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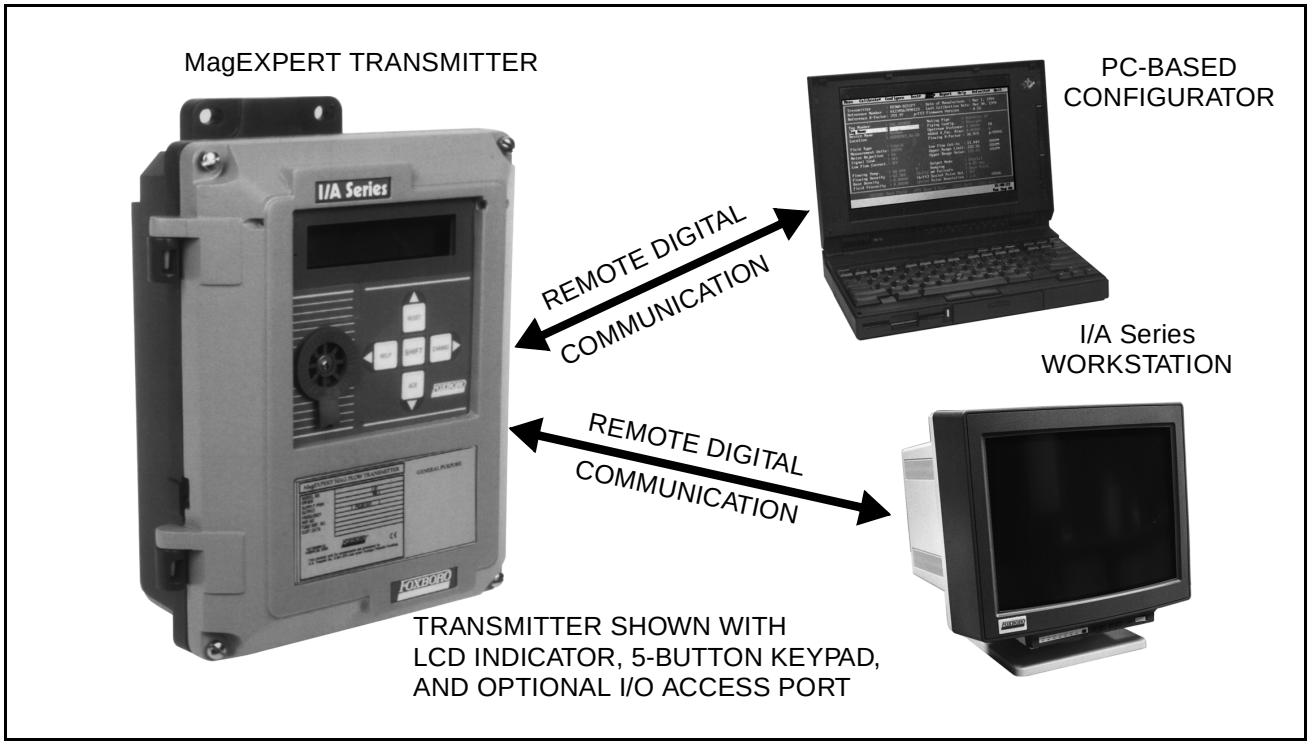
Find the *Schneider Electric / Invensys / Foxboro IMT96-SEADB10L-B* at our website: *Click HERE*

FOXBORO®

Product Specifications

PSS 1-6F8 A

I/A Series® Intelligent Magnetic Flow Transmitter
The MagEXPERT™ for use with 2800 Series Flowtubes



The MagEXPERT Magnetic Flow Transmitter is a significant advancement in magnetic flowmeter technology. When combined with the 2800 Series Magnetic Flowtube, it provides a reliable solution to the most noisy flowmeter applications such as High Consistency Pulp Stock, Slurries, Chemical Additives, and Pulsating Flow. The MagEXPERT uses the Foxboro patented eX-Pulse coil excitation method to create a strong measurement signal, coupled with optimum noise reduction capability and fast speed of response.

- Patented eX-Pulse Coil Excitation provides Superior Performance on Liquids with Entrained Air, Non-homogeneous Slurries, Dense Slurries, and Pulsating Flow
- Backward Compatibility with Existing 2800 Series Flowtubes
- Unidirectional or Bidirectional Flow
- Zero Signal Lock Capability
- Digital, Analog, and Pulse Output Signals
- Remote Communications via I/A Series System Workstation or PC-Based Configurator
- Simple Menu-Driven Software Configuration via I/A Series System, PC-Based Configurator, or Local On-board LCD Indicator/Keypad
- Backlit, 2-line, LCD Indicator w/5-Button Keypad
- Contact Inputs with Programmable Functionality for Remote Operation Capability
- Relay Outputs with Programmable Functionality for Alarming
- Software Configuration and Totals Protected in Nonvolatile Memory
- Online Diagnostic/Help Capability
- Conforms to Applicable European Union Directives (Product Marked with “CE” Logo)
- I/O Access Port Option allows Direct Connection of External PC-Based Configurator
- Standard 2-Year Warranty

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THE MagEXPERT TRANSMITTER WITH eX-Pulse COIL EXCITATION

The MagEXPERT Transmitter incorporates the patented eX-Pulse coil excitation method. It pulses the coils of a 2800 Series Flowtube with unipolar current excitation as shown in Figure 1.

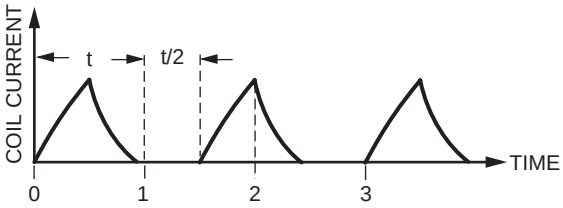


Figure 1. Coil Current versus Time

During an individual pulse, the coil current rises and then falls in an exponential manner. Hence the name eX-Pulse. Coil current pulses start on one and one-half (1 1/2) line cycle intervals. The additional 1/2 cycle introduces a reversal of the power line to flow signal on every pulse. This cancels the effect of power line voltage coupling to the flow signal.

The MagEXPERT is neither an ac transmitter, nor is it a pulsed dc transmitter. eX-Pulse excitation is a true technology advancement that combines the best from both ac and dc systems. MagEXPERT is similar to a pulsed dc transmitter in that it supplies power to the flowtube coils. This power is pulsed on/off to achieve zero stability (high precision), and the unit consumes low power. Also, MagEXPERT is similar to a conventional ac transmitter (like the Foxboro E96 series) in that:

- Flow signal is integrated over the entire pulse cycle
- Speed of response is fast
- Flow signal is high, similar to conventional ac systems
- And measurement frequency is high (2/3 of the power supply frequency – 40 Hz at 60 Hz supply power).

