EMF Series
ELECTROMAGNETIC FLOWMETER

Description

Introduction for EMF Series of Electromagnetic Flowmeters

The Electromagnetic Flowmeters(EMF) can be used to accurately measure the flowrate of liquids, paper pulp, slurry and mineral slurry which has an electrical conductivity greater than 5 μ S/cm.

EMF Integral Type is a flow measurement system in a compact design which integrates the primary and signal converter.

EMF Remote Type flow measurement system consists of a flowmeter primary and a remote mounted converter.

Principle of Operation

The Faraday Laws of Induction, which state that an induced electromotive force is generated in a conductor when it moves through a magnetic field, form the basis for the electromagnetic flowmeter measurements.

This measurement principle is applied to a conductive fluid which flows in a pipe in which a magnetic field is generated perpendicular to the flow direction (see Schematic 2).

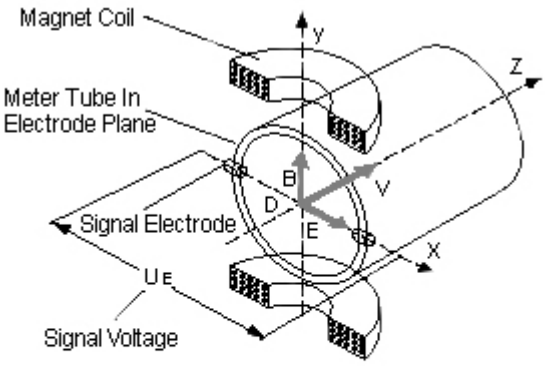
The electromotive force which is induced in the fluid is measured at two electrodes located diametrically opposite to each other.

This signal voltage UE is proportional to the magnetic induction B, the electrode spacing D and the average fluid velocity v.

Since the magnetic induction B and the electrode spacing D are constant values the signal voltage UE is proportional to the average fluid velocity v.

The equation for calculating the volumetric flowrate shows that the signal voltage UE is linear and proportional to the average fluid velocity v.

The induced signal voltage is converted into programmable analog and digital output signals in the converter.



U_E = Signal Voltage (V)
B = Magnetic Induction (T)
D = Electrode Specing (m)
v = Average Flow Velocity (m/s)
qv = Volume Flowrate (m³/s)
K = Ratio factor

