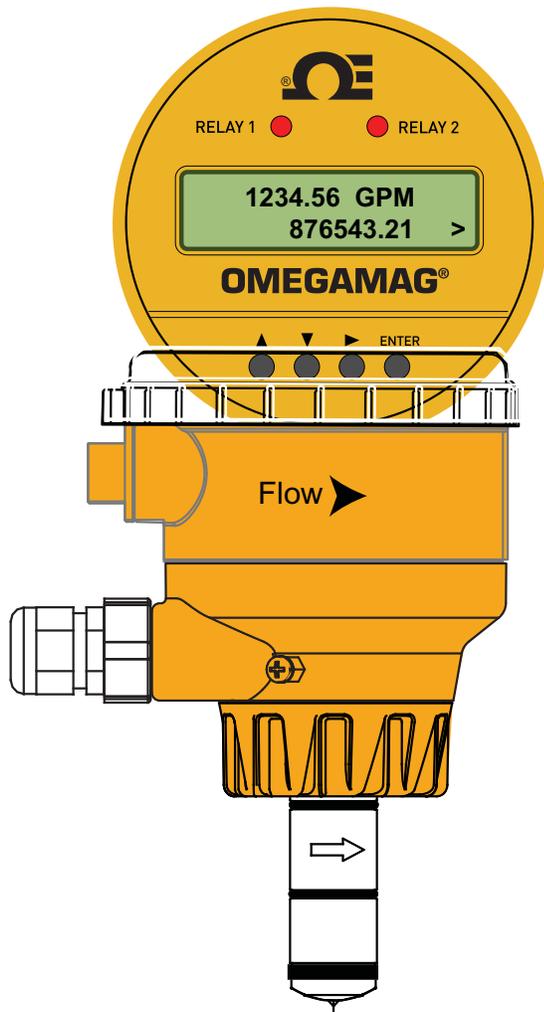
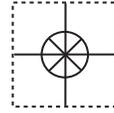


CE



# User's Guide

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product manual visit  
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STAMFORD, CT MANCHESTER, UK

## FMG-3000 SERIES Display Version Magmeter



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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

# 3000 Series OMEGAMAG® Display Version

6-2551.090-1-OM

Rev. D 3/12

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## 1.0 Description

The OMEGAMAG® measures the flow rate in a full pipe by monitoring the voltage produced when the (conductive) fluid moves through a magnetic field.

Output options include a traditional frequency signal and a 4 to 20 mA output.

The OMEGAMAG® is available in two sizes that will accommodate pipes from ½ inch through 8 inch diameters.

Select from three different material combinations to match the magmeter to the application requirements.

### SAFETY INSTRUCTIONS

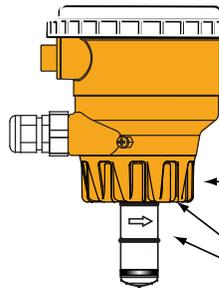
1. Depressurize and vent system prior to installation or removal.
2. Confirm chemical compatibility before use.
3. Do not exceed maximum temperature/pressure specifications.
4. Wear safety goggles or faceshield during installation/service.
5. Do not alter product construction.



### WARNING!

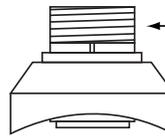
FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN THE SENSOR BEING EJECTED FROM THE PIPE!

- DO NOT USE ANY TOOLS ON THE RETAINING CAP. HAND TIGHTEN ONLY.
- LUBRICATE O-RINGS WITH A NON-PETROLEUM BASED, VISCOUS LUBRICANT (GREASE) COMPATIBLE WITH THE SYSTEM.
- DO NOT USE THREAD SEALANT OR LUBRICANTS ON THE RETAINING CAP OR ON THE PLASTIC FITTING THREADS.
- IF LEAKING IS OBSERVED FROM THE RETAINING CAP, IT INDICATES DEFECTIVE OR WORN O-RINGS ON THE SENSOR. DO NOT ATTEMPT TO CORRECT BY FURTHER TIGHTENING.



Do not use any tools to tighten the yellow retaining cap. DO NOT USE thread sealant or lubricants on retaining cap!

Lubricate O-rings with a non-petroleum based, viscous lubricant (grease) compatible with the system.



DO NOT USE thread sealant or lubricants on the fitting threads!



### Chemical Compatibility Warning

The retaining nuts of Magmeters are not designed for prolonged contact with aggressive substances. Strong acids, caustic substances and solvents or their vapor may lead to failure of the retaining nut, ejection of the sensor and loss of the process fluid with possibly serious consequences, such as damage to equipment and serious personal injury. Retaining nuts that may have been in contact with such substances e.g. due to leakage or spilling, must be replaced.

### Environmental Recommendations:

- When used properly, this product presents no inherent danger to the environment.
- Please follow local ordinance when disposing of this or any product with electronic components.

## 2.0 Specifications

### Wetted Materials:

- Sensor body and Electrodes and Grounding ring:
  - PP-D: Polypropylene and 316 SS
  - PVDF-D-HA: PVDF and Titanium
  - PVDF and Hast-C: PVDF and Hastelloy-C
- O-rings: FPM (standard)  
EPDM, Perfluoroelastomer (optional)



The user is responsible for determining the chemical suitability of these materials for a specific application.

- Case: PBT
- Display window: Polyamide

### Power Requirements

- 4 to 20 mA: 21.6 to 26.4 VDC, 22.1 mA max.  
400 mV p-p maximum ripple voltage
- Frequency: 5 to 26.4 VDC, 15 mA max.
- Digital: 5 to 6.5 VDC, 15 mA max.
- Auxiliary (only required for units with relays):  
9 to 24 VDC, 0.4A max
- Reverse polarity and short circuit protected

### Performance

- Pipe size range: DN15 to DN900 (½ to 36 in.)
- Flow Range  
(Bi-directional) Minimum: 0.05 m/s (0.15 ft/s)  
Maximum: 10 m/s (33 ft/s)
- Linearity: ±1% of reading +0.01 m/s (0.033 ft/s)
- Repeatability: ±0.5% of reading @ 25 °C (77 °F)
- Minimum Conductivity: 20 µS/cm

### Output Specifications

#### Current Output (4 to 20 mA)

- Max Loop Resistance: 300 Ω
- Loop Accuracy: 32 µA max. error (25°C @ 24 VDC)
- Temp. drift: ±1 µA per °C max.
- Power supply rejection: ±1 µA per V
- Isolation: Low voltage <48 VAC/DC  
from electrodes and aux power
- Maximum cable: 300 m (1000 ft.)
- Error condition: 22.1 mA

#### Frequency Output:

- Output modes: Freq, Freq+10, or Mirror Relay 1
- Max. Pullup Voltage: 30 VDC
- Reverse Polarity Protected to -40 V
- Max. Current Sink: 50 mA, current limited
- Maximum cable: 300 m (1000 ft.)

### Tests, Approvals & Standards

- CE



### Chemical Compatibility Warning

The retaining nuts of Magmeters are not designed for prolonged contact with aggressive substances. Strong acids, caustic substances and solvents or their vapor may lead to failure of the retaining nut, ejection of the sensor and loss of the process fluid with possibly serious consequences, such as damage to equipment and serious personal injury. Retaining nuts that may have been in contact with such substances e.g. due to leakage or spilling, must be replaced.

### Relay Specifications

- Relay 1 and 2 Type: Mechanical SPDT  
Rating: 5 A @ 30 VDC max., 5 A @ 250 VAC max.
- Relay 3 Type: Solid State  
Rating: 50 mA @ 30 VDC, 50 mA @ 42 VAC
- Hysteresis: Adjustable, plus timer delay
- Trigger Delay: Adjustable (0 to 9999.9 sec.)

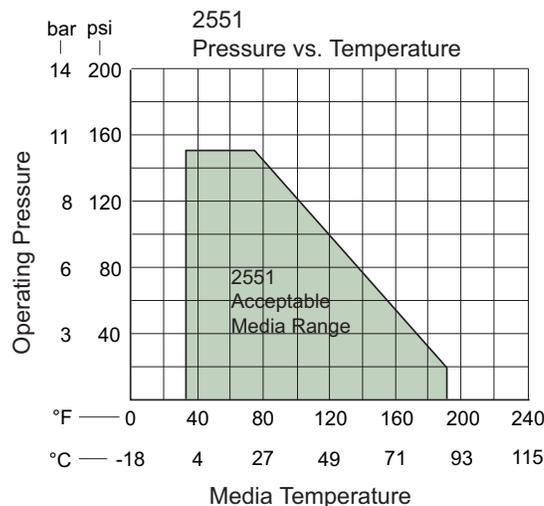
Relay Modes: Off, Low, High, Window, and Proportional Pulse  
Relay Source: Flow Rate, Resettable Totalizer  
Error Condition: Selectable; Fail Open or Fail Closed

### Display

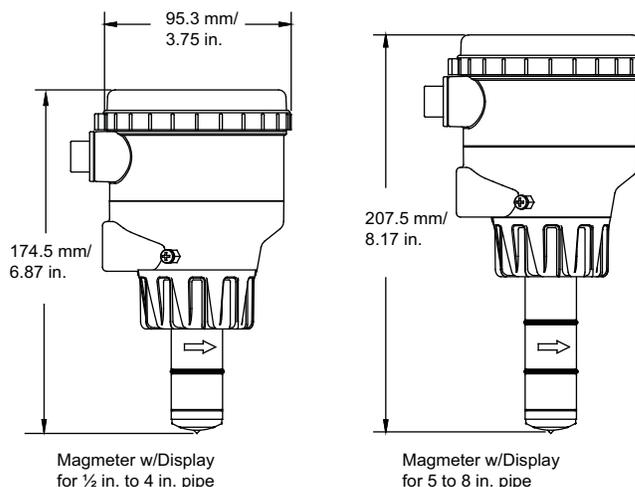
- Characters: 2 x 16
- Contrast: User-set in four levels
- Backlighting (only on relay versions):  
Requires external 9-24 VDC, 0.4 mA max.

