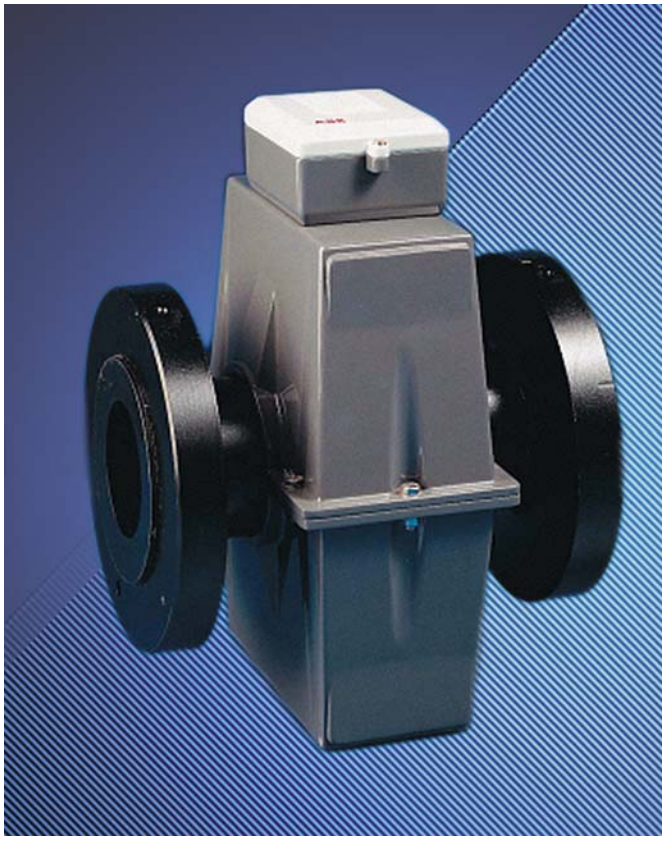
Data Sheet
D-FMP-MagMaster-MFE_8 (US)

Electro-Magnetic Flowmeters
Sensors
MagMaster MFE

- **Unrivalled flow performance**
  – ±0.2% accuracy.
- **Pulsed DC Technology Incorporates Benefits of AC Systems**
- **Operable flow range of 1000:1.**
- **Two-year warranty.**
- **Submersible and buriable sensors.**
- **FM approved and CSA certified for hazardous locations.**
- **Bi-directional flow metering system.**
- **Designed, manufactured and calibrated to internationally accepted standards**
  – ISO 9001/UKAS(NAMAS)/NIST/NATA
  – insures reliable, maintenance-free operation
- **CalMaster In-situ verification system enabled**



MagMaster MFE
Electro-Magnetic Sensors

INTRODUCTION

MAGMASTER flowmeters provide new levels of flow measurement and performance with an exclusive sensor design featuring ultra-linear magnetics and a patented signal processing system. The MagMaster utilizes pulsed DC technology coupled with the benefits of AC design.

Two modes – Process MAGMASTER and Slurry MAGMASTER are available in a wide range of sizes and options including electrode materials, liner materials and transmitter capabilities.

SPECIFICATIONS

Configuration:
Transmitter may be integral with sensor for sizes 1/2 to 16-inches (15-400mm) or remote from sensor for all sizes.

Separation (remote transmitters):
The maximum cable length is 330 feet. Longer lengths are special order.

Accuracy (under forward flow reference conditions) with MagMaster Transmitter

Flanged sensors:
Display, Serial communications, Frequency output:
±0.2% of reading or ±0.003 ft/sec (0.001m/s) (whichever is greater) up to a maximum velocity of >49 ft/sec (15m/s). See Figure below.

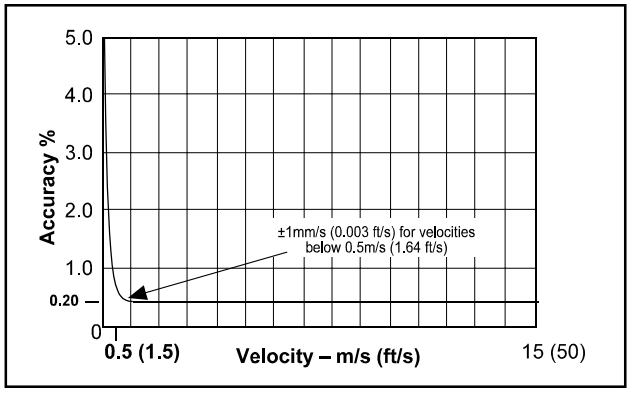
Analog output:
As Frequency output plus ±0.008mA.

