VERA MAG®

Vera Mag 5000
Electromagnetic Flow Meter

Installation, Operation and Maintenance Manual

Standard Model
For use in non-hazardous locations

HL Model
For use in hazardous locations:
- Class I, Division 2, Groups A-D, T4
- Class I, Zone 2 IIC T4

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McCROMETER

Contents

SAFETY

Safety Symbols And Warnings

Throughout this manual are safety warning and caution information boxes. Each warning and caution box will be identified by a large symbol indicating the type of information contained in the box. The symbols are explained below:

This symbol indicates important safety information. Failure to follow the instructions can result in serious injury or death.

This symbol indicates important information. Failure to follow the instructions can result in permanent damage to the meter or installation site.

Safety Warnings

When installing, operating, and maintaining McCrometer equipment where hazards may be present, you must protect yourself by wearing Personal Protective Equipment (PPE) and be trained to enter confined spaces. Examples of confined spaces are manholes, pumping stations, pipelines, pits, septic tanks, sewage digesters, vaults, degreasers, storage tanks, boilers, and furnaces.

You must follow all state and local laws, as well as Occupational Safety and Health Administration (OSHA) regulations concerning Personal Protective Equipment and confined-space entry. Specific requirements can be found in the OSHA section of the Code of Federal Regulations: *29 CFR, 1910.132 - 1910.140, Personal Protective Equipment; and CFR Title 29, Part 1910.146, Permit-Required Confined-Spaces.*

WARNING!
Incorrect installation or removal of meters can result in serious injury or death. Read the instructions in this manual on the proper procedures carefully.

WARNING!
Never enter a confined space without testing the air at the top, middle, and bottom of the space. The air may be toxic, oxygen deficient, or explosive. Do not trust your senses to determine if the air is safe. You cannot see or smell many toxic gases.

WARNING!
Never enter a confined space without the proper safety equipment. You may need a respirator, gas detector, tripod, lifeline, and other safety equipment.

WARNING!
Never enter a confined space without standby/rescue personnel within earshot. Standby/rescue personnel must know what action to take in case of an emergency.

1.0 DESCRIPTION OF THE FLOW METER

Ultra Mag meters are available with integral or remote mount transmitters. Standard display features include forward, reverse and net flow totalizers, flow rate, alarm monitoring, and automatic self diagnostics to ensure integrity. All data and values are in selectable units of measurement. System compatibility is assured with a choice of current, pulse and serial data. Please refer to the transmitter manual provided with your meter.

Ultra Mag operating parameters are set via the electronics keypad. The software features multilevel password protection capability to prevent inadvertent program or setting changes. Data is stored in nonvolatile memory.

The flanged end tube design permits use in a wide range of applications. The fabricated tube is stainless steel with steel or stainless steel flanges and incorporates the UltraLiner, an NSF approved fusion-bonded epoxy liner.

2.0 UNPACKING THE CRATE AND VERIFYING SERIAL NUMBERS

2.1 Uncrating

The shipping crate contains the following items:

- Electromagnetic meter assembly with grounding wire attached
- Transmitter cable (attached to meter)
- Signal transmitter
- Grounding rings
- Ground wires (2)
- User manuals for both the sensor and transmitter
- Installation hardware (2" & 3" only)
- Gaskets (4) (2" & 3" only)

When uncrating the Ultra Mag, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If for any reason it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damaged in return shipment due to improper packaging.

2.2 Verifying the Serial Numbers

The transmitter and sensor are supplied as a matched system. Verify the meter serial numbers on both the transmitter and sensor match. This will insure a properly calibrated system. The meter serial number is located on the side of the sensor body on a silver label. An example is shown below (Figure 1).

The tag on the side of the transmitter has the transmitter model number, the transmitter serial number and the meter serial number, which is calibrated to the transmitter. An example is shown at below (Figure 2).

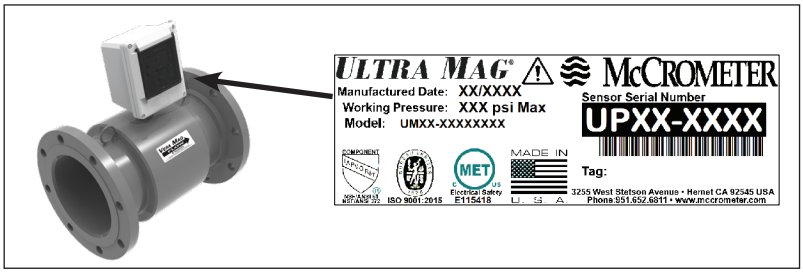


Figure 1. Flow meter serial number tag

IMPORTANT: Verify the meter serial numbers on both the transmitter and sensor match. If the meter serial numbers do not match, contact the factory before continuing with the installation.

Meter mount transmitter

Remote mount transmitter

Figure 2. Transmitter serial number tag

3.0 PREPARING FOR A NEW INSTALLATION

3.1 Meter Mounted Sensor Location

Adjoining pipe must be adequately supported, and the area around the sensor should provide sufficient drainage to prevent flooding the transmitter or conduits. The location chosen should provide room to read the display and be free from harsh electrical noise from adjacent equipment, cables, R.F.I., or E.M.I. The signal transmitter should not be subjected to intense, prolonged sunlight and/or vibrations. Unit should also be protected from heat.

3.2 Remote Mount Transmitter Location

The signal transmitter may be installed in a desired location provided that free access is available to allow the display to be viewed as required. The unit can be either wall mounted or panel mounted with masonry fixings or nuts and bolts respectively via the fixing holes provided. The maximum distance between the meter and the transmitter is 200 feet. For applications with extended lengths, consult factory.

3.3 Pipe Run Requirements

The meter needs to be located a minimum distance before and after flow disturbances, such as elbows, pumps, partially opened valves, and changes in pipe diameter. The uneven flow created by these obstructions can vary with each system.

The minimum distance is measured in pipe diameters (D). To ensure accuracy locate the sensor upstream and downstream of flow disturbances as follows:

1D Upstream / 0D Downstream

3.4 Positioning and Orienting the Sensor

The following installation recommendations should be followed (see Figure 3 for installation diagrams):

Horizontal installation

In horizontal pipe runs, the meter should be installed so that the junction box is vertical insuring the electrodes are positioned to prevent coating by sediments or loss of electrode contact due to air bubbles.

Vertical installation

In vertical pipe runs, the flow should be upward. In slurry application, a vertical position ensures optimal distribution of solids under all flow conditions.

Less than full pipes

In pipes which may encounter less than a full pipe of fluid, the meter must be positioned in a trap to ensure that the sensor is always completely filled with liquid.

4.0 FLOW METER INSTALLATION

NOTE Nothing in this manual supersedes local codes.

NOTE The flow of the medium should correspond to the direction shown by the arrow on the sensor.

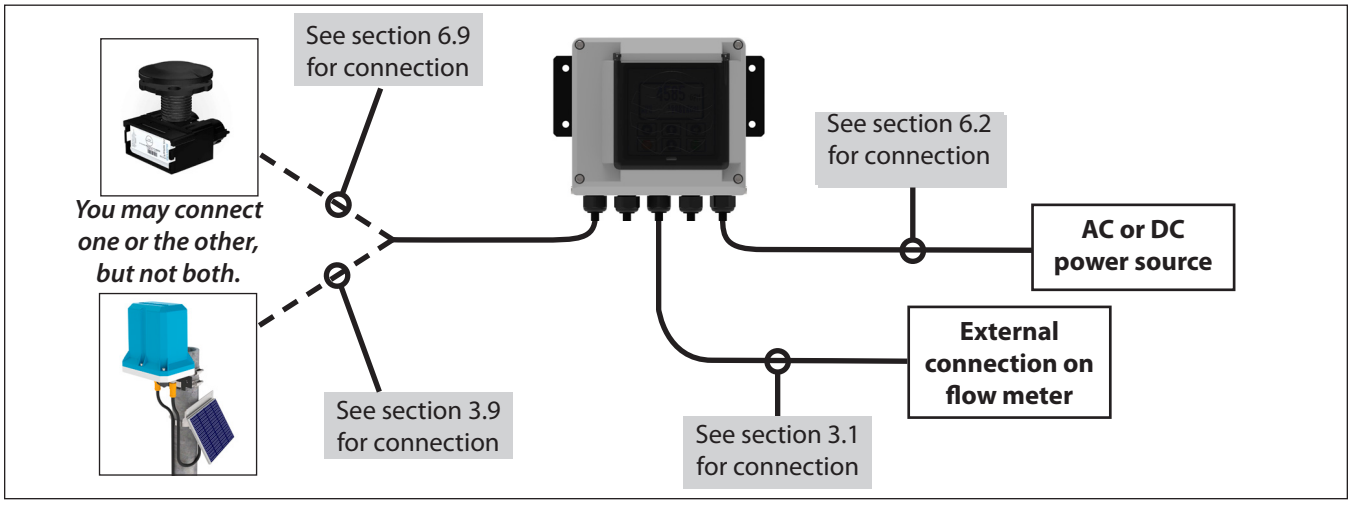
4.1 Flanged Meter Installation

Install the Ultra Mag flow meter inline between two flanged end pipes. The flow meter may require grounding, depending on the environment they are being installed in. Refer to section 8.0 for a full description of grounding methods that are available.

4.2 Example Remote Mount Configuration

After installing the sensor, mount the transmitter and connect the cable to the meter's junction box and the transmitter's external connection. Figure 3 below shows an example of a remote mount installation with an optional Smart Output connection.

Ensure that the cable from the sensor to the transmitter is of sufficient length. Connect it to the sensor and route the cable in the most appropriate manner. Insert the cable into the bottom of the housing through the gland seal, cut the cable to the desired length and terminate the wires in accordance with the wiring diagram.



IMPORTANT: The example shown above does not include grounding installation. The meter will need to be grounded according to each meter's requirements.

Figure 3. Example remote mount configuration

5.0 REMOTE MOUNT TRANSMITTER INSTALLATION

5.1 Mounting the ProComm Max Transmitter

Note: This applies to the remote mount transmitter only.

If possible, mount the transmitter in an electronics shed or environmental enclosure. The sun shield should be oriented in a direction to reduce sun damage and ensure readability.

Mount the transmitter to a solid surface using four bolts (Figure 4) or to a vertical or horizontal post using two clamps (Figure 5). This electronic unit is rated IP67 for temporary flooding.

If the brackets are not attached, attach them with the four screws.

Mount the transmitter to a solid surface with four bolts through the holes in the left and right brackets.