The Foxboro IMT25 Pulsed dc Transmitter still remains the most cost effective solution for general magnetic flow applications. However, the MagEXPERT Transmitter has superior capability to handle more difficult applications, such as liquids with entrained air, dense slurries, nonhomogeneous slurries, pulsating flow created by positive displacement type pumps, and applications where chemical additives create excessive noise.

CALIBRATION

All MagEXPERT Magnetic Flow Transmitters are factory calibrated to their specified accuracy with calibration equipment traceable to the U.S. National Institute of Science and Technology (NIST).

A SELECTION OF OUTPUT SIGNALS

The MagEXPERT Transmitter provides digital, analog, and pulse output signals.

The Digital Output Signal utilizes FoxCom communication protocol. The digital signal provides transmission of the flow signal and allows remote communications/configuration of the transmitter. FoxCom communication can be performed on an I/A Series System Workstation or a PC-based Configurator(1) at any point in the loop. The FoxCom output signal has a 4800 baud transmission rate.

The Analog Output Signal is 4 to 20 mA and can be configured to operate in one of four ways: unidirectional (single range), unidirectional (multiple range), bidirectional, and bidirectional split range. The transmitter can be programmed for up to three different flow ranges when measuring flow in one direction. For bidirectional flow, the user can input a separate flow range for the forward and reverse directions. Alternately, the output can be programmed as bidirectional split flow, where 12 mA represents zero flow, 4 mA represents the reverse flow upper range value, and 20 mA the forward flow upper range value. The analog output can be either internally or externally powered, and is independently isolated. The FoxCom digital signal is superimposed on the analog signal for remote communications. The superimposed FSK signal is limited to a 600 baud transmission rate when the 4 to 20 mA signal is active. When the FoxCom 4800 baud rate is used, the 4 to 20 mA signal is frozen at 10 mA.

The Pulse Output Signal can be configured for frequency mode or scaled mode. It is independently isolated from power ground and can be internally or externally powered. Frequency mode would be selected, for example, to drive an external rate meter. Maximum output frequency is selectable between 1000 and 10 000 Hz. Scaled mode would be selected, for example, to drive an external totalizer. Maximum output frequencies of 10 and 100 Hz are available. Pulse output is available simultaneously with either analog or digital output.

(1) Foxboro Model PC20 Configurator, or later version, can be used.

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COMPARISON OF MagEXPERT eX-Pulse TRANSMITTER WITH CONVENTIONAL ac AND PULSED dc TRANSMITTERS

Transmitter Feature	ac	Pulsed dc	eX-Pulse
Zero Stability	–	yes	yes
High Signal Strength	yes	–	yes
Low Power Consumption	–	yes	yes
Accuracy Better than 1%	–	yes	yes
Simplified Wiring and Installation	–	yes	yes
Immunity from External Power Line Effects	–	yes	yes
Digital Communications and Advanced Features	–	yes	yes
Measurement of Pulsating Flow	yes	limited	yes
Measure Noisy Fluids (e.g., slurries)	yes	limited	yes
Measurement of Liquids with Entrained Air	yes	limited	yes
Backward Compatibility to Foxboro Flowtubes	–	yes	yes

COMPATIBILITY OF MagEXPERT WITH FOXBORO FLOWTUBES

The MagEXPERT should be used with 15 to 900 mm (1/2 to 36 in) 2800 Series Magnetic Flowtubes that have been calibrated for use with this transmitter.

It can also be used with existing 2800 flowtubes to replace E96 Transmitters, but with reduced specifications (if the flowtube has not been calibrated for use with the MagEXPERT). However, the MagEXPERT will still provide performance equal to or better than the original E96 Transmitter flow system specifications.

Refer to PSS 1-6B5 A, PSS 1-6B5 C, and PSS 1-6B5 E for 2800 Series Magnetic Flowtube specifications.

CONTACT INPUTS AND RELAY OUTPUTS

The MagEXPERT Transmitter can accept two contact inputs. The functions of these inputs are programmable, and allow the user to perform transmitter operations from a remote location. Some applications of these inputs include: selection of flow range, resetting totals, acknowledging alarms, and providing an empty tube zero lock on all outputs. Both contacts must be used for multiple range service.

This transmitter also provides two relay outputs with programmable functionality. These outputs can be used to indicate reverse flow, to indicate alarm conditions (high flow rate, low flow rate, or high flow totals), and/or to indicate diagnostic alarms.

The contact inputs and relay outputs can be used together to perform simple sequencing tasks as well.

ZERO SIGNAL LOCK (FOR EMPTY TUBE CONDITIONS)

The MagEXPERT Transmitter can be programmed to lock all outputs at their zero flow values, and freeze totalizers. This may be necessary to hold the outputs at zero when an empty tube condition exists. This zero lock feature can be activated/deactivated by use of an external contact input (coming, for example from a pump or flow switch located in the piping system) provided by the user. The transmitter display will indicate when the zero lock circuit is activated.

LOCAL OPERATION OPTIONS

The door can be supplied blind, or with a local Keypad/LCD Indicator. The keypad is accessible from the front of the transmitter without opening the housing door. A hinged protective clear plastic window guard (to protect the Keypad/LCD Indicator) and I/O Access Port are other available door options.

The Keypad/LCD Indicator consists of a 32 alphanumeric character, 2-line, backlighted display and 5-button keypad. The display 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 “-” indicator shows flow direction. This option allows the transmitter to be used as a stand-alone device, giving the user complete operation and configuration capabilities.

Eight digits are available to display positive, negative and net totals. Ten digits are available to display net inventory total. Six digits are available to display rate.

The optional Clear Plastic Guard protects the LCD Indicator during washdown operations to prevent inadvertent activation of the keypad by the washdown stream. The Clear Plastic Guard is not required to obtain the NEMA 4X protection.

The optional I/O Access Port is a circular recess in the front door that is protected by a separate cover integrally connected to the front door to prevent loss or misplacement. Access to the port is made by loosening a screw on the port cover. Inside the port are two banana plug sockets that allow direct connection of a Foxboro PC-Based Configurator.

CE COMPLIANCE

These transmitters display the “CE” marking indicating conformance to all applicable European Community Directives.

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NOISE REDUCTION ALGORITHM

The MagEXPERT provides superior performance in noise generating processes (without the need for high damping constants) by use of a Foxboro exclusive noise reduction algorithm. The high signal strength resulting from eX-Pulse coil excitation, combined with the noise reduction algorithm, results in a system with fast speed of response on even the most difficult processes.