### Environmental

- Enclosure Rating : NEMA 4X/IP 65
- Storage Temperature: -20 to 70 °C (-4 to 158 °F)
- Relative Humidity: 0 to 95% (non-condensing)
- Operating Temperature  
Ambient: -10 to 70 °C (14 to 158 °F)  
Media: 0 to 85 °C (32 to 185 °F)
- Max. operating pressure: 10.3 bar @ 25 °C (150 psi @ 77 °F)  
1.4 bar @ 85 °C (20 psi @ 185 °F)

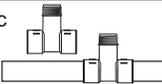


### Dimensions



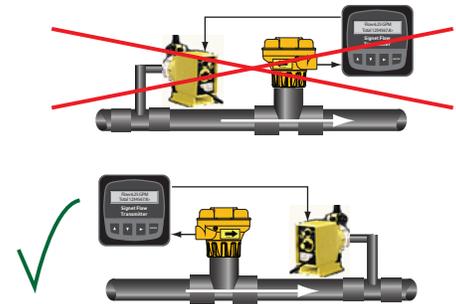
### 3. Installation: Pipe fittings

Omega offers a wide selection of installation fittings that control the position of the Magmeter electrodes in relation to the dimensions of the pipe. You will find a complete list of order numbers for installation fittings in the Calibration tables on pages 8-12.

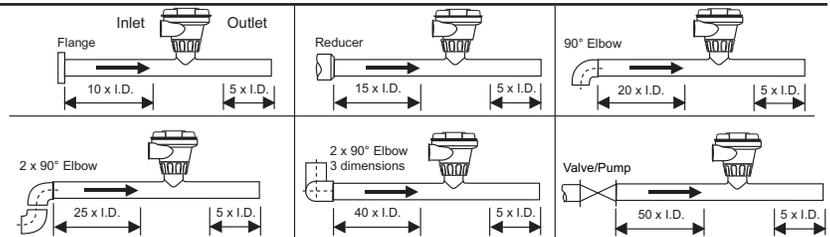
Type	Description	Type	Description
Plastic tees 	<ul style="list-style-type: none"> <li>0.5 to 2 inch versions</li> <li>MPVC or CPVC</li> </ul>	Iron, Carbon Steel, 316 SS Threaded tees 	<ul style="list-style-type: none"> <li>0.5 to 2 in. versions</li> <li>Mounts on threaded pipe ends</li> </ul>
PVC Glue-on Saddles 	<ul style="list-style-type: none"> <li>Available in 10 and 12 inch sizes only</li> <li>Cut 2-1/2 inch hole in pipe</li> <li>Weld in place using solvent cement</li> </ul>	Carbon steel & stainless steel Weld-on Weldolets 	<ul style="list-style-type: none"> <li>2 to 4 inch, cut 1-7/16 inch hole in pipe</li> <li>Over 4 inch, cut 2-1/8 inch hole in pipe</li> </ul>
PVC Saddles 	<ul style="list-style-type: none"> <li>2 to 4 inch, cut 1-7/16 inch hole in pipe</li> <li>6 to 8 inch, cut 2-1/8 inch hole in pipe</li> </ul>	Fiberglass tees 	<ul style="list-style-type: none"> <li>1.5 in. to 2 in. PVDF insert</li> </ul>
Iron Strap-on saddles 	<ul style="list-style-type: none"> <li>2 to 4 inch, cut 1-7/16 inch hole in pipe</li> <li>Over 4 inch, cut 2-1/8 inch hole in pipe</li> <li>Special order 14 in. to 36 in.</li> </ul>	Metric Union Fitting 	<ul style="list-style-type: none"> <li>For pipes from DN 15 to 50 mm</li> <li>PP or PVDF</li> </ul>

#### 3.1 Selecting a Location

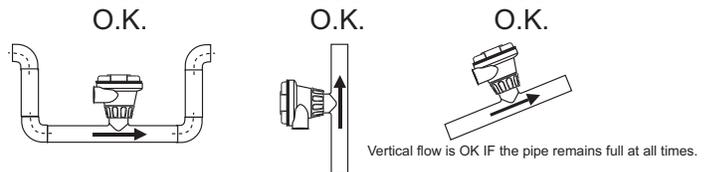
- The magmeter requires a full pipe and a fully developed turbulent flow profile for accurate measurement.
- If the piping system harbors air pockets or bubbles, take steps to locate the sensor so the air pockets will not contact the electrodes.
- In vertical installations, assemble the unit so the conduit ports are facing downward. This prevents condensation inside the conduit from being directed into the electronics housing.
- Chemical injection systems can temporarily alter the fluid conductivity and cause anomalies in the magmeter measurement. To avoid this problem, install the Magmeter UPSTREAM of the injection point.



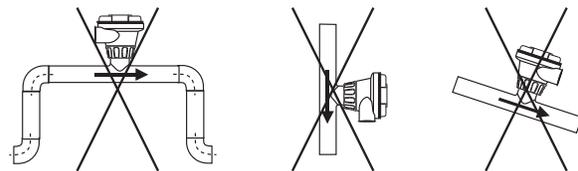
Select a location with sufficient distance of straight pipe immediately upstream of the sensor.



Locating the sensor in a trap or where the flow is upward helps to protect the sensor from exposure to air bubbles when the system is in operation.



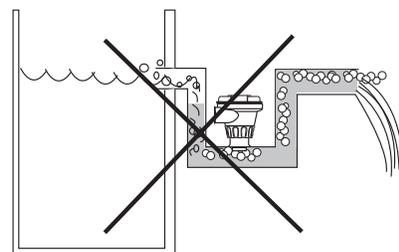
These configurations are not recommended because it is difficult to keep the pipe full.



#### 3.2 Empty Pipe Detection

In a gravity-flow system, the tank must be designed so the level does not drop below the outlet.

This causes the pipe to draw air in from the tank. If air bubbles pass across the Magmeter electrodes, the output will become erratic.

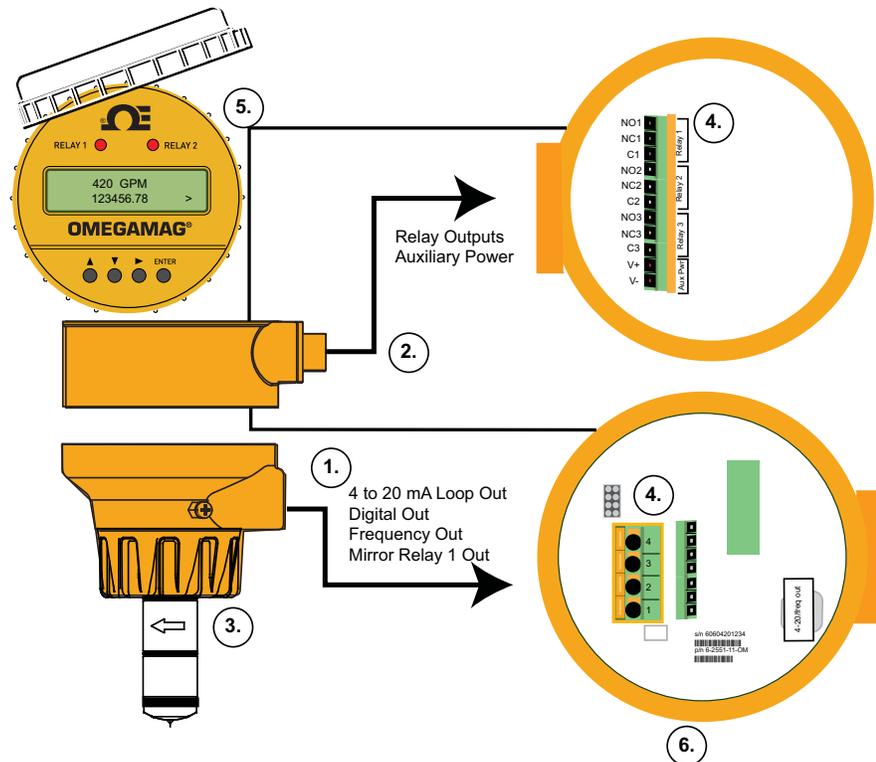


## 4.0 Overview of Display Magmeter

Display Magmeters use a dual-sided electronics module and dual conduit ports. Unused ports must be sealed to prevent corrosion and moisture from entering the circuitry.

- ① The lower set of conduit ports provide access to the wiring terminals for:
  - Loop Power
  - Flow Output Signal, whether it is a current loop, a frequency or the Mirror Relay 1 output.
- ② The upper set of conduit ports provide access to the wiring terminals for:
  - Relay output wiring
  - Auxiliary power for relay coils and display backlight
- ③ The sensor is marked with a directional arrow to indicate the direction identified as forward flow. An adhesive decal is also provided that can be affixed to the pipe to indicate the direction of forward flow. Flow in the opposite direction from the arrow will be identified as reverse flow on the display by a "-" symbol.
- ④ The terminals in the magmeter are designed to accommodate 14 to 22 AWG conductors.
- ⑤ The display includes two LEDs that light when Relay 1 or Relay 2 are activated.
  - All three relays can be monitored by scrolling to the Relay Status display located in the View menu.
  - If the Language option has not been made, new magmeters will always open with the Select Language display.
- ⑥ The part number, serial number and output type are identified on the electronics module.