Pressure effect:
Less than 0.15% over the operating range of the instrument.

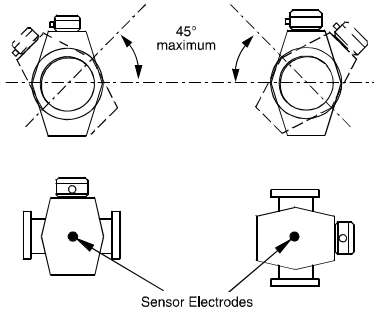
Temperature effect:
Sensor: <±0.03% of rate per 10°C.

Repeatability & Reproducibility:
±0.05% or ±.0008ft/s (±0.25mm/s), whichever is greater.

Conductivity:
Liquids and slurries having a conductivity of not less than 5µS/cm (5µmho/cm).

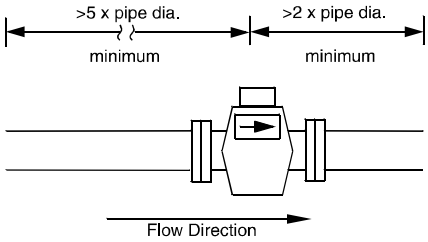


Mounting:
Directly into pipeline at any orientation. Electrodes can not be in vertical plane. Flow must be up if installed in a vertical pipe.



Recommended Mating Pipe Conditions:

Upstream: 5 to 10 diameters straight pipe depending on performance requirements and upstream disturbance.
Downstream: 2 to 3 diameters straight pipe depending on performance requirements and downstream disturbances.



Power consumption:
Less than 20VA with transmitter.

Hazardous Area Certification:
FM approved and CSA certified for Class I, Div. 2, Groups A, B, C, D hazardous locations.

NOTE: FM approved sensors for hazardous locations include an intrinsic safety shunt circuit for the electrodes allowing for a Div. 1 rating inside the pipe. The circuit is located in the larger than standard terminal box housing. CSA certified sensors for hazardous locations may or may not include the circuit, depending on the rating inside the pipe.

Calibration:
3 point, 8 point, witnessed, NIST/NAMAS, slurry calibration options.Calmaster fingerprinting.

Sensor cable connection:
0.5 inch NPT--single opening. A single cable is available that provides for the coil drive and electrode signals. See Options.

SPECIFICATION – SENSORS

MAGMASTER sensors are available in flanged styles and come in a wide choice of lining and electrode materials to satisfy all applications. (Refer to **Table B** for option details.)

Sizes (Nominal Bore):
1/2-inch to 80-inches (15mm to 2000mm).

Metering Tube:
Lined stainless steel. (304 SST)

Lining:
PFA-Perfluoroalkoxy fluorocarbon (chemically resistant to almost all liquids), Elastomer - chlorobutyl rubber and EPDM, Polyurethane, Neoprene and NSF 61 approved Elastomer.

Electrodes:
Non-removable, 316 S.S, Hastelloy C, Titanium, Tantalum and Platinum/Iridium. Treated titanium for pulp and paper applications where concentrations of stock are greater than 5% or liquid contains long fibers regardless of the concentration. Tungsten carbide coated electrodes for high abrasion mining, cement or flash applications.

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Hastelloy® is a registered trademark of Haynes International, Inc.

Grounding Electrode:
Fitted as standard in flanged meters, 1/2 in. to 6 in. (15 to 150 mm), in the same material as measuring electrodes.

Note: Pressure Limitations
Flanged meters:
Sizes 0.5-inch to 80-inch (15mm to 2000mm): maximum pressure dictated by flange rating.

Process Connections:
Flanged meter-Carbon steel flanges to mate with BS4504, DIN, UNI, AFNOR, ANSI, AS2129 and BS10 flanges.

Temperature:
Sensors (with integral transmitters):
Ambient: 14 to 140°F (–10 to +60°C)
Process Fluid:
Polyurethane lining: 14 to 158°F (–10 to +70°C)
All other linings: 14 to 176°F (–10 to +80°C)
Ambient and process fluid is limited to 14 to 176°F (-10° to 60°C) for the integral CSA-certified hazardous area meter
Sensors (remote transmitter): see **Table A**.

