ModMAG®

M-Series® | B-MAG Electromagnetic Flow Meters

M-Series®

7500P

Badger Meter

MAG-UM-00365-EN-05 (October 2014)

User Manual

CONTENTS

SCOPE OF MANUAL

This manual contains information concerning the installation, operation and maintenance of the M-Series 7500P flow meters. To ensure proper performance of the meters covered, the instructions given in this manual should be thoroughly understood. Retain the manual in a readily accessible location for future reference.

OPERATION

The 7500P Mag meter is intended for use in fluid metering applications for process batching in industrial plants or concrete operations.

The 7500P Mag meter is a stainless steel flow tube with an internal isolating lining. Two electromagnetic coils are located outside the flow tube, diametrically opposed to each other and protected by a stainless steel housing. Two electrodes, inserted into the flow tube, are positioned "flush" with the internal diameter of the tube and perpendicular to the coils. The coils are energized by a pulsed DC voltage provided by the electronic converter, and a magnetic field is generated across the flow tube section. According to Faraday's law, when conductive liquid flows through this magnetic field of the meter, a voltage is generated in the liquid. This voltage is directly proportional to the liquid flow velocity, and therefore to the actual volumetric flow rate of the liquid. The electronic converter measures this voltage, processes the signal and provides two digital pulse outputs, scalable to the desired volumetric value. These digital pulse outputs can be connected to a batch controller, a totalizer display unit for monitoring purposes, or to both devices simultaneously. The 7500P operation is not affected by suspended solids in the liquid. Variations of liquid temperature, viscosity or density have no influence in its principle of operation. A set of convenient, field proven pulse scaler rotary switches are provided for easy and straight-forward batch accuracy compensation.

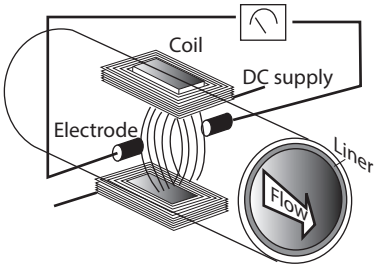


Figure 1: Meter operation

PRODUCT UNPACKING AND INSPECTION

Upon receipt of the product, perform the following unpacking and inspection process:

If the product package is damaged, request the carrier to be present when unpacking the product. If the product is damaged and the carrier is not present, request an inspection by the carrier's agent within 48 hours of delivery and file a claim with the carrier. A claim for equipment damage in transit is the sole responsibility of the purchaser.

Carefully open the shipping package and follow any instructions marked on the exterior. Remove all packing material and carefully remove the product from the package.

Retain an undamaged package and all packing material for possible use in reshipment or storage.

Visually inspect the product and applicable accessories for any physical damage such as scratches, loose or broken parts, or any other sign of damage that may have occurred during shipment.

Storage

If the meter is not to be installed right away, store it in the original container in a dry, sheltered location. Storage temperature: -4…158° F (-20…70° C).

METER INSTALLATION

Mag meters can operate accurately in any pipe line orientation. However, the most recommended installation position is vertical piping, with the liquid flowing upward.

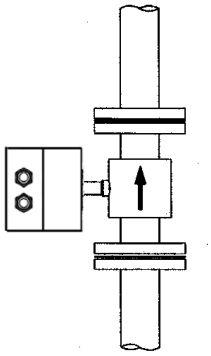


Figure 2: Vertical pipe mounting

This installation practice ensures two objectives:

- The pipe remains completely full of liquid, even at low flow, low pressure applications with a discharge to the atmosphere.
- Solid build-up or sediments that could be part of the process fluid will not deposit or accumulate on the liner and/or electrodes.

The model 7500P meter is designed to measure flow in one direction only. Carefully observe the "forward flow" label attached to the meter body and install the meter accordingly.

If horizontal piping orientation is required, the detector should be mounted in a position at which the electrodes axis will remain in an horizontal plane. See *Figure 3*.