Language  
English >



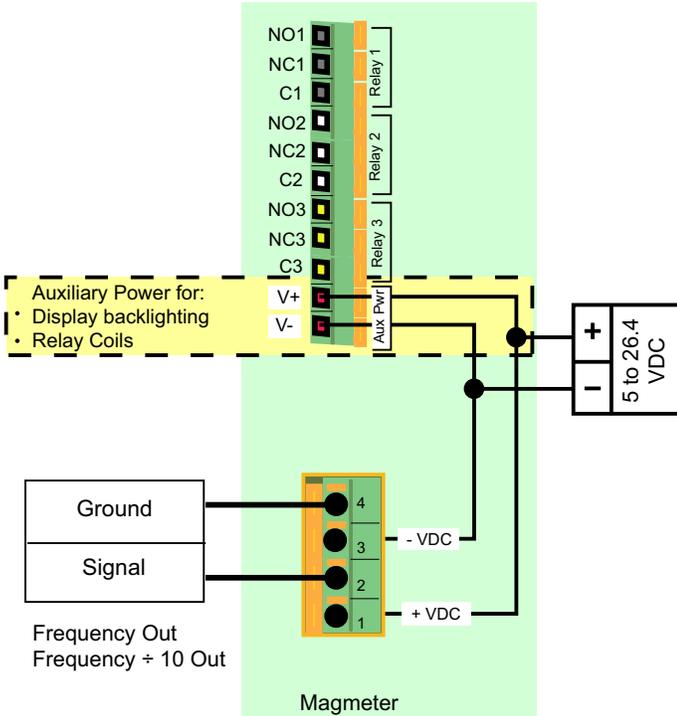
**HAND-TIGHTEN THE THREADED NUT ONTO THE INSTALLATION FITTING. DO NOT USE TOOLS!  
DO NOT USE THREAD SEALANT OR LUBRICANTS ON THE FITTING THREADS OR THE SENSOR CAP.**

## 5.0 Wiring

### 5.1 Basic Wiring

#### Frequency output

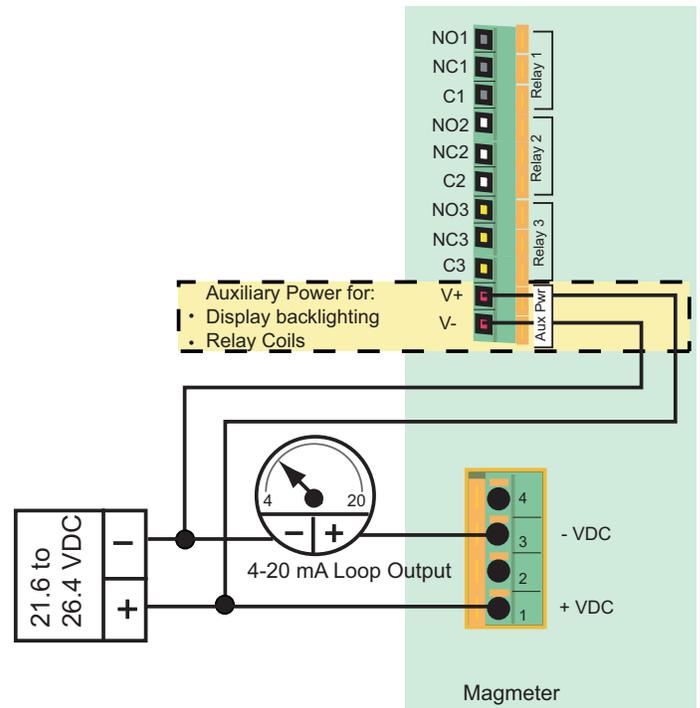
- FMG-3001, 3101 and 3201 OMEGAMAG®s may be programmed to provide an open collector FREQUENCY output.
- The maximum frequency output is 1000 Hz (@ 10 meters per second)
- If the Frequency ÷ 10 output is selected, the maximum frequency is 100 Hz (@ 10 meters per second)
- AUX PWR must be connected to power the display backlighting and to power the relay coils if included.



#### 4 to 20 mA output

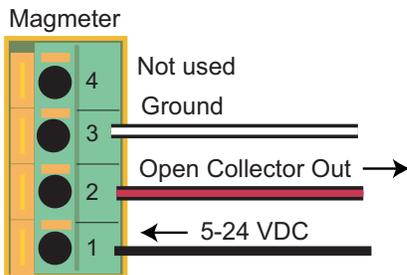
FMG-3002, 3102 and FPM-3202 OMEGAMAG®s provide a passive 4 to 20 mA loop output.

- External loop power (24 VDC) is required.
- Factory standard calibration is 4 to 20 mA = 0 - 5 m/s.
- The 4 to 20 mA output can be spanned to any range from -10 m/s to +10 m/s.
- AUX PWR must be connected to power the display backlighting and to power the relay coils if included.



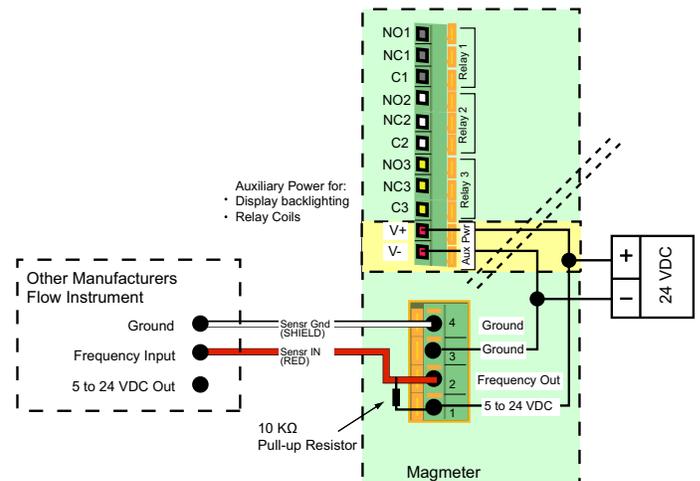
### 5.2 Wiring: Mirror Relay 1 output

The FMG-3001, 3101 and 3201 OMEGAMAG®s can be configured to provide an Open Collector output in lieu of the sensor signal provided by Frequency output selection. The Open Collector Output can be programmed via the Relay 1 menu.



### 5.3 The OMEGAMAG® and other manufacturer's instruments

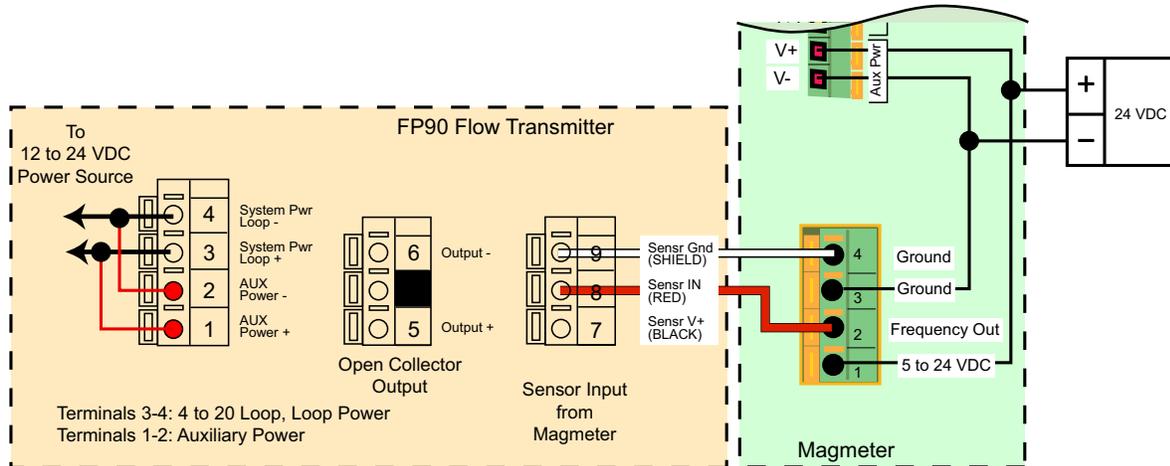
When using the magmeter in a system with other manufacturer's equipment, a pull-up resistor may be required to power the open collector output.



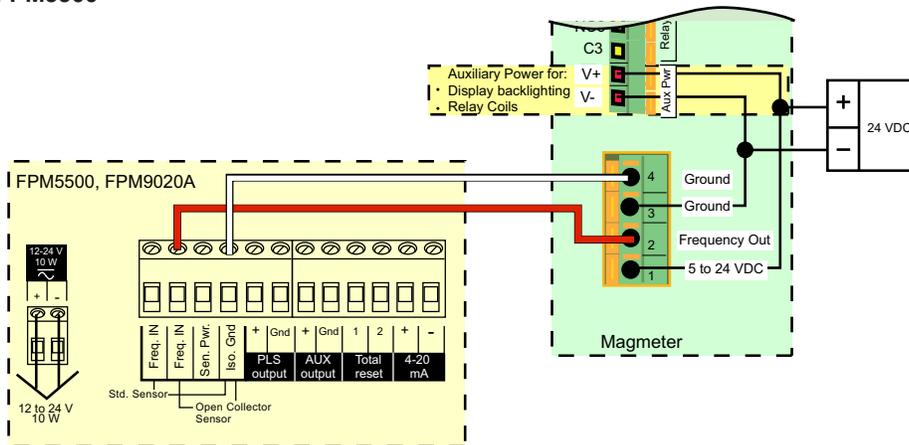
## 5.4 Wiring to Omega Flow Instruments

### The OMEGAMAG® and FP90 series Flow Transmitters

When connecting the magmeter to any FP90 model Transmitter, the AUXILIARY power in the FP90 must always be connected.



### The OMEGAMAG® and FPM5500



## 5.5 Wiring Relays

Relay 1, Relay 2 Type: Mechanical SPDT  
Rating: 5 A @ 30 VDC max., 5 A @ 250 VAC max

Relays 1 and 2 are dry contact relays rated for 5 A maximum current. Relays 1 and 2 are best suited for switching high voltage loads, such as AC powered pumps and valves.

When used to switch inductive loads, dry contact relays may be damaged by arcing. Omega recommends the installation of a filter device to prevent such damage.

