

pro^{sense} FMM Series (-1001) Magnetic-Inductive Flow Meters



Part No. FMM75-1001



Part No. FMM200-1001

Overview

AutomationDirect's ProSense FMM Series (-1001) Magmeter is designed to reliably detect the flow rate of conductive media up to 160 gallons per minute. The stainless steel, mechanically-robust design mounts directly in-line providing a compact, low-profile installation for process control. A 4-digit numeric display with pushbutton setup indicates flow rate, fluid temperature and total flow volume with selectable engineering units. Two outputs are available to remotely monitor the binary or analog status of flow rate/volume and temperature parameters. Simple to setup, easy to install and with no moving parts, the FMM is a reliable alternative to traditional flow meters and mechanical flow switches.

Features

- 1/2 to 2" NPT female process connections
- Measure up to 160 GPM
- Measure fluid temperature in addition to flow and volume
- 4-digit numeric display with pushbutton setup
- Selectable engineering units: GPM, GPH, GAL, °F, °C
- Two outputs selectable for switch, pulse, frequency or analog signals
- 4-pin M12 quick disconnect
- 5-year warranty



#E320431

See the end of the section for a series of Overview and Setup Videos



Output Function Selections

Output 1:

- Flow rate switch
- Volumetric flow totalizer pulse
- Volumetric flow totalizer preset switch
- Flow rate frequency (1-1/2 and 2 inch models only)
- Empty pipe detection switch (1-1/2 and 2 inch models only)

Output 2:

- Flow rate switch
- Temperature switch
- Analog flow rate
- Analog temperature
- Volumetric flow totalizer reset input
- Empty pipe detection switch (1-1/2 and 2 inch models only)



ProSense FMM Series (-1001) Magnetic Flow Meters					
Model	FMM50-1001	FMM75-1001	FMM100-1001	FMM150-1001	FMM200-1001
Price					
Weight	1.09 lb	1.18 lb	1.30 lb	6.74 lb	6.75 lb
Range	0 to 6.6 GPM	0 to 13.2 GPM	0 to 26.4 GPM	0 to 80.0 GPM	0 to 160.0 GPM
Process Connection	1/2" FNPT	3/4" FNPT	1" FNPT	1-1/2" FNPT	2" FNPT
Application	Conductive liquids: $\geq 20 \mu\text{S/cm}$ (micro Siemens per centimeter) liquids / viscosity: $< 70\text{cSt}$ (centiStoke) at 104°F				
Pressure Rating	232PSIG [16bar]				
Medium Temperature	14 to 158°F [-10 to 70°C]				
Operating Voltage	18 to 30VDC			18 to 32VDC	
Current Consumption	$< 120\text{mA}$			$< 150\text{mA}$	
Insulation Resistance	$> 100\text{M}\Omega$ (500VDC)				
Protection Class	III				
Reverse Polarity Protection	YES				
Output Functions					
Output Type / Function	OUT1: switch (N.O. or N.C. / PNP or NPN) / flow rate, volumetric flow totalizer preset, empty pipe detection (1-1/2 and 2") or pulse / volumetric flow totalizer or frequency / flow rate (1-1/2 and 2") OUT2: switch (N.O. or N.C. / PNP or NPN) / flow rate, temperature, empty pipe detection (1-1/2 and 2") or analog / flow rate, temperature or reset input / volumetric flow totalizer reset				
Switch/Pulse/Frequency Outputs	PNP / NPN Selectable N.O. / N.C. Selectable Current Rating: $2 \times 200\text{mA}$ Voltage Drop: $< 2\text{V}$ Short-circuit protection: Yes (non-latching) Overload protection: Yes Switch hysteresis or window function			PNP / NPN Selectable N.O. / N.C. Selectable Current Rating: $2 \times 250\text{mA}$ Voltage Drop: $< 2\text{V}$ Short-circuit protection: Yes (non-latching) Overload protection: Yes Switch hysteresis or window function 0.1 to 10000 Hz frequency	
Analog Output	4-20 mA max 22mA or 0-10 VDC selectable Max. load: 500Ω (4-20 mA) Min. load: 2000Ω (0-10 VDC)				

