

# pro<sup>sense</sup> FMM Series (-1002) Magnetic-Inductive Flow Meters

## Overview

Part No. [FMM75-1002](#)

AutomationDirect's ProSense FMM Series (-1002) Magmeters are designed to reliably detect the flow rate of conductive media up to 158.5 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 and fluid temperature with selectable engineering units. Two outputs are available to remotely monitor the analog status of flow rate and temperature parameters. Simple to set up, easy to install and with no moving parts, the FMM series is a reliable alternative to traditional flow meters and mechanical flow switches.

Part No. [FMM200-1002](#)

## Features

- 1/2 to 2" NPT female process connections
- Measure up to 158.5 GPM
- Measure fluid temperature in addition to flow
- 4-digit numeric display with pushbutton setup
- Selectable engineering units: GPM, GPH, LPM, m<sup>3</sup>/h, °F, °C
- Two analog output 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:

- Analog temperature

Output 2:

- Analog flow rate



| ProSense FMM Series (-1002) Magnetic Flow Meters |   |                            |                             |                             |                             |
|--|---|----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Model  | <a href="#">FMM50-1002</a>  | <a href="#">FMM75-1002</a> | <a href="#">FMM100-1002</a> | <a href="#">FMM150-1002</a> | <a href="#">FMM200-1002</a> |
| Price  | \$556.00  | \$602.00                   | \$666.00                    | \$997.00                    | \$1,075.00                  |
| Weight   | 1.14 lb   | 1.23 lb                    | 1.36 lb                     | 6.76 lb                     | 6.76 lb                     |
| Range  | 0 to 6.6 GPM  | 0 to 13.2 GPM              | 0 to 26.4 GPM               | 0 to 79.3 GPM               | 0 to 158.5 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                                | 20 to 30VDC   |                            |                             | 18 to 32VDC                 |                             |
| Current Consumption                              | 120mA   |                            |                             | $< 150\text{mA}$            |                             |
| Insulation Resistance                            | $> 100\text{M}\Omega$ (500VDC)  |                            |                             |                             |                             |
| Protection Class                                 | III   |                            |                             |                             |                             |
| Reverse Polarity Protection                      | YES   |                            |                             |                             |                             |
| Output Functions                                 |   |                            |                             |                             |                             |
| Output Type / Function                           | OUT1: analog signal / temperature<br>OUT2: analog signal / flow   |                            |                             |                             |                             |
| Analog Output                                    | 4-20 mA max 22mA<br>Max. load: 500 $\Omega$ (4-20 mA)<br>Overload protection: Yes   |                            |                             |                             |                             |
| Flow Rate Monitoring                             |   |                            |                             |                             |                             |
| Measuring Range                                  | 0.030 to 6.600 GPM  | 0.020 to 13.200 GPM        | 0.100 to 26.400 GPM         | 1.300 to 79.300 GPM         | 1.300 to 158.500 GPM        |
| Display Range                                    | -7.920 to 7.920 GPM   | -15.860 to 15.860 GPM      | -31.700 to 31.700 GPM       | -95.100 to 95.100 GPM       | -190.200 to 190.200 GPM     |
| Resolution                                       | 0.010 GPM   | 0.020 GPM                  | 0.050 GPM                   | 0.100 GPM                   | 0.100 GPM                   |
| Analog Start Point, ASP                          | 0.000 to 5.280 GPM  | 0.000 to 10.580 GPM        | 0.000 to 21.100 GPM         | 0.000 to 63.400 GPM         | 0.000 to 126.800 GPM        |
| Analog End Point, AEP                            | 1.320 to 6.600 GPM  | 2.640 to 13.220 GPM        | 5.300 to 26.400 GPM         | 15.900 to 79.300 GPM        | 31.700 to 158.500 GPM       |
| In Steps Of                                      | 0.010 GPM   | 0.020 GPM                  | 0.050 GPM                   | 0.100 GPM                   | 0.100 GPM                   |

