UniMag NFP Series Partially Full Magnetic Flowtubes

The UniMag NFP partially filled magnetic flowmeter system is suitable for pipe sizes 6" - 120" (150 - 3000 mm). It consists of a patented UniMag NFP flowtube assembly and remote 4411e transmitter. The flowtube incorporates a removable UniMag mean velocity sensor mounted on the underside of the horizontal flowtube. For diameters 38" (950 mm) and greater two such sensors are used.

A level transducer is embodied in the Unimag NFP flowtube. It is 4-20mA loop powered by the 4411e transmitter. The signal is linearized in the 4411e and multiplied by the mean velocity to obtain volumetric flow (see 4411e data sheet).

The level measurement is accomplished by a choice of an FMU ultrasonic level transducer or FMX hydrostatic level transducer. The choice is determined by whether there is convenient access to the top of the NFP flowtube (use FMU ultrasonic) or to the bottom of the NFP flowtube (use FMX hydrostatic.) Type FMU is not available for sizes < 12" (300 mm) Ø.

For partially full existing concrete or similar pipes, where holes cannot be cut in the pipe, see ChannelMag PM2 data sheet.

UNIMAG NFP SERIES FEATURE	BENEFIT
Totally encapsulated sensor components	Insensitive to high pipeline vibration and shock
Option for linerless flowtube construction	Lower initial cost; Eliminates the need for liner protectors
Patented 4411e AC coil excitation (high coil current & high pulsation frequency)	High signal-to-noise ratio for high insensitivity to media noise. Accuracy unaffected by electrode coatings such as sewage grease, calcium carbonate, algae or similar.
Field replaceable sensor with optional 5 year warranty (with EMCO start-up)	Minimizes downtime due to failures and reduces stocking costs (associated with spare parts)
Sensor reference coils	Output compensated for effects due to magnetic particles (slurries) and ambient/process temperature shifts
Internal grounding electrodes	Installation in non-conductive or lined pipe normally without grounding rings or external straps
Flowtubes manufactured to any length	Simplifies installation (no spacers or alteration)

See specifications for 4411e transmitters

ACCURACY

± 2% of rate for flows ≥ 2 fps (0.6 m/s)
± 0.04 fps (± 0.012 m/s) for flows < 2 fps (0.6 m/s)

Accuracy is traceable to the National Institute of Science and Technology. A NIST traceable calibration certificate is provided with each flowtube.

Accuracy is unaffected by electrode coatings such as sewage grease, calcium carbonate , algae or similar.

Note: For media such as ferric chloride, ferric sulphate (Odophos), high temperature paper mill liquors, lime mud or similar highly conductive media, flowmeter performance can be adversely affected. Please consult EMCO for these types of applications, otherwise performance guarantee is null and void.

MINIMUM STRAIGHT PIPING RUNS

Piping	Upstream Piping Requirement	Downstream Piping Requirement
Minimum Requirement	7 Diameters	3 Diameters
Single elbow, or tee upstream	7 Diameters	3 Diameters
Two elbows coupled in same plane	7 Diameters	3 Diameters
Two elbows, close coupled and out of plane	12 Diameters	3 Diameters
Pump, blending point, control valve upstream	20 Diameters	3 Diameters
Pump, control valve downstream		5 Diameters

Note: For lesser straight diameters consult EMCO.

FLOW RANGE

0 - 2 f/s (0 - 6 m/s) minimum to 0 - 50 f/s (0 - 15 m/s) maximum
or
0 - $5D^2$ gpm minimum to 0 - $120D^2$ gpm maximum, where D is in inches
(0 - $0.002D^2$ m^3/h minimum to 0 - $0.04D^2$ m^3h maximum, where D is in millimeters)
Note: Unless otherwise advised the maximum required flow rate will be considered at full pipe (max level) conditions.

MINIMUM LEVEL

Pipes 6" - 36": min. level 2" (50 mm)
Pipes 38" - 120": min. level 8" (200 mm)

COIL EXCITATION

Pulsed AC excitation. Consult data sheets for 4411e for more information.