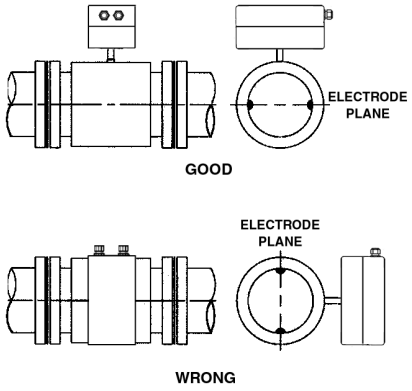


Figure 3: Horizontal installation

Piping Configuration

Appropriate piping arrangements should be made to ensure the meter is not exposed to extreme pipe vibrations. The piping arrangements should include appropriate pipe supports.

For optimum accuracy performance, sufficient inlet and outlet straight pipe runs are required. Three diameters of straight pipe are required on the inlet side of the meter, and two diameters are required on the outlet side, measured from the center of the meter body. See *Figure 4* for additional requirements.

Avoid installing the detector close to flow disturbance generating valves and fittings.

Do not install the detector in the outlet side of piston or diaphragm type pumps. Avoid all pipe locations where the flow is pulsating. Avoid installing the detector in the suction side of any pumps; possible creation of a vacuum can affect the meter performance or cause damage to the PTFE liner.

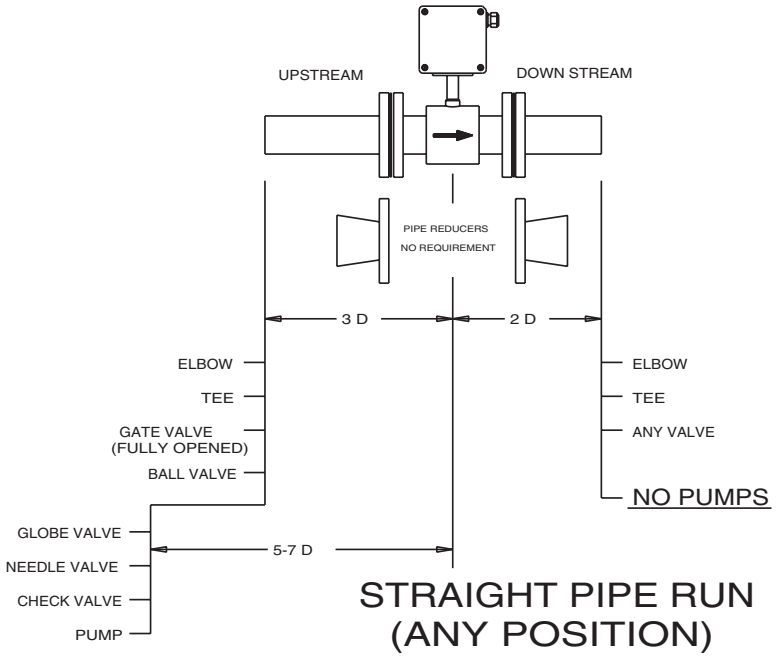


Figure 4: Pipe diameters

Temperature

NOTE: Environmental temperature of installation is not to exceed maximum specification of 122° F (50° C) for the meter. See *"Specifications" on page 13* for full temperature specifications.

Partially Full Pipe Situations

M-series meters are designed to operate in closed, full pipes.

It is relatively common to encounter situations where the process pipe will remain momentarily partially filled due to certain hydraulic conditions. Examples of this include discharge to the atmosphere (lack of back pressure), insufficient line pressure and gravity flow applications.

To eliminate the negative performance effects, a few guidelines should be observed (see *Figure 5*):

- Avoid installing the detector in the highest point of the pipe line.
- Do not install the detector in vertical, downward flow sections of the pipe.
- On-Off valves should always be located on the downstream side of the detector.
- Select the recommended vertical orientation when ever possible.
- Make sure the selected detector size complies with the application flow rate. Do not oversize pipe line and detector size.

