Reference Manual
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Rosemount® 8700M Magnetic Flowmeter Platform

with HART® Protocol

EMERSON.
Process Management

Rosemount® 8700M Magnetic Flowmeter Platform

⚠ WARNING

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

Failure to follow these installation guidelines could result in death or serious injury.

- Installation and servicing instructions are for use by qualified personnel only. Do not perform any servicing other than that contained in the operating instructions, unless qualified.
- Verify the installation is done safely and is consistent with the operating environment.
- If installed in explosive atmospheres [hazardous areas, classified areas, or an “Ex” environment], it must be assured that the device certification and installation techniques are suitable for that particular environment.
- Explosion hazard. Do not disconnect equipment when a flammable or combustible atmosphere is present.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing circuits.
- Do not connect a Rosemount 8732EM Transmitter to a non-Rosemount sensor that is located in an explosive atmosphere.
- Substitution of components may impair Intrinsic Safety.
- Follow national, local, and plant standards to properly earth ground the transmitter and sensor. The earth ground must be separate from the process reference ground.
- Rosemount Magnetic Flowmeters ordered with non-standard paint options or non-metallic labels may be subject to electrostatic discharge. To avoid electrostatic charge build-up, do not rub the flowmeter with a dry cloth or clean with solvents.

The electronics may store energy after power is removed. Allow ten minutes for charge to dissipate prior to removing electronics compartment cover.

- Explosions could result in death or serious injury.
- Verify the operating atmosphere of the sensor and transmitter is consistent with the appropriate hazardous locations certifications.
- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

Failure to follow safe installation and servicing guidelines could result in death or serious injury.

- Installation should be performed by qualified personnel only.
- Do not perform any service other than those contained in this manual.
- Process leaks may result in death or serious injury.
- The electrode compartment may contain line pressure; it must be depressurized before the cover is removed.

High voltage that may be present on leads could cause electrical shock.

- Avoid contact with leads and terminals.

Failure to follow these maintenance guidelines could result in death or serious injury.

- Installation and servicing instructions should be performed by qualified personnel only.
- Do not perform any servicing other than that contained in the operating instructions.
- Verify that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.
- Do not connect a Rosemount 8732EM to a non-Rosemount sensor that is located in an explosive atmosphere.
- Mishandling products exposed to a hazardous substance may result in death or serious injury.
- If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

Failure to follow these troubleshooting guidelines could result in death or serious injury.

- Installation and servicing instructions should be performed by qualified personnel only.
- Do not perform any servicing other than that contained in the operating instructions.
- Verify that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.
- Do not connect a Rosemount 8732EM to a non-Rosemount sensor that is located in an explosive atmosphere.
- Mishandling products exposed to a hazardous substance may result in death or serious injury.
- If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.
- The Rosemount 8732EM Transmitter has not been evaluated for use with other manufacturers' magnetic flowmeter sensors in hazardous (Ex or Classified) areas.
- Special care should be taken by the end-user and installer to ensure the 8732EM transmitter meets the safety and performance requirements of the other manufacturer's equipment.

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Process Management Sales Representative.

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Section 1 Introduction

1.1 System description

The 8700M Magnetic Flowmeter Platform consists of a sensor and a transmitter. The sensor is installed in-line with the process piping; the transmitter can be remotely mounted or integrally mounted to the sensor.

Figure 1-1. Field Mount Transmitters

Integral

Remote

There are three Rosemount® flow sensors available.[1] See Figure 1-2.

Figure 1-2. Flow Sensors

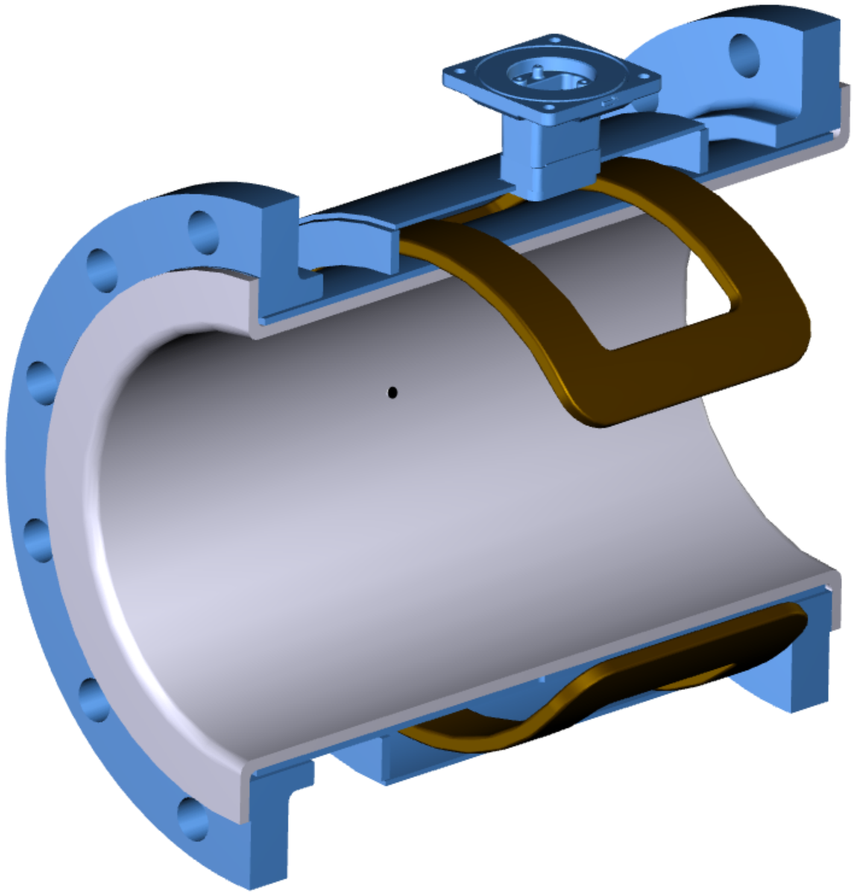
8705

8711

8721

1. *Also available for use with 8707 High Signal sensor with dual calibration (option code D2).*

Figure 1-3. 8705 Cross Section



The flow sensor contains two magnetic coils located on opposite sides of the sensor. Two electrodes, located perpendicular to the coils and opposite each other, make contact with the liquid. The transmitter energizes the coils and creates a magnetic field. A conductive liquid moving through the magnetic field generates an induced voltage at the electrodes. This voltage is proportional to the flow velocity. The transmitter converts the voltage detected by the electrodes into a flow reading.

1.2 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 2 Installation

2.1 Introduction

This section covers the steps required to physically install the magnetic flowmeter. Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Refer to the following safety messages before performing any operation in this section.

2.2 Safety messages

Note
This section provides basic installation guidelines for the Rosemount® 8700M Magnetic Flowmeter Platform with HART® protocol. For comprehensive instructions for detailed configuration, diagnostics, maintenance, service, installation, or troubleshooting refer to the appropriate sections in this manual. The quick start guide—as well as this manual—are available online at www.rosemount.com.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

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- Verify the installation is done safely and is consistent with the operating environment.
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- Explosion hazard. Do not disconnect equipment when a flammable or combustible atmosphere is present.
- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing circuits.
- Do not connect a Rosemount 8732EM Transmitter to a non-Rosemount sensor that is located in an explosive atmosphere.
- Substitution of components may impair Intrinsic Safety.
- Follow national, local, and plant standards to properly earth ground the transmitter and sensor. The earth ground must be separate from the process reference ground.
- Rosemount Magnetic Flowmeters ordered with non-standard paint options or non-metallic labels may be subject to electrostatic discharge. To avoid electrostatic charge build-up, do not rub the flowmeter with a dry cloth or clean with solvents.

NOTICE

- The sensor liner is vulnerable to handling damage. Never place anything through the sensor for the purpose of lifting or gaining leverage. Liner damage may render the sensor inoperable.
- Metallic or spiral-wound gaskets should not be used as they will damage the liner face of the sensor. If spiral wound or metallic gaskets are required for the application, lining protectors must be used. If frequent removal is anticipated, take precautions to protect the liner ends. Short spool pieces attached to the sensor ends are often used for protection.
- Correct flange bolt tightening is crucial for proper sensor operation and life. All bolts must be tightened in the proper sequence to the specified torque specifications. Failure to observe these instructions could result in severe damage to the sensor lining and possible sensor replacement.
- In cases where high voltage/high current are present near the meter installation, ensure proper protection methods are followed to prevent stray voltage / current from passing through the meter. Failure to adequately protect the meter could result in damage to the transmitter and lead to meter failure.
- Completely remove all electrical connections from both sensor and transmitter prior to welding on the pipe. For maximum protection of the sensor, consider removing it from the pipeline.

2.3 Transmitter symbols

Caution symbol — check product documentation for details ⚠

Protective conductor (grounding) terminal ⏚

2.4 Pre-installation

Before installing the Rosemount 8732EM Magnetic Flowmeter Transmitter, there are several pre-installation steps that should be completed to make the installation process easier:

- Identify the options and configurations that apply to your application
- Set the hardware switches if necessary
- Consider mechanical, electrical, and environmental requirements

2.5 Installation procedures

2.5.1 Transmitter installation

Installation of the Rosemount Magnetic flowmeter includes both detailed mechanical and electrical installation procedures.

2.5.2 Identify options and configurations

The typical installation of the 8732EM includes a device power connection, a 4–20mA output connection, and sensor coil and electrode connections. Other applications may require one or more of the following configurations or options:

- Pulse output
- Discrete input/discrete output
- HART multidrop configuration

Hardware switches

The 8732EM electronics stack is equipped with user-selectable hardware switches. These switches set the alarm mode, internal/external analog power, internal/external pulse power, and transmitter security. The standard configuration for these switches when shipped from the factory are as follows:

Table 2-1. Standard Switch Configuration

Alarm Mode	High
Internal/External Analog Power(1)	Internal
Internal/External Pulse Power(1)	External
Transmitter Security	Off

1. For electronics with intrinsically safe analog and pulse outputs, the power must be provided externally. In this configuration, these two hardware switches are not provided.

In most cases, it will not be necessary to change the setting of the hardware switches. If the switch settings need to be changed, follow the steps outlined in “Changing hardware switch settings” on page 40).

Note
To prevent switch damage, use a non-metallic tool to move switch positions.

Identify any additional options and configurations that apply to the installation. Keep a list of these options for consideration during the installation and configuration procedures.

2.5.3 Mechanical considerations

The mounting site for the 8732EM Transmitter should provide enough room for secure mounting, easy access to conduit entries, full opening of the transmitter covers, and easy readability of the Local Operator Interface (LOI) screen (if equipped).

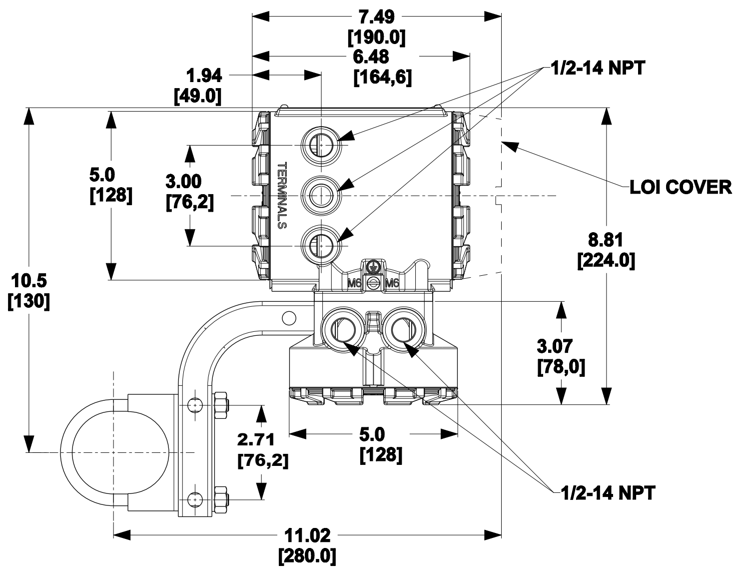
For remote mount transmitter (8732EMRxxx) installations, a mounting bracket is provided for use on a 2-in. pipe or a flat surface (see Figure 2-1).

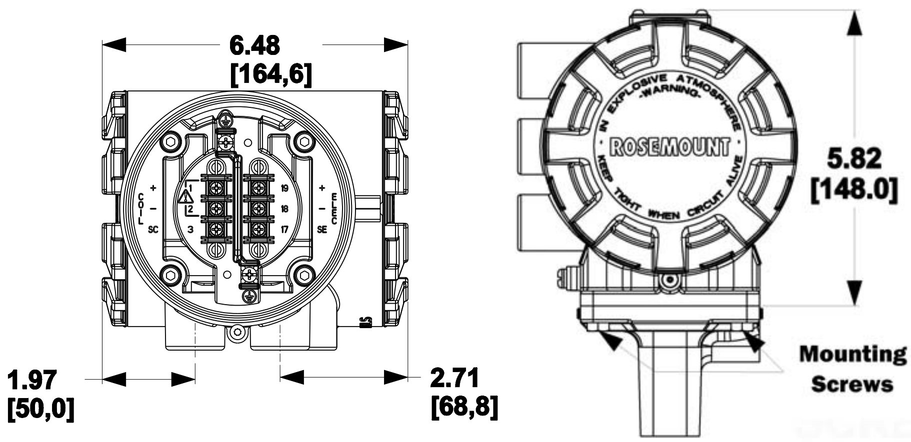
Note
If the 8732EM is mounted separately from the sensor, it may not be subject to limitations that might apply to the sensor.

Rotate integral mount transmitter housing

The transmitter housing can be rotated on the sensor in 90-degree increments by removing the four mounting screws on the bottom of the housing. Do not rotate the housing more than 180 degrees in any one direction. Prior to tightening, be sure the mating surfaces are clean, the O-ring is seated in the groove, and there is no gap between the housing and the sensor.

Figure 2-1. Rosemount 8732EM Dimensional Drawing





Note
Default conduit entries for FM approvals are 1/2-in. NPT. If M20 thread connections are required, thread adapters will be supplied.

2.5.4 Electrical considerations

Before making any electrical connections to the 8732EM, consider national, local and plant electrical installation requirements. Be sure to have the proper power supply, conduit, and other accessories necessary to comply with these standards.

Both remotely and integrally mounted 8732EM Transmitters require external power so there must be access to a suitable power source.

Table 2-2. Electrical Data

Rosemount 8732EM Flow Transmitter	
Power input	90–250VAC, 0.45A, 40VA 12–42VDC, 1.2A, 15W
Pulsed circuit	Internally powered (Active): Outputs up to 12VDC, 12.1mA, 73mW Externally powered (Passive): Input up to 28VDC, 100mA, 1W
4-20mA output circuit	Internally Powered (Active): Outputs up to 25mA, 24VDC, 600mW Externally Powered (Passive): Input up to 25mA, 30VDC, 750mW
Um	250V
Coil excitation output	500mA, 40V max, 9W max
Rosemount 8705-M and 8711-M/L Sensor[1]	
Coil excitation input	500mA, 40V max, 20W max
Electrode circuit	5V, 200uA, 1mW

1. Provided by the transmitter.

2.5.5 Environmental considerations

To ensure maximum transmitter life, avoid extreme temperatures and excessive vibration. Typical problem areas include the following:

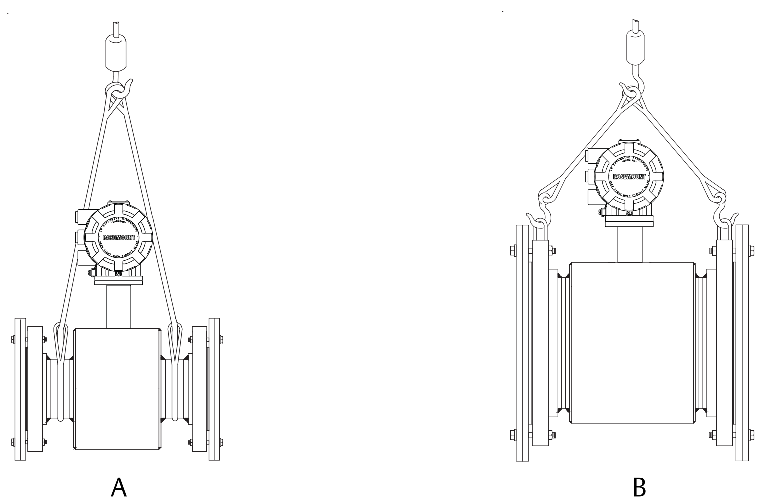
- High-vibration lines with integrally mounted transmitters
- Tropical/desert installations in direct sunlight
- Outdoor installations in arctic climates

Remote mounted transmitters may be installed in the control room to protect the electronics from the harsh environment and to provide easy access for configuration or service.

