drop in the power supply loop does not affect measurement accuracy.

Figure 26. Four-Wire Connection



To wire a transmitter, proceed with the following steps.

- 1. Screw in cover lock (if present) and remove the field terminals compartment cover by rotating it counterclockwise.
- 2. Run the supply voltage and output wires (0.50 mm² or 20 AWG, typical) through one of the transmitter conduit connections. If four-wire connection is used, use twisted single pair on the output side to protect the 1 to 5 V dc output from electrical noise.

- NOTE

Do not run transmitter wires in same conduit as mains (ac power) wires.

3. If shielded cable is used, earth (ground) the shield at the receiver **only**. Do **not** ground the shield at the transmitter. Cut and/or tape the shield so it cannot contact the metal housing.

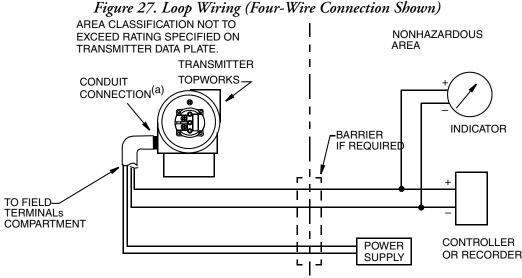
4. Plug unused conduit connection with the 1/2 NPT, PG 13.5 or M20 metal plug provided (or equivalent). To maintain specified explosion proof and dustignition proof protection, plug must engage a minimum of five full threads for 1/2 NPT connections; seven full threads for M20 and PG 13.5 connections. Thread sealant is recommended.

5. Connect an earth (ground) wire to the earth terminal in accordance with local practice.

A CAUTION

If the output circuit must be earthed (grounded), it is preferable to do so at the negative terminal of the receiver. To avoid errors resulting from earth loops or the possibility of short-circuiting groups of instruments in a loop, there should be only one earth in a loop.

6. Connect the power supply and receivers (such as controllers, recorders, indicators) as shown in the above figures. Typical loop wiring is shown in Figure 27.



- (a) Run conduit down to avoid moisture buildup in field terminals compartment.
- 7. Reinstall the cover onto the housing by rotating it clockwise to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in "Cover Locks" on page 32.
- 8. If wiring additional transmitters to the same power supply, repeat Steps 1 through 7 for each additional transmitter. The setup with multiple transmitters connected to a single power supply is shown in Figure 28.

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POWER SUPPLY

TRANSMITTER

TRANSMITTER

TRANSMITTER

RECEIVER

RECEIVER

RECEIVER

Figure 28. Wiring Several Transmitters to a Common Power Supply (Four-Wire Connection Shown)

9. For installations with long runs, it is recommended to use two twisted-pair cables with one pair connected to the power supply terminals and one pair connected to the output terminals. The two twisted pairs can be in individual shields or a common shield with the shield connected to the receiver. The shield must **not** be connected to the transmitter.

Putting a Differential Pressure Transmitter Into Operation

The following procedure explains how to sequence the valves in your flow measurement piping or optional bypass manifold to ensure that your transmitter is not overranged and that seal liquid is not lost. Refer to Figures 18 and 19.

— NOTE

This procedure assumes that the process shutoff valves are open.

- 1. Make sure that both upstream and downstream manifold valves are closed.
- 2. Make sure that the bypass valve is open.
- 3. Slowly open the upstream manifold valve.
- 4. Close the bypass valve.
- 5. Slowly open the downstream manifold valve.

Taking a Differential Pressure Transmitter Out of Operation

The following procedure explains how to sequence the valves in your flow measurement piping or optional bypass manifold to ensure that your transmitter is not overranged and that seal liquid is not lost. Refer to Figures 18 and 19.

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- NOTE -

This procedure assumes that the process shutoff valves are open.

- 1. Close the downstream manifold valve.
- 2. Close the upstream manifold valve.
- 3. Open the bypass valve.
- 4. Carefully open the vent screw to release any residual pressure before disconnecting lines.

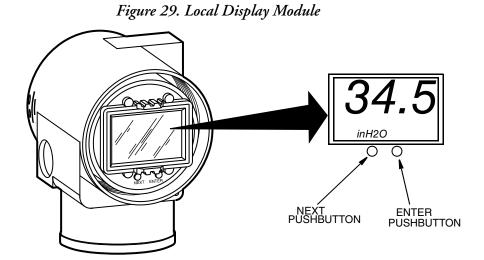
WARNING

When venting pressure from the transmitter, wear suitable protective equipment to prevent possible injury from process material, temperature, or pressure.

3. Operation Via Local Display

A local display, as shown in Figure 29, has two lines of information. The upper line is a 5-digit numeric display (4-digit when a minus sign is used); the lower line is a 7-digit alphanumeric display. The display provides local indication of measurement information and a means for performing calibration and configuration, viewing the database, and testing the display via a 2-button (Next and Enter) keypad. You can access these operations by means of a multi-level menu system. Entry to the Mode Select menu is made (from normal operating mode) by pressing the Next button. You can exit this menu, restore your prior calibration or configuration, and return to the normal operating mode at any time by going to Cancel and pressing the Enter button.

The following items can be selected from this menu: Calibration (CALIB); Configuration (CONFIG); and Testing the display (TST DSP). The top level structure diagram is shown in Figure 30.