# proSense® FMM Series (-1002) Magnetic-Inductive Flow Meters

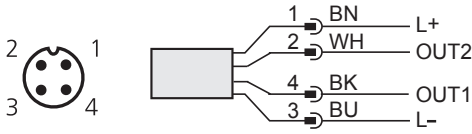
| ProSense FMM Series (-1002) Magnetic Flow Meters  |   |                 |               |   |               |
|---|---|-----------------|---------------|---|---------------|
| Model   | FMM50-1002  | FMM75-1002      | FMM100-1002   | FMM150-1002   | FMM200-1002   |
| <b>Temperature Monitoring</b>   |   |                 |               |   |               |
| Measuring Range   | -4 to 176°F [-20 to 80°C]   |                 |               |   |               |
| Resolution  | 0.5°F [0.2°C]   |                 |               |   |               |
| Analog Start Point, ASP   | -4.0 to 140°F [-20 to 60°C]   |                 |               |   |               |
| Analog End Point, AEP   | 32 to 176.0°F [0.0 to 80°C]   |                 |               |   |               |
| In Steps Of   | 0.5°F [0.28°C]  |                 |               |   |               |
| <b>Accuracy / Deviations</b>  |   |                 |               |   |               |
| <b>Flow Monitoring</b>  |   |                 |               |   |               |
| Accuracy*   | ± 2% MW + 0.5% VMR  |                 |               | ± 0.8% MW + 0.5% VMR***   |               |
| Repeatability*  | ± 0.2% VMR  |                 |               |   |               |
| <b>Temperature Monitoring</b>   |   |                 |               |   |               |
| Accuracy  | ± 2.5°K (Q > 0.26 GPM)  |                 |               | ± 1°K (Q > 4.00 GPM)  |               |
| <b>Reaction Times</b>   |   |                 |               |   |               |
| Power-On Delay Time   | 5s  |                 |               |   |               |
| <b>Flow Monitoring</b>  |   |                 |               |   |               |
| Response Time   | < 0.150s (dAP = 0)  |                 |               | < 0.350s (dAP = 0)  |               |
| Display Damping, dAP  | 0.0 to 3.0s   |                 |               | 0.0 to 5.0s   |               |
| <b>Temperature Monitoring</b>   |   |                 |               |   |               |
| Response Time   | T09 = 3s (Q > 4.00 GPM)   |                 |               |   |               |
| <b>Environment</b>  |   |                 |               |   |               |
| 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  |               |
| <b>Mechanical Data</b>  |   |                 |               |   |               |
| 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 (1.4404 / 316L); stainless steel (1.4571/316Ti); PEEK; 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   |               |
| <b>Displays / Operating Elements</b>  |   |                 |               |   |               |
| Display   | Display unit: 6 x LED green (l/min, m³/h, GPM, GPH, °C, °F)<br>Measured values: 4-digit alphanumeric display (7.5 mm)<br>Programming: 4-digit alphanumeric display (7.5 mm) |                 |               | Display unit: 6 x LED green (l/min, m³/h, GPM, GPH, °C, °F)<br>Function display: 1 x LED yellow (10³)<br>Measured values: 4-digit alphanumeric display (7.5 mm)<br>Programming: 4-digit alphanumeric display (7.5 mm) |               |
| <b>Electrical Connection</b>  |   |                 |               |   |               |
| Connection  | M12 connector; gold-plated contacts   |                 |               |   |               |
| <b>Tests / Approvals</b>  |   |                 |               |   |               |
| EMC   | EN 61000-4-2: 4kV CD / 8kV AD<br>EN 61000-4-3 HF radiated: 10 V/m<br>EN 61000-4-4 Burst: 2kV<br>EN 61000-4-5 Surge: 0.5 kV<br>EN 61000-4-6 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  |                 |               |   |               |
| * MW = Measured value<br>VMR = Final value of the measuring range<br>** To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page at <a href="http://www.automationdirect.com">www.automationdirect.com</a><br>*** > 4GPM medium and operating temperature of 72°F ± 7°F |   |                 |               |   |               |



Note: Check the chemical compatibility of the sensor's wetted parts with the medium to be measured.

