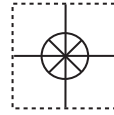


CE



User's Guide



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FMG-3000 SERIES Blind 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.

Omega FMG-3000 Series Magmeter

Topic:	Page	Topic:	Page
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1. Quick Start Guide

This manual contains the general installation, wiring and calibration data for the Omega FMG-3000 Series Magmeter with Frequency or Current output. The basic steps are outlined on this page. See each referenced section for detailed information.

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.



1. Position the PIPE SIZE Jumper according to your pipe size. See Sec. 5 Pg. 6.

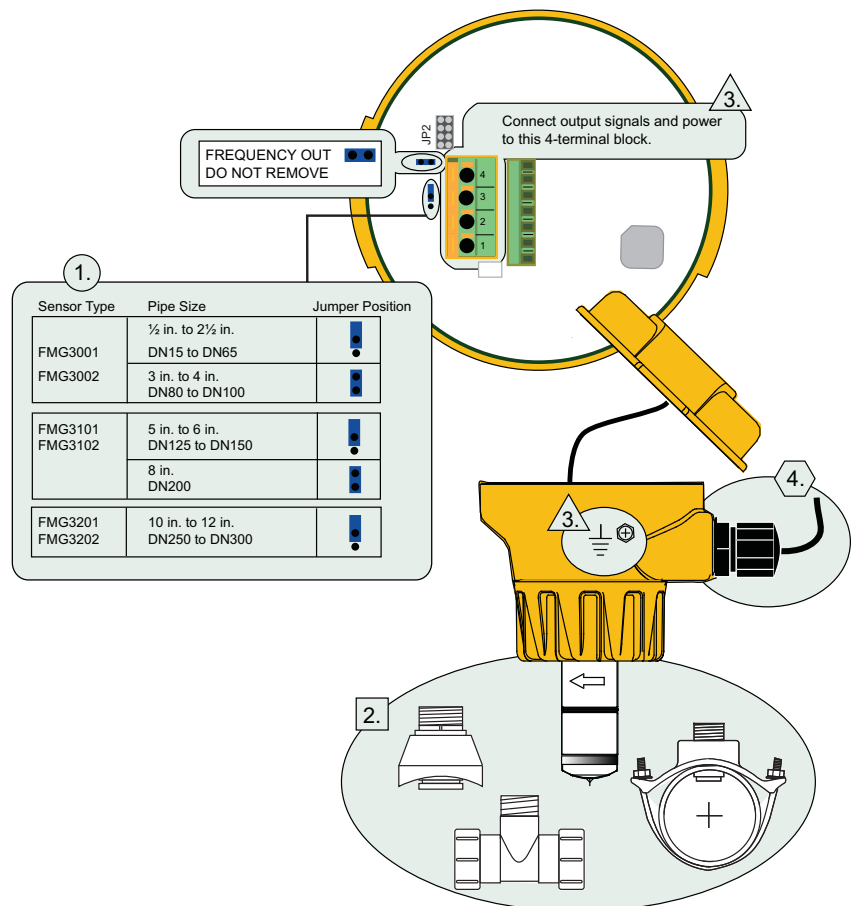
2. Install the Magmeter into the pipe. Use Omega installation fittings ONLY. The installation fitting is critical to Magmeter performance. See Sec. 3-4, Pg. 5.

3. Connect POWER and OUTPUT wiring. FMG-3001 and FMG-3101 Frequency out: See Sec. 8 Pg. 8. FMG-3002 and FMG-3102 current out wiring: See Sec. 7 Pg. 7.

GROUNDING

Without a good Earth Ground, the Magmeter may not operate efficiently. See Sec. 6 Pg. 7.

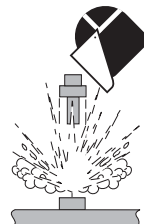
4. Route the wiring out through the two cable ports. Use appropriate hardware to secure the FMG-3000 from moisture intrusion. One Liquid Tight Connector is included. See Sec. 5 Pg. 6.





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 face shield during installation/service.
5. Do not alter product construction.
6. Disconnect power before attempting any service or wiring.