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Model	FMM50-1001	FMM75-1001	FMM100-1001	FMM150-1001	FMM200-1001
Flow Rate Monitoring					
Measuring Range	0.030 to 6.604 GPM	0.060 to 13.200 GPM	0.100 to 26.400 GPM	1.300 to 80.000 GPM	1.300 to 160.000 GPM
Display Range	-7.925 to 7.925 GPM	-15.840 to 15.840 GPM	-31.700 to 31.700 GPM	-96.000 to 96.000 GPM	-190.000 to 190.000 GPM
Resolution	0.010 GPM	0.020 GPM	0.050 GPM	0.100 GPM	0.100 GPM
Set Point, SP	0.060 to 6.600 GPM	0.120 to 13.200 GPM	0.250 to 26.400 GPM	1.700 to 80.000 GPM	2.100 to 160.000 GPM
Reset Point, rP	0.300 to 6.570 GPM	0.060 to 13.140 GPM	0.100 to 26.250 GPM	1.300 to 79.600 GPM	1.300 to 159.200 GPM
Analog Start Point, ASP	0.000 to 5.300 GPM	0.000 to 10.600 GPM	0.000 to 21.200 GPM	0.000 to 64.000 GPM	0.000 to 128.000 GPM
Analog End Point, AEP	1.300 to 6.600 GPM	2.600 to 13.200 GPM	5.200 to 26.400 GPM	16.000 to 80.000 GPM	32.000 to 160.000 GPM
In Steps Of	0.010 GPM	0.020 GPM	0.050 GPM	0.100 GPM	
Volumetric Flow Totalizer					
Pulse Value	0.010 to 30,300,000 GAL	0.010 to 99,990,000 GAL	0.010 to 100,000,000 GAL	0.020 to 80,000,000 GAL	0.020 to 160,000,000 GAL
Pulse Length	0.010 to 2s	0.005 to 2s	0.0025 to 2s	0.016 to 2s	0.008 to 2s
Temperature Monitoring					
Measuring Range	-4 to 176°F [-20 to 80°C]**				
Resolution	0.1°F	0.5°F			
Set Point, SP	-2.5 to 176°F			-2.0 to 176°F	
Reset Point, rP	-3.5 to 175.0°F			-3.0 to 175°F	
Analog Start Point, ASP	-4.0 to 140.5°F			-4.0 to 140°F	
Analog End Point, AEP	31.5 to 176.0°F			32.0 to 176°F	
In Steps Of	0.5°F				
Accuracy / Deviations					
Flow Monitoring					
Accuracy*	± 0.8% MW + 0.5% VMR			± 0.8% MW + 0.5% VMR***	
Repeatability*	± 0.2% VMR				
Temperature Monitoring					
Accuracy	± 4.5°K (Q > 0.26 GPM)			± 1°K (Q > 4.0 GPM)	
Reaction Times					
Power-On Delay Time	5s				
Flow Monitoring					
Start-Up Delay	N/A			0 to 50s	
Response Time	< 0.150s (dAP = 0)			< 0.350s (dAP = 0)	
Display Damping, dAP	0.0 to 5.0s				
Temperature Monitoring					
Response Time	T09 = 3s (Q > 4.0 GPM)				
Environment					
Ambient Temperature	14 to 140°F [-10 to 60°C]				
Storage Temperature	-13 to 176°F [-25 to 80°C]				
Protection	IP 67			IP 65, IP 67	
* MW = Measured value VMR = Final value of the measuring range ** Displays °F only *** > 4GPM medium and operating temperature of 72°F ± 7°F					