$U_E : B \cdot D \cdot v \cdot K$

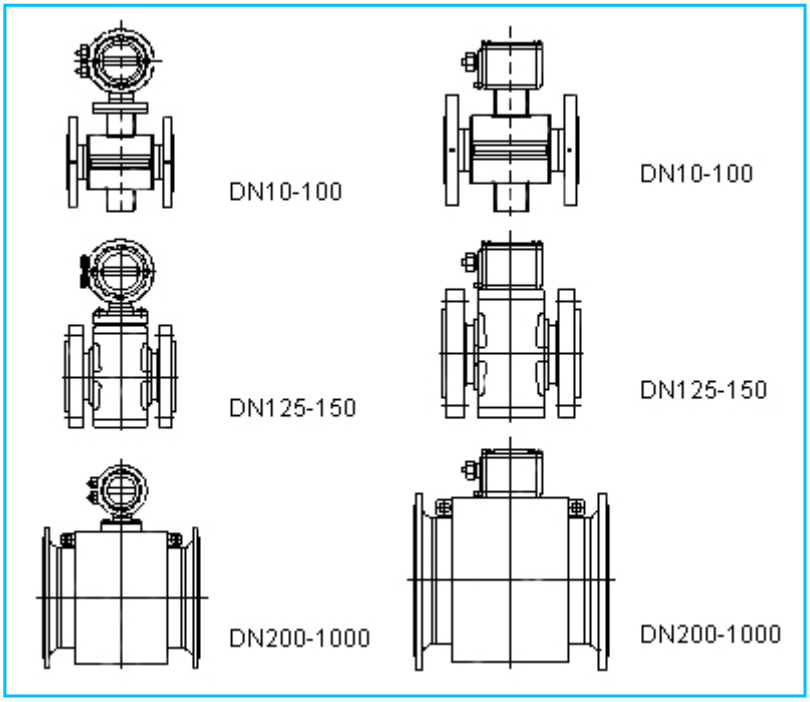
$qv = \frac{D^2\pi}{4} \cdot v$

$qv = \frac{\pi D}{4KB} \cdot U_E$

Electromagnetic Flowmeter Schematic

I EMF F/S(F) Series I

EMF Series Integral / Remote Type Overview



Fixed Flange

Specifications

Model	EMFF	EMFS
Accuracy	0.5% of rate	
Size (mm)	DN3-DN1000	DN10-DN1000
Pressure Class (MPa)	1.0-4.0 (According to size)	
Liner	Rubber, PTFE, PFA / It is available on ordering	
Conductivity	> 5μS/cm	
Electrodes	Stainless Steel 0Cr18Ni12Mo2Ti, HastelloyB2/C4, Platinum-Iridium, Ta, Ti	
Protection Class	IP67	
Fluid Temperature	-25~+130℃ (rubber liner ≤ 65℃)	

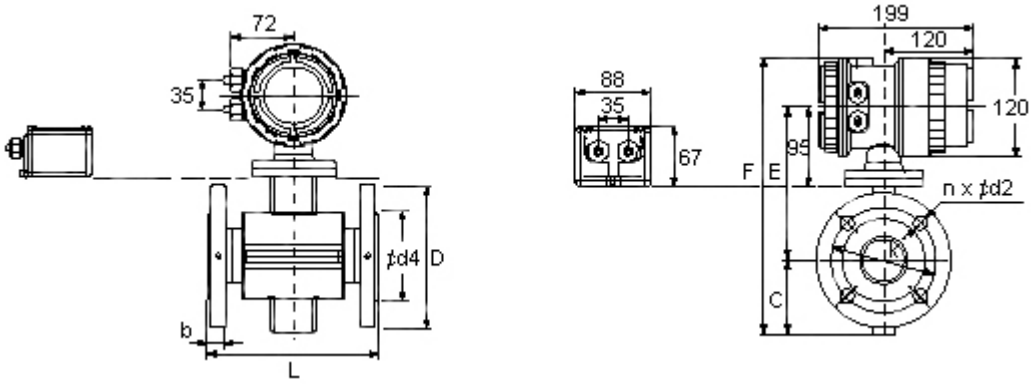
Specifications (Converter)

Supply Power	100-230V AC / 16.8-26.4V AC / 16.8-31.2V DC
Current Output	0/2-10mA, 0-5mA, 0/4-20mA, 0/4-10/12-20mA
Pulse Output	Active 24V DC pulse or passive optocoupler
Data Transfer	RS485 (Option)
Ext. Zero Return	Optocoupler input
Ext. Totalizer Reset	Optocoupler input
Forward / Reverse Metering	Signal over optocoupler output
Self Monitor	Yes
Local Display / Totalization	Yes
Housing	Aluminum(Standard), Stainless Steel(Option)
Communication	ASCII-Protocol

Dimensional

EMF F/S(F) (DN10-DN100) Flange Type

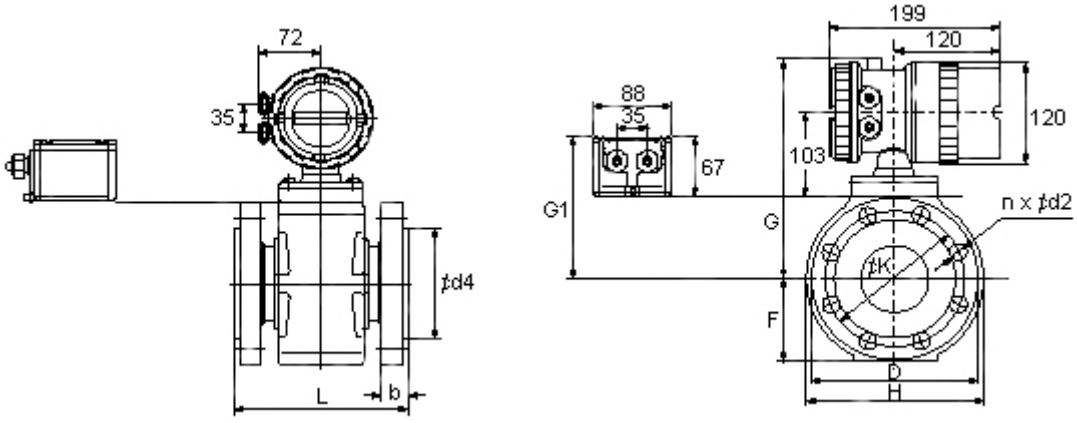
Remote Type Integral Type Remote Type Integral Type



