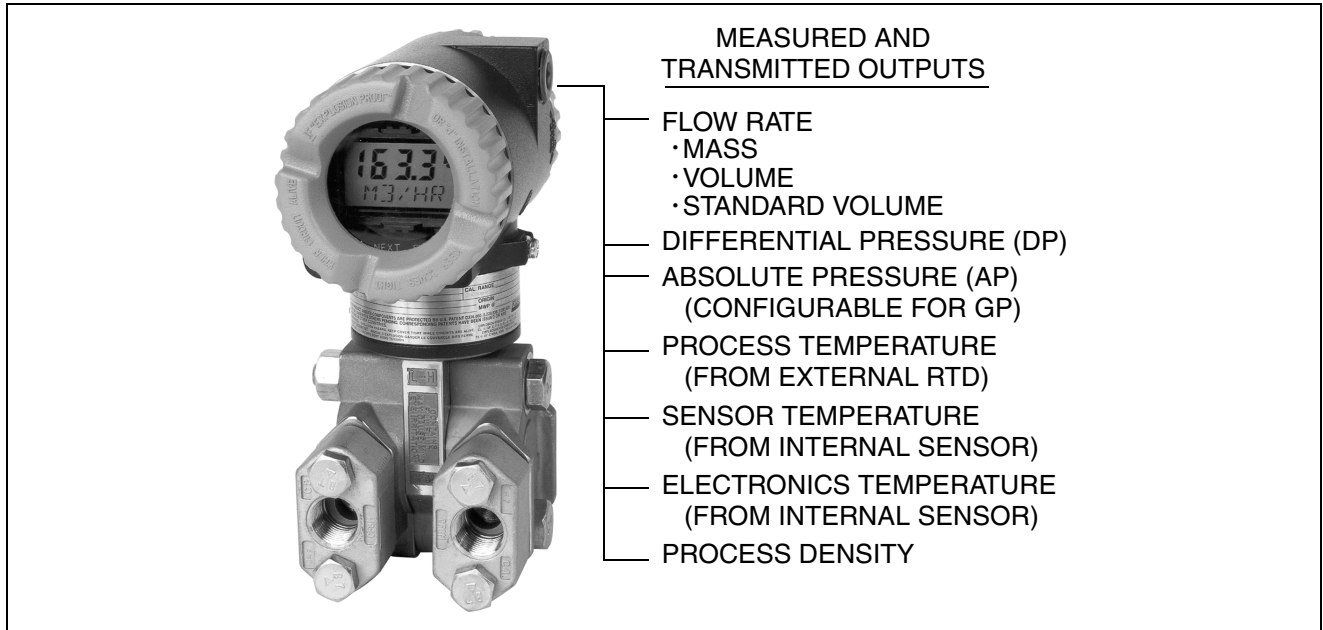


I/A Series® Multivariable Transmitters

Model IMV30 Series for P, DP, and T Measurements with HART® or FoxCom™ Communication Protocol



This intelligent two-wire transmitter provides precise and reliable measurement of pressure, differential pressure, sensor and electronics temperatures, and process temperature (from an external RTD). It transmits a 4 to 20 mA or digital output signal, as applicable, using HART or FoxCom Communication Protocol for remote configuration, calibration, and monitoring. When used with a primary flow element, it also calculates process density and flow rate, and provides transmission of all the measured and calculated values.

FEATURES

- One transmitter for many applications
 - Individual measurements on a 2-wire loop
 - Multiple measurements digitally
 - Assigns 4 to 20 mA to any measurement
- Convenient module change allows easy migration between communication protocols
- Calculates mass, volume, or standard volume flow rate based on multiple measurements, using a primary flow element
- Local configuration available with the optional LCD Indicator (PC-based configurator required for flow rate setup)
- Complies with NAMUR, Part 1 Interference Immunity Requirement
- CE marked; complies with EMC and ATEX European Directives
- Meets many testing agency requirements for hazardous area installations
- Standard 2-year warranty; 5-year optional

BENEFITS

- One transmitter replaces three separate transmitters, saving initial purchase costs
- Reduced process penetrations save money and reduce chances of fugitive emissions
- Fewer transmitters, less wiring, and fewer shutoff valves reduce installation costs
- Greater reliability due to fewer devices and less wiring means less chance of losses from downtime or process upsets
- Flow rate values from the transmitter eliminate allocation of system resources for flow rate calculations, reducing system costs
- High functionality and high performance provide exceptional value
- Numerous options and accessories offered to expand the capabilities of these transmitters

I/A Series PRESSURE TRANSMITTER FAMILY

These Transmitters are a complete family of gauge, absolute, d/p Cell®, multirange, multivariable, and premium performance transmitters, as well as transmitters with remote or direct mount pressure seals. They all use field-proven silicon strain gauge sensors and common topworks.

DIGITAL AND 4 TO 20 mA OUTPUT VERSIONS

The IMV30 provides 4 to 20 mA or digital output versions using FoxCom or HART communication protocols. See paragraphs that follow.

Digital FoxCom and/or 4 to 20 mA dc (Version -D Electronics)

FoxCom Digital Output

Provides Measurement Integration with I/A Series systems, transmission of multiple measurements, and workstation configuration and diagnostics. Also provides digital communications with a PC-based Configurator, or an optional LCD Digital Indicator.

FoxCom 4 to 20 mA Output

Allows direct analog connection to common receivers while still providing full Intelligent Transmitter Digital Communications with a PC-based Configurator, applicable I/A Series system FBMs, or optional LCD Digital Indicator.

Digital HART and 4 to 20 mA dc (Version -T Electronics)

4 to 20 mA with HART communications. Allows direct analog connection to common receivers while still providing full digital communications using a HART Communicator, PC-based Configurator, or optional LCD Digital Indicator.

Users having HART Communicators for other devices can have them upgraded with Foxboro software to accommodate these transmitters. Also, Foxboro will make use of the HART Foundation library of registered DDs (Device Descriptors), and reload the Communicator if the user desires to keep another supplier's DD along with the Foxboro DD.

EXCEPTIONALLY HIGH PERFORMANCE

- Accuracy to $\pm 0.05\%$ of Span
- Long term stability with drift less than $\pm 0.05\%$ URL per Year over a 5-year Period
- Minimized static pressure effect on DP by using pressure to compensate the DP measurement
- Excellent Ambient Temperature Effect Compensation due to Characterization and Microprocessor-Based Compensation
- Total Probable Error (TPE) significantly better than typical competitive transmitters

MULTIPLE MEASUREMENTS AND CALCULATIONS

- Differential Pressure (DP)
- Pressure (P)
- Process Temperature (from external RTD)
- Flow Rate (Mass, Volume, or Standard Volume)
- Density
- Sensor Temperature
- Electronics Temperature

FLOW RATE MEASUREMENT

- Can be used with primary flow devices such as orifice plates (see Figure 1), flow nozzles, Venturi tubes, and averaging pitot elements
- Flow rate equations for liquids, gases, and vapors, including natural gas and steam, reside in the IMV30 Transmitter
- With a separate RTD for Process Temperature Measurement, the IMV30 can calculate Mass Flow Rate, fully compensated for changes in absolute pressure and temperature
- Selection of Volume and Standard Volume Flow Rate, in addition to Mass Flow Rate
- Supports connection of a 2-, 3-, or 4-wire RTD, user-entered temperature, or calculation from saturation pressure (steam)
- Eliminates the need for a separate computer to make the flow rate calculations
- Flow rate transmission can be either in selectable EGU, such as kg/min (for the digital signal), or in Current (for the 4 to 20 mA analog signal), representing a specified flow rate range
- Continuous dynamic compensation for all variables, including:
 - Changes in fluid density
 - Dimensional changes in primary device and adjacent piping with temperature
 - Changes in discharge coefficient based on Reynolds Number (corrected for velocity, density, and viscosity)

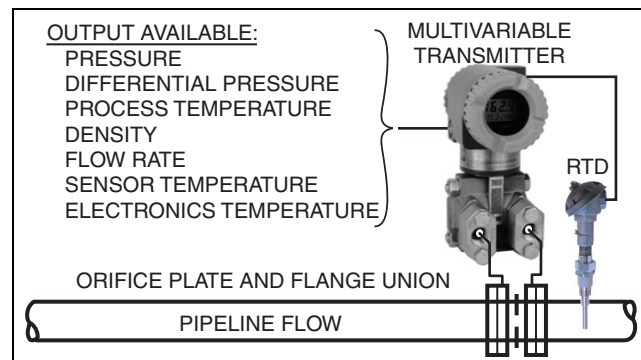


Figure 1. Flow Rate Measurement with Orifice Plate

PCMV MULTIVARIABLE TRANSMITTER CONFIGURATOR⁽¹⁾

- Windows-based software package to configure IMV30 Transmitter for flow rate applications
- Determines a set of application-specific coefficients to be downloaded to transmitter for use in the transmitter's flow rate equations
- Provides configuration for:
 - Choice of primary flow device (i.e., orifice, nozzle, Venturi, averaging pitot)
 - Choice of pressure tap location (i.e., flange, corner, or D and D/2)
 - Process fluid, from a database of density-temperature relationships for over 275 fluids, or from user-entered density and temperature data
 - Operating pressure and temperature ranges
 - Industry flow rate standards, such as AGA, API, ISO, and ASME⁽²⁾
- Easy-to-use configurator provides selections for user applications. For typical configurator screens, see Figures 2 to 4.

