

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

Engineering Specifications

February, 2005 / RO

1) INSTRUMENT

A) There shall be furnished an electromagnetic flow meter suitable for fixed-site measurement of bi-directional flow in a full pipe. The flow meter shall consist of a flowtube containing sensor(s) retained in a standpipe assembly and 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) SPOOL PIECE FLOW TUBE AND SENSORS

A) The nominal diameter of the flow tube shall be _____¹.

B) The spool piece flow tube shall be made of carbon steel and shall be protected inside and outside with a fusion bonded epoxy coating, approved to AWWA Specification C213 and National Sanitation Foundation Standard NSF 61 for potable water.

i) The flow tube function shall not be dependant on an insulating liner. Accuracy shall be not be affected by cuts or scratches in the flow tube coating.

ii) The flow tube shall be supplied with [(raised face carbon steel flanges to {ANSI 150rf [ANSI/AWWA C207 Class D flat face for nominal diameters of 28 in. (700 mm) and larger]}, {ANSI 300rf}, {DIN/BS4504 PN6}, {DIN/BS4504 PN10}, {DIN/BS4504 PN16}, {JIS 10krf}, {BS/AS2129 Table D}, {BS/AS2129 Table E} (plain ends)]².

- C) 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]³. 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 B), (Hastelloy C), (Titanium)]⁴. The electrode seals shall be made of Viton and sensor standpipe gaskets shall be made of elastomer rubber.

- ii) The flow tube 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 flowtube diameter, and frequency of not less than 2/3 of power supply frequency (40 Hz for a 60 Hz power supply frequency) for all size flowtubes. 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

- D) 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.

- E) The maximum media temperature shall be 175° F (80° C).
- F) The flow meter shall include [(1 sensor up to 14" diameter) (2 sensors up to 42" diameter or 4 sensors 48" diameter and greater)]⁵ to measure mean velocity in full pipes.
- G) 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).
- H) 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.
- I) [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 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)]⁶

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.
- J) 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.
- K) Maximum pressure shall be 150 psi (10 bar).

L) [The flow tube shall incorporate a 3/4 inch NPT female port for connection to a sampler, pressure transducer or similar .]⁷ [The flowtube shall incorporate a 1 1/2" NPT female port for connection to a sampler, pressure transducer or similar.] The sampler, pressure transducer or similar shall not be in the normal supply of the magmeter manufacturer.

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.]}⁸

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]⁹. 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]⁹.

F) The flow transmitter shall operate on [120Vac, 60Hz][230Vac, 50Hz][120Vac, 50Hz]¹⁰ 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 Unimag [DT] [DS]¹¹ Series electromagnetic flowmeter with 4411e transmitter, or equal.

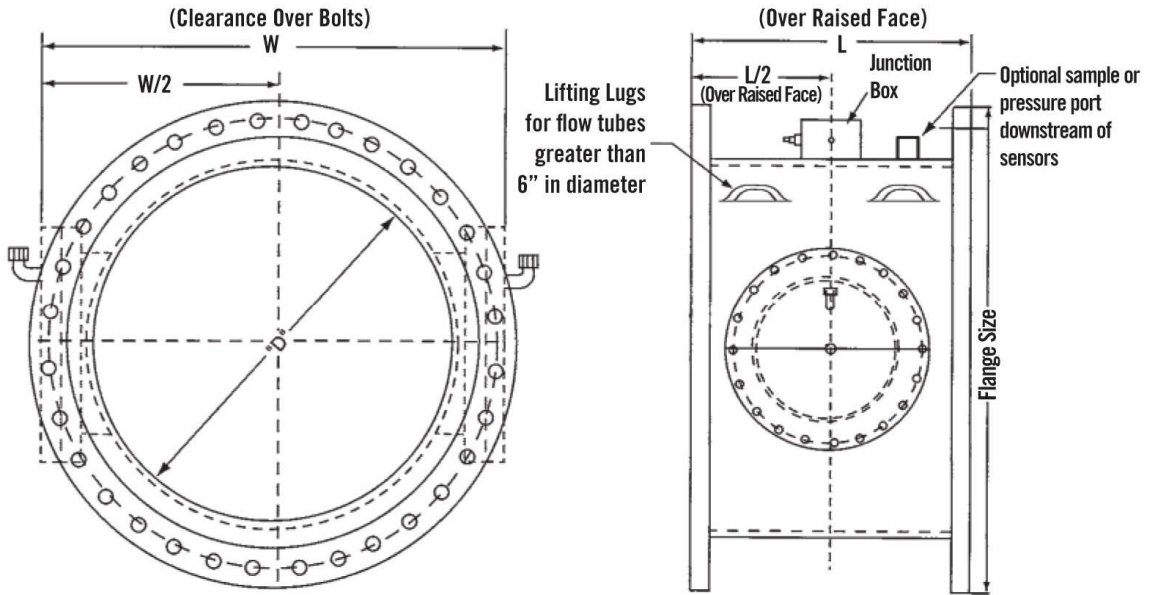
Notes:

- 1 Specify nominal diameter from 1 to 80 inches (25 to 2000 mm).
- 2 Specify flange type
- 3 Specify sensor material (pipe size dependent)
- 4 Specify electrode material (includes grounding material)
- 5 See data sheet for minimum recommended straight pipe runs
- 6 Specify accuracy for multiple or single sensors
- 7 Specify port size
- 8 Specify cable length
- 9 Specify ordinary or Class 1, Div. 2 locations
- 10 Specify power supply
- 11 Specify DT (multiple sensors) or DS (single sensors), dependant on flowtube size, accuracy requirement and straight pipe runs available.

