

EL 2200

Electromagnetic Flow Meter

Description

The EL 2200 series of electromagnetic sensors represent the state of the art for the accurate measurement for water cycle and process applications. Flow meters are available in line sizes from 1" through 16". This new generation sensor incorporates improvements to the signal protection as well as the magnetic distribution elements to create a unique electromagnetic field profile that ensures accuracy not only in turbulent flow, but also during the transitional and laminar flow regimes. The new extended linearity (EL) series meters are capable of a measurement range of more than 1000:1 without the aid of linearization software.

An electromagnetic flow meter bases its operation on the Faraday Principal, by which a conductor crossing a magnetic field generates a potential. The resultant potential is directly proportional to the flow velocity. The EL 2200 series flow meters utilize 304 stainless steel flow tube with carbon or stainless flanges, three Hastelloy C 22 electrodes are standard, with one electrode being used for ground to eliminate the need for costly grounding rings required by other manufactures. The standard liner materials are Ebonite or PTFE, with PTFE available as an option on 2" and larger meters. The flange and sensor exterior surface is coated with acrylic paint, providing excellent resistance to water.

Electronics available for the EL 2200 series consists of a base transmitter with optional panel mounted display, as well as a multiple output converter with integral display. Electronics can be mounted directly on the flow meter or remotely mounted. When the electronics are remotely mounted the entire flow meter meets IP 68 suitable for permanent immersion in water up to a depth of 10 meters.

Features

- No moving parts
- Hastelloy C 22 electrodes standard
- Grounding electrode eliminates ground rings
- Sealed electrode and coil assembly provides immunity to humidity variation and IP68 protection
- Unique field generation structure providing 1000:1 turndown
- Wide rangeability with a single unit
- No pressure drop
- Bidirectional capability



**Model EL 2200
Electromagnetic Flow Meter**

Specifications

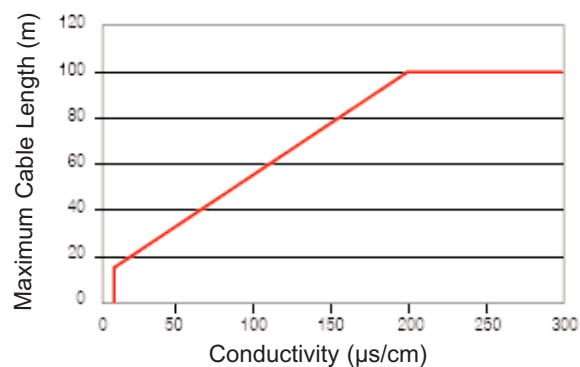
Accuracy	±0.2% of reading with velocity greater than 0.45 m/s
Repeatability	±0.1%
Max Fluid Velocity	10 m/s
Tube Material	304 Stainless steel
Line Sizes	1" to 16"
Flange Material	Stainless steel or carbon steel
Electrode Material	Hastelloy C 22 (standard)
Liner Material	Ebonite or PTFE PTFE optional 2" and above
Max Temp Range	Dependent on liner material when electronics remotely mounted Ebonite: -40° to 176° F PTFE: -40° to 356° F Note: Please contact factory if temperatures above 284° F (140° C) are required.
Max Operating Pressure	Dependent on flange rating
Max Cable Length	100 meters
Min Conductivity	5 µS/cm, 20 µS/cm for DI water
Rating	IP 68 up to a depth of 10 meters
CE Declaration	EN 61326:1997 to EN 61326/A3:2003
Straight Run	5D upstream and 3D downstream minimum

Specifications (cont'd)

Flow Tube Material	Flange Material	Electrode Material
304 stainless steel (std)	Acrylic painted carbon steel (std)	Hastelloy C-22 (std)
	316 stainless steel	Platinum
		Titanium
		Tantalum

Lining Material	Temperature Rating
Ebonite	-40° to 176° F, (-40° to 80° C)
PTFE	-40° to 356° F, (-40° to 180° C)