ANALOG OR DIGITAL TRANSMISSION

- The 4 to 20 mA analog output can be assigned to any one of the following variables:
 - Differential Pressure
 - Absolute Pressure
 - Process Temperature
 - Sensor Temperature
 - Electronics Temperature
 - Flow Rate
 - Density⁽³⁾

Also, these variables can be read digitally using the PC-based Configurator or HART Communicator (-T electronics only).

- The digital output can be used for direct communication with an I/A Series System FBM:
 - With FoxCom protocol, three of the above listed variables can be selected for high speed digital communication to the System with a fixed current.
 - With HART protocol, the above listed variables are digitally communicated to the system FBM with a 4 to 20 mA current.
 - All of the variables may be read digitally using the PC-based Configurator or HART Communicator (-T electronics only).

Figure 2. HART Device Configuration Screen

Figure 3. Orifice Plate Type Selection Screen

Inputs		Current Calibration		Enter Flow Equation Limits			
Input Variables	Cal LRV	Cal URV	Equation LRL	Equation URL	Units	Test Values	
M1 = DP	0.	29.9999	-1	44.9999	inH2O	34.12638	
M2 = AP	0.	100.	10	150	psia	149.7	
M5 = RTD	-328.	1562.	-0.0000419	399.9999	degF	398.2745	

Outputs		Calculated Limits			
Output Variables	Equation LRL	Equation URL	Units	Cal. Values	
M7 = Density	0	61.00329	lb/ft3	Coeff's Invalid	
M6 = Flow	-1605003	1605003	lb/h	Coeff's Invalid	

Figure 4. PCMV User Data Screen

(1) Refer to PSS 2A-1Z3 F for specifications relating to the Model PCMV Multivariable Transmitter Configurator.

(2) AGA = American Gas Association; API = American Petroleum Institute; ISO = International Standards Organization; and ASME = American Society of Mechanical Engineers.

(3) Density stated is at actual pressure and temperature, and based on known fluid parameters.

EASE OF INSTALLATION

- Rotatable Topworks
 - Allows installation in tight places
 - Positions indicator in preferred direction
 - Eases field retrofit
- Two conduit connections
 - Provide for easy wiring
 - Allow self-draining of condensation
- Wiring guides and terminations
 - Provide easy entry and plenty of space
 - Use large, rugged screw terminals for easy wire termination

PROCESS CONNECTORS

- Removable, gasketed connectors allow a wide range of selections, including 1/4 NPT, 1/2 NPT, Rc 1/4, Rc 1/2, and weld neck connectors

UNIQUE PROCESS COVER AND CELL BODY DESIGN

Biplanar Construction (Figure 5) 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 static pressure rating. 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.

Process Covers (Figure 5) 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 5) 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 ptfе as standard; ptfе provides nearly universal corrosion resistance, and eliminates the need to select and stock various elastomers to assure process compatibility.

ATEX Flameproof Design allows the transmitter to be installed in hazardous locations requiring ATEX Flameproof rating.

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

Tangential Draining and Venting (Figures 6 to 8) provide sensor cavity draining without the need for side drain connections, regardless of whether transmitter is mounted vertically or horizontally. The transmitter also provides venting with both horizontal and vertical mounting (venting in the vertical position is optimized by using optional side vents).

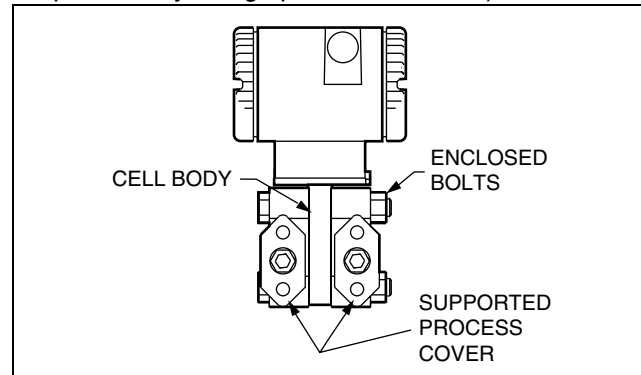


Figure 5. Biplanar Construction

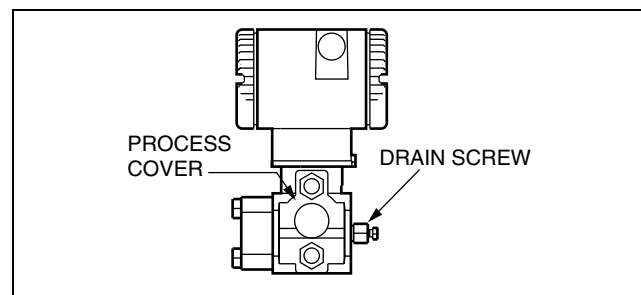


Figure 6. Vertical Mounting - Cavity Draining

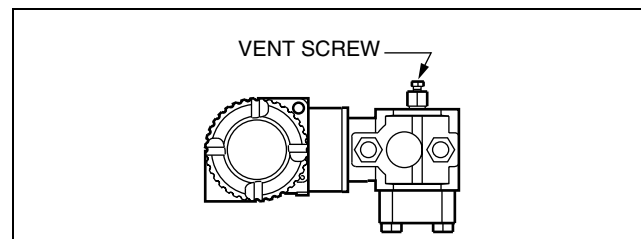


Figure 7. Horizontal Mounting - Cavity Venting and Self-Draining into Process Line

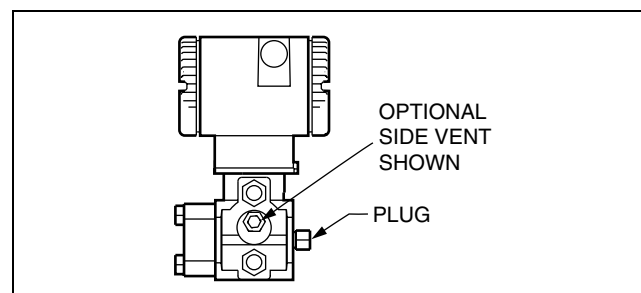


Figure 8. Vertical Mounting - Cavity Venting and Self-Draining into Process Line (Optional Side Vent Shown)

DIGITAL COMMUNICATION (See Figure 9)

- Digital integration – all communications between applicable I/A Series System fieldbus module (FBM) and transmitter are digital
- HART and FoxCom communications suitable for monitoring and control applications
- Measurements are in EGU for ease of use
- Continual monitoring of transmitter diagnostics
- Measurements communicated from transmitter lower range to upper range limit, regardless of calibrated range. This provides more flexibility and information and eliminates the need to rerange transmitters when conditions change
- Eliminates need for system analog input circuit, digital-to-analog conversion in the transmitter, and analog-to-digital conversion in the system, resulting in improved accuracy

OPTIONAL LCD DIGITAL INDICATOR

- A digital indicator (see Figure 16) 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 routine local configuration changes

