

Model IMT25L
I/A Series[®] Intelligent Magnetic Flow Transmitters with FoxCom[™]
Communication Protocol



IMT25L WITH
INTEGRAL MOUNTING



IMT25L WITH
REMOTE MOUNTING

The Foxboro[®] brand Model IMT25L Intelligent Magnetic Flow Transmitter, together with a Model 8000A, 8300, 9100A, 9200A, 9300A, or 2800 Magnetic Flowtube, combines to form an I/A Series Magnetic Flowmeters with pulsed dc excitation. The IMT25L provides maximum economy for basic applications that simply require an analog or digital output and that do not require the full feature set offered in the standard IMT25 Transmitter.

FEATURES

- ▶ Compatible with the Foxboro family of Magnetic Flowtubes.
- ▶ Digital Integration with the I/A Series System.
- ▶ Analog or digital output.
- ▶ Configurable using I/A Series System Workstation or PC-based Configurator.
- ▶ 85 to 264 V ac or 24 V dc Input Power selections.
- ▶ Online diagnostic help.
- ▶ Software configuration is protected in nonvolatile memory in the event of power loss.
- ▶ Optional I/O Access Port allows direct external connection of PC-based Configurator.
- ▶ Conforms to applicable European Union Directives (product marked with “CE” logo).
- ▶ Field test mode using Foxboro Model IMTSIM Magnetic Flowtube Simulator (PSS 1-6F7 A).
- ▶ 2-Year Warranty is standard.

SUPERIOR REPUTATION FOR DEPENDABILITY AND QUALITY

Foxboro magnetic flow measurement systems were introduced to the process industries in 1954 and these systems have demonstrated the broadest and most time-proven application expertise with tens of thousands of successful installations.

A SELECTION OF OUTPUT SIGNALS

The Model IMT25L transmitter provides digital or analog output signals, as described below.

The digital output signal utilizes the FoxCom communications protocol. The digital signal allows remote communications/configuration of the transmitter. All communications can be performed on an I/A Series System Workstation, or with a PC-based Configurator at any point in the loop. The digital output signal has a 4800 baud transmission rate and must be externally powered.

The analog output signal is 4 to 20 mA and must be externally powered. A digital signal is superimposed on the analog signal for communications with an I/A Series System or PC-based Configurator. The superimposed FSK signal has a 600 baud transmission rate. The analog output signal is not available simultaneously with the high baud digital output signal.

BACKWARD COMPATIBILITY

The I/A Series Intelligent IMT25L Transmitter can be used with Models 8300, 8000A, 9100A, 9200A, and 9300A Magnetic flowtubes. It can also be used with existing Models 2800 and 8000 Magnetic Flowtubes. This provides an advanced microprocessor-based, dc-pulsed magnetic flow system (and corresponding features) regardless of the Foxboro flowtube used.

COMPARTMENT ENCLOSURE

This compact design results in a low cost enclosure which accommodates all of the electronics and all of the terminations in a single compartment.

The IMT25L is a blind unit. The optional I/O access port allows convenient connection of the PC-based

Configurator at the transmitter. The optional I/O access port is a circular recess in the front face of the instrument protected by a separate cover integrally connected to the front panel to prevent loss or misplacement. Access to the port is made by loosening a screw on the port cover. Inside the access port are banana plug sockets.

INTEGRALLY MOUNTED CONSTRUCTION

The IMT25L is not only used as a remote-mounted transmitter, but can also be mounted directly to an 8000A or 9300A Series Flowtube as an integral and complete magnetic flow system.

LOW POWER CONSUMPTION

The IMT25L can accept either 85 to 264 V ac or 24 V dc power. With either supply, 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).

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 stability.

TQM — TOTAL QUALITY MANAGEMENT

The TQM program is our commitment to total product quality and customer satisfaction.

We have met all of the requirements of the International Quality Standard 9001 and was certified in April of 1991 for the “Design and Manufacturing of Process Control and Automation Equipment”. The certification applies to our entire US-based operations including manufacturing, design/development, production, installation, and service. The certification has remained valid since the initial award, as we have successfully passed scheduled periodic audits performed by the certifying agency.

CE COMPLIANCE

These transmitters display the “CE” logo indicating conformance to the appropriate European Community Standards, for electrical safety and immunity to sources of electromagnetic interference. This compliance also includes conformance to radio frequency emission limits.