Size (mm) DN	Pressure MPa	Dimension (mm)						Process Connection Dimension (mm)				Weight (kg)	
		L	d4	b	C	E	F	D	K	n	d2	Integral Type	Remote Type
10	4.0	200	41	14	62	157	281	90	60	4	14	5.5	4.5
15	4.0	200	46	14	62	157	281	95	65	4	14	5.5	4.5
20	4.0	200	56	16	73	168	292	105	75	4	14	6	5
25	4.0	200	65	16	73	168	292	115	85	4	14	6.5	5.5
32	4.0	200	76	18	78	173	297	140	100	4	18	8	7
40	4.0	200	84	18	82	177	301	150	110	4	18	8.5	7.5
50	4.0	200	99	20	90	185	337	165	125	4	18	11	9
65	4.0	200	118	22	104	199	365	185	145	8	18	16	13
80	4.0	200	132	24	110	205	377	200	160	8	18	19	16
100	1.6	250	156	22	130	225	417	220	180	8	18	20	17

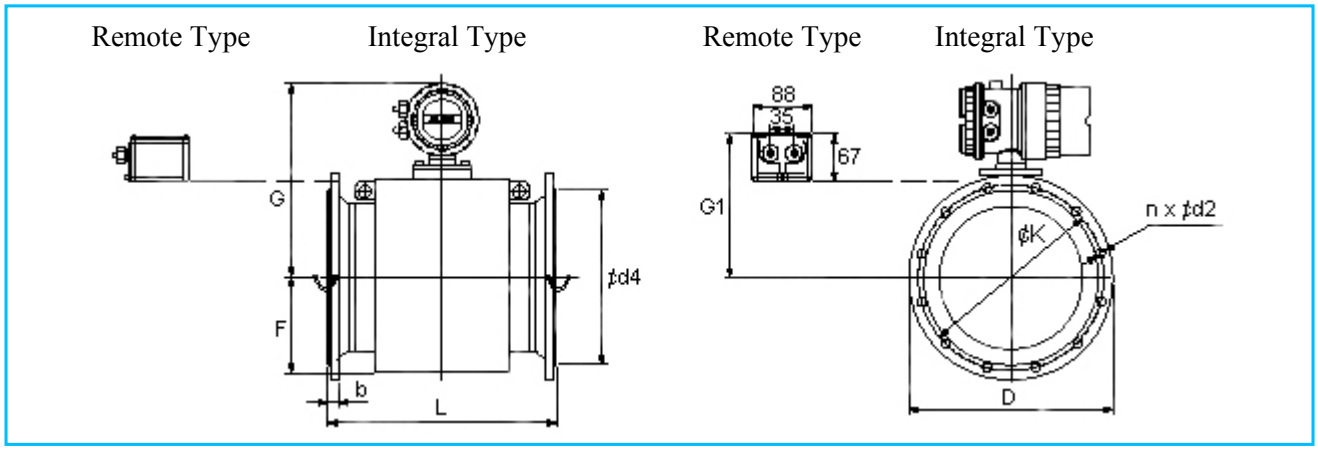
EMF F/S(F) (DN125-DN150) Flange Type

Remote Type Integral Type Remote Type Integral Type



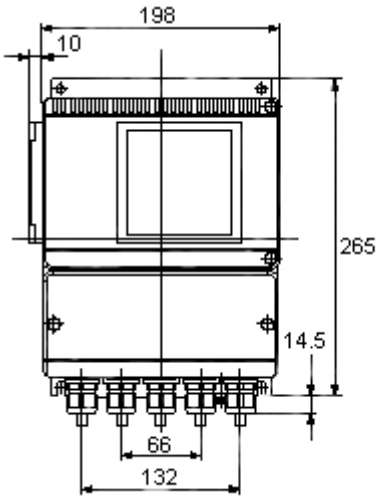
Size (mm) DN	Pressure MPa	Dimension (mm)							Process Connection Dimension (mm)				Weight (kg)	
		L	d4	b	F	G	G1	H	D	K	n	d2	Integral Type	Remote Type
125	1.6	250	184	22	130	292	199	250	250	210	8	18	31	27
150	1.6	300	211	24	150	313	220	285	285	240	8	22	33	29