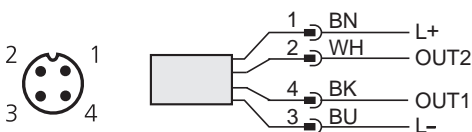
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ProSense FMM Series (-1001) Magnetic Flow Meters					
Model	FMM50-1001	FMM75-1001	FMM100-1001	FMM150-1001	FMM200-1001
Mechanical Data					
Process Connection	1/2" NPT female	3/4" NPT female	1" NPT female	1-1/2" NPT female	2" NPT female
Materials (wetted parts)	Stainless steel 316L / 1.4404; PEEK (polyether ether ketone); FKM			Stainless steel 316L / 1.4404; stainless steel 316Ti / 1.4571; PEEK (polyether ether ketone); Hastelloy C-4 (2.4610); Cetellen: FKM	
Housing Materials	Stainless steel 316L / 1.4404; PBT-GF 20; PC; EPDM/X			Stainless steel 316L / 1.4404; stainless steel 316Ti / 1.4571; PEI; FKM; PBT-GF 20; elastolan	
Displays / Operating Elements					
Display	Display unit: 6 x LED green (GPM, GPH, GAL, °F, 10 ³ , 10 ⁶) Switching Status: 2 x LED yellow Measured values: 4-digit alphanumeric display (7.5 mm) Programming: 4-digit alphanumeric display (7.5 mm)			Display unit: 6 x LED green (GPM, GPH, GAL, °F, 10 ³ , 10 ⁶) Switching Status: 2 x LED yellow Measured values: 4-digit alphanumeric display (7.5 mm) Programming: 4-digit alphanumeric display (7.5 mm)	
Electrical Connection					
Connection	M12 connector; gold-plated contacts				
Tests / Approvals					
EMC	EN 61000-4-2: 4kV CD / 8kV AD EN 61000-4-3 HF radiated: 10 V/m EN 61000-4-4 Burst: 2kV EN 61000-4-5 Surge: 0.5 kV EN61000-4-6 HF conducted: 10V				
Shock Resistance	DIN IEC 68-2-27: 20g (11ms)				
Vibration Resistance	DIN IEC 68-2-6: 5g (10 to 2,000Hz)				
Approvals*	UL (E320431), CE, RoHS				
* To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page at					



NOTE: CHECK THE CHEMICAL COMPATIBILITY OF THE SENSOR'S WETTED PARTS WITH THE MEDIUM TO BE MEASURED.

Wiring Diagram



Cable Assembly Wiring Colors:

Pin 1 - Brown
Pin 2 - White
Pin 3 - Blue
Pin 4 - Black

Colors to DIN EN 60947-5-2

For additional wiring details see individual product manuals.

Use FMM-GND1 if meter is installed in ungrounded pipe system.

Output Function Selections

Models:
FMM50-1001, FMM75-1001, FMM100-1001

Output 1:
Flow rate switch
Volumetric flow totalizer pulse
Volumetric flow totalizer preset switch

Output 2:
Flow rate switch
Temperature switch
Analog flow rate
Analog temperature
Volumetric flow totalizer reset input

Models:
FMM150-1001, FMM200-1001

Output 1:
Flow rate switch
Volumetric flow totalizer pulse
Volumetric flow totalizer preset switch
Flow rate frequency
Empty pipe detection switch

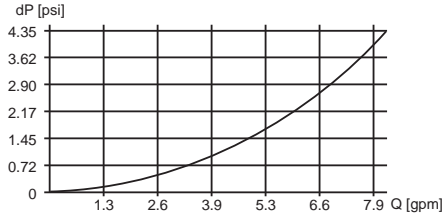
Output 2:
Flow rate switch
Temperature switch
Analog flow rate
Analog temperature
Volumetric flow totalizer reset input
Empty pipe detection switch

Note: Wiring colors are based on AutomationDirect CD12L and CD12M 4-pole cable assemblies.

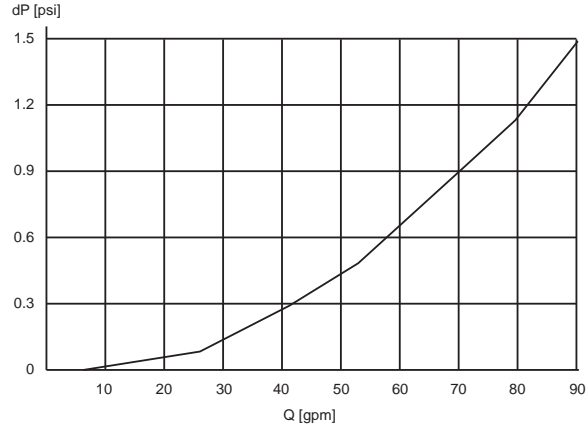
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Pressure Loss/Flow Rate*