2.6 Handling and lifting

- Handle all parts carefully to prevent damage. Whenever possible, transport the system to the installation site in the original shipping container.
- PTFE-lined sensors are shipped with end covers that protect it from both mechanical damage and normal unrestrained distortion. Remove the end covers just before installation.
- Keep the shipping plugs in the conduit connections until you are ready to connect and seal them.
- The sensor should be supported by the pipeline. Pipe supports are recommended on both the inlet and outlet sides of the sensor pipeline. There should be no additional support attached to the sensor.
- Additional safety recommendations for mechanical handling:
  - Use proper PPE (Personal Protection Equipment) including safety glasses and steel toed shoes).
  - Do not drop the device from any height.
- Do not lift the meter by holding the electronics housing or junction box.The sensor liner is vulnerable to handling damage. Never place anything through the sensor for the purpose of lifting or gaining leverage. Liner damage can render the sensor useless.
- If provided, use the lifting lugs on each flange to handle the Magnetic Flowmeter when it is transported and lowered into place at the installation site. If lifting lugs are not provided, the Magnetic Flowmeter must be supported with a lifting sling on each side of the housing.
  - Standard Pressure 3-in. through 36-in. Flanged Magnetic Flowmeters come with lifting lugs.
  - High Pressure (above 600#) 1-in. through 24-in. Flanged Magnetic Flowmeters come with lifting lugs.
  - Wafers and Sanitary Magnetic Flowmeters do not come with lifting lugs.

Figure 2-2. Rosemount 8705 Sensor Support for Handling and Lifting



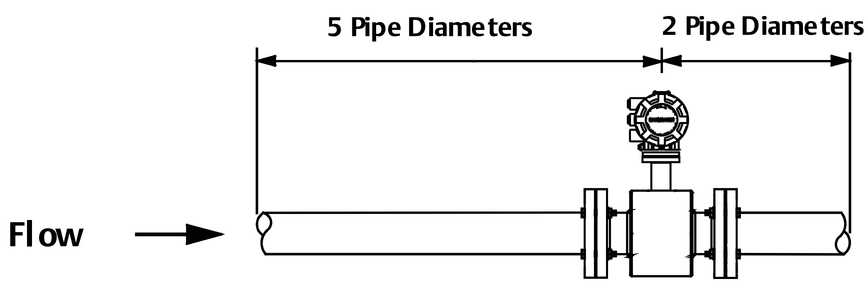
A. Without lifting lugs
B. With lifting lugs

2.7 Mounting

2.7.1 Upstream/downstream piping

To ensure specified accuracy over widely varying process conditions, install the sensor with a minimum of five straight pipe diameters upstream and two pipe diameters downstream from the electrode plane (see Figure 2-3).

Figure 2-3. Upstream and Downstream Straight Run



Installations with reduced upstream and downstream straight runs are possible. In reduced straight run installations, the meter may not meet absolute accuracy specifications. Reported flow rates will still be highly repeatable.

2.7.2 Flow direction

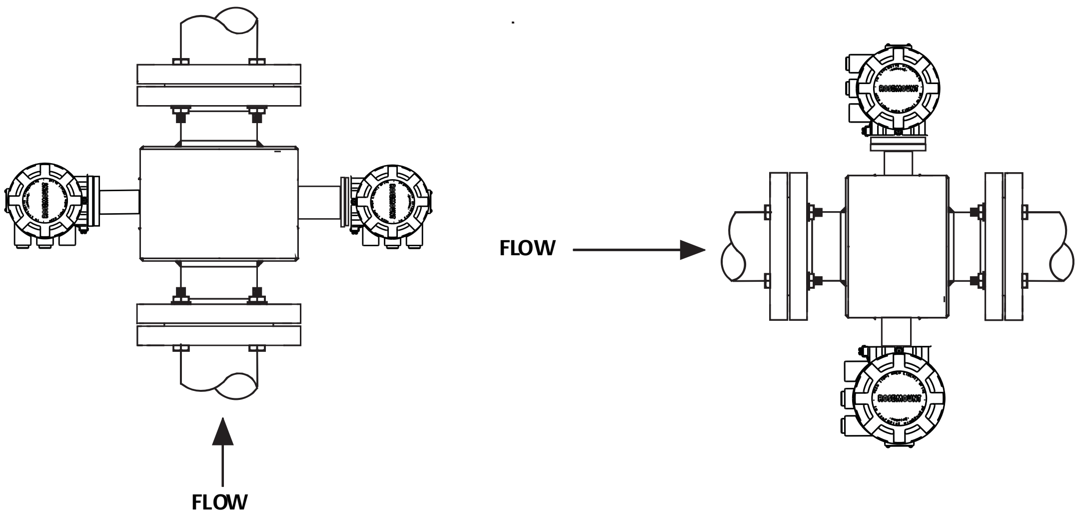
The sensor should be mounted so that the arrow points in the direction of flow. See Figure 2-4.

Figure 2-4. Flow Direction Arrow

2.8 Sensor location

The sensor should be installed in a location that ensures it remains full during operation. Vertical installation with upward process fluid flow keeps the cross-sectional area full, regardless of flow rate. Horizontal installation should be restricted to low piping sections that are normally full.

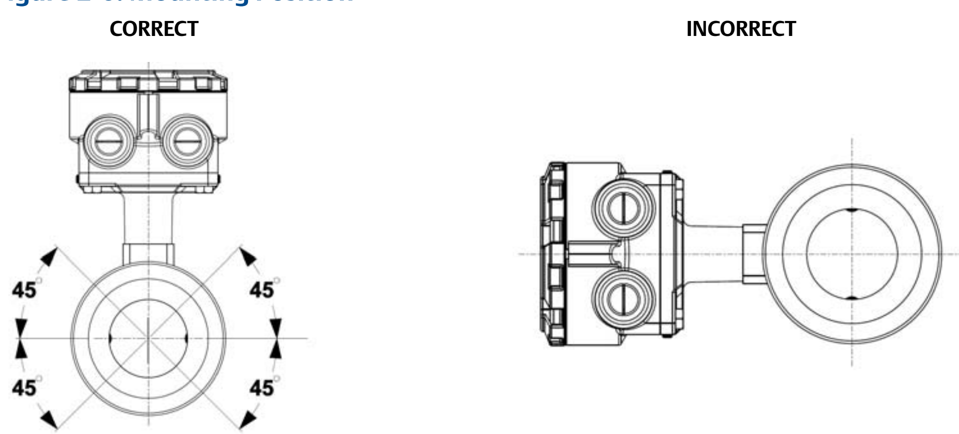
Figure 2-5. Sensor Orientation



2.8.1 Electrode orientation

The electrodes in the sensor are properly oriented when the two measurement electrodes are in the 3 and 9 o'clock positions or within 45 degrees from the horizontal, as shown on the left in Figure 2-6. Avoid any mounting orientation that positions the top of the sensor at 90 degrees from the vertical position as shown on the right in Figure 2-6.

Figure 2-6. Mounting Position



For hazardous location installations, refer to Appendix B for Installation Drawings 08732-2060 and 08732-2062 for sensor orientation pertaining to specific T-code compliance.

2.9 Sensor installation

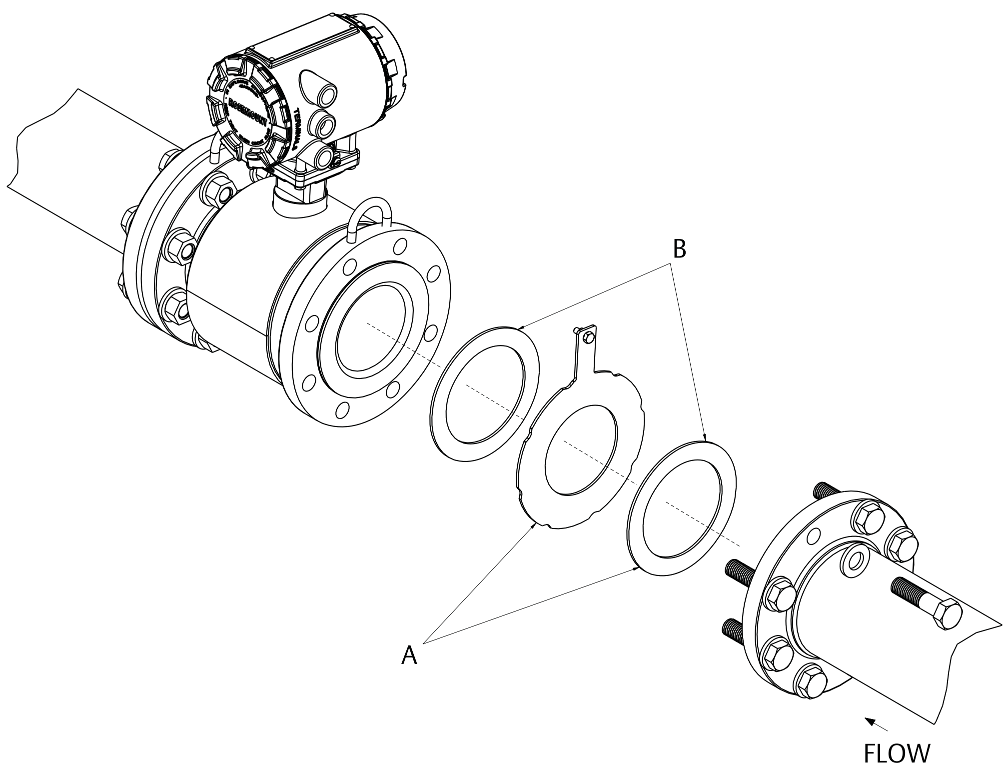
2.9.1 Flanged sensors

Gaskets

The sensor requires a gasket at each process connection. The gasket material must be compatible with the process fluid and operating conditions. Gaskets are required on each side of a grounding ring (see Figure 2-7). All other applications (including sensors with lining protectors or a grounding electrode) require only one gasket on each process connection.

Note
Metallic or spiral-wound gaskets should not be used as they will damage the liner face of the sensor. If spiral wound or metallic gaskets are required for the application, lining protectors must be used.

Figure 2-7. Flanged Gasket Placement



A. Grounding ring and gasket (optional)
B. Customer-supplied gasket

2.9.2 Flange bolts

Note
Do not bolt one side at a time. Tighten both sides simultaneously. Example:

1. Snug upstream
2. Snug downstream
3. Tighten upstream
4. Tighten downstream

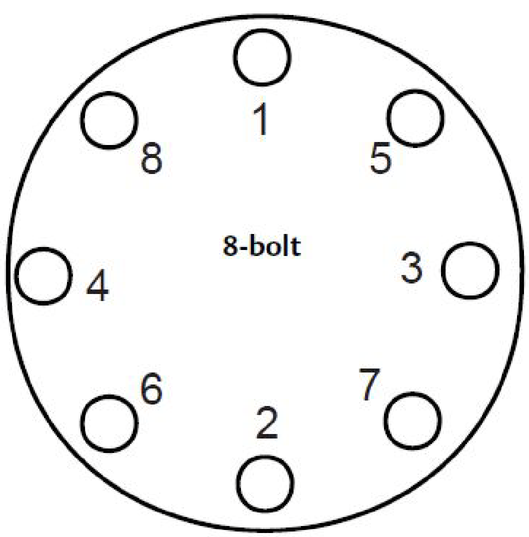
Do not snug and tighten the upstream side and then snug and tighten the downstream side. Failure to alternate between the upstream and downstream flanges when tightening bolts may result in liner damage.

Suggested torque values by sensor line size and liner type are listed in Table 2-4 for ASME B16.5 flanges and Table 2-5 for EN flanges. Consult the factory if the flange rating of the sensor is not listed. Tighten flange bolts on the upstream side of the sensor in the incremental sequence shown in Figure 2-8 to 20% of the suggested torque values. Repeat the process on the downstream side of the sensor. For sensors with greater or fewer flange bolts, tighten the bolts in a similar crosswise sequence. Repeat this entire tightening sequence at 40%, 60%, 80%, and 100% of the suggested torque values.

If leakage occurs at the suggested torque values, the bolts can be tightened in additional 10% increments until the joint stops leaking, or until the measured torque value reaches the maximum torque value of the bolts. Practical consideration for the integrity of the liner often leads the user to distinct torque values to stop leakage due to the unique combinations of flanges, bolts, gaskets, and sensor liner material.

Check for leaks at the flanges after tightening the bolts. Failure to use the correct tightening methods can result in severe damage. While under pressure, sensor materials may deform over time and require a second tightening 24 hours after the initial installation.

Figure 2-8. Flange Bolt Torquing Sequence



Prior to installation, identify the lining material of the flow sensor to ensure the suggested torque values are applied.

Table 2-3. Lining Material

Fluoropolymer liners	Other liners
T - PTFE	P - Polyurethane
F - ETFE	N - Neoprene
A - PFA	L - Linatex (Natural Rubber)
K - PFA+	D - Adiprene

Table 2-4. Suggested Flange Bolt Torque Values for Rosemount 8705 (ASME)

Size code	Line size	Fluoropolymer liners		Other liners	
		Class 150 (pound-feet)	Class 300 (pound-feet)	Class 150 (pound-feet)	Class 300 (pound-feet)
005	0.5-in. (15 mm)	8	8	N/A	N/A
010	1-in. (25 mm)	8	12	N/A	N/A
015	1.5-in. (40 mm)	13	25	7	18
020	2-in. (50 mm)	19	17	14	11
025	2.5-in. (65 mm)	22	24	17	16
030	3-in. (80 mm)	34	35	23	23
040	4-in. (100 mm)	26	50	17	32
050	5-in. (125 mm)	36	60	25	35
060	6-in. (150 mm)	45	50	30	37
080	8-in. (200 mm)	60	82	42	55
100	10-in. (250 mm)	55	80	40	70
120	12-in. (300 mm)	65	125	55	105
140	14-in. (350 mm)	85	110	70	95
160	16-in. (400 mm)	85	160	65	140
180	18-in. (450 mm)	120	170	95	150
200	20-in. (500 mm)	110	175	90	150
240	24-in. (600 mm)	165	280	140	250
300[1]	30-in. (750 mm)	195	415	165	375
360[1]	36-in. (900 mm)	280	575	245	525

1. Torque values are valid for ASME and AWWA flanges.

Table 2-5. Flange Bolt Torque and Load Specifications for 8705 (EN 1092-1)

Size code	Line size	Fluoropolymer liners (in Newton-meters)			
		PN10	PN 16	PN 25	PN 40
005	0.5-in. (15 mm)	N/A	N/A	N/A	10
010	1-in. (25 mm)	N/A	N/A	N/A	20
015	1.5-in. (40 mm)	N/A	N/A	N/A	50
020	2-in. (50 mm)	N/A	N/A	N/A	60
025	2.5-in. (65 mm)	N/A	N/A	N/A	50
030	3-in. (80 mm)	N/A	N/A	N/A	50
040	4-in. (100 mm)	N/A	50	N/A	70
050	5.0-in. (125 mm)	N/A	70	N/A	100
060	6-in. (150 mm)	N/A	90	N/A	130
080	8-in. (200 mm)	130	90	130	170
100	10-in. (250 mm)	100	130	190	250
120	12-in. (300 mm)	120	170	190	270
140	14-in. (350 mm)	160	220	320	410
160	16-in. (400 mm)	220	280	410	610
180	18-in. (450 mm)	190	340	330	420
200	20-in. (500 mm)	230	380	440	520
240	24-in. (600 mm)	290	570	590	850