I

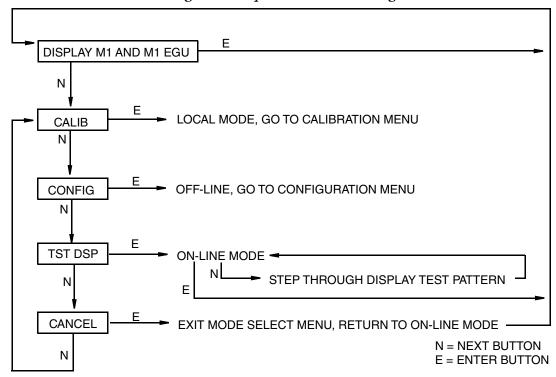
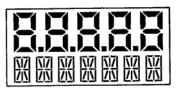


Figure 30. Top Level Structure Diagram

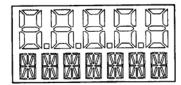
Testing the Display

You can access the Test Display mode by the same multi-level menu system that was used to enter Calibration and Configuration mode. Entry to the Mode Select menu is made (from normal operating mode) by pressing the Next button. The display reads CALIB, the first item on the menu. Press the Next button two times to get to the third item on the menu, TST DSP. Acknowledge your choice of this selection by pressing the Enter button. The display shows the first test segment pattern. You can step through the five patterns by repeated use of the Next button. You can abort the test at any time by pressing the Enter button. The five patterns are shown in Figure 31.

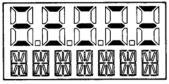
Figure 31. Display Test Segment Patterns
ALL SEGMENTS ON



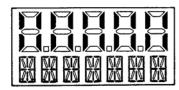
ALL SEGMENTS OFF



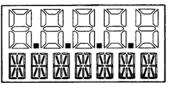
ALL HORIZONTAL SEGMENTS ON



ALL VERTICAL SEGMENTS ON



ALL DIAGONAL SEGMENTS AND DECIMAL POINTS ON



Error Messages

Table 3. Error Messages

Message	Interpretation
OVR RNG	Normalized calculation result greater than 2% above calibrated span. a. Overrange input; correct input condition. b. Bad span calibration; recalibrate span. c. Bad sensor connection; check electronics module to sensor connection. d. Defective or damaged sensor; replace sensor.
UND RNG	Normalized calculation result greater than 2% below calibrated zero. a. Underrange input; correct input condition. b. Bad zero calibration; recalibrate zero. c. Bad sensor connection; check electronics module to sensor connection. d. Defective or damaged sensor; replace sensor.
FDB ERR	CRC error detected in Factory Database on startup. a. Incorrect user database; replace sensor. b. Bad sensor connection; check electronics module to sensor. c. Defective or damaged sensor; replace sensor.
UDB ERR	CRC error detected in User Database on startup. a. Incorrect user database; all configuration and calibration information has been overwritten. Verify and/or update every configuration setting and perform all calibrations again before placing the transmitter back into service b. Bad sensor connection; check electronics module to sensor. c. Defective or damaged sensor; replace sensor.
BAD IN1	Normalized raw pressure input outside of limits. a. Extreme overrange or underrange input; correct input condition. b. Bad calibration; recalibrate transmitter. c. Bad sensor connection; check electronics module to sensor. d. Defective or damaged sensor; replace sensor.
BAD IN3	Normalized raw temperature input outside of limits. a. Bad sensor connection; check electronics module to sensor. b. Defective or damaged sensor; replace sensor.
BAD KEY	Invalid keypress detected. a. Pressing Enter when transmitter is on-line. b. Pressing Next or Enter while WAIT is displayed; try again after WAIT message has cleared.

4. Calibration

— NOTE

- 1. For best results in applications where high accuracy is required, rezero the transmitter output once it has stabilized at the final operating temperature.
- 2. Zero shifts resulting from position effects and/or static pressure effects can be eliminated by rezeroing the transmitter output.
- 3. When checking the zero reading of a transmitter operating in the square root mode, return the output to the linear mode. This eliminates an apparent instability in the output signal. Return the transmitter output to the square root mode after the zero check is complete.
- 4. After calibrating transmitters operating with a 4 to 20 mA (or 1 to 5 V dc) output signal, check the underrange and overrange output values to ensure that they extend beyond 4 and 20 mA (or 1 and 5 V dc) respectively.

General Calibration Notes

- 1. Each transmitter is factory characterized over its full rated differential pressure range. One benefit of this process is that every transmitter can measure any applied differential pressure within its range limits regardless of the calibrated range. The applied differential pressure is measured and converted into an internal digital value. This digital value of differential pressure is always available whether the transmitter is calibrated or not. Calibration assures that the transmitter rated accuracy is achieved over the calibrated range.
- 2. The internal digital value of differential pressure can be displayed on the local display, and converted to a 1 to 5 V dc analog output signal.
- 3. Each transmitter is factory calibrated to either a specified or a default calibrated range. This calibration optimizes the accuracy of the internal digital value of differential pressure over that range. If no range is specified, the default range is zero to the sensor upper range limit (URL).
- 4. The transmitter database has configurable values for both lower range value (LRV) and upper range value (URV). These stored values are used for two functions: defining the calibrated range and reranging without pressure.
 - a. Defining the Calibrated Range:
 - When either CAL LRV or CAL URV is initiated from the local pushbuttons, the transmitter expects that the differential pressure applied at the time the button is pressed is equal to the LRV or URV value respectively.
 - ♦ This function trims the internal digital value of differential pressure; that is, it performs a calibration based on the application of accurate differential pressures equal to the values entered for LRV and URV in the transmitter database.