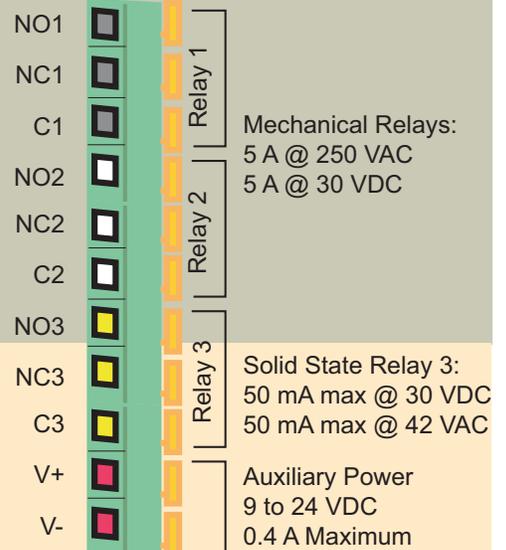
FP90RC RC Filter kit (for relay use)

Relay 3 Type: Solid State  
Rating: 50 mA @ 30 VDC, 50 mA @ 42 VAC

Relay 3 is a solid state relay. It can be applied exactly the same as a dry contact relay, but the current rating is 0.2 A (200 mA) maximum. Relay 3 is best suited to pulse applications and low voltage loads.

### Relay Terminal Legend:

**NO:** Normally Open  
**NC:** Normally Closed  
**C:** Common

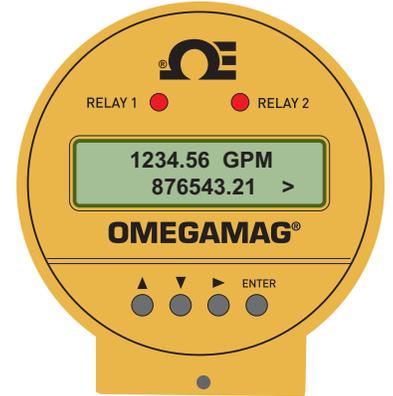


Auxiliary power must be connected to operate the relays and to power the display backlighting. Auxiliary power is fully isolated. The Loop Power supply may be used for Aux power if the power source provides a sufficient current rating.

## 6.0 View Menu

The VIEW menu contains all of the basic information available from the magmeter.

- The normal operating display shows the FLOW RATE on the top line of the display and the resettable totalizer on the lower line of the display.
- The Right Prompt symbol (>) always indicates a sub-menu associated with the current display. In this display it points the way to the TOTALIZER RESET function. See section 6.1 for detailed instructions.
- With AUXILIARY power connected to the magmeters with Relays, the display will be backlit. There is no switch to turn the backlight off.
-  A flashing character or text on the display indicates that the item is being edited. This manual uses a (red) star to illustrate a flashing display.
- The following information is viewed by scrolling UP or DOWN. These displays will remain in the display for 10 minutes, then the normal operating display will return.

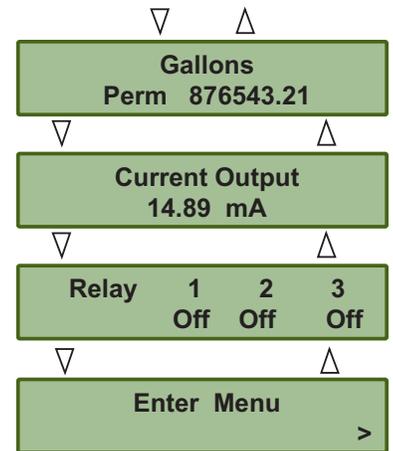


Show the permanent total. This totalizer cannot be reset.

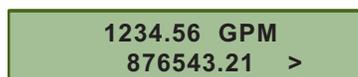
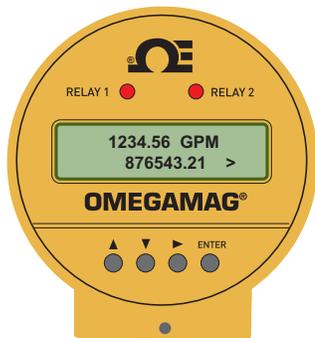
Shows the current output. For 4 to 20 mA Output models only.

Relay States shown for units with a relay board.

Enter menus from this display. See section 6.2.



### 6.1 Resetting the Resettable Totalizer



- From the normal operating display, press the RIGHT arrow key.
- The Resettable Totalizer can be configured to require the security code before allowing the reset. If the Total Reset set to "RESET OFF" this display will not appear. See section 11, Options Menu for instructions.
- Press any arrow key to toggle the flashing selection from NO to YES.
- Press the ENTER key. The totalizer will reset to 000000.00 and the display will immediately return to the normal operating display.

## 6.2 Navigating the Menus

### Normal Operation Display

The normal operating display shows the Flow Rate on the top line and the Resettable Totalizer on the bottom line.

- All menu instructions in this manual assume that the instrument is showing this display.

### Menu Directory

The magmeter uses seven main menus to provide access to the calibration and programming features. Each menu serves a specific function.

Starting from the normal operating display, there are two ways to access the menus:

- Press the UP arrow key to scroll to the Enter Menu display, then press the RIGHT arrow key.
- Press the ENTER key and hold it for about three seconds.

### Setup Menu

This menu contains all of the settings and information that the magmeter requires to operate, including the K-Factor, the totalizer settings, low flow cutoff, and several display characteristics. See section 7.0 for details related to this menu.

### Calibration Menu

The Calibration menu provides two different methods for adjusting the calibration. See section 8.0 for details related to this menu.

### Relay Menus

Each of the available relays in the FMG3001 and FMG3002 are programmed from their own dedicated menu. See section 9 for details related to these menus.

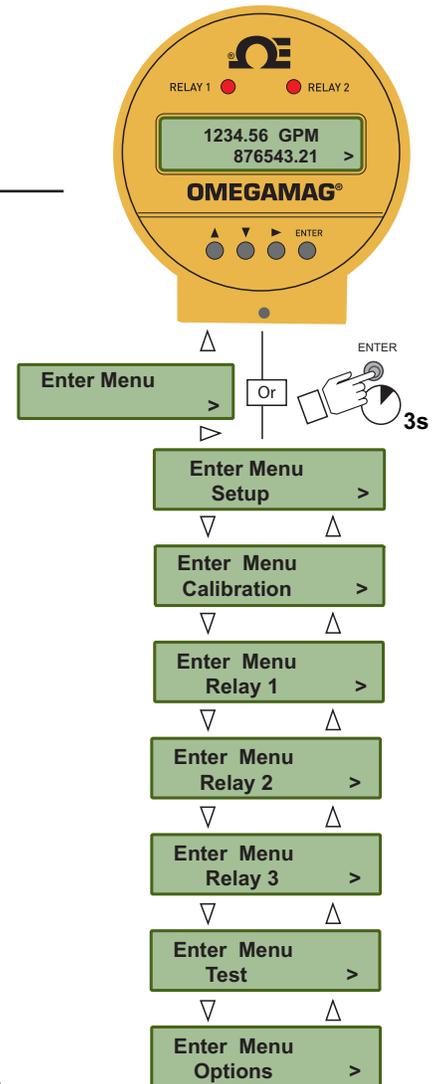
**Note:** Menu items associated with Relay 2 and Relay 3 are suppressed in models without relays. See section 9.0 for details related to this menu.

### Test Menu

The Test menu is used to manually toggle relays or to induce a known value out of the 4 to 20 mA terminals. See section 10.0 for details related to this menu.

### Options Menu

The Options menu contains those settings and values that are usually programmed during the initial installation, and then seldom modified, including the SECURITY CODE (see section 6.4). See section 11.0 for details related to the Options menu.



## 6.3 Keypad Functions

	Scrolls UP through any menu. If the display shows any flashing character or selection, scrolls UP to the previous value or selection.
	Scrolls DOWN through any menu. If the display shows any flashing character or selection, scrolls DOWN to the next value or selection.
	Press the UP and DOWN keys together to abandon any unsaved edits and return to the previous display.
	Opens the menu currently being displayed. In Edit modes, advances the flashing character. In menus with only two options (Yes or No, On or Off) toggles between selections.
ENTER	Saves a new selection in any menu. From Normal Operation display, jumps to first selection in Menu directory (when held for three seconds)

## 6.4 Security Code

The magmeter has a security code that can be programmed to any four digit numerical value.

- The factory setting is 0-0-0-0.
- To program the security code go to the Options menu.
- The security code will be required to edit any of the items in the menus. It is required only once for each editing session.
- Record the custom security code here or in a safe location.
- If the security code is lost, contact your Omega service center for instructions.



Security Code \_\_\_\_\_

WRITE IT DOWN!

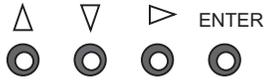
## 7.0 Setup Menu

The Setup menu contains all of the parameters necessary for the OMEGAMAG® to begin measuring flow.

NOTE: The Security Code must be entered before any changes can be made to the Setup menu. See the Options menu in section 11 for details.



Use the keypad to navigate through each setting.



The values shown for each menu item represent the factory standard setting. All magmeters are packaged with these settings.

**K-Factor:** See the charts in section 7.3 for values in pulses per U.S. Gallon or in pulses per Liter. To use other units, convert the published values as appropriate.



**Pipe Size:** Select the pipe size that is nearest to the nominal pipe size.



**Flow Units:** Set the units for the application. Four characters are available. The first three characters can be set to any symbol or alpha character, upper or lower case. The following special symbols are located between the upper case and lower case menus:

- (centered dot)            μ (micro)            \_ (blank)
- (dash)                    / (slash)            3 (for cubic units)

The last character selects the timebase for the flow rate measurement. Select S/s (seconds) M/m (minutes), H/h (hours) or D/d (days)



**Set 4 mA:** In the FMG3002 and FMG3102 versions only, set the flow rate where the current output will be 4 mA.



**Set 20 mA:** In the FMG3002 and FMG3102 versions only, set the flow rate where the current output will be 20 mA.

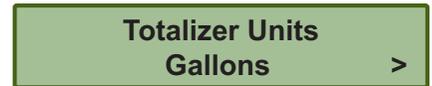


The 4 to 20 mA output may be spanned to monitor forward and reverse flow rates.

**Total Factor:** Set the factor by which the totalizer will count. This setting is made in the application units (ie; gallons, liters, etc.).



**Totalizer Units:** Set the Totalizer Units. This setting serves as a label for the totalizer displays only. It has no effect on the measurement. The special characters listed in the Total Factor settings are available here also.