Table 2-6. Flange Bolt Torque and Load Specifications for 8705 (EN 1092-1)

Size code	Line size	Other liners (in Newton-meters)			
		PN 10	PN 16	PN 25	PN 40
010	1-in. (25 mm)	N/A	N/A	N/A	20
015	1.5-in. (40 mm)	N/A	N/A	N/A	30
020	2-in. (50 mm)	N/A	N/A	N/A	40
025	2.5-in. (65 mm)	N/A	N/A	N/A	35
030	3-in. (80 mm)	N/A	N/A	N/A	30
040	4-in. (100 mm)	N/A	40	N/A	50
050	5.0-in. (125 mm)	N/A	50	N/A	70
060	6-in. (150 mm)	N/A	60	N/A	90
080	8-in. (200 mm)	90	60	90	110
100	10-in. (250 mm)	70	80	130	170
120	12-in. (300 mm)	80	110	130	180
140	14-in. (350 mm)	110	150	210	280
160	16-in. (400 mm)	150	190	280	410
180	18-in. (450 mm)	130	230	220	280
200	20-in. (500 mm)	150	260	300	350
240	24-in. (600 mm)	200	380	390	560

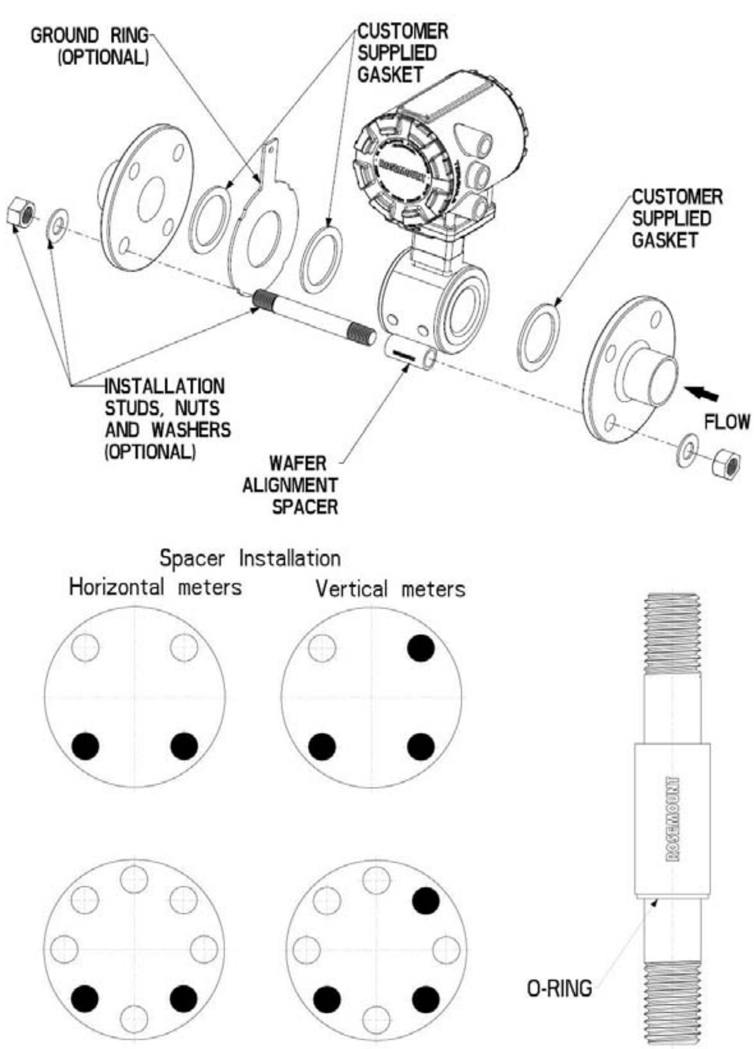
2.10 Wafer sensors

2.10.1 Gaskets

The sensor requires a gasket at each process connection. The gasket material selected must be compatible with the process fluid and operating conditions. Gaskets are required on each side of a grounding ring. See Figure 2-9 below.

Note
Metallic or spiral-wound gaskets should not be used as they will damage the liner face of the sensor.

Figure 2-9. Wafer Gasket Placement



2.10.2 Alignment

On 1.5-in. through 8-in. (40 through 200 mm) line sizes, Rosemount requires installing the alignment spacers to ensure proper centering of the wafer sensor between the process flanges.

1. Insert studs for the bottom side of the sensor between the pipe flanges and center the alignment spacer in the middle of the stud. See Figure 2-9 for the bolt hole locations recommended for the spacers provided. Stud specifications are listed in Table 2-7.
2. Place the sensor between the flanges. Make sure the alignment spacers are properly centered on the studs. For vertical flow installations slide the O-ring over the stud to keep the spacer in place. See Figure 2-9. Ensure the spacers match the flange size and class rating for the process flanges. See Table 2-8.
3. Insert the remaining studs, washers, and nuts.
4. Tighten to the torque specifications shown in Table 2-9. Do not over-tighten the bolts or the liner may be damaged.

Table 2-7. Stud Specifications

Nominal sensor size	Stud specifications
1.5 through 8-in. (40 through 200 mm)	CS, ASTM A193, Grade B7, threaded mounting studs

Table 2-8. Rosemount Alignment Spacer Table

Rosemount alignment spacer table			
Dash no. (-xxxx)	Line size		Flange rating
	(in)	(mm)	
0A15	1.5	40	JIS 10K-20K
0A20	2	50	JIS 10K-20K
0A30	3	80	JIS 10K
0B15	1.5	40	JIS 40K
AA15	1.5	40	ASME- 150#
AA20	2	50	ASME - 150#
AA30	3	80	ASME - 150#
AA40	4	100	ASME - 150#
AA60	6	150	ASME - 150#
AA80	8	200	ASME - 150#
AB15	1.5	40	ASME - 300#
AB20	2	50	ASME - 300#
AB30	3	80	ASME - 300#
AB40	4	100	ASME - 300#
AB60	6	150	ASME - 300#
AB80	8	200	ASME - 300#
DB40	4	100	EN 1092-1 - PN10/16
DB60	6	150	EN 1092-1 - PN10/16
DB80	8	200	EN 1092-1 - PN10/16
DC80	8	200	EN 1092-1 - PN25
DD15	1.5	40	EN 1092-1 - PN10/16/25/40
DD20	2	50	EN 1092-1 - PN10/16/25/40
DD30	3	80	EN 1092-1 - PN10/16/25/40

Table 2-8. Rosemount Alignment Spacer Table (continued)

Rosemount alignment spacer table			
Dash no. (-xxxx)	Line size		Flange rating
	(in)	(mm)	
DD40	4	100	EN 1092-1 - PN25/40
DD60	6	150	EN 1092-1 - PN25/40
DD80	8	200	EN 1092-1 - PN40
RA80	8	200	AS40871-PN16
RC20	2	50	AS40871-PN21/35
RC30	3	80	AS40871-PN21/35
RC40	4	100	AS40871-PN21/35
RC60	6	150	AS40871-PN21/35
RC80	8	200	AS40871-PN21/35

To order an Alignment Spacer Kit (qty 3 spacers) use p/n 08711-3211-xxxx along with the Dash no. above.

2.10.3 Flange bolts

Wafer sensors require threaded studs. See Figure 2-8 on page 13 for torque sequence. Always check for leaks at the flanges after tightening the flange bolts. All sensors require a second tightening 24 hours after initial flange bolt tightening.

Table 2-9. Rosemount 8711 Torque Specifications

Size code	Line size	Pound-feet	Newton-meter
015	1.5-in. (40 mm)	15	20
020	2-in. (50 mm)	25	34
030	3-in. (80 mm)	40	54
040	4-in. (100 mm)	30	41
060	6-in. (150 mm)	50	68
080	8-in. (200 mm)	70	95

2.11 Process reference connection

Figure 2-10 through Figure 2-13 illustrate process reference connections only. Earth safety ground is also required as part of the installation but is not shown in the figures. Follow national, local, and plant electrical codes for safety ground.

Use Table 2-10 to determine which process reference option to follow for proper installation.

Table 2-10. Process Reference Installation Options

Type of pipe	Grounding straps	Grounding rings	Reference electrode	Lining protectors
Conductive Unlined Pipe	See Figure 2-10	See Figure 2-11[(1)]	See Figure 2-13[(1)]	See Figure 2-13[(1)]
Conductive Lined Pipe	Insufficient Grounding	See Figure 2-11	See Figure 2-10	See Figure 2-11
Non-Conductive Pipe	Insufficient Grounding	See Figure 2-12	Not Recommended	See Figure 2-12

1. Grounding ring, reference electrode, and lining protectors are not required for process reference. Grounding straps per Figure 2-10 are sufficient.

Note
For line sizes 10-in. and larger, the ground strap may come attached to the sensor body near the flange. See Figure 2-14.

Figure 2-10. Grounding Straps in Conductive Unlined Pipe or Reference Electrode in Lined Pipe

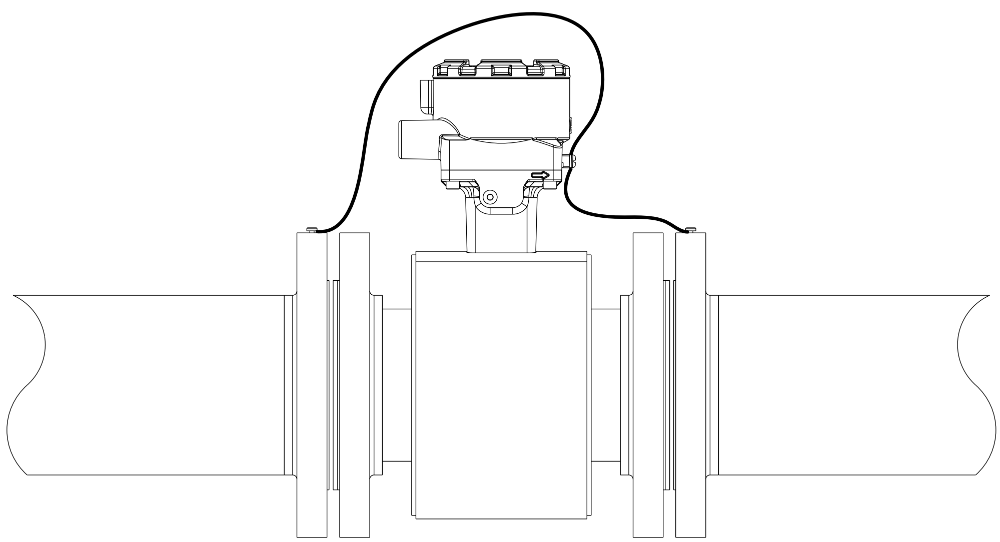


Figure 2-11. Grounding with Grounding Rings or Lining Protectors in Conductive Pipe

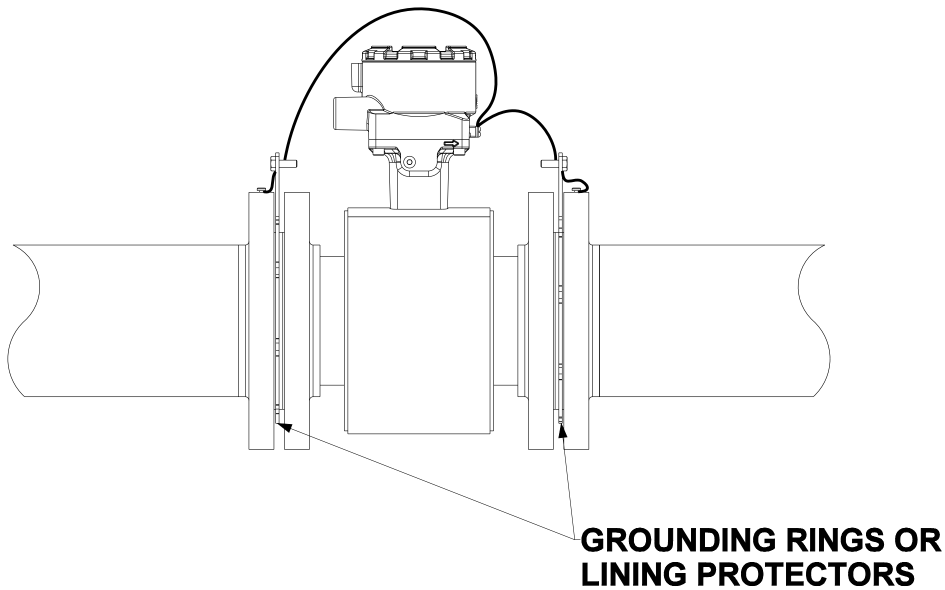


Figure 2-12. Grounding with Grounding Rings or Lining Protectors in Non-conductive Pipe