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◆ This function also sets the 1 and 5 volt output points; that is, the 1 and 5 volt points correspond to the values of LRV and URV in the database.

- If the transmitter is configured for reverse range, the 5 and 1 volt points correspond to the LRV and URV respectively.
- b. Reranging Without the Application of Pressure:
 - Since the transmitter continually determines an internal digital value of the measured differential pressure from the lower range limit (LRL) to the upper range limit (URL), the 1 and 5 volt output points can be assigned to any range values (within the span and range limits) without application of pressure.
 - ◆ The reranging function is accomplished by entering new database values for LRV and URV.
 - Reranging does not affect the calibration of the transmitter; that is, it does not
 affect the optimization of the internal digital value of differential pressure over
 a specific calibrated range.
 - If the reranged LRV and URV are not within the calibrated range, the measured values may not be as accurate as when they are within the calibrated range.
- 5. The internal digital value of differential pressure is sent directly to the indicator.
 - ♦ The display can show any measured differential pressure in selected units regardless of the calibrated range and the values of LRV and URV (within the limits of the transmitter and display). The display can also be 0 to 100 percent.
 - ♦ If the measured differential pressure is outside the range established by the LRV and URV values in the database, the display shows the measurement but also continually blinks to indicate that the measurement is out of range. The voltage signal is saturated at either the low or high overrange limit respectively but the display continually shows the pressure.
 - Custom flow units for display, including 0 to 100 percent, are used when the transmitter is in square root mode.
- 6. Zeroing does not affect the span.

When the transmitter is zeroed to compensate for installed position effect, the transmitter can have either LRV differential pressure applied (CAL LRV) or zero differential pressure applied (CAL AT0). If the range is zero-based, either method produces the same result. However, if the range is not zero-based, it is advantageous to have both methods available.

For example, consider a differential pressure transmitter having a range of 50 to 100 psig. If it is not feasible to vent the transmitter to atmosphere for zeroing (or to bypass the high to low sides for zeroing), it can be zeroed while the LRV differential pressure of 50 psi is applied by using the CAL LRV function. On the other hand, if the transmitter has been installed but there is no pressure in the process line yet (or the high and low sides can be connected by a bypass valve), it can be zeroed while open to atmosphere (or bypassed) by using the CAL ATO function.

a. Zeroing with LRV Pressure Applied (CAL LRV):

4. Calibration MI IDP10-V – October 2016

• Before using this zeroing function, apply a differential pressure to the transmitter equal to the value of LRV stored in the transmitter database.

- When you zero the transmitter, the internal digital value of differential pressure is trimmed to be equal to the value of LRV stored in the database and the voltage output set to 1 volt.
- If zeroing is done when the applied differential pressure is different from the LRV value in the database, the internal digital value of differential pressure is biased by the difference in the values but the output is still set at 1 volt.
- ♦ The CAL LRV (and CAL URV) function should be used when calibrating a transmitter for a specific range with known input differential pressures applied for the LRV and URV.
- b. Zeroing with Zero Pressure Applied (CAL AT0):
 - ♦ Make sure that the applied differential pressure is at zero. This means venting the transmitter to atmosphere or opening a bypass valve to connect high and low sides.
 - When you zero the transmitter, the internal digital value of the differential pressure is trimmed to be equal to zero and the voltage output set to an appropriate value such that the voltage output is a nominal 1 volt when the LRV pressure is applied later.
- 7. There is an independent trim on the digital-to-analog conversion stage. This trim allows for slight adjustment of the 1 and 5 volt outputs. This compensates for any slight difference that exists between the transmitter voltage output and an external reference device which is measuring the voltage.
 - ♦ The voltage trim does not affect the calibration or the reranging of the transmitter and does not affect the internal digital value of differential pressure or the display of measured differential pressure.
 - ◆ The voltage trim can be done with or without pressure applied to the transmitter.

Calibration Setup

The following sections show setups for field or bench calibration. Use test equipment that is at least three times as accurate as the desired accuracy of the transmitter.

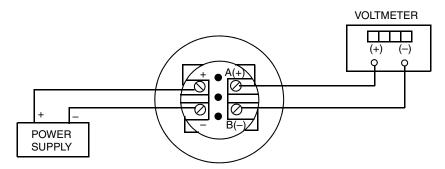
— NOTE -

It is not necessary to set up calibration equipment to rerange the transmitter to a different range. The transmitter can be accurately reranged by simply changing the lower range value and the upper range value, which are stored in the transmitter database.

MI IDP10-V – October 2016 4. Calibration

Setup of Electronic Equipment

Figure 32. 1 to 5 V dc Output Calibration Setup of Electronic Equipment



Field Calibration Setup

Field calibration is performed without disconnecting the process piping. In order to do this, you must have a bypass and shutoff valves between the process and the transmitter and one of the following:

- Access to the process connections on the nonprocess side of the transmitter.
- The optional vent screw in the side of the process covers.