MEDIA CONDUCTIVITY

> 1 µS/cm (1 micromho/cm)
> 0.08 or < 5 µS/cm use UniMag pre-amplifier option
For deionized, distilled, or demineralized water, consult EMCO.

ENVIRONMENTAL PROTECTION

NEMA 6 and IP68 indefinitely submersible to 30 ft. (10 m) water column, or NEMA 4X & IP65

MAXIMUM PRESSURE & TEMPERATURES

Metal Flowtubes	PVC or HDPE Flowtubes
175° F (80° C) @30 psig (2 bar g)	175° F (80° C) @ 15 psig (1 bar g) 150° F (65° C) @ 20 psig (1.3 bar g) 110° F (40° C) @ 30 psig (2 bar g)

AMBIENT TEMPERATURE RANGE

+14° F to 160° F (-10° C to +70° C)

GROUNDING

Internal grounding electrode on each sensor

NOTE:
1. For cathodic protected pipes, consult EMCO Flow Systems.
2. For transmission to a remote transmitter > 100 feet (30m), 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 EMCO and additional cost of remedy is extra to that of our normal supply.

CABLE TYPE

There are 3 separate cables used to the remote 4411e transmitter: 1 cable is for the sensing electrodes, 1 cable for the energizing coils and 1 cable for the reference coils. Each cable is 2-core multistranded and overall shielded, 2 x 18 gauge (US) e.g. Beldon #8760 or 2 x 0.75 mm^2. Additional cable of the same type is used for a pre-amp in the junction box, or for the FMU ultrasonic level transducer. A special cable is used for the FMX hydrostatic level transducer incorporating a "breather" tube to compensate for changes in barometric pressure.
For ATEX Zone 2 applications IEC approved cables must be used, with 4411e in the safe area.
For Class 1 Div. 2 applications cables must run in conduits or Teck metal clad cable, with 4411e in the safe area.

CABLE LENGTH TO TRANSMITTER

50 feet (15 m) as standard supply. Special distance cabling maximum 300 feet (100 m) for metal flowtubes, or 100 feet (30 m) for PVC or HDPE flowtubes. For cable lengths > 100 feet (30 m) a pre-amp is installed in the junction box.

Note: For distances up to 30 feet (10 m) all cables may run in the same conduit. Longer distances require that the cables run in separate conduits, approximately 1 foot (300 mm) apart. The energizer coil and reference coil cables may run in the same conduit longer than 30 feet, but the electrode cable must be separate.

For applications to ATEX Zne 2 requirements only one cable is permitted per cable connector.

For FMX hydrostatic level transducers the cable and breather < 50 feet (15 m) terminates in the 4411e transmitter. For > 50 feet (15 m) this special cable terminates in a separate plastic junction box.

MAXIMUM CABLE LENGTH

< 3 microS/cm: Maximum 30 feet (10 m)

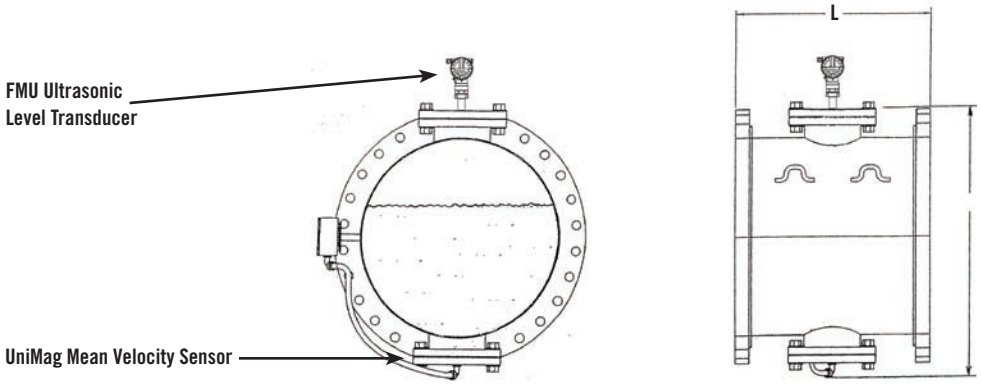
> 3 microS/cm: Maximum 300 feet or (10 x C) feet or 100 m max. or (3 x C) m, whichever is less. Max. for PVC or HDPE flowtubes is 100 feet (30 m).