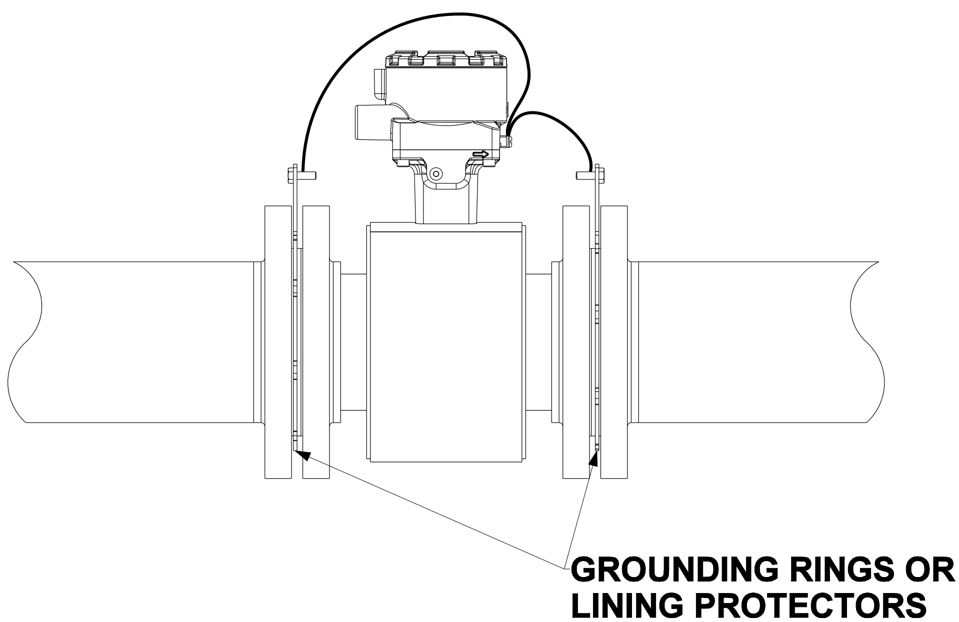


Figure 2-13. Grounding with Reference Electrode in Conductive Unlined Pipe

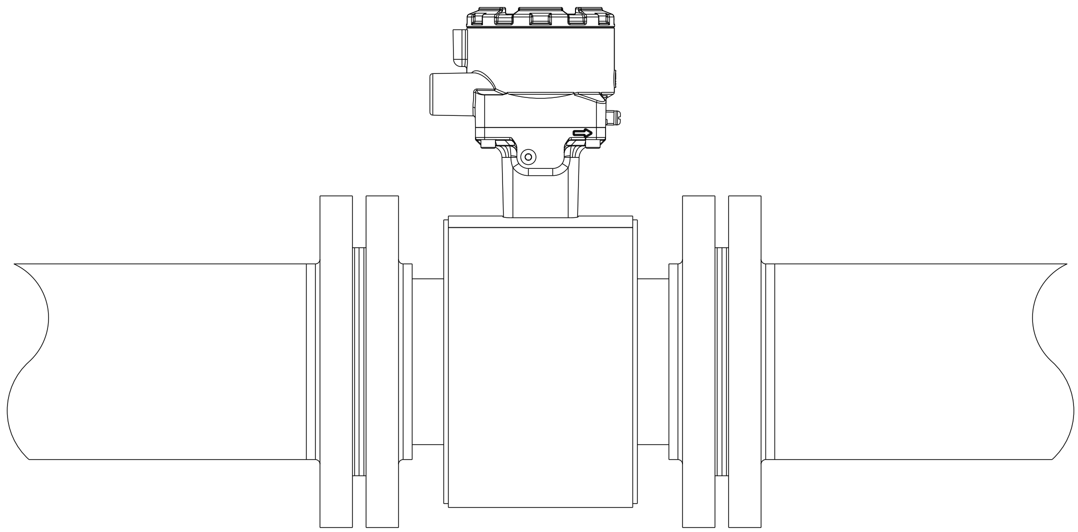
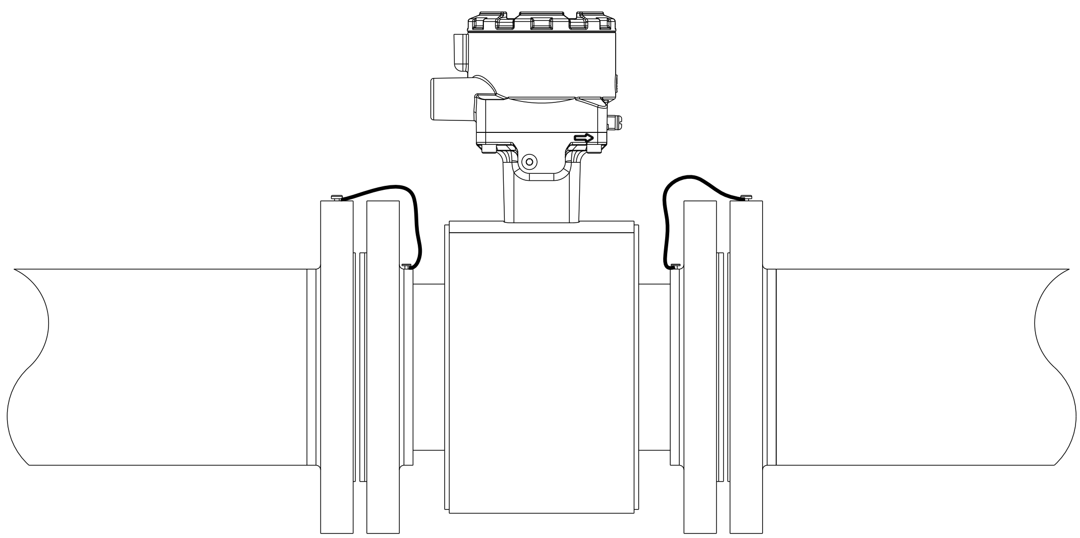


Figure 2-14. Grounding for Line Sizes 10-in. and Larger



2.12 Wiring the transmitter

This wiring section covers the wiring between the transmitter and sensor, the 4-20mA output, and supplying power to the transmitter. Follow the conduit, cable, and electrical disconnect requirements in the sections below.

For sensor wiring diagrams, reference Electrical Drawing 08732-1504 in Appendix C Wiring Diagrams.

For hazardous locations, reference Installation Drawings 08732-2060 and 08732-2062 in Appendix B .

For information on connecting to another manufacturer's sensor, refer to Appendix D Implementing a Universal Transmitter.

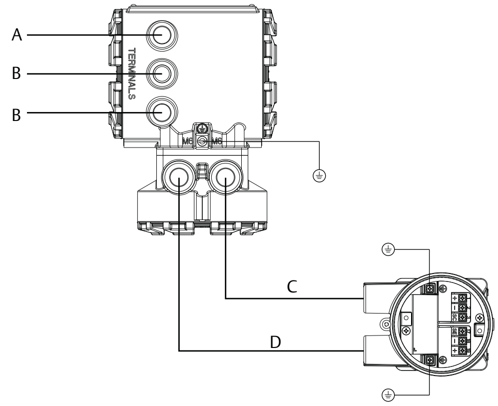
2.12.1 Conduit entries and connections

The standard conduit entries for the transmitter and sensor are $^1/_2$-in. NPT. Thread adapters are provided for units ordered with M20 conduit entries. Conduit connections should be made in accordance with national, local, and plant electrical codes. Unused conduit entries should be sealed with the appropriate certified plugs. The flow sensor is rated IP68 to a depth of 33 feet (10 meters) for 48 hours. For sensor installations requiring IP68 protection, the cable grands, conduit, and conduit plugs must be rated for IP68. The plastic shipping plugs do not provide ingress protection.

2.12.2 Conduit requirements

- For installations with an intrinsically safe electrode circuit, a separate conduit for the coil cable and the electrode cable may be required. Refer to the Installation Drawings in Appendix B.
- For installations with non-intrinsically safe electrode circuit, or when using the combination cable, a single dedicated conduit run for the coil drive and electrode cable between the sensor and the remote transmitter may be acceptable. Bundled cables from other equipment in a single conduit are likely to create interference and noise in the system. See Figure 2-15.
- Electrode cables should not be run together and should not be in the same cable tray with power cables.
- Output cables should not be run together with power cables.
- Select conduit size appropriate to feed cables through to the flowmeter.

Figure 2-15. Best Practice Conduit Preparation



A. Power
B. Output
C. Coil
D. Electrode

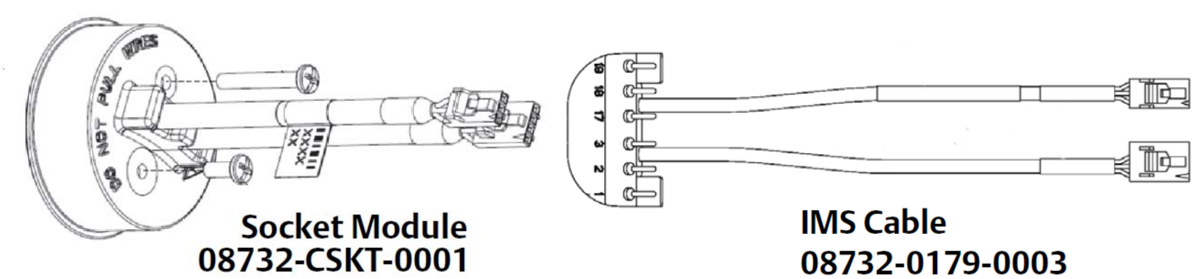
2.12.3 Connecting sensor to transmitter

Integral mount transmitters

Integral mount transmitters ordered with a sensor will be shipped assembled and wired at the factory using an interconnecting cable (see Figure 2-16). Use only the socket module or IMS cable provided by Emerson™ Process Management.

For replacement transmitters use the existing interconnecting cable from the original assembly. Replacement cables are available.

Figure 2-16. Interconnecting Cables



Remote mount transmitters

Cables kits are available as individual component cables or as a combination coil/electrode cable. Remote cables can be ordered direct from Emerson Process Management using the kit numbers shown in Table 2-11. Equivalent Alpha cable part numbers are also provided as an alternative. To order cable, specify length as quantity desired. Equal length of component cables is required.

Example: 25 feet = Qty (25) 08732-0065-0001

Table 2-11. Component Cable Kits

Standard temperature (-20 °C to 75 °C)			
Cable kit #	**Description**	**Individual cables**	**Alpha p/n**
08732-0065-0001 (feet)	Kit, Component Cables, Std Temp (includes Coil and Electrode)	Coil Electrode	518243 518245
08732-0065-0002 (meters)	Kit, Component Cables, Std Temp (includes Coil and Electrode)	Coil Electrode	518243 518245
08732-0065-0003 (feet)	Kit, Component Cables, Std Temp (includes Coil and I.S.Electrode)	Coil Intrinsically Safe Blue Electrode	518243 518244
08732-0065-0004 (meters)	Kit, Component Cables, Std Temp (includes Coil and I.S.Electrode)	Coil Intrinsically Safe Blue Electrode	518243 518244

Extended temperature (-50 °C to 125 °C)			
Cable kit #	**Description**	**Individual cables**	**Alpha p/n**
08732-0065-1001 (feet)	Kit, Component Cables, Ext Temp. (includes Coil and Electrode)	Coil Electrode	840310 518189
08732-0065-1002 (meters)	Kit, Component Cables, Ext Temp. (includes Coil and Electrode)	Coil Electrode	840310 518189
08732-0065-1003 (feet)	Kit, Component Cables, Ext Temp. (includes Coil and I.S.Electrode)	Coil Intrinsically Safe Blue Electrode	840310 840309
08732-0065-1004 (meters)	Kit, Component Cables, Ext Temp. (includes Coil and I.S.Electrode)	Coil Intrinsically Safe Blue Electrode	840310 840309

Table 2-12. Combination Cable kits

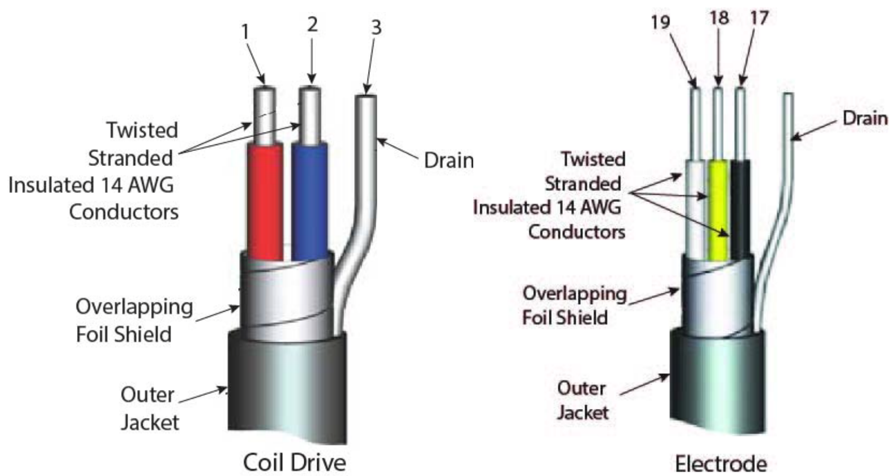
Coil/electrode cable (-20 °C to 80 °C)	
Cable kit #	**Description**
08732-0065-2001 (feet) 08732-0065-2002 (meters)	Kit, Combination Cable, Standard
08732-0065-3001 (feet) 08732-0065-3002 (meters)	Kit, Combination Cable, Submersible (80°C dry/60°C Wet) (33ft continuous)

Cable requirements

Shielded twisted pairs or triads must be used. For installations using the individual coil drive and electrode cable, see Figure 2-17. Cable lengths should be limited to less than 500 feet (152 m). Consult factory for length between 500–1000 feet (152–304 m). Equal length cable is required for each.

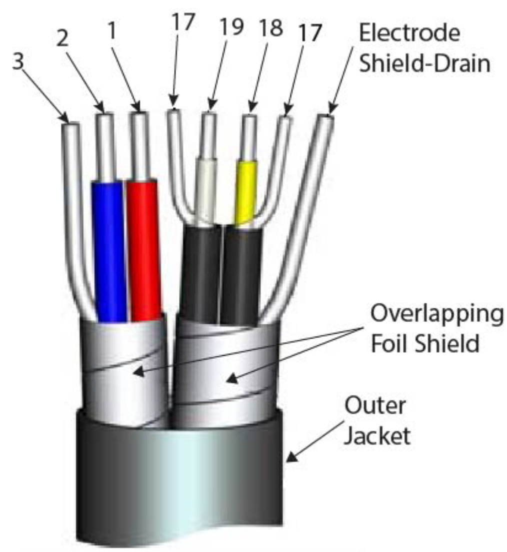
For installations using the combination coil drive/electrode cable, see Figure 2-18. Combination cable lengths should be limited to less than 330 feet (100 m).

Figure 2-17. Individual Component Cables



#	Color
1	Red
2	Blue
3	Drain
17	Black
18	Yellow
19	White

Figure 2-18. Combination Coil / Electrode Cable

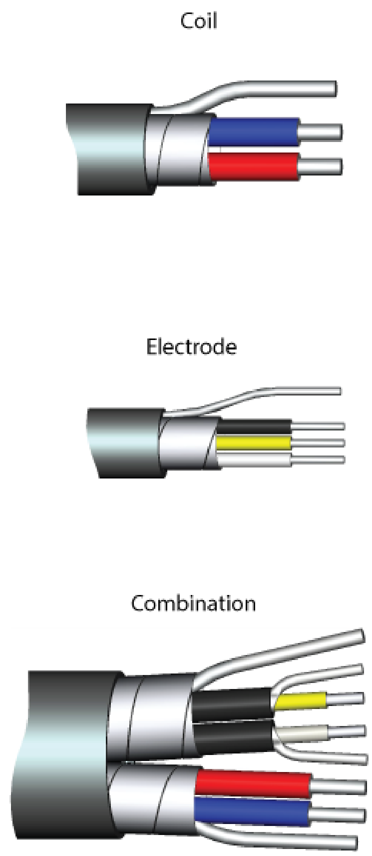


#	Color
1	Red
2	Blue
3	Drain
17	Reference
18	Yellow
19	White
-	Drain

Cable preparation

When preparing all wire connections, remove only the insulation required to fit the wire completely under the terminal connection. Prepare the ends of the coil drive and electrode cables as shown in Figure 2-19. Limit the unshielded wire length to less than one inch on both the coil drive and electrode cables. Any length of unsheathed conductor should be insulated. Excessive removal of insulation may result in an unwanted electrical short to the transmitter housing or other wire connections. Excessive unshielded lead length, or failure to connect cable shields properly, may expose the unit to electrical noise, resulting in an unstable meter reading.

Figure 2-19. Cable Ends



⚠ WARNING

Shock Hazard

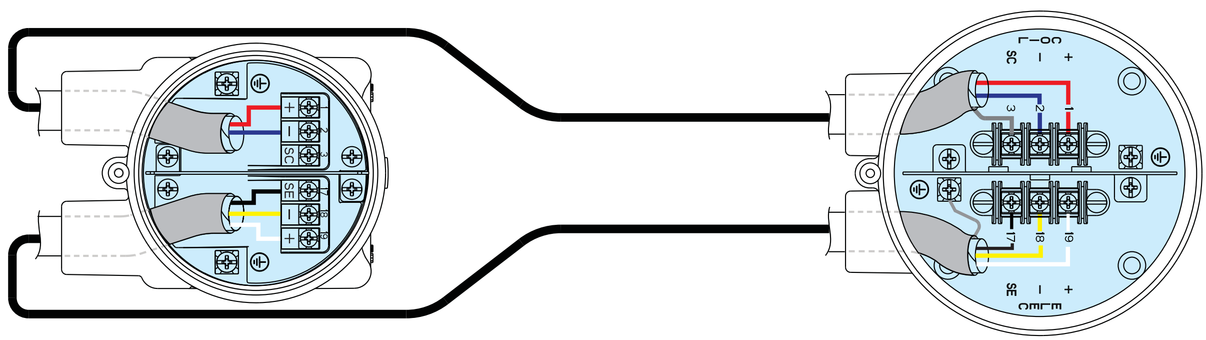
Potential shock hazard across remote junction box terminals 1 & 2 (40V).

Explosion Hazard

Electrodes exposed to process. Use only compatible transmitter and approved installation practices.

For process temperatures greater than 284 °F (140 °C), use a wire rated for 257 °F (125 °C).