EMF F/S(F) (DN200-DN1000) Flange Type

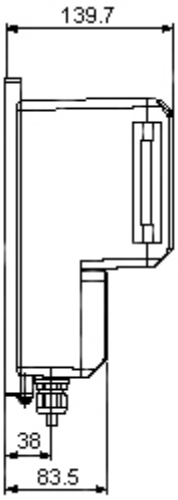


Size (mm) DN	Pressure MPa	Dimension (mm)						Process Connection Dimension (mm)				Weight (kg)	
		L	d4	b	F	G	G1	D	K	n	d2	Integral Type	Remote Type
200	1.0	350	266	24	179	344	251	340	295	8	22	55	53
200	1.6	350	266	24	179	344	251	340	295	12	22	55	53
250	1.0	450	319	26	206	386	297	405	350	12	22	81	79
250	1.6	450	319	26	206	386	297	405	355	12	26	81	79
300	1.0	500	370	28	250	415	322	512	400	12	22	86	81
300	1.6	500	370	28	250	415	322	512	410	12	26	86	81
350	1.0	500	429	26	250	430	341	505	460	16	22	131	126
350	1.6	500	429	30	250	430	341	520	470	16	26	145	140
400	1.0	600	480	26	275	456	367	565	515	16	26	160	155
400	1.6	600	480	32	275	456	367	580	525	16	30	180	175
450	1.0	600	532	28	300	480	392	615	565	20	26	178	173
450	1.6	600	532	34	300	480	392	640	585	20	30	200	195
500	1.0	600	582	28	310	492	403	670	620	20	26	196	191
500	1.6	600	609	34	310	492	403	715	650	20	33	220	225
600	1.0	600	682	30	362	543	454	780	725	20	30	230	225
600	1.6	700	720	36	362	543	454	840	770	20	36	300	292
700	1.0	700	794	30	415	595	495	895	840	24	30	319	315
700	1.6	700	794	36	415	595	495	910	840	24	36	387	383
800	1.0	800	901	32	465	645	545	1015	950	24	33	370	365
800	1.6	800	901	42	465	645	545	1025	950	24	39	435	430
900	1.0	900	1001	34	515	695	595	1115	1050	28	33	443	438
900	1.6	900	1001	44	515	695	595	1125	1050	28	39	545	540
1000	1.0	1000	1112	34	565	745	645	1230	1160	28	36	525	520
1000	1.6	1000	1112	46	565	745	645	1255	1170	28	42	725	720