UNIMAG MATERIALS OF CONSTRUCTION (REFER TO ORDERING CODE)

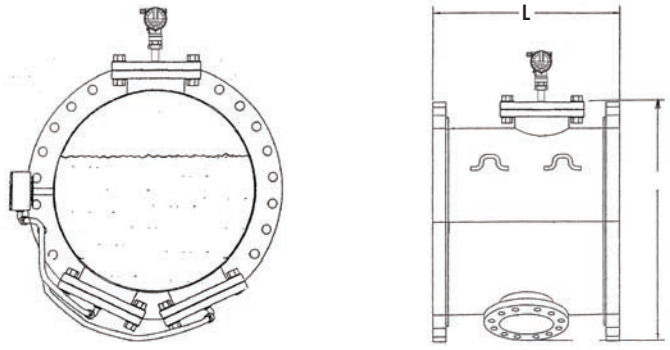
FLANGES/FLOWTUBE	Carbon Steel, 316 stainless steel with carbon steel flanges, HDPE (high density polyethylene) or PVC Standard 2 year warranty against material defects and bad workmanship, but not including media compatibility, erosion and abrasion, or for media > 180° F / 80° C. ***Maximum pressure and temperature rating of the flowtube may be limited by th flange type selected (refer to appropriate flange specifications). Flowtubes can be specially ordered with plain ends or with butt weld ends.***
FLOWTUBE LINERS / COATINGS	Fusion Bonded Epoxy ***Conforms to USA Sanitation Foundation Standard NSF61 and AWWA Standard C213 for drinking water, Tefzel (fusion bonded ETFE), PVC and HDPE.*** Tefzel
ELECTRODES	AISI 316 stainless steel, Hastelloy C, Titanium
SENSORS	Pipes 16" - 120" Ø (400 - 3000 mm): Polyurethane (Conforms to NSF61 and AWWA C213 for drinking water), elastomer gaskets, Viton electrode seals. Pipes 6" - 14" Ø (150 - 300 mm): PVDF (PVDF is approved by the US Food and Drug Administration #21 CFR 177.2510), elastomer gasket, Viton electrode seals, alternative with Teflon gaskets.

NOTES 1. Sensor assembly includes a non-wetted carbon steel cover flange, fusion bonded polyethylene protected 50 ft (15 m) of cable, re-enterable potting gel, junction box, conduit and stainless steel bolts. Special length cable on request.

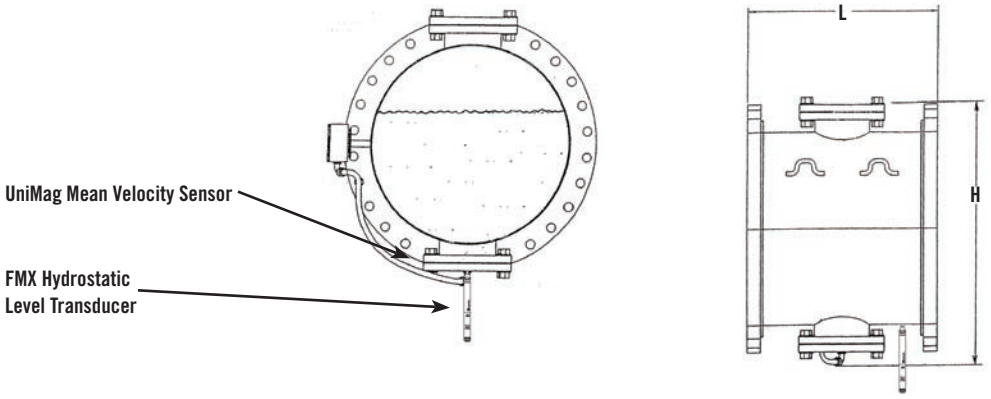
2. Standard 1 year warranty against material defects and bad workmanship, but not including media compatibility , erosion and abrasion, or for media > 180° F / 80° C.