Environmental Protection:
Sensors with integral transmitters:
NEMA 4X/IP65
Flanged sensors, with remote transmitters*:
NEMA 6P/IP68 with potted terminal box and cable - up to 33 ft (10m) depth.
Buriable:
3 ft. (1m) to 16 ft. (5m) depth (to top of sensor).

**NOTE: All remote sensors are supplied with potting compound for sealing on-site or can be ordered with cable connected to sensor and terminal box potted.*

Sensor Housing:
Flanged meters:
1/2 to 6-inch (15-150mm) Cast aluminum alloy, Epoxy coated.
Approved/certified & High temperature meters:
8- to 80-inch (200 to 2000mm) Fabricated steel.

Table A - Temperature Limits for Sensors (Remote Transmitter) at -30 to 140°F (-35 to 60°C) Ambient

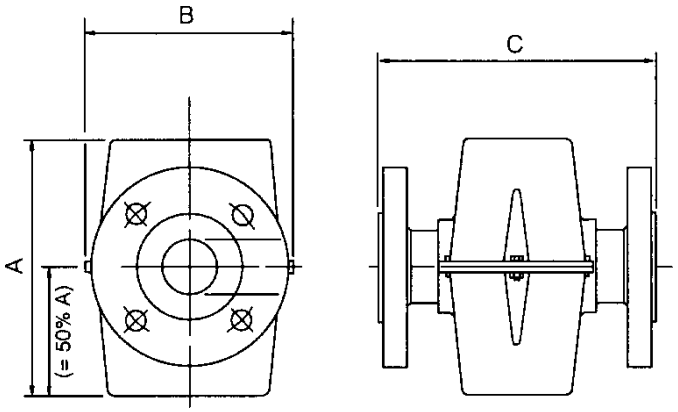
	Liner Material vs Process Fluid Temperature Maximum (°C/°F)		
Sensor Construction	*Teflon*	*Polyurethane Elastomer*	*Neoprene*
ABB Standard, Non-hazardous, 1/2" to 6", metal cased 8" to 80"	120/248	70/158	110/230
FM approved, CSA certified, Non-Hazardous, high temp., 1/2" to 80"	120/248	70/158	110/230
FM approved, CSA certified, Hazardous, high temp., 1/2" to 80"	120/248 *	70/158	110/230 *
FM approved, CSA certified, Non-Hazardous, 1/2" to 80"	80/176	70/158	80/176
FM approved, CSA certified, Hazardous, standard temp., 1/2" to 80"	60/140	60/140	60/140

** Note: 8- to 80-inch (200 –2000mm) sizes limited to 100°C (212°F)*

DIMENSIONS AND APPROXIMATE SHIPPING WEIGHT

1/2- to 6-inch (15 to 150mm) flanged sensors without transmitter or terminal box

Meter Size		A		B		C		Net Weight	
mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
15	0.5	174	6.9	140	5.5	200	7.9	9	20
20	0.75	174	6.9	140	5.5	200	7.9	9	20
25	1	210	8.3	176	6.9	200	7.9	10	22
40	1.5	210	8.3	176	6.9	200	7.9	12	27
50	2	210	8.3	176	6.9	200	7.9	14	31
65	2.5	280	11	219	8.6	200	7.9	19	42
80	3	280	11	219	8.6	200	7.9	20	44
100	4	312	12.3	230.5	9.1	250	9.9	28	62
150	5.9	370	14.6	281	11.1	300	11.8	39	86

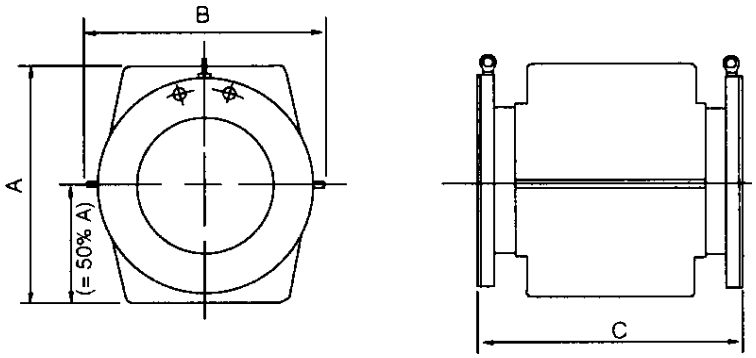


Polyurethane and PFA are raised face linings

DIMENSIONS AND APPROXIMATE SHIPPING WEIGHT

8-inch to 24-inch (200 to 600mm) flanged sensors without transmitter or terminal box