2. Specifications

Wetted Materials:

- Sensor body, electrodes and grounding ring:
 - -PP: Polypropylene and 316L Stainless Steel
 - -PVDF and 316L Stainless Steel
- O-rings: FPM standard
EPDM, (Perfluoroelastomer optional)

Other Materials:

- Case: PBT
- Ground terminal: 316 Stainless Steel

Power Requirements

- 4 to 20 mA: 21.6 to 26.4 VDC, 22.1 mA maximum
400 mV p-p maximum ripple voltage
- Frequency: 5 to 26.4 VDC, 15 mA maximum
- Reverse polarity and short circuit protected

Performance

- Pipe Size Range: FMG-3000: ½ in. to 4 in.
FMG-3100: 5 in. to 8 in.
FMG-3200: 10 in. to 12 in.
- Flow Range: Minimum: 0.05 m/s (0.15 ft/s)
Maximum: 10 m/s (33 ft/s)
- Linearity: $\pm(1\% \text{ reading} + 0.01 \text{ m/s})$
 $\pm(1\% \text{ reading} + 0.033 \text{ ft/s})$
- Repeatability: $\pm 0.5\%$ of reading @ 25 °C
- Minimum Conductivity: 20 $\mu\text{S/cm}$

Output Specifications

Current output (4 to 20 mA)

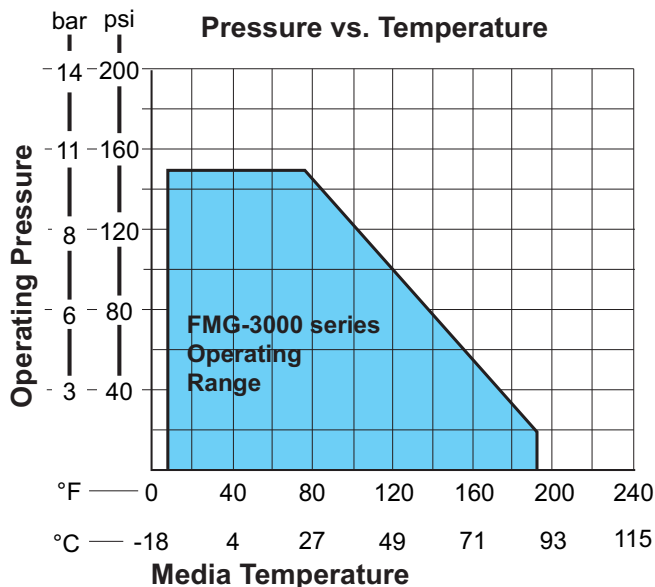
- Programmable and reversible
- Loop Accuracy: 32 μA max. error
(@ 25 °C @ 24 VDC)
- Temp. drift: $\pm 1 \mu\text{A}$ per °C max.
- Power Supply Rejection: $\pm 1 \mu\text{A}$ per V
- Isolation: Low voltage <48 VAC/DC
from electrodes and auxiliary power
- Maximum Cable: 300 m (1000 ft)
- Maximum Loop Resistance: 300 Ω
- Error Condition: 22.1 mA

Frequency output:

- Max. Pull-up Voltage: 30 VDC
- Short Circuit Protected: $\leq 30 \text{ V @ } 0 \Omega$ pull-up for one hour
- Reverse Polarity Protected - 40 V
- Overvoltage Protected to 40 V with pull-up resistor
- Max. Current Sink: 50 mA, current limited
- Maximum cable: 300 m (1000 ft)

Environmental Requirements

- 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)

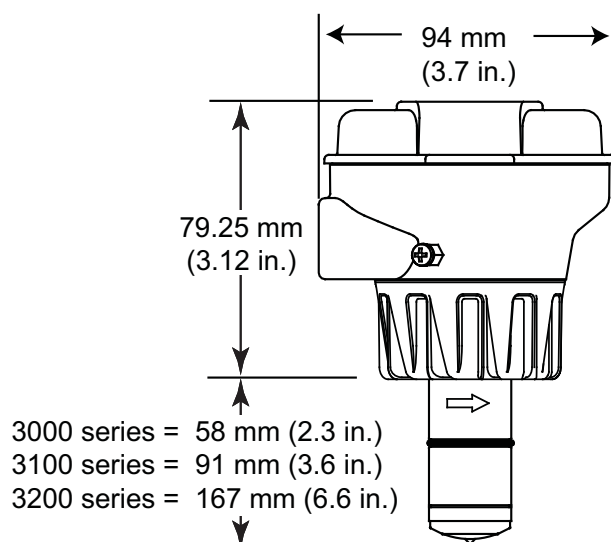


Max. Operating Pressure: 10.3 bar @ 25 °C (150 psi @ 77 °F)
1.4 bar @ 85 °C (20 psi @ 185 °F)