FIELD TEST CAPABILITY

IMT25L calibration accuracy can be verified using a Model IMTSIM Magnetic Flowtube Simulator. It is recommended that the IMT25L be ordered with the optional I/O Access Port to facilitate field verification using the PC-based Configurator.

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 +70°C (-22 and +158°F)
Process Temperature(a)	23 ± 2°C (73 ± 3°F)	See Note (a)	See Note (a)
Relative Humidity	50 ± 10%	5 and 100%(b)	5 and 100%(b,c)
Supply Voltage ▶ ac Voltage ▶ dc Voltage	▶ 100 to 240 V ac ▶ 24 V dc(d)	▶ 85 and 264 V ac ▶ Rated Voltage ±20%	▶ 85 and 264 V ac ▶ Rated Voltage ±20%
Supply Frequency	50 or 60 Hz	Rated Frequency ± 3 Hz	47 and 63 Hz
4 to 20 mA Output ▶ Supply Voltage ▶ External Load	▶ 24 V dc ▶ 250 Ω	(Refer to Figure 1) ▶ 10 and 50 V dc ▶ 0 and 1950 Ω	(Refer to Figure 1) ▶ 10 and 50 V dc ▶ 0 and 1950 Ω
Vibration	Negligible	0 and 5 m/s ² (0 and 0.5 “g”) from 5 to 500 Hz	5 m/s ² (0.5 “g”)(e) up to 500 Hz

- (a) Process temperature is not applicable to pipe- or surface-mounted transmitters. However, with flowtube-mounted transmitters, the ambient temperature operative limit at the transmitter [70°C (158°F)] must not be exceeded. Additionally, the process temperature is limited to 121°C (250°F).
- (b) Relative humidity limits listed apply only with transmitter covers properly installed.
- (c) During transmitter transportation or storage, the relative humidity limit is 0 and 100%.
- (d) Requires power supply with 1.5 A capacity for start-up surge.
- (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 – 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 (±0.0015 m/s)	<2.0 fps (<0.61 m/s)
1/16 to 1/4 in (1.6 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 (±0.0305 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 (±0.010 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 – 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)

Accuracy – 4 to 20 mA Output

Same as for pulse and digital outputs except add ±0.03% of span (which equates to ±0.0048 mA) to pulse and digital accuracy values above.

Response Time

Digital and Pulse		4 to 20 mA
0.2 sec	0.167 sec	Add 0.150 sec

SYSTEM PERFORMANCE SPECIFICATIONS**Ambient Temperature Effect**

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

DIGITAL OUTPUT

< 0.5% of span

4 to 20 mA OUTPUT

< 1% of span

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.

Supply Voltage Effect**DIGITAL OUTPUT**

No effect

4 TO 20 mA OUTPUT

0.005%/V within normal operating condition limits

Relative Humidity Effect

No effect when covers and seals are properly in place.

Switching and Indirect Lightning Transients

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

High Frequency Transients

Can withstand a high frequency transient of 2000 V common mode, 5 x 50 ns impulse per 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.

FUNCTIONAL SPECIFICATIONS

Electrical Output Signals

Two electrical output signals are available – Digital Output and 4 to 20 mA Output. See below.

FoxCom DIGITAL OUTPUT (4800 BAUD)

Transmitter transfers digital information using FoxCom communication protocol.

4 to 20 mA OUTPUT WITH SUPERIMPOSED FSK SIGNAL (600 BAUD)

The current output is independently isolated from fluid ground, and must be externally powered. Minimum current is 3.9 mA and maximum current is 22 mA. The 4 to 20 mA output and digital output are not available simultaneously.

Supply Voltage Requirements and External Loop Load Limitations

DIGITAL OUTPUT

Power supplied through I/A Series system or transmitter.

4 to 20 mA OUTPUT

4 to 20 mA output is isolated from fluid ground. Refer to Figure 1 for a graph of external supply voltage vs. output load resistance.

Transmitter Voltage

120 or 240 V ac, 50 or 60 Hz; or 24 V dc.

