

**Model IMT25**  
**I/A Series® Intelligent Magnetic Flow Transmitters**  
**with FOUNDATION Fieldbus Communication Protocol**



**FLOWTUBE-MOUNTED  
TRANSMITTER  
(WITH 9300A FLOWTUBE)**

**PIPE-OR SURFACE-MOUNTED  
TRANSMITTER**



The Foxboro® brand Model IMT25 Intelligent Magnetic Flow Transmitter is available from Invensys Process Systems (IPS). This transmitter is used for industrial applications that require accurate, reliable measurement of conductive fluids, and for plants that want to take advantage of the digital capabilities, interoperability, and installation savings of FOUNDATION fieldbus.

**FEATURES**

- ▶ FOUNDATION Fieldbus 31.25 kbits/s, Voltage Mode, MAU specification compliant.
- ▶ Interoperability tested – FOUNDATION registered.
- ▶ Digital precision, stability, and resolution ensure top measurement performance.
- ▶ Transmitter includes Fieldbus function blocks.
- ▶ Remote communications via FOUNDATION Fieldbus Protocol. For HART or FoxCom™ Communication Protocols, refer to PSS 1-6F5 A.
- ▶ Local configuration via the LCD Indicator with keypad.
- ▶ Compatible with Foxboro family of flowtubes.
- ▶ Unidirectional or bidirectional flow.
- ▶ Automatic and manual zero lock.
- ▶ Fieldbus supports many installation topologies.
- ▶ Scaled pulse or frequency output.
- ▶ Contact inputs with programmable functionality for remote operation, and relay outputs with programmable functionality for alarms.
- ▶ Supports all standard views, alarm messages, and trends.
- ▶ Software configuration and totals protected in nonvolatile memory in the event of power loss.

- ▶ Online diagnostics with Help function.
- ▶ Wiring savings in existing installations when mixing fieldbus segments with 4 to 20 mA wires.
- ▶ Enclosure meets NEMA 4X and IEC IP66.
- ▶ Compact single or dual compartment.
- ▶ Optional I/O access port allows direct connection of external configurator.
- ▶ Field test mode using Foxboro Model IMTSIM Magnetic Flowtube Simulator.
- ▶ Conforms to applicable European Union Directives (Product marked with “CE” logo).
- ▶ Meets FM and CSA requirements for hazardous area locations.
- ▶ Standard 2-year warranty.

### GENERAL DESCRIPTION - I/A SERIES MAGNETIC FLOW TRANSMITTERS

#### SUPERIOR REPUTATION FOR DEPENDABILITY AND QUALITY

IPS introduced magnetic flow measurement systems to the process industries in 1954, and has demonstrated the broadest and most time-proven application expertise with thousands of successful installations.

#### MULTIPLE PACKAGING CONFIGURATIONS

The IMT25 enclosure accommodates all of the electronics and terminations in a single compartment. An optional second enclosure, attached to the primary enclosure, is offered for users who require the wiring terminals to be isolated and sealed from the electronics compartment. The transmitter can be used as a remote-mounted transmitter, or can be integrally mounted to a Model 8000A or a Model 9300A Flowtube as an integral and complete magnetic flow system. See Figure .

#### COMPATIBILITY WITH MANY FLOWTUBES

This Intelligent Transmitter can be used with Models 8300, 8000A, 9100A, 9200A, and 9300A Flowtubes. It can also be used with existing Models 2800 and 8000 Flowtubes. This provides an advanced microprocessor-based, dc-pulsed magnetic flow system (and corresponding features) regardless of the Foxboro Flowtube Model used.

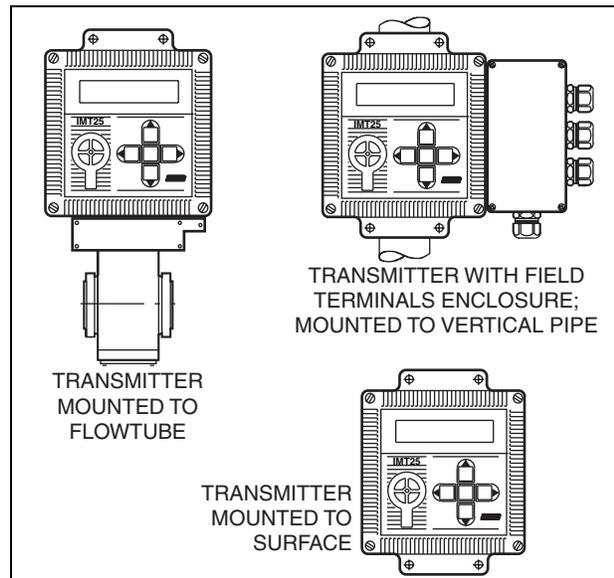


Figure 1. Multiple Packaging Configurations

#### LOW POWER CONSUMPTION

The transmitter can accept 85 to 264 V ac power. The power consumption is less than 24 watts.

#### CALIBRATION

All transmitters are factory-calibrated to their specified accuracy with calibration equipment traceable to U.S. National Institute of Science and Technology (NIST).

## CONTACT INPUTS AND CONTACT OUTPUTS

Transmitter can accept two contact closure inputs. The function(s) of these inputs are programmable, and allow the user to perform transmitter functions from a remote location. Some functions of these inputs include: selection of flow range, resetting totals, and acknowledging alarms. (Both contacts must be used for multiple range service.) The transmitter also provides two contact (relay) outputs with programmable functionality. These outputs can be used to indicate reverse flow, alarm conditions (i.e., high flow rate, low flow rate, or high flow totals), and/or diagnostic alarms.

## NOISE REDUCTION ALGORITHM

Provides superior noise reduction in noise generating processes without high damping. This results in a system with a fast speed of response and excellent zero stability.

## ON-LINE DIAGNOSTICS WITH HELP FUNCTION

While in the RUN mode, the IMT25 continuously performs many internal diagnostic functions. The display automatically indicates any diagnostic condition that is detected, and can actually be programmed to blink for a diagnostic error, thus easily drawing the attention of floor personnel. In addition, the IMT25 can be programmed to energize one or both of the alarm relays for a diagnostic error.

Diagnostic Error messages are displayed in clear text. Each error has an associated help message that can be displayed by pressing the HELP button whenever the diagnostic prompt appears. The diagnostic help message gives the user more detailed information on the potential problem, as well as potential trouble shooting techniques to eliminate the problem.

## CE COMPLIANCE

These transmitters display the “CE” designation indicating conformance to the appropriate European Community Standards for immunity to sources of EMI, and conformance to RF emission limits.

