Micro Motion[®] Specific Gravity Meters (SGM)

Gas specific gravity measurement





Safety and approval information

This Micro Motion product complies with all applicable European directives when properly installed in accordance with the instructions in this manual. Refer to the EU declaration of conformity for directives that apply to this product. The EU declaration of conformity, with all applicable European directives, and the complete ATEX Installation Drawings and Instructions are available on the internet at www.emerson.com or through your local Micro Motion support center.

Information affixed to equipment that complies with the Pressure Equipment Directive, can be found on the internet at www.emerson.com.

For hazardous installations in Europe, refer to standard EN 60079-14 if national standards do not apply.

Other information

Full product specifications can be found in the product data sheet. Troubleshooting information can be found in the configuration manual. Product data sheets and manuals are available from the Micro Motion web site at www.emerson.com.

Return policy

Follow Micro Motion procedures when returning equipment. These procedures ensure legal compliance with government transportation agencies and help provide a safe working environment for Micro Motion employees. Micro Motion will not accept your returned equipment if you fail to follow Micro Motion procedures.

Return procedures and forms are available on our web support site at www.emerson.com, or by phoning the Micro Motion Customer Service department.

Emerson Flow customer service

Email:

- Worldwide: flow.support@emerson.com
- Asia-Pacific: APflow.support@emerson.com

Telephone:

North and South America		Europe and Middle East		Asia Pacific	
United States	800-522-6277	U.K.	0870 240 1978	Australia	800 158 727
Canada	+1 303-527-5200	The Netherlands	+31 (0) 704 136 666	New Zealand	099 128 804
Mexico	+41 (0) 41 7686 111	France	0800 917 901	India	800 440 1468
Argentina	+54 11 4837 7000	Germany	0800 182 5347	Pakistan	888 550 2682
Brazil	+55 15 3413 8000	Italy	8008 77334	China	+86 21 2892 9000
		Central & Eastern	+41 (0) 41 7686 111	Japan	+81 3 5769 6803
		Russia/CIS	+7 495 981 9811	South Korea	+82 2 3438 4600
		Egypt	0800 000 0015	Singapore	+65 6 777 8211
		Oman	800 70101	Thailand	001 800 441 6426
		Qatar	431 0044	Malaysia	800 814 008
		Kuwait	663 299 01		
		South Africa	800 991 390		
		Saudi Arabia	800 844 9564		
		UAE	800 0444 0684		

Contents

Planning	1
1.1 Installation and commissioning overview	1
1.4 Recommended installation for specific gravity applications	3
1.5 Power requirements	4
2.1 Mount the meter enclosure to a wall	7
2.3 Rotate the display on the transmitter (optional)	
Wiring	12
3.3 Heater wiring	
Groundina	23
	1.2 Installation checklist

1 Planning

Topics covered in this chapter:

- Installation and commissioning overview
- Installation checklist
- Best practices
- Recommended installation for specific gravity applications
- Power requirements

1.1 Installation and commissioning overview

Following is an overview of the tasks to install and commission the Specific Gravity Meter (SGM). These tasks must be completed before configuring and using the meter.

As part of the SGM commissioning process, you are required to perform an onsite calibration of the meter. Onsite meter calibration requires calibration gases and additional hardware to calibrate the meter. See the configuration and use manual for more information on planning the SGM commissioning. The configuration and use manual provides guidance on selecting the calibration gases, as well as instruction on performing an onsite calibration.

Process	Reference
Confirm you have all parts necessary and meet the basic installation requirements.	See Section 1.2
Consider the installation best practices for the meter.	See Section 1.3
Mount the meter.	See Section 2.1
Connect the gas bypass lines to the meter.	See Section 2.2
Wire the meter according to the recommended practices for your process environment and required approvals.	See Chapter 3
Select the control pressure for the meter.	See Micro Motion Specific Gravi-
Purge cycle the meter. ty Meters (SGM): 0 and Use Manual	
Calibrate the meter.	ana ose wanaa

1.2 Installation checklist

Verify the contents of the product shipment to confirm that you have all parts and information necessary for the installation.