If the transmitter is to be removed from the process for calibration, refer to "Bench Calibration Setup" on page 47.

For field calibration, an adjustable air supply and a pressure measuring device are required. For example, a dead weight tester or an adjustable clean air supply and pressure gauge can be used. The pressure source can be connected to the transmitter process connection with pipe fittings or it can be connected to the vent screw assembly using a calibration screw. The calibration screw has a Polyflo fitting and can be used for pressures up to 700 kPa (100 psi). It is available as Part Number F0101ES.

To set up the equipment, refer to Figure 33 and use the following procedure.

1. If the transmitter is in operation, follow the "Taking a Differential Pressure Transmitter Out of Operation" procedure on page 37.

A CAUTION

With liquid service, drain both sides of transmitter to avoid calibration errors.

- 2. If a calibration screw is being used, remove the vent screw and replace it with the calibration screw. Connect the pressure source to the calibration screw using 6 x 1 mm or 0.250 inch tubing.
 - If a calibration screw is **not** being used, remove the entire vent screw assembly or drain plug (as applicable) from the high pressure side of the transmitter. Connect calibration tubing using a suitable thread sealant.
- 3. Close the bypass valve opened in Step 1.
- 4. Complete the setup shown in Figure 33.

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— NOTE

For vacuum applications, connect the calibrating pressure source to the low pressure side of the transmitter.

5. If calibrating the output signal, also connect equipment as shown in Figure 32.

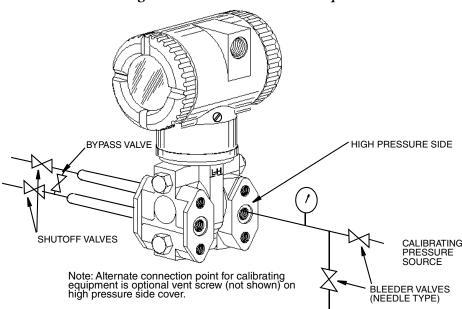


Figure 33. Field Calibration Setup

Bench Calibration Setup

The bench calibration setup requires disconnecting the process piping. For calibration setup without disconnecting the process piping, refer to "Field Calibration Setup" on page 46.

The bench calibration setup is shown in Figure 34. Connect the input piping to the high pressure side of the transmitter as shown. Vent the low pressure side of the transmitter.

— NOTE

For vacuum applications, connect the calibrating pressure source to the low pressure side of the transmitter.

If calibrating the output signal, also connect equipment as shown in Figure 32.

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BYPASS VALVE

HIGH PRESSURE SIDE

CALIBRATING PRESSURE SOURCE
SOURCE
(NEEDLE TYPE)

Figure 34. Bench Calibration Setup

Calibration Using the Local Display

To access the Calibration mode (from normal operating mode), press the Next button. The display reads CALIB, the first item on the menu. Acknowledge your choice of this selection by pressing the Enter button. The display shows the first item in the Calibration menu.

A CAUTION

Anytime Calibration (CALIB) mode is entered, the transmitter output is automatically set to 1 volt until Cancel or Save is selected and the transmitter comes back on-line. Make sure that the control loop is in manual before selecting CALIB.

- NOTE

During calibration, a single change could affect several parameters. For this reason, if an entry is entered in error, re-examine the entire database or use the Cancel feature to restore the transmitter to its starting configuration and begin again.

Table 4. Calibration Menu

Item	Description		
CAL AT0	Calibrate with zero pressure.		
CAL LRV	Calibrate with pressure at 0% of transmitter range (LRV).		
CAL URV	Calibrate with pressure at 100% of transmitter range (URV).		
ADJ 1V	Adjust nominal 1 volt output.		
ADJ 5V	Adjust nominal 5 volt output.		
ADJ 1V causes the following four submenus.			
Α 1VΔΔ	Increase 1 volt output by large step.		
A 1V $ abla abla$	Decrease 1 volt output by large step.		
A 1V∆	Increase 1 volt output by small step.		
A 1V∇	Decrease 1 volt output by small step.		
ADJ 5V causes the following four submenus.			
Α 5VΔΔ	Increase 5 volt output by large step.		
A 5V $\nabla\nabla$	Decrease 5 volt output by large step.		
A 5VΔ	Increase 5 volt output by small step.		
A 5V∇	Decrease 5 volt output by small step.		

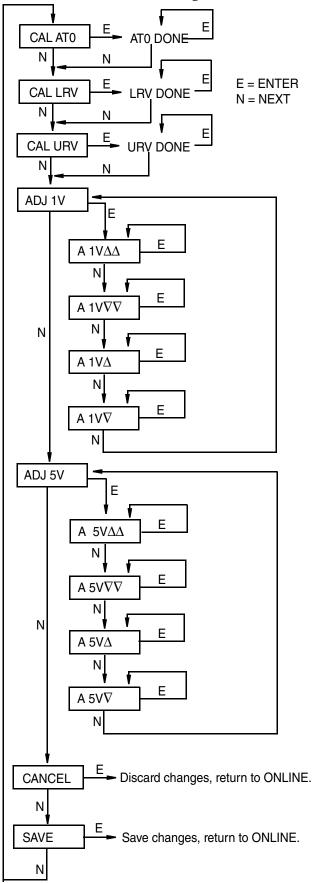
- NOTE -

- 1. It is not necessary to use the Adj 1 V or Adj 5 V menu selections unless there is a plant requirement to make the 1 and 5 V dc output values exactly match readings on certain plant calibration equipment and the calibration operations done result in a small but unacceptable difference between the transmitter voltage output and the test equipment voltage readout values.
- 2. The IDP10-V transmitter can be reranged without the application of pressure.