## SIMPLE, MENU-DRIVEN SOFTWARE WITH INTEGRAL HELP FUNCTION

The IMT25 is configured by exiting the Run mode and entering the Set-Up mode. The configuration is in matrix form, with each row of the matrix dedicated to a particular function. Each matrix row, namely System, Outputs, Alarms, Diagnostics, Identity, Passcodes, Transmitter, and Calibration, has programming or menu blocks that allow the user to enter data to configure that particular function.

The user scrolls through the matrix using the keys on the keypad (see Table 1). The user, starting in the first row, scrolls to visit all the menu blocks in that row and provides the needed information. He continues this process to the other rows until all required functions have been configured.

This versatile instrument provides many different functions. Simple applications that require, for example, only three menu blocks, can be configured in just a few minutes.

The transmitter is easy to configure because easy-to-read prompts and icons have been preprogrammed to assist the first time user. All menu blocks have help messages that clearly tell the user what information is required in that block, and how to enter it. The help message can be displayed by depressing the HELP key whenever the prompt for that block appears. These messages are like having the instruction book programmed into the memory of the unit.

**Table 1. Function Keys**

Key	Function
UP ARROW	<ul style="list-style-type: none"> <li>Move up in product structure.</li> <li>Scroll up in menu, list of characters, or on-line Help message.</li> </ul>
SHIFT + RESET	<ul style="list-style-type: none"> <li>Reset totals and empty pipe count.</li> </ul>
DOWN ARROW	<ul style="list-style-type: none"> <li>Move down in product structure.</li> <li>Scroll down in menu, list of characters, or on-line Help message.</li> </ul>
SHIFT + ACK	<ul style="list-style-type: none"> <li>Acknowledge alarm or diagnostic messages.</li> </ul>
LEFT ARROW	<ul style="list-style-type: none"> <li>Move to left in product structure.</li> <li>Cancel parameter selection or data entry.</li> </ul>
SHIFT + HELP	<ul style="list-style-type: none"> <li>Access on-line Help.</li> </ul>
RIGHT ARROW	<ul style="list-style-type: none"> <li>Move to right in the product structure.</li> <li>Enter parameter selection or data entry.</li> </ul>
SHIFT + CHANGE	<ul style="list-style-type: none"> <li>Access Edit mode.</li> </ul>

**AUTOMATIC OR MANUAL ZERO LOCK**

Automatic or Manual Zero Lock can be used to lock all rate outputs at zero percent (zero flow) and freeze all totals. The display indicates when the zero lock is activated. In Manual mode, the zero lock can be activated/deactivated at any time by an external contact closure supplied by the user. In the Automatic mode, it can be used to issue an alarm and/or lock all outputs when an increase in electrode impedance is detected, such as can occur when a pipe is empty.

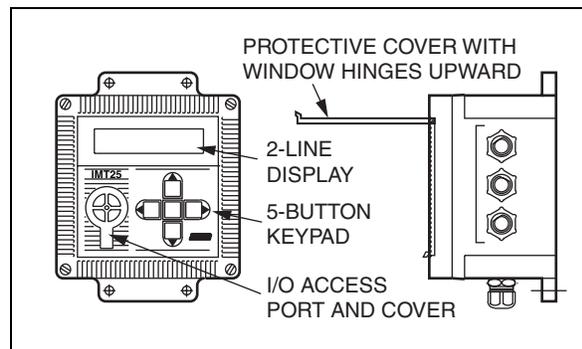
**FRONT PANEL OPTIONS**

A display/keypad, a protective cover with a clear plastic window guard, and an I/O access port with cover are front panel options. See Figure 2.

The display consists of a 2-line, 16 characters per line, back-lighted LCD indicator. The characters are 10 mm (0.4 in) high and can indicate positive total, negative total, net total, net inventory total, and rate in conventional flow units. A “+” or “-” indicates flow direction. The keypad has five keys as described in Table 1. This front panel option allows the transmitter to be used as a stand-alone unit and gives the user complete operation and configuration capabilities.

The cover with a clear plastic window protects the display/keypad during washdown operations and prevents inadvertent activation of the buttons by the washdown stream. However, the front panel is protected to NEMA 4X even without the cover.

The circular I/O access port has a cover integrally connected to the panel to prevent misplacement or loss. Loosening a screw on the cover provides access to two banana plug sockets. These sockets allow direct connection of the FOUNDATION fieldbus host. This option negates the need to remove the housing cover to access the above terminals.



*Figure 2. Front Panel Options*

## FIELDBUS TECHNOLOGY

### INTRODUCTION

The FOUNDATION fieldbus is an all digital, serial, two-way communication system which interconnects field devices, such as transmitters, actuators, and controllers. It is a Local Area Network (LAN) with built-in capability to distribute control application across the network. This technology consists of the Physical Layer, the Communication Stack, and the User Application Blocks.

### Physical Layer Standards

The Fieldbus Foundation uses IEC 1158-2 and ISA S50.02 Physical Layer Standards as references to define, as a minimum, the signaling and electrical properties of a fieldbus device's Physical Layer interface.

### Communication Stack

The Communication Stack comprises a Data Link Layer (DLL), a Fieldbus Access Sublayer (FAS), and a Fieldbus Message Specification (FMS).

#### **The Data Link Layer (DLL) provides:**

- ▶ Scheduled Communication
- ▶ Unsolicited Communication

#### **The Fieldbus Access Sublayer (FAS) provides:**

- ▶ Client/Server VCR (Virtual Communication Relationship) – This is used for queued, unscheduled, user-initiated, one-to-one communication between the devices on the fieldbus.
- ▶ Report Distribution VCR – Typically allows fieldbus devices to send alarm notifications to operator console.

- ▶ Publisher/Subscriber VCR – Allows fieldbus device to publish data, and send function block I/O data, such as transmitter process variable and primary output data to operator console.

### **The Fieldbus Message Specification (FMS)**

FMS services allow users to send messages to each other across the fieldbus. The FMS describes communication services, message formats, and protocol required for the user application.

### User Application Blocks

These are software blocks which represent different types of user application functions. The types of blocks used with the IMT25 Transmitter are a Resource Block, a Function Block, and a Transducer Block.

#### **Resource Block (One per Device)**

This block identifies the transmitter and includes data such as the device name, serial number, device description (DD), DD revision, manufacturer ID, device type, device revision, and diagnostics.

#### **Analog Input (AI) Function Block**

An Analog Input (AI) function block contains the configurable parameters needed to define the measurement for use with other function blocks. Typical available parameters in the AI block include revision level, tag description, alarms, process variables, transducer scale values, and strategy.

#### **Transducer Block**

This block contains the actual measurement(s). Other parameters include calibrated range, EGUs, sensor range limits, sensor configuration, linearization, reranging, and diagnostics.