Meter Size		A		B		C (w / liners)		Net Weight	
mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
200	8	400	15.7	396	15.6	418	16.5	52	115
250	10	446	17.6	455	17.9	488	19.2	80	176
300	12	508	20	510	20.1	538	21.2	108	238
350	14	560	22	562	22.1	568	22.4	120	264
400	16	614	24.2	596	23.5	618	24.3	186	410
450	18	656	25.8	640	25.2	698	27.5	210	462
500	20	710	28	700	27.6	768	30.2	266	586
600	24	810	31.9	810	31.9	918	36.1	378	832



Polyurethane and FEP are raised face linings

DIMENSIONS AND APPROXIMATE SHIPPING WEIGHT

28-inch to 80-inch (700 to 2000mm) flanged sensors without terminal box

Meter Size NB		Length A		Approx Weight (10lb bar flanges)	
mm	inch	mm	inch	kg	lb
700	28	1140	44.9	530	1166
760	30	1200	47.2	600	1320
800	32	1270	50.0	610	1345
900	36	1410	55.5	770	1694
1000	39	1550	61.0	1000	2205
1050	42	1617	63.7	1250	2750
1200	48	1812	71.3	1400	3080
1400	54	2112	83.1	1800	3960
1500	60	2262	89.1	1950	4290
1600	66	2414	95.0	2620	5764
1800	72	2250	88.6	2400	5280
2000	80	2500	98.4	3200	7040