Part	Quantity
Micro Motion [®] Specific Gravity Meter (SGM)	1
Labeled enclosure (if applicable), which includes: - Enclosure mounting feet - Instructions for attaching the mounting feet	1
Accessories kit: - M20 to 1/2-inch NPT adapter (if applicable) - 1/2-inch NPT blanking plug - 2.5 mm hex key	1
Calibration certificate	1
Safety instructions booklets	2
Micro Motion Product Documentation DVD	1

П Make sure that all electrical safety requirements are met for the environment in which the meter will be installed. Make sure that the local ambient and process temperatures and process pressure are within the limits of the meter. Make sure that the hazardous area specified on the approval tag is suitable for the environment in which the meter will be installed. If installing the meter in a hazardous area, confirm that you have the required safety П barriers or galvanic isolators for your installation. П Make sure that you will have adequate access to the meter for verification and maintenance. П Make sure that the process gas meets the recommended characteristics regarding composition, temperature, and pressure for your installation. Verify that you have all equipment necessary for your installation. Depending on

your application, you may be required to install additional parts for optimal

☐ Follow recommended best practices for installing the SGM.

1.3 Best practices

The following information can help you get the most from your meter.

- Handle the meter with care. Follow local practices for lifting or moving the meter.
- Ensure that the process gas is clean and dry.

performance of the meter.

- Do not use gases incompatible with the materials of construction. To prevent corrosion of the sensing element, the process gas should be compatible with Ni-Span-C.
- Do not expose the meter to excessive vibration (greater than 0.5 g continuously). Vibration levels in excess of 0.5 g can affect the meter accuracy.
- Do not operate the meter above its rated pressure or process temperature.

- Install an external coalescing filter in the sample gas inlet pipework to minimize condensate and dust contamination.
- Verify that the filters in your system are not causing any excessive flow restrictions.
- Installing the meter in a weather-proof enclosure thermally insulates the meter to maintain temperature equilibrium between the sample and pipeline gases.
- Ensure good ventilation around the meter and/or enclosure to prevent gas build-up in the unlikely event of a leak.
- Ensure meter is not transported when it contains hazardous substances, including fluids that may have leaked into and are still contained within the case.

1.4 Recommended installation for specific gravity applications

To ensure optimum performance of the meter, Micro Motion recommends that you install the meter inside an enclosure that is mounted to a wall. The following diagram illustrates the recommended installation of the SGM.

N D G K SGM

Figure 1-1: Typical wall-mounted installation of the SGM in an enclosure

- A. Input valve
- B. Calibration valve
- C. Exit valve
- D. Isolation valve
- E. Purging valve
- F. Pipeline
- G. Coalescing filter
- H. Pressure regulator
- I. Flowmeter
- J. Calibration gas inputs
- K. Pressure relief connection
- L. Gas outlet connection
- M. Gas inlet connection
- N. Vent
- O. Electrical cable conduit
- P. Wall-mounted enclosure with SGM

Note

- To ensure that you do not operate the meter above its rated pressure, you must install a pressure regulator between the gas line and the meter.
- For ATEX installations, you are required to install a coalescing filter and element (as supplied).

1.5 Power requirements

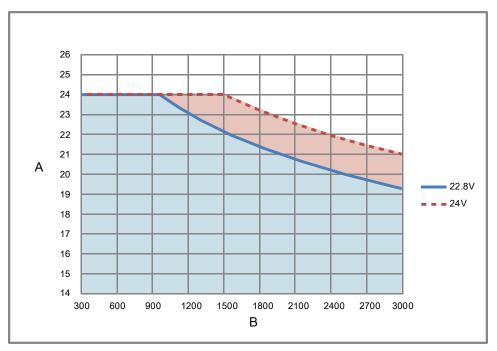
Following are the DC power requirements to operate the meter:

- 24 VDC, 0.45 W maximum
- Minimum 22.8 VDC with 1000 m (3280 ft) of 0.20 mm² (18 AWG) power-supply cable

• At startup, power source must provide a minimum of 0.5 A of short-term current at a minimum of 19.6 V at the power-input terminals.

