

EMCO DeltaKit Electromagnetic Flowmeter with 4411e Transmitter for Measurement of Bi-Directional Flow in Full Pipes

Engineering Specifications

February, 2005 / RO

1) INSTRUMENT

There shall be furnished an electromagnetic flow sensor assembly suitable for fixed-site measurement of bi-directional flow in an existing full pipe, sizes 2" – 120" (50 – 3000 mm). The flowmeter shall consist of a flow sensor(s) assembly retained in an optional standpipe and powered and signal processed by a remote flow transmitter. The transmitter shall indicate bi-directional flow rate and totalize in the forward, reverse and net forward direction, as well as transmit bi-directional flow signals from separate terminals. The sensor(s) shall be field-interchangeable. They shall contain a reference coil, which measures and compensates for magnetic entrainments in the media, exciter coils to completely fill the flowtube cross section with magnetic flux and electrodes to measure the flow signal.

2) EXISTING PIPE, SENSORS AND ASSEMBLY

A) The internal diameter of the existing pipe shall be ____¹. The external diameter of the existing pipe shall be ____². The pipes shall be assumed full, unless otherwise advised.³

B) The existing pipe shall be made from [carbon steel or ductile iron internally uncoated] [carbon steel or ductile iron internally coated] [stainless steel internally uncoated] [stainless steel internally coated].⁴

Should the existing pipe be coated the accuracy shall not be affected by cuts or scratches in that coating.

C) There shall be a [carbon steel standpipe, flanged and contoured to the existing pipe outside diameter, and suitable for welding to an existing carbon steel pipe] [stainless steel standpipe, flanged and contoured to the existing pipe outside diameter, and suitable for welding to existing stainless steel pipe] [no standpipe].⁵

- D) Each flow sensor shall incorporate an integral grounding electrode. External grounding rings and straps shall not normally be necessary.

Note: for transmission to a remote transmitter > 100 feet (30 m), or when excessive unequal potentials exist between the pipeline and the flowmeter cable shields, it may be necessary to have a grounding ring or other grounding arrangement installed. Such excessive unequal potentials are beyond the control of the magmeter manufacturer and additional cost of remedy is extra to that of the magmeter normal supply.

The sensors shall use solid state design, with the reference coils, exciter coils and electrodes, hard encapsulated in [Kynar (polyvinylidene fluoride PVDF, PVF2) that conforms to US Food and Drug Administration # 21 CFR 177.2510 for flowtubes up to 14" (350mm) nominal diameter] [polyurethane that conforms to AWWA Specification C213 and National Sanitation Foundation Standard 61 for use with potable water for nominal diameters of 16 in. (400 mm) and above]⁶. The sensors shall be field-replaceable and field-interchangeable without the need for recalibration.

- i) The electrodes shall be made of [(Type 316 stainless steel), (Hastelloy C), (Titanium)]⁷. The electrode seals shall be made of Viton and sensor standpipe gaskets shall be made of elastomer rubber.

- ii) The flow sensor shall use unipolar Pulsed AC electromagnetic excitation from the remote transmitter, with a typical magnetizing current of 1 – 5.5 A base to peak, dependant on sensor size, and frequency of not less than 2/3 of power supply frequency (40 Hz for a 60 Hz power supply frequency) for all size flow sensors. This shall ensure a high signal-to-media noise ratio, whereby such media coatings as sewage grease, algae, calcium carbonate or similar do not affect accuracy. There shall be an auto zero feature, such that there shall be no zero offset due to this relatively high exciter frequency

- E) The minimum media conductivity shall be 1 microS/cm.

For conductivity less than 5 microS/cm and cable lengths > 100 feet (30 m) a pre-amp shall be installed in the flow tube junction box.