**OPERATING CONDITIONS**

<b>Transmitter Influence</b>	<b>Reference Operating Conditions</b>	<b>Normal Operating Condition Limits</b>	<b>Operative Limits (e)</b>
Ambient Temperature without LCD Indicator(a)	23 ± 2°C (73 ± 3°F)	-20 and +55°C (-4 and +131°F)	-30 and +70°C(b) (-22 and +158°F)(b)
Ambient Temperature with LCD Indicator(a)	23 ± 2°C (73 ± 3°F)	-20 and +55°C (-4 and +131°F)	-20 and +70°C(b) (-4 and +158°F)(b)
Process Temperature(a)	23 ± 2°C (73 ± 3°F)	See Note (a)	See Note (a)
Relative Humidity	50 ± 10%	5 and 100%(c)	5 and 100%(c,d)
Supply Voltage, ac - Transmitter	120 V ac, 240 V ac	85 and 264 V ac	85 and 264 V ac
Supply Frequency, ac - Transmitter	50 or 60 Hz	Rated Frequency ±3 Hz	47 and 63 Hz
Supply Voltage - Digital Output	24 V dc	9 and 32 V dc	9 and 32 V dc
	Transmission Output Signal Powered by Fieldbus Power Supply		
Supply Voltage - Pulse Output Load - Pulse Output	24 V dc 480 Ω	5 and 42 V dc 1 and 80 mA dc	5 and 42 V dc 1 and 80 mA dc
Vibration	Negligible	0 and 5 m/s <sup>2</sup> (0 and 0.5 "g") from 5 to 500 Hz	5 m/s <sup>2</sup> (0.5 "g") up to 500 Hz

- (a) Process temperature is not applicable to pipe- or surface-mounted transmitters. However, with flowtube-mounted transmitters, ambient temperature operative limit of 70°C (158°F) must not be exceeded. Also, process temperature is limited to 121°C (250°F).
- (b) During transportation and storage, the ambient temperature limits are -40 and +85°C (-40 and +185°F) without an LCD Indicator; and -30 and +80°C (-22 and +176°F) with an LCD Indicator.
- (c) Relative humidity limits listed apply only with transmitter covers properly installed.
- (d) During transmitter transportation or storage, the relative humidity limit is 0 and 100% with transmitter covers properly installed.
- (e) During transportation, the packaged transmitter can withstand normal handling and shipping conditions without damage.

**SYSTEM PERFORMANCE SPECIFICATIONS – TRANSMITTER AND FLOWTUBE**  
(At Reference Operating Conditions unless Otherwise Specified)

**Accuracy Notes**

- ▶ Accuracy specified as percent of flow rate reading, unless otherwise indicated.
- ▶ Accuracy specified using water as the fluid at reference operating conditions.
- ▶ Accuracy specified with 8000A, 8300, 9100A, 9200A, 9300A, and 2800 Series Flowtubes
- ▶ Accuracy rating assumes no flange piping mismatch, and also assumes a straight pipe upstream (5 pipe diameters minimum) and a straight pipe downstream (3 pipe diameters minimum) measured from center of flowtube.
- ▶ Accuracy rating includes effects of hysteresis, linearity, zero error, and repeatability.

**Accuracy – Pulse and Digital Output; with 8000A, 8300, and 2800 Series Flowtubes**

8000A	8300	2800(a)	System Accuracy	Flow Velocity
1/2 to 6 in (15 to 150 mm)	1/2 to 18 in (15 to 450 mm)	None	± 0.25% of Reading	≥ 2.0 fps (≥ 0.61 m/s)
			± 0.005 ft/s (± .0015 m/s)	< 2.0 fps (< 0.61 m/s)
1/16 to 1/4 in (1.16 to 6 mm)	20 to 36 in (500 to 900 mm)	None	± 0.50% of Reading	≥ 2.0 fps (≥ 0.61 m/s)
			± 0.010 ft/s (± .0305 m/s)	< 2.0 fps (< 0.61 m/s)
None	None	All Sizes	± 1.00% of Reading	≥ 3.3 fps (≥ 1 m/s)
			± 0.033 ft/s (± .010 m/s)	< 3.3 fps (< 1 m/s)

(a) Values in table above are for 2800 Series Flowtubes that have been calibrated for use with IMT25 Transmitters in accordance with ECEP 13420D. An average factor can be used, at a reduced accuracy, for 2800 Series Flowtubes that do not have an IMT25 Transmitter calibration factor.

**Accuracy – Pulse and Digital Output; with 9100A, 9200A, and 9300A Flowtubes**

9100A	9200A	9300A	System Accuracy	Flow Velocity
None	None	1/2 to 6 in (25 to 150 mm)	± 0.25% of Reading	≥ 2.0 fps (≥ 0.61 m/s)
			± 0.005 ft/s (± 0.0015 m/s)	< 2.0 fps (< 0.61 m/s)
1 to 78 in (25 to 2000 mm)	8 to 40 in (200 to 1200 mm)	8 to 16 in (200 to 400 mm)	± 0.50% of Reading	≥ 2.0 fps (≥ 0.61 m/s)
			± 0.010 ft/s (± 0.00305 m/s)	< 2.0 fps (< 0.61 m/s)

**Reproducibility**

±0.167% of flow rate, or ±0.01% of URL, whichever is greater

**Ambient Temperature Effect**

(For any variation from Reference Operating Temperature within the Operating Limits)

< 0.5% of reading, or <0.01% of flowmeter capacity, whichever is greater.

**Supply Voltage Effect**

A change in supply voltage of +10 or -15% from reference can cause the output to change <0.1% or <0.15% of reading, or <0.001% or 0.0015% of flowmeter capacity, whichever is greater.

**RFI Effect**

The output error is less than 5% of calibrated span for radio frequencies in the range of 27 to 1000 MHz and field intensity of 10 V/m when the transmitter is properly installed and housing covers are in place.

## PERFORMANCE SPECIFICATIONS (CONT.)

### Relative Humidity Effect

A change in RH from 50 to 95% at 30°C (85°F) wet bulb temperature can cause the output to change <1.0% of reading, or <0.01% of flowmeter capacity, whichever is greater.

### Output Load Effect

Pulse Output - <0.05% of span.

### Switching and Indirect Lightning Transients

Can withstand 1000 V common mode and 500 V normal mode, 1.2 x 20  $\mu$ s impulse per ANSI/IEEE Standard C62.41-1980 and IEC Std. 61000-4-5.

### High Frequency Transients

Can withstand a high frequency transient of 2000 V common mode, 5 x 50 ns impulse (IEC Standard 61000-4-4).

### Electrostatic Discharge

Can withstand application of 6000 V contact discharge, or 8000 V air discharge of an electrostatic field per IEC Standard 61000-4-2.