Maximum cable length per liquid conductivity



Meter Flow Range

Meter Model	Meter I.D. (inch)	Minimum Flow Rate (GPM)	Maximum Flow Rate (GPM)
EL2200-025	1.00	1.38	69.21
EL2200-032	1.25	2.44	122.22
EL2200-040	1.50	3.48	173.76
EL2200-050	2.00	5.57	278.30
EL2200-065	2.50	9.92	496.23
EL2200-080	3.00	13.96	697.97
EL2200-100	4.00	24.41	1220.70
EL2200-125	5.00	38.29	1914.25
EL2200-150	6.00	57.52	2875.79
EL2200-200	8.00	102.60	5130.19
EL2200-250	10.00	164.45	8222.44
EL2200-300	12.00	236.19	11809.44
EL2200-350	14.00	283.75	14187.54
EL2200-400	16.00	375.58	18778.79

* Flow rate chart based on a velocity range of 0.2 - 10 m/s. The meter will function at a turndown of 1000:1 at reduced accuracy

Note:Flow meter sizes up to 80" are available. Please contact factory for specifications.

Extended Flow Range Performance

Background

Electromagnetic flow meters use Faraday's Law of Electromagnetic Induction to determine the velocity of a liquid flowing in a pipe. They are very well known for their rugged construction, open architecture which creates minimal pressure drop, proven field experience, and their intrinsically linear response. They are typically used whenever a slightly conductive liquid flow rate needs to be measured with high precision.

In recent years there have been developments and improvements in the electronics which drive the magnetic field. Most meters now use a pulsed DC electromagnetic field versus excitation with AC or constant DC. These improvements have minimized the effects of noise, reduced drift and eliminated the need for zero adjustments. All of these changes have made electromagnetic flow meters more accurate, and have extended their use to very low conductive fluids.

Description

The EL 2200 series of flow meters represents the next evolution in technology improvements for electromagnetic flow meters. At high flow rates, almost all magmeters show a roughly linear accuracy curve. The level of accuracy will vary from one manufacture to the other dependent on the quality of the product, but in general the output is inherently linear. What distinguishes one instrument from the other is the fact that at extremely low flow rates, the linearity or accuracy decreases exponentially. The EL 2200 series is the result of research, development and testing focused on these low flow conditions.

Research for the EL 2200 focused on the magnetic field itself, in particular the arrangement of the field within the sensor. The optimum magnetic field not only needs to operate within the well defined fully developed turbulent flow profile, but also within the transient conditions and the laminar flow velocity profile. Based on this research improvements were made to the arrangement of the signal protection as well as the magnetic distribution elements.

The results of these product improvements are demonstrated in Figure 1. The performance of meters from four of the leading magmeter manufactures were compared to an EL 2200 over the full operating range. The meters tested were 3" flanged units and all five meters were tested on the same calibration stand under like conditions.