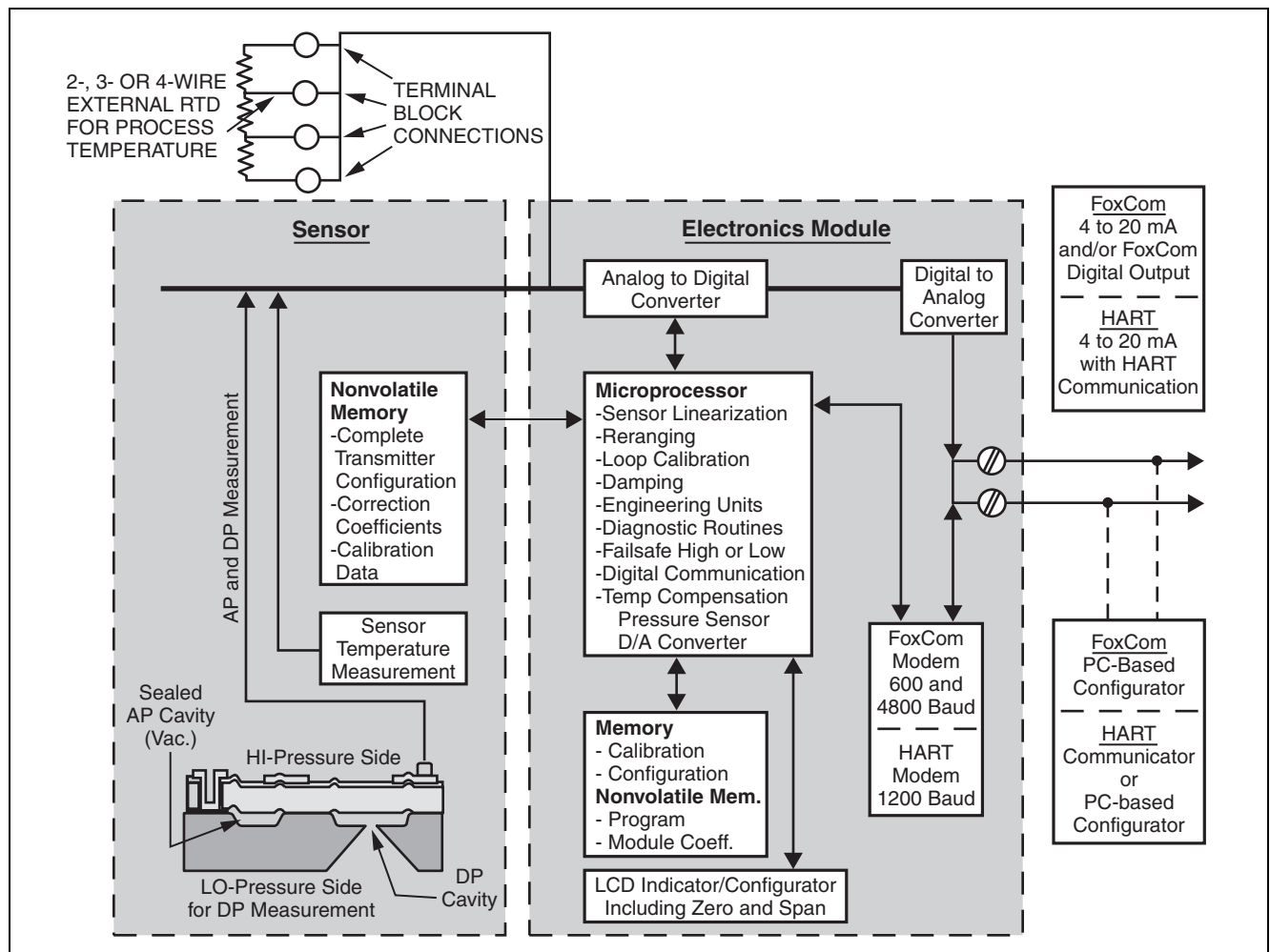


Figure 9. IMV30 FoxCom and HART Functional Block Diagram

FUNCTIONAL SPECIFICATIONS

Span and Range Limits for Differential Pressure Measurement

Span Code(b)	Span Limits			Range Limits (a)		
	kPa	inH ₂ O	mbar	kPa	inH ₂ O	mbar
L	0.12 and 2.5	0.5 and 10	1.2 and 25	-2.5 and +2.5	-10 and +10	-25 and +25
A	0.75 and 7.5	3 and 30	7.5 and 75	-7.5 and +7.5	-30 and +30	-75 and +75
B	0.5 and 50	2 and 200	5 and 500	-50 and +50	-200 and +200	-500 and +500
C	2.5 and 210	10 and 840	25 and 2100	-210 and +210	-840 and +840	-2100 and +2100

(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) See maximum static, working, and range limits table below for available combinations of DP and AP span codes.

Span and Range Limits for Absolute Pressure Measurement (a)

Span Code(b)	Span Limits			Range Limits		
	MPa	psi	bar or kg/cm ²	MPa	psia	bar or kg/cm ² abs
D	0.02 and 2.1	3 and 300	0.21 and 21	0 and 2.1	0 and 300	0 and 21
G	0.07 and 3.4	10 and 500	0.7 and 34	0 and 3.4	0 and 500	0 and 34
E	0.21 and 10	30 and 1500	2.1 and 100	0 and 10	0 and 1500	0 and 100

(a) Absolute Pressure measured directly; Gauge Pressure calculated from user-entered barometric pressure constant.

(b) See maximum static, working, and range limits table below for available combinations of DP and AP span codes.

Sensor URL, Maximum Static and Working Pressure (MWP), and Maximum Overrange Pressure

Allowable Span Code Combinations DP and AP	Sensor URL (DP and AP)				Maximum Static and Maximum Working Pressure		Maximum Overrange Pressure	
	DP	AP	DP	AP	MPaa	psia	MPaa	psia
L and G	10 inH ₂ O	500 psia	2.5 kPa	3.4 MPaa	3.4	500	5.2	750
A and G	30 inH ₂ O	500 psia	7.5 kPa	3.4 MPaa	3.4	500	5.2	750
B and D	200 inH ₂ O	300 psia	50 kPa	2.1 MPaa	2.1	300	3.1	450
B and E	200 inH ₂ O	1500 psia	50 kPa	10 MPaa	10	1500	15	2250
C and D	840 inH ₂ O	300 psia	210 kPa	2.1 MPaa	2.1	300	3.1	450
C and E	840 inH ₂ O	1500 psia	210 kPa	10 MPaa	10	1500	15	2250

Output Signal and Configuration

FOXCOM PROTOCOL

Digital FoxCom and/or 4 to 20 mA. Configurable using a PC-based Configurator, or optional LCD Indicator with on-board pushbuttons. Model PCMV Flow Configurator required for flow rate applications.

HART PROTOCOL

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 with a HART Communicator, PC-based Configurator, or optional LCD Indicator with on-board pushbuttons. Model PCMV Flow Configurator required for flow rate applications.

Measured and Transmitted Outputs

- Absolute Pressure (Configurable for Gauge Pressure)
- Differential Pressure
- Sensor Temperature
- Electronics Temperature
- Process Temperature (from External RTD)

Calculated⁽¹⁾ and Transmitted Outputs

- Process Density - Flowing Conditions
- Mass Flow Rate
- Volume Flow Rate - Flowing Conditions
- Volume Flow Rate at Base Conditions - e.g., Standard ft³/h (SCFH), or Normal m³/h (NCMH)

Field Wiring Reversal

No transmitter damage.

Adjustable Damping (DP and Pressure)

The transmitter response time is normally 1.0 s, or the electronically adjustable setting of 0.00 (none), 0.25, 0.50, 1, 2, 4, 8, 16, or 32 seconds, whichever is greater, for a 90% recovery from an 80% input step as defined in ANSI/ISA S51.1.

Zero and Span Adjustments

Zero and span adjustments can be initiated from the PC-based Configurator or the optional LCD Indicator.

Suppressed Zero and Elevated Zero

Suppressed or elevated zero ranges are acceptable provided Span and Range Limits are not exceeded.

Zeroing for Nonzero-Based Ranges

Dual Function Zeroing from the optional LCD indicator pushbuttons allows differential pressure zeroing with either zero differential or LRV differential applied. This greatly simplifies position effect zeroing on many pressure and level applications. The PC-based Configurator or HART Communicator provides zeroing at any user-entered value.

Write Protect Jumper

Can be positioned to lock out all configurators from making transmitter database changes. This makes transmitter suitable for safety shutdown system applications that require this feature.

Supply Voltage

FoxCom DIGITAL OUTPUT

Power supplied through I/A Series System

FoxCom 4 TO 20 mA OUTPUT

Nominal minimum supply voltage is 11.5 V dc. See Figure 10.

HART 4 TO 20 mA OUTPUT WITH A SUPERIMPOSED DIGITAL SIGNAL

Nominal minimum supply voltage is 11.5 V dc. See Figure 10.

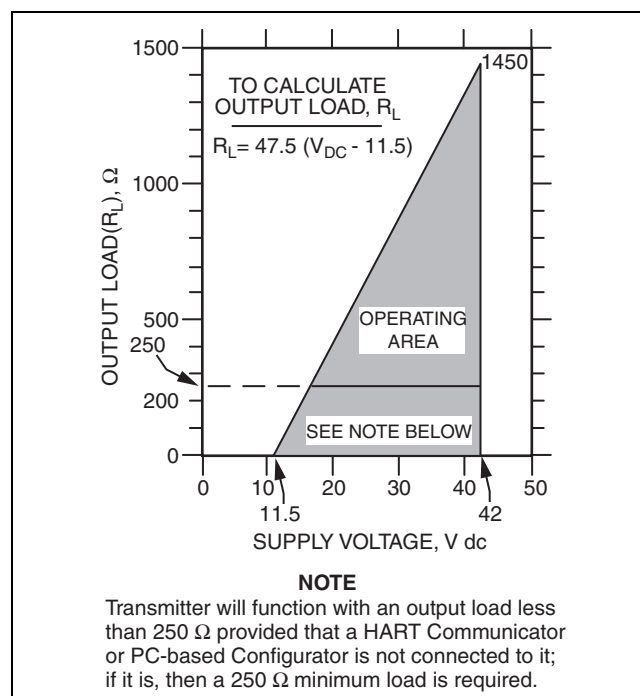


Figure 10. 4 to 20 mA Output, Supply Voltage vs. Output Load

Minimum Allowable Absolute Pressure vs. Transmitter Temperature

WITH SILICONE FILL FLUID

Full vacuum: up to 121 °C (250 °F)

WITH FLUORINERT FILL FLUID

Refer to Figure 11.