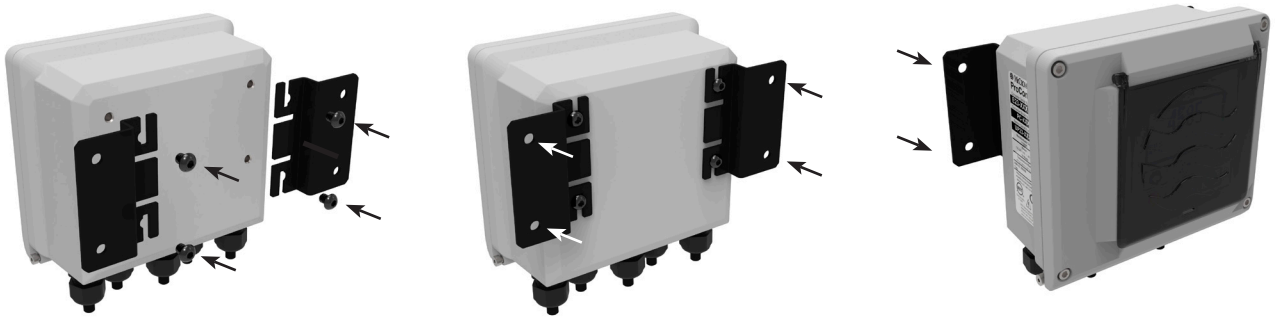
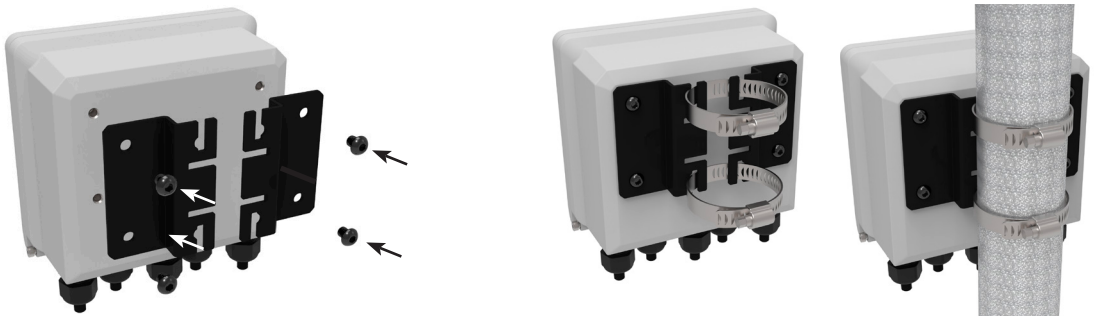


Figure 4. Mounting transmitter to solid surface

Remove brackets, reverse them, and reattach as shown.

Open clamps and attach around post. Slide bracket tabs onto clamps and tighten them.



Remove brackets, reverse them, and reattach as shown.

Open clamps and attach around post. Slide bracket tabs onto clamps and tighten them.

Figure 5. Mounting transmitter to vertical or horizontal post

5.2 Installing Cables through Cable Glands and Conduit

All electrical cables enter the transmitter through compression fittings or optional customer-supplied conduit located on the side or bottom of the transmitter (Figure 6, Figure 7, Figure 8) . Ensure that all compression glands are properly tightened and all unused fittings are plugged so the case remains sealed.

The power cable and wiring harnesses are each assigned specific cable glands where they will pass through into the transmitter. See section 5.4 for cable gland assignment for wiring harnesses and section 6.3 for wiring diagrams.

All cable compression glands must be properly tightened to prevent moisture intrusion and maintain the IP67 rating. To insure IP67 rating, use only round cable 0.24" to 0.47" in diameter.

Attaching conduit directly to the enclosure may introduce dangerous gasses and moisture into the enclosure creating a dangerous condition, and will remove the enclosure's IP67 rating.

Figure 6. Remote mount transmitter with five cable gland pass-throughs

The remote mount transmitter is shipped with five 1/2" NPT cable glands. Up to three cable glands may be removed and replaced with 1/2" conduits.

Figure 7. Remote mount transmitter with three conduit pass-throughs

Figure 8. Meter mount transmitter with four cable gland pass-throughs

Attaching conduit directly to the enclosure may introduce dangerous gasses and moisture into the enclosure creating a dangerous condition, and will remove the enclosure's IP67 rating. **Damage caused by attaching conduit to the enclosure or altering the enclosure in any way is not covered by the warranty.**

5.3 Pulling Sensor Cable Through Electrical Conduit

It is very important to protect the end of the sensor cable when pulling it through a conduit. Water can accumulate in low portions of conduit. Always use a cable cover, or similar method, to seal the end of the cable against water when pulling the cable through conduit (see Figure 9). This will ensure proper operation of the meter.

NOTE Cable cover is not provided.

1. Tie a rope or cable-snake securely around the middle of the cable cover.
2. Carefully pull the rope or snake until the sensor cable end clears the conduit.
3. Bring the cable end to the transmitter location. If necessary, secure the cable so that it does not fall back through the conduit.
4. Remove the cable cover by pulling the rip wire. The cable cover will tear off (discard the cover).

CAUTION: Do not cut the cable cover off. Doing so may damage the sensor cable and adversely effect the calibration of the meter.

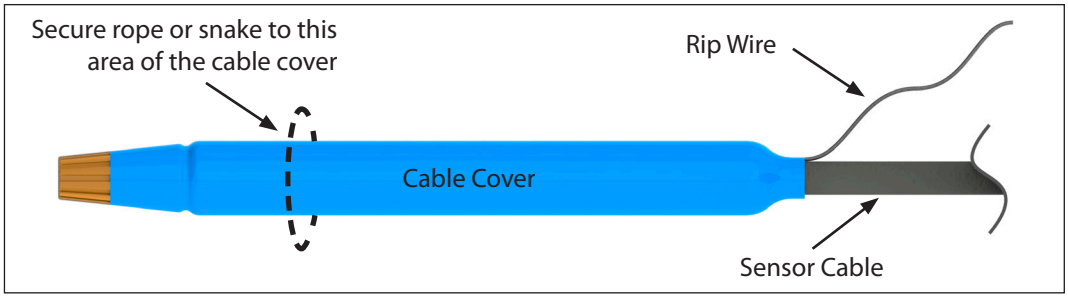


Figure 9. Cable Cover

5.4 Cable Gland Assignment for Wiring Harnesses

To prevent signal interference and to keep the wiring organized, each cable gland is assigned for a specific wiring harness. Refer to the assignment diagrams (Figure 10) below when you route your cable run.

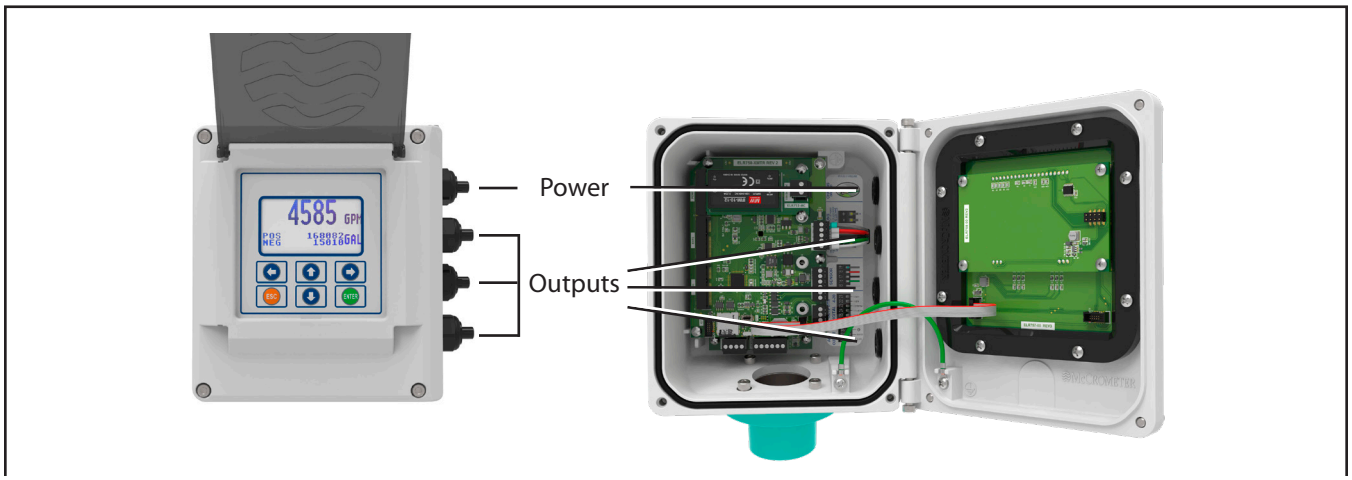


Figure 10. Meter mount transmitter cable assignments

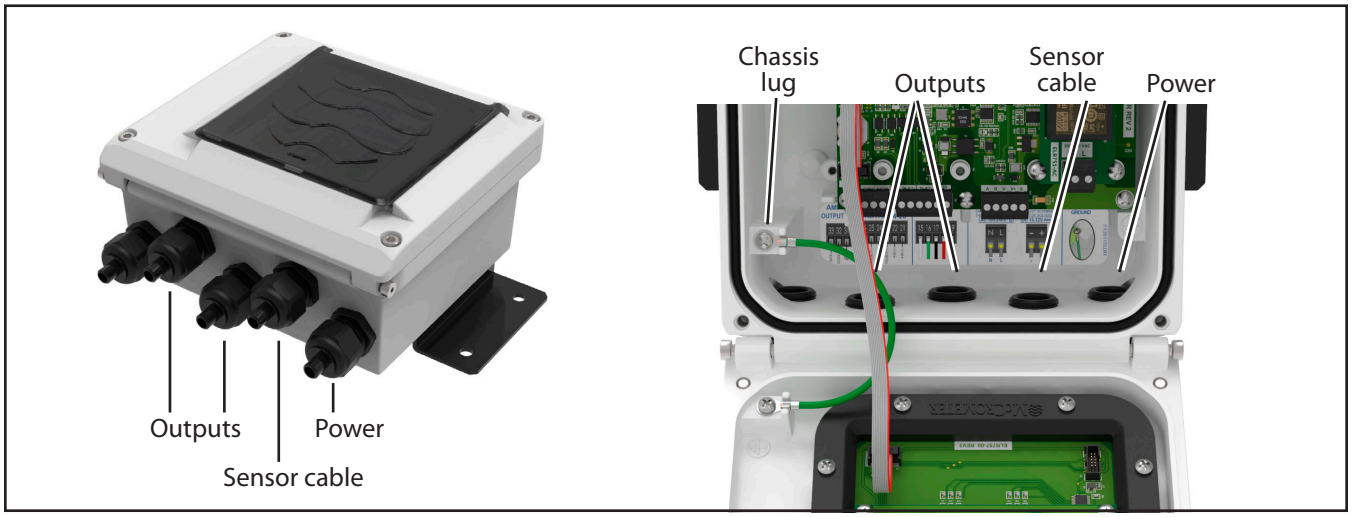


Figure 11. Remote mount transmitter cable assignments

6.0 INTERNAL WIRE CONNECTION

> ***WARNING!***
> Ensure device is disconnected or circuit breaker is open per the requirements of IEC 60947-1 and IEC 60947-3 before opening the opening the transmitter.