Figure 1

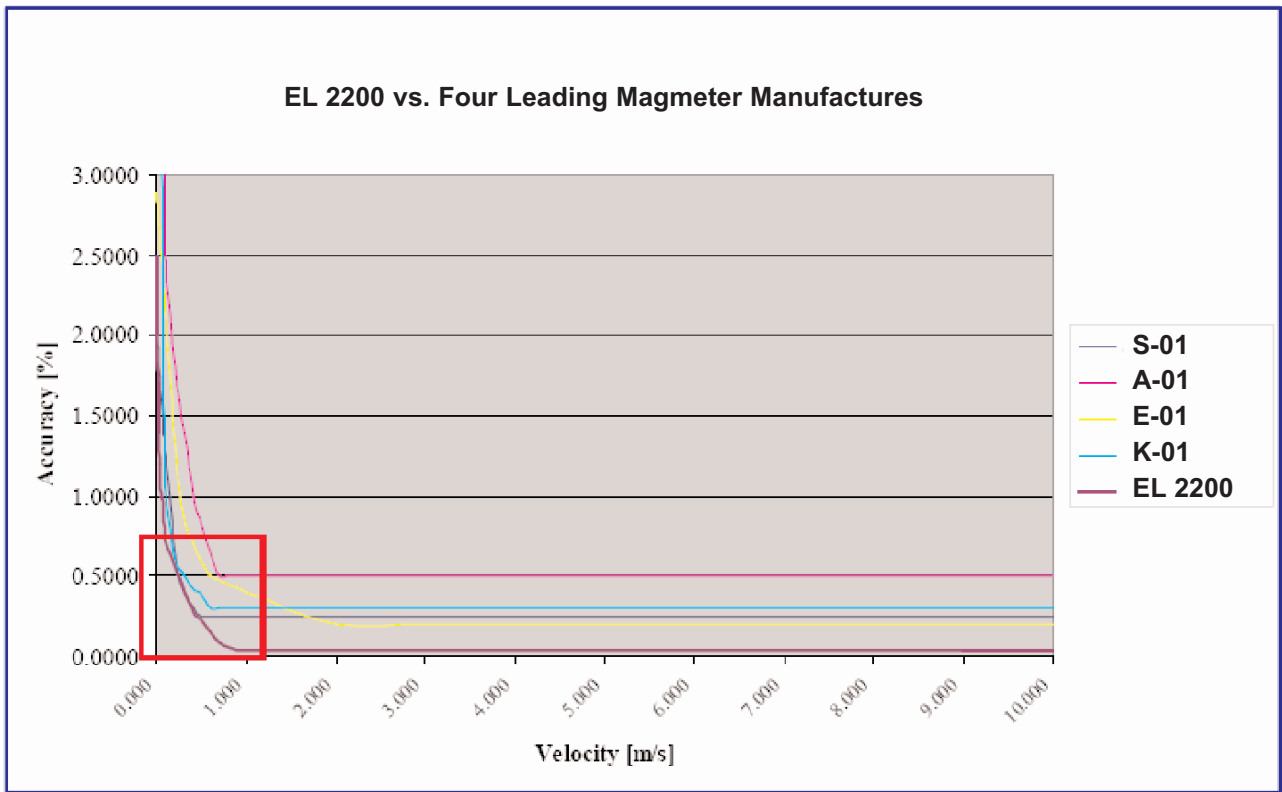