### European Union Directives

- ▶ Complies with Electromagnetic Compatibility Requirements of European EMC Directive 89/336/EEC by conforming to the following CENELEC and IEC Standards: EN 50081-2, EN 50082-2, and IEC 61000-4-2 through 61000-4-6.
- ▶ Complies with NAMUR Part 1 Interference Immunity Requirement (EMC).
- ▶ Conforms to Applicable European Union Directives ("CE" Logo marked on product)

## FUNCTIONAL SPECIFICATIONS

### Output Signal

#### DIGITAL OUTPUT

FOUNDATION fieldbus digital, serial, two-way communication system that runs at 31.25 kbits/s. The Manchester-encoded digital output signal is superimposed on the dc power signal on the bus, and conforms to IEC 1158-2 and ISA 50.02.

#### PULSE OUTPUT

This is 2-wire solid state type output configurable as a scaled pulse or frequency output. This output is available simultaneously with digital output.

##### *Scaled Pulse Output Mode*

Speed Selection	Pulse Width	Maximum Frequency
Slow	50.0 ms	10 Hz
Medium	5.0 ms	100 Hz

##### *Frequency Output Mode (Unidirectional Only)*

0 Hz to either 1, 2, 5, or 10 kHz, user programmable

### Supply Voltage - Digital Output

Transmission output signal powered by a specially designed fieldbus power source (9 to 32 V dc) connected to the bus.

### Supply Voltage - Transmitter

The IMT25 is locally powered and does not draw power from the bus. The digital output is powered by the Fieldbus power supply.

### Power Consumption

Less than 24 W at reference voltage and frequency

### Bus Sizing Parameters

- ▶ Current Consumption: 12 mA, nominal
- ▶ Minimum Voltage: 9 V dc
- ▶ Virtual Communication Relationships: 20 VCR

### Output Damping

Field-programmable from 0.1 to 49.9 seconds. This feature is used for reducing the frequency response of the transmitter as required by the process.

### Measurements

#### BIDIRECTIONAL FLOW

- “+” or “-” rate in engineering units
- “+” or “-” rate in % of URV

#### TOTALIZATION

- “+” or “-” Bidirectional Total, 8 digits
- Net Total, 8 digits
- Net Inventory Total, 10 digits

#### NOTE

Totals are protected in nonvolatile memory in the event of power loss.

### Flow Velocity Limits

#### MAXIMUM VELOCITY

10 m/s (33 ft/s)

#### MINIMUM URV (UPPER RANGE VALUE)

0.5 m/s (1.65 ft/s)

### Ranging

The transmitter is easily adjusted for the desired flow rate units and to the required upper range value locally via the LCD Indicator and keypad, or remotely over Fieldbus.

### Low Flow Cut-Off

A low flow cut-off algorithm stops the pulse output, rate indicator, and digital measurement value when measurement signal falls below a velocity of 0.01 m/s (0.033 ft/s).

### Auto Zero Lock (Empty Pipe Detection)

This function automatically drives the pulse and digital output signals to zero flow rate when the flowtube's electrodes become uncovered by the conductive liquid.

**FUNCTIONAL SPECIFICATIONS (CONT.)**

**Self-Test**

During power up and periodically during normal operations, the electronics will self-test the system to identify the presence of any faults, and isolate the fault to the transmitter or flowtube.

**Test Mode**

Transmitter calibration accuracy can be verified using a Foxboro Model IMTSIM Portable Magnetic Flowtube Simulator. The IMT25 has a Test mode to facilitate the test and provide a way to log the test data into the transmitter. See “Accessories” section.

**Pulse Output – Internally Powered**

Pulse output may share the same circuit reference as the current output. This circuit reference can only be grounded in one location.

**VOLTAGE**

24 V dc  $\pm 15\%$

**CURRENT**

1 mA minimum to 80 mA maximum

**OFF-STATE LEAKAGE**

200  $\mu$ A maximum

**Pulse Output – Externally Powered**

Output is independently isolated from fluid ground.

**VOLTAGE**

5 to 42 V dc

**CURRENT**

1 mA minimum to 80 mA maximum

**OFF-STATE LEAKAGE**

200  $\mu$ A maximum

**Contact (Relay) Outputs**

Quantity: 2

Contact Output Type:

Relay, 1 form A (isolated). Contact outputs are not short circuit proof. External fuses are required if this feature is used. Inductive loads can be driven with external surge absorbing devices connected across contact terminations.

Voltage Rating:

60 V dc maximum

30 V ac rms maximum

Current Rating:

3 amps maximum resistive

**Contact Inputs**

Quantity: 2

Contact Input Type:

Requires current sinking device such as contact closure or transistor switch between terminal block connections provided. The contact inputs share the same circuit reference, but are isolated from the flowtube ground.

Voltage Rating (Open Circuit Voltage):

24 V dc,  $\pm 15\%$

Current (Closed Circuit Current):

12 mA,  $\pm 15\%$

**Preset/Calibration**

The transmitter may be used as a pulse generating source to check and/or calibrate other instruments in the output loop, such as indicators, controllers, and recorders. This feature may be activated locally by pressing pushbuttons. The output signals can also be adjusted remotely via the host computer.

## FUNCTIONAL SPECIFICATIONS (CONT.)

### Process Fluid Conductivity and Signal Cable Length

The maximum allowable cable length is a function of the cable type, process fluid conductivity, and whether the cables are in the same or separate conduits. Standard system accuracy will be maintained when the installations are in accordance with Table 2.

### Host/Transmitter Communication

You may monitor, configure, and calibrate your transmitter using the following:

- ▶ The LCD Indicator/Keypad (Not for Calibration)
- ▶ FOUNDATION fieldbus Host consisting of an I/A Series System Workstation having a FOUNDATION fieldbus interface electronics PWA
- ▶ FOUNDATION fieldbus Host consisting of a PC equipped with a FOUNDATION fieldbus interface electronics PWA
- ▶ Any other FOUNDATION fieldbus Certified Host

### Remote Communication

Using FOUNDATION fieldbus protocol, transmitter communications includes the following:

- ▶ Resource State
- ▶ Manufacturer ID
- ▶ Device Type, Revision
- ▶ DD Resource, Revision
- ▶ Resource Diagnostic Parameters
- ▶ Output in % or EGU (Engineering Units)
- ▶ Electronic Damping
- ▶ Resource Diagnostic
- ▶ Alarms
- ▶ Calibration
- ▶ Date of Last Calibration
- ▶ Calibrator's Name
- ▶ FOUNDATION fieldbus Parameters (not necessarily configurable with Integral Display/Keypad)

**Table 2. Process Fluid Conductivity and Cabling**

Maximum Cable Length(a)	Minimum Fluid Conductivity(a)	Signal and Coil Drive Cables
300 m (1000 ft)	5 $\mu$ S/cm	Signal and Coil Drive Cables in separate conduit. Signal Cable to be Foxboro Part No. R0101ZS (feet) or B4017TE (metres).
225 m (750 ft)	5 $\mu$ S/cm	Signal and Coil drive cables in same conduit. Signal Cable to be Foxboro Part No. R0101ZS (feet) or B4017TE (metres).
150 m (500 ft)	20 $\mu$ S/cm	Signal cable may be in same conduit as coil drive cable. Signal cable to be good quality twisted shielded pair, preferably no smaller than 1.0 mm <sup>2</sup> (or 18 AWG) for mechanical considerations (Belden 8760 or 9318, Alpha 5610/1801 or 5611/1801, or equivalent).