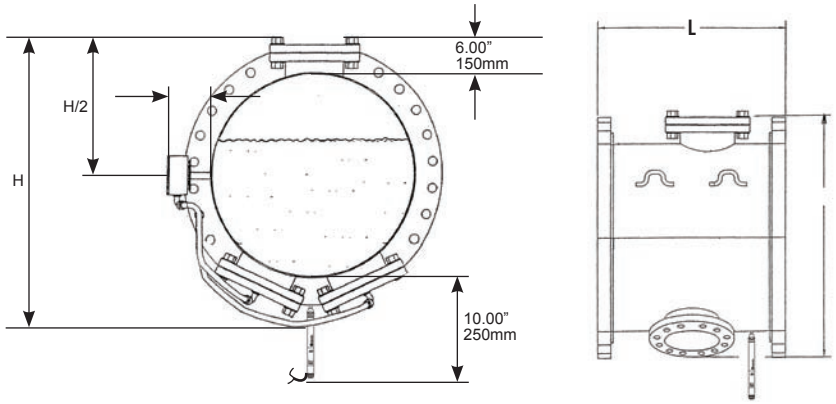
Flowtube Assemblies 24" - 36" (600 - 900 mm) with FMU Ultrasonic Level Transducer



Flowtube Assemblies 38" (950 mm) and Greater with FMU Ultrasonic Level Transducer



Flowtube Assemblies 6" - 36" (150 - 900 mm) and Greater with FMX Hydrostatic Level Transducer



Flowtube Assemblies 38" (950 mm) and Greater with FMX Hydrostatic Level Transducer

Nominal Size D		Dimension L *		Dimension H with FMU Ultrasonic Level Transducer		Dimension H with FMX Hydrostatic Level Transducer		Approximate Weight	
Inches	mm	Inches	mm	Inches	mm	Inches	mm	LB	KG
6	150	12 *	305 * 380	--	--	25	670	100	46
8	200	18	457	--	--	28	710	185	84
10	250	18	457	--	--	30	760	225	102
12	300	18	457	30	760	32	815	301	137
14	350	18	457	31	790	33	840	335	152
16	400	20	508	35	890	37	940	490	223
18	450	20	508	37	940	39	990	515	234
20	500	20	508	39	990	41	1050	615	280
24	600	24	610	43	1090	45	1140	840	382
28	700	30	762	46	1170	48	1220	980	445
30	760	30	762	48	1220	50	1270	1280	580
32	800	30	762	50	1270	52	1320	1310	595
36	900	30	762	55	1395	57	1450	1625	740
42	1000	40	1016	61	1550	63	1600	1980	900
48	1200	40	1016	67	1710	69	1760	2210	1015
56	1400	48	1219	75	1910	77	1960	2860	1300
60	1600	48	1219	83	2110	85	2160	2930	1335
72	1800	48	1219	95	2420	97	2460	3609	1633
80	2000	48	1219	103	2620	105	2670	3898	1764

*** Notes:**

1) For flowtubes 6" Ø (150 mm) having ¾" or 1½" NPT sampling or pressure ports, or for installation with FMX hydrostatic level transducer, Dimension L = 15.0" (380 mm)

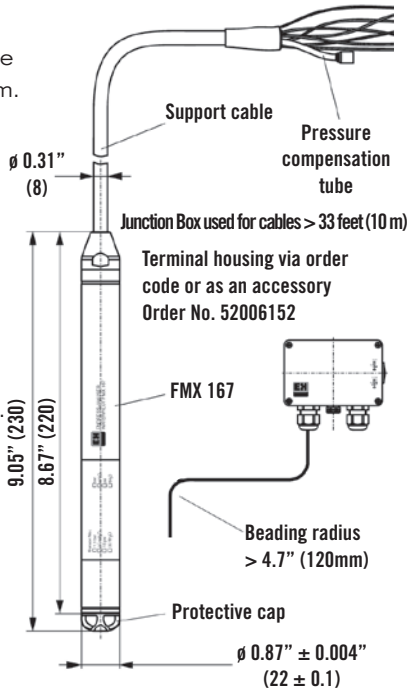
2) For outside flange diameter, see appropriate flange specification.