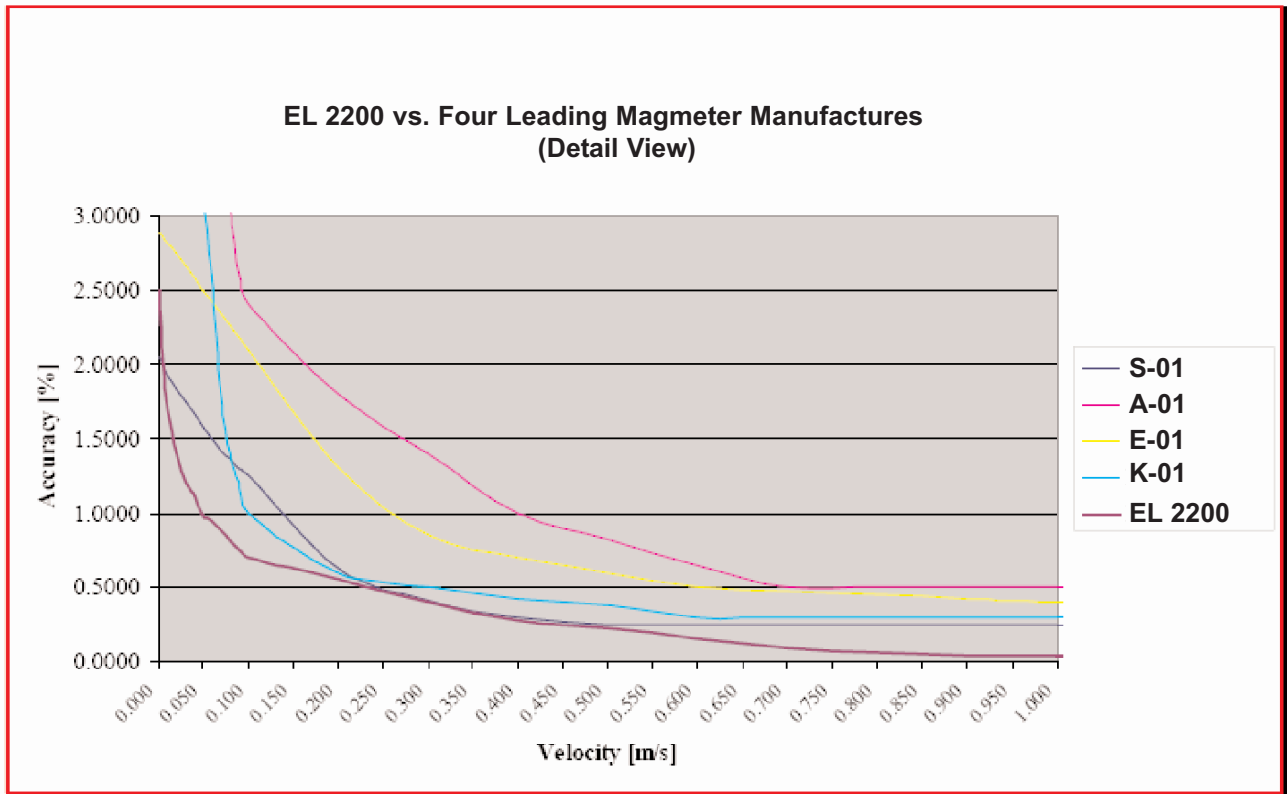