6.1 Remote Mount Cable Connection to Sensor

The ProComm Max transmitter is designed to connect to a single-port transmitter box mounted on meter. See Figure 22 as an example showing the Ultra Mag meter. This design converts flow data and sends it to the ProComm Max transmitter. All calibration data is held in non-volatile memory at the transmitter. Consequently, cable distances from the transmitter to the transmitter have no effect on meter calibration. This will allow users to swap transmitters in the field if needed, requiring only the SD card in the transmitter to be moved to the replacement unit.

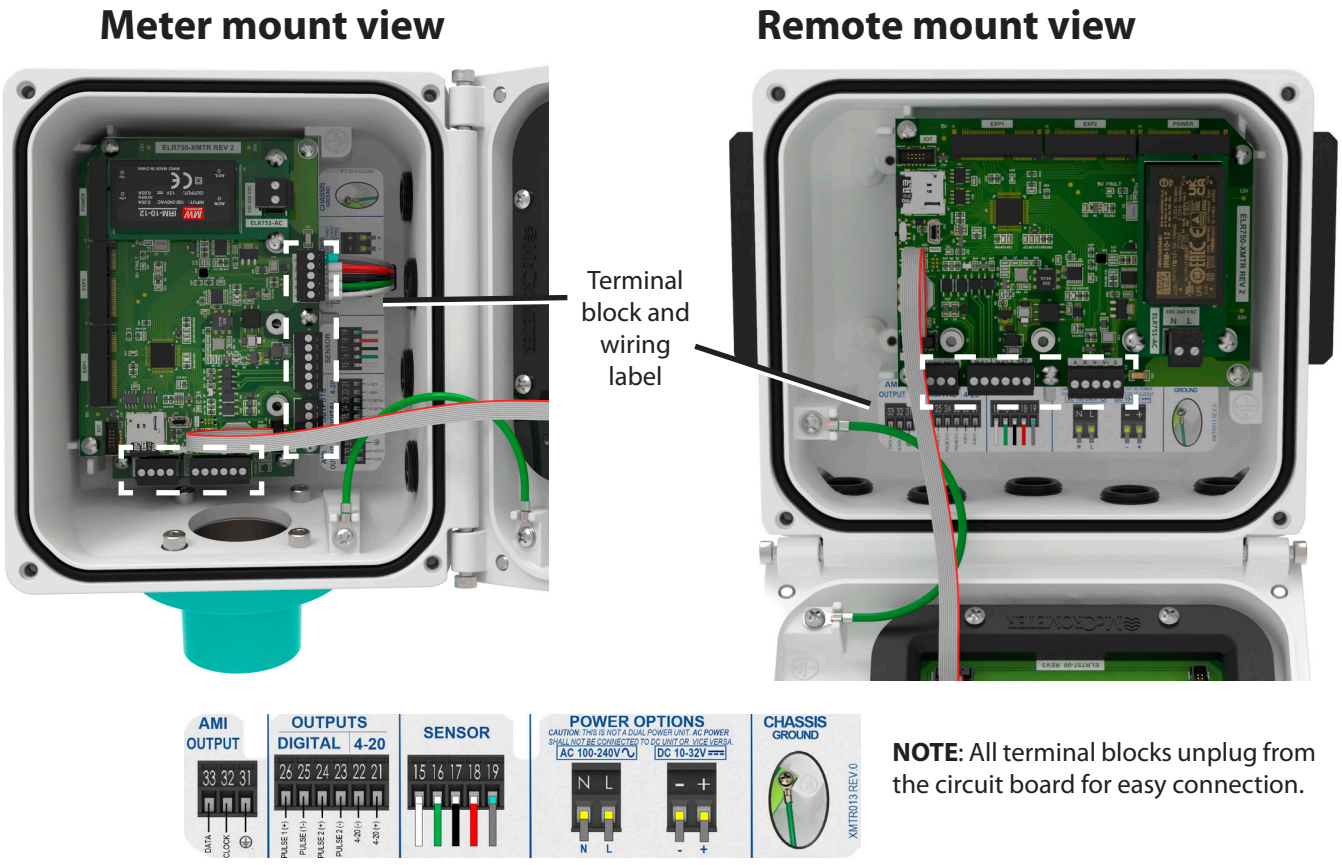
The port on the transmitter is available as either a cable gland fitting or a quick connect fitting.

Figure 12. Transmitter box mounted on a mag meter

6.2 Terminal Block Diagram

All connections are made on the terminal blocks. To access the terminal blocks, loosen the four screws on the front of the transmitter and open the front panel. The example shown below (Figure 13) does not necessarily represent all transmitter models, however, it shows the placement for all terminal blocks used in all models.

NOTE: The terminal blocks unplug from the circuit board for easy connection.

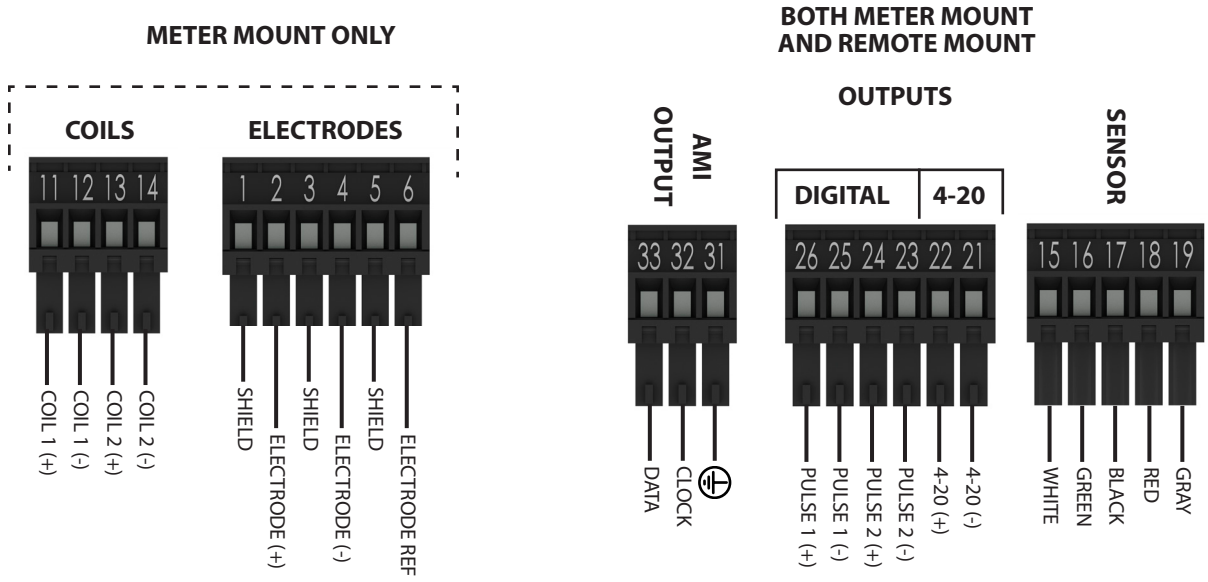


NOTE: All terminal blocks unplug from the circuit board for easy connection.

Figure 13. Terminal block diagram

6.3 Wiring Diagrams

CAUTION - Always disconnect the power cord before attempting any electrical connections.



Terminal Block Assignments

Terminal	Cable	Wire Color
COILS		
11	COIL 1 (+)	
12	COIL 1 (-)	
13	COIL 2 (+)	
14	COIL 2 (-)	

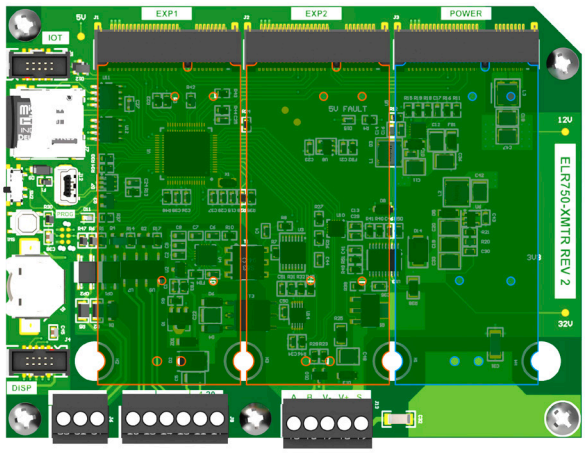
Terminal	Cable	Wire Color
ELECTRODES		
1	SHIELD	
2	ELECTRODE (+)	
3	SHIELD	
4	ELECTRODE (-)	
5	SHIELD	
6	ELECTRODE REF	

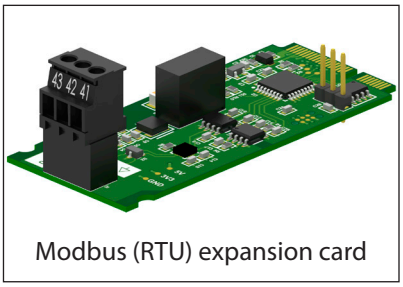
Terminal	Cable	Wire Color
OUTPUTS		
26	PULSE 1 (+)	
25	PULSE 1 (-)	
24	PULSE 2 (+)	
23	PULSE 2 (-)	
22	4-20 (+)	
21	4-20 (-)	

Terminal	Cable	Wire Color
SENSOR		
15	A	White
16	B	Green
17	(-) DC	Black
18	(+) DC	Red
19	SHIELD	Gray/Bare

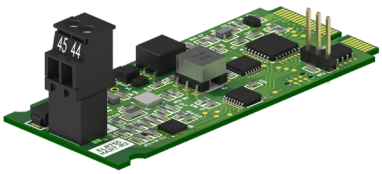
Terminal	Cable	Wire Color
AMI		
33	DATA	Varies. See section 3.8
32	CLOCK	
31	GROUND	