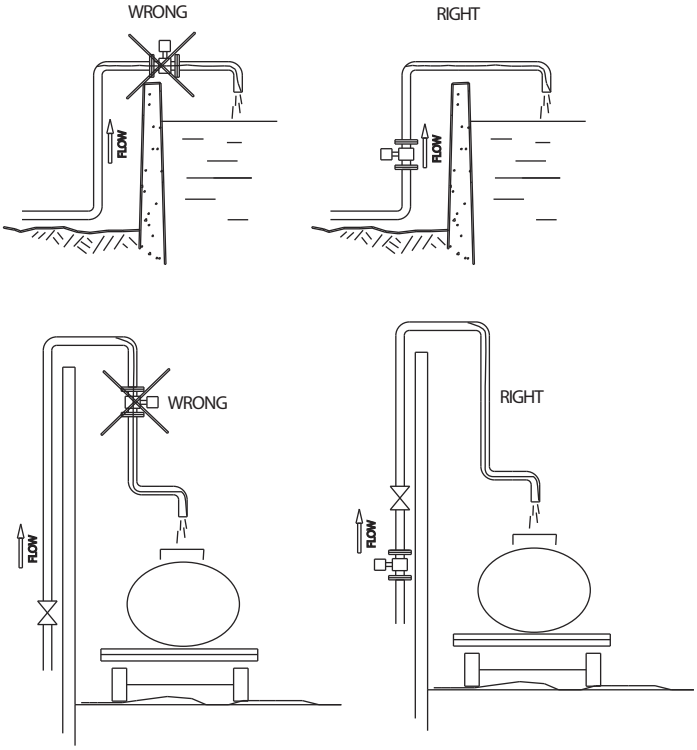


Figure 5: Proper installation locations

GROUNDING

Proper grounding is vital to ensure a good mag meter operation. To ensure proper grounding, the 7500P mag meter is provided with a set of protective grounding rings. The rings also serve as protection for the liner. The main purpose of the ground connection is to provide electrical continuity between the liquid media, the amplifier's input ground or zero voltage reference, and a good, solid earth ground. Connect a grounding strap to a solid, local earth ground (tower structure or pipe support) (see illustration). It is recommended to use copper wire, at least 12 AWG. When installing the meter, also use standard gaskets to avoid leaks.

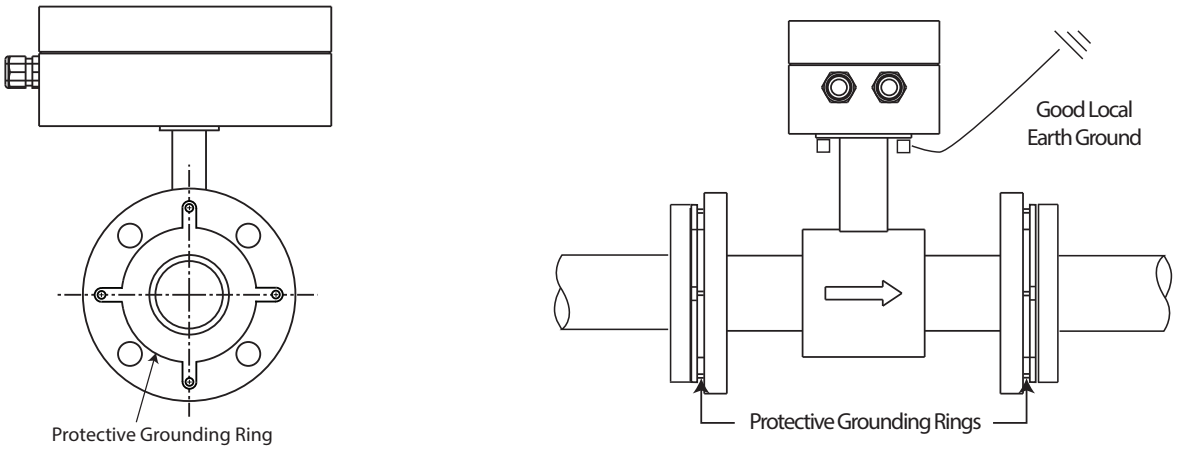


Figure 6: Protective grounding rings

ELECTRICAL CONNECTIONS

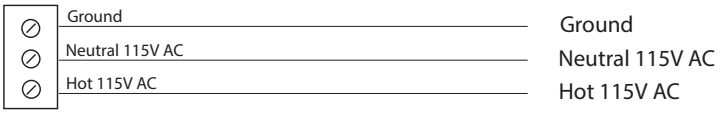


Figure 7: Power supply connection

Connecting to 110V AC from Batch Control Panel Power Supply

This connection is for batch panels that require a 115V AC hot pulse for meter signals.