Power cable recommendations

Figure 1-2: Minimum wire gauge (AWG per feet)



- A. AWG
- B. Distance of installation

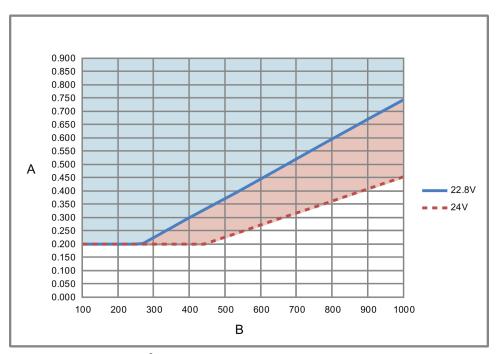


Figure 1-3: Minimum wire area (mm² per meter)

- A. Minimum wire area (mm²)
- B. Distance of installation

2 Mounting

Topics covered in this chapter:

- Mount the meter enclosure to a wall
- Connect the gas bypass lines
- Rotate the display on the transmitter (optional)

2.1 Mount the meter enclosure to a wall

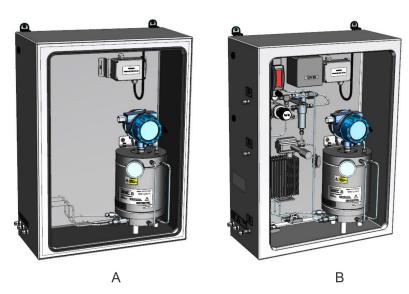
Micro Motion recommends that you install the meter in an enclosure that is mounted to a wall

When you order the meter with an enclosure, the meter and pipework inside the enclosure are configured at the factory to allow for easy installation of the meter in your process pipeline.

Important

If you are installing the SGM as a stand-alone device (not inside an enclosure): for best performance, you must ensure that the SGM is not exposed to rapid changes in temperature.

Figure 2-1: SGM installed in mounting enclosure



- A. Stainless steel insulated enclosure (600 x 800 x 300 mm)
- B. Stainless steel insulated enclosure (600 x 800 x 300 mm) with sample conditioning system

Procedure

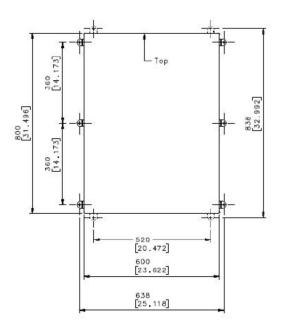
- 1. Attach the mounting brackets to the exterior of the meter enclosure. All necessary parts and instructions for attaching the feet are shipped with the product.
- 2. Prepare the mounting location on the wall. See *Mounting dimensions for small enclosure* and *Section 2.1.1* for the mounting dimensions of the small and large enclosures.
- 3. Attach the meter enclosure to the wall-mount location.

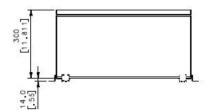
A CAUTION!

When lifting or transporting the meter inside the enclosure, be sure not to drop the meter. While the meter enclosure is designed to minimize damage due to shocks, dropping the meter will damage the meter.

2.1.1 Mounting dimensions for a large enclosure

Figure 2-2: Mounting dimensions for large enclosure





2.2 Connect the gas bypass lines

Once you have mounted the meter, you are ready to connect the gas bypass lines. There are three lines: sample gas input, sample gas output, and pressure relief.

Each connector is a 1/4-inch Swagelok bulkhead fitting. These connectors are located on the outside of the enclosure.

Procedure

Connect the lines to the appropriate connector.

▲ CAUTION!

Be sure to connect the gas input line to the appropriate fitting. Connecting the gas input line to the wrong fitting could cause damage to the meter.