6.4 Installing Expansion Cards

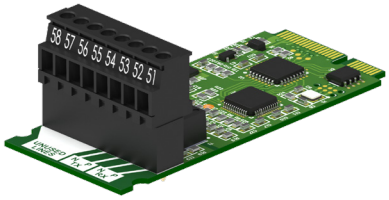




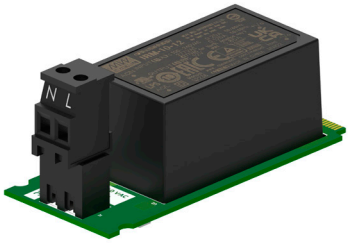
Modbus (RTU) expansion card



HART expansion card



Ethernet expansion card



AC power card

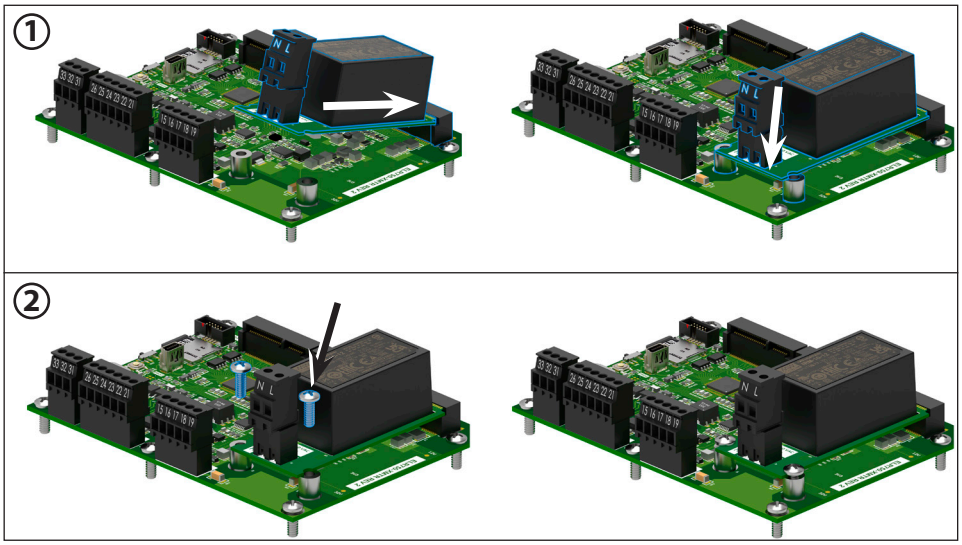
DC power card

Inserting the expansion card

Refer to the images that accompany each step. The AC power card is shown as an example. See section 6.5 for wiring diagrams for both AC and DC power.

1. Slide the card into the connection slot. Set the card flat on the two support posts.

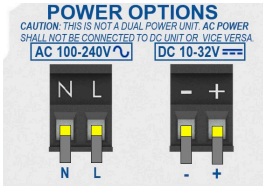
2. Insert and tighten two screws to secure the card in place.



6.5 Transmitter Power Wiring Diagram

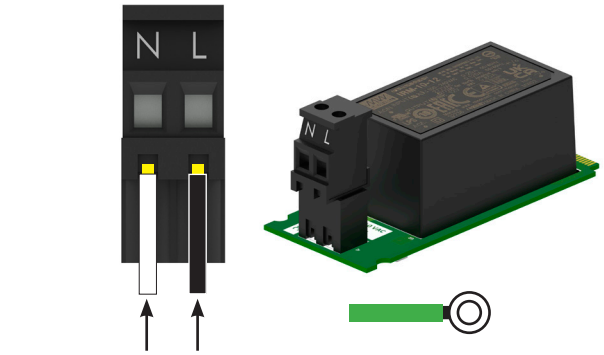
WARNING!
Hazardous supply voltage can shock, burn, or cause death.

These instructions are for connecting either the AC or DC power option. The connections are shown below above the appropriate power card.



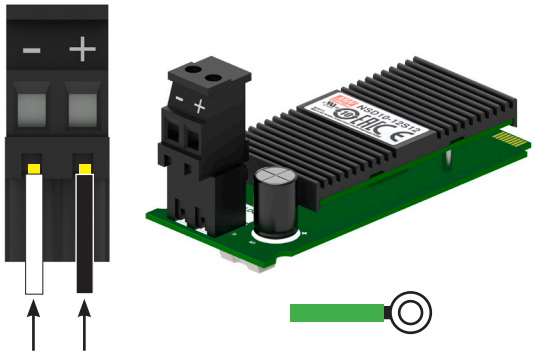
Install the power card as described in section 3.4. Connect power as shown below in Figure 14 and Figure 15.

The power supply line must be equipped with external surge protection for current overload (fuse or circuit breaker with limiting capacity not greater than 10A). It must be easily accessible for the operator and clearly identified.



Neutral Wire (typically a white wire)
Line Wire (typically a black wire)
Ground Wire (typically a green wire)

Figure 14. AC Power Supply Terminal Block

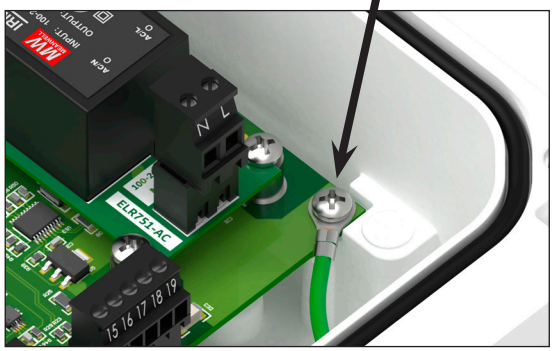


Power Supply (typically a white wire)
Power Supply + (typically a red wire)
Ground Wire (typically a green wire)

Figure 15. Optional DC Power Supply Terminal Block

Chassis Ground Connection

Location of Chassis Ground Lug



AC power card at left as an example of the ground connection.

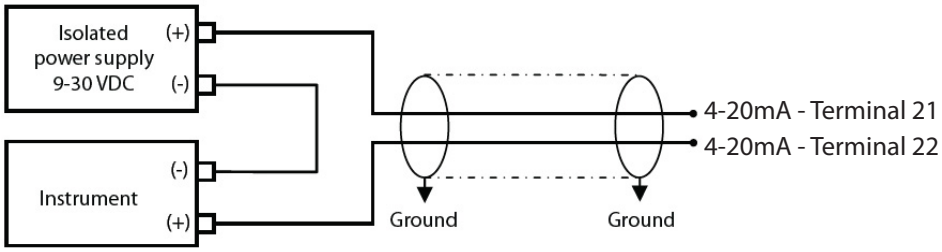
6.6 4-20mA Hook-Up

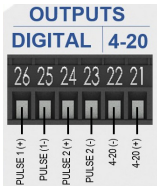
Isolated 4-20mA current loops are used to output flow data to external devices. Maximum load impedance is 1,000Ω, and the maximum voltage without load is 27VDC. The transmitter has the capability to detect a loss of load on this output. To disable this function set the value "mA Val. Fault" under the ALARMS menu to zero (see manual 30124-60, ProComm Max Transmitter Manual). A graphical example of the usage of the current loop with external device is shown below:

If the external device requires a voltage input, a precision resistor placed across the input terminals of the external device will change the current to voltage. Calculate the required resistor using Ohm's law (V = I x R). For example, a 250Ω resistor will provide an input voltage of one to five volts with the transmitter range being set from 4mA to 20mA. An additional 4 to 20mA loop output is available.

IMPORTANT
The transmitter powers the 4-20mA loops. Do not use external power for the 4-20mA loop as it may cause permanent damage to the transmitter.

Output type: 4-20mA current loop, sink powered





Output type: 4-20mA current loop, source powered

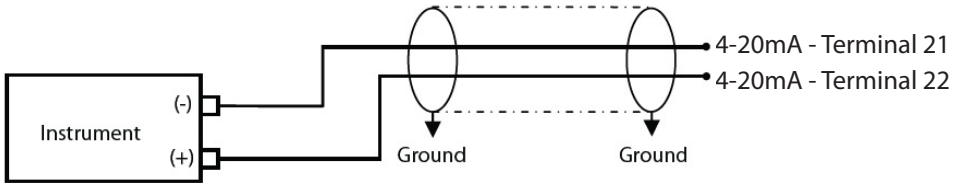


Figure 16. 4-20mA Hook-Up

6.7 Opto-Isolated Pulse Output Hook-Up

The outputs are open collector transistor outputs used to communicate with or activate external devices.

- Opto-isolated output with collector and emitter terminals floating and freely connectable
- Maximum switching voltage: 40 VDC
- Maximum switching current: 100mA
- Maximum saturation voltage between collector and emitter 1.2V@100mA
- Maximum switching frequency (load on the collector or emitter, RL=470Ω, VOUT=24VDC): 1250Hz
- Maximum reverse current bearable on the input during an accidental polarity reversion (VEC): 100mA
- Isolation from other secondary circuits: 500 V

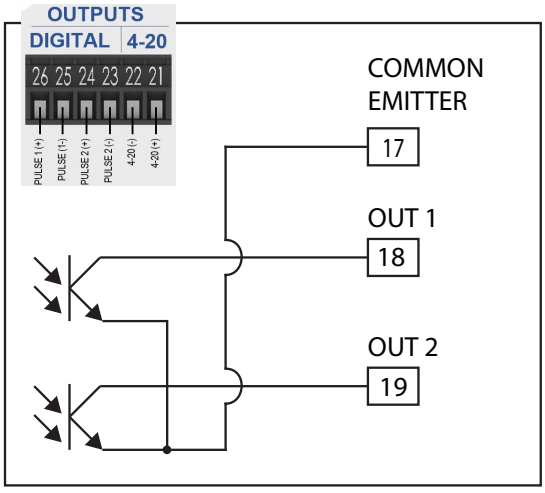


Figure 17. Opto-Isolated Pulse Output Diagram

IMPORTANT
Digital outputs are not isolated from each other. All digital outputs MUST use the same power source.

6.8 Opto-Isolated Input

- Opto-isolated input
- 500 V isolation
- 2-40 VDC on voltage
- Input programming per input menu, will perform functions set to ON.

Input example shown at right.

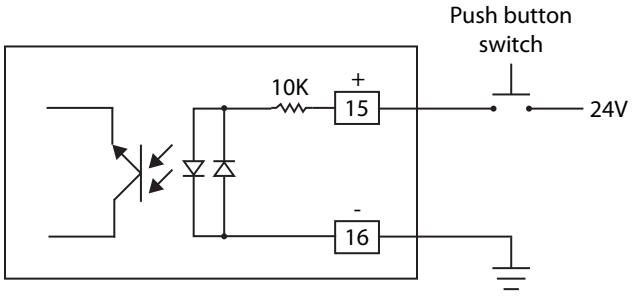


Figure 18. Opto-Isolated Input Diagram

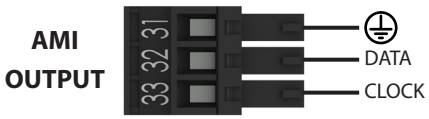
6.9 Optional Smart Output Hook Up

The convertor comes pre-wired with an interconnection that should readily connect to most AMI transceivers. Where interconnective devices are not mechanically compatible or where non-standard wiring is encountered, the installer can opt to remove the connector from the end of the transmitter's interface cable and make direct connection via the wiring table shown at right.