Figure 2 below shows an exploded view of the high lighted area indicated in Figure 1.

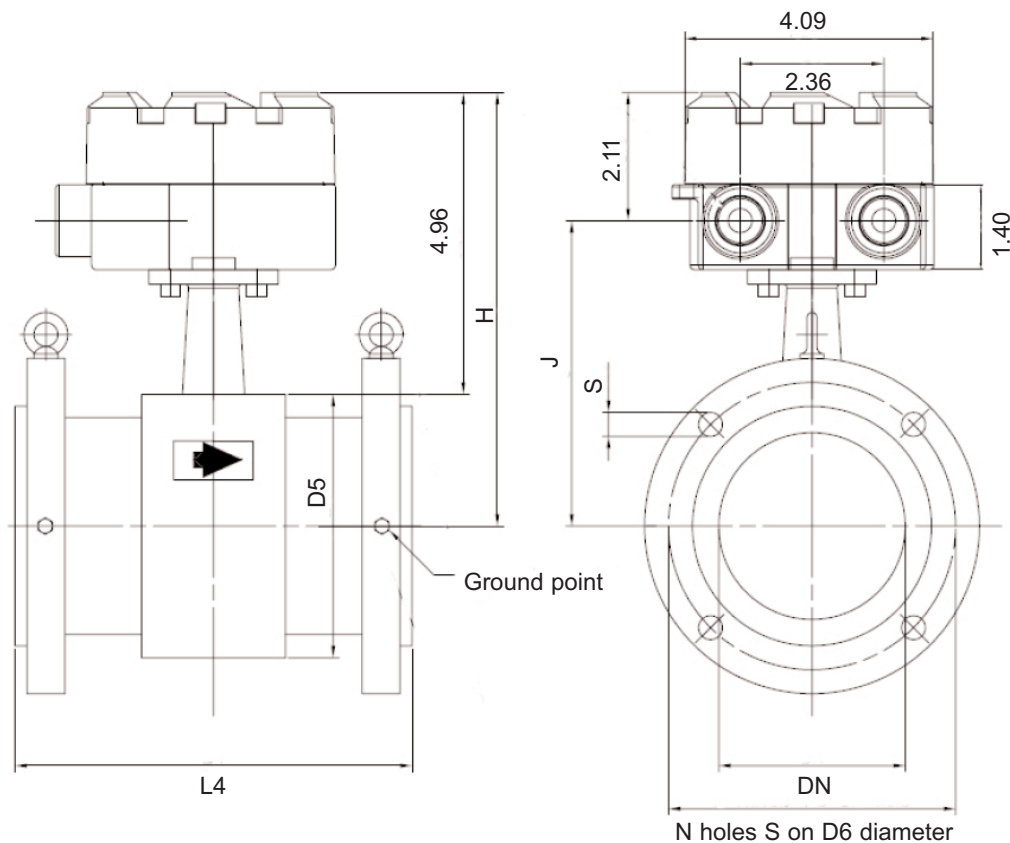
Figure 2



Conclusion

The accuracy of the typical electromagnetic flow meter starts to degrade at approximately a 14:1 turndown ratio from the maximum velocity rating. The benefits of the research focused on improving the low velocity performance of the EL 2200 series meters can be seen in this competitive performance testing. The EL 2200 series flow meters achieved a higher level of accuracy than the competitive meters throughout the entire operating range. Starting at approximately 0.7 m/s the accuracy of the competitive equipment began to degrade while the EL 2200 meter maintained an accuracy of less than 0.5% down to 0.25 m/s. Typically a 1% accuracy all the way down to 0.04m/s can be expected from the EL 2200 series as compared to values much higher for traditional meters. This improved performance allows the Flow Technology EL 2200 meters to provide a much wider usable flow range while maintaining a higher level of accuracy.