Figure 2-3: Gas bypass connectors (located on the side of the enclosure)

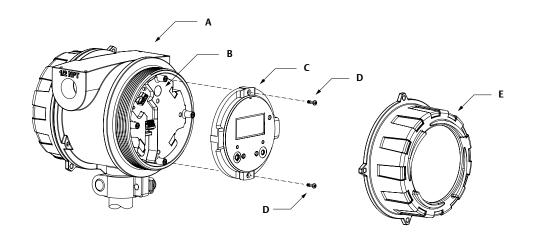


- A. Pressure relief
- B. Process gas output
- C. Process gas input

2.3 Rotate the display on the transmitter (optional)

The display on the transmitter electronics module can be rotated 90° or 180° from the original position.

Figure 2-4: Display components



- A. Transmitter housing
- B. Sub-bezel
- C. Display module
- D. Display screws
- E. Display cover

Procedure

- 1. If the meter is powered up, power it down.
- 2. Turn the display cover counterclockwise to remove it from the main enclosure.
- 3. Carefully loosen (and remove if necessary) the semi-captive display screws while holding the display module in place.
- 4. Carefully pull the display module out of the main enclosure until the sub-bezel pin terminals are disengaged from the display module.

Note

If the display pins come out of the board stack with the display module, remove the pins and reinstall them.

- 5. Rotate the display module to the desired position.
- 6. Insert the sub-bezel pin terminals into the display module pin holes to secure the display in its new position.

- 7. If you have removed the display screws, line them up with the matching holes on the sub-bezel, then reinsert and tighten them.
- 8. Place the display cover onto the main enclosure.
- 9. Turn the display cover clockwise until it is snug.
- 10. If appropriate, power up the meter.

3 Wiring

Topics covered in this chapter:

- Terminals and wiring requirements
- Intrinsically safe output wiring
- Heater wiring

3.1 Terminals and wiring requirements

Three pairs of wiring terminals are available for transmitter outputs. These outputs vary depending on your transmitter output option ordered. The Analog (mA), Time Period Signal (TPS), and Discrete (DO) outputs require external power, and must be connected to an independent 24 VDC power supply.

For meters connecting to a remote-mount Model 2700 FOUNDATION™ fieldbus transmitter, you must wire the meter to the remote-mount Model 2700 transmitter using a 4-wire cable connection. See the processor wiring content in this manual for information on how to wire the meter.

The screw connectors for each output terminal accept a maximum wire size of 14 AWG (2.5 mm²).

Important

- Output wiring requirements depend on the hazardous area classification of the environment in which the meter is installed. It is your responsibility to verify that this installation meets all corporate, local, and national safety requirements and electrical codes.
- If you will configure the meter to poll an external temperature or pressure device, you must wire the mA output to support HART communications. You may use either HART/mA single-loop wiring or HART multi-drop wiring.

Table 3-1: Transmitter outputs

	Output channels		
Transmitter version	A	В	С
Analog	4–20 mA + HART	4–20 mA	Modbus/RS-485
Time period signal (TPS)	4–20 mA + HART	Time Period Sig- nal (TPS)	Modbus/RS-485
Fixed	4–20 mA (tem- perature)	Time period sig- nal (TPS)	Disabled
Processor for remote-mount Model 2700 FOUNDATION fieldbus	Disabled	Disabled	Modbus/RS-485

3.2 Intrinsically safe output wiring

Micro Motion provides safety barrier and galvanic isolator installation kits for wiring the meter in a hazardous environment. These kits provide the appropriate barriers or isolators depending on the outputs available and approvals required.

Information provided about wiring the safety barriers and galvanic isolators is intended as an overview. You should wire the meter according to the standards that are applicable at your site.

A CAUTION!

- Meter installation and wiring should be performed by suitably trained personnel only in accordance with the applicable code of practice.
- Refer to the hazardous area approvals documentation shipped with your meter. Safety
 instructions are available on the Product Documentation DVD and accessible at
 www.emerson.com.