- F) The maximum media temperature shall be 175° F (80° C).
- G) The flow meter shall include [(1 sensor up to 14" diameter) (2 sensors up to 42" diameter or 4 sensors 48" diameter and greater)]⁸ to measure mean velocity in full pipes.
- H) The mean velocity measurement range shall be from 0 to 2 feet per second (0 to 0.6 meters per second) to 0 to 50 feet per second (0 to 15 meters per second).
- I) The minimum detectable mean velocity shall be 0.02 feet per second (0.006 meters per second). However, a default low flow cut-off relay shall actuate at 2% of full scale, unless otherwise specified.
- J) [The accuracy of multiple sensor magnetic flowmeter shall be:
± 0.5% of rate for > 1.5 fps (0.45 m/s)
± 0.0075 fps (0.00225 m/s) for < 1.5 fps (0.45 m/s)
The accuracy of a single sensor magnetic flowmeter for pipes 14" (350 mm) and less shall be:
± 0.5% of rate for > 2 fps (0.6 m/s)
± 0.01 fps (0.003 m/s) for < 2 fps (0.6 m/s)]⁹
- This accuracy shall be traceable to the US National Institute of Standards and Technology (NIST), and shall be guaranteed provided that specification parameters and installation recommendations are met. A NIST traceable calibration certificate shall be provided with each flow meter.
- K) A non-full pipe condition shall be indicated by a user-supplied signal using one of the contact inputs on the flow transmitter, or by detection of the level dropping below the sensor electrodes.
- L) Maximum pressure shall be 150 psi (10 bar).

- M) The wiring from the flow transmitter to the sensors shall be three separate 2-core, multi-stranded and overall shielded cables, each core 18 gauge (0.75 mm²). {[The wiring from the flow transmitter to the sensors shall be 50 feet (15m) long.] [The wiring from the flow transmitter to the sensors shall be _____long.]}¹⁰

For Cable lengths > 100 feet (30 m) a pre-amp shall be installed in the flowtube junction box.

- N) The flowtube assembly shall be indefinitely submersible to 30 feet (10m) water column to NEMA 6 and IP68.
- O) [The flowtube assembly shall be Entela approved to UL and CSA standards for use in Ordinary Locations][The flowtube assembly shall be Entela approved to NEC and CSA standards for use in Class 1, Division 2 explosive atmospheres]¹¹. The transmitter must be located in the safe area.

3. FLOW TRANSMITTER

A) The flow transmitter shall be a remote, microprocessor based Pulsed AC technology with an auto zero feature to allow exciter frequencies of 2/3 x power frequency for all size flowtubes, without zero offset.

B) The flow transmitter shall have an input impedance of 10¹² ohms.

C) The flow transmitter shall have a time constant of not less than 30ms.

D) The flow transmitter shall include bi-directional isolated, internally powered 4 – 20mA outputs from separate terminals into a maximum load of 800 Ohms. A scaleable pulse frequency output shall be available, with a frequency mode 0 – 1000Hz to 0 – 10000Hz, 30Vdc, 250mA or externally powered relay 125Vac, 1A, 30VA.

E) The flow transmitter shall be [Entela approved to UL and CSA standards for use in ordinary locations][Entela approved to NEC and CSA standards for Class 1, Division 2 explosive atmospheres, with the transmitter located in the safe area]¹¹.

F) The flow transmitter shall operate on [120Vac, 60Hz][230Vac, 50Hz][120Vac, 50Hz]¹² line power. Typical power consumption shall be 15W.

G) The flow transmitter shall be housed in a wall mounting, UV ray resistant fiber glass enclosure. It shall be watertight, dust-tight and corrosion resistant to NEMA 4X and IP65. The enclosure shall embody lockable stainless steel latches, as well as a screwed down lid. Electrical connections shall be suitable for conduit connections.

H) The transmitter shall have a waterproof and backlit LCD display, 4 lines with 20 characters.

I) The transmitter shall be programmable using a tactile feedback, waterproof and sealed keypad. All necessary diagnostics, user security password readings and system status shall be available using the keypad. A separate calibration box shall be unnecessary.