Tests, Approvals & Standards









- NEMA 4X
- CE

Dimensions



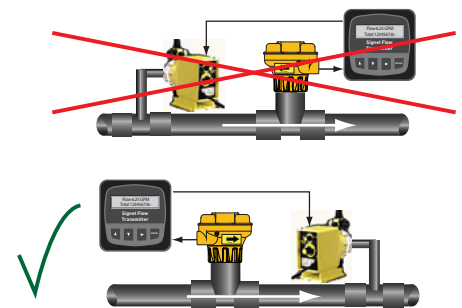
3. Installation: Pipe fittings

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.

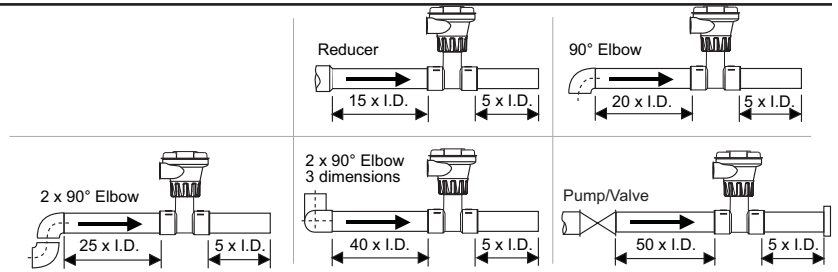
Type	Description	Type	Description
Plastic tees 	<ul style="list-style-type: none"> 0.5 to 2 inch versions MPVC or CPVC 	Iron, Carbon Steel, 316 SS Threaded tees 	<ul style="list-style-type: none"> 0.5 to 2 in. versions Mounts on threaded pipe ends
PVC Glue-on Saddles 	<ul style="list-style-type: none">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

4. Selecting a Location

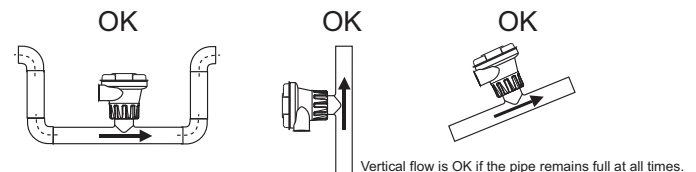
- The FMG-3000 requires a full pipe and a fully developed turbulent flow profile for accurate measurement.
- If the piping system harbors air pockets or bubbles, take steps to locate the sensor so the air pockets will not contact the electrodes.
- In vertical installations, assemble the unit so the conduit 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.



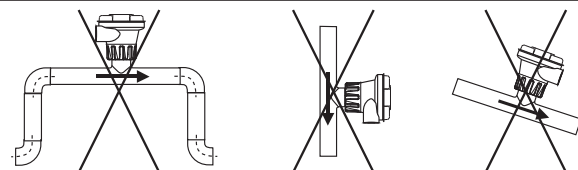
Select a location with sufficient distance of straight pipe immediately upstream of the sensor.



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.

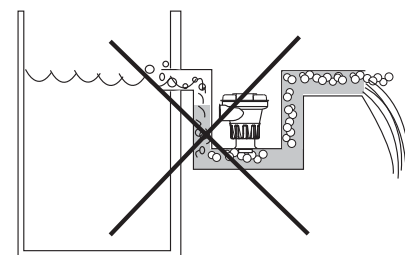


These configurations are not recommended because it is difficult to keep the pipe full.



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.



5. FMG-3000 Magmeter Configuration

Whether using the FMG-3000 frequency or 4 to 20 mA output, the wiring terminals located on the inside of the yellow cover are identical. All of the connections from the Magmeter to external equipment (Datalogger, Chart Recorder, Flow meter, etc.) are made at the large 4-position terminal connector.

