FPI MAG 3000 ELECTROMAGNETIC FLOW METER WITH PROCOMM ELECTRONIC TRANSMITTER

PART 1 - GENERAL

1.1 SCOPE

This section describes the requirements for an electromagnetic insertion flow meter and microprocessor-based signal transmitter. Under this item, the contractor shall furnish and install the insertion mag meter equipment and accessories as indicated on the plans and as herein specified.

1.1 SUBMITTALS

The following information shall be included in the submittal for this section:

1. Data sheets and catalog literature for the 395 or 394 Insertion Mag meter and the microprocessor-based signal transmitter
2. Connection diagrams for equipment wiring.
3. List of spare parts and optional equipment.

PART 2 - PRODUCTS

2.1 ELECTROMAGNETIC INSERTION FLOWMETER (FPI MAGMETER)

The electromagnetic insertion flow meter shall consist of a flow sensor based on Faraday's Law of Electromagnetic Induction and microprocessor-based signal transmitter.

A. Sensor:

1. Operating principle: Utilizing Faraday's Law of Electromagnetic Induction, the flow of a conductive liquid around the sensor induces an electrical voltage that is proportional to the velocity of the flow.
2. Construction: The sensor material shall be constructed of 316 Stainless Steel and coated with NSF 61 certified approved epoxy coating.
3. Hastelloy Electrodes (Optional) shall be used when corrosive fluid is present.
4. Sensor operating Temp: +14° to +140° F @ 250 PSI
5. Electronics operating temperature (Transmitter): -4° to +140° F
6. Size: 4" to 138" diameter (see instrument schedule)
7. Installation hardware shall include a Stainless Steel 2" full ported valve with a stainless-steel nipple.
8. Submergence:
    a. The sensor shall be NEMA 6P or IP68 rated to be permanently submerged up to 6 feet.
    b. The sensor shall be NEMA 6P or IP68 rated to be permanently submerged up to 30 feet (option with IP68 rated strain relief connection only).

B. Transmitter:

1. Electronic Enclosure: Shall be a NEMA 4X, IP67 rated enclosure.
2. Transmitter/display: Background illumination with alphanumeric 8-line graphical backlit LCD display with 6-keyouch programming to indicate flow rate, totalized values, settings, and faults.
3. Power supply:
    a. 100/240 VAC
    b. 10-35 VDC (option)
    c. Battery (option)

4. Operating temperature: -4 to +140 degrees F.
5. Outputs:
   a. 4-20 mA (0-21mA).
   b. Two separate digital programmable outputs:
      1) Open collector transistor usable for pulse
      2) Frequency and alarm settings
6. Communications-Optional:
   a. SmartTrax
   b. AMI Smart Output (Sensus, Itron 6, Itron 9).
      1) Sensus
      2) Itron 6 digit
      3) Itron 9 digit
      4) Neptune
7. Transmitter Self Diagnostics
8. Manufacturer shall provide an optional Hazardous Location certified model. Certified by MET to UL 6100-1 and MET C22.2 No. 61010-1-04
   a. Class I, Division 2, Groups A-D, T5
   b. Class I, Zone 2, IIC T5
9. Sensor and signal transmitter performance:
   a. Flow Range: .2 FPS to 32 FPS for accuracies stated below.
   b. Accuracy:
      1) ProComm Go Electronics : ±1% of measured value ±0.006 ft/s (±0.0018 m/s)
      2) Reverse Flow: ±1% of measured value ±0.006 ft/s (±0.0018 m/s)
   c. Cable Length: Remote Mount
      1) AC or DC Power: Up to 500'/152.4m
   d. Manufacturer shall offer optional Quick Connect cabling for remote mounted installations.
   e. Repeatability: ±0.05% or ±.0008ft/s (±0.25mm/s), whichever is greater
   f. Conductivity: Minimum 5 µs/cm
   g. Optional meter mounted transmitter.
   h. Bi-directional flow capabilities (optional)
   i. Power & Signal Cabling: The power and signal between the transmitter and sensor are combined in a single cable.
   j. Flow Direction Measurement: Forward and reverse flow indication and forward, reverse, net totalization is available.

2.2 THE ELECTROMAGNETIC INSERTION FLOW METER SHALL BE FPI MAG 3000 395 FOR FORWARD FLOW, OR 394 BI-DIRECTIONAL FULL PROFILE INSERTION MAG METER OR EQUAL.

2.3 SPARE PARTS

A. Spare parts for the equipment shall include the following, unless otherwise noted:

1. Extra operation manuals as required.

2.4 OPERATOR FUNCTIONS

A. Calibration

1. Each flow sensor shall have wet flow calibration of the complete meter flow element and its signal transmitter. The calibration facilities must be traceable to the National Institute of Standards and Technology (N.I.S.T). All the calibration information and factory settings matching the sensor shall be stored in an integrally mounted memory unit. The memory unit shall store sensor calibration data and signal transmitter settings for the lifetime of the product. At initial commissioning, the flow meter commences measurement without any initial programming. Any customer specified settings are downloaded to the memory unit. Should the signal transmitter need to be replaced, the new signal transmitter will upload all previous settings and resume measurement without any need for reprogramming or rewiring.
2. Manufacturer shall provide a calibrated meter set which includes the sensor element, the cabling and the transmitter.
3. An N.I.S.T. certificate of calibration shall accompany each flow element.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow manufacturer's recommendation for the minimum upstream and downstream installation requirements for the flow element.