Proceed to calibrate your transmitter by using the Next key to select your item and the Enter key to specify your selection per Figure 35. At any point in the calibration you can Cancel, restore your prior calibration and return to the on-line mode or Save your new calibration.

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Figure 35. Calibration Structure Diagram



CAL AT0: To set or reset the zero point at zero differential pressure, apply zero differential pressure to the transmitter and, at display of CAL AT0, press Enter. This can be done whether LRV is zero or not. Completion is indicated by the display AT0 Done.

CAL LRV: To set or reset 0% of range input, apply differential pressure to the transmitter equal to the lower range value (LRV) in the transmitter database and, at display of CAL LRV, press Enter. Completion is indicated by the display LRV Done.

CAL URV: To set or reset 100% of range input, apply differential pressure to the transmitter equal to the upper range value (URV) in the transmitter database and, at display of CAL URV, press Enter. Completion is indicated by the display URV Done.

ADJ 1V: To adjust the 1 volt output, go to Adj 1V using the Next button and press Enter.

To increase the 1 volt output by a large (3.397 mV) step, press Enter at the display A 1VΔΔ. To decrease it by a large step, go to the display A 1V∇∇ by pressing the Next button and then Enter. To increase it by a small (0.679 mV) step, go to the display A 1VΔ with the Next button and then press Enter. To decrease it by a small step, go to the display A 1V∇ with the Next button and then press Enter.

ADJ 5V: To increase or decrease the 5 volt output by large or small steps, follow a procedure similar to that for changing the 1 volt output explained immediately above.

Error Messages

Table 5. Error Messages

Message	Interpretation	
LOLIMIT	Volt and 5 Volt calibration adjustment has reached lower limit. a. Improper calibration setup; correct setup. b. Bad D/A converter; replace electronics module.	
HILIMIT	1 volt and 5 volt calibration adjustment has reached upper limit. a. Improper calibration setup; correct setup. b. Bad D/A converter; replace electronics module.	
BADZERO	Recalculation of offset during CAL AT0, CAL LRV resulted in out of range value. a. Applied pressure too high during operation. b. Improper calibration setup.	
BADSPAN	Recalculation of slope during CAL URV operation resulted in out of range value. a. Applied pressure too low during CAL URV operation. b. Improper calibration setup.	

MI IDP10-V – October 2016 4. Calibration

5. Configuration

You can access the Configuration mode by the same multi-level menu system that was used to enter Calibration mode. Entry to the Mode Select menu is made (from normal operating mode) by pressing the Next button. The display reads CALIB, the first item on the menu. Press the Next button again to get to the second item on the menu, CONFIG. Acknowledge your choice of this selection by pressing the Enter button. The display shows the first item in the Configuration menu. You can then configure items shown in the following table. The initial factory configuration is also given in this table.

- NOTE

During configuration, a single change may affect several parameters. For this reason, if an entry is entered in error, re-examine the entire database or use the Cancel feature to restore the transmitter to its starting configuration and begin again.

Table 6. Configuration Menu

Item	Description	Initial Factory Configuration ^(a)
OUT DIR	Output direction: forward or reverse	Forward
OUTMODE	Output: linear or type of square root	Linear
OUTFAIL	Fail mode output: low or high	High
DAMPING	Damping: none, 2-, 4-, or 8-seconds	None
DISPEGU	Display measurement in EGU or in percent of span	Use EGU
EGU SEL	Engineering units for calibrated range and display: select from list if linear mode; Choose Percent or enter custom units if square root mode.	Per Sales Order for Linear; Percent for Sq Rt
EGU LRV ^(c)	Set Lower Range Value (LRV)	Per Sales Order
EGU URV ^(c)	Set Upper Range Value (URV)	Per Sales Order
DSP URV ^(d)	User-defined Upper Range Value for display	Per Sales Order

⁽a) Default settings. If optional feature "-C2" is specified, the initial factory configuration is custom per order.

Proceed to configure your transmitter by using the Next key to select your item and the Enter key to specify your selection per Figure 36. At any point in the configuration you may Cancel your changes and return to the on-line mode or Save your changes.

⁽b) Not applicable to IDP10-AS and IDP10-VS.

⁽c) This parameter is only shown when OUTMODE is LINEAR.

⁽d)This parameter is only shown when OUTMODE is one of the square root selections.