Power Consumption

Less than 24 W at reference voltage and frequency

Flow Velocity Limits

LOW FLOW CUTOFF (For Digital Output)

0.01 m/s (0.033 ft/s)

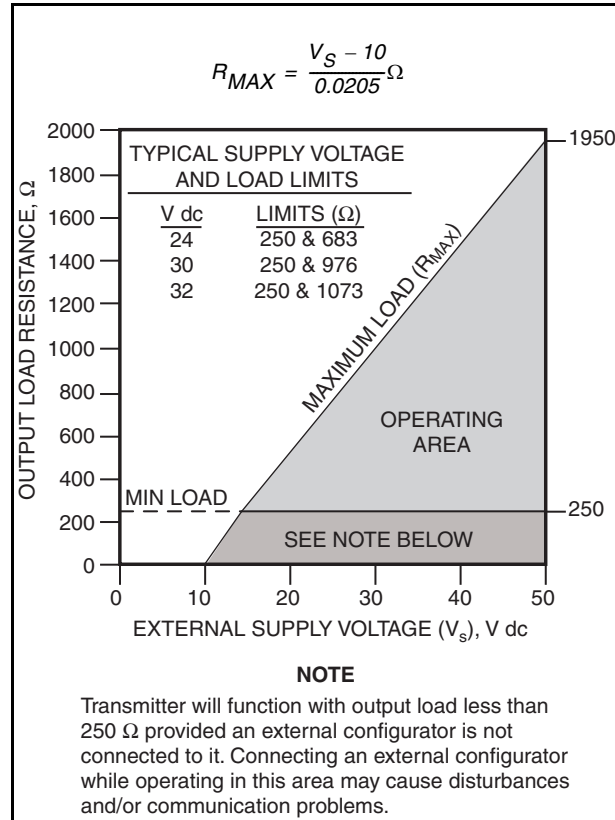
MAXIMUM VELOCITY

10 m/s (33 ft/s)

MINIMUM URV (Upper Range Value)

0.5 m/s (1.65 ft/s)

Figure 1. 4 to 20 mA Output, External Supply Voltage vs. Output Load Resistance



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.

Ranging

The transmitter is easily adjusted for the desired flow rate units and to the required upper range value through the I/A Series System, or PC-based Configurator.

Low Flow Cut-Off

A low flow cut-off algorithm stops the digital and pulse measurement values when the measurement signal falls below a velocity of 0.033 ft/s. Note that there is no low flow cut-off with 4 to 20 mA current output.

Preset/Calibration

The transmitter may be used as an analog source to check and/or calibrate other instruments in the output loop, such as indicators, controllers, and recorders. The output signal can be adjusted to any value via the I/A Series System, or PC-based Configurator.

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.

Diagnostics

The transmitter provides a number of internal diagnostic functions. The outputs can be configured to go upscale or downscale when a diagnostic condition exists. Diagnostics are also communicated via the digital output.

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 1.

Table 1. Process Fluid Conductivity and Cabling

Maximum Cable Length (a)	Minimum Fluid Conductivity (a)	Signal and Coil Drive Cables
300 m (1000 ft)	5 µS/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 µS/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 µS/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 ² (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 cable length between the IMT25L and the flowtube. Refer to TI 027-072 for conductivity of various process liquids.

Digital Communications

The transmitter communicates bidirectionally over the field wiring to the PC-based Configurator (installed anywhere in a Division 2 area along the 4 to 20 mA loop) and/or I/A Series System. Using the PC-based Configurator or I/A Series workstation, the following functions can be performed:

- ▶ Reconfigure Measurement Information
 - Flow Rate in EGUs, %, or URV
 - Net and Grand Total
 - Flow Rate Damping
 - Flowtube Meter Factor (Calibration Factor)
- ▶ Reconfigure Transmitter Status and Configuration
 - Transmitter Output Mode
 - Outputs
 - Noise reduction
- ▶ Reconfigure Transmitter Identity
 - Flowtube Model Code and Serial Number
 - Tag Number and Tag Name
 - Device Name
 - Location
- ▶ Operate Diagnostic and Calibration Functions
 - 4 to 20 mA output preset
 - 4 to 20 mA calibration

Communications Format

Communications is based upon the FSK (Frequency Shift Keying) technique. The FSK tones are superimposed on the 4 to 20 mA output leads. Communication between the PC-based Configurator and the transmitter does not disturb the output signal.

4 to 20 mA OUTPUT

The transmitter sends its measurement to the loop as a continuous 4 to 20 mA dc signal. This version communicates with the Configurator at distances up to 1800 m (6000 ft). Other specifications are a Data Transmission Rate of 600 Baud and a Scan Frequency 4 times/s.

DIGITAL OUTPUT

The transmitter sends its measurement to the I/A Series System as a digital signal. Remote communications occur between the transmitter and Configurator, and/or I/A Series System at distances up to 600 m (2000 ft). Other specifications are Data Transmission Rate of 4800 baud and a Scan Frequency of 10 times/s.