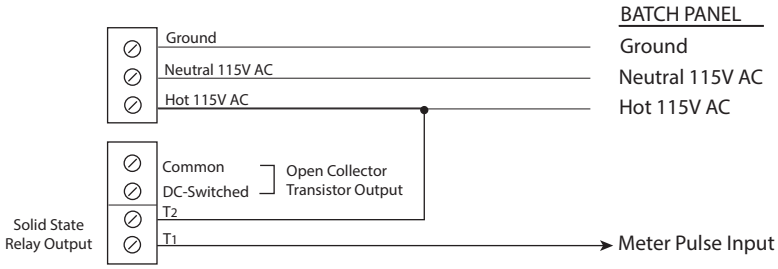


Figure 8: Connection for batch panels

It is recommended that the batch panel manufacturer be consulted to confirm the required pulse signal. For a 115V AC neutral pulse signal to the batch panel, simply connect the T2 jumper to the 115 neutral power supply.

Wiring to PC100 Controller

For connection of the open collector scaled pulse output from the Model 7500P to the PC 100 Controller, follow the diagram below:

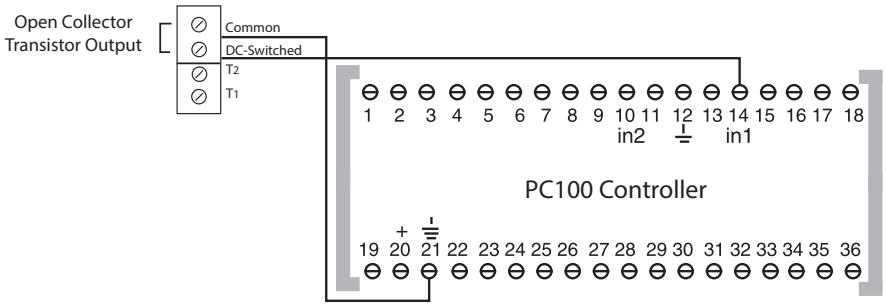
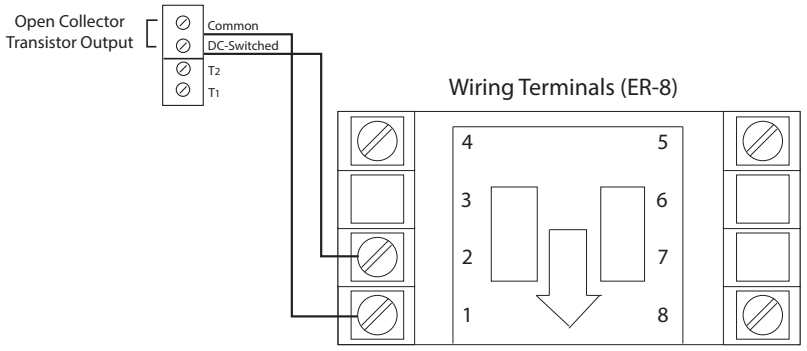


Figure 9: PC100 wiring

Wiring to ER-8 Totalizer/Rate Indicator



1	DC common
2	Count input - NPN signal 280 Hz or dry contact 95 Hz
3	Not used
4	Remote reset - resets count value when switched to common
5	Front panel program enable - allows access to program mode when connected to common
6	Not used
7	Not used
8	DC supply input - 10…28V DC for backlighting

CALIBRATION

The Model 7500P is tested and calibrated with a test configuration included with each meter when shipped. If recalibration of your system accuracy may be required, the Model 7500P provides a feature, using four rotary switches, that permits a simple recalibration procedure.