MI IDP10-V - October 2016 5. Configuration

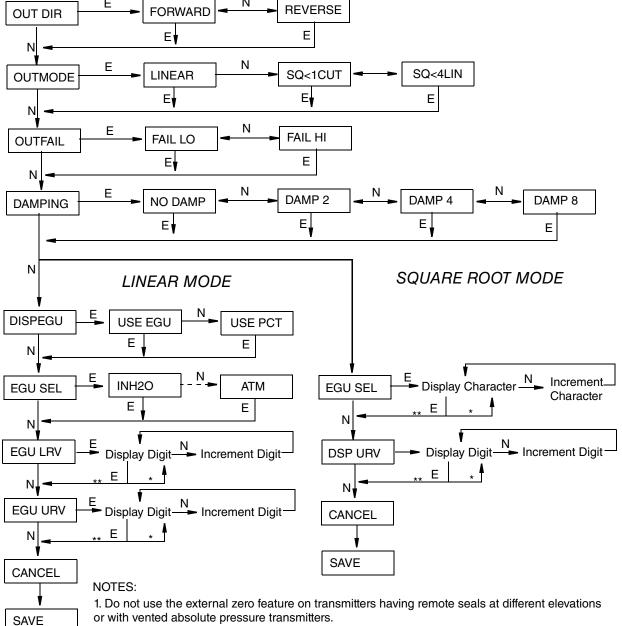


Figure 36. Configuration Structure Diagram

- or with vented absolute pressure transmitters.
- 2. Square root functions should not be selected on absolute and gauge pressure or flange level transmitters.
- 3. Display in Linear Mode may be pressure units of calibrated range or percent (no custom units).
- 4. Display in Square Root Mode requires configuration of flow units or percent and allows user entry of URV in flow units.
 - *If character is not the last position on the display line, advances to next character.
 - **If character is the last position on the display line, advances to next menu item.

Commentary on Configuration Structure Diagram

In general, use the Next button to select an item and the Enter button to specify a selection. OUT DIR:

To configure the Output Direction, go to OUT DIR with the Next button and press Enter. Use the Next button to select FORWARD (4 - 20 mA) or REVERSE (20 - 4 mA) and press Enter.

OUTMODE:

To configure the mode of the output, go to OUTMODE with the Next button and press Enter. Use the Next button to select LINEAR, SQ<1CUT (square root with cutoff below 1% of calibrated pressure range), or SQ<4LIN (square root with dual slope linear below 4% of calibrated pressure range) and press Enter.

- NOTE

If you wish the output and display to be in square root, it is necessary to first configure OUTMODE as LINEAR and follow the Linear Mode path to establish the pressure LRV and URV. Then go back and configure OUTMODE as one of the square root mode selections and follow the Square Root mode path.

OUTFAIL:

The Outfail feature provides high or low output with certain malfunctions. To configure the fail mode output, go to OUTFAIL with the Next button and press Enter. Use the Next button to select FAIL LO or FAIL HI and press Enter.

DAMPING:

To configure additional damping, go to DAMPING with the Next button and press Enter. Use the Next button to select NO DAMP, DAMP 2, DAMP 4, or DAMP 8 and press Enter.

DISPEGU:

To configure the display to present the measurement in engineering units or percent of span, go to DISPEGU with the Next button and press Enter. Then use the Next button to select Use EGU or Use Pct and press Enter.

EGU SEL:

To configure engineering units for your calibrated range and display, go to EGU SEL with the Next button and press Enter. Depending on how OUTMODE is configured, the remainder of the configuration takes one of two paths.

If OUTMODE was configured as LINEAR, use the Next button to select one of the following units: INH₂O, INHG, FTH₂O, MMH₂O, MMHG, PSI, BAR, MBAR, G/CM², KG/CM², PA, KPA, MPA, TORR, or ATM and press Enter. The display advances to EGU LRV.

If OUTMODE was configured as SQ<1CUT or SQ<4LIN, you can specify any custom display unit up to seven characters in length. The display shows Percent with the first character flashing. Use the Next button to step through the library of characters to select the desired first character, then press Enter. Your selection is entered and the second character flashes. Repeat this procedure until you have created your new unit name. If the unit name has less than seven characters, use blanks for the remaining spaces. When you have configured the seventh space, the display advances to DSP URV.

MI IDP10-V – October 2016 5. Configuration

EGU LRV:

To configure the LRV, press Enter at the prompt EGU LRV. Use the Next button to toggle between a space or a minus and press Enter. Then use the Next button to step through the library of numerical characters to select the desired first digit, and press Enter. Your selection is entered and the second digit flashes. Repeat this procedure until you have entered your last digit. Then use the Next button to move the decimal point to its desired location and press Enter.

EGU URV:

Similar to EGU LRV immediately above.

DSP URV:

To configure the display URV in the units specified, press Enter at the prompt DSP URV. Use the Next button to toggle between a space or a minus and press Enter. Then use the Next button to step through the library of numerical characters to select the desired first digit, and press Enter. Your selection is entered and the second digit flashes. Repeat this procedure until you have entered your last digit. Then use the next button to move the decimal point to its desired location and press Enter.

Reranging the Transmitter

The transmitter can be reranged without application of pressure. To do this in linear mode, just reconfigure EGU LRV and EGU URV. To rerange the transmitter being used in Square Root mode, perform the following procedure:

- 1. In Configuration, set OUTMODE to LINEAR. This is a temporary state.
- Then configure EGU LRV and EGU URV, first changing the units in EGU SEL if necessary.
- 3. Save this configuration.
- 4. Set OUTMODE back to your choice of square root mode.
- 5. Change EGU SEL and DSP URV if required.
- 6. Save this configuration.