Figure 2-20. Remote Junction Box Views



Wire	Terminal
RED	1
BLUE	2
BLACK	17
YELLOW	18
WHITE	19

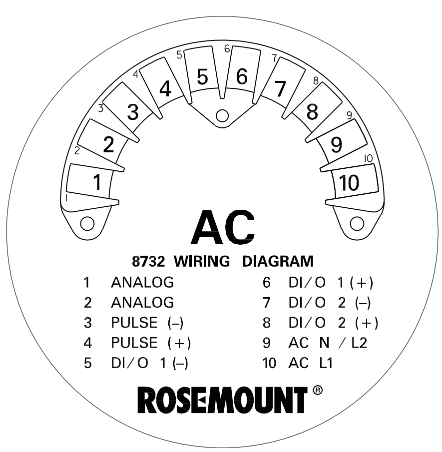
Wire	Terminal
RED	1
BLUE	2
Shield	3
BLACK	17
YELLOW	18
WHITE	19

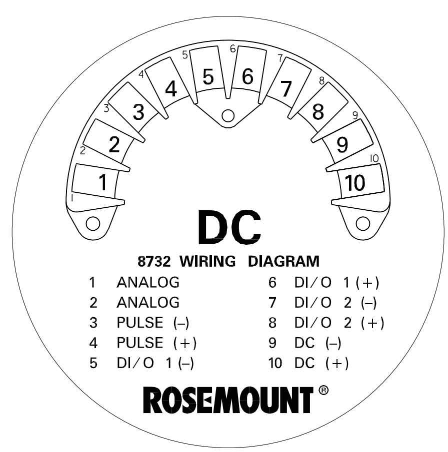
For sensor wiring diagrams, reference the installation drawings in Appendix C Wiring Diagrams. For hazardous locations, reference the drawings in Appendix B Product Certifications.

2.12.4 8732EM terminal block connections

Remove the back cover of the transmitter to access the terminal block. See Figure 2-21 for terminal identification. To connect pulse output and/or discrete input/output, reference Appendix C Wiring Diagrams. For installations with intrinsically safe outputs, reference the hazardous location installation drawings in Appendix B Product Certifications.

Figure 2-21. Terminal Block Connections





2.12.5 Analog output

The analog output signal is a 4-20mA current loop. The loop can be powered internally or externally via a hardware switch located on the front of the electronics stack. The switch is set to internal power when shipped from the factory. For units with a display, the LOI must be removed to change switch position.

Intrinsically safe analog output requires a shielded twisted pair cable.

For HART communication a minimum loop resistance of 250 ohms is required. It is recommended to use individually shielded twisted pair cable. The minimum conductor size is 0.51 mm diameter (#24 AWG) for cable runs less than 5,000 feet (1,500m) and 0.81 mm diameter (#20 AWG) for longer distances.

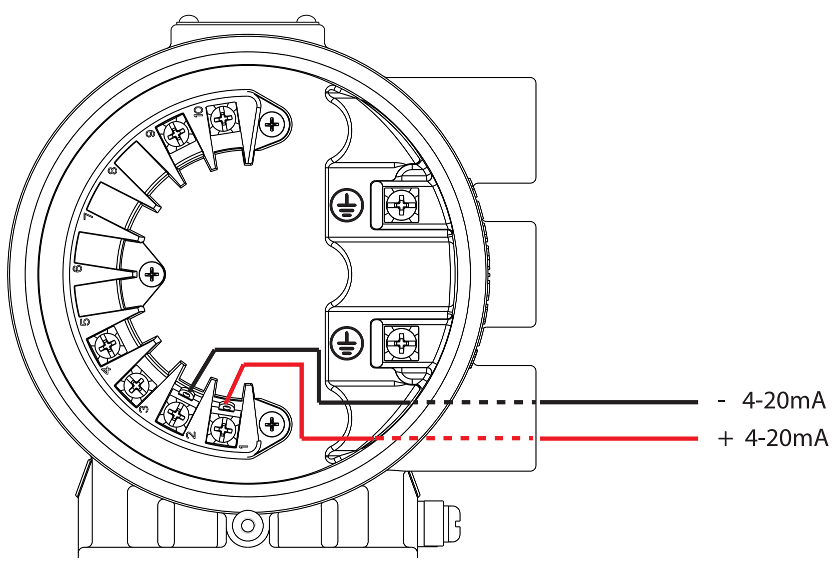
Internal power

The 4-20mA analog signal is a 24VDC active output.

Maximum allowable loop resistance is 500 ohms.

Wire terminal 1 (+) and terminal 2 (-). See Figure 2-22.

Figure 2-22. Analog Wiring—Internal Power



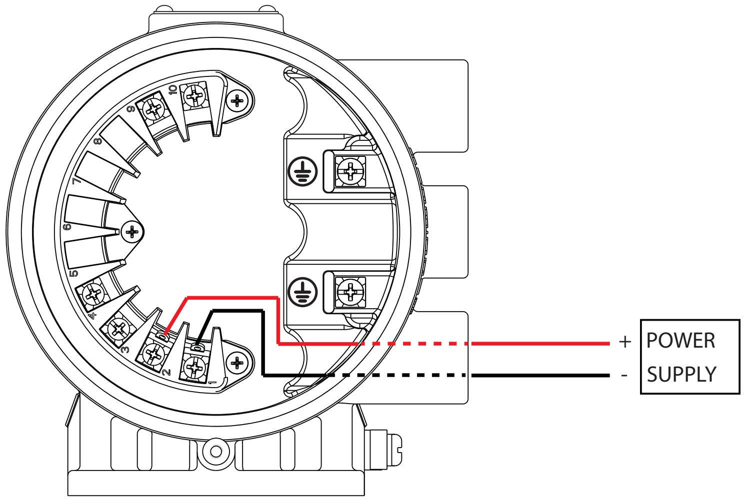
Note
Terminal polarity for the analog output is reversed between internally and externally powered.

External power

The 4-20mA analog signal is passive and must be powered from an external power source. Power at the transmitter terminals must be 10.8 - 30VDC.

Wire terminal 1 (-) and terminal 2 (+). See Figure 2-23.

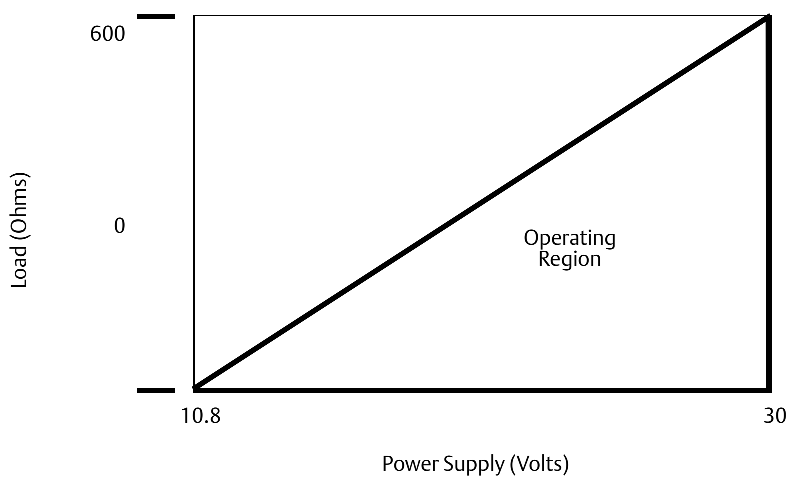
Figure 2-23. Analog Wiring—External Power



Analog loop load limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described in Figure 2-24.

Figure 2-24. Analog Loop Load Limitations

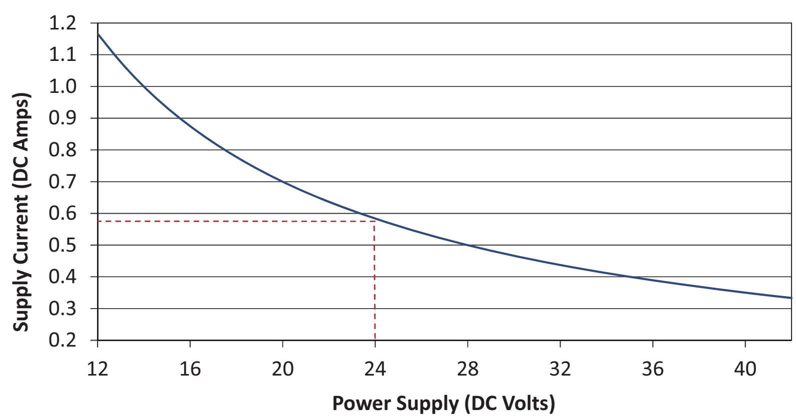


R_{max} = 31.25 (V_{ps} – 10.8)
V_{ps} = Power Supply Voltage (Volts)
R_{max} = Maximum Loop Resistance (Ohms)

2.12.6 Powering the transmitter

The 8732EM transmitter is available in two models. The AC powered transmitter is designed to be powered by 90–250VAC (50/60Hz). The DC powered transmitter is designed to be powered by 12–42VDC. Before connecting power to the 8732EM, be sure to have the proper power supply, conduit, and other accessories. Wire the transmitter according to national, local, and plant electrical requirements for the supply voltage. See Figure 2-25 or Figure 2-26.

Figure 2-25. DC Power Requirements

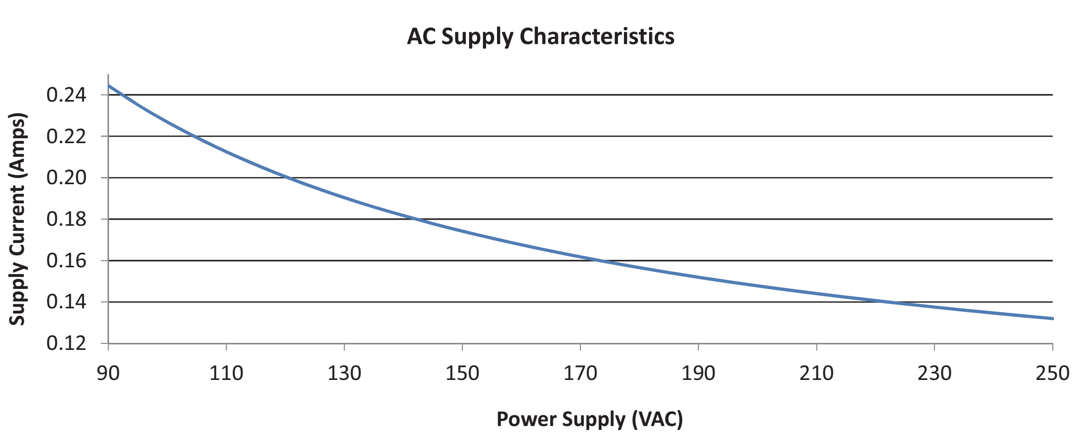


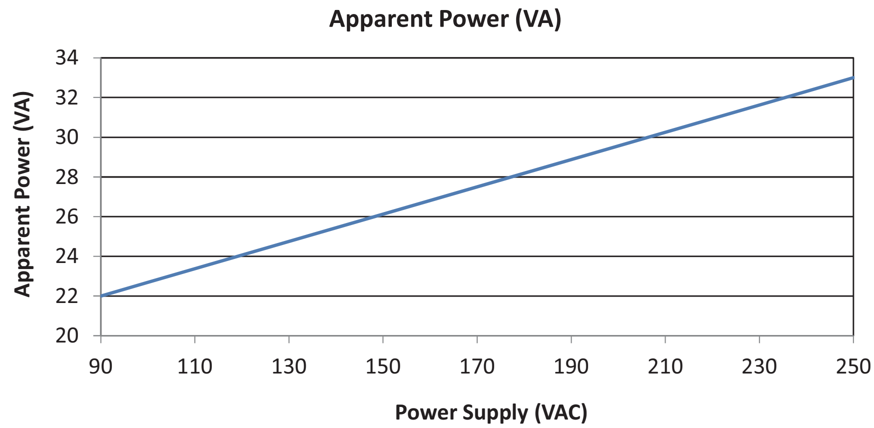
Peak inrush is 42A at 42VDC supply, lasting approximately 1ms.

Inrush for other supply voltages can be estimated with:

Inrush (Amps) = Supply (Volts) / 1.0

Figure 2-26. AC Power Requirements





Peak inrush is 35.7A at 250VAC supply, lasting approximately 1ms.

Inrush for other supply voltages can be estimated with:

Inrush (Amps) = Supply (Volts) / 7.0

Supply wire requirements

Use 10–18 AWG wire rated for the proper temperature of the application. For wire 10–14 AWG use lugs or other appropriate connectors. For connections in ambient temperatures above 122 °F (50 °C), use a wire rated for 194 °F (90 °C). For DC powered transmitters with extended cable lengths, verify that there is a minimum of 12VDC at the terminals of the transmitter with the device under load.

Electrical disconnect requirements

Connect the device through an external disconnect or circuit breaker per national and local electrical code.

Installation category

The installation category for the 8732EM is OVERVOLTAGE CAT II.

Overcurrent protection

The 8732EM transmitter requires overcurrent protection of the supply lines. Fuse rating and compatible fuses are shown in Table 2-13.

Table 2-13. Fuse Requirements

Input voltage	Fuse rating	Compatible fuse
90–250VAC rms	1 Amp, 250V, $I^2t \geq 1.5\ A^2s$ Rating, Fast Acting	Bussman AGC-1, Littelfuse 31201.5HXP
12–42VDC	3 Amp, 250V, $I^2t \geq 14\ A^2s$ Rating, Fast Acting	Bel Fuse 3AG 3-R, Littelfuse 312003P, Schurter 0034.5135

Power terminals

See Figure 2-21 for terminal block connections.

For AC powered transmitter (90–250VAC, 50/60 Hz):

- Connect AC Neutral to terminal 9 (AC N/L2) and AC Line to terminal 10 (AC/L1).

For DC powered transmitter:

- Connect negative to terminal 9 (DC -) and positive to terminal 10 (DC +).
- DC powered units may draw up to 1.2A.

2.13 Cover jam screw

For flow meters shipped with a cover jam screw, the screw should be installed after the instrument has been wired and powered up. Follow these steps to install the cover jam screw:

1. Verify the cover jam screw is completely threaded into the housing.
2. Install the housing cover and verify the cover is tight against the housing.
3. Using a 2.5 mm hex wrench, loosen the jam screw until it contacts the transmitter cover.
4. Turn the jam screw an additional 1/2 turn counterclockwise to secure the cover.

Note
Application of excessive torque may strip the threads.

5. Verify the cover cannot be removed.

2.14 Basic configuration

Once the magnetic flowmeter is installed and power has been supplied, the transmitter must be configured through the basic setup. The basic setup parameters can be configured through either an LOI or a HART communication device.

- For instructions on operation of the LOI or HART Communication device, refer to Section 4.
- If configuration beyond the basic setup parameters is required, refer to Section 5 for a complete list of device parameters.

Configuration settings are saved in nonvolatile memory within the transmitter.

2.14.1 Basic setup

Tag

LOI menu path	Basic Setup, Tag
Traditional Fast Keys	1,3,1
Device dashboard	2,2,9,1,1

Tag is the quickest and shortest way of identifying and distinguishing between transmitters. Transmitters can be tagged according to the requirements of your application. The tag may be up to eight characters long.

Flow units (PV)

LOI menu path	Basic Setup, Flow Units, PV Units
Traditional Fast Keys	1,3,1
Device dashboard	2,2,1,2

The flow units variable specifies the format in which the flow rate will be displayed. Units should be selected to meet your particular metering needs. See Table 2-14 for available units of measure.

Line size

LOI menu path	Basic Setup, Line Size
Traditional Fast Keys	1,3,1
Device dashboard	2,2,1,4,2

The line size (sensor size) must be set to match the actual sensor connected to the transmitter. The size must be specified in inches. See Table 2-15 for available sensor sizes.

Upper Range Value (URV)

LOI menu path	Basic Setup, PV URV
Traditional Fast Keys	1,3,1
Device dashboard	2,2,1,3,3

The URV sets the 20 mA point for the analog output. This value is typically set to full-scale flow. The units that appear will be the same as those selected under the flow units parameter. The URV may be set between –39.3 ft/s to 39.3 ft/s (–12 m/s to 12 m/s). There must be at least 1 ft/s (0.3 m/s) span between the URV and LRV.

Lower Range Value (LRV)

LOI menu path	Basic Setup, PV LRV
Traditional Fast Keys	1,3,1
Device dashboard	2,2,1,3,2

The LRV sets the 4 mA point for the analog output. This value is typically set to zero flow. The units that appear will be the same as those selected under the flow units parameter. The LRV may be set between –39.3 ft/s to 39.3 ft/s (–12 m/s to 12 m/s). There must be at least 1 ft/s (0.3 m/s) span between the URV and LRV.