- Signals and associated wire colors in the McCrometer SmartOutput™ interface cable are identified together in the top row of the table at right.
- Corresponding wire colors for transceivers from each compatible AMI vendor are identified in the columns under the top row.

McCrometer AMR Interface Pinout

	28 Power/Clock	29 Data	27 Ground
Badger	Red	Green	Black
Elster	Green	Red	Black
Itron	Black	Red	Green
Neptune	Black	Red	Green
Sensus	Red	Green	Black



6.10 Connecting the SmartTrax Remote Transmitting Unit

The SmartTrax remote transmitting unit will need to be installed remotely from the transmitter, regardless of whether the transmitter is mounted directly on the sensor or installed remotely from the sensor. Use the output transmitter port to run the cable through (section 5.2).

The example configuration in section 6.9 shows the SmartTrax with an optional solar panel. If you use a solar panel or an external AC or DC power source, you will need to use the female connection shown in Figure 21 and Figure 22.

For specific wiring diagrams to connect the transmitter to the transmitter, see Figure 19 and Figure 20.

For more detail on the SmartTrax transmitter, including specifications, installation requirements, location, and remote data access, see the SmartTrax Installation, Operation, and Maintenance manual, 30125-82.

All Field Mag 5000 meters come software-preconfigured to accept SmartTrax in the future. When a SmartTrax unit is purchased, simply mount the unit as directed and wire the unit as indicated in the SmartTrax documentation. No specific options need to be selected at the time of order of the Field Mag 5000 meter.

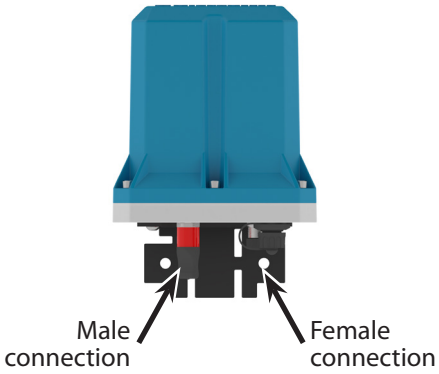


Figure 19. Connections, front view

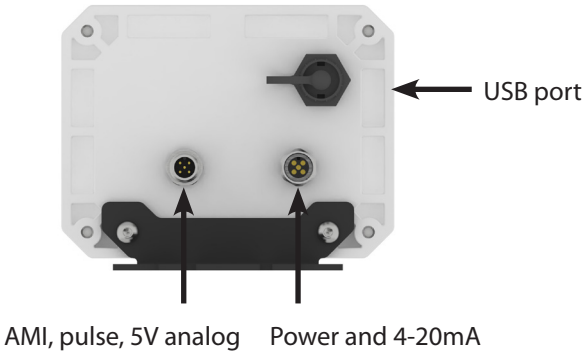


Figure 20. Connections, bottom view

6.11 Pin-out of Male and Female Connectors

FEMALE CABLE

4-20mA & Power Connector

Figure 21. Pin-out of Female Connector

PULSE 1 & 2	
PULSE 1	BLACK
PULSE 2	BROWN
GROUND	GRAY

AMI		
FUNCTION	**COLOR**	**TERMINAL***
DATA	BLACK	33
CLOCK	BROWN	32
GROUND	GRAY	31

5V ANALOG	
5V OUTPUT	WHITE
ANALOG IN	BLUE
GROUND	GRAY

* Indicates terminal on PCB (page 9).

MALE CABLE

Pulse / AMI / 5V Analog Connector

Figure 22. Pin-out of Male Connector

4-20mA	
4-20mA -	WHITE
4-20mA +	BROWN

DC POWER / SOLAR	
9-30 VDC+	BLUE
GROUND / V-	BLACK

6.12 Installing the Optional Solar Panel

The optional solar panel can be installed as shown in Figure 23. There are two panel sizes with nominal power rated as 2.4W and 5.1W respectively. Do not use the optional solar panel used to provide power to the ProComm GO transmitter.

Install the solar panel adjacent to the SmartTrax unit so that the two can be connected with the 6' cable. Connect the cable from the solar panel to the female connection (Figure 23).

If the cable is not connected to the solar panel, refer to the wiring diagram shown in Figure 21 and Figure 22.

Figure 23. SmartTrax with attached solar panel

7.0 EXTERNAL WIRE CONNECTION

7.1 Cable Gland Connections

10-35VDC Power/4-20mA Output And Pulse Output

The flow meter has one dedicated port and two optional ports on the back side of the electronics enclosure. The dedicated port (center) is used to download data logger information or for meter service and troubleshooting. The two optional ports are for:

1. Optional 10-35 VDC power and 4-20mA output
2. Optional pulse outputs (flow volume and alarms)
3. AMI output
4. 100-240 VAC power

The flow meter is configured at the factory for the optional outputs and requested by the customer at the time of order. The external cables attach through a permanent cable gland (standard, Figure 24) or through a screw locking-type waterproof connector (quick connect option, Figure 25 - see next section).

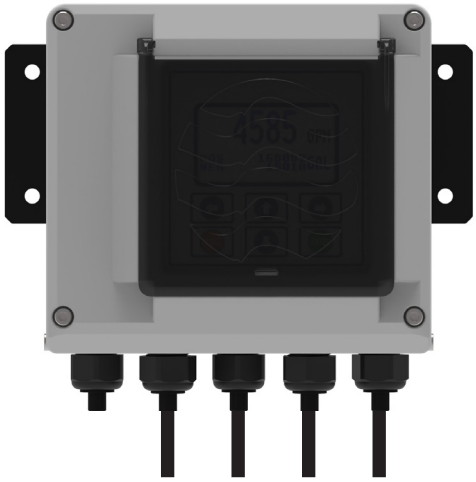


Figure 24. Standard cable gland

7.2 Quick Connect Cable Ends (optional)

IMPORTANT
Connections to the sensor must be made with cable supplied by McCrometer specifically for that purpose. Do not substitute the supplied cable with other types of cable, even for short runs. For repairs or added lengths of cable, the entire cable between the sensor and the transmitter must be replaced. (Contact factory for replacement cable.)

Quick Connect cable end fittings are optional. If selected at the time of order, follow the instructions below:

1. Remove the protective caps from both the receiving ports and the cable ends.
2. Insert the cable end into the port until fully seated, then turn the knurled collar on the cable to the right until the cable is tight.
3. With both cables properly attached to the meter, connect the meter-end protective cap to the cable-end protective cap. This insures that the protective caps remain free from dirt.

IMPORTANT NOTE: When the cables are not attached to the meter insure that the protective caps are properly secured to cable ends and the receiving ports to insure all connections remain free from dirt.

WARNING
EXPLOSION HAZARD. DO NOT CONNECT/DISCONNECT CONNECTORS OR WIRING OR REMOVE ENCLOSURE LID WHILE WITHIN AN ELECTRICALLY CLASSIFIED HAZARDOUS AREA.

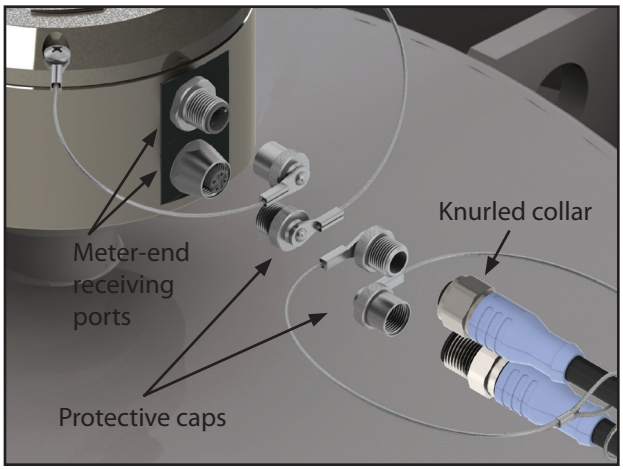


Figure 25. Optional quick connect cable ends

IMPORTANT
When not in use, always keep the attached cap firmly screwed into the connector to insure a water-tight seal. Also, keep the contacts in the cable connector clean and dry during assembly.

IMPORTANT
To connect sensor and transmitter via quick connect plugs and sockets, only use the supplied cable assemblies from McCrometer.

8.0 GROUNDING AND ELECTRICAL INTERFERENCE

The sensor body must have electrical contact with the media. This is achieved via grounding rings. For best performance, McCrometer provides grounding rings for all sizes, and they should be installed.

IMPORTANT

NOTE: On meters installed on a line with cathodic protection it may be necessary to insulate the meter from the line. Consult your cathodic protection vendor for instructions.

Always ensure that the transmitter and the sensor are grounded (earthed) correctly. The grounding of the sensor and transmitter ensures that the equipment and liquid have an equal potential. For most installations the quality of grounding by the provided cabling assures the sensor is properly grounded and additional grounding of the sensor is not required. However, in instances where this is not the case, i.e. the equipment and fluid do not have an equal potential, such as where the installation location and/or media is subjected to electrical interference, additional grounding steps may be required. Consult an electrician experienced with instrumentation installations to determine if electrical interference is present. For further information on installation environments and sensor grounding, please contact McCrometer Technical Support.

8.1 Fluid Conductivity

The fluid to be measured must have a minimum conductivity of 5µS/cm for an electromagnetic flow meter to operate. Systems with such low conductivity require that the system is well grounded with no electrical interference. Also, In low conductivity fluids (less than 50 µS/cm) long cable lengths may affect flow meter's ability to read the flow signal.

To eliminate rapid changes in fluid conductivity, it is recommended that all blending and chemical injecting be done downstream of the meter to avoid possible measurement error and/or issues. If blending or chemical injecting is performed upstream of the meter, is should be done upstream of the meter early enough so the flow media is thoroughly mixed prior to entering the measurement area.

8.2 Sensor Grounding Methods

The grounding rings and gaskets must be used to ensure a positive seal at the flanges, and to ensure fluid is properly grounded to sensor. For best performance, McCrometer provides grounding rings, which should be installed for all sizes.

When installing into a PVC or plastic pipe system, grounding rings are required for all sizes.