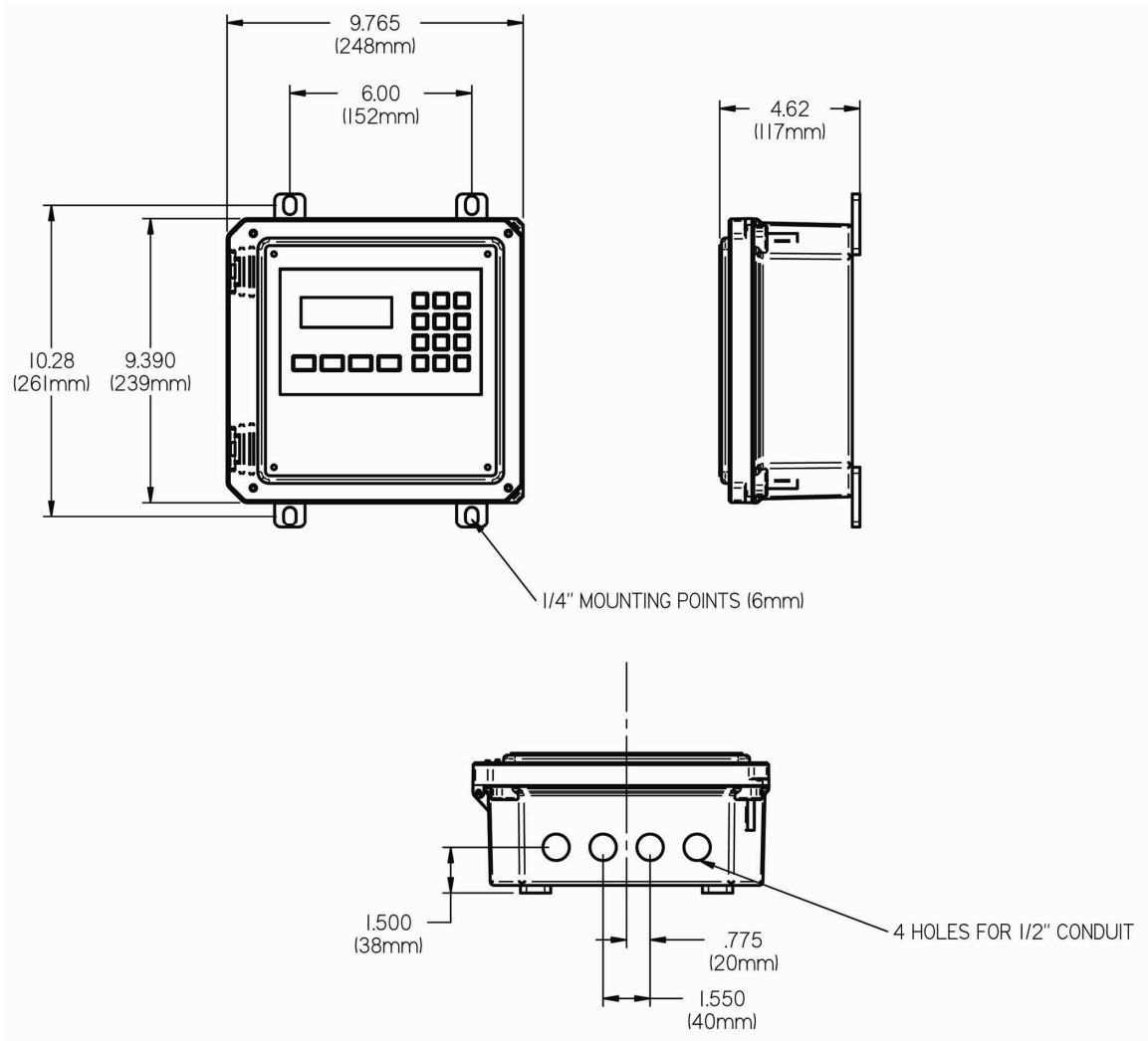
UniMag Flow Tube Dimensions & Weights for Flow Measurement in Full Pipes

UniMag Multiple-Sensor Flow Tube Dimensions & Weights For flow measurement only (or flow and pressure measurement) in full pipes							
Nominal Size		Length (dimension)		Width (dimension)		Approximate	
in.	mm	in.	mm	in.	mm	lbs.	kg
2	50	10.0	254	13.1	331	43	20
2-1/2	65	10.0	254	13.6	344	50	23
3	80	10.0	254	14.4	364	55	25
4	100	12.0	305	16.4	415	80	36
5	125	12.0	305	17.6	446	92	42
6	150	12.0	305	18.7	474	100	46
8	200	18.0	457	21.3	540	185	84
10	250	18.0	457	23.6	598	225	102
12	300	18.0	457	25.8	654	301	137
14	350	18.0	457	27.1	687	335	152
16	400	20.0	508	30.3	768	490	223
18	450	20.0	508	32.5	824	515	234
20	500	20.0	508	34.6	878	615	280
24	600	24.0	610	38.9	987	840	382
28	700	30.0	762	41.8	1060	980	445
30	760	30.0	762	43.9	1114	1280	580
32	800	30.0	762	46.1	1170	1310	595
36	900	30.0	762	50.3	1276	1625	740
42	1000	40.0	1016	56.5	1434	1980	900
48	1200	40.0	1016	62.6	1589	2210	1015
56	1400	48.0	1219	70.6	1792	2860	1300
60	1600	48.0	1219	78.7	1998	2930	1335
66	1700	48.0	1219	89.0	2261	3280	1490
72	1800	48.0	1219	90.5	2297	3609	1633
80	2000	48.0	1219	98.5	2501	3898	1767

EMCO UniMag Flow Tube for Full Pipe Measurement



4411e Flow Transmitter



Weight: 7 lb (3.2 kg)