(a) Values in table are fluid conductivity minimums, and maximum distance between transmitter and flowtube. See TI 027-072 for various process liquid conductivities.

**FUNCTIONAL SPECIFICATIONS (CONT.)**

**Diagnostics and Alarms**

The transmitter provides a number of internal diagnostics and configurable alarm functions (low flow, high flow, and high totals). The display will automatically indicate any diagnostic or alarm condition that exists. The relay outputs can be configured to activate on an alarm or diagnostic condition to provide remote indication of such events. Diagnostics and alarms are communicated via the Digital Output.

**Installation Characteristics**

Parameter	Specification
Intrinsically Safe	No
Maximum No. of Devices(a)	32
Maximum Cable Length(b)	1900 m (6234 ft)
Maximum Spur Length(b)(c)	120 m (394 ft)

- (a) Device quantity may be less; depends on power consumed, type of cable used, and accessory devices added.
- (b) Maximum cable length (control bus plus spurs) is based on use of #18 AWG (0.8 mm<sup>2</sup>) shielded twisted pair cable. See Installation Manual for the precise relationship between cable length, spur lengths, cable type, and number of devices.
- (c) Minimum spur length is 1 m (3.3 ft).

**Installation Topologies**

Figures 3 and 4 show typical installation topologies. Figure 3 shows a bus with spurs, a daisy chain, and a tree. Figure 4 shows a mixed topology installation where a bus with spurs, daisy chain, and tree are connected in series. See paragraphs that follow for a brief description of each topology.

**BUS WITH SPURS TOPOLOGY**

Devices connected to bus segment via a spur. The spur cable can vary in length to 120 m (394 ft). The length of the spur can limit the total fieldbus length.

**DAISY CHAIN TOPOLOGY**

Fieldbus cable routed from device to device on the same segment. Installation practices should ensure that one device can be disconnected without disrupting the continuity of the segment.

**TREE TOPOLOGY**

Devices on a single fieldbus segment are connected to a common junction box using individual twisted pair wire. With this topology, maximum spur lengths must be considered.

**MIXED TOPOLOGY**

Mixed topologies allow the connection of other installation topologies in a series configuration. A mixed topology, although not often used, must follow the rules relating to total fieldbus length.

### FUNCTIONAL SPECIFICATIONS (CONT.)

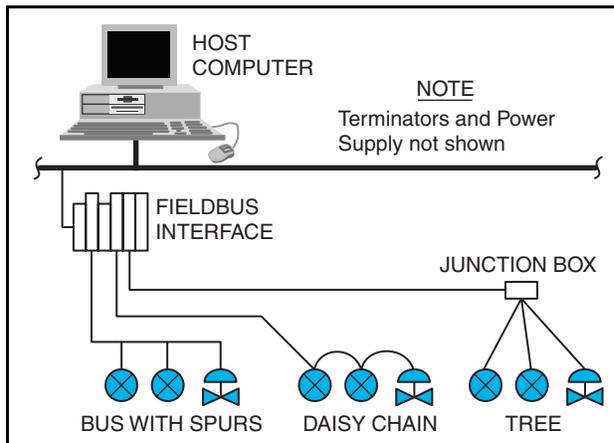


Figure 3. Miscellaneous Installation Topologies

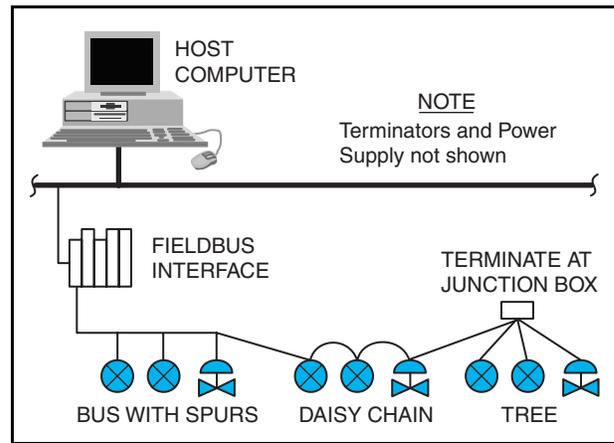


Figure 4. Installation with Mixed Topologies

### ELECTRICAL SAFETY SPECIFICATIONS

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
CSA Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2 Hazardous locations.	Temperature Class T4 at maximum ambient of 70°C.	L
FM ordinary locations.	—	M
FM nonincendive, Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III, Division 2 Hazardous locations.	Temperature Class T4 at maximum ambient of 70°C.	N
Testing Laboratory Approval or Certification <u>not</u> Required.	—	Z

#### NOTE

These transmitters have been designed to meet the electrical safety descriptions listed above. For detailed information, or status of testing laboratory approvals or certifications, contact Foxboro.

## PHYSICAL SPECIFICATIONS

### Transmitter Enclosure

The standard enclosure is a single compartment design which houses the electronics, power supply, and all field terminations. Provisions for four standard conduit/cable access holes (nonthreaded holes) are sized to accept 1/2 NPS or M20 fittings. These standard holes are located as indicated in the “Dimensions – Nominal” section. Two or four optional conduit/cable access holes can also be provided as indicated in the “Optional Selections and Accessories” section. The enclosure compartment is protected with a front gasketed cover which seals the unit. Upon removing the cover, a lanyard attached to both inside surfaces (of the cover and enclosure) retains the cover, thereby eliminating the misplacing or otherwise damaging of the cover assembly. This cast aluminum enclosure is weatherproof as defined by IEC IP66, and provides the watertight and corrosion resistant protection of NEMA Type 4X. See Optional Selections section for information relating to a dual compartment enclosure that separates the field terminals from all other transmitter electronics.

### Mounting Position

The transmitter can be mounted in any position without degrading performance. The front cover of the transmitter housing can be rotated in 90° increments to allow easy viewing of the display for any installation orientation.