**Low Flow Cutoff:** Set a flow rate that the magmeter will use as a minimum threshold. If the flow rate falls below this value, the magmeter will respond as if the flow were zero.



**Averaging:** Set the averaging period based on the installation and flow conditions. Smaller values allow the magmeter to respond to changes in flow rate quickly, while larger values smooth the fluctuations caused by installation and flow conditions. See section 7.1 for details.



**Sensitivity:** Set a percentage of maximum range by which the flow must change to override the averaging feature and "jump" quickly to the new flow rate. See detailed explanation in section 7.1.



## 7.1 Averaging and Sensitivity

Even the most carefully engineered flow systems may experience erratic and unstable conditions. If the instability is communicated to the output functions, the results may create problems for control devices.

To alleviate these issues, the magmeter provides two adjustments that operate in tandem. The information here will help in determining the appropriate settings for any specific application.

### Averaging

- The AVERAGING setting dictates the time over which the magmeter will average the flow signal. The LCD display is updated every second. With averaging at 14 seconds, the flow rate on the display is an average of the previous 14 seconds input.

Short averaging times provide the fastest display and output response to changes in the flow rate.

Higher averaging times help to smooth the display and current output where the flow in the pipe is erratic or unstable due to installation limitations.

### Sensitivity

- The SENSITIVITY setting determines how the magmeter responds to sudden surges in the flow rate. It "overrides" the Averaging function just long enough to allow an actual change in flow rate to be displayed, then resumes the averaging. The result is a smooth flow display and a quick response to large shifts in the flow rate.

The settings for Sensitivity represent a percentage of the magmeter's maximum range, or 10 m/s.

Example: A sensitivity setting of 25% means that the flow rate must change instantly and by more than 2.5 m/s before the function is enabled.

NOTE: The SENSITIVITY function is ineffective if the Averaging function is set to zero.

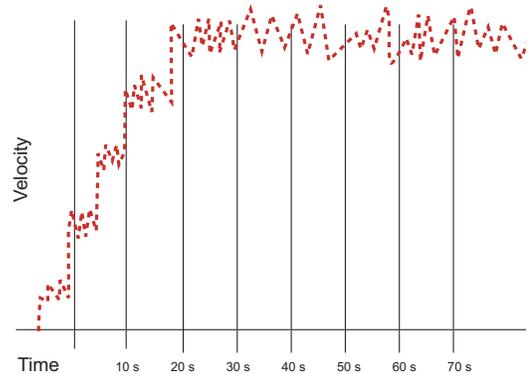


#### CAUTION

The SENSITIVITY function changes the response characteristics of the magmeter. If used as part of a tuned closed loop control system such a change may be undesirable.

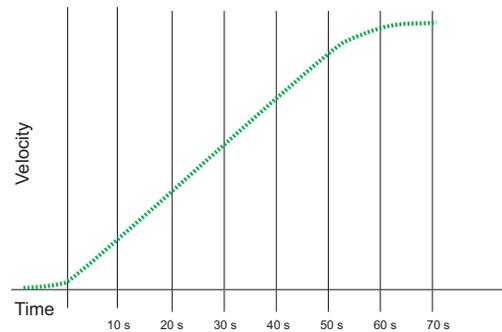
### No Averaging

With AVERAGING set to zero, the flow rate will be displayed immediately and with no filtering. This line represents the actual output of the flow sensor as it responds to unstable flow conditions in the pipe.



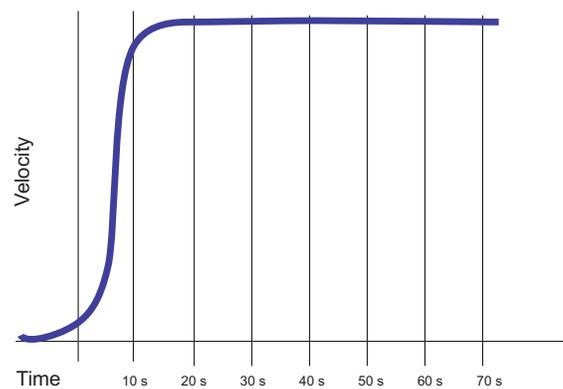
### Averaging Only

With AVERAGING set to 50 seconds and SENSITIVITY still set to zero the flow rate is stabilized, but a sharp change in flow rate is not represented on the display or at the output for 50 seconds or longer.



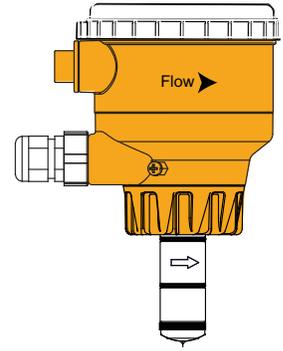
### Averaging and Sensitivity

With AVERAGING at 50 seconds and SENSITIVITY set to 25%, the flow rate is stabilized, while the sudden shift in flow is reflected very quickly.



## 7.2 Bi-Directional Flow

- The magmeter is designed to measure bi-directional flow.
- The forward flow direction is indicated by the directional arrow molded into the side of the magmeter sensor.
- The conduit ports are assembled at the factory to point UPSTREAM. They may be reversed by disassembling the components of the magmeter and reassembling.



**Flow Rate Display:** The "+" sign is suppressed during forward flow. "-123.45 GPM" during reverse flow.

**Totalizer Display:** The totalizer will count during forward flow conditions only. During reverse flow the totalizer will not increment.

**Relay Outputs:** May be set to detect reverse flow: "Low Setpoint at -25GPM."

**4 to 20 mA output:** May be scaled to span any flow range:  
For example: "4 to 20 mA = -100 GPM to +100 GPM"

**Frequency output, Frequency ÷ 10 output:** Reverse flow is processed same as forward flow in the frequency output magmeters.

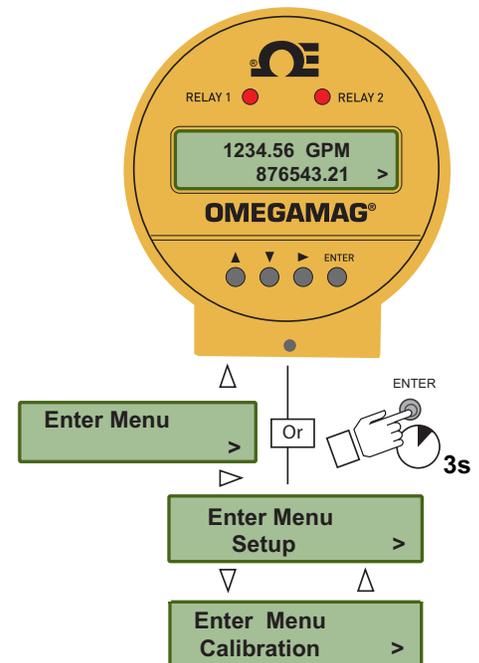
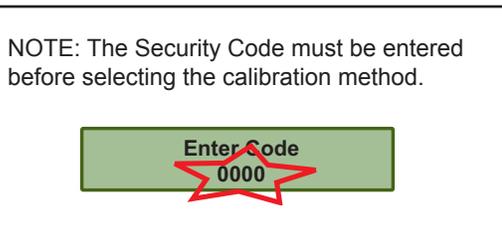
## 8.0 Calibration Menu

The K-Factors published in this manual assume that the flow conditions in the pipe are ideal.

Many factors that affect the flow rate are beyond the control of the magmeter; variations in actual pipe dimensions, pipe smoothness, and other flow conditions will contribute to the total system error.

Performing a custom calibration with the magmeter in place will adjust the K-factor and can serve to compensate for installation conditions that may be less than ideal.

Select one of the calibration methods in this menu to achieve the most accurate measurement possible in a specific application.



### 8.1 Volume Method Of Calibration

Use the volume method of calibration if the fluid passing the magmeter can be measured by a volumetric method (as in a vessel of known volume, or by weight). It requires the ability to pump a known volume of water past the magmeter, and then input the volume into the magmeter program. It is most useful for small pipes and lower flow rates.

When performed properly, volumetric calibration is the most accurate method. For best results a five minute test period is recommended, and the test period should be no less than two minutes.

Press Enter To Start	At START, the magmeter begins counting the flow past the sensor.
Press Enter To Stop	At STOP, the magmeter stores the total flow accumulated since the START.
Enter Volume 000000. GPM	Enter the VOLUME that has been pumped past the sensor.
Value must be more than 0.0	This error message appears if volume entered or the accumulated flow is zero. Repeat the test after checking the system.
K-Factor Out of Range	This message appears if the new K-Factor is less than 0.0001 or greater than 999999. To correct the problem, perform the volumetric flow again, and be certain that the volume entered is accurate.
K-Factor 45.6789	Using the information from the VOLUME method, the magmeter will recalculate a new K-Factor. Press ENTER to accept the new value, or use the keypad to adjust the value.

## 8.2 Rate Method Of Calibration

Use this method if the magmeter must be calibrated to match a reference flow meter. This is the method most commonly used by monitoring agencies, and for large pipes where volumetric calibration is impractical. The accuracy of this calibration method is largely dependent on the accuracy of the reference meter and the proximity of the reference to the magmeter.

**Set New Flowrate**  
45.6789

The flow rate shown is based on the existing calibration of the magmeter. Use the keypad to modify the flow rate to match the reference meter. The magmeter will automatically calculate a new K-Factor based on the new flow rate.

**K-Factor**  
Out of Range

This message appears if the new K-Factor is less than 0.0001 or greater than 999999. To correct the problem, reexamine the flow rate and make certain it is accurate.

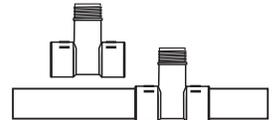
**K-Factor**  
56.7890

Using the information from the RATE MATCHING method, the magmeter will recalculate a new K-Factor. Press ENTER to accept the new value, or use the keypad to adjust the value.