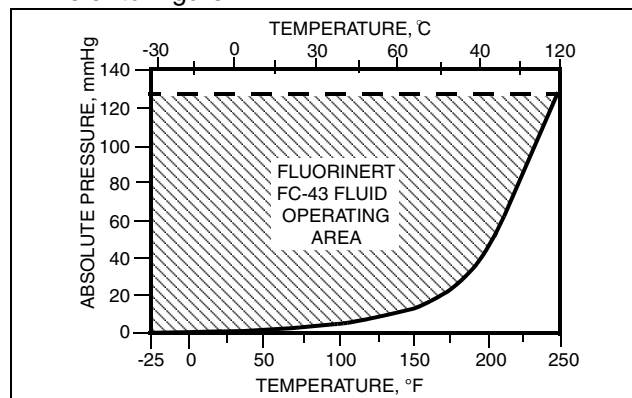


Figure 11. Minimum Allowable Absolute Pressure vs. Transmitter Temperature, Fluorinert FC-43, 2.6 cs at 25°C (77°F)

Flow Cutoff and Low Differential Pressure (DP)

When configured for flow rate calculations, Flow Cutoff Value may be entered in flow units, and Noise Reduction may be set "OFF" or "ON", where:

OFF = Flow Rate calculated from square root of DP

ON = Flow Rate calculated from dual slope linear DP below 4% of maximum configured DP

When configured as a standard DP transmitter in square root mode, it may be set for cutoff-to-zero for DP < 1% of maximum DP, or Dual Slope Linear for DP < 4% of maximum DP.

Process Temperature Measurement and Limits MEASUREMENT

DIN/IEC, 2-, 3-, or 4-wire, 100 ohm, Platinum RTD

RANGE LIMITS

-200 and +850°C (-328 and +1562°F)

Current Outputs for Overrange, Fail, and Offline Conditions - FoxCom and HART Only

Parameter	FoxCom	HART
OFFLINE	User configurable between 4 and 20 mA	
SENSOR FAILURE	User configurable to Fail LO or Fail HI	
FAIL LO	3.60 mA	3.60 mA
UNDERRANGE	3.75 mA	3.80 mA
OVERRANGE	21.00 mA	20.50 mA
FAIL HI	22.00 mA	21.00 mA

(1) Density and Flow Equations used for the calculated outputs, and Flow Terminology, are from R. W. Miller's *Flow Measurement Engineering Handbook*, available from Foxboro by specifying Part Number B0150YW.

FUNCTIONAL SPECIFICATIONS (Cont.)

Communications – FoxCom and HART

FoxCom configurable for either analog or digital mode. HART available in analog or multidrop mode. Digital communications is provided in all 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. See Table 1 for FoxCom and HART communication parameters.

Table 1. Communication Parameters - FoxCom and HART

Parameter	FoxCom		HART	
	Analog Mode 4 to 20 mA	Digital Mode Fixed Current	Analog Mode 4 to 20 mA	Multidrop Mode Fixed Current (a)
Configurator/Communicator	PC-based Configurator		HART Communicator(b), or PC-based Configurator	
Communication Rate	600 baud	4800 baud	1200 baud	1200 baud
Communication Distance (Rated)	1800 m (6000 ft)	600 m (2000 ft)	3050 m (10 000 ft)	1525 m (5000 ft)
Output Signal Updated	30 times/s	10 times/s	30 times/s	4 times/s

(a) Multidrop mode supports communication with up to 15 transmitters on a single pair of signal/power wires.

(b) Model PCMV Multivariable Transmitter Configurator required for flow rate configuration.

Communications Functional Block Diagrams
(Figures 12 to 15)

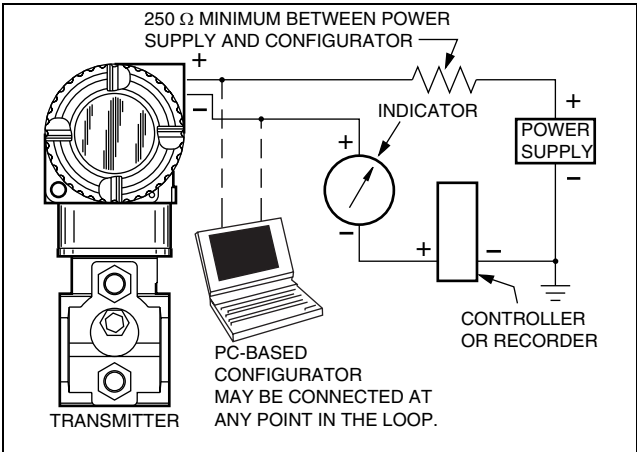


Figure 12. FoxCom 4 to 20 mA Topology

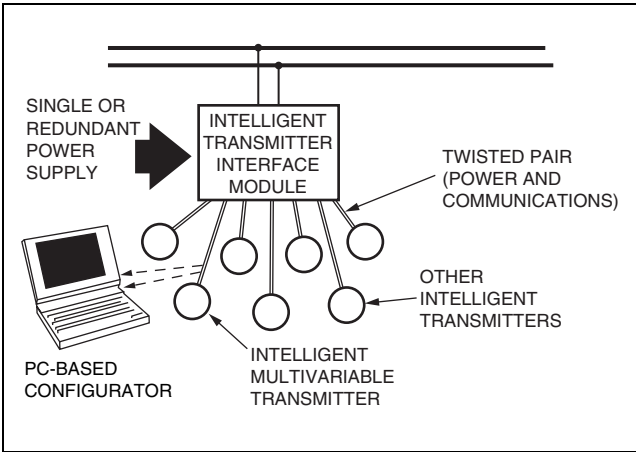


Figure 14. FoxCom Digital Topology

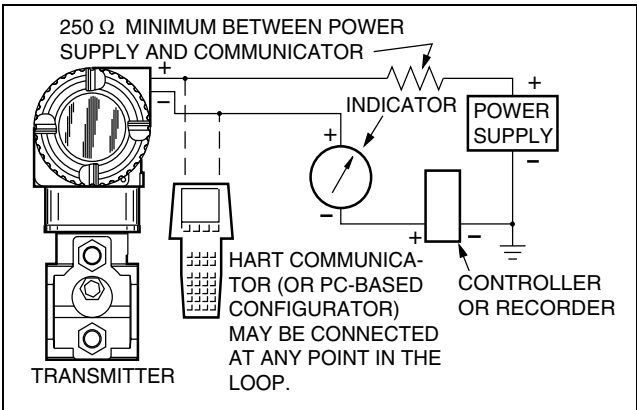


Figure 13. HART 4 to 20 mA Topology

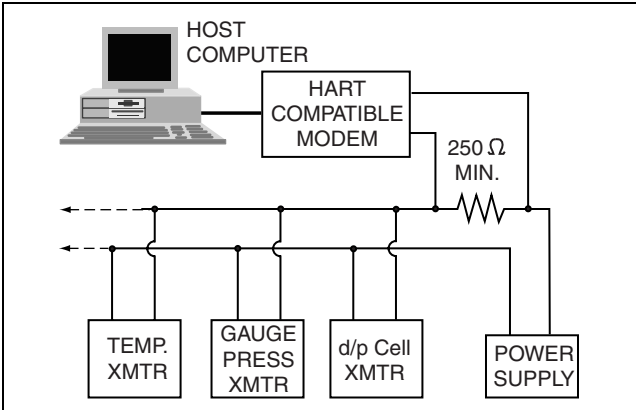


Figure 15. HART Multidrop Topology

Configuration and Calibration Data, and Electronics Upgradeability

All factory characterization data, and user configuration and calibration data, are stored in the sensor. This means that the electronics module can be replaced or changed from one type to another.

A module may be replaced without the need for reconfiguration or recalibration. Although module replacement can affect accuracy up to 0.20% of span, this error can be removed by an mA trim without application of pressure.

Changing module types may require reconfiguration and recalibration, as well as a different terminal block, if applicable, but all factory characterization data is retained.

Configuration Capability (Also see Note below)

Variable	Measurement
Primary Variable	Differential Pressure (DP)
Secondary Variable	Absolute Pressure (AP)
Tertiary Variable	Process Temperature

NOTE

Numerous parameters can be configured and/or displayed, such as electronic damping, failsafe direction, transmitter calibration, tag data, etc. See applicable configuration documents for details.

Available Units for Calibrated Range

Pressure					Temp.
inH ₂ O	mH ₂ O	Pa	mbar	psi	C
ftH ₂ O	inHg	kPa	bar	atm	F
mmH ₂ O	mmHg	MPa	g/cm ²		R
cmH ₂ O	cmHg	torr	kg/cm ²		K

Optional Custom Configuration (Option -C2)

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

Optional Liquid Crystal Display (LCD) Digital Indicator with On-Board Pushbuttons (Figure 16)

Indicator provides:

- Two Lines; five numeric characters on top line (four when a minus sign is needed) and seven alphanumeric characters on bottom line.
- Measurement Readout; value displayed on top line, and units label displayed on bottom line.
- Configuration and Calibration Prompts.