TRANSMITTER ENCLOSURE

The transmitter enclosure is fitted with a hinged front cover that provides easy access to the wiring terminals. The electronics within the enclosure are protected by internal plastic covers. The enclosure can be mounted to a flat surface, recessed into a panel, or mounted to a nominal DN 50 or 2-inch pipe. The cast aluminum enclosure has a high build epoxy paint finish. Four conduit/cable access holes are provided (nonthreaded) that accept standard 1/2-inch or M20 fittings. The enclosure is dusttight and weatherproof per ICE IP66, and provides the watertight and corrosion resistant protection of NEMA Type 4X.

SIMPLE SETUP WITH INTEGRAL HELP FUNCTION

The MagEXPERT Transmitter uses the same configuration software, with a few minor exceptions, as the IMT25 Transmitter. Any user familiar with the IMT25 should be able to operate the MagEXPERT right out of the box, without any additional training.

Communication can be done with the Foxboro PC-based Configurator, an I/A Series System Workstation, or the local keypad/LCD Indicator. For a basic flow measurement with a 4 to 20 mA or digital output, the setup is very simple, requiring only the Flowtube Calibration Factor and your Upper Range Value (URV) to be entered. A simple Quick Start pamphlet (located in a plastic jacket on the inside surface of the door) describes how to enter these values.

The transmitter is a very versatile instrument and can provide many different functions in addition to simple flow measurement. To activate these features, additional configuration is needed. To simplify this task, the instruction book shipped with your instrument contains function-specific road maps and instructions to get you started.

ON-LINE DIAGNOSTICS WITH INTEGRAL HELP FUNCTION

While in the Measurement mode, the transmitter continuously performs a number of internal diagnostic functions. The indicator automatically displays any diagnostic condition that is detected, and can actually be programmed to blink for a diagnostic error to easily draw the attention of floor personnel. In addition, it can be programmed to energize one or both alarm relays for a diagnostic error.

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

OPERATING CONDITIONS

Transmitter Influence	Reference Operating Conditions	Normal Operating Condition Limits	Operative Limits
Ambient Temperature	23 ±2°C (73±3°F)	-20 and +55°C (-4 and +131°F)	-30 and +60°C (-22 and +140°F)
Relative Humidity	50 ±10%	5 and 100%(a)	5 and 100%(a)(b)
Power Input	120 or 240 V ac, 60 Hz	+10% and -15% ±5%	+10% and -15% ±5%
	230 V ac 50 Hz	±10% ±5%	±10% ±5%
4 to 20 mA Output(c) • Supply Voltage • External Load	 • 24 V dc • 250 ohms	 • 10 and 50 V dc • 0 and 1950 ohms	 • 10 and 50 V dc • 0 and 1950 ohms
Pulse Output • Supply Voltage • External Load	 • 24 V dc • 480 ohms	 • 5 and 42 V dc • 62.5 and 5000 ohms	 • 5 and 42 V dc • 62.5 and 5000 ohms

(a) Relative humidity limits listed apply only with transmitter door properly installed and closed.
(b) During transmitter transportation or storage, the relative humidity is 0 and 100%.
(c) Refer to Figure 2 for plot of supply voltage vs. external load.

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PERFORMANCE SPECIFICATIONS

(At Reference Operating Conditions, System Performance of Combined Transmitter and Flowtube, unless otherwise specified)

Accuracy – Digital and Pulse Outputs

Flow System	Tube Size	System Accuracy(a)(b)	Flow Velocity
2800 Flowtube Factory Calibrated for MagEXPERT Note (c)	15 to 300 mm (1/2 to 12 in)	±0.50% of rate ±0.010 fps (±0.00305 mps)	≥2.0 fps (0.61 mps) <2.0 fps (0.61 mps)
	400 to 900 mm (14 to 36 in)	±1.0% of rate ±0.02 fps (±0.006 mps)	≥2.0 fps (0.61 mps) <2.0 fps (0.61 mps)

(a) To obtain Analog Output accuracy, add ±0.03% of span (equal to ±0.0048 mA) to the Digital/Pulse Output accuracy listed above.
(b) Accuracy listed is with zero flow setting.
(c) You can use MagEXPERT (IMT96) with a 2800 Series Flowtube that has not been factory calibrated; the expected accuracy value in this case is 0.5% greater than that shown. Accuracy specified is based on a nominal factor determined by calculation using the actual calibration factor from the tube to be retrofitted.

Accuracy - Definitions

- Accuracy specified using water as the fluid at reference operating conditions
- Accuracy rating is specified based upon 2800 Series Flowtube sizes 15 to 900 mm (1/2 to 36 in), that have been factory calibrated for the MagEXPERT Transmitter
- Accuracy includes effects of hysteresis, linearity, zero error, and repeatability
- Accuracy assumes no flange piping mismatch. It also assumes that there is a straight pipe upstream (5 pipe diameters minimum), and downstream (3 pipe diameters minimum), measured from center of flowtube

Response Time(a)

Digital and Pulse Outputs		Analog Output	
50 Hz	60 Hz	50 Hz	60 Hz
0.03 s	0.025 s	0.18 s	0.175 s

(a) The interval of time between the initiation of the input step and the time at which the output signal first attains 90% of its final steady state value.

Ambient Temperature Effect

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

DIGITAL AND PULSE OUTPUTS

<0.5% of reading, or <0.01% of maximum URV, whichever is greater

ANALOG OUTPUT

0.1 mA plus Digital and Pulse Outputs Effects listed above.

Supply Voltage Effect

A change in the supply voltage of +10% or -15% (+10% or -10% for 230 V ac) from the Reference Operating Voltage causes the output to change less than 0.1% or 0.15% of reading, or 0.001% or 0.0015% of maximum URV, whichever is greater.

Relative Humidity Effect

A change in the relative humidity from 5% to 95% at 30 °C (85 °F) wet bulb temperature causes the output to change less than 1% of reading, or 0.01% of maximum URV, whichever is greater.

Signal Cable and Fluid Conductivity Effect

Refer to Functional Specifications section for effects relating to long signal cables (> 500 ft [> 150 m]), and/or low fluid conductivities (< 20 µS/cm).