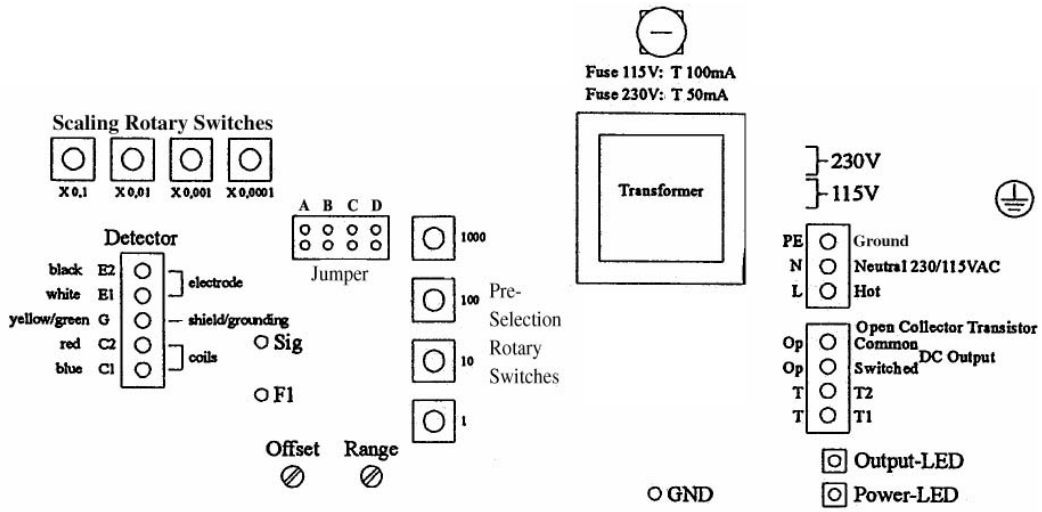


Figure 10: Rotary switch location

Recalibration Procedure

If it is necessary to recalibrate the meter, this can be done by changing the scale factor which is set on the four rotary switches located in the upper left hand corner. See *Figure 10 on page 10*. To make this change, follow the following step.

1. Determine the exact quantity of fluid that actually passed through the meter by using a calibrated volumetric container or by weighing the container.
2. Note the volume of fluid indicated by meter.
3. Note the current scale factor on the four rotary switches.
4. Use the following formula to calculate the new scale factor for recalibration:

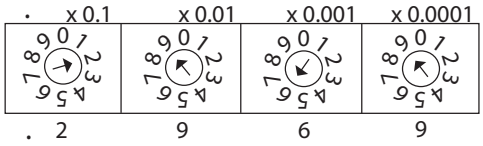
$$\frac{\text{Qty delivered}}{\text{Qty on meter}} \times \text{Old scale factor} = \text{New scale factor}$$

5. Enter new scale factor on the rotary switches.
6. Rerun test to verify that the recalibration is correct.

Example:
You have a 3" size meter in your installation. You run a test batch quantity of 238 gallons. The totalizer on the meter indicates 203 gallons. Your present scale factor on the four rotary switches is .2533. See *Table 1* for preset scale factors.

Using the formula:

$$\frac{238}{203} \times 0.2533 = 0.2969$$



1/2" Meter (1…30 gpm)	Scaling factor
1 pulse per gallon	0.0500
10 pulse per gallon	0.5000
100 pulse per gallon	0.5000
500 pulse per gallon	0.5000
1 pulse per liter	0.5000
1" Meter (3…80 gpm)	
1 pulse per gallon	0.5000
10 pulse per gallon	0.5000
100 pulse per gallon	0.5000
500 pulse per gallon	0.5000
1 pulse per liter	0.5000
2" Meter (10…315 gpm)	
1 pulse per gallon	0.2500
10 pulse per gallon	0.2500
1 pulse per liter	0.0946
3" Meter (24…690 gpm)	
1 pulse per gallon	0.2533
10 pulse per gallon	0.2533
1 pulse per liter	0.1892
4" Meter (40…1200 gpm)	
1 pulse per gallon	0.5000
10 pulse per gallon	0.5000
1 pulse per liter	0.1892

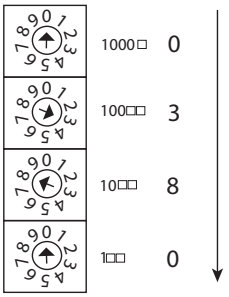
Table 1: Scale factors

Pre-Selection Switches

In *Figure 10 on page 10*, note the location of the four *Pre-Selection Rotary Switches*. These switches are set at the factory per meter size and general magnitude of pulse output desired. If a change of resolution (pulse output value) is required, change the Pre-Selection Switches to the values in *Table 2*.

Example:

If you have a 3" meter with 1 pulse per gallon the switches are set at 0380.