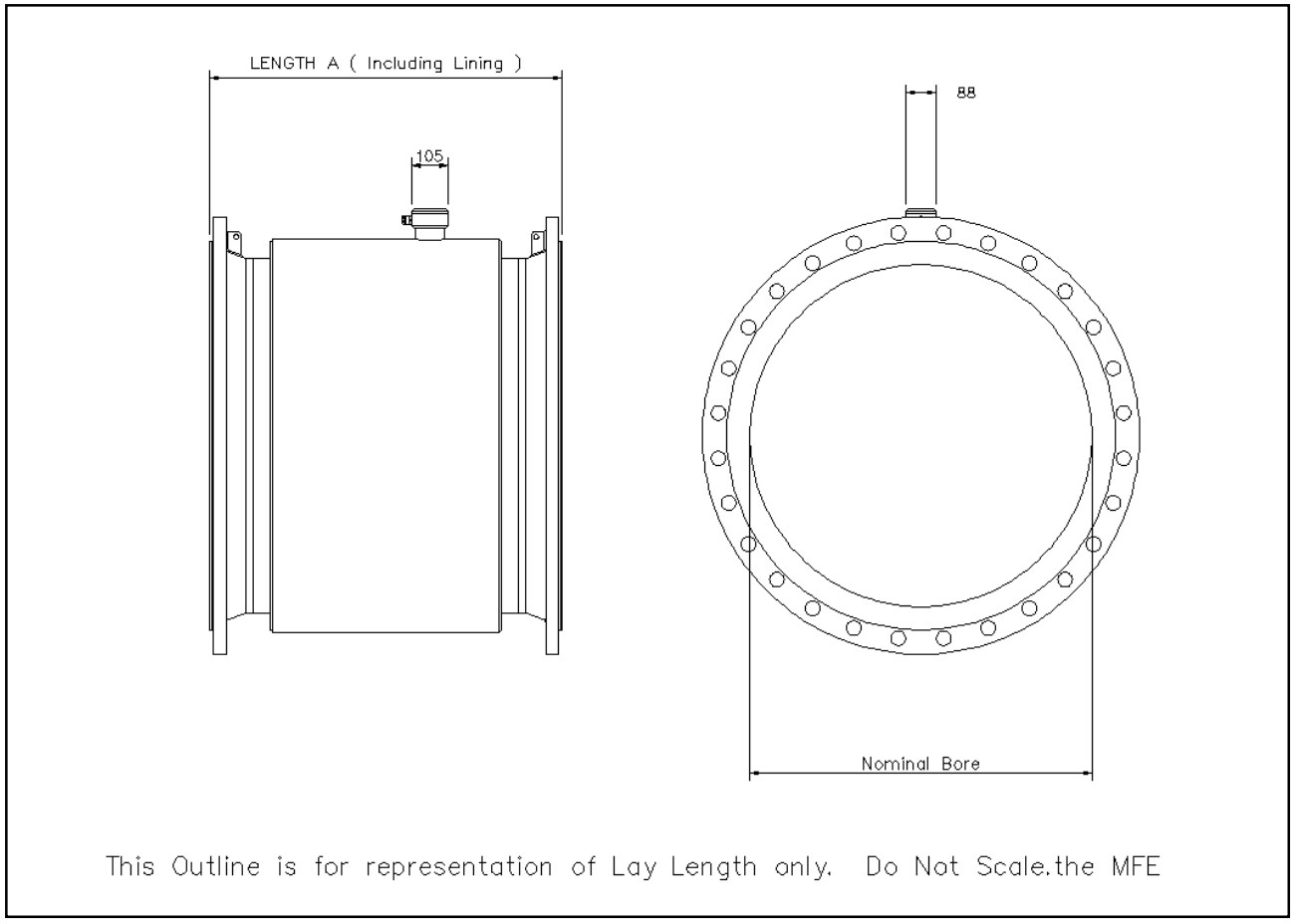


Table B - CAPACITY TABLE - Flowmeter Sizing

Size		USGPMs				
mm	Inches	Operable Minimum Flow	Flow Rate Deviation (See Note 1)	Minimum Flow at Rated Accuracy	Maximum Flow @ 10m/s (33ft./sec)	Standard Calibrated range (See Note 2)
15	0.5	0.03	0.003	1.4	28	10
20	0.75	0.05	0.005	2.5	49	15
25	1	0.08	0.008	3.9	77	25
40	1.5	0.2	0.02	10	199	60
50	2	0.31	0.031	15.6	311	100
65	2.5	0.53	0.053	26.3	525	150
80	3	0.8	0.08	39.8	796	225
100	4	1.24	0.12	62.2	1244	400
150	6	2.8	0.28	140	2800	900
200	8	4.98	0.5	249	4980	1500
250	10	7.78	0.78	389	7780	2000
300	12	11.2	1.12	560	11,202	3000
350	14	15.2	1.5	762	15,248	4000
400	16	19.9	2	996	19,916	5000
450	18	25.2	2.5	1260	25,209	6000
500	20	31.1	3.1	1556	31,122	7500
600	24	44.8	4.5	2240	44,812	10,000
700	28	61	6.1	3046	60,920	
760	30	67	6.7	3347	66,930	
800	32	80	8.0	3978	79,560	
900	36	101	10.1	5035	100,700	
1000	40	124	12.4	6215	124,300	
1050	42	150	15.0	7520	150,400	
1200	48	179	17.9	8950	179,000	
1400	54	244	24.4	12185	243,700	
1500	60	280	28.0	13985	279,700	
1600	66	318	31.8	15915	318,300	
1800	72	403	40.3	20140	402,800	
2000	80	497	49.7	24865	497,300	

Note 1:

Flow rate deviation listed is the plus and minus inaccuracy in terms of USGPM for all flows below the Minimum Flow at Rated Accuracy column. These values apply to the pulse/frequency/displayed output of flanged meters.

Note 2:

The transmitter is set to this range for the 4-20 mA output unless otherwise specified.

Table C - Piping Configuration Chart

Configuration	Up Stream	Down Stream	Comments
Elbow	0 – 3 *	None	
Tee	3	None	
Reducers	None	None	<15º
Control Valves	10	2	
Gate Valves	None	None	Fully open
Check Valves	10	None	
Butterfly Valves	10	2	
Pump	10	None	
Magmeter accuracies of 1% can be achieved with these configurations			