Electromagnetic Compatibility (EMC)

ELECTROSTATIC DISCHARGE (ESD) IMMUNITY

Contact discharge of 6 kV per IEC 1000-4-2 (EN 61000-4-2)

RADIATED RF IMMUNITY

10 V/m per IEC 1000-4-3 (EN 61000-4-3)

ELECTRICAL FAST TRANSIENTS/BURST IMMUNITY

2 kV per IEC 1000-4-4 (EN 61000-4-4)

SURGE WITHSTAND IMMUNITY

2 kV per IEC 1000-4-5 (EN 61000-4-5)

CONDUCTED RF IMMUNITY

Per IEC 1000-4-6 (EN 61000-4-6)

MAGNETIC FIELD IMMUNITY

20 gauss per IEC 1000-4-8 (EN 61000-4-8)

POWER DIPS AND INTERRUPTIONS

Per IEC 1000-4-11 (EN 61000-4-11)

RADIATED AND CONDUCTED EMISSIONS

Per IEC CIS PR 11, Class A (EN 55011)

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FUNCTIONAL SPECIFICATIONS

Flow Rate Limits (Velocity)

MAXIMUM VELOCITY
10 m/s (33 ft/s)
MINIMUM UPPER RANGE VELOCITY FOR 100% OUTPUT
0.5 m/s (1.65 ft/s)
MINIMUM MEASURABLE FLOW RATE
0.01 m/s (0.033 ft/s)

Low Flow Cut-Off

A low flow cut-off algorithm holds the pulse output, rate indicator, and digital measurement at zero when the measurement signal falls below 0.01 m/s (0.033 ft/s). The analog output remains active at zero flow, unless specifically configured to go to zero when flow rate falls below a user-configured value.

Measurements

FLOW RATE - UNI- OR BIDIRECTIONAL
+ or - Rate in Engineering Units
+ or - Rate in % of Upper Range Value
TOTALIZATION
+ or - Bidirectional Total (8 digits)
Net Total (8 digits)
Net Inventory Total (10 digits)

Power Consumption

Power for the flow measurement system (IMT96 and 2800 Series Flowtube) is less than 100 VA, regardless of tube size.

Output Damping

Field programmable feature is used for reducing the frequency response of the transmitter as required by the process.

Self Test

In the background to normal flow calculations, the system continuously performs self-test checks. If a fault is found that makes flow calculation impossible, the outputs go “LO” or “HI” based on configuration choice. A diagnostic message identifying the problem is also issued. This message can be read on the local LCD Indicator, with the PC-based Configurator, or on an I/A Series Workstation.

Preset/Calibration

The transmitter may be used as a 4 to 20 mA or pulse generating source to check and/or calibrate other instruments in the loop, such as indicators, controllers, and recorders. This feature may be activated by pressing keypad buttons. The output signals can also be adjusted to any value, remotely, via the external PC-based configurator.

Ranging

The MagEXPERT Transmitter is easily adjusted for the desired flow rate units and to the required upper range value. This range data may also be keyed in through the Foxboro PC-based configurator.

Electrical Output Signals

Three output signals are available: digital, analog, and pulse. The digital output uses FoxCom protocol. All three signals are available simultaneously except that the analog output is not available with 4800 baud digital signal output.

DIGITAL OUTPUT (4800 BAUD)
Transmitter transfers digital information using FoxCom communication protocol.

ANALOG OUTPUT WITH SUPERIMPOSED DIGITAL (600 BAUD)
The current output is independently isolated and can be internally or externally powered. The current output is configurable to a 4 to 12 and 12 to 20 mA split range for bidirectional flow applications. Maximum current is 21.5 mA, and minimum current is 3.86 mA.

PULSE OUTPUT
This is a 2-wire solid state type output, and is configurable as a scaled pulse or frequency output. Pulse output is available simultaneously with analog and digital outputs.

Scaled Pulse Output Mode
Configurable per Table Below.

Pulse Width	Maximum Frequency
50 ms	10 Hz
5 ms	100 Hz

Frequency Pulse Output Mode
0 to 1000, 2000, 5000, or 10 000 Hz square wave output, user programmable.

Relay Outputs

Quantity: 2
Type: Relay, 1 form A (isolated)
Voltage Rating: 60 V dc maximum
30 V ac rms maximum
Current Rating: 3 A maximum resistive

Contact Inputs

Quantity: 2
Voltage Rating: 25 V dc max
Current Rating: 15 mA max
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 power ground.

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Diagnostics and Alarms

The transmitter provides a number of internal diagnostics and configurable alarm functions (low flow, high flow, and high totals). The LCD Indicator 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. Also, the output signal can be configured to go upscale, downscale, or remain active when an alarm condition exists. For diagnostic conditions, the output signal can be configured to go downscale or upscale. Diagnostics and alarms are also communicated via the digital output.

Supply Voltage Requirements and External Loop Load Limitations

The transmitter is capable of switch selectable internally or externally powered outputs.

DIGITAL OUTPUT

Output powered by the MagEXPERT Transmitter or by I/A Series System Workstation

ANALOG OUTPUT (EXTERNALLY POWERED)

Analog output is independently isolated from fluid ground. Figure 2 below is a graph of external supply voltage vs. output load resistance.

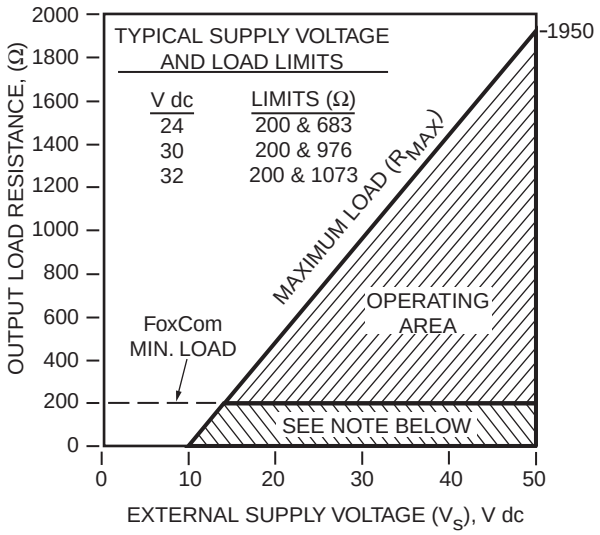


Figure 2. 4 to 20 mA Output, External Supply Voltage vs. Output Load Resistance

NOTE

MagEXPERT will function with output load less than 200 ohms provided an external configurator is not connected to it. Connecting an external configurator while operating in this area may cause disturbances and/or communications problems.

Supply Voltage Requirements and External Loop Load Limitations (Cont.)

ANALOG OUTPUT (INTERNALLY POWERED)

Output may share the same circuit reference as the pulse output, if pulse output is also internally powered. This circuit reference may only be grounded in one location.