# pro<sup>ense</sup>® FMM Series (-1002) Magnetic-Inductive Flow Meters

## 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:**  
**FMM50-1002, FMM75-1002, FMM100-1002,**  
**FMM150-1002, FMM200-1002**

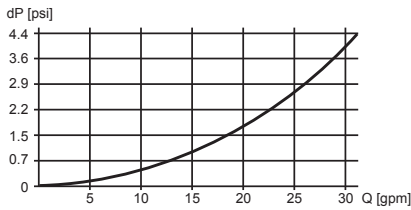
**Output 1:**  
**Analog temperature**

**Output 2:**  
**Analog flow rate**

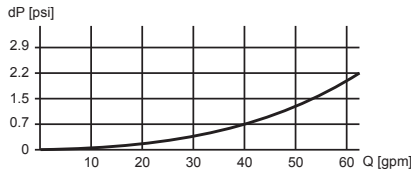
*Note: Wiring colors are based on AutomationDirect CD12L and CD12M 4-pole cable assemblies.*

## Pressure Loss/Flow Rate\*

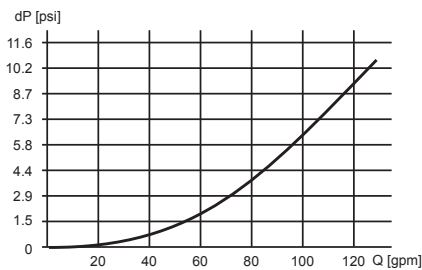
FMM50-1002



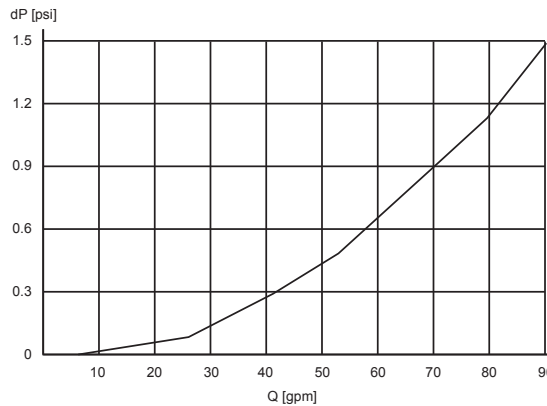
FMM75-1002



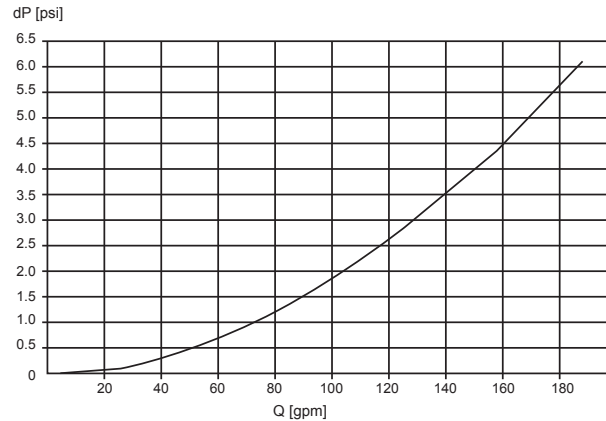
FMM100-1002



FMM150-1002



FMM200-1002



\* when used with water @ 68°F [20°C]