## 8.3 Calibration Data: K-Factors\* and Full Scale Current Values

### Plastic Installation Fittings: PVC Tees and Saddles

PIPE SIZE (IN.)	FITTING TYPE	K-Factor Gallons	K-Factor Liters*	20 mA= in GPM	20 mA= in LPM
<b>SCH 80 PVC TEES FOR SCH 80 PVC PIPE</b>					
½	FP-5305M	2277.00	601.58	13.10	49.60
¾	FP-5307M	1407.6	371.90	20.97	79.38
1	FP-5310M	861.17	227.52	34.21	129.50
1¼	FP-5312M	464.91	122.83	67.10	253.99
1½	FP-5315M	331.43	87.56	92.54	350.25
2	FP-5320M	192.89	50.96	145.15	549.38
<b>SCH 80 PVC TEES FOR SCH 80 CPVC PIPE</b>					
½	FP-5305C	2277.0	601.58	13.18	49.87
¾	FP-5307C	1407.6	371.90	21.31	80.67
1	FP-5310C	861.17	227.52	34.84	131.86
1¼	FP-5312C	464.91	122.83	64.53	244.24
1½	FP-5315C	331.43	87.56	90.52	342.62
2	FP-5320C	192.89	50.96	155.53	588.70
<b>SCH 80 PVC SADDLES FOR SCH 80 PVC PIPE</b>					
2	FP-5320S	193.83	51.21	154.77	585.81
2½	FP-5325S	138.01	36.46	217.38	822.78
3	FP-5330S	83.89	22.16	357.62	1353.60
4	FP-5340S	40.88	10.80	733.88	2777.74
6	FP-5360S	22.53	5.95	1331.85	5041.06
8	FP-5380S	12.52	3.31	2395.41	9066.64
10	FP-5381S	7.94	2.10	3778.75	14302.57
12	FP-5382S	5.71	1.51	5256.69	19896.57
<b>SCH 80 PVC SADDLES FOR SCH 40 PVC PIPE</b>					
2	FP-5320S	180.01	47.56	166.66	630.81
2½	FP-5325S	123.72	32.69	242.49	917.82
3	FP-5330S	75.81	20.03	395.71	1497.76
4	FP-5340S	41.87	11.06	716.56	2712.19
6	FP-5360S	19.71	5.21	1521.92	5760.46
8	FP-5380S	11.73	3.10	2558.12	9682.50
10	FP-5381S	7.43	1.96	4037.60	15282.3
12	FP-5382S	5.23	1.38	5734.87	21706.48

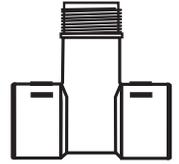


**Plastic Installation Fittings for Metric Pipes:**

Polypropylene True Union Tees

PVDF True Union Tees

PVC True Union Tees



PIPE SIZE (IN.)	FITTING TYPE	K-Factor Gallons	K-Factor Liters*	20 mA= in GPM	20 mA= in LPM
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**SCH 80 PVC TEES FOR SCH 80 PVC PIPE**

1/2	FP-5305M	2277.00	601.58	13.10	49.60
3/4	FP-5307M	1407.6	371.90	20.97	79.38
1	FP-5310M	861.17	227.52	34.21	129.50
1 1/4	FP-5312M	464.91	122.83	67.10	253.99
1 1/2	FP-5315M	331.43	87.56	92.54	350.25
2	FP-5315M	192.89	50.96	145.15	549.38

**SCH 80 PVC TEES FOR SCH 80 CPVC PIPE**

1/2	FP-5305CM	2277.0	601.58	13.18	49.87
3/4	FP-5307CM	1407.6	371.90	21.31	80.67
1	FP-5310CM	861.17	227.52	34.84	131.86
1 1/4	FP-5312CM	464.91	122.83	64.53	244.24
1 1/2	FP-5315CM	331.43	87.56	90.52	342.62
2	FP-5320CM	192.89	50.96	155.53	588.70

**SCH 80 PVC SADDLES FOR SCH 80 PVC PIPE**

2	FP-5320S	193.83	51.21	154.77	585.81
2 1/2	FP-5325S	138.01	36.46	217.38	822.78
3	FP-5330S	83.89	22.16	357.62	1353.60
4	FP-5340S	40.88	10.80	733.88	2777.74
6	FP-5360S	22.53	5.95	1331.85	5041.06
8	FP-5380S	12.52	3.31	2395.41	9066.64
10	FP-5381S	7.94	2.10	3778.75	14302.57
12	FP-5382S	5.71	1.51	5256.69	19896.57

**SCH 80 PVC SADDLES FOR SCH 40 PVC PIPE**

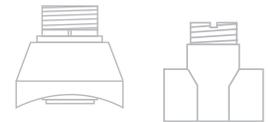
2	FP-5320S	180.01	47.56	166.66	630.81
2 1/2	FP-5325S	123.72	32.69	242.49	917.82
3	FP-5330S	75.81	20.03	395.71	1497.76
4	FP-5340S	41.87	11.06	716.56	2712.19
6	FP-5360S	19.71	5.21	1521.92	5760.46
8	FP-5380S	11.73	3.10	2558.12	9682.50
10	FP-5381S	7.43	1.96	4037.60	15282.3
12	FP-5382S	5.23	1.38	5734.87	21706.48

**Metal Installation Fittings:**

Carbon Steel Tees and Weld-olets

Stainless Steel Tees and Weldolets

Galvanized Iron Tees



PIPE SIZE (IN.)	FITTING TYPE	K-Factor Gallons	K-Factor Liters*	20 mA= in GPM	20 mA= in LPM
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**CARBON STEEL TEES ON SCH 40 PIPE**

½	FM-5305CS	1572.66	415.50	19.08	72.20
¾	FM-5307CS	1086.73	287.11	27.61	104.49
1	FM-5310CS	582.34	153.86	51.52	194.99
1¼	FM-5312CS	377.48	99.73	79.48	300.81
1½	FM-5315CS	267.79	70.75	112.03	424.02
2	FM-5320CS	167.85	44.35	178.73	676.48

**STAINLESS STEEL TEES ON SCH 40 PIPE**

½	FMG-5305	1601.26	423.05	18.74	70.91
¾	FMG-5307	937.78	247.76	31.99	121.08
1	FMG-5310	606.18	160.15	49.49	187.32
1¼	FMG-5312	279.68	73.89	107.26	405.99
1½	FMG-5315	147.65	39.01	203.19	769.06
2	FMG-5320	111.90	29.56	268.09	1014.73

**STAINLESS STEEL WELDOLETS ON SCH 40 PIPE**

2½	FMG-5325	106.31	28.09	282.19	1068.10
3	FMG-5330	72.27	19.09	415.12	1571.25
4	FMG-5340	36.84	9.73	814.34	3082.28
4	FMG-5350	29.28	7.73	1024.70	3878.50
4	FMG-5360	20.29	5.36	1478.26	5595.21
8	FMG-5380	11.73	3.10	2557.72	9680.96
10	FMG-5381	7.45	1.97	4028.83	15249.1
12	FMG-5382	5.24	1.39	5722.73	21660.5

**CARBON STEEL WELDOLETS ON SCH 40 PIPE**

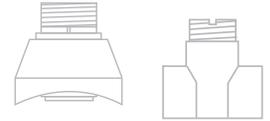
2½	FM-5325CS	105.70	27.93	283.82	1074.27
3	FM-5330CS	70.68	18.67	424.45	1606.56
4	FM-5340CS	36.38	9.61	824.65	3121.30
4	FM-5350CS	29.28	7.73	1024.70	3878.50
6	FM-5360CS	20.29	5.36	1478.26	5595.21
8	FM-5380CS	11.73	3.10	2557.72	9680.96
10	FP-5381CS	7.45	1.97	4028.83	15249.1
12	FP-5382CS	5.24	1.39	5722.73	21660.5

**GALVANIZED IRON TEES ON SCH 40 PIPE**

1	FP-5310GI	558.50	147.56	53.71	203.31
1¼	FP-5312GI	334.45	88.36	89.70	339.51
1½	FP-5315GI	248.97	65.78	120.49	456.07
2	FP-5320GI	146.00	38.57	205.48	777.76

**Metal Installation Fittings:**

Bronze and Copper Tees and Brazolets



PIPE SIZE (IN.)	FITTING TYPE	K-Factor Gallons	K-Factor Liters*	20 mA= in GPM	20 mA= in LPM
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**BRONZE TEES ON SCH 40 PIPE**

1	FP-5310BR	582.34	153.86	51.52	194.99
1¼	FP-5312BR	330.54	87.33	90.76	343.53
1½	FP-5315BR	254.76	67.31	117.76	445.71
2	FP-5320BR	157.36	41.58	190.64	721.58

**COPPER TEES FITTING ON COPPER PIPE SCH K**

½	FP-5305CU	2459.19	649.72	12.20	46.17
¾	FP-5307CU	1108.02	292.74	27.08	102.48
1	FP-5310CU	649.87	171.70	46.16	174.73
1¼	FP-5312CU	422.03	111.50	71.09	269.06
1½	FP-5315CU	281.43	74.35	106.60	403.47
2	FP-5320CU	136.02	35.94	220.55	834.78

**COPPER TEES FITTING ON COPPER PIPE SCH L**

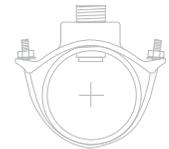
½	FP-5305CU	2406.30	635.75	12.47	47.19
¾	FP-5307CU	1174.77	310.37	25.54	96.66
1	FP-5310CU	672.28	177.62	44.62	168.90
1¼	FP-5312CU	402.84	106.43	74.47	281.87
1½	FP-5315CU	294.99	77.94	101.70	384.92
2	FP-5320CU	149.63	39.53	200.50	758.89

**COPPER/BRONZE BRAZOLET ON SCH 40 PIPE**

2½	FP-5325BR	117.31	30.99	255.74	967.96
3	FP-5330BR	78.62	20.77	381.58	1444.28
4	FP-5340BR	45.13	11.92	664.77	2516.15
5	FP-5350BR	32.79	8.66	914.91	3462.95
6	FP-5360BR	22.73	6.01	1319.87	4995.72
8	FP-5380BR	13.14	3.47	2283.68	8643.71
10	FP-5381BR	8.34	2.20	3597.17	13615.29
12	FP-5382BR	5.87	1.55	5109.58	19339.76