Voltage	Load Resistance Range
24 V dc ±15%	0 to 500 ohms

NOTES

1. A 200 ohm load resistor is required to allow proper communications.
2. Load resistance is 300 ohms maximum if the pulse output is also internally powered.

PULSE OUTPUT (EXTERNALLY POWERED)

Output independently isolated from power ground.

Voltage	5 to 42 V dc
Current	80 mA maximum
Off State Leakage	200 µA maximum

PULSE OUTPUT (INTERNALLY POWERED)

The pulse output may share the same circuit reference as the analog output. This circuit reference can only be grounded in one location.

Voltage	24 V dc ±15%
Current	80 mA maximum
Off State Leakage	200 µA maximum

Communications Format

FoxCom protocol is based upon Frequency Shift Keying (FSK) technique. Digital information is communicated by FSK tones which are superimposed on the transmitter power/signal leads. Communication between the external configurator and transmitter does not disturb the output signal.

ANALOG OUTPUT (4 to 20 mA)

When configured for analog output, the transmitter sends its measurement as a continuous 4 to 20 mA dc signal and communicates with the PC-based Configurator at distances up to 1800 m (6000 ft). Other specifications are listed in Table 1.

DIGITAL OUTPUT

When configured for digital output, the transmitter sends its measurement to the I/A Series system as a digital signal (analog output is frozen at 10 mA in this mode). Communications occur between the transmitter and PC-based Configurator, and/or I/A Series System Workstation up to 600 m (2000 ft) away from the Fieldbus Module. See Table 1 for other specifications.

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FUNCTIONAL SPECIFICATIONS (Cont.)

Communications Format (Cont.)

Table 1. Specifications for Analog (4 to 20 mA) Output and Digital Output Communications

Parameter	Specifications for	
	4 to 20 mA	Digital
Minimum Load	200 Ω	200 Ω
Data Transmission Rate	600 baud	4800 baud
Transmission Level	±0.5 mA	±0.5 mA
Measurement Updates for Internal Recalculations	10 times/s	10 times/s
Measurement Updates for Loop Communications	4 times/s	10 times/s

Digital Communications

FoxCom allows communications between a Foxboro PC-based configurator and/or I/A Series System Workstation and the MagEXPERT at the transmitter or remotely along the 4 to 20 mA loop. The following are the functions that can be performed using digital communications and the local LCD Indicator/keypad:

Display/Reconfigure Measurement Information

- Flow Rate in EGUs
- Flow Rate in % of URV
- Flow Direction
- Forward, Reverse, Net and Grand Total
- Flow Rate Damping
- Meter Factor (Calibration Factor)

Display/Reconfigure Status and Configuration

- Transmitter Output Mode
- Outputs
- Alarm Functions, Set Points, and Deadbands
- Noise Reduction
- Output Response to Alarms/Diagnostics
- Passcode Protection
- Contact Inputs Status and Function
- Relay Outputs Status and Function

Display/Reconfigure Identity

- Flowtube Model Number
- Flowtube Serial Number
- Tag Information

Display/Operate Diagnostic and Calibration Functions

- 4 to 20 mA and Pulse Output Present
- 4 to 20 mA Calibration
- Online Diagnostics

Functional Block Diagrams (Figures 3 and 4)

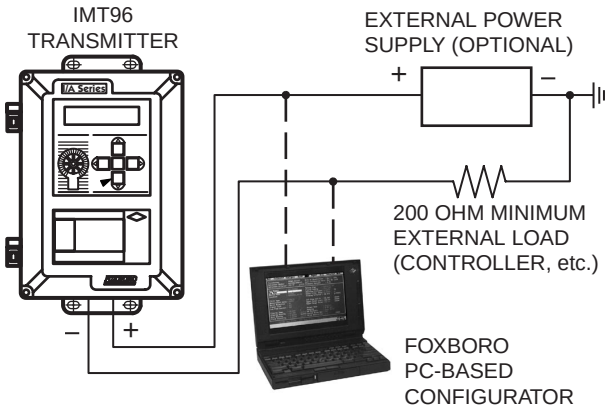


Figure 3.
Analog (4 to 20 mA) Output Block Diagram

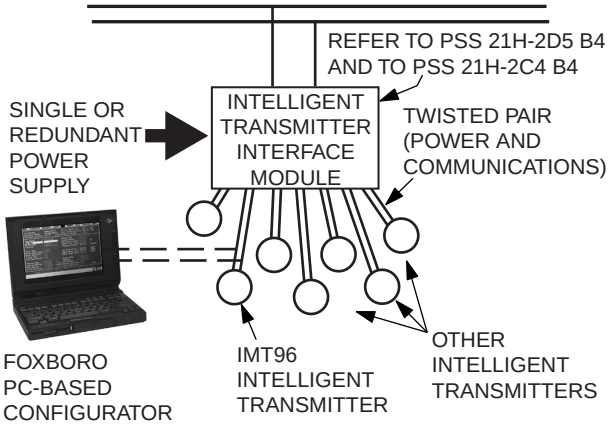


Figure 4.
Digital Output Block Diagram

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FUNCTIONAL SPECIFICATIONS (Cont.)

Signal Cable Length and Fluid Conductivity (Note 1)

The limits on cable length and fluid conductivity are 1000 ft (300 m) and 2 µS/cm. However, for cable lengths greater than 500 ft (150 m), or conductivities less than 20 µS/cm, the system accuracy is affected, as indicated in the paragraphs that follow (Note 2).

CABLE LENGTH AND FLUID CONDUCTIVITY TO MAINTAIN STANDARD SYSTEM ACCURACY

If the cable length is less than 500 ft (150 m) and the fluid conductivity is greater than 20 µS/cm, then the standard system accuracy can be maintained with the following wiring:

- Signal cable is either a Foxboro cable (Note 3) or a good quality twisted shielded pair (Note 4).
- Coil power wiring is 14 AWG twisted shielded pair (Note 5).
- Signal and coil power wiring can be in the same conduit.

CABLE LENGTH EFFECT ON SYSTEM ACCURACY (Note 2)

When the cable length is between 500 and 1000 ft (150 and 300 m), an additional error (cable length effect) is introduced. This error, in % of system accuracy, depends on the signal cable used, as follows:

- Signal Cable Used:
  - Foxboro cable per Note 3; Error is 0.2% for every 100 ft in excess of 500 ft (30 m in excess of 150 m)
  - Shielded cable per Note 4; Error is 0.4% for every 100 ft in excess of 500 ft (30 m in excess of 150 m)
- Coil power wiring is 14 AWG twisted shielded pair (Note 5)
- Signal and coil power wiring can be in the same conduit.