Pushbuttons provide for:

- Configuration⁽¹⁾ Functions
- Calibration Functions

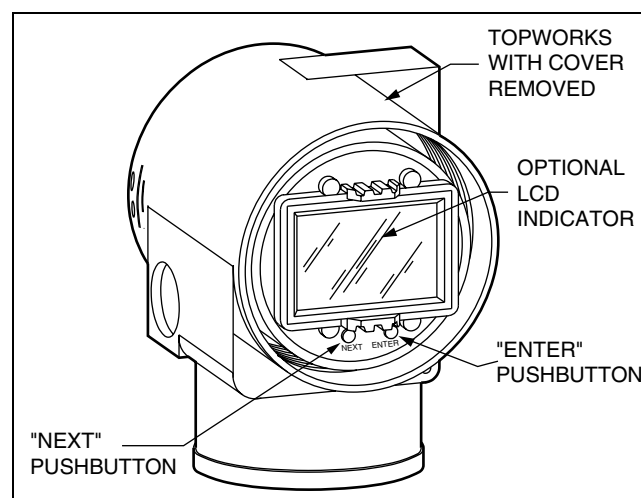


Figure 16. LCD Indicator with On-Board Pushbuttons

(1) Model PCMV Multivariable Transmitter Configurator required for flow rate configuration.

OPERATING, STORAGE, AND TRANSPORTATION CONDITIONS

Influence	Reference Conditions	Normal Operating Conditions (a)	Operative Limits (a)	Transportation and Storage Limits
Sensor Body Temperature <ul style="list-style-type: none">• w/Silicone Fill Fluid• w/Fluorinert Fill Fluid	<ul style="list-style-type: none">• 24 ± 2°C (75 ± 3°F)• 24 ± 2°C (75 ± 3°F)	<ul style="list-style-type: none">• -29 to + 82°C (-20 to +180°F)• -29 to + 82°C (-20 to +180°F)	<ul style="list-style-type: none">• -46 and +121°C (b) (-50 and +250°F) (b)• -29 and +121°C (-20 and +250°F)	<ul style="list-style-type: none">• Not Applicable• Not Applicable
Electronics Temperature <ul style="list-style-type: none">• with LCD Indicator (Note c)	<ul style="list-style-type: none">• 24 ± 2°C (75 ± 3°F)• 24 ± 2°C (75 ± 3°F)	<ul style="list-style-type: none">• -29 to + 82°C (-20 to +180°F)• -20 to + 82°C (-4 to +180°F)	<ul style="list-style-type: none">• -40 and +85°C (-40 and +185°F)• -29 and +85°C (-20 and +185°F)	<ul style="list-style-type: none">• -54 and +85°C (-65 and +185°F)• -54 and +85°C (-65 and +185°F)
Relative Humidity (Note d)	50 ±10%	0 to 100%	0 and 100%	0 and 100% Noncondensing
Supply Voltage – mA Output	30 ± 0.5 V dc	11.5 to 42 V dc	11.5 and 42 V dc	Not Applicable
Output Load – mA Output	650 Ω	0 to 1450 Ω (e)	0 and 1450 Ω (e)	Not Applicable
Vibration	1 m/s ² (0.1 “g”)	6.3 mm (0.25 in) Double Amplitude: from 5 to 15 Hz with Aluminum Housing from 5 to 9 Hz with 316 ss Housing		11 m/s ² (1.1 “g”) from 2.5 to 5 Hz (in Shipping Package)
		0 to 30 m/s ² (0 to 3 “g”) from 15 to 500 Hz with Aluminum Housing; 0 to 10 m/s ² (0 to 1 “g”) from 9 to 500 Hz with 316 ss Housing		
Mounting Position	Upright or Horizontal (f)		No Limit	Not Applicable

(a) When DIN Construction Options D2/D4/D6/D8 are used, temperature limits are 0 and 60°C (32 and 140°F).

(b) Selection of Option -J extends the low temperature operative limit of transmitters with silicon filled sensors down to -50°C (-58°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) With topworks cover on and conduit entrances sealed.

(e) See Figure 10 for minimum load required for proper FoxCom or HART communication.

(f) Sensor process wetted diaphragms in a vertical plane.

PERFORMANCE SPECIFICATIONS

Zero-Based Calibrations; Stainless Steel Sensor with Silicone Fluid; Under Reference Operating Conditions unless otherwise specified; URL = Upper Range Limit and Span = Calibrated Span

Accuracy⁽¹⁾ - Differential Pressure

Span Codes	Accuracy in % of Span	
	Spans $\geq 10\%$ URL	Spans $< 10\%$ URL
B and C	± 0.05	$\pm (0.005) \left(\frac{\text{URL}}{\text{Span}} \right)$
L and A	± 0.10	$\pm (0.010) \left(\frac{\text{URL}}{\text{Span}} \right)$

NOTE

Also add $\pm 0.025\%$ to the accuracy to determine the total analog output accuracy if the DP measurement is assigned to the 4 to 20 mA output signal.

Accuracy⁽¹⁾ - Absolute Pressure ⁽²⁾

Span Codes	Accuracy in % of Span	
	Spans $\geq 10\%$ URL	Spans $< 10\%$ URL
C and D	± 0.05	$\pm (0.005) \left(\frac{\text{URL}}{\text{Span}} \right)$
	Spans $\geq 5\%$ URL	Spans $< 5\%$ URL
G	± 0.05	$\pm (0.0025) \left(\frac{\text{URL}}{\text{Span}} \right)$

NOTE

Also add $\pm 0.025\%$ to the accuracy to determine the total analog output accuracy if the AP measurement is assigned to the 4 to 20 mA output signal.

(1) Accuracy stated includes the effects of linearity, hysteresis, and repeatability.

(2) For gauge pressure accuracy, add anticipated variation from user-entered barometric pressure.

PERFORMANCE SPECIFICATIONS Cont.(**Accuracy - Process Temperature**

$\pm 0.28^{\circ}\text{C}$ (0.5°F) within $\pm 140^{\circ}\text{C}$ (250°F) of the normal operating point.

Accuracy - Flow Measurement

$\pm 1.0\%$ of flow rate when configured for typical head class meter applications.

Stability (Long Term Drift)

$< \pm 0.05\%$ of URL per year over a 5-year period.

Power-up Time

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

Vibration Effect

$\pm 0.2\%$ of URL per "g" for vibrations in the range of 5 to 500 Hz; with double amplitudes of 6.3 mm (0.25 in) in the range of 5 to 15 Hz, or accelerations of 3 "g" in the range of 15 to 500 Hz, whichever is smaller, for aluminum housings; and with double amplitudes of 6.3 mm (0.25 in) in the range of 5 to 9 Hz, or accelerations of 1 "g" in the range of 9 to 500 Hz, whichever is smaller, for 316 ss housings.

RFI Effect

The output error is less than 0.1% of span for radio frequencies in the range of 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. 801-3.)

Supply Voltage Effect

Output changes less than 0.005% of span for each 1 V change within the specified supply voltage requirements. See Figure 10.

Static Pressure Effect on Differential Pressure

The zero and span shift for a 0.7 MPa, 100 psi, change in static pressure is:

ZERO SHIFT

Span Limit Code		Zero Shift for a 0.7 MPa (100 psi) Change:
DP	AP	in % of URL
L	G	± 0.150
A	G	± 0.050
B	D	± 0.007
B	E	± 0.010
C	D	± 0.002
C	E	± 0.004

SPAN SHIFT

$\pm 0.01\%$ of Reading

Ambient Temperature Effect

Total effect on the digital output value for both absolute and differential pressure for a 28°C (50°F) change within Normal Operating Condition Limits is $\pm(0.03\% \text{ URL} + 0.06\% \text{ Reading})$; except the effect on differential pressure for DP Span Code A is $\pm 0.18\% \text{ URL} + 0.025\% \text{ Reading}$; and effect for DP Span Codes A and L is $\pm(0.18\% \text{ URL} + 0.025\% \text{ Reading})$.

When a measurement is assigned to the 4 to 20 mA output, add 0.025% of Span to the digital output error to determine the total effect on the analog output.

Position Effect

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

Electromagnetic Compatibility

- Complies with NAMUR Part 1 Interference Immunity Requirement (EMC)
- Complies with electromagnetic compatibility requirements of European EMC Directive 89/336/EEC by conforming to following CENELEC and IEC Standards: EN 50081-2, EN 50082-2, IEC 801-2 through 801-6

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. Output shift is $< 1.0\%$. (Per ANSI/IEEE C62.41-1980 and IEC Std. 801-5.)

PHYSICAL SPECIFICATIONS

Process Cover and Connector Material (Process Wetted)

316 ss or Hastelloy C, as specified.

Process Cover and Process Connection Gaskets

Glass filled ptfе (Chemloy)

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. For the NACE B7M bolting option, refer to PSS 2A-1Z9 E.

Sensor Material (Process Wetted)

316 L ss or Hastelloy C, as specified

Sensor Fill Fluids

Silicone Oil or Fluorinert (FC-43)

Environmental Protection

Transmitter is dusttight and weather proof per IEC IP66 and provides the environmental and corrosion resistant protection of NEMA Type 4X.

Electronics Module

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

Electronics Housing and Housing Covers

Housing has two compartments to separate the electronics from the field connections. The housing and covers are made from low copper, 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, PG 13.5, 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. Refer to Figure 17.

Mounting Position

The transmitter may be mounted in any orientation.

Approximate Mass

3.5 kg (7.8 lb) – without Process Connectors

4.2 kg (9.2 lb) – with Process Connectors

Add 1.1 kg (2.4 lb) – with 316 ss Housing

Add 0.2 kg (0.4 lb) – with LCD Indicator Option

Dimensions

See "Dimensions – Nominal" section and Dimensional Print DP 020-432.