IMPORTANT

Information For Grounding Ring Installations

- Gaskets must be used on either side of the grounding ring to provide a proper seal on the flanges. One gasket is used on flanges without a grounding ring.
- Rings & gaskets must align concentrically with the pipe so they do not obstruct or affect flow through the tube.
- The two grounding rings and four gaskets require an additional installation width of 0.5".

1. Preferred method of grounding

Dura Mag meters come standard with a set of grounding rings for use with the preferred method of grounding Dura Mag meters.

This method can be used for all installations, but it is required for non-conductive or internally coated pipe. When pipes are non-conductive, such as PVC or internally coated pipe, you must substitute direct grounding with grounding rings. (Figure 26)

Attach the provided 12 gauge wire or equivalent to the sensor ground lug. Then connect this sensor ground lug to an earth ground point; refer to NEC or local grounding regulations for wiring requirements in making this connection.

Next, connect the two mating grounding rings with a 12 gauge wire or equivalent, attached to the grounding ring lugs, and connect them both to the earth ground. The Dura Mag should be electrically isolated from the pipeline.

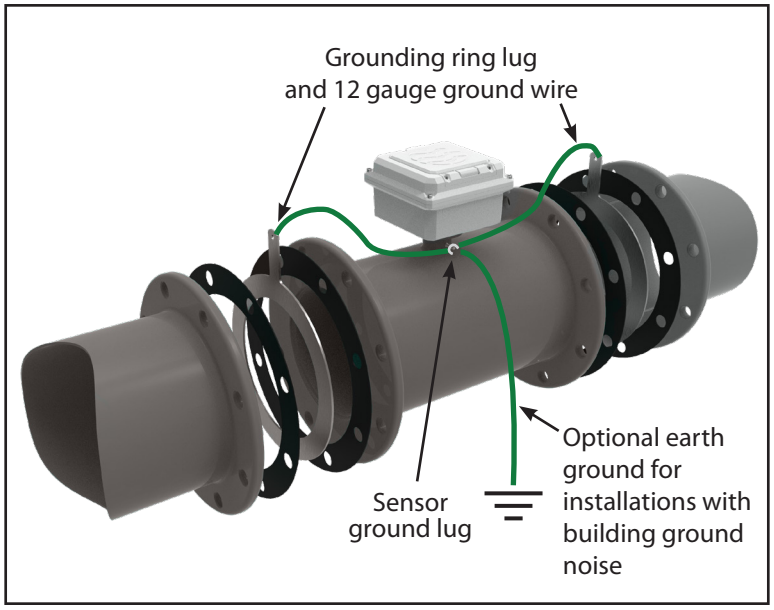


Figure 26. Preferred method of grounding

2. Sensor grounding for meters in an electrically noisy environment

If there is electrical noise in the fluid column or electrical current in the pipe, it can be minimized or eliminated using grounding rings or by grounding the pipeline. This applies to meters mated to conductive uncoated pipe.

Attach the provided 12 gauge wire, or equivalent, to the ground lug. Then connect the sensor ground lug to an earth ground point. (Figure 27)

Next, connect the two mating pipe sections with a 12 gauge wire or equivalent and connect them both to the earth ground. The Dura Mag should be electrically isolated from the pipeline.

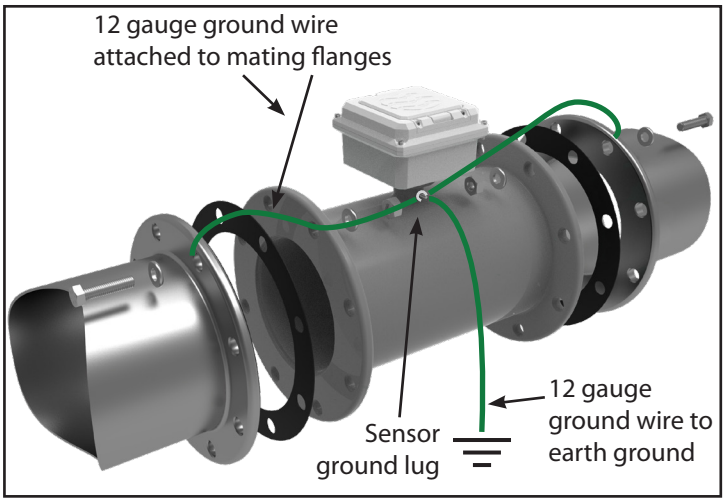


Figure 27. Sensor grounding for meters in an electrically noisy environment

3. Sensor grounding for meters with minimal ground noise

Attach the provided 12 gauge wire, or equivalent, to the sensor ground lug. Then connect this sensor ground lug to an earth ground point. (Figure 28)

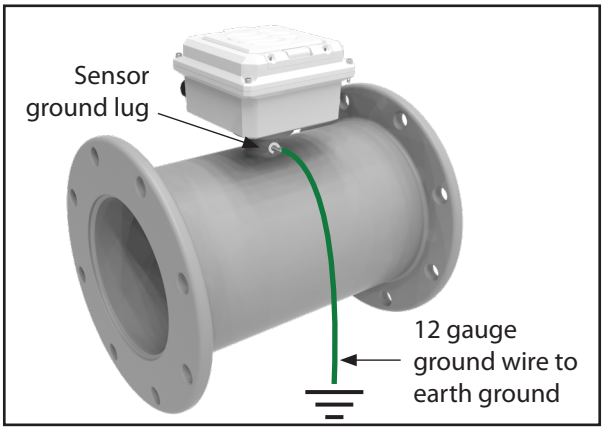
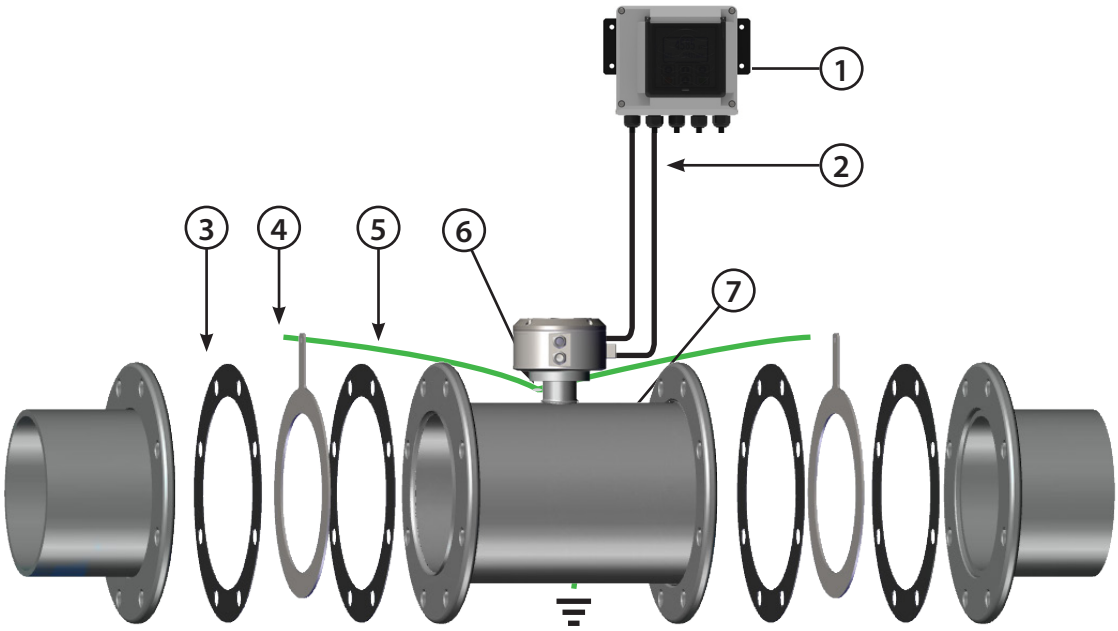


Figure 28. Sensor grounding for meters with minimal ground noise

9.0 REPLACEMENT PARTS

Need new exploded image with PC2 transmitter



The image above is representative for all Ultra Mag meter models and sizes.

NO.	PART NUMBER	DESCRIPTION
1	PC-RA1	AC Transmitter (Dual 4-20mA Output)
1	PC-RD1	DC Transmitter (Dual 4-20mA Output)
1	PC-RA2	AC Transmitter w/ Modbus RS485 Communications Protocol
1	PC-RD2	DC Transmitter w/ Modbus RS485 Communications Protocol
2	15035 / 15036	Dual Cables - Submersible
3	1-1557-*	Gaskets (Optional)
4	3-2781-*	Grounding Rings, Stainless Steel (Optional on 4"-12")
5	3-2757-‡‡	Grounding Wire Assembly
6	1-1201-10	Nut, Hex, Brass
7	15029	Earth Ground Wire

*** INSERT METER SIZE TO COMPLETE PART NUMBER - INSERT -02 FOR 2", -04 FOR 4", -06 FOR 6", ETC.**
‡‡ -W = 2" - 16" -14 = 14" - 20" -24 = 24" - 30" -36 = 36" - 48"

When ordering replacement parts, please specify: Meter Size • Meter Model • Meter Serial Number

10.0 SPECIFICATIONS, WEIGHTS, AND DIMENSIONS

10.1 Flow Meter Specifications

11.2 Physical Specifications

Measurement Method	Electromagnetic flow based on Faraday's law
Directionality	Forward and reverse flow indication and forward, reverse, net totalization are standard with all meters
Pipe Sizes	1.5", 2", 2.5", 3", 4", 6", 8", 10", 12", 14", 16", 18", 20", 24"
Body Style	**Flanged:** 1-1/2" to 24"
Materials	Carbon steel, stainless steel, epoxy liner
Liner	135 epoxy Ultraliner
Electrodes	Type 316 stainless steel, Hastelloy optional
Electrical Connections	• Compression gland seals • Quick-Connect
Signal Transmitter	Vera Mag 3000: ProComm GO Very Mag 5000: ProComm Max
Transmitter Mount	Either meter mount or remote mount
Sensor Cable Lengths	• **Standard**: 25'/7.6 m McCrometer supplied submersible cable with each remote mount unit. • **Optional:** Up to 500'/152.4 m, or 25'/7.6 m max for battery powered. • **Quick Connect:** Available in standard cable lengths: Feet: 25, 50, 75, 100, 125, 150, 175, 200, 500 Meters: 7.6, 15.25. 22.5, 30.5, 38.1, 45.75, 53.3, 61, 152.4 Custom cable lengths at additional cost.