Dimensions



EL 2200 with ANSI 150 RFF

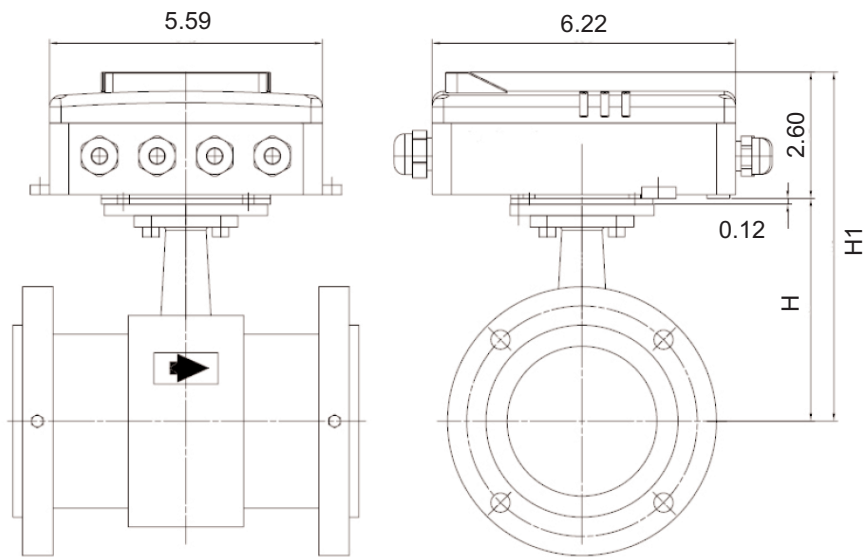
EL 2200 with ANSI 300 RFF

DN	D5	L4	J	D6	N	S	H	DN	D5	L4	J	D6	N	S	H
Inch	Inch	Inch	Inch	Inch	#	Inch	Inch	Inch	Inch	Inch	Inch	Inch	#	Inch	Inch
1.00	2.52	7.87 0/- .12	4.11	3.12	4	0.626	6.22	1.00	2.52	7.87 0/- .12	4.11	3.50	4	0.748	6.22
1.25	3.03	7.87 0/- .12	4.37	3.50	4	0.626	6.48	1.25	3.03	7.87 0/- .12	4.37	3.87	4	0.748	6.48
1.50	3.23	7.87 0/- .12	4.47	3.87	4	0.626	6.57	1.50	3.23	7.87 0/- .12	4.47	4.50	4	0.748	6.57
2.00	3.86	7.87 0/- .12	4.78	4.75	4	0.748	6.89	2.00	3.86	7.87 0/- .12	4.78	5.00	8	0.874	6.89
2.50	4.49	7.87 0/- .12	5.10	5.50	4	0.748	7.20	2.50	4.49	7.87 0/- .12	5.10	5.87	8	0.874	7.20
3.00	5.00	7.87 0/- .12	5.35	6.00	4	0.748	7.46	3.00	5.00	7.87 0/- .12	5.35	6.63	8	0.874	7.46
4.00	5.98	9.84 0/- .12	5.85	7.50	8	0.748	7.95	4.00	5.98	9.84 0/- .12	5.85	7.87	8	0.874	7.95
5.00	7.01	9.84 0/- .12	6.36	8.50	8	0.874	8.46	5.00	7.01	9.84 0/- .12	6.36	9.25	8	0.874	8.46
6.00	8.11	11.81 0/- .12	6.91	9.50	8	0.874	9.02	6.00	8.11	11.81 0/- .12	6.91	10.63	12	0.874	9.02
8.00	10.12	13.78 0/- .12	7.91	11.75	8	0.874	10.02	8.00	10.12	13.78 0/- .12	7.91	13.00	12	1.000	10.02
10.00	12.24	17.72 0/- .19	8.98	14.24	12	1.000	11.08	10.00	12.24	17.72 0/- .19	8.98	15.25	16	1.126	11.08
12.00	14.25	19.69 0/- .19	9.98	17.00	12	1.004	12.09	12.00	14.25	19.69 0/- .19	9.98	17.75	16	1.248	12.09
14.00	15.51	21.65 0/- .19	10.61	18.75	12	1.126	12.72	14.00	15.51	21.65 0/- .19	10.61	20.25	20	1.248	12.72
16.00	17.48	23.62 0/- .19	11.59	21.25	16	1.126	13.70	16.00	17.48	23.62 0/- .19	11.59	22.50	20	1.374	13.70

Note: DIN flanges are available, please contact factory for information.