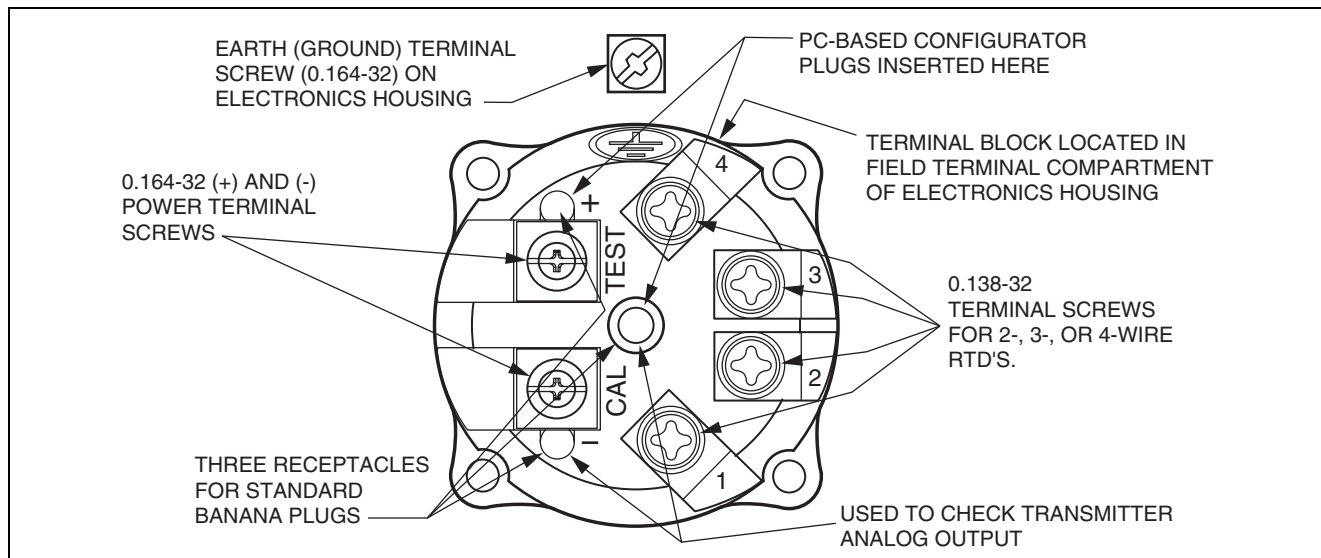


Figure 17. Field Terminal Connections

ELECTRICAL SAFETY SPECIFICATIONS

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
ATEX intrinsically safe; II 1 GD, EEx ia IIC, Zone 0; or II 1/2 G EEx ib IIC, Zone 0/Zone 1; hazardous locations.	For Version -T only. Temperature Class T4-T6. See certificate KEMA 00ATEX1009 X for conditions.	E
ATEX flameproof; II 2 GD, EEx d IIC, Zone 1; hazardous locations.	Temperature Class T6. See certificate KEMA 00ATEX2019 X for conditions.	D
ATEX protection n; II 3 GD, EEx nL IIC, Zone 2; hazardous locations.	For Version -T only. Temperature Class T4-T6. See certificate KEMA 00ATEX1060 X for conditions.	N
ATEX multiple certifications, ia and ib, d, and n. Refer to ATEX Codes E, D, and N for details.	For Version -T only. Refer to Codes E, D, and N for application conditions. See WARNING below.	M
CSA intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations. Also Class I, Division 1, Zone 0, Ex ia IIC.	For Version -T only. Connect per MI 020-427. Temperature Class T4A at 40°C (104°F), and T3C at 85°C (185°F) maximum ambient.	C
CSA explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof apparatus for Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations. Also flameproof Class I, Zone 1, Ex d IIC.	Seal not required, except for acetylene where a conduit seal is required within 50 mm (2 in) of enclosure. Temperature Class T6 at 80°C (176°F) and T5 at 85°C (185°F) maximum ambient.	
CSA for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; and Class III, Division 2 hazardous locations.	For Version -T only. Connect to source not exceeding 42.4 V. Temperature Class T6 at 40°C (104°F), and T4A at 85°C (185°F) maximum ambient.	
FM intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations. Also Class I, Division 1, Zone 0, AEx ia IIC.	For Version -T only. Connect per MI 020-427. Temperature Class T4A at 40°C (104°F), and T4 at 85°C (185°F) maximum ambient.	F
FM explosionproof for Class I, Division 1, Groups B, C, and D; and dust-ignitionproof apparatus for Class II, Division 1, Groups E, F, and G; and Class III, Division 1 hazardous locations. Also flameproof Class I, Zone 1, AEx d IIC.	Seal not required, except for acetylene where a conduit seal is required within 50 mm (2 in) of enclosure. Temperature Class T6 at 80°C (176°F) and T5 at 85°C (185°F) maximum ambient.	
FM nonincendive apparatus for Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; and Class III, Division 2 hazardous locations.	For Version -T only. Connect to source not exceeding 42.4 V. Temperature Class T6 at 40°C (104°F), and T4A at 85°C (185°F) maximum ambient.	

NOTE

Transmitter has been designed to meet the electrical safety descriptions listed. Contact Invensys Foxboro for information or status of testing laboratory approvals or certifications.

WARNING

When selecting ATEX Safety Design Code M, the user must permanently mark (check off in rectangle block on data plate) one type of protection only (ia and ib, d, or n). This mark cannot change. See Installation MI for further information.

MODEL CODE

Description				Model
Multivariable Transmitter				IMV30
Electronics Versions and Output Signal				
Intelligent; Digital, FoxCom and 4 to 20 mA dc, Configurable (Version -D)				-D
Intelligent; Digital HART and 4 to 20 mA dc (Version -T)				-T
Structure Code - Process Cover, Sensor Material, and Sensor Fill Fluid				
Process Cover	Sensor Material	Sensor Fill Fluid		
316 ss	316L ss	Silicone		22
316 ss	316L ss	Fluorinert		23
316 ss	Hastelloy C	Silicone		26
316 ss	Hastelloy C	Fluorinert		27
Hastelloy C	Hastelloy C	Silicone		46
Hastelloy C	Hastelloy C	Fluorinert		47
Span Limits - Differential Pressure Measurement				
kPa	inH₂O	mbar	Available with	
0.12 and 2.5	0.5 and 10	1.2 and 25	AP Code G only	L
0.75 and 7.5	3 and 30	7.5 and 75	AP Code G only	A
0.5 and 50	2 and 200	5 and 500	AP Codes D and E only	B
2.5 and 210	10 and 840	25 and 2100	AP Codes D and E only	C
Span Limits - Pressure Measurement (Absolute Measured; Gauge Calculated)				
MPa	psi	bar or kg/cm	Available with	
0.02 and 2.1	3 and 300	0.21 and 21	DP Codes B and C only	D
0.07 and 3.4	10 and 500	0.7 and 34	DP Codes L and A only	G
0.21 and 10	30 and 1500	2.1 and 100	DP Codes B and C only	E
Process Connector Type (Material Same as Process Cover Material)				
None, Covers tapped for 1/4 NPT				0
1/4 NPT (Not Available with Structure Codes 46 and 47 - Hastelloy C Process Cover)				1
1/2 NPT				2
Rc 1/4 (Not Available with Structure Codes 46 and 47) - Hastelloy C Process Cover				3
Rc 1/2				4
1/2 Schedule 80 Welding Neck (Not Available with Structure Codes 46 and 47 - Hastelloy C Process Cover)				6
Conduit Connection and Housing Material				
1/2 NPT Connection, Aluminum Housing				1
PG 13.5 Connection, Aluminum Housing (Available with Electrical Safety Codes E, D, M, and N only)				2
1/2 NPT Connection, 316 ss Housing				3
PG 13.5 Connection, 316 ss Housing (Available with Electrical Safety Codes E, D, M, and N only)				4
M20 Connection, Aluminum Housing (Available with Electrical Safety Codes E, D, M, and N only)				5
M20 Connection, 316 ss Housing (Available with Electrical Safety Codes E, D, M, and N only)				6
Electrical Safety (See Electrical Safety Specifications Section for Description and Approval Status)				
ATEX intrinsically safe, ia, ib (with Electronic Version -T only)				E
ATEX flameproof, d				D
ATEX protection n (with Electronic Version -T only)				N
ATEX Multiple Certifications (includes ATEX Codes E, D, and N) (with Electronic Version -T only)				M
See Electrical Specifications section for user marking WARNING				
CSA Certified, ia, d, and Division 2 (ia, d, and Div. 2 for -T; d only for -D)				C
See Electrical Safety Specifications section for Zone Certifications				
FM Approved, ia, d, and n (ia, d, and n for -T; d only for -D)				F
See Electrical Safety Specifications section for Zone Approvals				
Optional Selections (a)				
Refer to descriptions that follow.				
Mounting Bracket Set				
Painted Steel Bracket with Plated Steel Bolts				-M1
Stainless Steel Bracket with Stainless Steel Bolts				-M2
Digital Indicator with Pushbuttons				
Digital Indicator, Pushbuttons, and Window Cover				-L1