3.2.1 Hazardous area entity parameters

A DANGER!

- Hazardous voltage can cause severe injury or death. To reduce the risk of hazardous voltage, shut off power before wiring the meter.
- Improper wiring in a hazardous environment can cause an explosion. Install the meter only in an area that complies with the hazardous classification tag on the meter.

Input entity parameters

Table 3-2: Input entity parameters: all connections

Parameter	Power supply	4–20 mA /Discrete Output/Time Period Signal	RS-485
Voltage (U _i)	30 VDC	30 VDC	18 VDC
Current (I _i)	484 mA	484 mA	484 mA
Power (P _i)	2.05 W	2.05 W	2.05 W
Internal capacitance (C _i)	0.0 pF	0.0 pF	0.0011 pF
Internal inductance (L _i)	0.0 H	0.0 H	0.0 H

RS-485 output and cable parameters

All connections to the meter receive their power from the connected intrinsically safe barrier. All cable parameters are derived from the output parameters of these devices. The RS-485 connection also receives power from the connected barrier (MTL7761AC), although this connection has specific output and cable parameters.

Table 3-3: RS-485 output and cable entity parameters (MTL7761AC)

Input parameters	
Voltage (U _i)	18 VDC
Current (I _i)	100 mA
Internal capacitance (C _i)	1 nF
Internal inductance (L _i)	0.0 H
Output parameters	
Voltage (U _o)	9.51 VDC
Current (instantaneous) (I _o)	480 mA
Current (steady state) (I)	106 mA
Power (P _o)	786 mW
Internal resistance (R _i)	19.8 Ω
Cable parameters for Group IIC	
External capacitance (C _o)	85 nF
External inductance (L _o)	154 μH
External inductance/resistance ratio (L_o/R_o)	31.1 μΗ/Ω
Cable parameters for Group IIB	
External capacitance (C _o)	660 nF
External inductance (L _o)	610 μH
External inductance/resistance ratio (L _o /R _o)	124.4 μΗ/Ω

Hazardous area voltage Hazardous area current The meter entity parameters require the selected barrier's opencircuit voltage to be limited to less than 30 VDC (Vmax = 30 VDC).

The meter entity parameters require the selected barrier's short-circuit currents to sum to less than 484 mA (Imax = 484 mA) for all outputs.

Hazardous area capacitance

The capacitance (Ci) of the meter is 0.0011 μ F. This value added to the wire capacitance (Ccable) must be lower than the maximum allowable capacitance (Ca) specified by the safety barrier. Use the following equation to calculate the maximum length of the cable between the meter and the barrier: Ci + Ccable \leq Ca

Hazardous area inductance

The inductance (Li) of the meter is $0.0~\mu H$. This value plus the field wiring inductance (Lcable), must be lower than the maximum allowable inductance (La) specified by the safety barrier. The following equation can then be used to calculate the maximum cable length between the meter and the barrier: Li + Lcable \leq La

3.2.2 Wire all intrinsically safe outputs using safety barriers

Micro Motion provides a safety barrier installation kit for wiring the meter in a hazardous area. Contact your local sales representative or customer support at flow.support@emerson.com for more information on ordering a barrier kit.

A CAUTION!

- Meter installation and wiring should be performed by suitably trained personnel only in accordance with the applicable code of practice.
- Refer to the hazardous area approvals documentation shipped with your meter. Safety
 instructions are available on the Product Documentation DVD and accessible at
 www.emerson.com.

The safety barrier kit provides barriers for connecting all of the available meter outputs. Use the provided barriers with the designated output.

Output(s)	Barrier
4–20 mA	MTL7728P+
4–20 mATime Period Signal (TPS)Discrete	MTL7728P+
Modbus/RS-485	MTL7761AC
Power	MTL7728P+

Procedure

Wire the barriers to the appropriate output terminal and pins (see Figure 3-1).