11.3 Performance and Operational Specifications

Process Fluid Temperature	-10 to 93°C (14 to 200°F)
Ambient Temperature	-10 to 60°C (14 to 140° F)
IP Rating	• Quick Connect (NEMA 6P/IP68 with remote transmitter) • Compression gland seals (NEMA 6P/IP68 with remote transmitter)
Sensor Submersibility Depth	**With standard strain relief cable:** 1.8 m (6 ft.) **With optional quick connect cable:** 9 m (30 ft.)
Pressure Rating	• 285 PSI maximum working pressure • 500 PSI maximum working pressure
Velocity Range	0.2 to 32 FPS
Accuracy	• Vera Mag 3000: Battery powered: 1% of measured value ±0.006 ft/s (±0.0018 m/s) • Vera Mag 5000: Standard: +/- 0.2% of measured value ±0.006 ft/s (±0.0018 m/s) **IMPORTANT NOTICE ON FLOW METER ACCURACY:** The Vera Mag 3000 flow meter cable and the electronics are factory calibrated for accuracy as a single unit. Changing the cable length with the splice kit changes the accuracy of the meter and invalidates the calibration certificate. The Vera Mag 5000 flow meter does not have this restriction. Multiple point wet flow calibration of every complete flow tube with its signal transmitter. If desired, the tests can be witnessed by the customer. The McCrometer test facilities are traceable to the National Institute of Standards & Technology. Uncertainty relative to flow is ±0.15%.
Repeatability	±0.05% or ±.0008ft/s (±0.25mm/s), whichever is greater

Flow Meter Specifications (cont.)

Head Loss	None. No obstruction in line and no moving parts
Conductivity	5 µs/cm
Pipe Run Requirements	3000: 1½" to 3" Flanged style meters — 0D upstream / 0D downstream 4" - 24" Steel flanged meters — 2D upstream / 1D downstream 5000: 1½" to 3" Flanged style meters — 0D upstream / 0D downstream 4" - 24" Steel flanged meters — 1D upstream / 0D downstream

11.4 Other Specifications

Certifications and Approvals	**Standard model:**
	• ISO 9001:2015 certified quality management system
	• Certified by MET to UL 61010-1
	• Certified to NSF / ANSI Standards*
	HL Model:
	• ISO 9001:2015 certified quality management system
	• Certified by MET to UL 61010-1 and MET C22.2 No. 61010-1-04
	  • Class I, Division 2, Groups A-D, T4
	  • Class I, Zone 2, IIC T4
	• Certified to NSF / ANSI Standards*

System Options	• Additional sensor cable up to 475' • Annual verification / calibration • Stainless steel ID tag
Meter Options and Accessories	• DC powered transmitter (10-35 VDC, 10 W) • Meter mounted transmitter • Extended warranty • ANSI flanges • Special lay lengths, including ISO standard lay lengths • Quick connect cable fittings • Transmitter sun shield • Battery or battery-solar powered transmitter
Output Options	• Modbus • HART • Smart Output™ (Sensus, Itron 6, Itron 9)
Warranty	**Meter:** 2 year warranty **Liner:** Lifetime guarantee

* Certified by IAPMO R&T to NSF/ANSI 61 for material safety and NSF/ANSI 372 for low lead content.

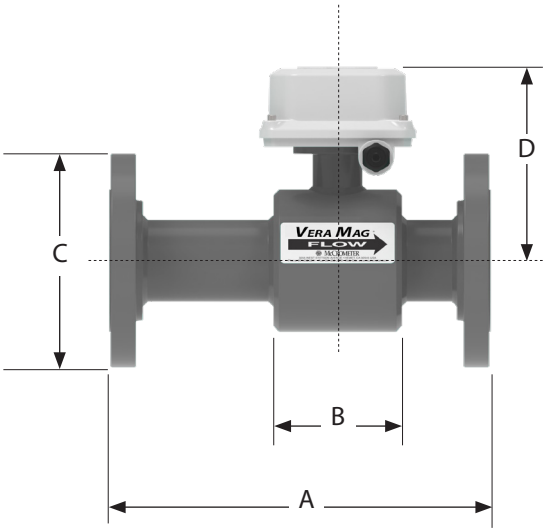
10.2 Flow Meter Dimensions and Weights

1½" to 3" Models

Pipe Size (Nominal)	Flow Ranges (0.2 to 32 FPS) Min-Max GPM	DIMENSIONS (Lay Lengths)							Est. Shipping Weight (lbs.)*	
		A**		B	C		D			
		CL150 ANSI 150#	CL300 ANSI 300#		CL150 ANSI 150#	CL300 ANSI 300#	CL150 ANSI 150#	CL300 ANSI 300#	CL150 ANSI 150#	CL300 ANSI 300#
1 ½"	1.29-200	11	14	4.5	5.0	6.1	6.5	7.25	93	not offered
2"	1.29-200	11	14	4.5	6.0	6.5	6.5	7.25	93	70
2 ½"	3.25-510	13.4	15.5	4.5	7.0	7.5	7.0	7.75	94	not offered
3"	3.25-510	13.4	15.5	4.5	7.5	8.25	7.0	7.75	94	80

* For remote mount meters, add 4 lbs for ProComm Max transmitter.

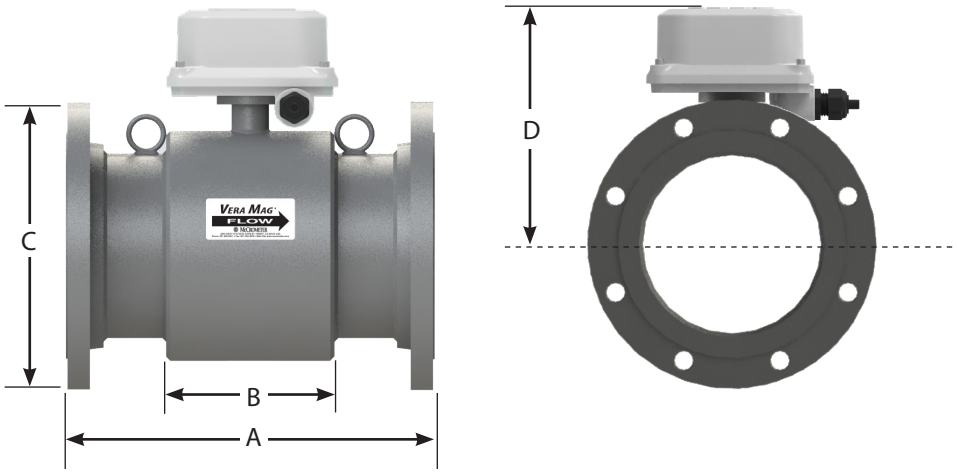
** DIM A is not according to ISO 20456 for the 1-1/2" to 3" size range.



4" to 12" Models Body Style

Pipe Size (Nominal)	Flow Ranges (0.2 to 32 FPS) Min-Max GPM	A**	B	C		D***	Est. Shipping Weight (lbs.)*	
		Lay Length	Shield Length	ANSI			ANSI	
				150# CL150	300# CL300		150# CL150	300# CL300
4"	6.97-1110	9.84	4.125	9.00	10.00	7.56	167	167
6"	16.1-2560	11.81	5.75	11.00	12.50	8.56	186	186
8″	29.2-4670	13.78	6.875	13.50	15.00	9.63	250	250
10″	46.3-7400	17.72	9.125	16.00	17.50	10.63	290	290
12″	67.3-10760	19.7	9.75	19.00	20.50	11.75	350	350

* Shipping weights are estimated and may change due to specific order packaging
** DIM A in accordance with ISO 20456 for 4″ to 24″ line sizes.
*** DIM D represents the remote transmitter height in relation to the meter centerline.

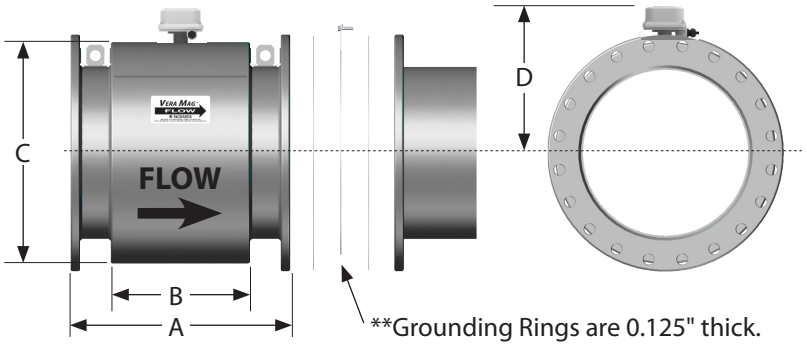


Flow Meter Dimensions and Weights (cont.)

14+" Models Body Style

Pipe Size (nom.)	Flow Ranges (0.2 to 32 FPS) Min-Max GPM	Dimensions					Est. Shipping Weight (lbs.)*	
		A**	B	C		D***		
		Lay Length		150# CL150	300# CL300		150# CL150	300# CL300
14"	90.1-14410	21.65	10.375	21.00	23.00	13.56	480	480
16"	117-18670	23.62	12.375	23.50	25.50	14.31	500	639
18"	149-23820	23.00	12.375	25.00	28.00	15.31	600	600
20"	186-29600	25.59	14.375	27.50	30.50	16.25	725	725
24"	269-43040	30.70	18.875	32.00	36.00	18.25	1,430	1,430

*Shipping weights are estimated and may change due to specific order packaging
** DIM A in accordance with ISO 20456 for 4" to 24" line sizes.
*** DIM D represents the remote transmitter height in relation to the meter centerline.