- NOTE

When OUTMODE is set in square root mode, the last saved differential pressure range set by entering EGU LRV and EGU URV in linear mode is always maintained.

5. Configuration MI IDP10-V – October 2016

Character Lists

Table 7. Alphanumeric Character List

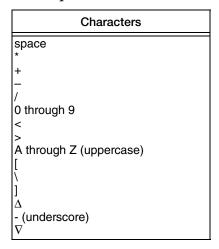


Table 8. Numeric Character List

Characters
_
0 through 9

Error Messages

Table 9. Error Messages

Message	Interpretation	
BAD LRV	Entered value for EGU LRV is outside sensor limits.	
BAD URV	Entered value for EGU URV is outside sensor limits.	
BAD RNG	Recalculation of turndown during EGU LRV or EGU URV resulted in out of range value. Entered values for EGU LRV and/or EGU URV were either too close together or too far apart.	
RNG>EGU	Recalculation of display value for EGU LRV or EGU URV resulted in out of range value. Selection of (linear) EGU units caused display to overflow.	
LRVNOT0	Attempting mode change from LINEAR to SQ<1CUT or SQ<4LIN when EGU LRV is not 0.0.	

MI IDP10-V – October 2016 5. Configuration

6. Maintenance

A DANGER

For nonintrinsically safe installations, to prevent a potential explosion in a Division 1 hazardous area, de-energize transmitters before you remove threaded housing covers. Failure to comply with this warning could result in an explosion resulting in severe injury or death.

Parts Replacement

Parts replacement is generally limited to the electronics module assembly, housing assembly, sensor assembly, terminal block assembly, cover O-rings, and optional display. For part numbers relating to the transmitter and its options, see PL 009-005.

Replacing the Terminal Block Assembly

- 1. Turn off transmitter power source.
- 2. Remove the Field Terminals compartment cover by rotating it counterclockwise. Screw in cover lock if applicable.
- 3. Remove the four socket head screws securing the terminal block.
- 4. Disconnect the loop wiring connector from the terminal block.
- 5. Remove the terminal block and the gasket under it.
- 6. Reconnect the loop wiring connector to the new terminal block.
- 7. Install the new terminal block and new gasket and reinstall the four screws to 0.67 N·m (6 in·lb) in several even increments.
- 8. Reinstall the cover onto the housing by rotating it clockwise to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in "Cover Locks" on page 32.
- 9. Turn on transmitter power source.

Replacing the Electronics Module

To replace the electronics module assembly, proceed as follows:

- 1. Turn off transmitter power source.
- 2. Screw in cover lock (if present) and remove the threaded electronics compartment cover by rotating it counterclockwise.

MI IDP10-V – October 2016 6. Maintenance

3. Remove the electronics module from the housing by loosening the two captive screws that secure it to the housing. These screws are located towards the sides of the housing. Then pull the module out of the housing.

A CAUTION

The electronics module is "one assembly" at this point and is electrically and mechanically connected to topworks with a flexible ribbon signal cable, a 2-wire power cable, and in some cases, a cable for an optional external zero pushbutton. Do **not** exceed the slack available in these cables when removing the assembled module.

- 4. Unplug all cable connectors from the rear of the electronics module, noting the location of each cable, and place the module on a clean surface.
- 5. Predetermine connector orientation, then insert the cable connectors into the replacement module. Replace the module in the housing and tighten the two screws that secure it to the housing.

— NOTE -

To rotate display, see "Positioning the Display" on page 31.

- 6. Reinstall the cover onto the housing by rotating it clockwise to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. If cover locks are present, lock the cover per the procedure described in "Cover Locks" on page 32.
- 7. Turn on transmitter power source.

The module replacement procedure is now complete.

- NOTE

The transmitter configuration is stored in the sensor assembly. Therefore, the configuration settings are retained when replacing the electronics module. Recalibration, however, is recommended.

Removing and Reinstalling the Housing Assembly

To remove and reinstall the housing assembly, proceed as follows:

- 1. Remove the electronics module per Steps 1 through 4 in the previous procedure.
- 2. If your housing has an anti-rotation screw, remove the red lacquer from the screw recess. Turn the screw three full turns counterclockwise.
- 3. If your housing has a retention clip, remove the red lacquer from the screw recess. Remove the screw completely, and slide the clip off the housing. Save the clip and screw for future use.
- 4. Remove the housing by rotating it counterclockwise (when viewed from the top). Use caution to avoid damaging the sensor cable.
- 5. Inspect the sensor O-ring for damage. If the O-ring is damaged, replace it with the appropriate O-ring. (See parts list for your transmitter). Lubricate the O-ring with silicone lubricant (Part Number 0048130 or equivalent). Verify that the O-ring is situated in the groove of the neck.

A WARNING

Failure to reuse or install the proper O-ring for a CSA labeled product violates ANSI / ISA 12.27.01.