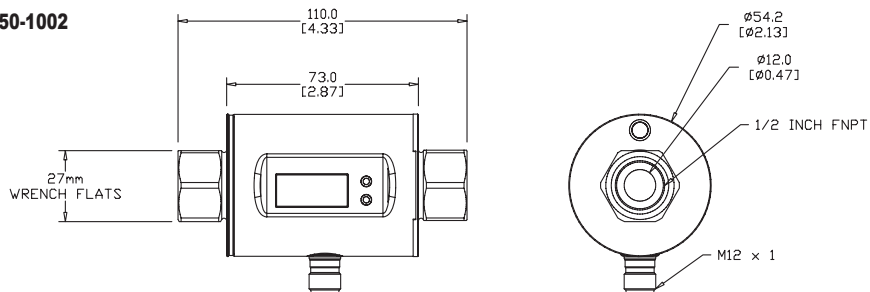


# FMM Series (-1002) Magnetic-Inductive Flow Meters

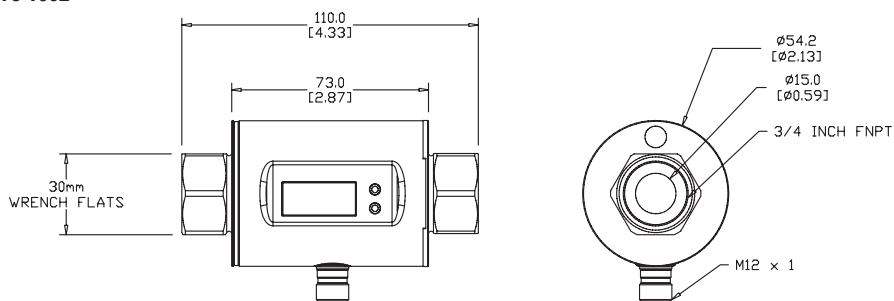
## Dimensions

mm [inches]