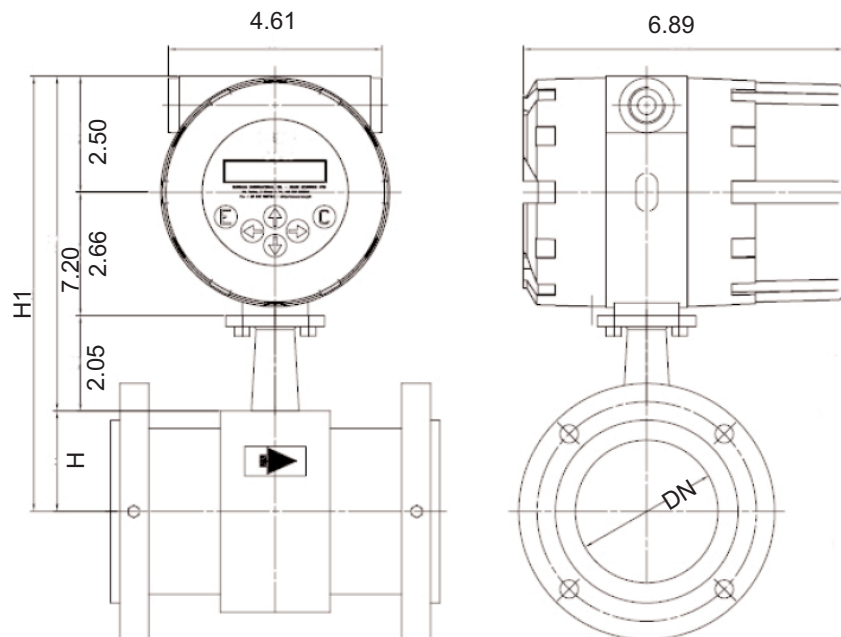
Dimensions

EL 2200 with MC 106 mounted

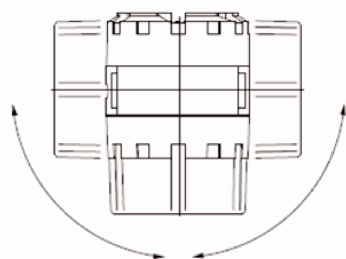


Size	H	H1
Inch	Inch	Inch
1.00	3.66	6.26
1.25	3.92	6.52
1.50	4.02	6.61
2.00	4.33	6.93
2.50	4.65	7.24
3.00	4.90	7.50
4.00	5.39	7.99
5.00	5.91	8.50
6.00	6.46	9.06
8.00	7.46	10.06
10.00	8.52	11.12
12.00	9.53	12.13
14.00	10.16	12.76
16.00	11.14	13.74

EL 2200 with MC 308C mounted



Size	H	H1
Inch	Inch	Inch
1.00	1.26	8.46
1.25	1.52	8.72
1.50	1.61	8.82
2.00	1.93	9.13
2.50	2.24	9.45
3.00	2.50	9.70
4.00	2.99	10.20
5.00	3.50	10.71
6.00	4.06	11.26
8.00	5.06	12.26
10.00	6.12	13.33
12.00	7.13	14.33
14.00	7.76	14.96
16.00	8.74	15.94



Possible Rotation Angle

Weights (without packing)

Meter Model	Size	ANSI 150	ANSI 300
	Inch	lb	lb
EL2200-025	1.00	15	18
EL2200-032	1.25	10	22
EL2200-040	1.50	22	29
EL2200-050	2.00	22	29
EL2200-065	2.50	33	37
EL2200-080	3.00	35	49
EL2200-100	4.00	46	66
EL2200-125	5.00	64	88
EL2200-150	6.00	71	123
EL2200-200	8.00	154	176
EL2200-250	10.00	159	240
EL2200-300	12.00	223	320
EL2200-350	14.00	249	399
EL2200-400	16.00	309	556

Compatible Electronics

MC 308C Series Features



- High end controller
- Batching
- Bi directional functionality
- AC and DC versions
- Low power consumption mode
- 2 line 16 character display
- Digital outputs
- Analog outputs
- Alarm outputs

MC 106 Series Features



- Base level transmitter
- Frequency output
- Analog output
- AC and DC versions
- 2 line 16 character display
- Alarm output

Model Number

EL2200										
Code	Size	Code	Size							
-025	1"	-125	5"							
-032	1.25"	-150	6"							
-040	1.5"	-200	8"							
-050	2"	-250	10"							
-065	2.5"	-300	12"							
-080	3"	-350	14"							
-100	4"	-400	16"							
Code	Fitting	Code	Fitting							
A15	ANSI 150	U16	UNI PN 16							
A30	ANSI 300	U25	UNI PN 25							
A60	ANSI 600	U40	UNI PN 40							
U10	UNI PN 10									
Flange Material		Coil Housing Material		Code						
Carbon Steel (std)		Carbon Steel (std)		F						
316 Stainless Steel		304 Stainless Steel		S						
Lining Material				Code						
PTFE (std. on 1" and 1.5")				P						
Ebonite / hard rubber (std. on all sizes)				E						
Electrode Configuration			Code							
3 electrodes in Hastelloy C (std)			5							
3 electrodes in platinum			6							
3 electrodes in titanium			3							
3 electrodes in tantalum			8							
4 electrodes in Hastelloy C (used for empty pipe detection)			F							
4 electrodes in titanium (used for empty pipe detection)			G							
Mounting Configuration				Code						
Electronics mounted on meter				C						
Remote mounted electronics (cable ordered separately)				S						
IP 68 (maximum submersion depth)				Code						
1.5 m				A						
10 m				B						

Note:Flow meter sizes up to 80" are available. Please contact factory for specifications.



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