B. Wiring between flow element and remote mounted signal transmitters shall use cable type and procedures as per the manufacturers' recommendations.

3.2 MANUFACTURER'S ASSISTANCE

A. Warranty

1. The manufacturer of the electromagnetic flow meter shall provide a two-year warranty that the equipment shall be free from defects in design, workmanship, or materials. Extended warranties up to five years shall be available for additional cost.
2. The manufacturer of the electromagnetic flow meter shall provide a Lifetime Guarantee on the flow element Ultra Liner fusion bonded epoxy liner.
3. In the event a component fails to perform as specified or is proven defective in service during the guarantee period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.

FPI Mag 3000 Flow Meter Specifications

The full pipe averaging flow meter comes complete with Mounting Hardware, AC Converter with Dual 4-20mA output, 25 Feet of Dual Submersible Cables with quick connects at sensor, Stainless Steel Body, 316 Stainless Steel Electrodes, NSF Approved Fusion Bonded Epoxy Coating, 2" Stainless Steel Ball Valve (minimum of 1-7/8" port I.D.), 2" x Close Stainless Steel Nipple, 2-Year Warranty.

Physical Specifications

Measurement	Electromagnetic
Directionality	Forward and reverse
Pipe Sizes	Up to 138"
Body Style	Full profile insertion
Materials	• Stainless steel body • 316 stainless steel electrodes • NSF approved fusion bonded epoxy coating • 2" stainless steel ball valve (minimum of 1-7/8" port I.D.) • 2" x close stainless steel nipple
Coating	Fusion bonded epoxy (NSF 61 approved) coated 316 stainless steel
Electrodes	316 Stainless Steel, Hastelloy optional
Electrical Connections	Quick Connect
Electronics	ProComm GO electronics
Electronics Mount	Remote mount only
Sensor Cable Lengths	• Standard: 25'/7.6 m McCrometer supplied submersible cable with each remote mount unit. • Optional: Up to 500'/152.4 m, or 25'/7.6 m max for battery powered. • Quick connect: Available in standard cable lengths: Feet: 25, 50, 75, 100, 125, 150, 175, 200, 500 Meters: 7.6, 15.25. 22.5, 30.5, 38.1, 45.75, 53.3, 61, 152.4 Custom quick connect cable lengths at additional cost.
Insertion Hardware	316 Stainless Steel
Compression Seal	Silicone Rubber

Performance and Operational Specifications

Measurement Method	Volumetric flow in filled flow conduits 4" (100 mm) to 138" (3,500 mm) utilizing insertable electromagnetic averaging sensor. Flow indication in English Standard or Metric units.
Direction Measurement	• 395 sensor: Forward flow measurement and reverse flow indication • 394 sensor: Bidirectional flow measurement
Operating Temperature	-10 to 60°C (14 to 140°F) up to 250 PSI
Storage Temperature	-15 to 60°C (5 to 140° F) Note regarding storage: During freezing conditions and when meter is not in use, sensor must be removed from pipe and stored in dry conditions. **Note: Damage to the sensor caused by allowing the sensor freeze in the pipe is not covered by the warranty.**
IP Rating	• Standard model: Quick Connect (IP68) • HL model: Quick Connect (IP67)
Sensor Submersibility Depth	With standard quick connect: 9 m (30 ft.)

Calibrated accuracy for forward and bidirectional sensors	• ProComm Go Electronics : ±1% of measured value ±0.006 ft/s (±0.0018 m/s) • Reverse Flow: ±1% of measured value ±0.006 ft/s (±0.0018 m/s)
Linearity	0.3% of Range
Repeatability	0.2% of Reading
Pipe Run Requirements	Pipe run requirements for the FPI Mag sensor can vary, depending on the disturbances in the pipe run. See FPI Mag flow meter manual 30127-05, step 3 of the installation procedure for a table of upstream and downstream straight-pipe run recommendations.

Other Specifications

Certifications and Approvals	**Standard model:**
	• ISO 9001:2015 certified quality management system
	• Certified by MET to UL 61010-1
	• Certified to NSF / ANSI Standards*
	HL Model:
	• ISO 9001:2015 certified quality management system
	• Certified by MET to UL 61010-1 and MET C22.2 No. 61010-1-04
	  • Class I, Division 2, Groups A-D, T5
	  • Class I, Zone 2, IIC T5
	• Certified to NSF / ANSI Standards*

System Options	• Hastelloy electrodes • Annual verification / calibration • Stainless steel ID tag
Meter Options and Accessories	• Sensor insertion tool • Extension to hardware clearance • Additional sensor cable up to 475' (500' max for model 395 and 200' max for model 394)
Warranty	2 years

* Certified by IAPMO R&T to NSF/ANSI 61 for material safety and NSF/ANSI 372 for low lead content.

Note regarding cable length: McCrometer recommends minimizing cable length. Electromagnetic flow meters may have unfavorable signal strength to noise ratio in electrically noisy environments. Longer lengths of cable increase the likelihood of interference. In those cases where the meter's signal must be transmitted a long distance, or where the environment may be particularly noisy, we suggest using the converter's analog output(s) that allows locating the transmitter as close as possible to the metering location.

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