- 6. Feed the sensor cable through the housing neck into the electronics compartment.
- 7. Screw the housing onto the sensor neck until it bottoms. Do not over tighten. Be careful not to damage the sensor cable or dislodge the neck O-ring.
- 8. If your housing has an anti-rotation screw, engage the screw until it touches the sensor neck and back it off 1/8th turn. It is important that the screw is not touching the sensor. Fill the screw recess with red lacquer (Part Number X0180GS or equivalent). the housing may then be rotated up to one full turn counterclockwise for optimum access.
- 9. If your housing has a retention clip, insert the clip over the boss in the housing neck so that the hole in the clip is aligned with the hole in the boss. Install the screw but do not tighten. Rotate the housing up to one full turn counterclockwise for optimum access. Tighten the retention clip screw and fill the screw recess with red lacquer (Part Number X0180GS or equivalent). The housing can still be rotated for optimum access.
- 10. Reinstall the electronics module per Steps 5 through 7 in the previous procedure.

Replacing the Sensor Assembly

To replace the sensor assembly, refer to Figures 37 and 38 and proceed as follows:

- 1. Remove the electronics module as described above.
- 2. Remove the housing as described above.
- 3. Remove the process covers from sensor by removing two hex head bolts.
- 4. Replace the gaskets in the process covers.
- 5. Install the process covers and housing on the new sensor. Torque cover bolts to 100 N·m (75 lb·ft) in several even increments. Torque values are 68 N·m (50 lb·ft) when 316 ss bolts are specified; 75 N·m (55 lb·ft) when B7M bolts are specified.
- 6. Reinstall electronics module.
- 7. Pressure test the sensor and process cover assembly by applying a hydrostatic pressure of 150% of the maximum static and overrange pressure rating to both sides of the process cover/sensor assembly simultaneously through the process connections. Hold pressure for one minute. There should be no leakage of the test fluid through the gaskets. If leakage occurs, retighten the cover bolts per Step 5 (or replace the gaskets) and retest.

A CAUTION

Perform hydrostatic test with a liquid and follow proper hydrostatic test procedures.

MI IDP10-V – October 2016 6. Maintenance

Figure 37. Replacing the Sensor Assembly

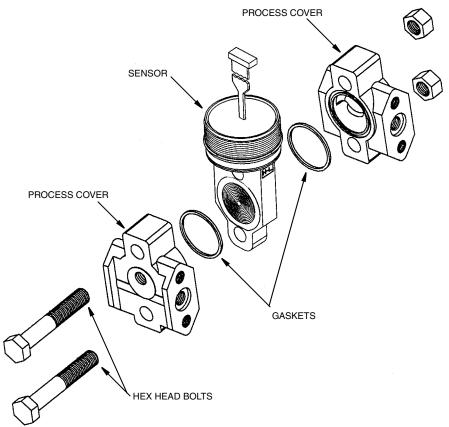
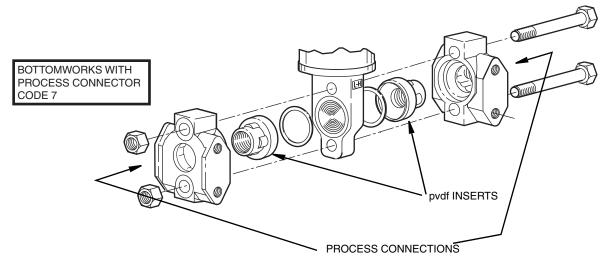


Figure 38. Replacing the Sensor Assembly (pvdf Inserts)



6. Maintenance MI IDP10-V – October 2016

Rotating Process Covers for Venting

As received, your IASPT Transmitter provides sensor cavity draining without the need for side drain connections, regardless of whether the transmitter is mounted vertically or horizontally. Sensor cavity venting is provided by mounting the transmitter horizontally or with the optional vent screw (-V). However, if you did not specify this option, you can still achieve venting (instead of draining) with vertical mounting by rotating the process covers. See Figure 39.

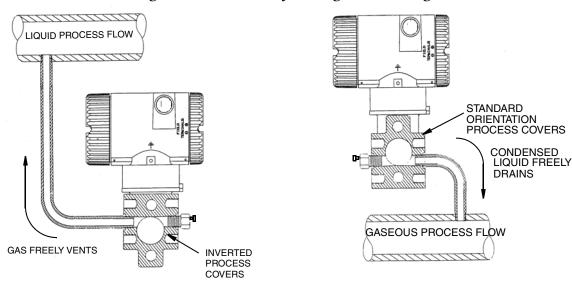


Figure 39. Sensor Cavity Venting and Draining

To rotate the process covers, refer to Figure 37 and proceed as follows:

- 1. Turn off the transmitter power source and remove the transmitter from the process.
- 2. Remove the process covers from sensor by removing two hex head bolts.
- 3. Replace gaskets in process covers.
- 4. Rotate the process covers so that the longer tab is at the bottom.
- 5. Reinstall process covers and bolts. Torque cover bolts to 100 N·m (75 lb·ft) in several even increments. Torque values are 68 N·m (50 lb·ft) when 316 ss bolts are specified; 75 N·m (55 lb·ft) when B7M bolts are specified.
- 6. Pressure test the sensor and process cover assembly by applying a hydrostatic pressure of 150% of the maximum static and overrange pressure (see "Standard Specifications" on page 11) to both sides of the process cover/sensor assembly simultaneously through the process connections. Hold pressure for one minute. There should be no leakage of the test fluid through the gaskets. If leakage occurs, retighten the cover bolts per Step 4 or replace the gaskets and retest.

A CAUTION

Perform hydrostatic test with a liquid and follow proper hydrostatic test procedures.

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