Calibration number

LOI menu path	Basic Setup, Cal Number
Traditional Fast Keys	1,3,1
Device dashboard	2,2,1,4,1

The sensor calibration number is a 16-digit number generated at the Rosemount factory during flow calibration, is unique to each sensor, and is located on the sensor tag.

PV damping

LOI menu path	Basic Setup, PV Damping
Traditional Fast Keys	1,3,1
Device dashboard	2,2,1,3,4

Primary variable damping allows selection of a response time, in seconds, to a step change in flow rate. It is most often used to smooth fluctuations in output.

Table 2-14. Available Flow Units

Volumetric units	Mass units
gal / sec	lbs / sec
gal / min	lbs / min
gal / hr	lbs / hr
gal / day	lbs / day
L / sec	kg / sec
L / min	kg / min
L / hr	kg / hr
L / day	kg / day
ft3 / sec	(s) tons / min
ft3 / min	(s) tons / hr
ft3 / hr	(s) tons / day
ft3 / day	(m) tons / min
cm3 / min	(m) tons / hr
m3 / sec	(m) tons / day
m3 / min	
m3 / hr	**Velocity units**
m3 / day	ft / sec
Impgal / sec	m / sec
Impgal / min	
Impgal / hr	**Special units**
Impgal / day	Special (User Defined)
B42 / sec (1 barrel = 42 gallons)	
B42 / min (1 barrel = 42 gallons)	
B42 / hr (1 barrel = 42 gallons)	
B42 / day (1 barrel = 42 gallons)	
B31 / sec (1 barrel = 31 gallons)	
B31 / min (1 barrel = 31 gallons)	
B31 / hr (1 barrel = 31 gallons)	
B31 / day (1 barrel = 31 gallons)	

Table 2-15. Available Sensor Sizes

Sensor size	
0.10-in. (2.5 mm)	18-in. (450 mm)
0.15-in. (4 mm)	20-in. (500 mm)
0.25-in. (6 mm)	24-in. (600 mm)
0.30-in. (8 mm)	28-in. (700 mm)
0.50-in. (15 mm)	30-in. (750 mm)
0.75-in. (20 mm)	32-in. (800 mm)
1.0-in. (25 mm)	36-in. (900 mm)
1.5-in. (40 mm)	40-in. (1000 mm)
2.0-in. (50 mm)	42-in. (1050 mm)
2.5-in. (65 mm)	44-in. (1100 mm)
3.0-in. (80 mm)	48-in. (1200 mm)
4.0-in. (100 mm)	54-in. (1350 mm)
5.0-in. (125 mm)	56-in. (1400 mm)
6.0-in. (150 mm)	60-in. (1500 mm)
8.0-in. (200 mm)	64-in. (1600 mm)
10-in. (250 mm)	66-in. (1650 mm)
12-in. (300 mm)	72-in. (1800 mm)
14-in. (350 mm)	78-in. (1950 mm)
16-in. (400 mm)	80-in. (2000 mm)

Section 3 Advanced Installation Details

3.1 Introduction

This section details some of the advanced installation considerations when utilizing the Rosemount® 8700M Magnetic Flowmeter Platform.

3.2 Safety messages

⚠ WARNING

The electronics may store energy after power is removed. Allow ten minutes for charge to dissipate prior to removing electronics compartment cover.

Note
The electronics stack is electrostatically sensitive. Be sure to observe handling precautions for static-sensitive components.

3.3 Hardware switches

The electronics are equipped with four user-selectable hardware switches. These switches set the Alarm Mode, Internal/External Analog Power, Transmitter Security, and Internal/External Pulse Power.

Definitions of these switches and their functions are provided below. To change the settings, see below.

3.3.1 Alarm mode

If an event occurs that would trigger an alarm in the electronics, the analog output will be driven high or low, depending on the switch position. The switch is set in the HIGH position when shipped from the factory. Refer to Table 5-1 on page 88 and Table 5-2 on page 88 for analog output values of the alarm.

3.3.2 Transmitter security

The security switch on the 8732EM allows the user to lock out any configuration changes attempted on the transmitter. No changes to the configuration are allowed when the switch is in the ON position. The flow rate indication and totalizer functions remain active at all times.

With the switch in the ON position, access to review the operating parameters is available. No configuration changes are allowed.

Transmitter security is set in the OFF position when shipped from the factory.

3.3.3 Internal/external analog power

The 8732EM 4-20 mA loop may be powered internally or by an external power supply. The internal /external power supply switch determines the source of the 4-20 mA loop power.

Transmitters are shipped from the factory with the switch set in the INTERNAL position.

The external power option is required for multidrop configurations. A 10-30 VDC external supply is required and the 4-20 mA power switch must be set to the EXTERNAL position. For further information on 4-20 mA external power, see “Analog output” on page 29.

3.3.4 Internal/external pulse power

The 8732EM pulse loop may be powered internally or by an external power supply. The internal/external power supply switch determines the source of the pulse loop power.

Transmitters are shipped from the factory with the switch set in the EXTERNAL position.

A 5-28 VDC external supply is required when the pulse power switch is set to the EXTERNAL position. For further information on the pulse external power, see “Connect pulse output” on page 41.

3.3.5 Changing hardware switch settings

To change the switch settings, complete the steps below:

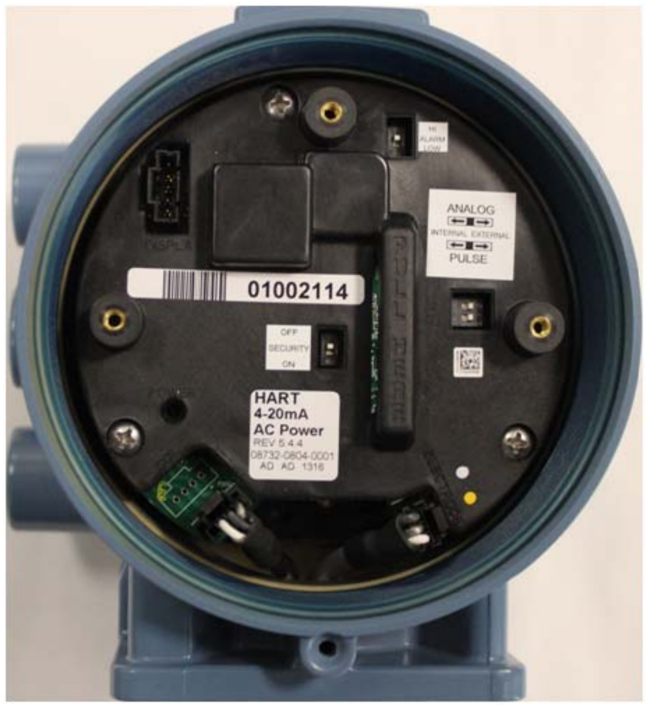
Note
The hardware switches are located on the top side of the electronics board and changing their settings requires opening the electronics housing. If possible, carry out these procedures away from the plant environment in order to protect the electronics.

---

1. Place the control loop into manual control.
2. Disconnect power to the transmitter
3. Remove the electronics compartment cover. If the cover has a cover jam screw, this must be loosened prior to removal of the cover.
4. Remove the LOI, if applicable.
5. Identify the location of each switch (see Figure 3-1).

6. Change the setting of the desired switches with a small, non-metallic tool.
7. Replace the LOI if applicable, and the electronics compartment cover. If the cover has a cover jam screw, this must be tightened to comply with installation requirements. See "Cover jam screw" on page 33 for details on the cover jam screw.
8. Return power to the transmitter and verify the flow measurement is correct.
9. Return the control loop to automatic control.

Figure 3-1. Rosemount 8732EM Electronics Stack and Hardware Switches



3.4 Additional loops

There are three additional loop connections available on the 8732EM Transmitter:

- Pulse output - used for external or remote totalization.
- Channel 1 can be configured as discrete input or discrete output.
- Channel 2 can be configured as discrete output only.

3.4.1 Connect pulse output

The pulse output function provides a galvanically isolated frequency signal that is proportional to the flow through the sensor. The signal is typically used in conjunction with an external totalizer or control system. The default position of the internal/external pulse power switch is in the EXTERNAL position. The user-selectable power switch is located on the electronics board.

External

For transmitters with the internal/external pulse power switch (output option code A) set in the EXTERNAL position or transmitters with intrinsically safe outputs (output option code B) the following requirements apply:

Supply voltage: 5 to 28 VDC
Maximum current: 100 mA
Maximum power: 1.0 W
Load resistance: 200 to 10k Ohms (typical value 1k Ohms)

Output option code	Supply voltage	Resistance vs cable length
A	5-28 VDC	See Figure 3-2 on page 43
B	5 VDC	See Figure 3-3 on page 43
B	12 VDC	See Figure 3-4 on page 44
B	24 VDC	See Figure 3-5 on page 44

Pulse mode: Fixed pulse width or 50% duty cycle
Pulse duration: 0.1 to 650 ms (adjustable)
Maximum pulse frequency: Output option code A is 10,000 Hz
Maximum pulse frequency: Output option code B is 5000 Hz
FET switch closure: solid state switch

Figure 3-2. Output Option Code A—Maximum Frequency vs. Cable Length

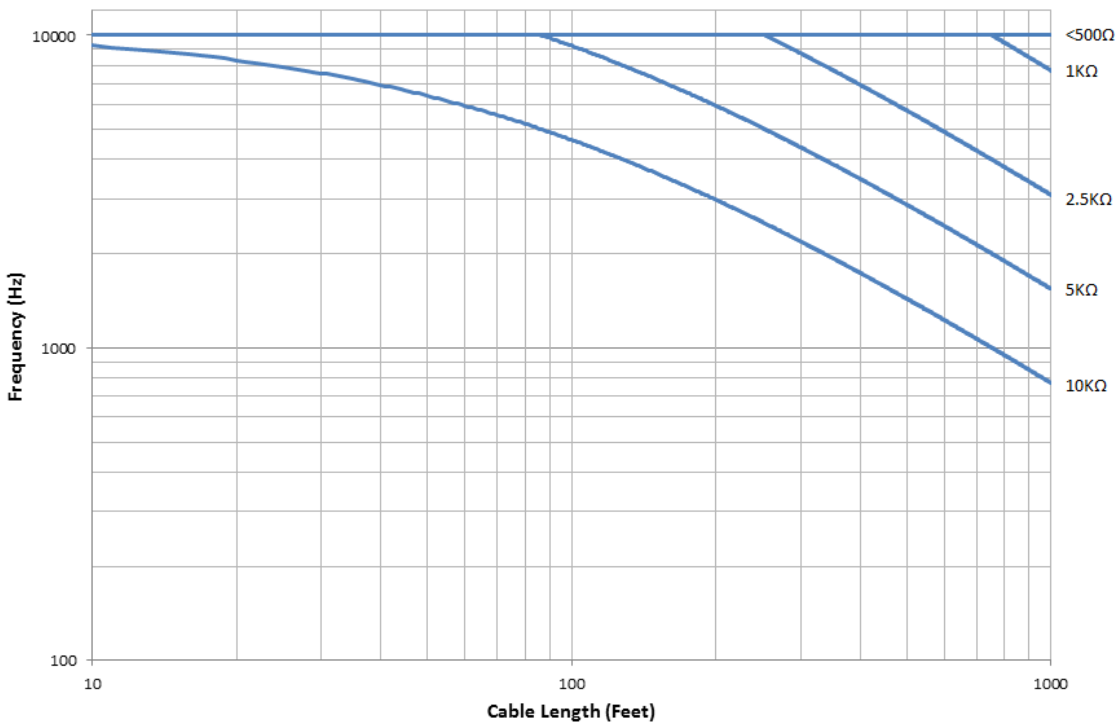
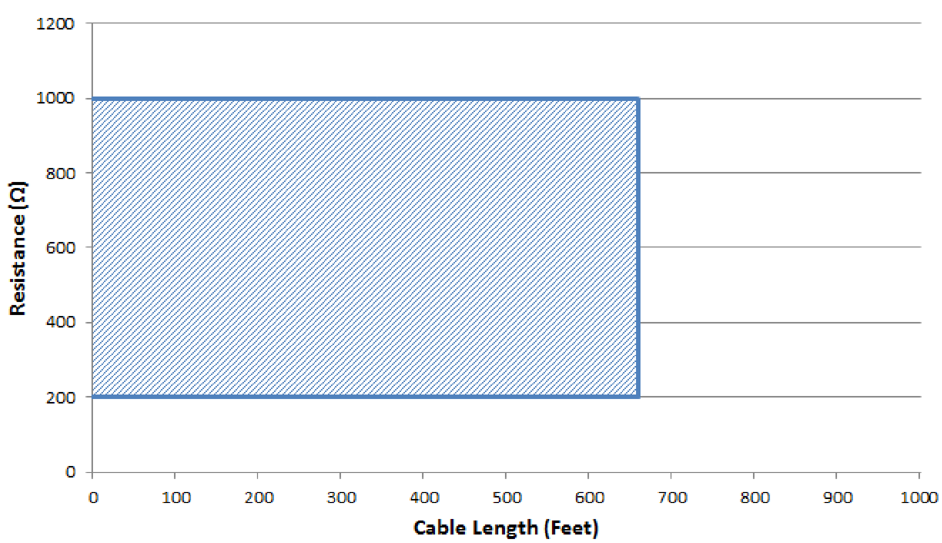
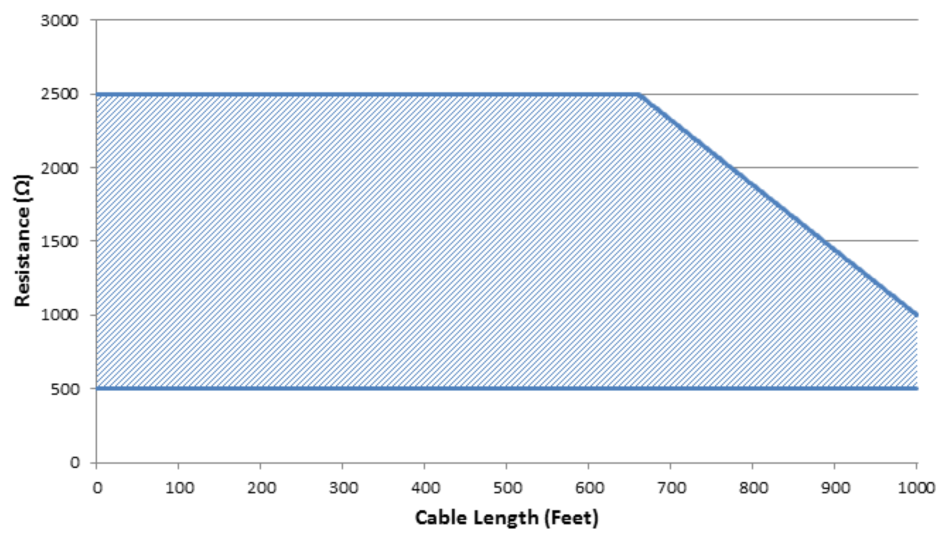


Figure 3-3. Output Option Code B—5 VDC Supply



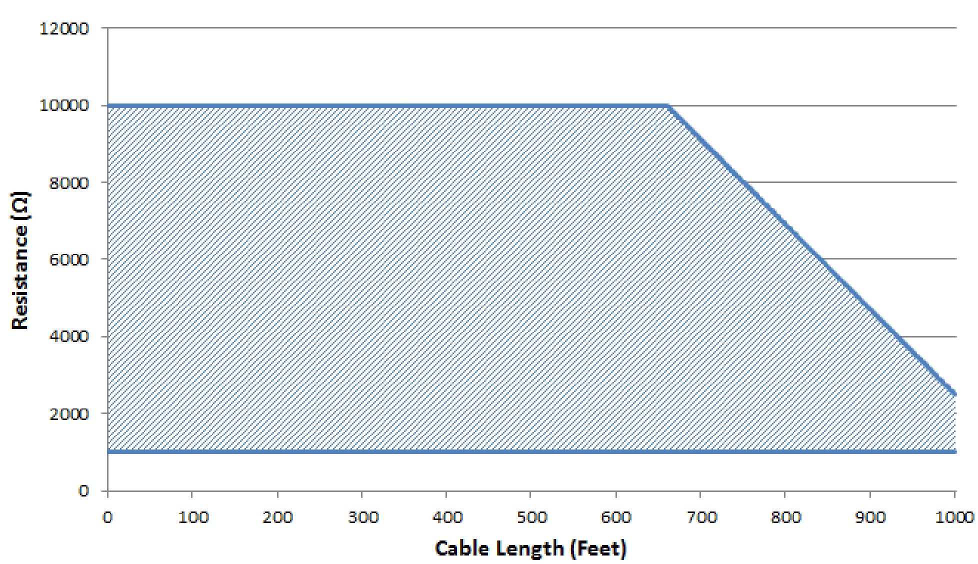
At 5000 Hz operation with a 5 VDC supply, pull-up resistances of 200 to 1000 Ohms allow cable lengths up to 660 ft (200 m).