When the cover is removed the wiring from the sensor can be seen connected to the smaller terminal block. These connections should always remain connected to prevent inadvertent damage or miswiring.

The terminals on the FMG-3000 Magmeter are designed for conductors from 16 AWG to 22 AWG.



WARNING!

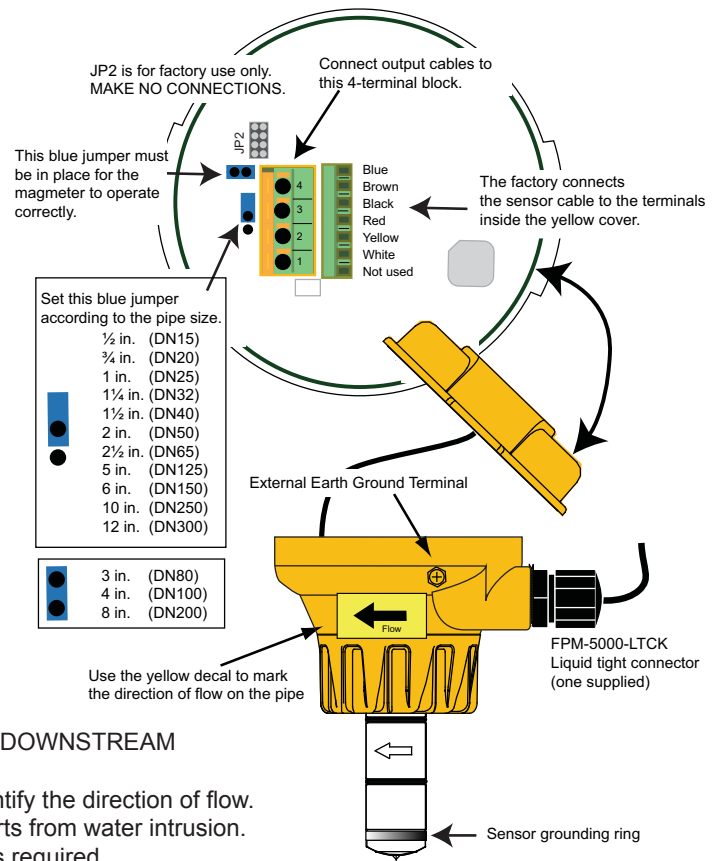
If the second conduit port is used, carefully drill the opening.

(The plastic is too strong to be punched out.)

- Secure the Magmeter in a vise to prevent damage or injury.
- The plastic inside the port is very thin. Do not allow the drill to penetrate too deeply and damage the Magmeter wiring.

Important:

- The directional arrow on the body of the sensor must be pointed **DOWNSTREAM** for correct operation.
- The **FLOW** arrow decal can be placed directly on the pipe to identify the direction of flow.
- Use a cable gland or a liquid tight connector to seal the cable ports from water intrusion.
- The yellow housing may be reversed to align the conduit ports as required.
- If the Magmeter is installed on a vertical pipe, the conduit ports should be turned to point downward. This will prevent condensation from being channeled into the enclosure.
- Use plumber's tape or a suitable sealant on cable ports.



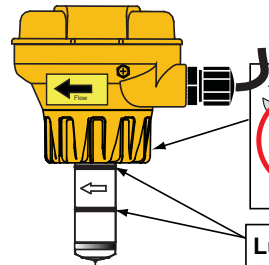
WARNING!

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.

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.



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 viscous non-petroleum based lubricant (grease) compatible with the system.

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

6. General Installation and Grounding Tips

Sensor conditioning

The Magmeter output signal may be unstable immediately after installation. Allowing the sensor to soak in a full pipe (or in any container of water) for 24 hours will stabilize the performance.