**Metal Installation Fittings:**

Iron Saddles



PIPE SIZE (IN.)	FITTING TYPE	K-Factor Gallons	K-Factor Liters*	20 mA= in GPM	20 mA= in LPM
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**SCH 80 IRON SADDLE ON SCH 80 PIPE**

2	FP-5320GIS	194.85	51.48	153.96	582.75
2½	FP-5325GI	142.28	37.59	210.86	798.10
3	FP-5330GI	87.53	23.13	342.72	1297.20
4	FP-5340GI	40.62	10.73	738.58	2795.54
5	FP-5350GI	29.28	7.74	1024.43	3877.48
6	FP-5360GI	22.30	5.89	1345.58	5093.03
8	FP-5380GI	12.52	3.31	2395.41	9066.64
10	FP-5381GI	7.94	2.10	3778.75	14302.5
12	FP-5382GI	5.65	1.49	5311.45	20103.8

**SCH 80 IRON SADDLE ON SCH 40 PIPE**

2	FP-5320GIS	185.35	48.97	161.85	612.61
2½	FP-5325GI	127.47	33.68	235.36	890.83
3	FP-5330GI	76.62	20.24	391.54	1481.99
4	FP-5340GI	40.23	10.63	745.72	2822.57
5	FP-5350GI	27.32	7.22	1098.24	4156.83
6	FP-5360GI	19.71	5.21	1521.92	5760.46
8	FP-5380GI	11.61	3.07	2584.23	9781.30
10	FP-5381GI	7.36	1.94	4078.8	15438.2
12	FP-5382GI	5.18	1.37	5793.39	21927.9

## 9.0 Relay Menus

Magmeter models FMG-300X, 310X and 320X have two dry contact relays (Relays 1 and 2) and one Solid State relay (Relay 3).

Any of these relays can be set to any of the operating modes listed below.

The setpoint values for HIGH, LOW and WINDOW modes can be set to negative values if required.

For example, a LOW alarm might be set to activate if the flow rate falls below -10 GPM.

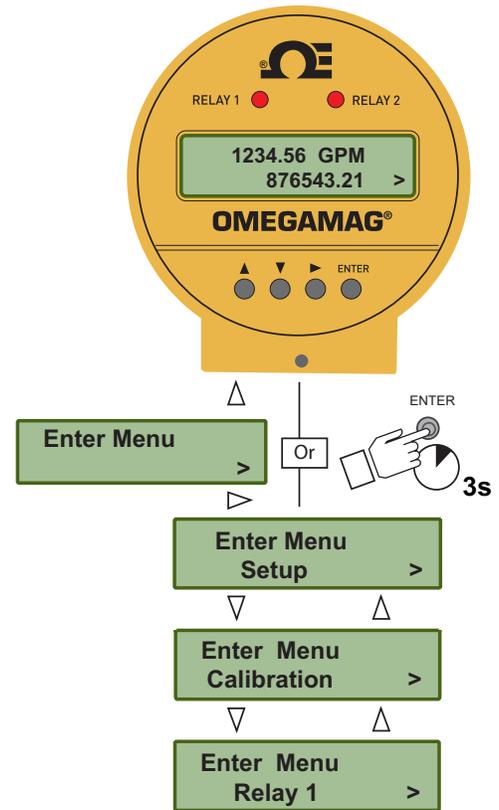
Negative values are not available for relays in PULSE or TOTAL modes.

**Off:** If a relay is not used, it can be turned Off to prevent contact wear.



NOTE: The Security Code must be entered before modifying the relay menu.

Enter Code  
0000



### 9.1 Pulse Relay mode

Program a relay to activate for a fixed period, for each volume of fluid that passes the sensor.

For example, program the relay to pulse once for 100 ms for every 3 gallons that pass by the sensor.

Relay 1 Mode  
Pulse >

Relay 1 Volume  
0.0000 Gal >

Relay 1 Width  
0.1 secs >

Relay Volume: Set the volume of fluid that the magmeter must measure before activating the relay for one pulse.

Pulse Width: Adjust the length of time the relay will remain activated. The pulse width setting is dependent on the type of external equipment being connected to the relay.

### 9.2 Total Relay mode

Program a relay to activate when the Resettable Totalizer reaches a specific value. The maximum setting is 999999.

Application example: A filter must be replaced in a reverse osmosis system every 10000 gallons. The service representative that installs a new filter sets Relay 3 to Total mode, sets the setpoint at 10000 and resets the totalizer to 000000.00. When the totalizer is reset, the relay will be deactivated and the process begins anew.

Every time the totalizer reaches 10000, the relay activates and lights a message indicator to remind the operator to contact the service representative to replace the filter.

Relay 1 Mode  
Total >

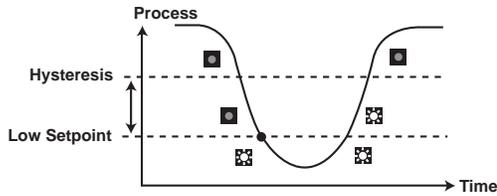
Relay 1 Set High  
000000 >

### 9.3 High, Low, or Window Relay modes

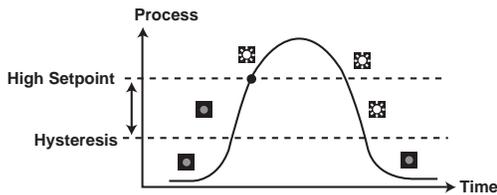
Program the relay to activate when the flow rate reaches a setpoint (High or Low) or when the flow rate moves outside of a prescribed range (window).

#### Reverse Flow

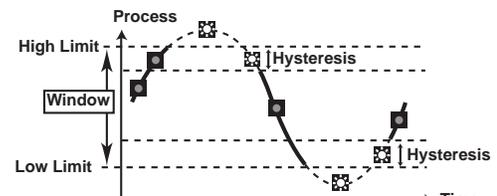
The setpoint values for HIGH, LOW and WINDOW modes can be set to negative values if required. For example, a LOW alarm might be set to activate if the flow rate falls to -10 GPM.



Relay behavior with LOW Setpoint

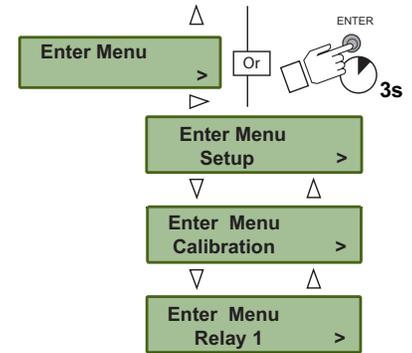
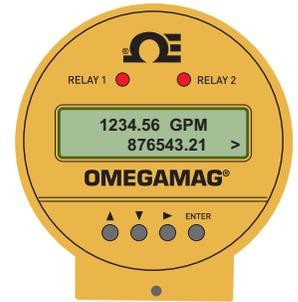


Relay behavior with HIGH Setpoint



Relay behavior with WINDOW Setpoints

Relay activated   
Relay deactivated 





NOTE: The Security Code must be entered before modifying the relay menu.

Enter Code  
0000

The values shown for each menu item represent the factory standard setting. All magmeters are packaged with these settings.

Set Low: Set the flow rate where a Low relay will be activated.

Set High: Set the flow rate where a High relay will be activated.

Set Window: Set a range where the relay will be deactivated. If the flow rate moves outside of the low or high boundaries the relay will be activated.

Hysteresis: Set a flow rate increment where the relay will be deactivated. The hysteresis setting serves to prevent relay "chatter" when the flow rate recovers from an alarm condition by requiring the flow rate to move substantially within the setpoint.

Example: If high setpoint is 100 GPM, and hysteresis is 5 GPM, the relay will be activated if flow rate reaches 100.1 GPM, but will only be deactivated when the flow rate is 95 GPM (5 GPM inside the setpoint.)

Delay: Set a time period for the relay to wait after reaching the setpoint. This delay serves to prevent the relay "chatter" by allowing the flow rate time to move back within the setpoint.

Example: If the delay is set to 5 seconds, in the example above the relay will not be activated until the flow rate exceeds 100 GPM for 5 seconds.

Relay 1 Mode Low >	Relay 1 Set Low 00.000 GPM >
	Relay 1 Hys 00.000 GPM >
	Relay 1 Delay 0.1 secs >
Relay 1 Mode High >	Relay 1 Set High 00.000 GPM >
	Relay 1 Hys 00.000 GPM >
	Relay 1 Delay 0.1 secs >
Relay 1 Mode Window >	Relay 1 Set Low 00.000 GPM >
	Relay 1 Set High 00.000 GPM >
	Relay 1 Hys 00.000 GPM >
	Relay 1 Delay 0.1 secs >

The menu repeats for Relay 2 and Relay 3.

## 10.0 Test Menu

The Test menu provides a simple method to verify that the system is operating properly. Auxiliary power **MUST** be connected to the magmeter to activate the relays.



Test Output 4.20 mA >
Test Relay 1 Open Closed >
Test Relay 2 Open Closed >
Test Relay 3 Open Closed >

Shown for 4 to 20 mA models only.

Use the keypad to enter any current output from 4.0 mA minimum to 22.1 mA maximum.

Shown for Relay models only

Toggle any of these relays ON and OFF to verify that the system is operating properly.

Auxiliary power **MUST** be connected to the magmeter to test the relays.



## 11.0 Options Menu

The Options Menu contains those features and settings that will normally be set one time and then seldom changed. These include language preference, decimal placement, Security Code assignment, etc.



Language English >
Security Code **** >
Contrast 2 >
Total Reset Lock On >
Noise Rejection 60 Hz >
Flow Decimal ****. ** >
Total Decimal *****. ** >
Separator ddd.d >
Output Mode Frequency >

Select from English, German, French or Spanish.

This Selection will be displayed at first power-up of a new magmeter.