Figure 3-4. Output Option Code B—2 VDC Supply



At 5000 Hz operation with a 12 VDC supply, pull-up resistances of 500 to 2500 Ohms allow cable lengths up to 660 ft (200 m). Resistances from 500 to 1000 Ohms allow a cable length of 1000 ft (330 m).

Figure 3-5. Output Option Code B—24 VDC Supply



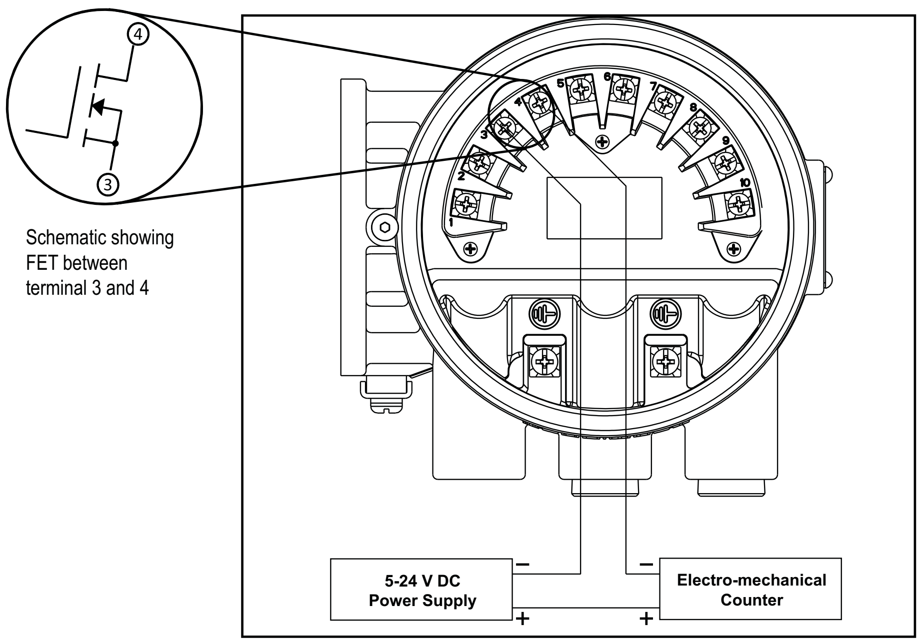
At 5000 Hz operation with a 24 VDC supply, pull-up resistances of 1000 to 10,000 Ohms allow cable lengths up to 660 ft (200 m). Resistances from 1000 to 2500 Ohms allow a cable length of 1000 ft (330 m).

Complete the following steps to connect an external power supply.

1. Ensure the power source and connecting cable meet the requirements outlined previously.
2. Turn off the transmitter and pulse output power sources.
3. Run the power cable to the transmitter.
4. Connect - DC to terminal 3.
5. Connect + DC to terminal 4.

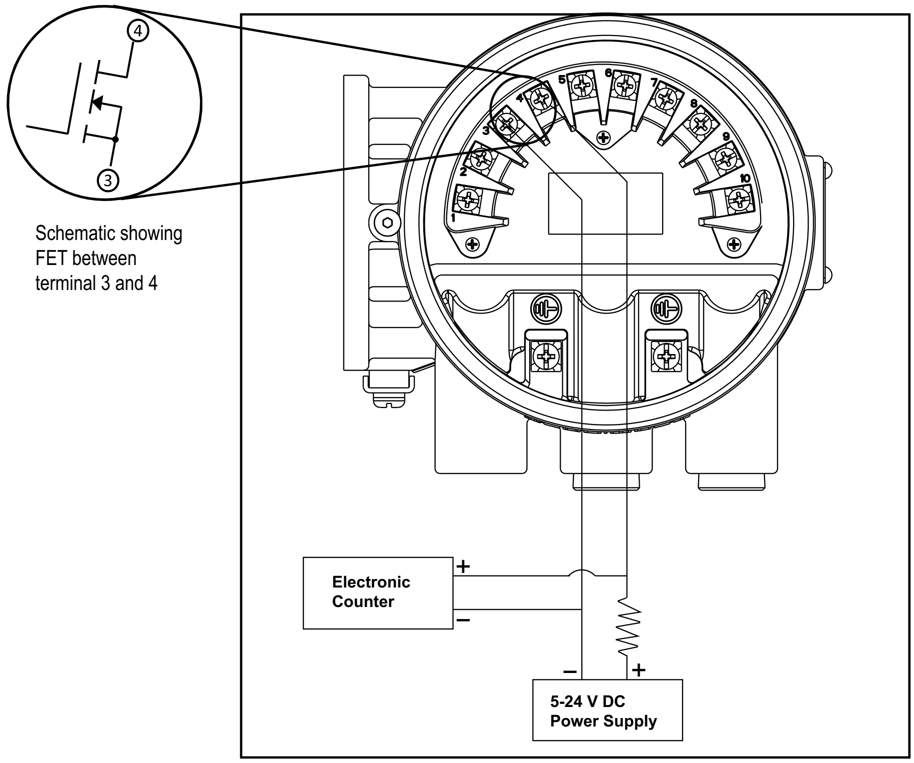
Refer to Figure 3-6 and Figure 3-7.

Figure 3-6. Connecting an Electromechanical Totalizer/Counter with External Power Supply



Note
Total loop impedance must be sufficient to keep loop current below maximum rating. A resistor can be added in the loop to raise impedance.

Figure 3-7. Connecting to an Electronic Totalizer/Counter with External Power Supply



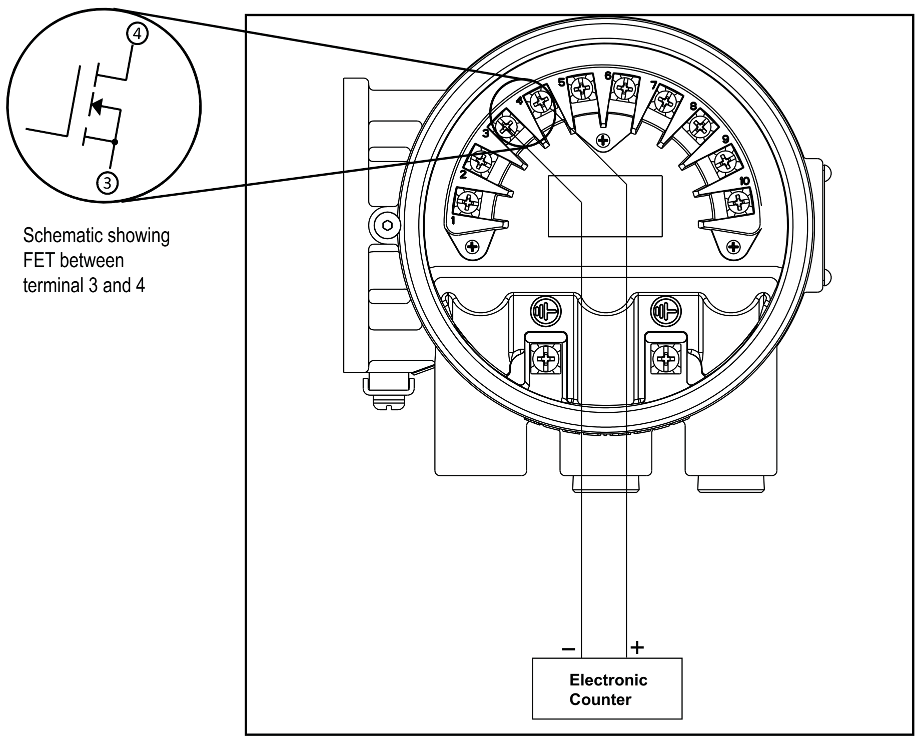
Note
Total loop impedance must be sufficient to keep loop current below maximum rating.

Internal

When the pulse switch is set to internal, the pulse loop will be powered from the transmitter. Supply voltage from the transmitter can be up to 12 VDC. Refer to Figure 3-8 and connect the transmitter directly to the counter. Internal pulse power can only be used with an electronic totalizer or counter and cannot be used with an electromechanical counter.

1. Turn off the transmitter.
2. Connect - DC to terminal 3.
3. Connect + DC to terminal 4.

Figure 3-8. Connecting to an Electronic Totalizer / Counter with Internal Power Supply



3.4.2 Connect discrete output

The discrete output control function can be configured to drive an external signal to indicate zero flow, reverse flow, empty pipe, diagnostic status, flow limit, or transmitter status. The following requirements apply:

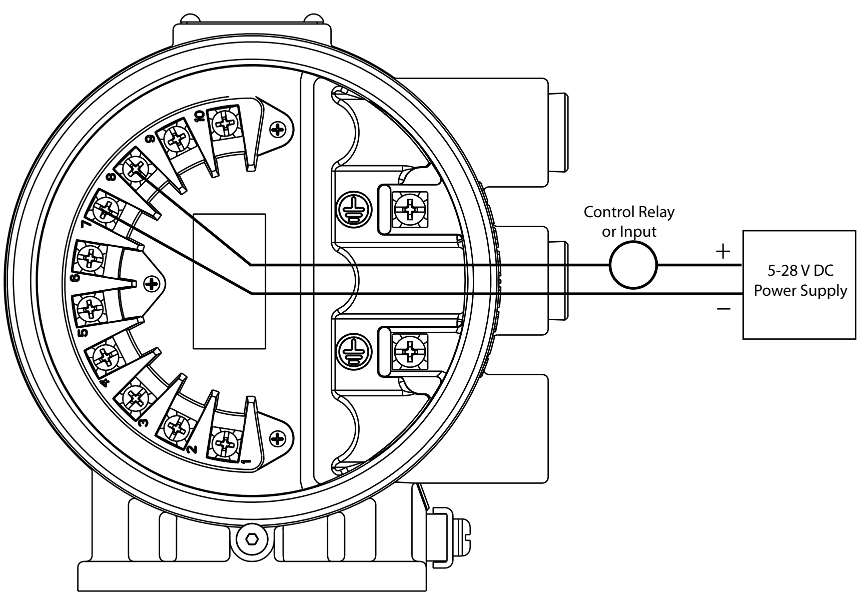
Supply Voltage: 5 to 28 VDC
Maximum Voltage: 28 VDC at 240 mA
Switch Closure: solid state relay

For discrete output control, connect the power source and control relay to the transmitter. To connect external power for discrete output control, complete the following steps:

1. Ensure the power source and connecting cable meet the requirements outlined previously.
2. Turn off the transmitter and discrete power sources.
3. Run the power cable to the transmitter.
4. Channel 1: Connect -DC to terminal 5, connect +DC to terminal 6.
5. Channel 2: Connect -DC to terminal 7, connect +DC to terminal 8.

Refer to Figure 3-9 and Figure 3.5.

Figure 3-9. Connect Discrete Output to Relay or Control System Input



Note
Total loop impedance must be sufficient to keep loop current below maximum rating. A resistor can be added in the loop to raise impedance.

3.4.3 Connect discrete input

The discrete input can provide positive zero return (PZR) or net totalizer reset. The following requirements apply:

Supply Voltage: 5 to 28 VDC
Control Current: 1.5 - 20mA
Input Impedance: 2.5 kΩ plus 1.2V Diode drop. See Figure 3-11.

To connect the discrete input, complete the following steps.

1. Ensure the power source and connecting cable meet the requirements outlined previously.
2. Turn off the transmitter and discrete power sources.
3. Run the power cable to the transmitter.
4. Connect -DC to terminal 5.
5. Connect +DC to terminal 6.

Refer to Figure 3-10 and Figure 3-11.

Figure 3-10. Connecting Discrete Input

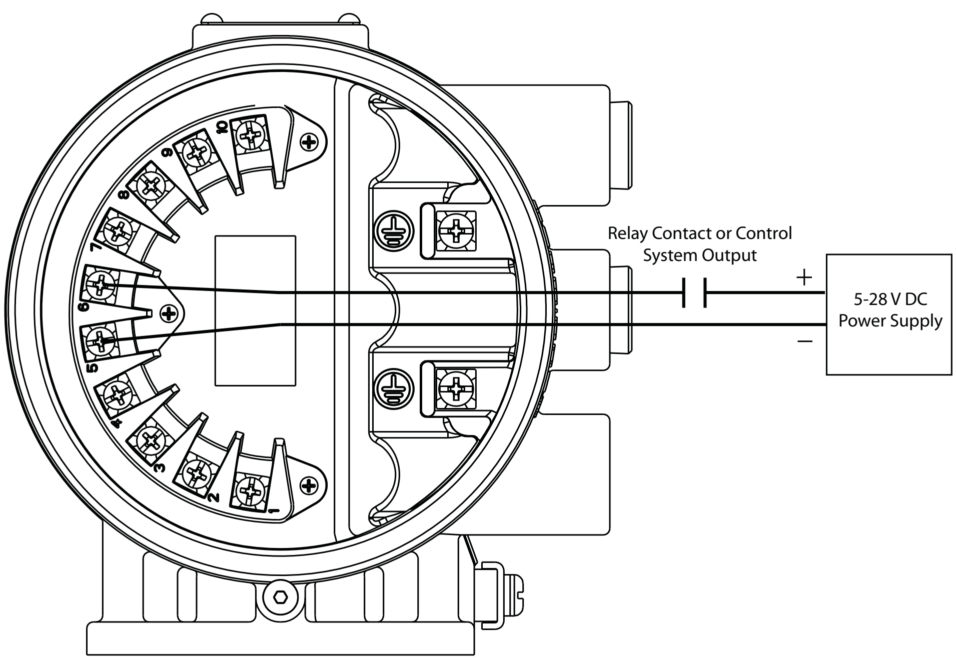
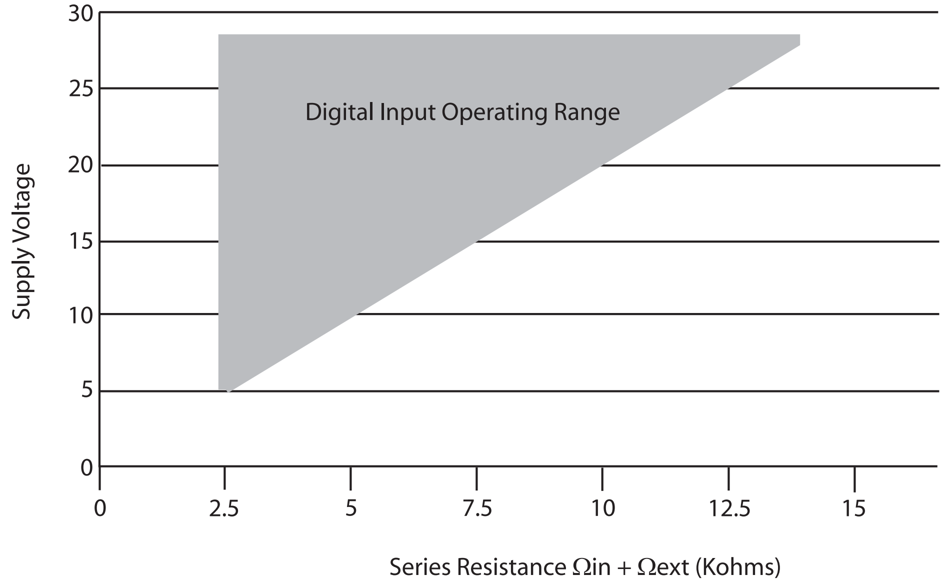


Figure 3-11. Discrete Input Operating Range



3.5 Process reference connection

Establishing a process reference for the sensor is one of the most important details of sensor installation. Proper process reference creates the lowest noise environment for the transmitter to make a stable reading. Refer to Table 2-10 on page 20 to determine which option to follow for proper installation.