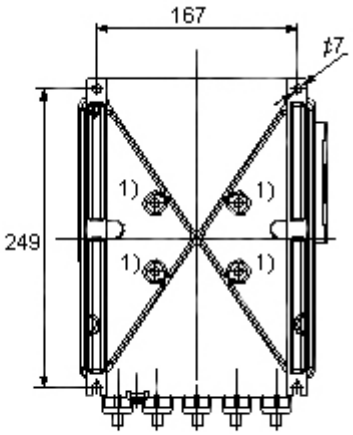
Converter of EMF Remote Type



Field Mounting Housing
with Window

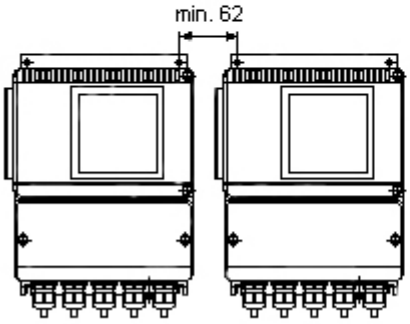


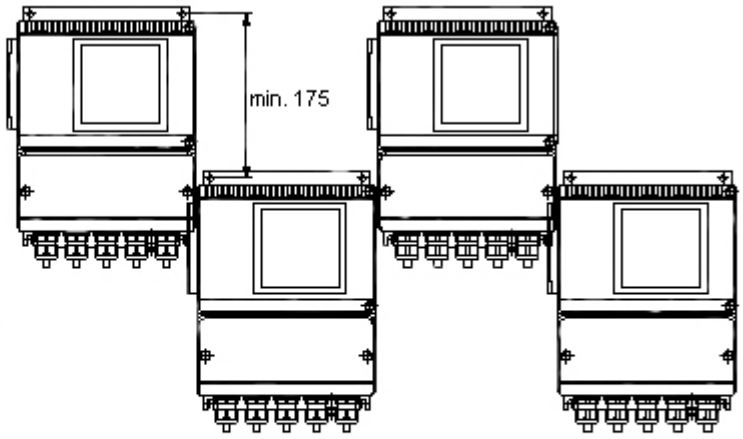
Cable Connector
M20 × 1.5



Mounting Dimensions

Mounting Kit Upon Request

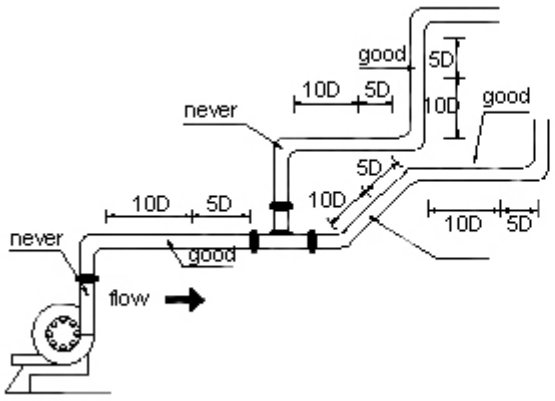




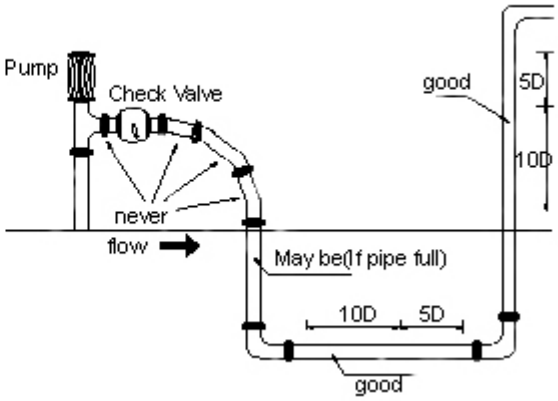
All dim's in mm

ISO Projection Method E

Sensor Installation



Site Selection

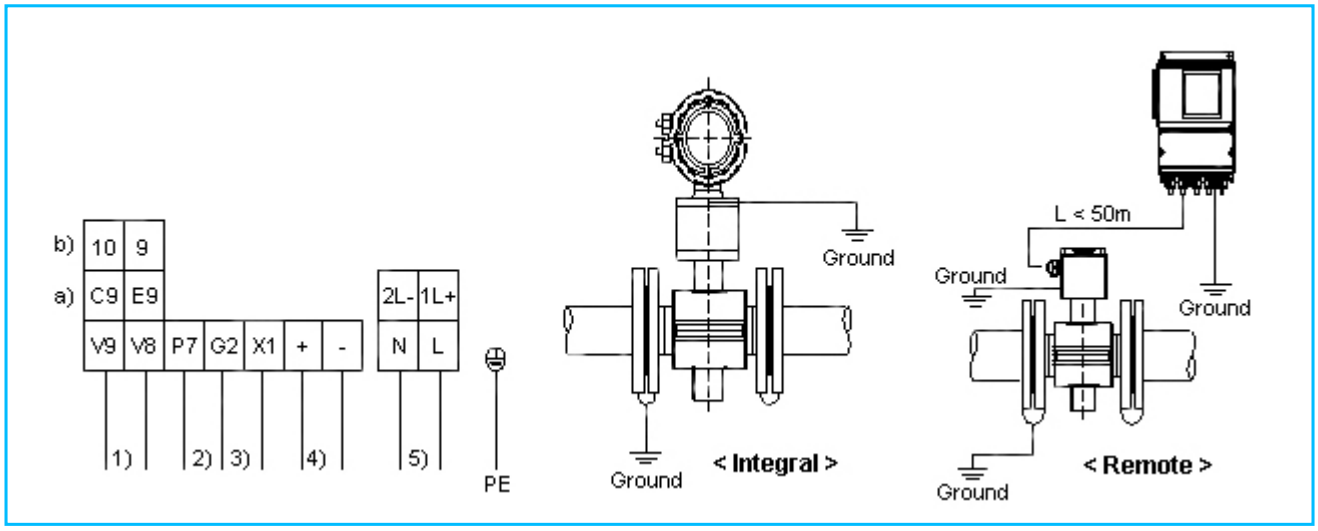


Sensor Location

Flow Range

Meter Size DN	Std. Press Rating MPa	Min. Flow Range / Flow Velocity 0 to 0.5 m/s	Max. Flow Range / Flow Velocity 0 to 10 m/s
10	4.0	0 ~ 2.25 l/min	0 ~ 45 l/min
15	4.0	0 ~ 5 l/min	0 ~ 100 l/min
20	4.0	0 ~ 7.5 l/min	0 ~ 150 l/min
25	4.0	0 ~ 10 l/min	0 ~ 200 l/min
32	4.0	0 ~ 20 l/min	0 ~ 400 l/min
40	4.0	0 ~ 30 l/min	0 ~ 600 l/min
50	4.0	0 ~ 3 m³/h	0 ~ 60 m³/h
65	4.0	0 ~ 6 m³/h	0 ~ 120 m³/h
80	4.0	0 ~ 9 m³/h	0 ~ 180 m³/h
100	1.6	0 ~ 12 m³/h	0 ~ 240 m³/h
125	1.6	0 ~ 21 m³/h	0 ~ 420 m³/h
150	1.6	0 ~ 30 m³/h	0 ~ 600 m³/h
200	1.0 / 1.6	0 ~ 54 m³/h	0 ~ 1080 m³/h
250	1.0 / 1.6	0 ~ 90 m³/h	0 ~ 1800 m³/h
300	1.0 / 1.6	0 ~ 120 m³/h	0 ~ 2400 m³/h
350	1.0 / 1.6	0 ~ 165 m³/h	0 ~ 3300 m³/h
400	1.0 / 1.6	0 ~ 225 m³/h	0 ~ 4500 m³/h
500	1.0	0 ~ 330 m³/h	0 ~ 6600 m³/h
600	1.0	0 ~ 480 m³/h	0 ~ 9600 m³/h
700	1.0	0 ~ 660 m³/h	0 ~ 13200 m³/h