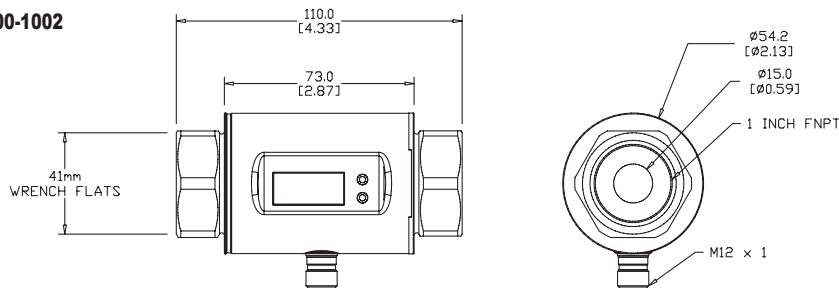
**Part No. FMM50-1002**



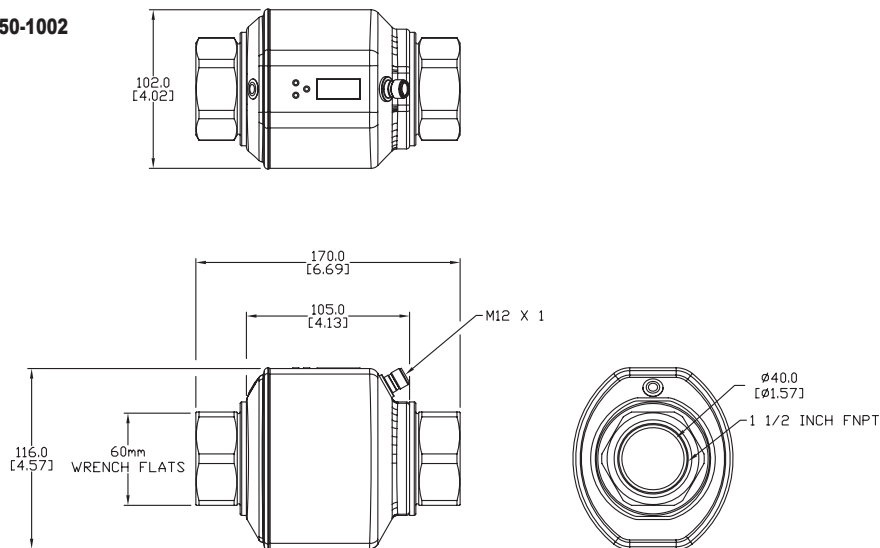
**Part No. FMM75-1002**



**Part No. FMM100-1002**



**Part No. FMM150-1002**



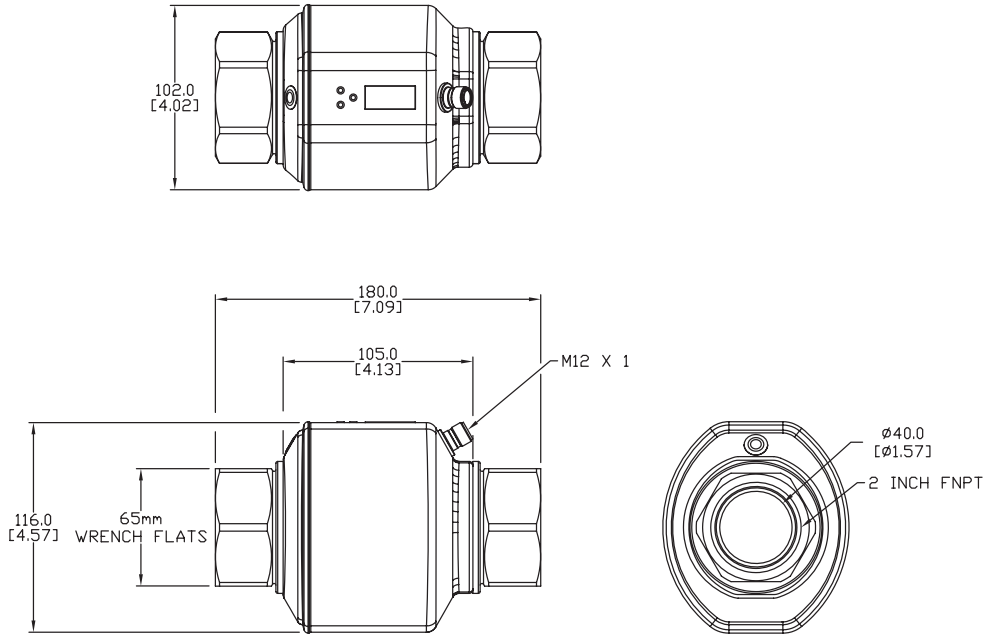
See our website [www.AutomationDirect.com](http://www.AutomationDirect.com) for complete Engineering drawings.

# proense® FMM Series (-1002) Magnetic-Inductive Flow Meters

## Dimensions

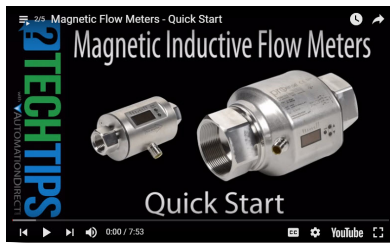
Part No. FMM200-1002

mm [inches]

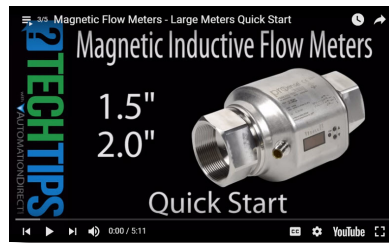


See our website [www.AutomationDirect.com](http://www.AutomationDirect.com) for complete Engineering drawings.

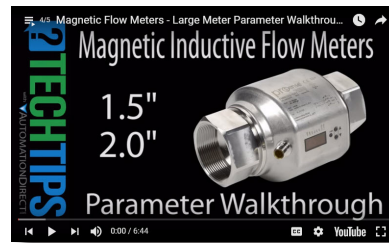
## Video Links



Click on the thumbnail or go to <https://www.automationdirect.com/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://www.automationdirect.com/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://www.automationdirect.com/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 -1002 Series Magnetic Flow Meters



Click or scan the above QR code to be taken to the installation insert for the FMM 150 and 200 -1002 Series Magnetic Flow Meters