** Depending on electrode orientation*

Electro-Magnetic Flowmeters Magmaster-MFE Remote/Integral		**MFE**
	Standard Product =	
		Code
1 : Bore Size		
0.5 in (15mm)		**150**
0.75 in (20mm)		**200**
1 in (25mm)		**250**
1.5 in (40mm)		**400**
2 in (50mm)		**500**
2.5 in (65mm)		**650**
3 in (80mm)		**800**
4 in (100mm)		**101**
6 in (150mm)		**151**
8 in (200mm)		**201**
10 in (250mm)		**251**
12 in (300mm)		**301**
14 in (350mm)		**351**
16 in (400mm)		**401**
18 in (450mm)		**451**
20 in (500mm)		**501**
24 in (600mm)		**601**
28 in (700mm)		**701**
2 : Flanged Styyle End Connections		
Standard, Flanged ANSI Class 150 compatible Fully rated, 0.5 to 24 inch	(Note: 1)	**3**
Flanged ANSI Class 300 compatible, Fully rated, 8 to 28 inch	(Note: 2)	**K**
Flanged AWWA C207 Class B, Fully rated, 8 to 28 inch	(Note: 3)	**U**
Flanged AWWA C207 Class D, Fully rated, 8 to 28 inch	(Note: 3)	**V**
3 : Lining Materials		
Teflon bonded FEP, 8 in. (200mm)	(Note: 4)	**3**
Teflon bonded FEP, 10 in. (250mm)	(Note: 5)	**3**
Teflon bonded FEP, 12 in. (300mm)	(Note: 6)	**3**
Teflon bonded FEP, 14 in. (350mm)	(Note: 7)	**3**
Teflon bonded FEP, 16 in. (400mm)	(Note: 8)	**3**
Elastomer, 2 ... 28 in. (50mm-700mm)	(Note: 9)	**4**
Polyurethane, 1 ... 24 in. (25mm-600mm)	(Note: 10)	**6**
Teflon (PFA), 0.5 to 6 in. (15mm-150mm)	(Note: 11)	**7**
Neoprene, 8 to 24 inches (200mm-600mm)	(Note: 12)	**8**
Elastomer NSF61 approved (50mm-700mm)		**E**

MFE		**Code**
4 : Electrodes		
316 Stainless Steel		**1**
Hastelloy C		**2**
Titanium		**3**
Tantalum, 0.5 through 6 inches (15mm-150mm)	(Note: 11)	**4**
Tantalum, > 8 inches (> 200mm)	(Note: 3)	**4**
Platinum/Iridium, 0.5 through 6 inches (15mm-150mm)	(Note: 11)	**5**
Platinum/Iridium, > 8 inches (> 200mm)	(Note: 3)	**5**
Tungsten Carbide Coated 316SST (For Mining, Cement, Flash Applications)		**6**
Treated Titanium Slurry Electrode (only with slurry calibration & slurry mode transmitter)		**8**
316 Stainless Steel, Slurry Calibration		**A**
Hastelloy "C", Slurry Calibration		**B**
5 : Sensor Construction		
ABB standard, Non-hazardous location.		**1**
ABB standard, Non-hazardous location. Metal case for 8 through 24 inches. High process temperature	(Note: 2)	**4**
FM approved, CSA certified non-incendive for Class I, Div 2, Groups A,B,C,D hazard. locations, intrinsically safe electrodes, remote transmitter only		**6**
FM approved, CSA certified non-incendive for Cl. I, Div. 2 'Groups A,B,C,D, hazardous locations, intrinsically safe electrodes, remote sensor only High temperature process fluid temperature		**7**
FM approved, CSA certified non-hazardous locations Standard temperature range		**8**
FM approved, CSA certified for non-hazardous locations High temperature process temperature Remote transmitter only		**D**
6 : Accessories		
None		**0**
0.5 in. Grounding ring (one piece)	(Note: 13)	**1**
1 in. Grounding ring (one piece)	(Note: 14)	**1**
1.5 in. Grounding ring (one piece)	(Note: 15)	**1**
2 in. Grounding ring (one piece)	(Note: 16)	**1**
2.5 in. Grounding ring (one piece)	(Note: 17)	**1**
3 in. Grounding ring (one piece)	(Note: 18)	**1**
4 in. Grounding ring (one piece)	(Note: 19)	**1**
6 in. Grounding ring (one piece)	(Note: 20)	**1**
8 in. Grounding ring (one piece)	(Note: 4)	**1**
10 in. Grounding ring (one piece)	(Note: 5)	**1**
12 in. Grounding ring (one piece)	(Note: 6)	**1**
14 in. Grounding ring (one piece)	(Note: 7)	**1**
16 in. Grounding ring (one piece)	(Note: 8)	**1**
18 in. Grounding ring (one piece)	(Note: 21)	**1**
20 in. Grounding ring (one piece)	(Note: 22)	**1**
24 in. Grounding ring (one piece)	(Note: 23)	**1**
0.5 in. Grounding ring (two piece)	(Note: 13)	**8**
1 in. Grounding ring (two piece)	(Note: 14)	**8**
1.5 in. Grounding ring (two piece)	(Note: 15)	**8**
2 in. Grounding ring (two piece)	(Note: 16)	**8**
2.5 in. Grounding ring (two piece)	(Note: 17)	**8**
3 in. Grounding ring (two piece)	(Note: 18)	**8**
4 in. Grounding ring (two piece)	(Note: 19)	**8**
6 in. Grounding ring (two piece)	(Note: 20)	**8**
8 in. Grounding ring (two piece)	(Note: 4)	**8**
10 in. Grounding ring (two piece)	(Note: 5)	**8**
12 in. Grounding ring (two piece)	(Note: 6)	**8**