1/2" Meter (1…30 gpm)	Pre-Selection Factor	Jumper Position
1 pulse per gallon	1500	D
10 pulse per gallon	1500	D
100 pulse per gallon	0150	D
500 pulse per gallon	0030	D
1 pulse per liter	3965	D
1" Meter (3…80 gpm)		
1 pulse per gallon	6000	D
10 pulse per gallon	0600	D
100 pulse per gallon	0060	D
500 pulse per gallon	0012	D
1 pulse per liter	1585	D
2" Meter (10…315 gpm)		
1 pulse per gallon	0750	C
10 pulse per gallon	0075	C
1 pulse per liter	0075	C
3" Meter (24…690 gpm)		
1 pulse per gallon	0380	B
10 pulse per gallon	0038	B
1 pulse per liter	0038	B
4" Meter (40…1200 gpm)		
1 pulse per gallon	0250	A
10 pulse per gallon	0025	A
1 pulse per liter	0025	A

Table 2: Pre-selection factor and jumper position

Jumper Location

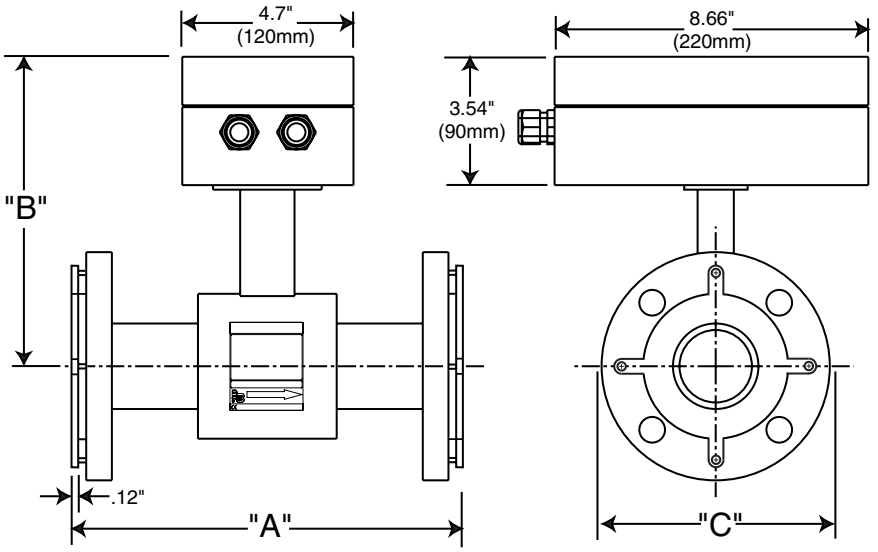
There are four jumper positions designated by A, B, C, and D. See *Figure 10 on page 10* for jumper positions for meter size.

NOTE: The jumper must be located in the correct position for the respective meter size.

SPECIFICATIONS

Detector	
Working Pressure	150 psi (10 bar)
End Connections	ANSI 150# carbon steel flanges
Flow Tube Material	AISI 316 stainless steel
Housing and Flange Material	Carbon steel, enamel paint finishing
Liner Material	PTFE
Electrode Material	Alloy C
Maximum Liquid Temperature	212° F (100° C)
Amplifier	
Power Supply	110V AC ±10%, 5 VA
Coil Excitation	Pulsed DC, 7.5 Hz
Minimum Liquid Conductivity	5 micromhos/cm
Maximum Output Frequency	10 khz
System Accuracy	±0.5% of rate
Repeatability	±0.2%
Enclosure	Powder coated cast aluminum, NEMA 4
Mounting	Meter mounted only
Environmental	–4…122° F (–20…50° C)
Output 1	Solid state relay up to 230V, 500 mA
Output 2	Opto-isolated open collector, 50 mA @ 24V DC
Flow Direction	Unidirectional
Pulse Width	50% duty cycle
Cable Connections	Two 1/2 in. NPT cord grip

DIMENSIONS



INCLUDING PROTECTIVE/GROUNDING RING

Meter Size	A in. (mm)	B in. (mm)	C in. (mm)	Flow Ranges gpm (lpm)	
				min.	max.
1/2 in.	6.9 (175)	8.1 (207)	3.5 (89)	1 (3.8)	20 (76)
1 in.	9.1 (231)	8.1 (207)	4.3 (108)	3 (11.4)	80 (303)
2 in.	10 (254)	9.1 (232)	6 (152)	10 (37.9)	320 (1211)
3 in.	12 (305)	9.8 (250)	7.5 (191)	22 (83.3)	690 (2612)
4 in.	14 (356)	10.1 (257)	9 (229)	40 (151.4)	1300 (4921)

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