### Enclosure Material

Cast aluminum (1% copper content, maximum)

### Enclosure Finish

Epoxy powder coat, gray

### Transmitter Mounting

#### PIPE MOUNTING

Two integrally cast flanges provided at the top and bottom rear of the enclosure, along with a kit of stainless steel parts (provided by Foxboro), are used for mounting on a DN 50 or 2 in pipe.

#### SURFACE MOUNTING

The two flanges at the top and bottom rear of the enclosure are provided to allow securing the transmitter to a wall or surface.

#### FLOWTUBE MOUNTING

This type of mounting is only applicable to transmitters used with 8000A and 9300A Series Flowtubes. In these installations, the transmitter is secured to the top surface of the flowtube using a mounting bracket and gasket seal.

### Approximate Mass - Transmitter Only

#### SINGLE COMPARTMENT TRANSMITTER

2.9 kg (6.5 lb)

#### DUAL COMPARTMENT TRANSMITTER

3.9 kg (8.7 lb)

## OPTIONAL SELECTIONS AND ACCESSORIES

### Option -A: I/O Access Port

This port, with two banana plug sockets, allows easy connection to the fieldbus output signal. It is made accessible by unscrewing the terminal block cover screw and exposing the terminal block. The cover not only protects the terminals from the environment, but is also marked to identify terminal functions. It is attached to a lanyard, which is also integrally attached to the front panel, thus preventing misplacement and loss of the cover when disconnected from the port. Specify Optional Selection -A.

### Option -B: Protective Guard for Display and Keypad Panel

This hinged (upward) clear plastic guard (cover) protects the front panel display and keypad. The cover protects against inadvertent manipulation of the keys, and allows for “hose downs” of the transmitter housing. Specify Option -B.

### Option -C and -D: Dual Compartment Enclosure

An optional secondary enclosure is available for those installations which require a sealed separation between the electronics and the field terminations. With this option, a separate field terminals compartment is provided which is sealed and separated from the primary electronics compartment. Therefore, all field terminations can be made by simply removing the terminations compartment cover without having to expose the electronics to the environment. The terminal strips contained in the secondary housing allow for easy wiring, installation, and replacement. Specify Optional Selection -C for a secondary housing with top insertion type terminal block, or Optional Selection -D for a secondary housing with lug type terminal block.

### Model IMTSIM Magnetic Flowtube Simulator

The IMTSIM is a portable instrument that simulates a magnetic flowtube. It is used to verify the accuracy of an IMT25 in the field. Its accuracy is sufficient to validate the transmitter accuracy, but can not be used to recalibrate the transmitter. An unlikely out-of-calibration transmitter must be returned to Foxboro for recalibration. The IMTSIM is powered by the IMT25 Transmitter, and can also be used as a general purpose maintenance, setup, or troubleshooting tool. See PSS 1-6F7 A for further description, specifications, and ordering instructions.

### Option -G: Cable Glands for Nonconduit Applications

These 1/2 NPT cable glands provide a rain tight, strain relieved entrance for 6.8 to 12.2 mm (0.27 to 0.48 in) diameter cable. The body and seal nut are nylon and the compression gland is neoprene. Selectable using Model Code Option -G.

### Foxboro Signal Cable (See Table 2)

For remote-mounted Transmitter applications only. Two-core (two-conductor), multiscreened (multi-shielded) cable with two driven screens (shields).

Maximum length is 300 m (1000 ft). If expressing length in feet, order Part Number R0101ZS. If length units are metres, order Part Number B4017TE.

OPTIONAL SELECTIONS AND ACCESSORIES (CONT.)

**Conduit/Cable Access Holes**

As stated previously, four conduit/cable access holes are provided standard with the transmitter. Also, either two or four additional holes can be provided as shown and described in Figure 5 and the table below.

Specify	Added Holes Provided at
ECEP 14357-A	Locations 4 and 6
ECEP 14357-B	Locations 7 and 8
ECEP 14357-C	Locations 4, 6, 7, and 8