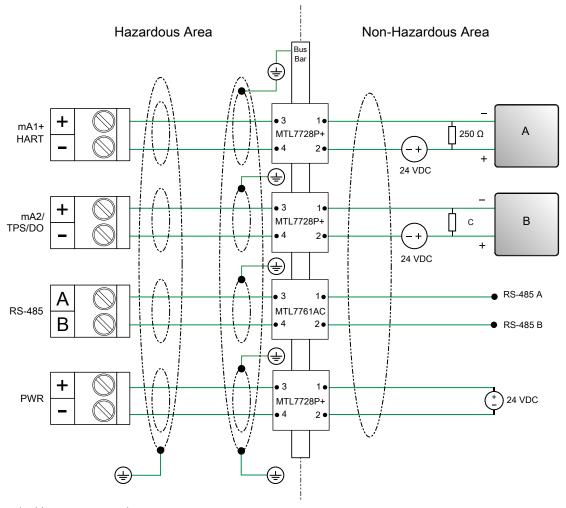


Figure 3-1: Intrinsically safe mA/DO/TPS output wiring using safety barriers

- A. HART/Field Communicator device
- B. Signal device
- C. The recommended resistance will vary depending on your Channel B output. For mA outputs, 250 Ω is the recommended resistance. For TPS or Discrete outputs, 500–1000 Ω is the recommended resistance.

A CAUTION!

- In an electrically noisy environment, screen the cable in a safe area.
- To meet the EC Directive for Electromagnetic Compatibility (EMC), use a suitable instrumentation cable to connect the meter. The instrumentation cable should have individual screens, foil or braid over each twisted pair, and an overall screen to cover all cores. Where permissible, connect the overall screen to earth at both ends (360° bonded at both ends). Connect the inner individual screens at only the controller end.
- For safety, do not terminate the inner individual screens to earth in a hazardous area.
- Use metal cable glands where the cables enter the meter amplifier box. Fit unused cable ports with metal blanking plugs.

3.2.3 Wire the intrinsically safe Analog outputs version using galvanic isolators

Micro Motion provides a galvanic isolator installation kit specific to wiring the Analog version of the meter in a hazardous area. Contact your local sales representative or Micro Motion Customer Support at <code>flow.support@emerson.com</code> for more information on ordering an isolator kit for your meter.

A CAUTION!

- Meter installation and wiring should be performed by suitably trained personnel only in accordance with the applicable code of practice.
- Refer to the hazardous area approvals documentation shipped with your meter. Safety
 instructions are available on the Micro Motion Product Documentation DVD and
 accessible on the Micro Motion website at www.emerson.com.

The galvanic isolator kit (Analog version) provides isolators for connecting the following outputs. Use the provided isolators with the designated output.

Note

The RS-485 barrier is not isolated.

Output(s)	Isolator
4–20 mA + HART	MTL5541
4–20 mA	MTL5541
Modbus/RS-485	MTL7761AC
Power	MTL5523

Procedure

Wire the isolators to the appropriate output terminal and pins (see *Figure 3-2*).

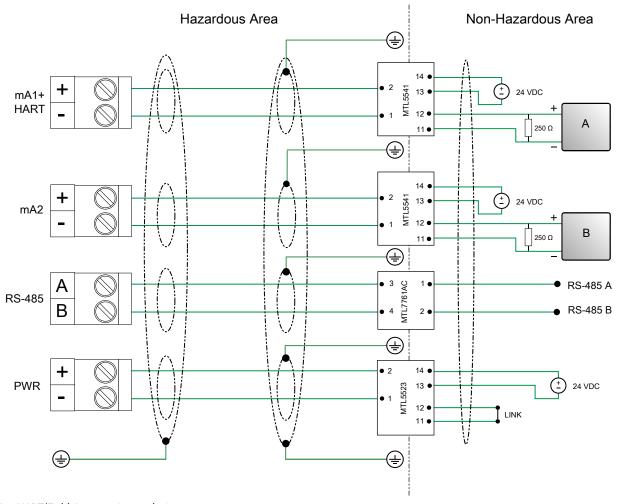


Figure 3-2: Intrinsically safe output wiring using galvanic isolators (mA outputs option)

- A. HART/Field Communicator device
- B. Signal device

A CAUTION!