3) For larger sizes consult EMCO.

FMX 167 Hydrostatic Level Transducer Specification

A hydrostatic pressure transducer is standard supply for measuring level in partially filled pipes. It is also normally used when the level sensor needs to be hidden from view, or if there is substantial froth on the surface of the media, or if access to the flowtube is at the bottom.

Basic Type	FMX167
Range	0 - 20" (0 - 500 mm) to 0 - 600 feet (0 - 180 m)
Accuracy	± 0.2% full scale or 0.072" (1.8 mm) eg. accuracy at 10" level = 0.072/20 x 100 = 0.36% accuracy at 36" level = 0.072/36 x 100 = 0.2%
Barometric Pressure Change	Cable contains "breather" tube for compensation Mounted integrally on CM2 ChannelMag sensors Mounted at side of channel for widths < 8" (200 mm)
Cable Length	See ordering code. Normally same length as CM2 cables. Max. length 1000 feet (300 m)
2-wire 4411e Signal	4 - 20mA, 2 wire system, 18 VDC.
Electromagnetic Compatibility	Interference emission to EN 61326 for CE requirements
Protection	NEMA 6 and IP68 indefinately to 700 feet (200 m) w.c Porous Gore-Tex Teflon filter protects internals
Ambient Temperature	14 to 158 degrees F (-10 to 70 degrees C)
Materials of Construction	Transducer housing: 316L stainless steel Sensor disphragm: aluminum trioxide ceramic Internal seal: standard Viton, optional EPDM Protective cap: high density polyethelene Cable: polyethelene with Gore-Tex Teflon filter
Explosive Atmospheres	See ordering code
Weight	Probe: 0.63 lb (0.3 kg) Cable: Add 0.13 lb/foot (0.05 kg/m)



The cable contains a breather tube and is normally terminated in the 4411e transmitter. This cable must not be kinked or blocked. An intermediate terminal housing is available, as well as a cable mounting screw or mounting clamp, as shown. Terminal housing supplied for level transducer cable greater than 50 feet (15 m). Breather tube ends in terminal housing.

FMX 167 Ordering Code

FMX 167 – 1 2 3 4 . 5 6 7

1. Certificate
   - A = Standard
   - B = ATEX II 2 G — EEx Ia IIC T6
   - C = ATEX II 3 G — EEx nA IIC T6
   - D = FM approved — IS, Class I, Div. 1, Grps A-D
   - E = CSA approved — IS, Class I, Div. 1, Grps A-D
   - F = CSA — General purpose
2. Mechanical Connection (cable suspension)
   - 1 = None
   - 2 = Mounting clamp, 316L SS
   - 3 = Cable mounting screw G 1½ A 304 SS
   - 4 = Cable mounting screw 1½" NPT, 304 SS
   - 9 = Special version
3. Measuring Cell Tube Material
   - A = 316L SS cell enclosure
   - Y = Special version
4. Measuring Range

		Max. Overload
FA = 0 to 3 ftH_2O	MA = 0 to 1 mH_2O	73 psi
FB = 0 to 6 ftH_2O	MB = 0 to 2 mH_2O	73 psi
FC = 0 to 15 ftH_2O	MC = 0 to 4 mH_2O	101 psi
FD = 0 to 20 ftH_2O	MD = 0 to 6 mH_2O	145 psi
FE = 0 to 30 ftH_2O	ME = 0 to 10 mH_2O	145 psi
FF = 0 to 60 ftH_2O	MF = 0 to 20 mH_2O	261 psi
FG = 0 to 150 ftH_2O	MG = 0 to 40 mH_2O	352 psi
FH = 0 to 300 ftH_2O	MH = 10 to 100 mH_2O	580 psi
FK = 0 to 600 ftH_2O	MK = 0 to 200 mH_2O	580 psi