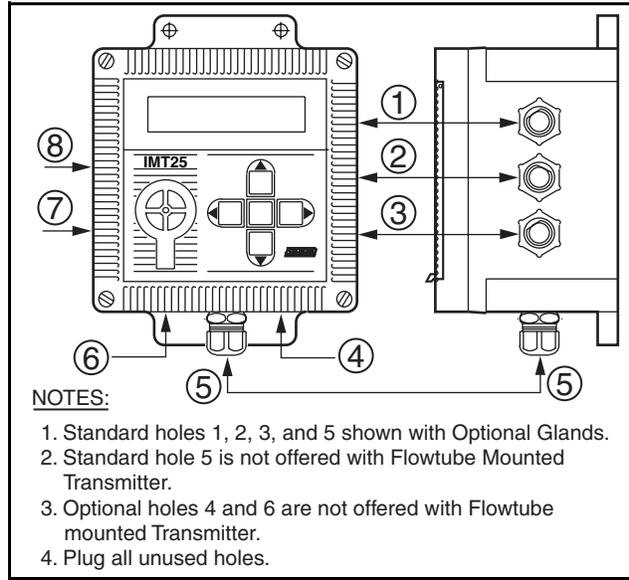


Figure 5. Location of Conduit/Cable Access Holes

MODEL CODE

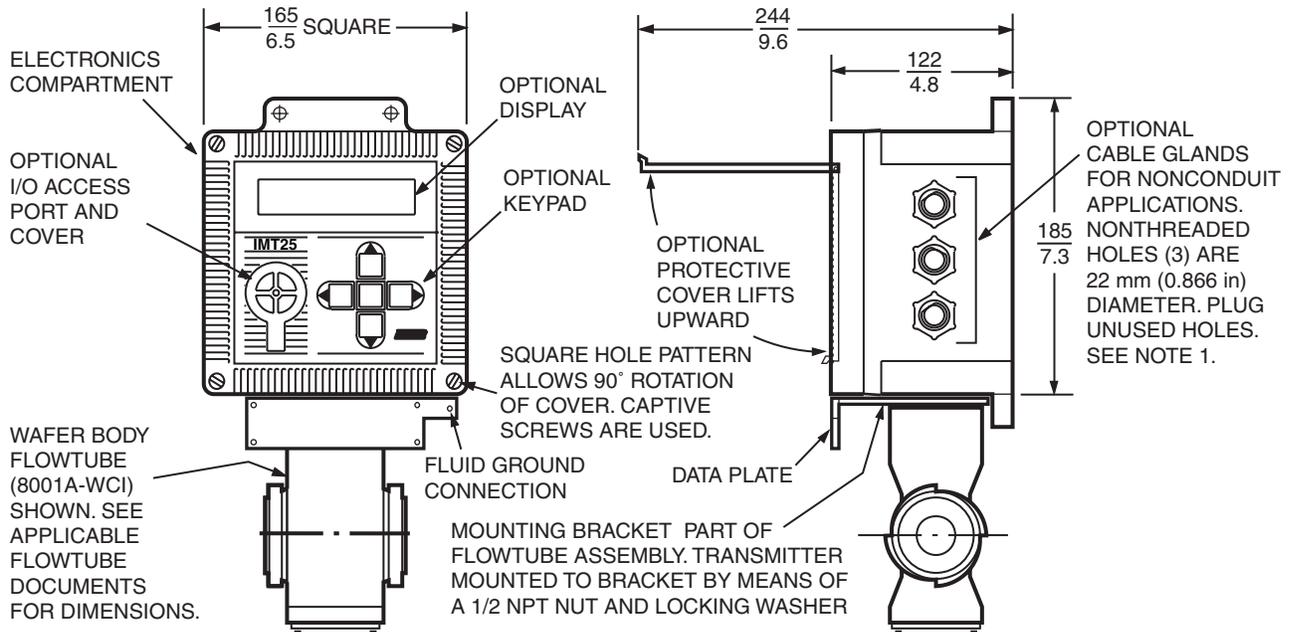
<u>Description</u>	<u>Model</u>
I/A Series Magnetic Flow Transmitter	IMT25
<b><u>Transmitter Mounting</u></b>	
Pipe Mounting	-P
Surface or Wall Mounting	-S
Flowtube Mounting (a,b)	-I
<b><u>Language</u></b>	
English	E
<b><u>Nominal Supply Voltage and Frequency</u></b>	
120 and 240 V ac, 50 and 60 Hz	A
<b><u>Communications Protocol (c)</u></b>	
FOUNDATION Fieldbus 31.25 kbits/s, Voltage Mode MAU	F
<b><u>Integral LCD Indicator/Keypad</u></b>	
Blind; No Indicator or Keypad	A
LCD Indicator with Keypad (d)	B
<b><u>Transmission Output Signal</u></b>	
FOUNDATION Fieldbus, 31.25 kbits/s, Voltage Mode MAU, Externally Powered (e)	5
<b><u>Pulse Output Signal (f,g)</u></b>	
Off (Can be Reconfigured in the Field from OFF to ON)	0
On, Internally Powered	1
On, Externally Powered	2
<b><u>Electrical Safety (Also see “Electrical Safety Specifications” section)</u></b>	
CSA, Class I, Division 2	L
FM, Ordinary Locations	M
FM, Nonincendive, n	N
No Testing Laboratory Approval or Certification Required	Z
<b><u>Optional Selections</u></b>	
I/O Access Port	-A
LCD Indicator/Keypad with a Clear Plastic Protective Guard (Cover)	-B
Dual Compartment Enclosure w/Top Insertion Type Terminal Block (h)	-C
Dual Compartment Enclosure w/Lug Type Terminal Block (h)	-D
Cable Glands for Nonconduit Applications (Cannot be used with Electrical Safety Code L and N)	-G
Example: IMT25-PEAFA70K-A	

- (a) Flowtube mounted transmitter may only be used with process temperatures not exceeding 120°C (250°F).
- (b) IMT25 can only be integrally mounted to Model 8000A and Model 9300A Flowtubes.
- (c) For flowmeters with FoxCom or HART Communication Protocol, see PSS 1-6F5 A.
- (d) The LCD Indicator has ambient temperature limits of -20 and +70°C (-4 and 158°F).
- (e) Powered by a Fieldbus power supply.
- (f) Internal versus external power can be changed in field by a switch setting.
- (g) Pulse output can be configured as either scaled pulse output mode or frequency output mode.
- (h) The electronics are in the main enclosure, and the customer terminations are in the secondary enclosure (terminations box).