FLUID CONDUCTIVITY EFFECT ON SYSTEM ACCURACY (Note 2)

For fluid conductivities between 2 and 20 µS/cm, an additional error (fluid conductivity effect) is introduced. This error, in % of standard system accuracy, is equal to 4 divided by the conductivity in µS/cm. For example, if the fluid conductivity is 10 µS/cm, then 4 divided by 10 equals an error of 0.4%. The following wiring must be used:

- Signal cable is Foxboro cable per Note 3.
- Coil power wiring is 14 AWG twisted shielded pair per Note 4.
- Signal and coil power wiring must be in separate conduits.

NOTES

1. Refer to TI 027-072 for values of fluid conductivities of over 200 process liquids.
2. Apply both the long cable and low conductivity errors, as applicable - they are additive.
3. Foxboro signal cable R0101ZS (length ordered in feet), or cable B4017TE (same cable, but length ordered in meters).
4. Good quality twisted shielded pair, 18 AWG, or larger size; such as Belden 87□□ Series, and Alpha 56□□ Series.
5. Good quality twisted shielded pair, 14 AWG; such as Belden 8720, or Alpha 5616 B1401.

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PHYSICAL SPECIFICATIONS

Transmitter Enclosure

The MagEXPERT Transmitter enclosure is a single compartment design with a hinged front door which houses the electronics, power supply, and all field terminations. Field terminations and electronics are separated for safety reasons. Generous space has been provided around the termination connections to facilitate wiring. The interior compartment is protected by the front gasketed door which seals the unit. The enclosure is weatherproof as defined by IEC IP66, and provides the watertight and corrosion resistance protection of NEMA Type 4X.

Transmitter Mounting (Also see "Dimensions - Nominal" section)

The transmitter can be pipe, surface, wall, or panel mounted. The preferred orientation is vertical to facilitate reading the LCD Indicator and to simplify the opening and closing of the front door.

PIPE MOUNTING

Two integrally cast flanges are provided at the top and bottom rear of the enclosure. These flanges are used for mounting the unit on a nominal DN 50 or 2 in vertical pipe.

SURFACE, WALL, OR PANEL MOUNTING

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

Enclosure Material and Finish

Light weight cast aluminum material protected with a high-build epoxy paint finish.

Electrical Connections

The transmitter is supplied with four standard conduit/cable access holes (nonthreaded) sized to accept 1/2 NPT or M20 fittings. Standard wiring termination is to a lug type terminal block as shown in Figure 5. An optional terminal block that provides receptacles for 90° insertion plugs can also be provided and is described in the "Optional Features" section.

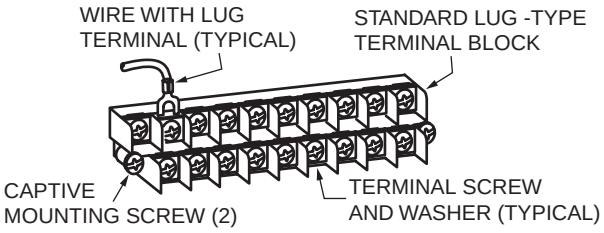


Figure 5. Standard Lug Type Terminal Block
(See Figure 6 for Optional Terminal Block)

Approximate Transmitter Mass

5.2 kg (11.5 lb.)

ELECTRICAL SAFETY SPECIFICATIONS(a)

Testing Laboratory, Types of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
CSA certified for use in ordinary locations.	–	K
CSA certified for use in 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.	L
FM approved for use in ordinary locations.	–	M
FM approved for use in nonincendive, Class I, II, and III, Division 2, Groups A, B, C, D, F, and G hazardous locations.	Temperature Class T4.	N
CENELEC EEx nC [ib] IIC, Zone 2, Zone 1 Connection.	Temperature Class T4.	S
CENELEC, EEx nC IIC, Zone 2.	Temperature Class T4.	U
Testing laboratory approval or certification not required.	–	Z

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

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MODEL CODE

Description	Model
I/A Series MagEXPERT Intelligent Magnetic Flow Transmitter	IMT96
Transmitter Mounting	
Pipe Mounting	-P
Surface, Wall, or Panel Mounting	-S
Language	
English Only	E
Nominal Supply Voltage and Frequency	
120 V ac, 47 to 63 Hz	A
230 V ac, 47 to 63 Hz	B
240 V ac, 47 to 63 Hz	C
Communication Protocol	
Digital FoxCom and/or 4 to 20 mA, Configurable	D
Integral LCD Indicator/Keypad (a)	
No LCD Indicator/Keypad	A
LCD Indicator with Wide Angle Display and Keypad	B
Transmission Signal Output (b)	
Internally Powered, 4 to 20 mA and Superimposed Digital Signal; 600 Baud FoxCom	1
Externally Powered, 4 to 20 mA and Superimposed Digital Signal; 600 Baud FoxCom	2
Internally Powered, Digital Signal; 4800 Baud FoxCom	3
Externally Powered, Digital Signal; 4800 Baud FoxCom	4
Pulse Output Signal (b)(c)	
OFF	0
Internally Powered, ON	1
Externally Powered, ON	2
Electrical Safety Classification (Also see Electrical Safety Specifications Section)(d)	
CSA, General Purpose (Ordinary) Locations	K
CSA, Class I, Division 2; Class II, Division 2; Class III, Division 2	L
FM, General Purpose (Ordinary) Locations	M
FM, Nonincendive, Class I, II, III, Division 2	N
CENELEC EEx nC [ib] IIC, Zone 2, Zone 1 Connection	S
CENELEC EEx nC IIC, Zone 2	U
No Certification Required	Z
Optional Selections	
I/O Access Port	-A
LCD Indicator/Keypad Protective Cover	-B
Terminal Block for 90° Insertion Plug (Replaces Lug Type Block)	-C
Cable Glands (Nonconduit Applications) Not for Electrical Classification Code L or N	-G
Example: IMT96-PEADB10M-A	

(a) The LCD Indicator has ambient temperature limits of -20 to +70°C (-4 to +158°F).
(b) Internal versus external power can be changed in the field by switch selection.
(c) Pulse output can be configured as either a scaled Pulse Output, or a frequency Pulse Output.
(d) Contact Foxboro for status of testing laboratory certifications or approvals.

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OPTIONAL FEATURES AND ACCESSORIES

I/O Access Port

The port contains two banana plug sockets and is used for local connection of PC-based configurators. Access to the plugs are made by unscrewing the cover screw, and removing the cover from the front door. The port cover protects the plugs from the environment. The port cover is also integrally attached to the front door, thus preventing misplacement and loss when removed. Specify optional selection suffix “-A”.