Continued on next page

Optional Selections Codes (a)				Optional Suffix
DIN 19213 Construction used with Process Connector Code "0" and 316 ss Process Covers Only (e)				
Process Cover	Cover Screw	Connector Screw		
Type	Material	Size	Material	
Single Ended	Steel	M10 (by User)	—	-D1
Double Ended (f) (Blind Kidney Flange on back)	Steel	M10	Steel	-D2
Single Ended	Steel	7/16 (by User)	—	-D3
Double Ended (f) (Blind Kidney Flange on back)	Steel	7/16	Steel	-D4
Single Ended	316 ss	7/16 (by User)	—	-D5
Double Ended (f) (Blind Kidney Flange on back)	316 ss	7/16	316 ss	-D6
Single Ended	17-4 ss	7/16 (by User)	—	-D7
Double Ended (f) (Blind Kidney Flange on back)	17-4 ss	7/16	17-4 ss	-D8
Cleaning and Preparation				
Unit Degreased - for Silicone Filled Sensors Only (Not for Oxygen/Chlorine/Other Fluids that may react with Silicone)				-X1
Cleaned and Prepared for Oxygen Service - for Fluorinert Filled Sensors Only				-X2
Cleaned and Prepared for Chlorine Service - for Fluorinert Filled Sensors Only (d)				-X3
Bolting for Process Covers/Connectors (e)				
316 ss Bolts and Nuts				-B1
17-4 ss Bolts and Nuts (d)				-B2
B7M Bolts and 2HM Nuts, conform to NACE MR-01-75 Class II				-B3
Conduit Connectors - Specify Only One				
Hawke-Type 1/2 NPT Cable Gland for use with Conduit Connection Codes 1 and 3 (f)				-A1
M20 Conduit Thread Adapter for use with Conduit Connection Codes 1 and 3 (f)				-A3
Electronics Housing Features				
Custody Transfer Lock and Seal				-Z2
Custom Factory Configuration				
Digital Output (4 to 20 mA Default if not selected) - for Electronics Version -D only				-C1
Full Factory Configuration (Requires Configuration Form to be Filled Out)				-C2
Tubing Connectors (h)				
316 ss, Connecting 6 mm Tubing to 1/4 NPT Process Connector				-E3
316 ss, Connecting 12 mm Tubing to 1/2 NPT Process Connector				-E4
Instruction Books (Common MI, Brochure, and Full Documentation Set on CD-ROM is Standard)				
Without Instruction Book and CD; Only "Getting Started" brochure is supplied				-K1
Miscellaneous Optional Selections				
Low Temperature Operative Limit of Electronics Housing Extended down to -50°C (-58°F) (i)				-J
Supplemental Customer Tag (Stainless Steel Tag wired onto Transmitter)				-T
Vent Screw in Side of Each Process Cover (Not Available with DIN 19213 Construction)				-V
Five Year Warranty				-W

(a) Refer to PSS 2A-1Z9 E for additional optional features and accessories not listed in Model Code.

(b) Mounting Bracket Set options (-M1 and -M2) and Vent Screw Option -V are not available.

(c) Temperature limits derated to 0 and 60°C (32 and 140°F) with Options -D2, -D4, -D6, and -D8.

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

(e) Not available with DIN 19213 Construction options. For stainless steel bolting with DIN 19213, specify -D5, -D6, -D7, or -D8.

(f) Available with Electric Safety Codes E, D, M, and N only.

(g) Available with Electric Safety Code E only.

(h) Tubing connectors not available with Process Connector Codes 3, 4, and 6 (R_c and Weld Neck types).

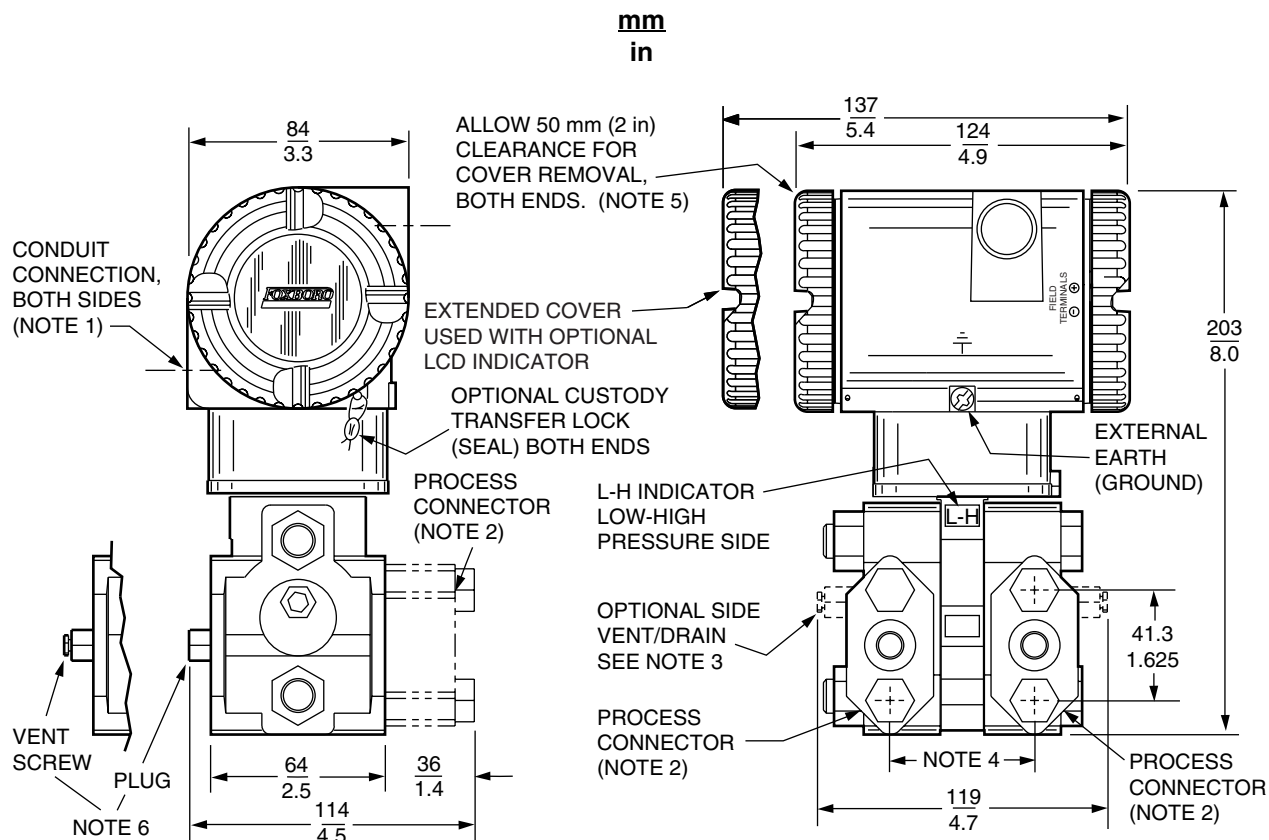
(i) Option -J not available with Structure Codes 23, 27, and 47, or DIN Construction Codes D2, D4, D6, or D8.

SUGGESTED RFQ SPECIFICATIONS

The manufacturer shall provide field-mounted multivariable transmitter(s) featuring remote digital communications capability for measuring absolute pressure, differential pressure, and temperature, and transmitting a 4 to 20 mA dc and/or digital output signal (software selectable) for use in a standard two-wire dc supply voltage system. The transmitted signals shall be used with a PC-based configurator for transmission of calculated mass flow rate measurements. The specifications for this Multivariable transmitter are as follows:

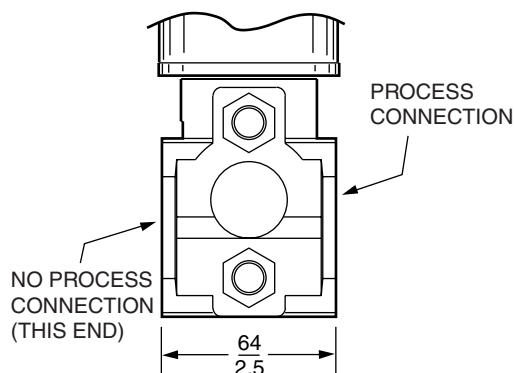
Communication Protocol:	FoxCom or HART, digital and/or 4 to 20 mA dc output signal
Remote Communications:	Must not interfere with output
Accuracy:	Digital Output: $\pm 0.05\%$ of calibrated span 4 to 20 mA Output: $\pm 0.075\%$ of calibrated span
Damping:	Settable for a range of none to 32 seconds
RFI Protection:	0.1% error between 27 and 1000 MHz at 30 V/m field intensity
Span Limits:	Absolute Pressure Measurement 3 and 300 psi, 10 and 500 psi, 30 and 1500 psi, or SI/Metric Equivalents Differential Pressure Measurement 0.5 and 10 in H ₂ O, 3 and 30 inH ₂ O, 2 and 200 inH ₂ O, 10 and 840 inH ₂ O, or SI/Metric Equivalents
Process Temperature:	Transmitter includes terminals to receive either a 2-, 3-, or 4-wire, 100 ohm, platinum DIN/IEC RTD to measure process temperature. Span Limits are 10 and 538°C (50 and 1000°F); and Range Limits are -200 and +850°C (-328 and 1562°F).
Mounting:	On process piping or optional mounting bracket
Input Connection:	With process connectors to accept 1/4 NPT, 1/2 NPT, Rc 1/4 or Rc 1/2, 1/2 Schedule 80 welding neck
Housing:	Aluminum housing with epoxy finish, or 316 ss housing; with 1/2 NPT, PG 13.5, or M20 conduit connections.
Electronics:	Easily replaceable modular electronics in a NEMA 4X (IEC IP66) housing sealed with O-rings for protection against moisture or other contaminants. Optional integral LCD Indicator with on-board configuration pushbuttons.
Process Cover Materials Available:	316 ss or Hastelloy C
Sensor Materials Available:	316L ss or Hastelloy C
Approvals and Certifications:	Must be suitable for Division 1 and Zone 0, Zone 1 hazardous area locations, and conform to all applicable European Union Directives.
Approximate Mass:	3.5 kg (7.8 lb), without process connectors; 4.2 kg (9.2 lb), with process connectors; With 316 ss housing, add 1.1 kg (2.4 lb); With optional LCD indicator, add 0.2 kg (0.4 lb).
Model Code:	I/A Series Intelligent IMV30 Multivariable Transmitter with FoxCom or HART Communication Protocol, or equivalent