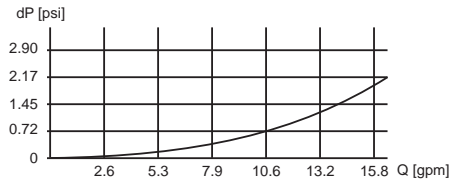
FMM50-1001



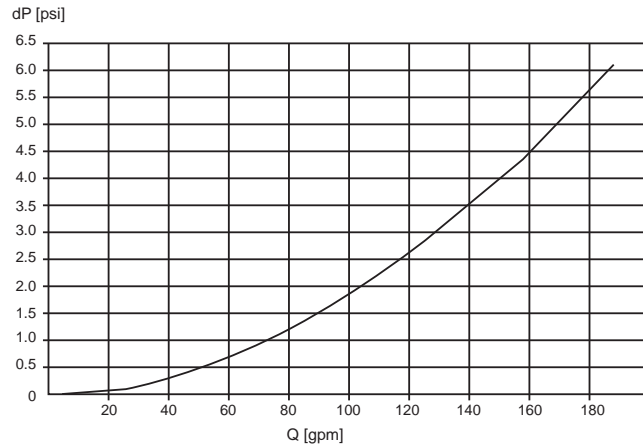
FMM150-1001



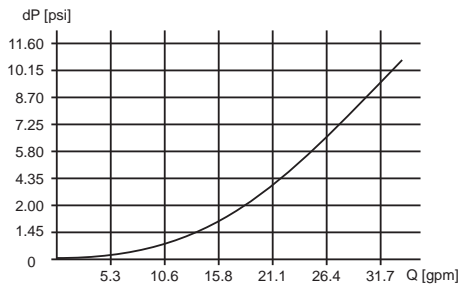
FMM75-1001



FMM200-1001



FMM100-1001

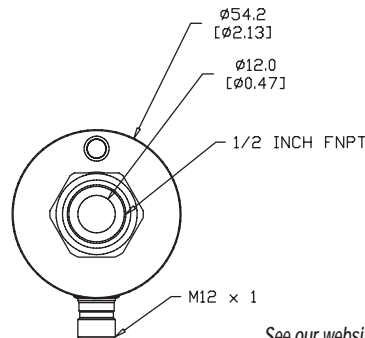
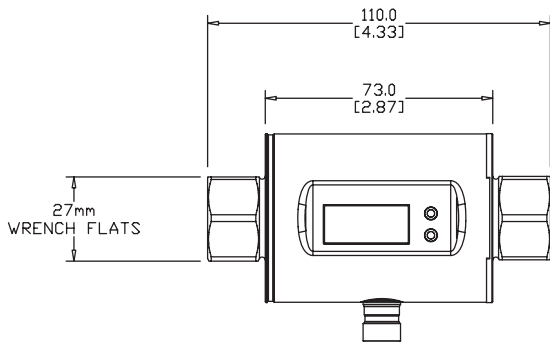


* when used with water @ 68°F [20°C]

Dimensions

mm [inches]

Part No. FMM50-1001



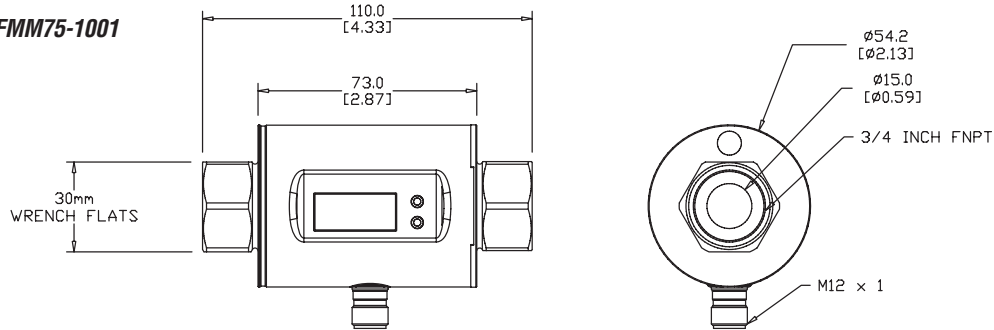
See our website for complete Engineering drawings.