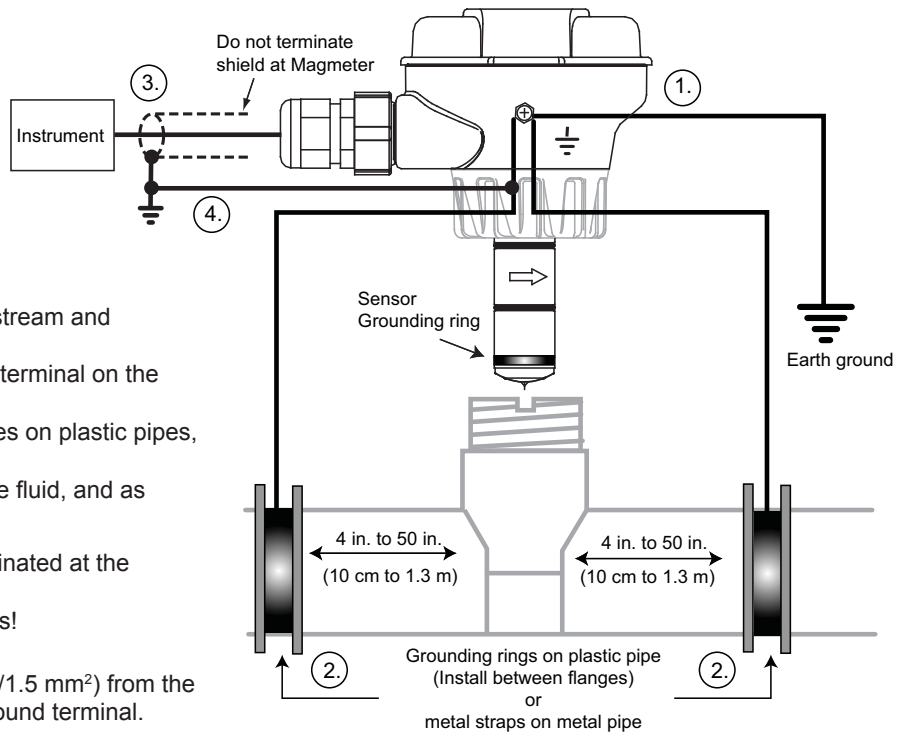
- Very low conductivity fluids may require a longer conditioning period. The Magmeter may not operate properly in fluids where the conductivity is less than 20 $\mu\text{S}/\text{cm}$.

Grounding

The FMG-3000 Magmeter is unaffected by moderate levels of electrical noise. However, in some applications it may be necessary to ground portions of the system to eliminate electrical interference. The grounding requirements will vary with each installation.

One or more of the following steps may be applied if the FMG-3000 Magmeter is affected by electrical noise:

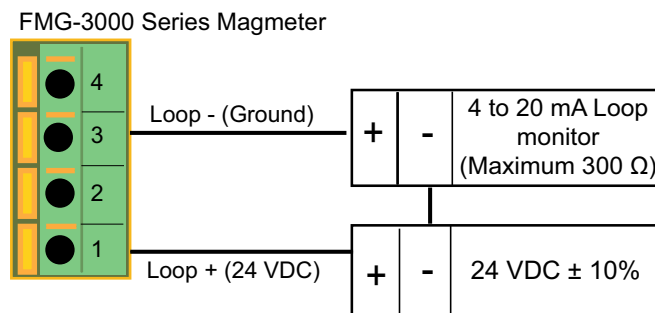
- ① The ground terminal on the outside of the yellow housing is connected internally to the grounding ring at the tip of the sensor. Connect a wire (14 AWG/1.5 mm² recommended) from this terminal directly to a local Earth ground.
- ② Install fluid grounding devices immediately upstream and downstream of the Magmeter. Connect the fluid grounds to the Earth ground terminal on the FMG-3000. Use flanged grounding rings or metal electrodes on plastic pipes, or metal clamps on metal pipes. Fluid grounds must be in direct contact with the fluid, and as near to the Magmeter as possible.
- ③ The shield from the output cable must be terminated at the remote instrument ONLY. This shield must not be connected at both ends!
- ④ Connect an additional wire (minimum AWG 14/1.5 mm²) from the remote instrument ground to the Magmeter ground terminal.



7. Wiring the FMG-3002, 3102 and 3202 Magmeter with 4 to 20 mA Loop Output

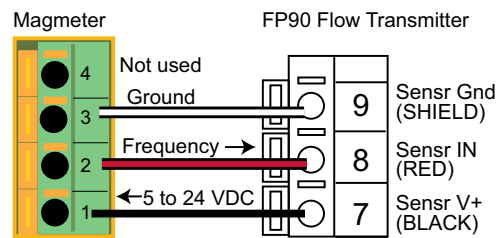
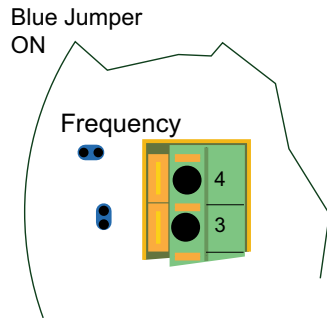
The FMG-3002, 3102 and 3202 Magmeters are traditional 2-wire passive 4 to 20 mA loop transmitters.