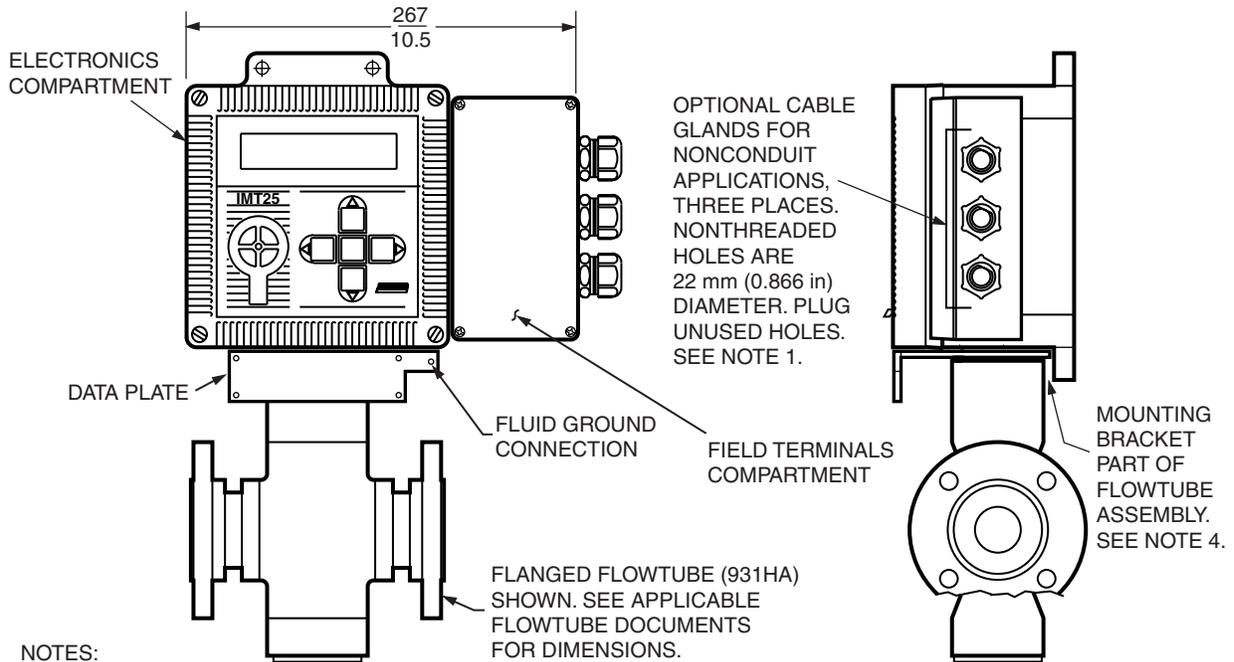
**DIMENSIONS-NOMINAL**

**FLOWTUBE MOUNTED TRANSMITTER - SINGLE COMPARTMENT**

**mm  
in**



**FLOWTUBE MOUNTED TRANSMITTER - OPTIONAL DUAL COMPARTMENT**



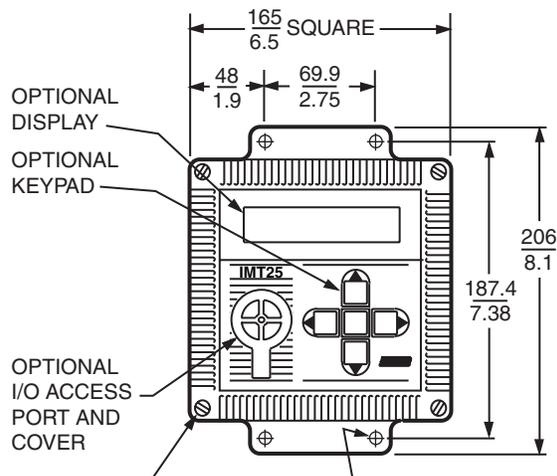
**NOTES:**

1. PLUG UNUSED CONDUIT CONNECTIONS (OR HOLES) WITH PLUGS TO MAINTAIN NEMA 4 MOISTURE AND DUST PROTECTION.
2. SIGNAL AND COIL DRIVE WIRING BETWEEN TRANSMITTER AND FLOWTUBE ARE PERFORMED BY FOXBORO AT PLANT OF MANUFACTURE WHEN BOTH UNITS ENTERED ON SAME ORDER.
3. SEE "OPTIONAL SELECTIONS" SECTION IF ADDITIONAL CONDUIT/CABLE ACCESS HOLES ARE REQUIRED.
4. FLOWTUBE ASSEMBLY MOUNTED AT FACTORY IN POSITION SHOWN, AND CAN BE ROTATED ±1/4 TURN. FACTORY-MOUNTED POSITION RECOMMENDED FOR 3 INCH AND SMALLER 8000A SERIES FLOWTUBES.

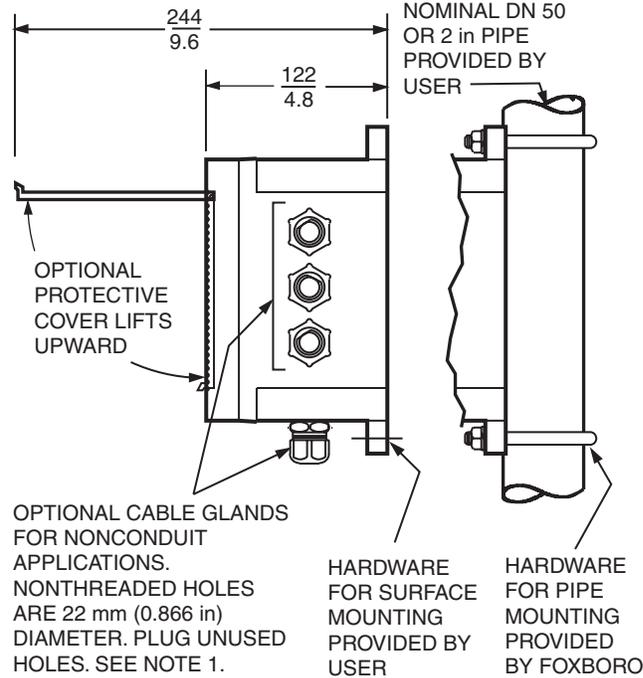
**DIMENSIONS-NOMINAL (CONT.)**

**SURFACE AND PIPE MOUNTED TRANSMITTER - SINGLE COMPARTMENT**

**mm  
in**



SQUARE HOLE PATTERN ALLOWS 90° ROTATION OF COVER. CAPTIVE SCREWS ARE USED.  
8.86 mm (0.35 in) DIAMETER HOLES FOUR PLACES ON FLANGES; FOR SURFACE AND PIPE MOUNTING.

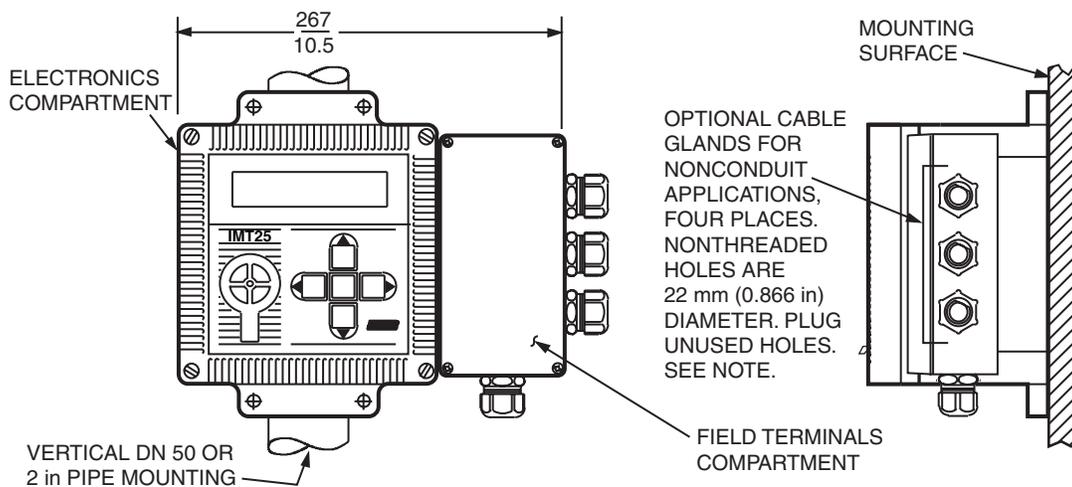


OPTIONAL CABLE GLANDS FOR NONCONDUIT APPLICATIONS. NONTHEADED HOLES ARE 22 mm (0.866 in) DIAMETER. PLUG UNUSED HOLES. SEE NOTE 1.

HARDWARE FOR SURFACE MOUNTING PROVIDED BY USER

HARDWARE FOR PIPE MOUNTING PROVIDED BY FOXBORO

**SURFACE AND PIPE MOUNTED TRANSMITTER - OPTIONAL DUAL COMPARTMENT**



**NOTES:**

1. PLUG UNUSED CONDUIT CONNECTIONS (OR HOLES) WITH PLUGS TO MAINTAIN NEMA 4 MOISTURE AND DUST PROTECTION.
2. SEE "OPTIONAL SELECTIONS" SECTION IF ADDITIONAL CONDUIT/CABLE ACCESS HOLES ARE REQUIRED.

## ORDERING INSTRUCTIONS

1. Model Number
2. Signal Cable Part Number (if required); See Optional Selections and Accessories section. Also see Table 2.
3. Optional Conduit/Cable Access Holes (if required); See Optional Selections and Accessories section.
4. User Tag Data

## OTHER M&I PRODUCTS

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