4. The full pipe flowmeter shall be a DeltaKit Series electromagnetic flowmeter with 4411e transmitter, or equal.

Notes:

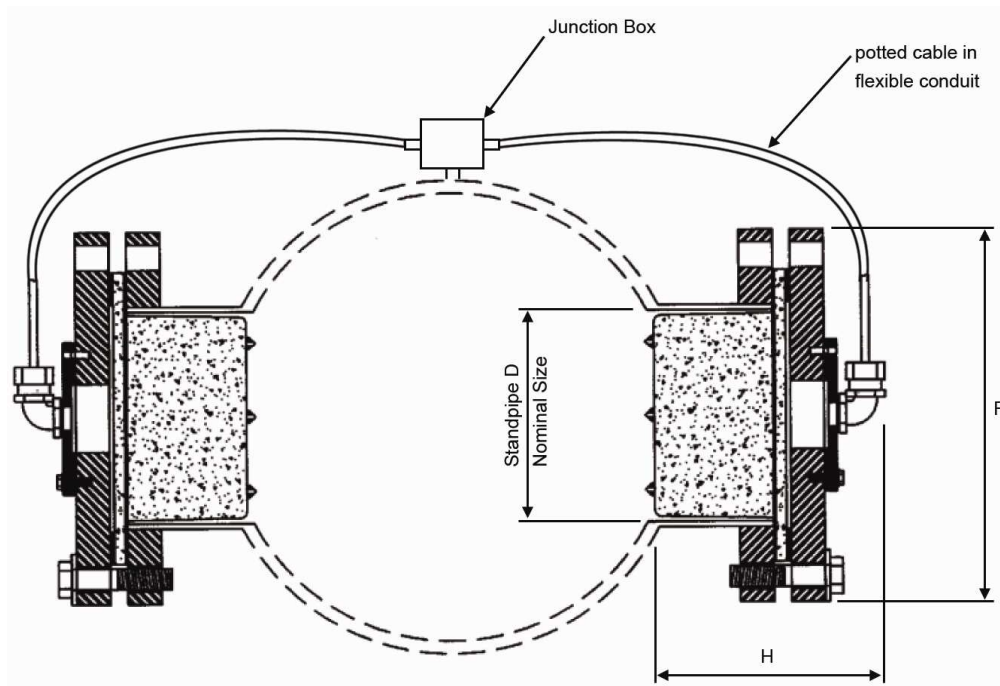
- 1 Specify internal diameter
- 2 Specify external diameter
- 3 There are cases where the sensor assembly may be used as a spare for a non-full pipe UniMag.
- 4 Specify type of pipe
- 5 Specify type of standpipe or no standpipe
- 6 Specify sensor material (pipe size dependent)
- 7 Specify electrode material (includes grounding material)
- 8 See data sheet for minimum recommended straight pipe runs and accuracy at Paragraph J
- 9 Specify accuracy for multiple or single sensors
- 10 Specify cable length
- 11 Specify ordinary or Class 1, Div. 2 locations
- 12 Specify power supply

DeltaKit Dimensions & Weights

Pipe Size	D		H		F		1 Sensor (note 1)	2 Sensors (note 1)	4 Sensors (note 1)	Single Standpipe and Flange (note 2)
	in	mm	in	mm	in	mm				
2"-3" (50-80 mm)	2"	50 mm	6"	152 mm	6.0"	152 mm	9 lb (4 kg)	16 lb (8 kg)	N/A	19 lb (9 kg)
4"-6" (100-150 mm)	3"	80 mm	6"	152 mm	7.5"	190 mm	15 lb (7 kg)	27 lb (12 kg)	N/A	24 lb (11 kg)
8"-14" (200-350 mm)	6"	150 mm	6.75"	170 mm	11"	280 mm	38 lb (17 kg)	71 lb (32 kg)	N/A	40 lb (18 kg)
16"-24" (400-600 mm)	8"	200 mm	7.5"	190 mm	13.5"	345 mm	63 lb (29 kg)	118 lb (54 kg)	N/A	74 lb (34 kg)
28-48" (700-1200 mm)	12"	300 mm	7.5"	190 mm	19"	460 mm	118 lb (54 kg)	225 lb (102 kg)	440 lb (200 kg)	120 lb (55 kg)
> 50" (1250 mm)	12"	300 mm	7.5"	190 mm	19"	460 mm	118 lb (54 kg)	225 lb (102 kg)	440 lb (200 kg)	120 lb (55 kg)