   - VV = Adjusted to customer specifications from 0_____
   - YY = Special version
5. Measuring Cell Seal
   - 1 = Viton
   - 2 = EPDM
   - 9 = Special version
6. Extension Cable
   - A = Length in _____ meters, PE cable
   - B = 10m PE cable, can be shortened
   - C = 20m PE cable, can be shortened
   - E = 30 ft cable, PE, can be shortened
   - F = 60 ft cable, PE, can be shortened
   - G = Length in _____ feet, PE cable
   - Y = Special version
7. Additional Equipment
   - 1 = Probe with integrated Pt 100, 4-wire
   - 3 = Terminal housing with GORE-TEX® filter, NEMA 4X

FMU 40 & FMU 41 Ultrasonic Level Transducer Specification

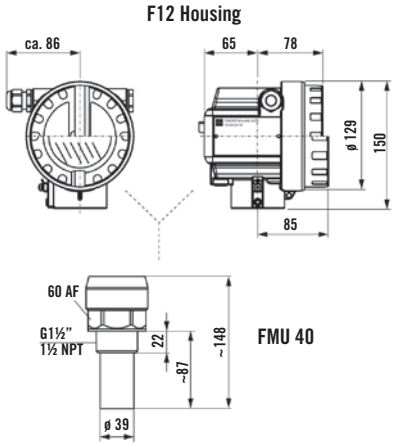
As an alternative to the hydrostatic level transducer, an ultrasonic level transducer may be incorporated in a convenient man hole. This must be at least 1 diameter upstream or downstream of the end of the ramps of the PM2 ChannelMag sensor ramps. This avoids critical flow rise or fall errors.

Basic Type	FMU 40
Range	0 - 24" (0 - 300 mm) to 0 - 120" (0 - 3000 mm)
Accuracy	± 0.2% full scale with min. range 200"
Minimum Dead Band	10" (250 mm)
Air Density Changes	Automatic temperature compensation
Connection	1½" NPT male for FMU 40 2" NPT male for FMU 41
2-Wire 4411e Signal	4 - 20mA, 2 wire system, 18VDC
HART Communication	Included
Protection	NEMA 6 and IP68 for 24 hours @ 6 feet w.c
Electromagnetic Compatibility	Interference emission to EN 61326
Indication	4 digit LCD
Ambient Temperature	-5 to +40 degrees F (-20 to +60 degrees C)

Note: Outside these temperatures the LCD function is restricted. A protective cover is recommended if operating in strong sunlight.

Cable Entry	½" NPT
Materials of Construction	PVDF sensor with EPDM seal Aluminum enclosure, chromed and powder coated, sea water resistant.
Housing	F12 housing is standard
Explosive Atmospheres	FM and CSA Class 1 Div. 1 or 2 optional
Weight	FMU 40 approx. 5.5 lb (2.5 kg)

NOTE: Not available for < 12" (300 mm) diameter



FMU 40 Ordering Code

FMU 40 -- 1 2 3 4 5 6 ☐☐☐☐☐☐

1. Certificate
   - A = Non-hazardous version
   - S = FM IS Cl. I, II, III; Div. 1, Grps A - G
FM NI Cl. I, Div. 2
   - T = FM XP Cl. I, II, III; Div. 1, Grps A - G
   - U = CSA IS Cl. I, II, III; Div. 1, Grps A - G
CSA NI Cl. I, Div. 2
   - V = CSA XP Cl. I, II, III; Div. 1, Grps A - G
   - N = CSA General Purpose

2. Process Connection
   - R = G 1½, ISO 228
   - N = 1½" NPT

3. Power Supply / Communication
   - B = 2-wire, 4 to 20 mA loop-powered / HART
   - H = 4-wire, 10.5 to 32 VDC / 4 to 20 mA HART
   - G = 4-wire, 90 to 253 VAC / 4 to 20 mA HART
   - D = 2-wire PROFIBUS-PA
   - F = 2-wire Foundation Fieldbus