800	1.0	0 ~ 900 m³/h	0 ~ 18000 m³/h
900	1.0	0 ~ 1200 m³/h	0 ~ 24000 m³/h
1000	1.0	0 ~ 1350 m³/h	0 ~ 27000 m³/h

Wiring Connection



1) a) **Scaled Pulse Output**, passive, Pulse width adjustable between 0.1 ms and 2000 ms.
Terminals : V8, V9, Function E9, C9
Optocoupler specifications :
fmax 1.3 kHz
0 V ≤ UCEL ≤ 2 V, 16 V ≤ UCEH ≤ 30 V
0 mA ≤ ICEH ≤ 0.2 mA, 2 mA ≤ ICEL ≤ 220 mA

b) **Scaled Pulse Output**, active Pulse width adjustable between 0.1 ms and 2000 ms.
Terminals : V8, V9, Function 9, 10
20 mA ≤ I ≤ 150 mA ; fmax ≤ 4 Hz, pulse width ≤ 50 ms, pulse T16 V ≤ 25 ms,
16 V ≤ U ≤ 30 V ; on/off ratio 1:4 (Ton : Toff)
fmax 1.3 kHz, 2 mA ≤ I ≤ 20 mA ; 16 V ≤ U ≤ 30 V

2) **Contact Output**, Function assigned in the software as :
System Monitor, Empty Pipe, Max. -Min. -Alarm or F/R signal, Terminals G2, P7.
Optocoupler specifications :
0 V ≤ UCEL ≤ 2 V, 16 V ≤ UCEH ≤ 30 V
0 mA ≤ ICEH ≤ 0.2 mA, 2 mA ≤ ICEL ≤ 220 mA

3) **Contact Input**, Function assigned in the software as : external Zero Return or external Totalizer Reset.
Terminals G2, X1.
Optocoupler specifications :
16 V ≤ U ≤ 30 V, Ri=2k Ω

4) **Current Output**, selectable, Terminals : +/-,
0/4-20 mA, load ≤ 600 Ω ;
0/2-10 mA, load ≤ 1200 Ω ;
0-5 mA, load ≤ 2400 Ω ;

5) **Supply Power**, see Name plate

※ The default factory setting is the Forward direction signal.