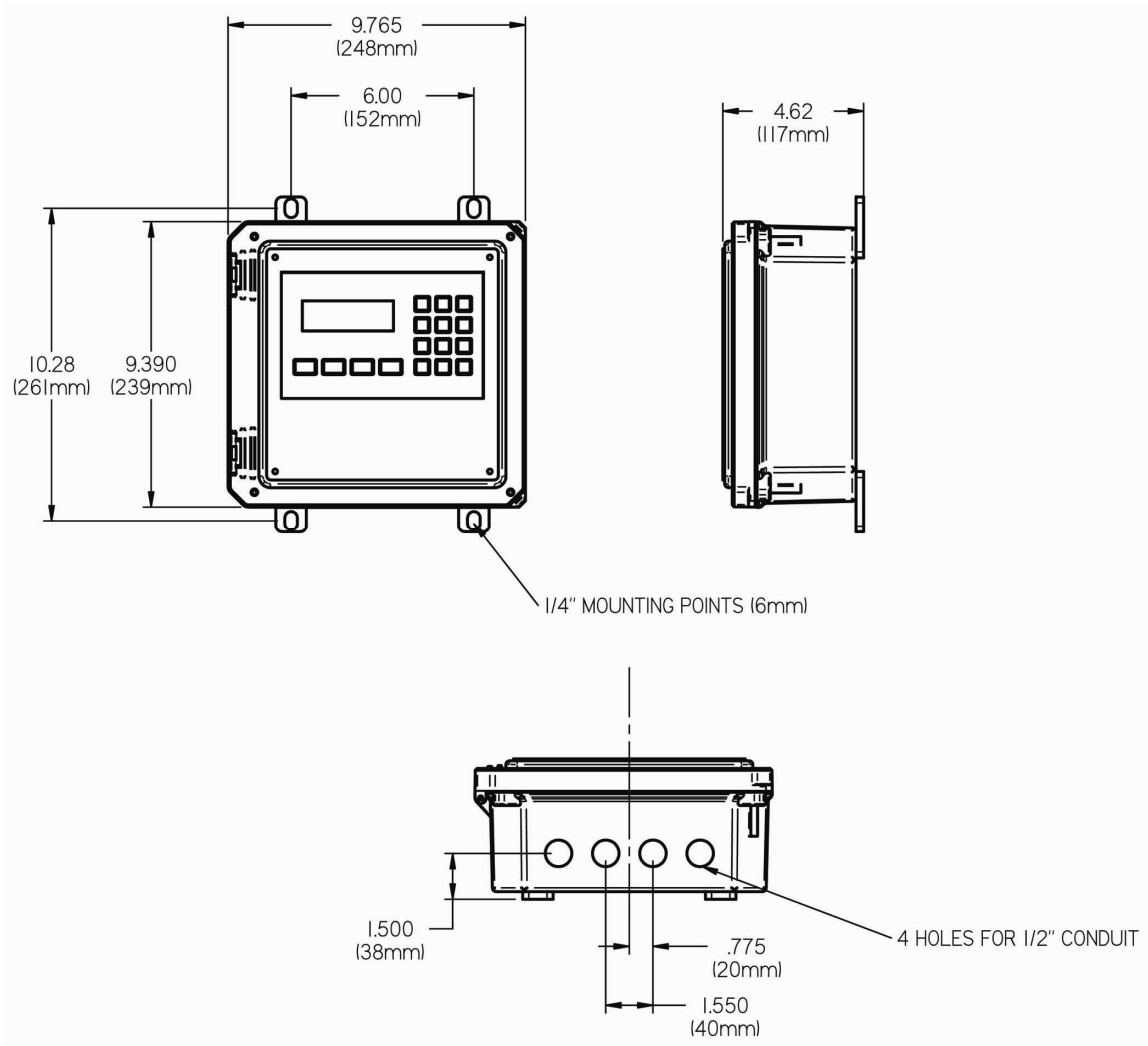
NOTES

1. Weight of sensor(s) only
2. Add the weight of the standpipe and the weight of the flange assemblies to the sensor only to arrive at the total
3. 2-3 inch pipes use 2 inch (50 mm) sensor assemblies; 4-6 inch pipes use 3 inch (80 mm) sensor assemblies; 8-14 inch pipes use 6 inch (150 mm) sensor assemblies; 16-24 inch pipes use 8 inch (200 mm) sensor assemblies; 28 inch and larger pipes use 12 inch (300 mm) sensor assemblies.



Note: For overall dimension see UniMag DS or DT data sheets

4411e Flow Transmitter



Weight: 7 lb (3.2 kg)