- In an electrically noisy environment, screen the cable in a safe area.
- To meet the EC Directive for Electromagnetic Compatibility (EMC), use a suitable instrumentation cable to connect
 the meter. The instrumentation cable should have individual screens, foil or braid over each twisted pair, and an
 overall screen to cover all cores. Where permissible, connect the overall screen to earth at both ends (360° bonded at
 both ends). Connect the inner individual screens at only the controller end.
- For safety, do not terminate the inner individual screens to earth in a hazardous area.
- Use metal cable glands where the cables enter the meter amplifier box. Fit unused cable ports with metal blanking plugs.

3.2.4 Wire the intrinsically safe Time Period Signal (TPS) or Discrete output version using galvanic isolators

Micro Motion provides a galvanic isolator installation kit specific to wiring the Time Period Signal (TPS) and Discrete versions of the meter in a hazardous area. Contact your local sales representative or Micro Motion Customer Support at <code>flow.support@emerson.com</code> for more information on ordering an isolator kit for your meter.

A CAUTION!

- Meter installation and wiring should be performed by suitably trained personnel only in accordance with the applicable code of practice.
- Refer to the hazardous area approvals documentation shipped with your meter. Safety
 instructions are available on the Micro Motion Product Documentation DVD and
 accessible on the Micro Motion website at www.emerson.com.

The galvanic isolator kit (TPS/Discrete version) provides isolators for connecting the following outputs. Use the provided isolators with the designated output.

Note

The RS-485 barrier is not isolated.

Output(s)	Isolator
4–20 mA + HART	MTL5541
Time Period Signal (TPS) Discrete	MTL5532
Modbus/RS-485	MTL7761AC
Power	MTL5523

Procedure

1. Wire the isolators to the appropriate output terminal and pins (see *Figure 3-3*).

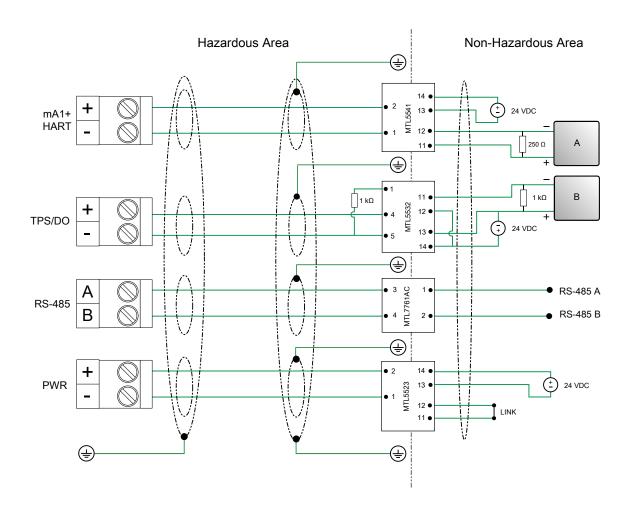


Figure 3-3: Hazardous area output wiring using galvanic isolators (TPS and Discrete output options)

- A. HART/Field Communicator
- B. Signal device

A CAUTION!

- In an electrically noisy environment, screen the cable in a safe area.
- To meet the EC Directive for Electromagnetic Compatibility (EMC), use a suitable instrumentation cable to connect the meter. The instrumentation cable should have individual screens, foil or braid over each twisted pair, and an overall screen to cover all cores. Where permissible, connect the overall screen to earth at both ends (360° bonded at both ends). Connect the inner individual screens at only the controller end.
- For safety, do not terminate the inner individual screens to earth in a hazardous area.
- Use metal cable glands where the cables enter the meter amplifier box. Fit unused cable ports with metal blanking plugs.

2. Set the isolator switch settings for the TPS/DO connection (MTL5532 isolator). You must set the isolator switches appropriately for Pins 1 through 5 (see *Table 3-4*).