- External loop power (24 VDC $\pm 10\%$) is required.
- **The maximum loop resistance the Magmeter can accommodate is 300 Ω .**
- All FMG-3002, 3102 and 3202 Magmeters are shipped from the factory with the 4 to 20 mA output scaled for 0 to 5 m/s (0 to 16.4 ft/s). The Calibration charts on pages 8-12 list the 20 mA setpoint for each installation fitting. Use this information to program the 4 to 20 mA range of the loop device (PLC, Datalogger, recorder, etc.)

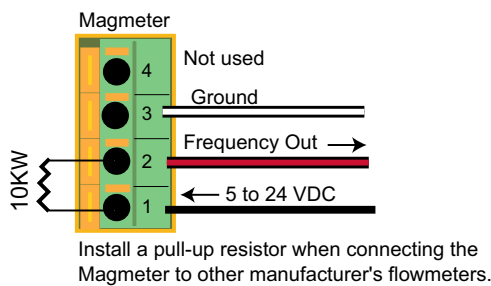


8. Wiring the FMG-3001 and FMG-3101 Magmeters with Frequency output

- The FMG-3001 and FMG-3101 Magmeters output an open collector frequency signal.
- A 10 K Ω pull up resistor must be connected between terminals 1 and 2 if the magmeter is used with third-party equipment..

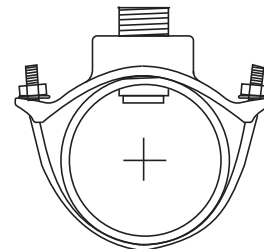


Connect AUX power on the FP90 to provide the power to the FMG3000 OPEN COLLECTOR output.



9. Calibration Data: K-Factors* and Full Scale Current Values

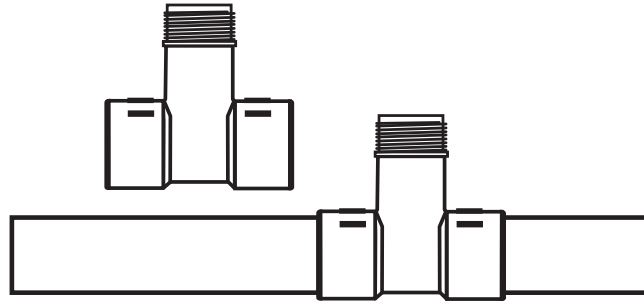
Metal Installation Fittings Iron Saddles



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

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-5320M	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

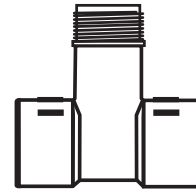
9. Calibration Data: K-factors* and Full Scale Current Values

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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POLYPROPYLENE FITTINGS (DIN/ISO ,BS, ANSI)

½	FP-5105PO	2192.73	579.32	13.68	51.78
¾	FP-5107PO	1327.81	350.81	22.59	85.52
1	FP-5110PO	737.16	194.76	40.70	154.04
1¼	FP-5112PO	453.46	119.81	66.16	250.41
1½	FP-5115PO	275.03	72.66	109.08	412.86
2	FP-5120PO	156.87	41.45	191.24	723.83

PVDF FITTINGS (DIN/ISO ,BS, ANSI)

½	FP-5105	1946.49	514.26	15.41	58.34
¾	FP-5107	1158.05	305.96	25.91	98.05
1	FP-5110	749.09	197.91	40.05	151.58
1¼	FP-5112	439.51	116.12	68.26	258.36
1½	FP-5115	248.93	65.77	120.52	456.16
2	FP-5120	146.85	38.80	204.30	773.26

PVC FITTINGS (DIN/ISO, BS, ANSI)