Type Selection

EMF Series Electromagnetic Flowmeter DN10-DN1000)

<Integral Type>

Ordering Number															
EMFF	Electromagnetic Flowmeter Integral type														
	Liner														
	H	Rubber (DN≥25)						**P**	PFA (DN10-100)						
	T	PTFE (DN10-800)						**Z**	Other						
		Meter Size													
		10	DN 10	**50**	DN 50			**2H**	DN 200			**5H**	DN 500		
		15	DN 15	**65**	DN 65			**2F**	DN 250			**6H**	DN 600		
		20	DN 20	**80**	DN 80			**3H**	DN 300			**7H**	DN 700		
		25	DN 25	**1H**	DN 100			**3F**	DN 350			**8H**	DN 800		
		32	DN 32	**1Q**	DN 125			**4H**	DN 400			**9H**	DN 900		
		40	DN 40	**1F**	DN 150			**4F**	DN 450			**1T**	DN 1000		
			Electrode material / Ground Electrode material 1)												
			S	0Cr18Ni12Mo2Ti / None				**E**	0Cr18Ni12Mo2Ti / With						
			B	Hastelloy B2 / None				**N**	Hastelloy B2 / With						
			H	Hastelloy C4 / None				**O**	Hastelloy C4 / With						
			M	Titanium / None				**I**	Titanium / With						
			T	Tantalum / None				**Q**	Tantalum / With						
			P	Platinum-Iridium / None				**G**	Platinum-Iridium / With						
				Pressure Rating											
				C	1.0MPa			**E**	2.5MPa			**Z**	Other		
				D	1.6MPa			**F**	4.0MPa						
					Flange material / Piping Flange										
					0	None(Wafer type) / Non		**3**	Stainless steel / None			**7**	Stainless steel / With		
					1	Carbon steel / None		**5**	Carbon steel / With						
						Accessories									
						A	None			**C**	Ground plate				
							Temperature Range								
							S	Standard temperature < 130℃							
								Protection Class							
								2	IP67						
									Supply Power						
									E3 G	High voltage 100-230V AC					
									E3 K	Low voltage 16.8-26.4V AC / 16-31.2V DC					
										Display					
										DD	Magnet Stick operation and lighted display				
											In-/Output Options				
											01	Current output+Pulse output active+Contact input+Contact output			
											03	Current output+Pulse output passive+Contact input+Contact output			
											05	Current output+Pulse passive+Contact output+RS485			
												Application			
												0	Converter housing with threads for calbe connector M20x1.5(Standard)		
EMFF							**S**	**2**		**DD**					

Type Selection

EMF Series Electromagnetic Flowmeter DN10-DN1000)

<Remote Type>

Ordering Number												
EMFS	Electromagnetic Flowmeter Remote type											
	Liner											
	H	Rubber (DN≥25)			P	PFA (DN10-100)						
	T	PTFE (DN10-800)			Z	Other						
		Meter Size										
		10	DN 10	50	DN 50	2H	DN 200	5H	DN 500			
		15	DN 15	65	DN 65	2F	DN 250	6H	DN 600			
		20	DN 20	80	DN 80	3H	DN 300	7H	DN 700			
		25	DN 25	1H	DN 100	3F	DN 350	8H	DN 800			
		32	DN 32	1Q	DN 125	4H	DN 400	9H	DN 900			
		40	DN 40	1F	DN 150	4F	DN 450	1T	DN 1000			
			Electrode material / Ground Electrode material 1)									
			S	0Cr18Ni12Mo2Ti / None		E	0Cr18Ni12Mo2Ti / With					
			B	Hastelloy B2 / None		N	Hastelloy B2 / With					
			H	Hastelloy C4 / None		O	Hastelloy C4 / With					
			M	Titanium / None		I	Titanium / With					
			T	Tantalum / None		Q	Tantalum / With					
			P	Platinum-Iridium / None		G	Platinum-Iridium / With					
				Pressure Rating								
				C	1.0MPa	E	2.5MPa	Z	Other			
				D	1.6MPa	F	4.0MPa					
					Flange material / Piping Flange							
					0	None(Wafer type) / Non	3	Stainless steel / None	7	Stainless steel / With		
					1	Carbon steel / None	5	Carbon steel / With				
						Accessories						
						A	None	C	Ground plate			
							Temperature Range					
							S	Standard temperature < 130℃				
								Protection Class				
								2	IP67 (thds, for cable connector M20 x 1.5) Std			
								3	IP68			
EMFS							S					