Functional Block Diagrams (Figures 2 and 3)

Figure 2. 4 to 20 mA Functional Block Diagram

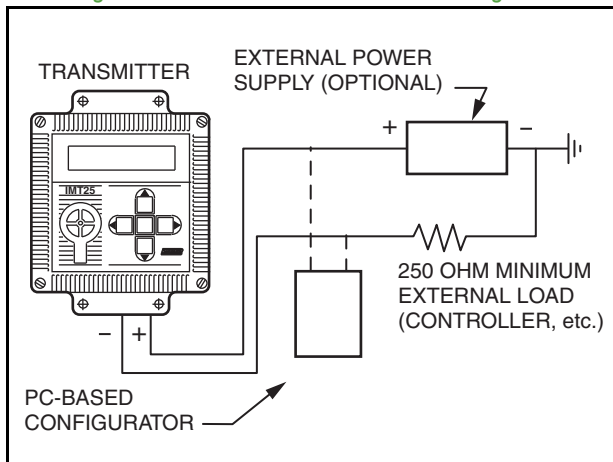
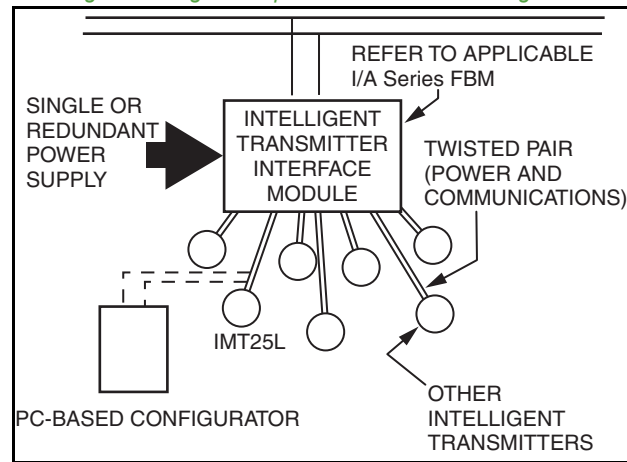


Figure 3. Digital Output Functional Block Diagram



PHYSICAL SPECIFICATIONS

Transmitter Enclosure

The transmitter enclosure is a single compartment design which houses the electronics, power supply, and all field terminations. Provisions for four nonthreaded holes are sized to accept 1/2 NPS or M20 fittings. These conduit openings are located at the bottom and side surfaces of the enclosure. 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.

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 installation.

Transmitter Mounting

PIPE MOUNTING

Two integrally cast flanges are provided at the top and bottom rear of the enclosure, together with a kit of stainless steel parts, are used for mounting transmitter to a DIN 50 or 2 in pipe.

SURFACE MOUNTING

The two flanges can also be used to secure 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.

Enclosure Material and Finish

Cast aluminum (1% copper content, maximum); epoxy powder coat; gray.

Approximate Mass - Transmitter Only

2.9 kg (6.5 lb)

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; and Class III, Division 2 hazardous locations.	Temperature Class T4 at maximum ambient of 70°C.	L
FM ordinary locations.	—	M
FM nonincendive, Class I, II, and III, Division 2, Groups A, B, C, D, F, and G hazardous locations.	Temperature Class T4 at maximum ambient of 70°C.	N
Testing Laboratory Approval or Certification not Required.	—	Z

OPTIONAL SELECTIONS AND ACCESSORIES

Option -A: I/O Access Port and Cover

An I/O access port and cover allow access to two banana plugs that are provided for connection to the hand-held terminals or PC-based configurators. The access port cover not only protects the terminals from the environment, but is also marked to identify terminal functions. The cover is integrally attached to the front panel, thus preventing misplacement and loss of the cover when removed. Specify Optional Selection -A.

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 Optional Selection -G.

Foxboro Signal Cable

For Remote-Mounted Transmitter 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. Refer to Table 1 for recommended installation of this cable.