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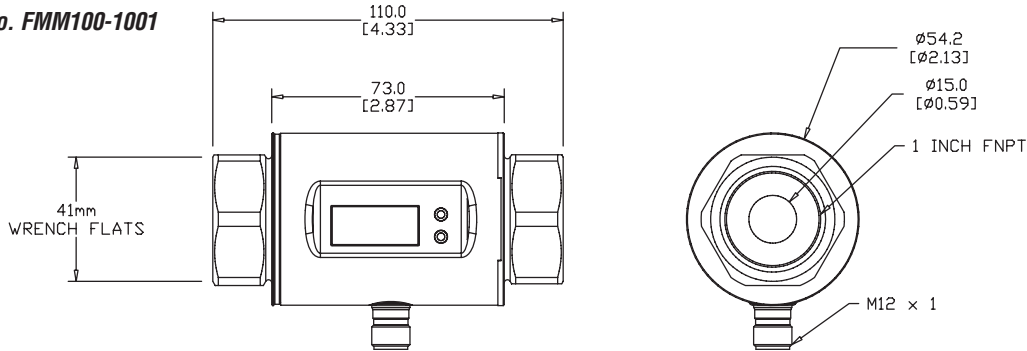
Dimensions

mm [inches]

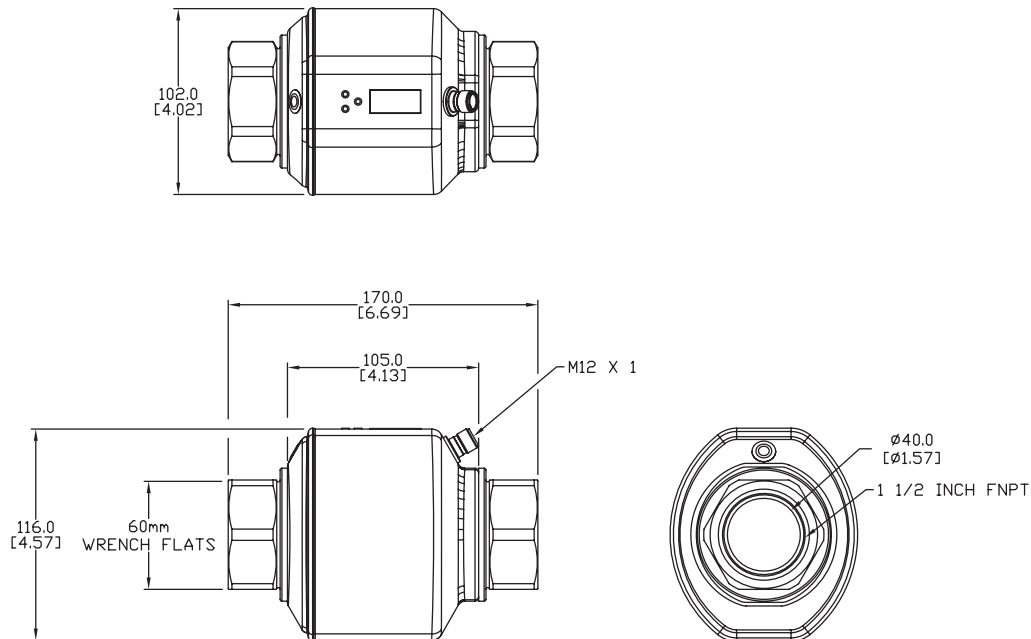
Part No. FMM75-1001



Part No. FMM100-1001



Part No. FMM150-1001



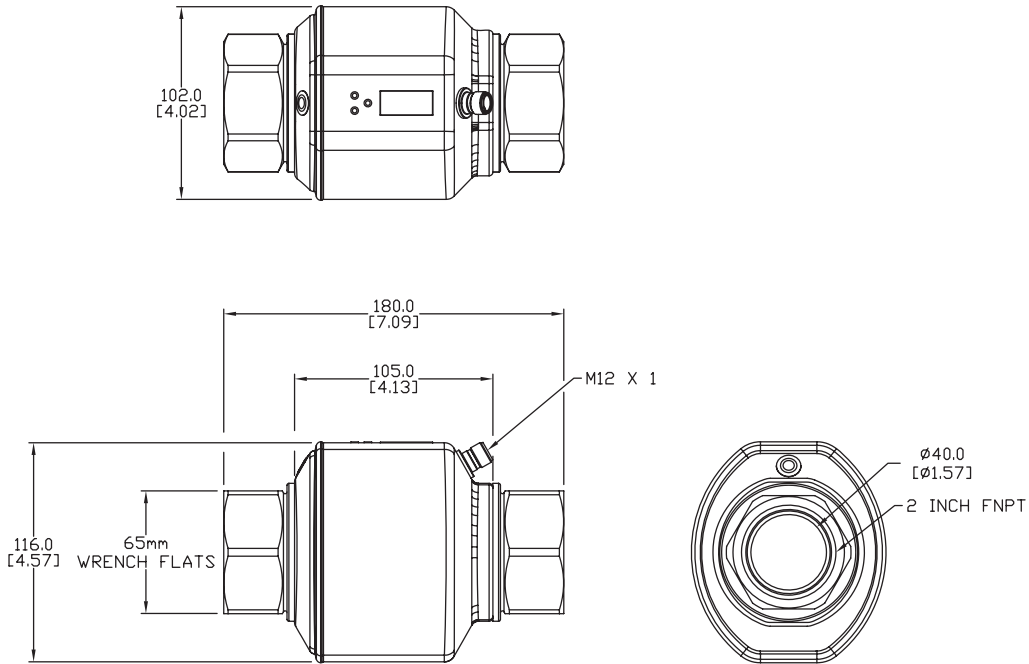
See our website for
complete Engineering drawings.

pro^{ense}® FMM Series (-1001) Magnetic-Inductive Flow Meters

Dimensions

mm [inches]

Part No. FMM200-1001



See our website for complete Engineering drawings.

Video Links



Click on the thumbnail or go to <https://VID-FL-0003> for a short Quick Start video for the 0.5", 0.75 and 1" FMM Series Magnetic-Inductive Flow Meters



Click on the thumbnail or go to <https://VID-FL-0004> for a short Quick Start video for the 1.5" and 2.0" FMM Series Magnetic-Inductive Flow Meters



Click on the thumbnail or go to <https://VID-FL-0005> for a short Parameter Setup video of the FMM Series Magnetic-Inductive Flow Meters using live demos.