4. Display / Operation
   - 1 = Without LCD
   - 2 = With LCD VU 331 / on-site operation

5. Housing
   - A = F12 aluminum housing, coated, NEMA 6P
   - C = T12 aluminum housing with separate terminal compartment, coated, NEMA 6P

6. Cable Entry
   - 2 = M 20 x 1.5
   - 3 = G ½
   - 4 = ½" NPT
   - 5 = M 12 PROFIBUS-PA plug-in connector
   - 6 = 7/8" Foundation Fieldbus plug-in connector

UniMag NFP Flowtube Ordering Information

Notes: You must order UniMag and transmitter separately (see appropriate data sheet) for a complete flowmeter. Also order Level Transducer separately.

NFP 008 C E T X R 1 A A

NFP = UniMag NFP Flowtube

Nominal Size
Min. 006 = 6" (150 mm)
Max. 120 = 120" (3000 mm)
OOS = Special (note 1)

Flowtube / Flange Materials
C = Carbon Steel
A = 316 Stainless Steel Flowtube, Carbon Steel Flanges
H = HDPE Flowtube, Non-Wetted Carbon Steel Flanges
P = PVC Flowtube (Max. 12" / 300 mm)
S = Special (note 1)

Sensor Materials (Note 9)
E = PVDF with elastomer gaskets, Viton seals (6" - 14" / 150 - 350 mm) Ø
D = PVDF with Teflon gaskets, Viton seals (6" - 14" / 150 - 350 mm) Ø
P = Polyurethane with elastomer gaskets, Viton seals (16" - 120" / 400 - 3000 mm) Ø
S = Special (note 1)

Electrodes (Viton Seals) (Note 6)
T = AISI 316 Stainless Steel
C = Hastelloy C
I = Titanium
S = Special (note 1)

Flowtube Liners and Coatings
X = Fusion Bonded Epoxy Coating (note 2)
Z = Heavy Duty Tefzel (ETFE) (note 3)
P = PVC flowtube, No Coating
H = HDPE flowtube, No Coating
S = Special (note 1)

Transmitter Supply
A = 120V, 60 Hz transmitter supply
B = 230V, 50 Hz transmitter supply
C = 120V, 50 Hz transmitter supply
S = Special

Options
A = Pre-amplifier (note 4)
B = Extra Long 316 stainless steel electrodes (note 5)
W = Special Warranty (EMCO discretion) - No extra charge
E = Extra Length Cables
L = Special Lay Length
P = Sampling Port ¾" NPT female
N = Sampling Port 1½" NPT female
O = No Options - No Extra
S = Special - may be a combination of features (note 1)

Process Connections
1 = ANSI 150 RF (< 28 in.); ANSI/AWWA C207 Class D FF (≥ 28 in.)
2 = ANSI 300 RF
3 = AWWA FF (specify class)
4 = DIN/BS4504 PN6
5 = DIN/BS4504 PN10
6 = DIN/BS4504 PN16
7 = J1S10krf
8 = BS/AS2129 Table D
9 = BS/AS2129 Table E
C = Plain Ends
S = Special (note 1)

Transmitter Installation
R = 50 ft. (15 m) cables NEMA 6/IP68 indefinitely submersible to 30 feet w.c.
X = Entela approved to NEC/CSA Class 1, Div. 2, Grp C, D, Temp. T4. 50 feet cables (15 m)
C = Entela approved to ATEX Zone 2. 50 feet cables (15 m)
S = Special (note 1)

NOTES
1. *All special orders must include a complete description along with the ordering code. Use for combinations.*
2. *Version X is fusion bonded inside and outside.*
3. *Do not use with abrasive slurries. Tefzel is inside and outside.*
4. *Pre-amp required in junction box for fluid conductivity < 5 µS/cm, or cable length > 100 feet (30 m). For demineralized, deionized or distilled water, consult EMCO.*
5. *Extra-long electrodes are provided for thick, non-fluidic coating or residual silt applications.*

EMCO FLOW SYSTEMS