DIMENSIONS-NOMINAL

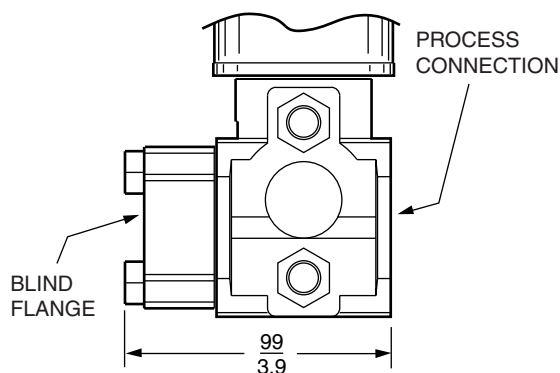


NOTES:

1. CONDUIT CONNECTION 1/2 NPT OR PG 13.5, 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.



OPTIONAL DIN CONSTRUCTION
SINGLE ENDED PROCESS COVER
OPTIONS -D1, -D3, -D5, AND -D7

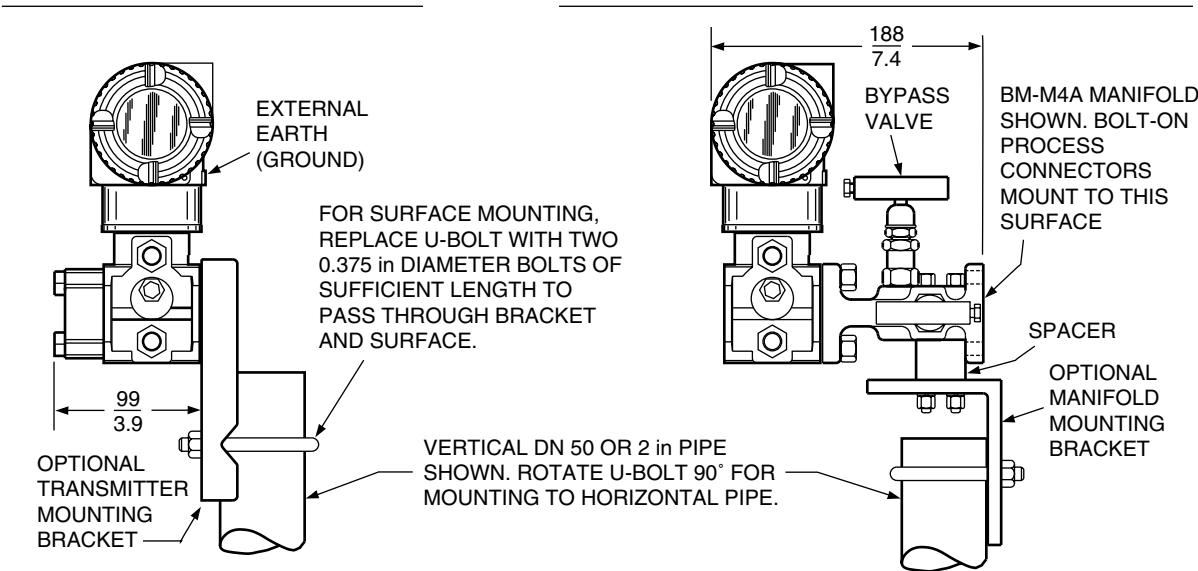


OPTIONAL DIN CONSTRUCTION
DOUBLE ENDED PROCESS COVER
OPTIONS -D2, -D4, -D6, AND -D8

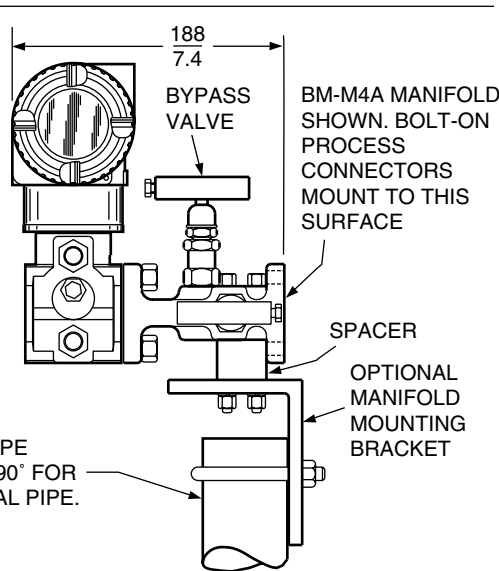
DIMENSIONS-NOMINAL

mm
in

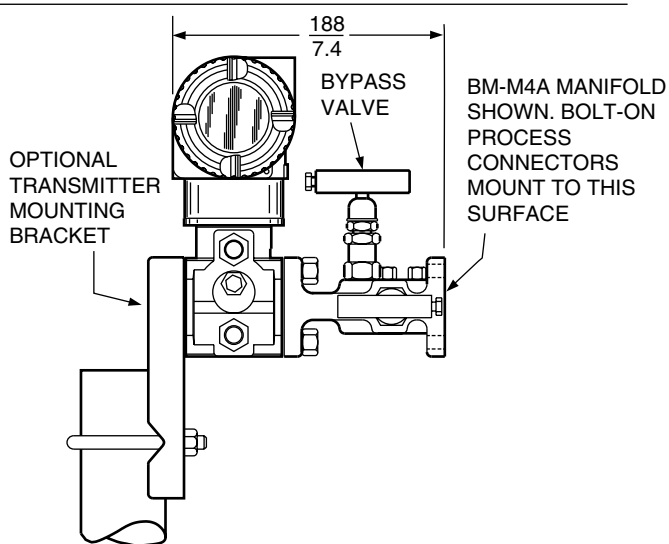
TRANSMITTER WITH MOUNTING
OPTIONS -M1 OR -M2



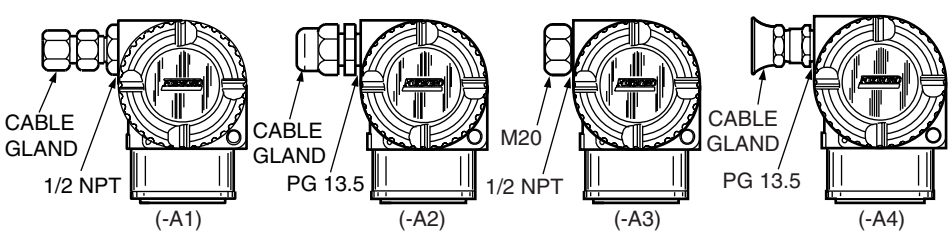
TRANSMITTER WITH OPTIONAL 3-VALVE BYPASS
MANIFOLD AND MANIFOLD MOUNTING BRACKET



TRANSMITTER WITH OPTIONAL 3-VALVE BYPASS
MANIFOLD AND TRANSMITTER MOUNTING BRACKET



TRANSMITTER WITH CONDUIT CONNECTOR OPTIONS -A1 TO -A4



ORDERING INSTRUCTIONS

1. Model Number
2. Calibrated Pressure Ranges for both DP and AP using allowable pressure units listed in Functional Specifications section.
3. Configuration Data Form when Factory Configuration Option -C2 is specified
4. Optional Features and Accessories not Included in Model Code (See PSS 2A-1Z9 E)
5. User Tag Data - Data Plate 32 characters maximum.
If more than 32 characters are needed, also specify Option -T (Supplemental Customer Tag).
6. User Tag Data - Software (Database)
12 characters maximum for Version -D, FoxCom.
8 characters maximum for Version -T, HART.

OTHER M&I PRODUCTS

Invensys Foxboro provides a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, positioners, temperature, controlling, and recording. For a listing of these offerings, visit the Invensys Foxboro web site at:

www.foxboro.com/instrumentation

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representative.
Facsimile: 1-508-549-4999

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