MFE		**Code**
6 : Accessories (Cont.)		
14 in. Grounding ring (two piece)	(Note: 7)	**8**
16 in. Grounding ring (two piece)	(Note: 8)	**8**
18 in. Grounding ring (two piece)	(Note: 21)	**8**
20 in. Grounding ring (two piece)	(Note: 22)	**8**
24 in. Grounding ring (two piece)	(Note: 23)	**8**
7 : Calibration		
Standard, 3-point calibration, no pressure test		**A**
8-point Calibration, no Pressure Test 0.5 ... 6 in. (15mm ... 150mm)	(Note: 11)	**B**
8-point Calibration, no Pressure Test > 8 in. (200mm)	(Note: 3)	**B**
Custom calibration		**9**
CalMaster 1 Fingerprint with 3-point Calibration, no pressure test		**I**
8 : Unused		
Unused		**0**
9 : Unused		
Unused		**0**
10 : Glanding		
Conduit entry: 0.5 in. NPT - order cable and length per OPTIONS		**4**
Conduit entry: 0.5 in. NPT - cable fitted and potted order cable and length per OPTIONS		**8**
11 : Transmitter Type		
Sensor built for integral mounted MagMaster transmitter (< 16 in. only)	(Note: 25)	**EH**
Sensor built for Remote MagMaster transmitter		**ER**

OPTIONS: Cable, sensor/transmitter (list number of feet)
Standard, Can be used with FM/CSA approved instruments STT3350
Submersible-Waterproof. Cannot be used with FM/CSA approved instruments STT3500

Note A: FM approved, CSA certified sensors or transmitter must be part of an approved/certified MAGMASTER system.
Note B: Cable must be priced separately. See P-FMZ-10D9000 for current price information.

Note 1: Not available with Bore Size code 701
Note 2: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 701
Note 3: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151
Note 4: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 251, 301, 351, 401, 451, 501, 601, 701
Note 5: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 301, 351, 401, 451, 501, 601, 701
Note 6: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 351, 401, 451, 501, 601, 701
Note 7: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 401, 451, 501, 601, 701
Note 8: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 451, 501, 601, 701
Note 9: Not available with Bore Size code 150, 200, 250, 400
Note 10: Not available with Bore Size code 150, 200, 701
Note 11: Not available with Bore Size code 201, 251, 301, 351, 401, 451, 501, 601, 701
Note 12: Not available with Bore Size code 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

MFE

Note 13: Not available with Bore Size code 150, 200, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 14: Not available with Bore Size code 150, 200, 250, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 15: Not available with Bore Size code 150, 200, 250, 400, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 16: Not available with Bore Size code 150, 200, 250, 400, 500, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 17: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 18: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 151, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 19: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 201, 251, 301, 351, 401, 451, 501, 601, 701

Note 20: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 501, 601, 701

Note 21: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 601, 701

Note 22: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 701

Note 23: Not available with Bore Size code 150, 200, 250, 400, 500, 650, 800, 101, 151, 201, 251, 301, 351, 401, 451, 501, 601

Note 24: Not available with Bore Size code 451, 501, 601, 701 and Sensor Constructoin code 6, D

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