# pro<sup>sense</sup>® 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.

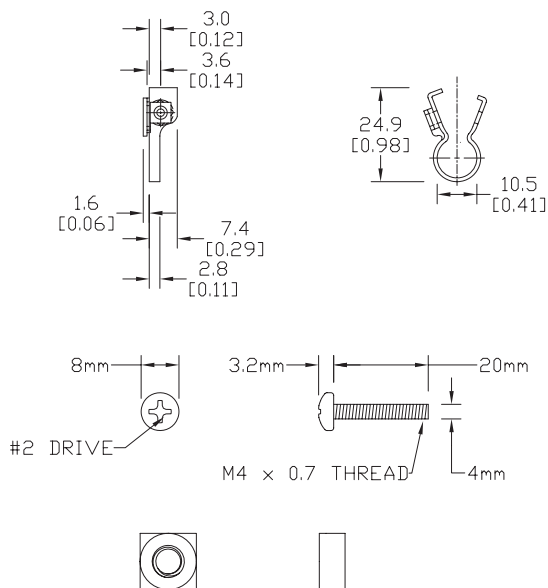
Note: Improper grounding may cause inaccurate readings

| ProSense Magnetic Flow Meter Accessories |  |        |          |
|--|--|--------|----------|
| Part No.                                 | Description  | Price  | Weight   |
| <b>FMM-GND1</b>                          | ProSense 316 stainless steel grounding clamp for magnetic flow meters with an M12 connector. | \$7.50 | 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 [www.AutomationDirect.com](http://www.AutomationDirect.com) for complete Engineering drawings.

# 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. The Endress+Hauser Picomag series has no minimum inlet or outlet pipe run requirements making it ideal for small confined spaces. Refer to the magmeter's specifications and operating instruction documents for specific information regarding application and installation requirements.



### ProSense FMM Series



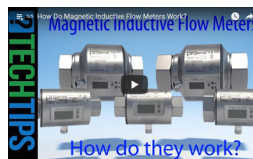
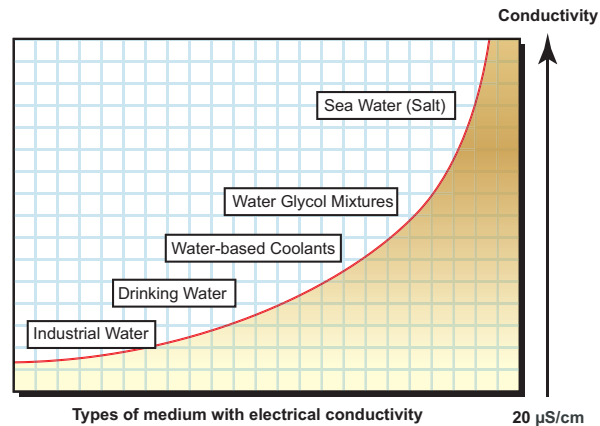
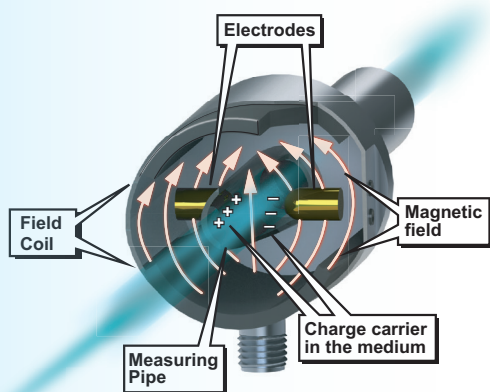
Click on the thumbnail or go to <https://www.automationdirect.com/VID-FL-0002> for a short overview video of the FMM Series Magnetic-Inductive Flow Meters

### Endress+Hauser Picomag Series

## 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://www.automationdirect.com/VID-FL-0006> for a short video to learn how Magnetic Inductive Flow Meters works