MODEL CODE

<u>Description</u>	<u>Model</u>
I/A Series Magnetic Flow Transmitter	IMT25L
<u>Transmitter Mounting</u>	
Pipe Mounting	-P
Surface or Wall Mounting	-S
Flowtube Mounting (Integrally Mounted Transmitter) (a,b)	-I
<u>Language</u>	
English/German	D
<u>Nominal Supply Voltage and Frequency</u>	
120 and 240 V ac, 50 and 60 Hz	A
24 V dc (c)	B
<u>Communication Protocol</u>	
FoxCom Communication Protocol	D
<u>Front Face</u>	
Blind; No Indicator or Keypad	A
<u>Transmission Output Signal</u>	
Externally Powered, 4 to 20 mA and Superimposed Digital Signal 600 Baud FoxCom	2
Externally Powered, Digital 4800 Baud FoxCom	4
<u>Additional Outputs</u>	
None	0
<u>Electrical Safety (Also see Electrical Safety Specifications section)</u>	
CSA, Class I, Division 2	L
FM, Ordinary Locations	M
FM, Nonincendive, n	N
No Testing Laboratory Approval or Certification Required	Z
<u>Optional Selections</u>	
I/O Access Port and Cover	-A
Cable Glands for Nonconduit Applications	-G
(Cannot be used with Electrical Safety Code L and N)	
Example: IMT25L-PDADA20K-A	

(a) Flowtube mounted transmitter may only be used with process temperatures not exceeding 120°C (250°F).

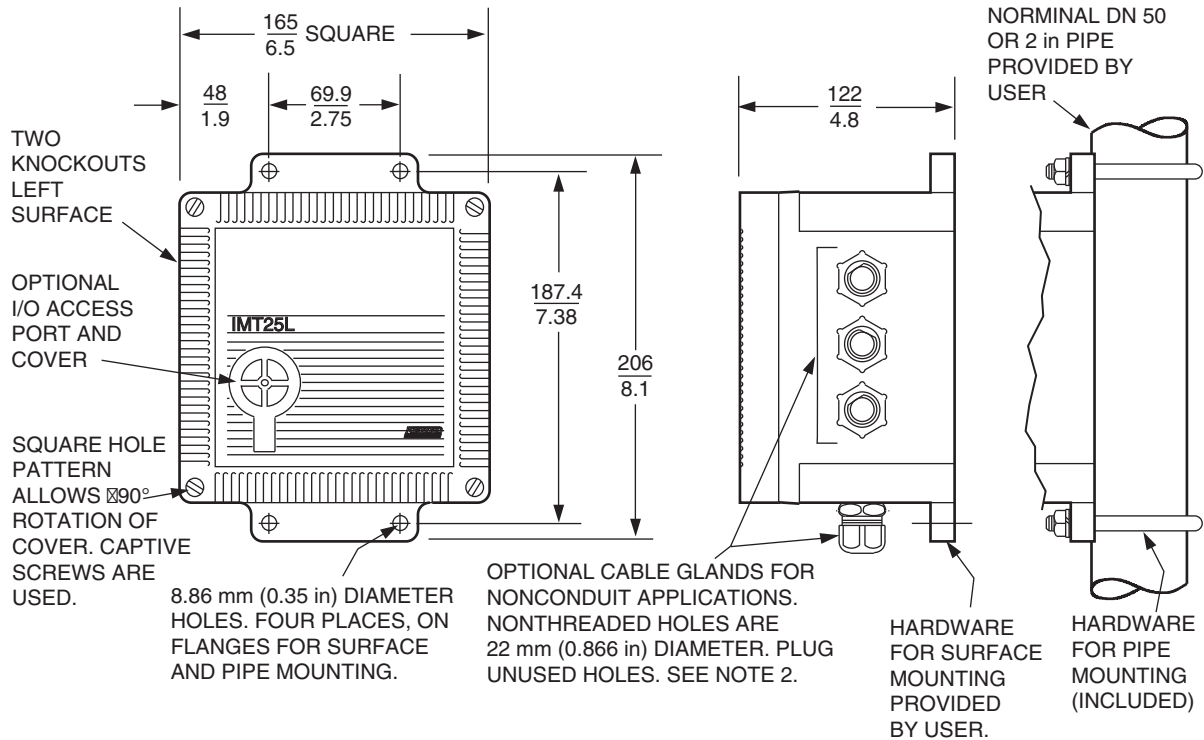
(b) IMT25L can only be integrally mounted to Model 8000A and Model 9300A Flowtubes.

(c) The 24 V dc selection requires a start-up current of 1.5 amperes.