Click or scan the above QR code to be taken to the installation insert for the FMM 50 and 75 -1001 Series Magnetic Flow Meters



Click or scan the above QR code to be taken to the installation insert for the FMM 150 and 200 -1001 Series Magnetic Flow Meters

pro^{sense}® Magnetic-Inductive Flow Meter Accessories



The FMM-GND1 Grounding Clamp is used when an FMM series Magnetic-Inductive Flow Meter is installed in an ungrounded pipe system (e.g. PVC pipe).

Simply place the FMM-GND1 Grounding Clamp around the base of the M12 connector and attach a grounded wire to FMM-GND1 Grounding Clamp with the supplied machine screw and nut.

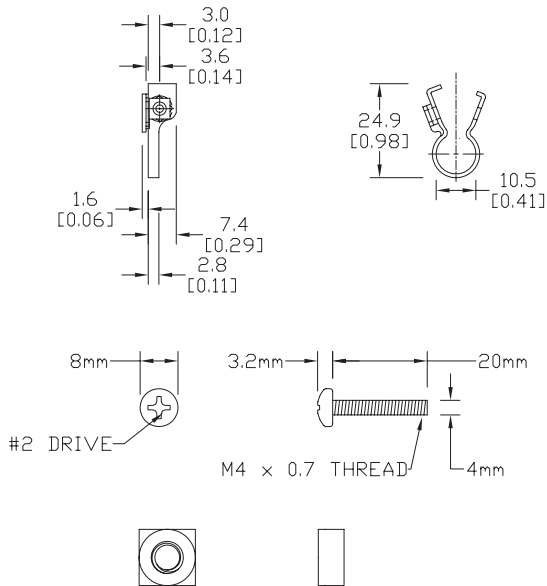
Note: Improper grounding may cause inaccurate readings

ProSense Magnetic Flow Meter Accessories			
Part No.	Description	Price	Weight
FMM-GND1	ProSense 316 stainless steel grounding clamp for magnetic flow meters with an M12 connector.		0.015 lb

Dimensions

mm [inches]

Part No. FMM-GND1



Grounding Clamp Installation

The ProSense magnetic flow meter grounding clamp is installed as shown above.