10.3 ProComm Max Transmitter Specifications

Physical Specifications

Electronic Housing	Diecast aluminum, powder coated enclosure w/ tamper resistant seal
Transmitter Dimensions	Remote Mount: Height: 7.3" (18.5 cm) Width: 8.5" (21.6 cm) Depth: 4.3" (10.9 cm) Meter Mount: Height: 6.9" (17.5 cm) Width: 7.2" (18.25 cm) Depth: 6.2" (15.7 cm)
Power	AC Power: 100-240 VAC / 47-66 Hz (10 W) DC Power: 10-35 VDC (10 W) Note: AC or DC must be specified at time of ordering.
Connection Options	Conduit option: 1/2" NPT threaded connections
Galvanic Isolation	All outputs are galvanically isolated from power supply up to 500 V
Conductivity	Minimum conductivity of 5µS/cm

Performance and Operational Specifications

Location	Indoor or outdoor use
Operating and Storage Temperature	-4° to 140° F (-20° to 60° C)
IP Rating	IP67 Die cast aluminum transmitter
Standard Outputs	Single 4-20mA (standard). Galvanically isolated and fully programmable for zero and full scale. A second 4-20mA is available. Two separate digital programmable outputs: open collector transistor usable for pulse, frequency, or alarm settings. • Volumetric Pulse • Range Indication • Maximum switching voltage: 35 VDC • Maximum switching current: 100mA • Insulation from other secondary circuits: 500V
Optional Outputs	• Modbus • HART • Ethernet IP • Datalogger • Smart Output™ (Sensus, Itron 6, Itron 9)

Display and Measurement

Keyboard and Display	Can be used to access and change set-up parameters using six membrane keys and an LCD display

Units

GAL	Gallons	B42	Barrel (42G)	MH1	Miners Inch Hour (11.22G)
CUF	Cubic Feet	B46	Barrel (46G)	MD1	Miners Inch Day (11.22G)
AFT	Acre Feet	B55	Barrel (55G)	MH9	Miners Inch Hour (9G)
CUM	Cubic Meters	IMG	Imperial Gallon	MD9	Miners Inch Day (9G)
LIT	Liters	AIN	Acre Inch	KGL	Kilo Gallons
MML	Megaliter	TON	Ton (Short)	MGL	Mega Gallons
MTT	Metric Ton (KL)	MM1	Miners Inch Minute (11.22G)	IN3	Cubic Inch
B31	Barrel (31G)	MM9	Miners Inch Minute (9G)		

Other Specifications

Standard Model	• ISO 9001:2015 certified quality management system • Certified by MET to UL 61010-1	

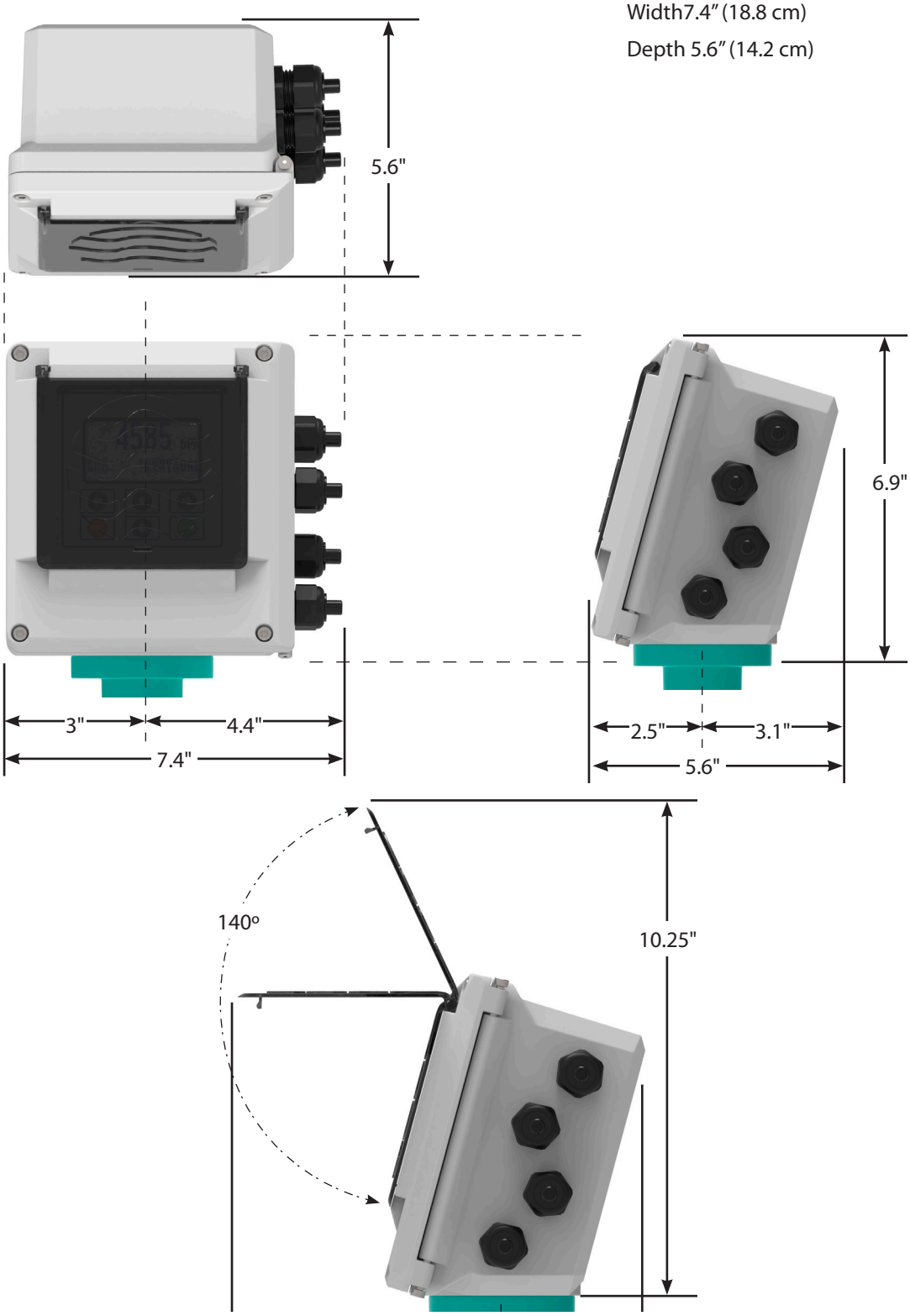
HL Model	• ISO 9001:2015 certified quality management system
	• Certified by MET to UL 61010-1 and MET C22.2 No. 61010-1-04
	  • Class I, Division 2, Groups A B C D, T4
	  • Class I, Zone 2, IIC T4	

IMPORTANT
Refer to certification requirements. Do not substitute components.

11.0 DIMENSIONS

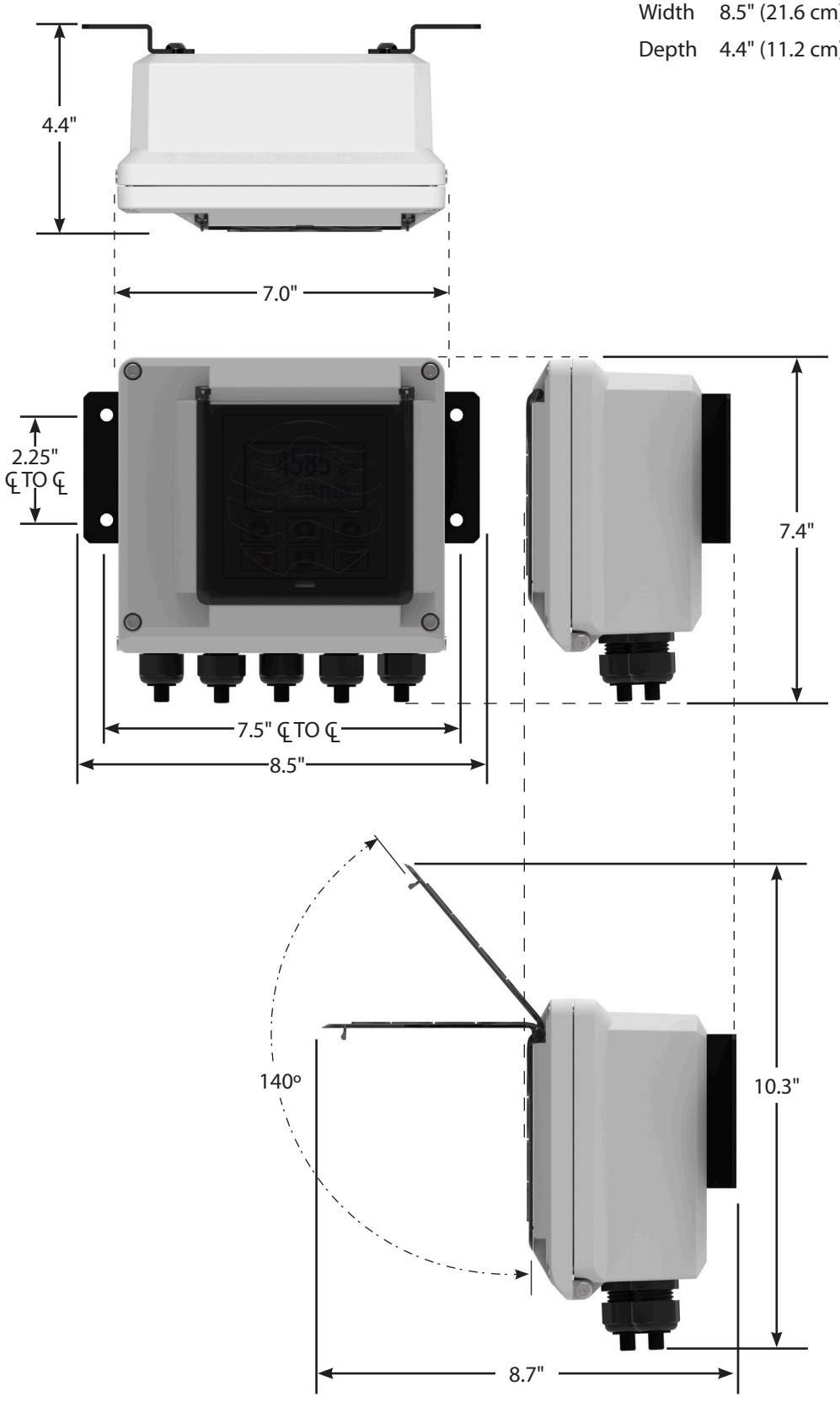
Meter Mount Transmitter Dimensions

Height 6.9" (17.6 cm)
Width7.4" (18.8 cm)
Depth 5.6" (14.2 cm)



10.4 ProComm Max Transmitter Dimensions

Height 7.4" (18.9 cm)
Width 8.5" (21.6 cm)
Depth 4.4" (11.2 cm)



11.0 RETURNING A UNIT FOR REPAIR

If the unit needs to be returned to the factory for repair, please do the following:

- Prior to calling for a return authorization number, determine the model number, serial number, and reason for return.
- Contact McCrometer Customer Service Department and ask for a Return Authorization (RA) number.
  - Telephone: 1-800-220-2279
  - Email: customerservice@mccrometer.com
- Ship the meter in the original packaging, if possible. Do not ship manuals, power cords, or other parts with your unit unless required for repair.
- Please make sure the meter is clean and free from foreign debris prior to shipping. McCrometer may charge a cleaning fee if the meter is sent without being cleaned.
- Write the RA number on the outside of the shipping box. All return shipments should be insured.
- Address all shipments to:

  McCrometer, Inc.
  RMA #
  3255 W. Stetson Avenue
  Hemet, CA 92545

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of two (2) years from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer Inc., Attn: Technical Support, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA
TEL: 951-652-6811 • 800-220-2279 • FAX: 951-652-3078
www.mccrometer.com