Security Code can be set to any four digit number. Factory standard setting is 0000.

Set for best view after the magmeter is installed. Larger number means display appears darker.

Lock ON requires the Security Code before resetting the resettable totalizer. Lock OFF reset with no security code.

Filters out common 50 or 60 Hz electrical noise.

Set the maximum resolution for the FLOW RATE display by limiting the decimal to this point. The Flow Rate display will auto-scale from this resolution up to whole units.

Set the maximum resolution for the TOTALIZER display by limiting the decimal to this point. The Totalizer display will always show this resolution.

Select decimal point or comma for use in numeric displays.

For Frequency/Digital models only: Select Freq output, Freq ÷ 10 output, Mirror Relay 1 output or Digital output.

The values shown for each menu item represent the factory standard setting. All magmeters are packaged with these settings.

### 11.1 Output Modes

In **FREQUENCY** output mode, the OMEGAMAG® serves as a traditional flow sensor and provides an output pulse that is compatible with most Omega POWERED flow instruments. It is not compatible with the FPM5800 Self-Powered Flow Meter or the FPM5750 series Battery-powered flow totalizer. The frequency output range is from 0 Hz to 1000 Hz.

The **FREQUENCY ÷ 10** output mode reduces the output frequency of the OMEGAMAG® to a range that is useful for some programmable logic controllers (PLC). The frequency output range is from 0 Hz to 100 Hz. This shift does not affect the stated accuracy of the magmeter's frequency output.

The **MIRROR RELAY 1** output mode allows Frequency models to use the Open Collector Output like a relay that can be programmed via the Relay 1 menu.

If the magmeter is equipped with relays, this mode will mirror the settings of Relay 1.

If the magmeter is not equipped with relays, this mode can still be selected and programmed via the Relay 1 menu.

## 12.0 Technical Information

### 12.1 Grounding

Pre-calibration conditioning: The magmeter may appear to be unstable immediately after installation. Allow the sensor to sit in a full pipe for **24 hours** before beginning calibration and operation.

- Use a cable gland or a liquid tight connector to seal the cable ports from water intrusion.
- Use Teflon tape or a suitable sealant on cable ports.
- The magmeter must be carefully grounded to eliminate electrical noise that may interfere with the measurement.
- Grounding requirements will vary with each installation.
- The following recommendations should be applied in sequence until the interference is eliminated.

- ① The ground terminal on the outside of the yellow housing is connected internally to the grounding ring at the tip of the sensor. Connect a conductor (14 AWG/2.08 mm<sup>2</sup> wire recommended) from this terminal directly to Earth ground to prevent electrical noise from interfering with the magmeter signal.

If the interference persists, apply step #2:

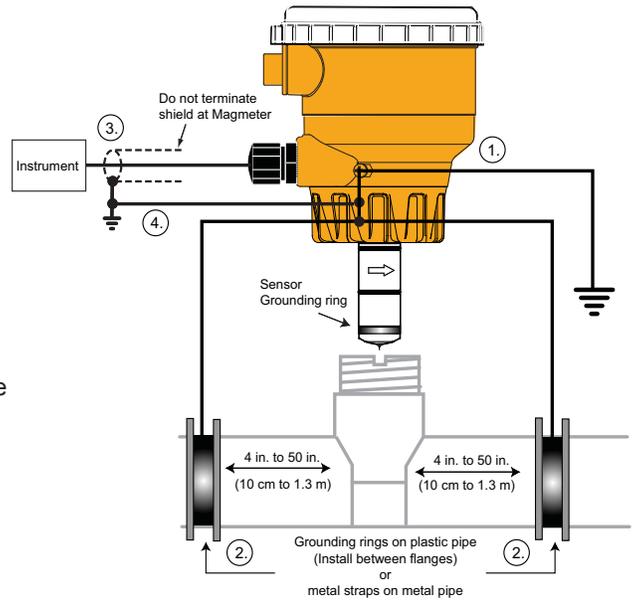
- ② Connect grounding rings, metal clamps or grounding electrodes to the pipe immediately upstream and downstream of the magmeter sensor location. These devices must be in contact with the fluid.

If the interference persists, apply step #3:

- ③ The shield from the output cable must be terminated at the remote instrument ONLY. This shield must not be connected at both ends!

If the interference persists, apply step #4:

- ④ Connect an additional wire (minimum AWG 14/2.08 mm<sup>2</sup>) from the remote instrument ground to the magmeter ground terminal.



## 13.0 Ordering Information

Order number	Description
FMG-3001-PP-D	Display Magmeter, freq out, PP sensor, 0.5 to 4 inch pipe
FMG-3001-PVDF-D-HA	Display Magmeter, freq out, PVDF/HA sensor, 0.5 to 4 inch pipe
FMG-3101-PP-D	Display Magmeter, freq out, PP sensor, 5 to 8 inch pipe
FMG-3101-PVDF-D-HA	Display Magmeter, freq out, PVDF/HA sensor, 5 to 8 inch pipe
FMG-3201-PP-D	Display Magmeter, freq out, PP/SS sensor, 10 to 12 inch pipe
FMG-3201-PVDF-D-HA	Display Magmeter, freq out, PVDF/HA sensor, 10 to 12 inch pipe
FMG-3002-PP-D	Display Magmeter, 4 to 20 out, PP sensor, ½ to 4 inch pipe
FMG-3002-PVDF-D-HA	Display Magmeter, 4 to 20 out, PVDF/HA sensor, 0.5 to 4 inch pipe
FMG-3102-PP-D	Display Magmeter, 4 to 20 out, PP sensor, 5 to 8 inch pipe
FMG-3102-PVDF-D-HA	Display Magmeter, 4 to 20 out, PVDF/HA sensor, 5 to 8 inch pipe
FMG-3202-PP-D	Display Magmeter, 4 to 20 mA out, PP/SS sensor, 10 to 12 inch pipe
FMG-3202-PVDF-D-HA	Display Magmeter, 4 to 20 mA out, PVDF/HA sensor, 10 to 12 inch pipe

### Replacement Parts and Accessories

FPP-1220-0021	O-ring, FPM
FPP-1224-0021	O-ring, EPDM
FPP-1228-0021	O-ring, FFPM
FPM-5000-LTCK	Liquid Tight Connector Kit

## 12.2 Maintenance

The OMEGAMAG® requires very little maintenance. There are no user-serviceable components in the magmeter.

- If the fluid contains deposits and solids that may coat the electrodes, a regular cleaning regimen is recommended.
- Do not use abrasive materials on the metal electrodes. Clean with soft cloth and mild detergent only.
- Use a cotton swab and mild detergent to remove deposits on the metal electrodes.

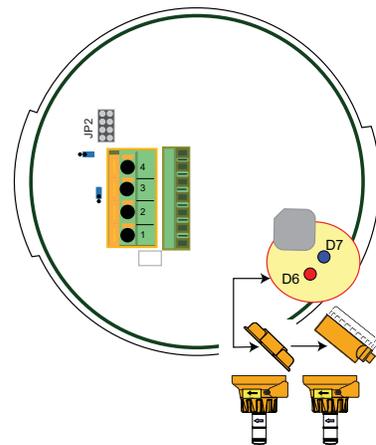
## 12.3 Troubleshooting

Symptom	Possible Cause	Solution
Output is erratic and unstable.	Magmeter installed too close to upstream obstruction.	Relocate the magmeter to have straight uninterrupted pipe upstream of the sensor for at least 10 x the pipe diameter.
	Magmeter located in area exposed to air bubbles/pockets.	Eliminate air bubbles in the pipe.
	Magmeter is installed in pipe backwards.	Remove the magmeter and reinstall with the flow direction arrow on the sensor body pointed DOWNSTREAM.
	Electrical noise is interfering with the measurement.	Review the grounding of the magmeter and the pipe. Install adequate Earth ground to allow the Magmeter to operate properly.
	Electrodes are coated with deposits or chemical oxide layers.	Carefully clean the electrodes. Refer to sensor manual for details.
Output is not 0 when flow is stopped.	Electrodes not adequately conditioned in fluid.	Allow the sensor to sit in full pipe for 24 hours then restart.
	Fluid is moving inside the pipe	Increase the Low Flow Cutoff. (section 7.0)
No 4-20 mA output.	Loop power not connected correctly.	Connect 24 VDC $\pm$ 10% connected to loop terminals 1 and 3
4-20 mA current output is incorrect.	4-20 mA is not scaled properly	Check and reset in the Setup Menu
No Frequency output.	Magmeter is wrong model.	Frequency model: FMG3001 or FMG3101
	Incorrect setting in Options Menu.	Select Frequency in the Options menu.
	Wiring is not correct.	Check wiring, make corrections.
	Frequency input to other manufacturer's flow instrument does not have pull-up resistor.	Install 10 k $\Omega$ resistor. (section 5.1)
No flow rate, current output is 22 mA	The fluid is too clean for Magmeter.	Unsuitable application for Magmeter.
	Electronic component failure.	Return Magmeter to factory.
Blank display, no backlighting, no relay LEDs, but external equipment using output signal is still working.	Magmeter AUX power is not connected.	Connect AUX power (section 5.5) (9 to 24 VDC, 0.4 A max.)
Error Message: "Error Not Saved"	Main power is below specification	Correct the main power deficiency

## Troubleshooting with the RED and BLUE lights

The FMG-3000 uses two colored LEDs to indicate the status of the instrument. They are located at the top of the magmeter, inside the clear plastic cap.

- |                       |  |
|-----------------------|--|
| No Lights:            | The power is off or the sensor is not connected                      |
| Solid Blue (D7):      | The power is on, the pipe is full, but there is no flow in the pipe. |
| Blinking Blue (D7):   | Normal operation, blink rate is proportional to the flow rate.       |
| Alternating Red-Blue: | Empty pipe indication (electrodes are not wet.)                      |
| Blinking Red (D6):    | System errors (Electrical noise interference)                        |
| Solid Red (D6):       | Instrument error (defective electronics component)                   |





## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 13 months from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

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**CONDITIONS:** Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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