The switches are located on the side of the isolator, and must be set to either **Off** (the up position) or **On** (the down position).

Figure 3-4: MTL5532 switch location (plus ON/OFF switch position)

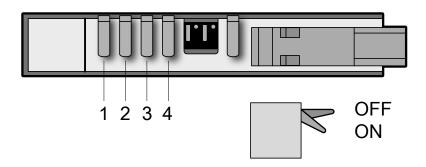


Table 3-4: MTL5532 switch settings

Switch	ON/OFF?
1	ON
2	OFF
3	OFF
4	OFF

3.3 Heater wiring

Use this procedure to wire a 115/230 volt heater.

Prerequisites

- Use THHN wire or equal for connecting lines rated for 90 °C minimum, and for connectors rated for 105 °C.
- Refer to the name plate on the heater for the temperature setting, heater watts, and supply voltage.

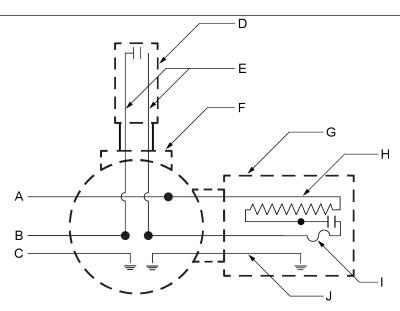
Procedure

1. Open the junction box cover.



2. Use the following table and figure to wire the heater.

N or L2	NEUTRAI OR LIVE 2
L1	LIVE 1
PN	GROUND



- A. NorL2
- B. L1
- C. Ground
- D. Thermostat
- E. Black
- F. Inside junction box
- G. Heater block
- H. Red/white stripe
- I. White or black
- J. Green

4 Grounding

The meter must be grounded according to the standards that are applicable at the site. The customer is responsible for knowing and complying with all applicable standards.

Prerequisites

Micro Motion suggests the following guides for grounding practices:

- In Europe, EN 60079-14 is applicable to most installations, in particular Sections 12.2.2.3 and 12.2.2.4.
- In the U.S.A. and Canada, ISA 12.06.01 Part 1 provides examples with associated applications and requirements.
- For IECEx installations, IEC 60079-14 is applicable.

If no external standards are applicable, follow these guidelines to ground the meter:

- Use copper wire, 18 AWG (0.75 mm²) or larger wire size.
- Keep all ground leads as short as possible, less than 1 Ω impedance.
- Connect ground leads directly to earth, or follow plant standards.

A CAUTION!

Ground the meter to earth, or follow ground network requirements for the facility. Improper grounding can cause measurement error.

Procedure

Check the joints in the pipeline.

- If the joints in the pipeline are ground-bonded, the sensor is automatically grounded and no further action is necessary (unless required by local code).
- If the joints in the pipeline are not grounded, connect a ground wire to the grounding screw located on the sensor electronics.



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Micro Motion Inc. USA

Worldwide Headquarters 7070 Winchester Circle Boulder, Colorado USA 80301 T+1 303-527-5200 T+1 800-522-6277 F+1 303-530-8459 www.emerson.com

Micro Motion Asia

Emerson Automation Solutions 1 Pandan Crescent Singapore 128461 Republic of Singapore T +65 6777-8211 F +65 6770-8003

Micro Motion Europe

Emerson Automation Solutions Neonstraat 1 6718 WX Ede The Netherlands T+31 (0) 70 413 6666 F+31 (0) 318 495 556 www.micromotion.nl

Micro Motion United Kingdom

Emerson Automation Solutions Emerson Process Management Limited Horsfield Way Bredbury Industrial Estate Stockport SK6 2SU U.K. T +44 0870 240 1978 F +44 0800 966 181

Micro Motion Japan

Emerson Automation Solutions 1-2-5, Higashi Shinagawa Shinagawa-ku Tokyo 140-0002 Japan T+81 3 5769-6803 F+81 3 5769-6844

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