½	FP-5105M	2067.76	546.30	14.51	54.91
¾	FP-5107M	1136.61	300.29	26.39	99.90
1	FP-5110M	716.52	189.31	41.87	158.47
1¼	FP-5112M	446.07	117.85	67.25	254.56
1½	FP-5115M	278.83	73.67	107.59	407.23
2	FP-5120M	159.36	42.10	188.26	712.55

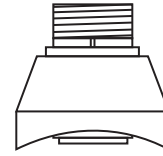
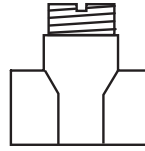
9. Calibration Data: K-factors* and Full Scale Current Values

Metal Installation Fittings:

Carbon Steel Tees and Weldolets

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

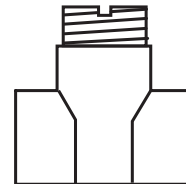
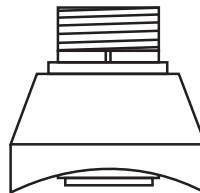
GALVANIZED IRON TEES ON SCH 40 PIPE

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

9. Calibration Data: K-factors* and Full Scale Current Values

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

10. Maintenance

The FMG-3000 series Magmeter 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 schedule 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 at the tip of the sensor.

10.1. 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.

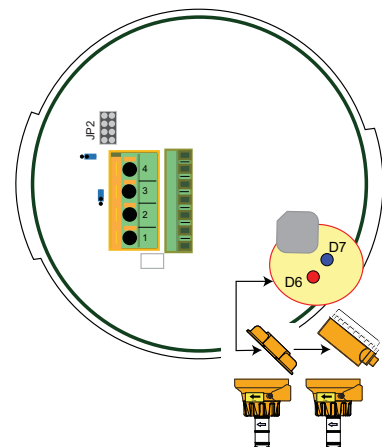
10.2. Troubleshooting

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 solids.	Carefully clean the electrodes.
	New sensor; metal surface not properly conditioned.	Soak sensor overnight in fluid.
Output is not 0 when flow is stopped.	Electrodes not adequately conditioned.	Soak sensor overnight in fluid.
	Vibration or other movement in pipe causes magmeter to detect flow.	Increase the Low Flow Cutoff.
	Electrical noise interference	Modify grounding to protect the Magmeter from interference.
	Defective Magmeter	Return to factory for service.
4 to 20 mA output is incorrect.	4 to 20 mA is not scaled same as Loop device.	Respan Loop device to match Magmeter.
	Range Jumper not placed correctly.	Set Range Jumper correctly.
	Defective Magmeter	Return to factory for service
Frequency output is inoperative Loop output is inoperative.	Blue jumper not in correct position	Place blue jumper correctly. (page 6)
	Wiring is not correct.	Check wiring, make corrections.
	Frequency input to other manufacturer's flow instrument does not have pull-up resistor.	Install 10 kΩ resistor. (page 8)
Output is 22.1 mA	Conductivity is less than 20 μS/cm (The fluid is too clean for Magmeter.)	Unsuitable application for Magmeter.
	Electronic component failure.	Return Magmeter to factory.

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)



11. Ordering Information

Order number	Output	Body material/Electrode material, Pipe size range
FMG-3001-PP	Freq	PP/316SS, 0.5 to 4 in.
FMG-3101-PP	Freq	PP/316SS, 5 to 8 in.
FMG-3201-PP	Freq	PP/316SS, 10 to 12 in.
FMG-3001-PVDF-HA	Freq.	PVDF/Hast, 0.5 to 4 in.
FMG-3101-PVDF-HA	Freq	PVDF/Hast, 5 to 8 in.
FMG-3201-PVDF-HA	Freq	PVDF/Hast, 10 to 12 in.
FMG-3002-PP	Loop	PP/316SS, 0.5 to 4 in.
FMG-3102-PP	Loop	PP/316SS, 5 to 8 in.
FMG-3202-PP	Loop	PP/316SS, 10 to 12 in.
FMG-3002-PVDF-HA	Loop	PVDF/Hast, 0.5 to 4 in.
FMG-3102-PVDF-HA	Loop	PVDF/Hast, 5 to 8 in.
FMG-3202-PVDF-HA	Loop	PVDF/Hast, 10 to 12 in.

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



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.

LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

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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