DIMENSIONS – NOMINAL

mm
in

SURFACE AND PIPE MOUNTED TRANSMITTER

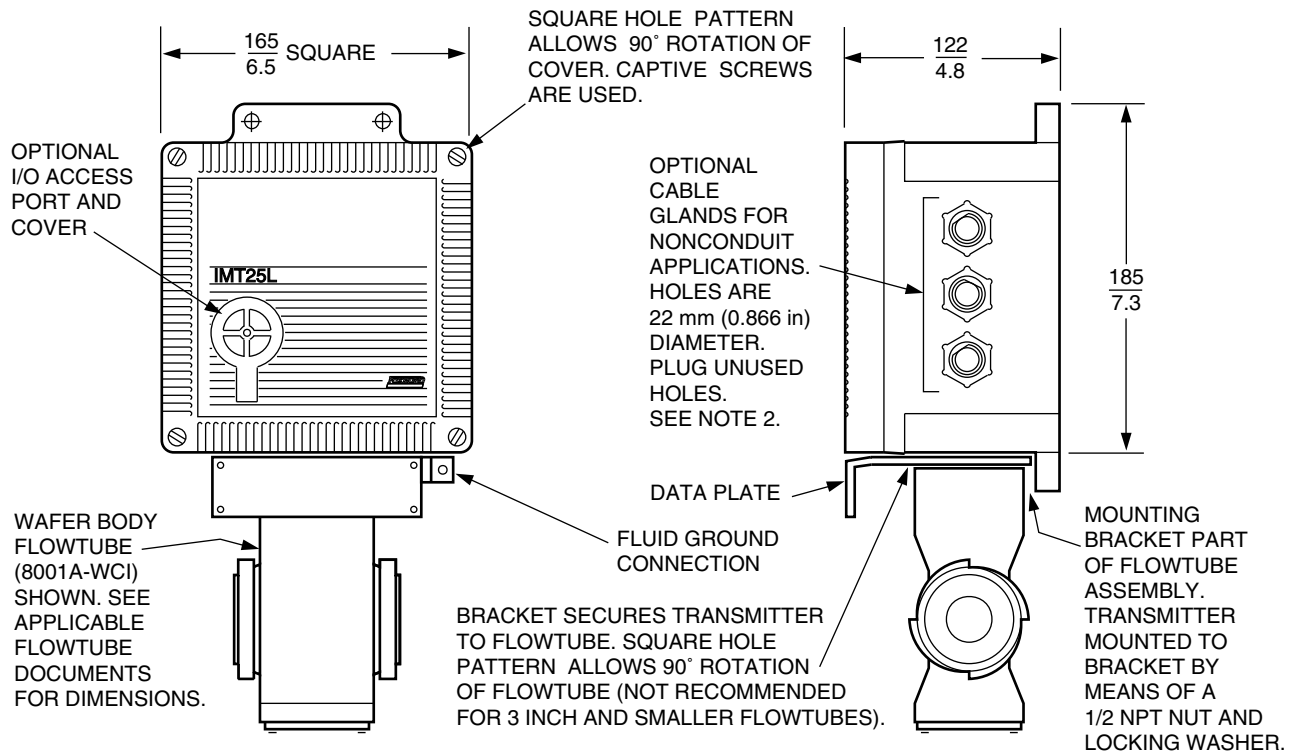


NOTES

- HOLES ARE PROVIDED ON FOR CONDUIT CONNECTIONS AND OPTIONAL CABLE GLANDS AS FOLLOWS:
 - RIGHT SURFACE, THREE HOLES
 - BOTTOM SURFACE, ONE HOLE IN THE CENTER.
- PLUG UNUSED CONDUIT CONNECTIONS (OR HOLES) WITH PLUGS TO MAINTAIN NEMA 4 MOISTURE AND DUST PROTECTION (SEE MI 021-393).
- SEE NEXT PAGE FOR FLOWTUBE MOUNTED TRANSMITTERS.

$\frac{\text{mm}}{\text{in}}$

FLOWTUBE MOUNTED TRANSMITTER



NOTES

1. HOLES ARE PROVIDED ON RIGHT SURFACE FOR CONDUIT CONNECTIONS OR OPTIONAL CABLE GLANDS.
2. PLUG UNUSED CONDUIT CONNECTIONS (OR HOLES) WITH PLUGS TO MAINTAIN NEMA 4 MOISTURE AND DUST PROTECTION (SEE MI 021-393).
3. SIGNAL AND COIL DRIVE WIRING BETWEEN TRANSMITTER AND FLOWTUBE ARE PERFORMED AT PLANT OF MANUFACTURE.

NOTES

ORDERING INSTRUCTIONS

1. Model Number
2. Signal Cable Part Number (if required);
see Optional Selections and Accessories section.
3. User Tag Data

OTHER FOXBORO PRODUCTS

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

www.fielddevices.foxboro.com