Note: the ground wire shown above is not included.

See our website for complete Engineering drawings.

pro^{sense}® FMM Series Magnetic-Inductive Flow Meters

Magnetic-Inductive Flow Meter Application



Magnetic-inductive flow meters (Magmeters) are one of the most widely used technologies for liquid flow monitoring in industrial process markets such as wastewater, mining and minerals, utilities, food and beverage, and pharmaceuticals. To ensure reliable and accurate operation, some important application requirements should be considered. Meeting the minimum conductivity of the liquid and properly installing with a full pipe are required in order to avoid significant error or the meter not functioning at all. Additionally,

the presences of air bubbles should be avoided as they will affect the accuracy of the meter's measurements. Installation location in the piping is important because disturbances in the flow caused by bends in the pipe, valves, reductions, etc. can cause inaccuracies. Refer to the magmeter's specifications and operating instruction documents for specific information regarding application and installation requirements.

Click on the thumbnail or go to <https://VID-FL-0002> for a short overview video of the FMM Series Magnetic-Inductive Flow Meters



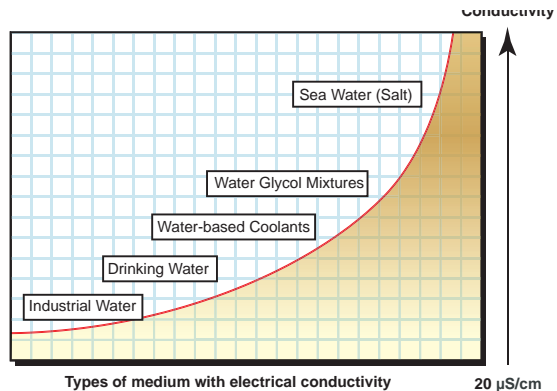
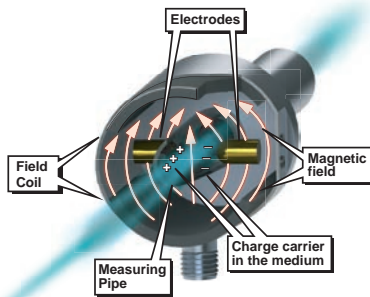
Magnetic-Inductive Flow Meter Measuring Principle

Magmeters operate by using the magnetic-inductive measuring principle in which a magnetic field is generated in the specified measuring pipe by current-carrying coils. When the media flows through the pipe, the ions of the conductive media are diverted perpendicularly to the magnetic field with the positive and negative charge carriers flowing in opposite directions. The two electrodes that are in contact with the medium then measure the voltage that is induced.

The measured signal voltage is proportional to the average flow velocity. By knowing the inside pipe diameter of the unit, the volumetric flow rate is determined. Magmeters are suitable for use with a variety of conductive liquids in industrial process applications such as those in the following graph:



Click on the thumbnail or go to <https://VID-FL-0006> for a short video to learn how Magnetic Inductive Flow Meters works



ProSense FMM Series Magnetic Flow Meter Selection Guide								
Model	Price	Process Connection	Flow Range	Temperature Range	Display Units	Output 1	Output 2	Empty Pipe Detection
FMM50-1001		1/2" FNPT	0 to 6.6 GPM	-4 to 176 °F [-20 to 80 °C]	GPM, GPH, GAL, or °F	Switch or pulse (flow)	Switch, analog or reset input (flow or temperature)	No
FMM75-1001		3/4" FNPT	0 to 13.2 GPM					Yes
FMM100-1001		1" FNPT	0 to 26.4 GPM					
FMM150-1001		1-1/2" FNPT	0 to 80 GPM					
FMM200-1001		2" FNPT	0 to 160 GPM					
FMM50-1002		1/2" FNPT	0 to 6.6 GPM		GPM, GPH, LPM, m ³ /h, °F, °C	Analog 4-20 mA (temperature)	Analog 4-20 mA (flow)	No
FMM75-1002		3/4" FNPT	0 to 13.2 GPM					Yes
FMM100-1002		1" FNPT	0 to 26.4 GPM					
FMM150-1002		1-1/2" FNPT	0 to 79.3 GPM					
FMM200-1002		2" FNPT	0 to 158.5 GPM					