# Magnetic-Inductive Flow Meters

| 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        |    |
| <a href="#"><u>FMM50-1001</u></a>                       | \$556.00   | 1/2" FNPT          | 0 to 6.6 GPM   | -4 to 176°F<br>[-20 to 80°C] | GPM, GPH,<br>GAL, or °F           | Switch or pulse<br>(flow)            | Switch, analog<br>or reset input<br>(flow or<br>temperature) | No                          |    |
| <a href="#"><u>FMM75-1001</u></a>                       | \$602.00   | 3/4" FNPT          | 0 to 13.2 GPM  |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM100-1001</u></a>                      | \$666.00   | 1" FNPT            | 0 to 26.4 GPM  |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM150-1001</u></a>                      | \$997.00   | 1-1/2" FNPT        | 0 to 80 GPM    |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM200-1001</u></a>                      | \$1,075.00 | 2" FNPT            | 0 to 160 GPM   |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM50-1002</u></a>                       | \$556.00   | 1/2" FNPT          | 0 to 6.6 GPM   |                              | GPM, GPH,<br>LPM, m³/h,<br>°F, °C | Switch, pulse or<br>frequency (flow) | Analog<br>4-20 mA<br>(temperature)                           | Analog<br>4-20 mA<br>(flow) | No |
| <a href="#"><u>FMM75-1002</u></a>                       | \$602.00   | 3/4" FNPT          | 0 to 13.2 GPM  |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM100-1002</u></a>                      | \$666.00   | 1" FNPT            | 0 to 26.4 GPM  |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM150-1002</u></a>                      | \$997.00   | 1-1/2" FNPT        | 0 to 79.3 GPM  |                              |                                   |                                      |  |                             |    |
| <a href="#"><u>FMM200-1002</u></a>                      | \$1,075.00 | 2" FNPT            | 0 to 158.5 GPM |                              |                                   |                                      |  |                             |    |

| Endress + Hauser Picomag Magnetic-Inductive Liquid Flow Meter Selection |            |                    |                |                             |                       |                       |  |  |  |
|---|------------|--------------------|----------------|-----------------------------|-----------------------|-----------------------|--|--|--|
| Part No.  | Price      | Process Connection | Flow Range     | Temperature Range           | Totalizer Range       | Conductivity Range    | Output 1   | Output 2   | Empty Pipe Detection   |
| <a href="#"><u>DMA15-AAACA1</u></a>                                     | \$664.00   | 1/2" FNPT          | 0 to 9.2 GPM   | 14 to 158°F<br>[10 to 70°C] | +/-3.436E10<br>liters | 20 to 30,000<br>µS/cm | <ul style="list-style-type: none"> <li>• Flow rate, analog or switch</li> <li>• Temperature, analog or switch</li> <li>• Conductivity, analog or switch</li> <li>• Volumetric flow totalizer pulse</li> <li>• Empty pipe detection switch</li> <li>• Flow totalizer reset digital input</li> </ul> | <ul style="list-style-type: none"> <li>• Flow rate, analog or switch</li> <li>• Temperature, analog or switch</li> <li>• Conductivity, analog or switch</li> <li>• Empty pipe detection switch</li> <li>• Flow totalizer reset digital input</li> <li>• Flow override digital input</li> </ul> | Yes  |
| <a href="#"><u>DMA20-AAACA1</u></a>                                     | \$762.00   | 3/4" FNPT          | 0 to 19.8 GPM  |                             |                       |                       |  |  | Yes  |
| <a href="#"><u>DMA25-AAACA1</u></a>                                     | \$890.00   | 1" FNPT            | 0 to 39.6 GPM  |                             |                       |                       |  |  | Yes  |
| <a href="#"><u>DMA50-AAACA1</u></a>                                     | \$1,131.00 | 2" FNPT            | 0 to 198.1 GPM |                             |                       | 20 to 10,000<br>µS/cm |  |  | <ul style="list-style-type: none"> <li>• Flow override digital input</li> <li>• IO-Link</li> </ul> |