Protective Cover for LCD Indicator/Keypad

This option provides a hinged (upward) clear plastic protective cover for the LCD Indicator/Keypad. This cover protects against inadvertent manipulation of the keys during hose down operations. Specify optional selection suffix “-B”.

Foxboro Signal Cable

Foxboro two-core (two conductor), multi-screened (multi-shielded) cable with two driven screens (shields). Maximum length is 300 m (1000 ft). This cable needs to be used for installation of an IMT96 transmitter to the flowtube if the fluid conductivity is lower than 20 uS/cm, or if the distance between the flowtube and transmitter exceeds 500 ft (150 m). If ordering the cable in units of feet, order Part Number R0101ZS. If ordering the cable in units of meters, order Part Number B4017TE.

Cable Glands for Nonconduit Applications

These cable glands are used to 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. Four cable gland assemblies are provided. Specify optional selection “-G”.

90° Insertion Type Terminal Block

This option is for those users who prefer an insertion-type terminal block (Figure 6), rather than the standard lug-type terminal block shown in Figure 5. With this insertion-type terminal block, the user inserts the bare end of an insulated wire into an opening on the terminal block, and turns the captive screw until the inserted wire is clamped down within the fixture. Specify optional selection suffix “-C”.

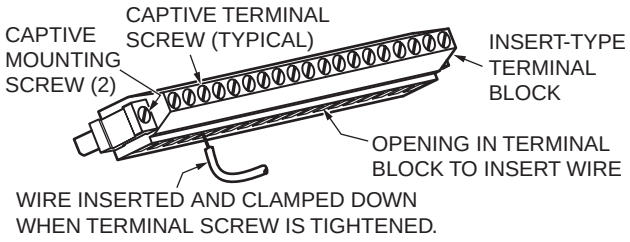


Figure 6. Optional Insert-Type Terminal Block
(See Figure 5 for Standard Lug-Type Terminal Block)

ORDERING INSTRUCTIONS

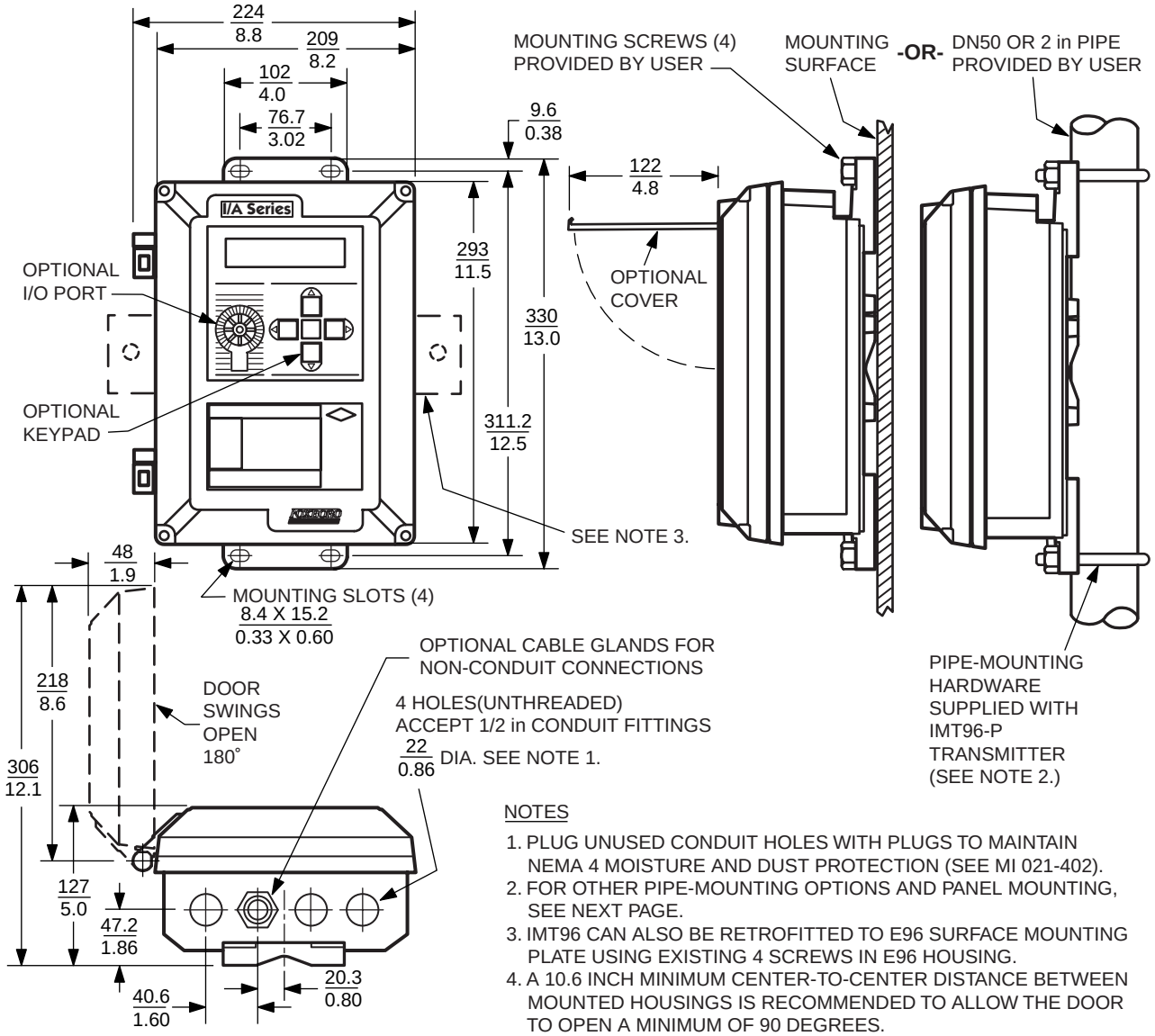
1. MagEXPERT (Model IMT96) Model Number
2. Foxboro Signal Cable Part Number and Length (if necessary)
3. User Tag Information

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DIMENSIONS - NOMINAL

mm
in

SURFACE, WALL, AND PIPE MOUNTING



NOTES

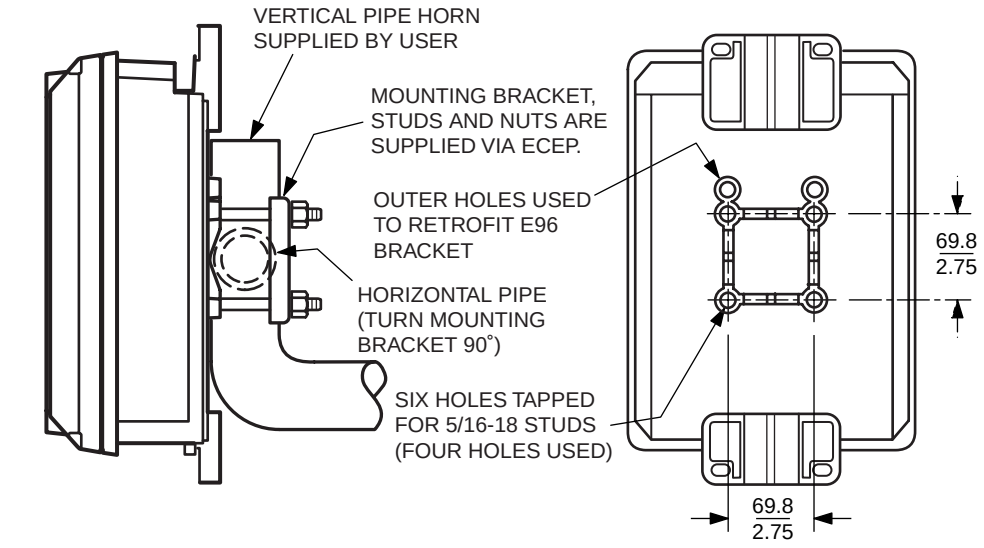
1. PLUG UNUSED CONDUIT HOLES WITH PLUGS TO MAINTAIN NEMA 4 MOISTURE AND DUST PROTECTION (SEE MI 021-402).
2. FOR OTHER PIPE-MOUNTING OPTIONS AND PANEL MOUNTING, SEE NEXT PAGE.
3. IMT96 CAN ALSO BE RETROFITTED TO E96 SURFACE MOUNTING PLATE USING EXISTING 4 SCREWS IN E96 HOUSING.
4. A 10.6 INCH MINIMUM CENTER-TO-CENTER DISTANCE BETWEEN MOUNTED HOUSINGS IS RECOMMENDED TO ALLOW THE DOOR TO OPEN A MINIMUM OF 90 DEGREES.

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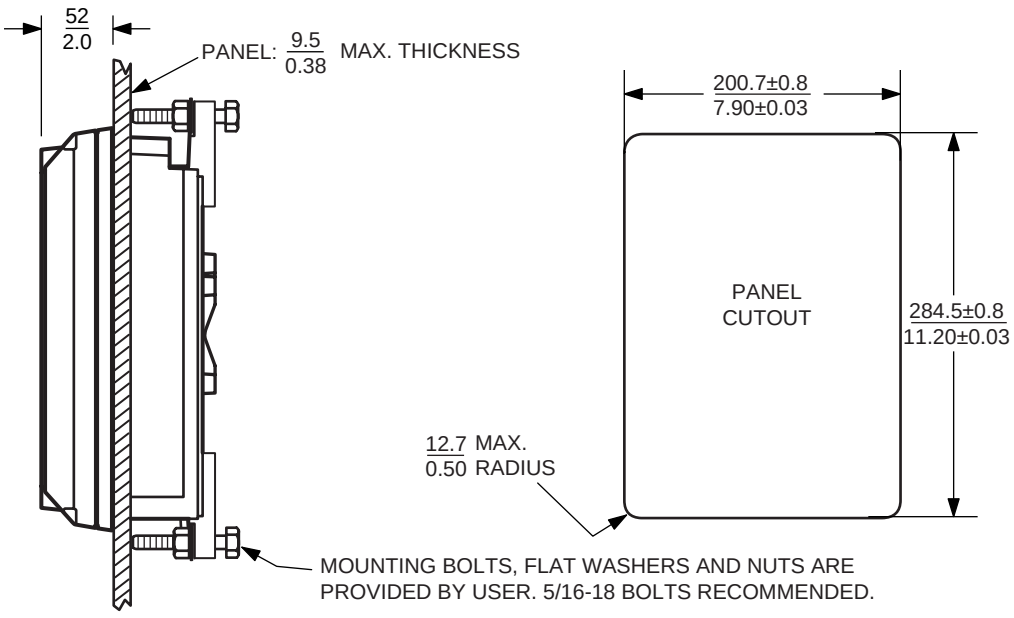
DIMENSIONS - NOMINAL (Cont.)

mm
in

MOUNTING TO VERTICAL HORN OR HORIZONTAL PIPE



PANEL MOUNTING



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I/A Series INTELLIGENT TRANSMITTERS



PRODUCT SPECIFICATION SHEETS (PSSs) FOR INTELLIGENT TRANSMITTERS

Category	Device Types	Models	PSS Numbers
Mass Flow	Flowtubes	CFS10; CFS20; CFS30	1-2B1 A; 1-2B4 A; 1-2B5 A
	Transmitters	CFT10; CFT15; CFT30	1-2B3 C; 1-2B3 D; 1-2B5 A
Magnetic Flow	Flowtubes	2800 Series	1-6B5 A, 1-6B5 C, 1-6B5 E
	Transmitters	IMT25/IMT25L	1-6F5 A/1-6F6 A
		IMT96 (MagEXPERT)	PSS 1-6F8 A
Vortex Flow	Flowmeters	83 Series	1-8A1 E (83F and 83W); 1-8A2 D (83S)
Pressure	Transmitters	I/A Series (-D)	2A-1C13 A; 2A-1C14 A; 2A-1C14 D; 2A-1C14 E; 2A-1Z9 E
		I/A Series (-T)	2A-1C13 B; 2A-1C14 B; 2A-1C14 F; 2A-1C14 G; 2A-1Z9 E
		I/A Series (-A, -I)	2A-1C13 C; 2A-1C14 C; 2A-1C14 H; 2A-1C14 J; 2A-1Z9 E
		I/A Series (-V)	2A-1C13D; 2A-1Z9 E
		I/A Series (-F)	2A-1C13E; 2A-1Z9 E
Electrochemical	Transmitters	870IT Series	6-1B1 B; 6-3N2 A
Temperature	Transmitters	RTT20	2A-1F4 A; 2A-1Z9 F (Options)
Valves	Positioner	SRD 991	EVE0105 A-(en)
Remote Communication	Configurators	HHT (FoxCom Only)	2A-1Z3 A
		PC20 (FoxCom & HART)	2A-1Z3 E
	I/A Series Interfaces (FoxCom Only)	FBM18 & FBM39	21H-2D5 B4; 21H-2C4 B4
		FBM43 & FBM44	21H-2D8 B4; 21H-2D4 B4

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