Note
Consult factory for installations requiring cathodic protection or situations where there are high electrical currents or high electrical potentials present in the process.

3.6 Coil housing configuration

The coil housing provides physical protection of the coils and other internal components from contamination and physical damage that might occur in an industrial environment. The coil housing is an all-welded and gasket-free design.

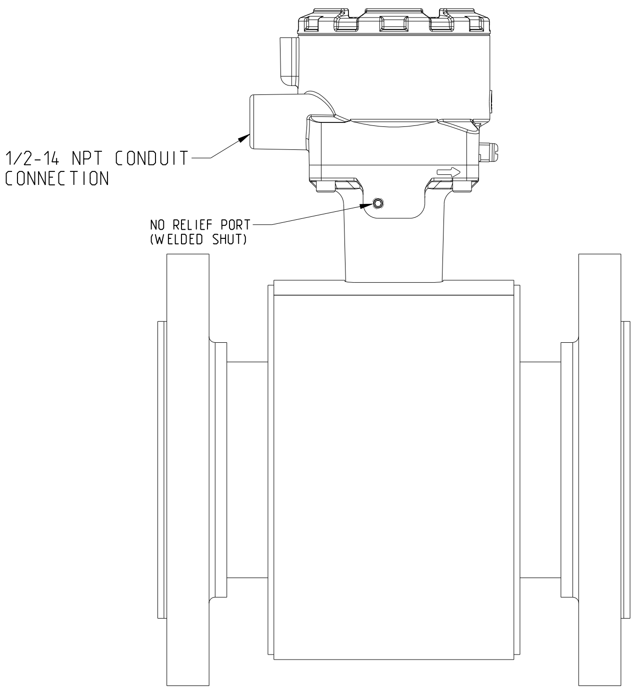
The 8705 model is available in four coil housing configurations. Configurations are identified by the M0, M1, M2, or M4 options codes found in the model number. The 8711 and 8721 models are only available in one coil housing coil configuration; a separate option code is not available.

3.6.1 Standard coil housing configuration

The standard coil housing configuration is a factory sealed all-welded enclosure and is available for the following models (see Figure 3-12):

- 8705 with option code M0 - 8705xxxxxxxxM0
- 8711 with option code M/L - 8711xxxxxxM/L
- 8721 with option code R/U - 8721xxxxxxR/U

Figure 3-12. Standard Housing Configuration (8705 Shown)



3.6.2 Process leak protection (option M1)

The 8705 is available with process leak detection through the use of a threaded connection and pressure relief valve (PRV). This coil housing configuration is a factory sealed all-welded enclosure. The M1 configuration is available for the 8705 only.

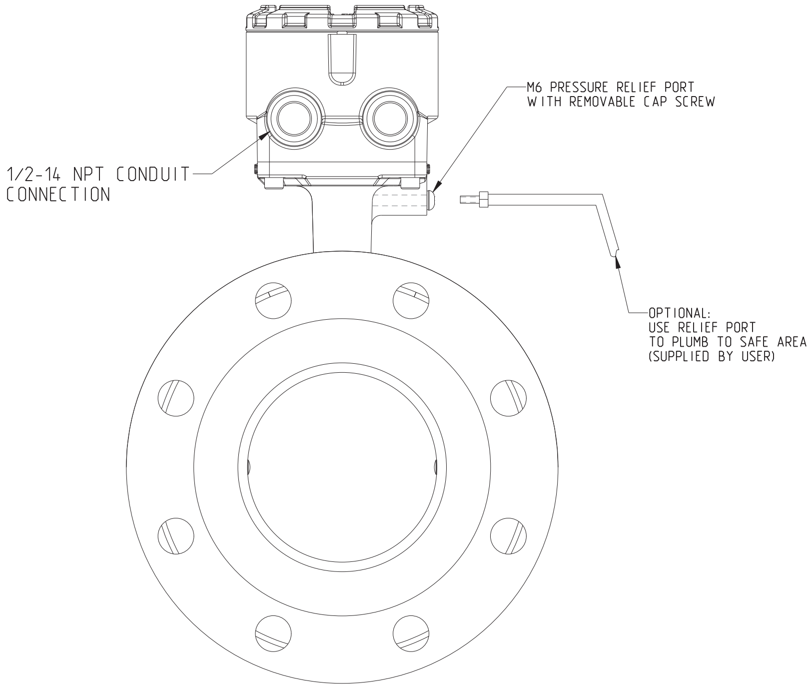
- 8705 with option code M1 - 8705xxxxxxxxM1

A PRV can be installed in the threaded connection to prevent possible over-pressuring of the coil housing caused by a primary seal failure. The PRV is capable of venting fugitive emissions when pressure inside the coil housing exceeds five psi. Additional piping may be connected to the PRV to drain any process leakage to a safe location (see Figure 3-13).

In the event of a primary seal failure, this configuration will not protect the coils or other internal components of the sensor from exposure to the process fluid.

Note
The PRV is supplied with the meter to be installed by the customer. Installation of the PRV and any associated piping must be performed in accordance with environmental and hazardous area requirements.

Figure 3-13. 8705 with M1 Coil Housing Configuration and PRV



3.6.3 Process leak containment (Option M2 or M4)

The 8705 is available with process leak containment. The coil housing configuration is a factory sealed all-welded enclosure with the addition of sealed electrode compartments. The M2/M4 configuration is available for the 8705 only.

- 8705 with option code M2/M4 - 8705xxxxxxxxM2/M4

This configuration divides the coil housing into separate compartments, one for each electrode and one for the coils. In the event of a primary seal failure, the fluid is contained in the electrode compartment. The sealed electrode compartment prevents the process fluid from entering the coil compartment where it may damage the coils and other internal components. The electrode compartments are designed to contain the process fluid up to a maximum pressure of 740 psig.

- **Code M2** - sealed, welded coil housing with separate sealed and welded electrode compartments (see Figure 3-14).
- **Code M4** - sealed, welded coil housing with separate sealed and welded electrode compartments with a threaded port on the electrode tunnel cap, capable of venting fugitive emissions (see Figure 3-15).

Note
To properly vent process fluid from the electrode compartment to a safe location, additional piping is required and must be installed by the user. Installation of any associated piping must be performed in accordance with environmental and hazardous area requirements. In the event of primary seal failure, the electrode compartment may be pressurized. Use caution when removing the cap screw.

Figure 3-14. 8705 with M2 Coil Housing Configuration

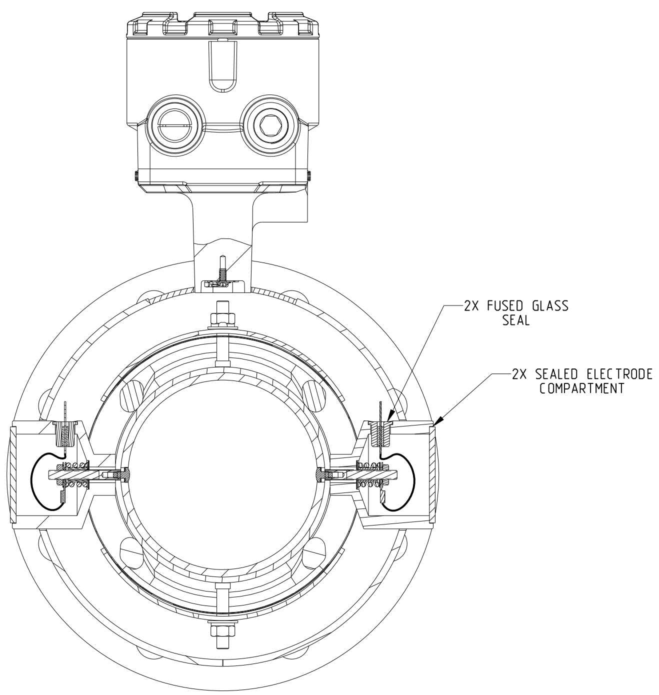
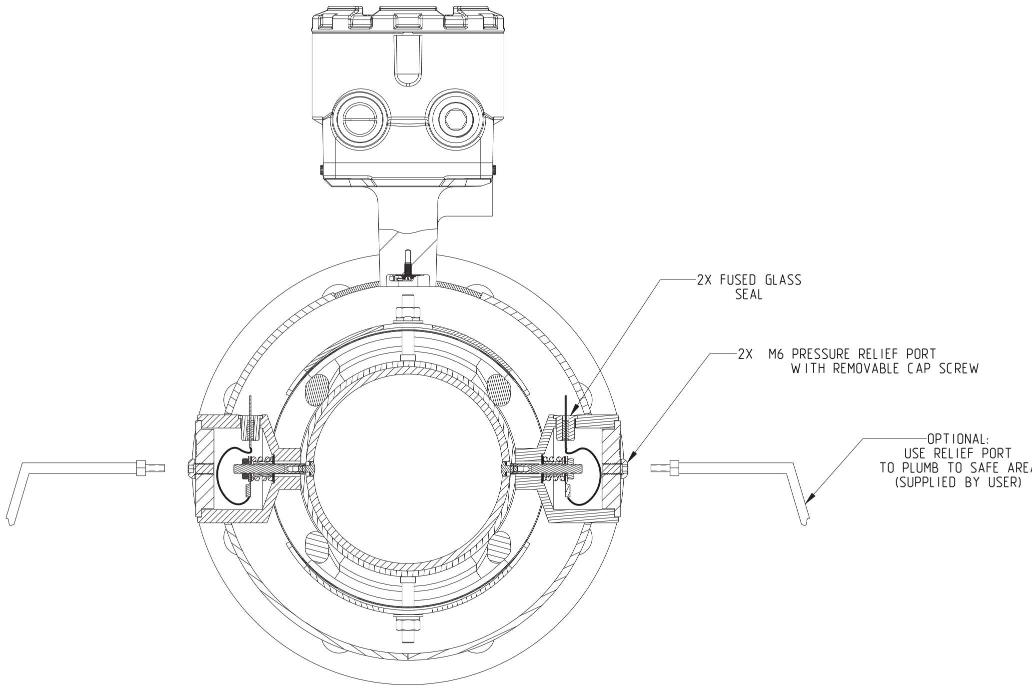


Figure 3-15. 8705 with M4 Coil Housing Configuration

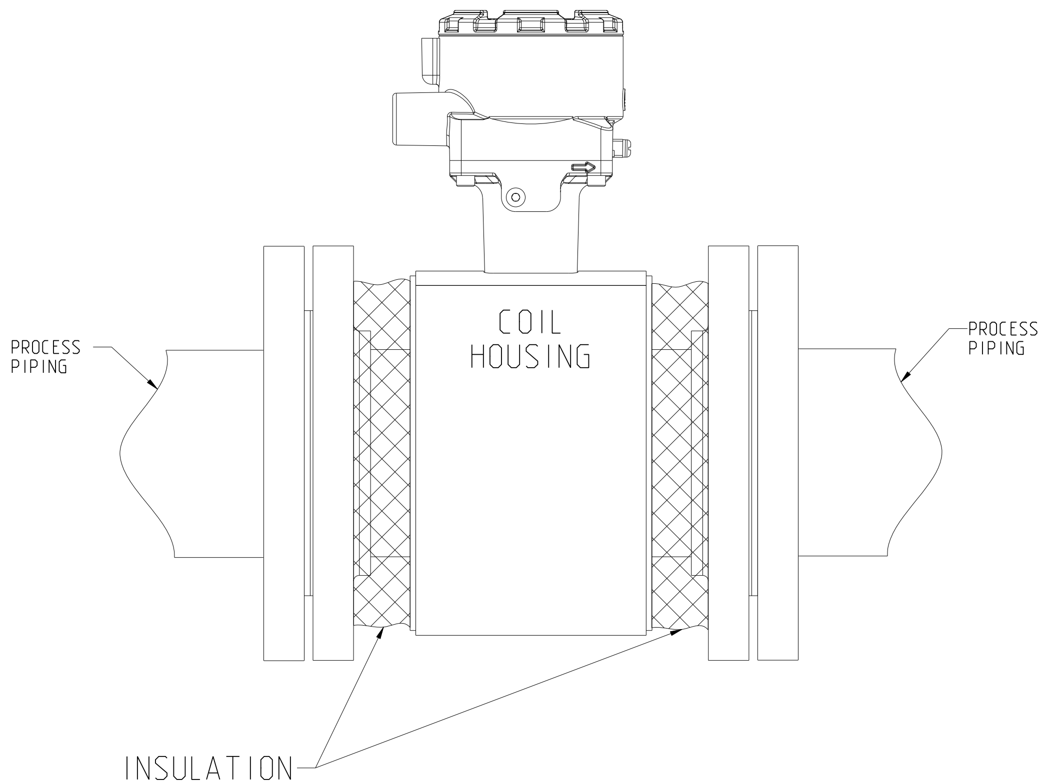


3.6.4 Higher temperature applications and sensor insulation best practices

Insulation of the magnetic flowmeter sensor is not typically recommended. However, in applications with higher temperature process fluids (above 150°F / 65°C), plant safety, sensor reliability, and sensor longevity can be improved with careful attention to proper insulation.

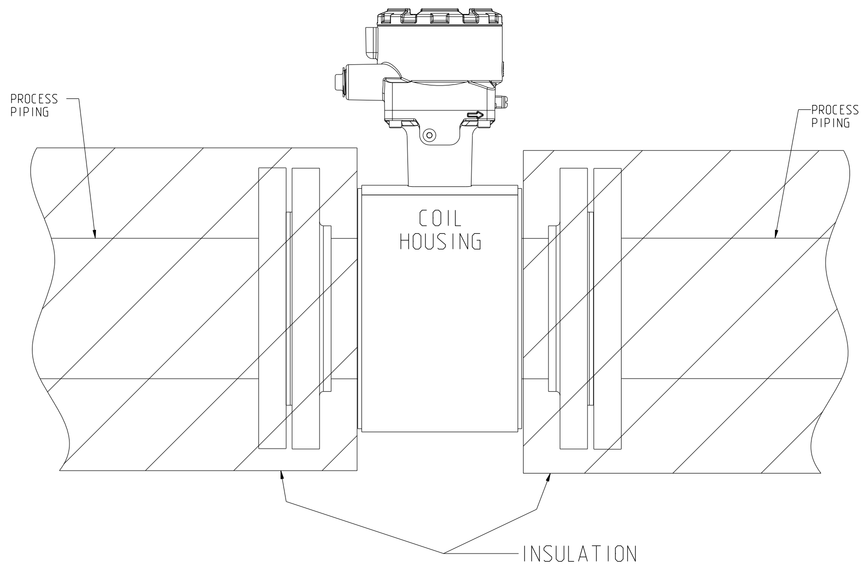
1. In applications where process fluid permeation of the liner has been observed or may be expected, the rate of permeation can be reduced by decreasing the temperature gradient between the process fluid and the outside of the meter body. In these applications only the space between the process flanges and the coil housing should be insulated (see Figure 3-16).

Figure 3-16. Insulating a Rosemount Magnetic Flowmeter for Permeation



2. When insulation of the magnetic flowmeter sensor is required due to plant safety standards designed to protect personnel from contact burns, extend the insulation up to the coil housing, covering both ends of the sensor and flanges (Figure 3-17). The insulation should NOT cover the coil housing or the terminal junction box. Insulating the coil housing and the terminal junction box can result in overheating of the coil compartment and terminals, resulting in erratic/erroneous flow readings and potential damage or failure of the meter.

Figure 3-17. Insulating a Rosemount Magnetic Flowmeter for Safety/Plant Standards



Section 4 Operation

4.1 Introduction

The 8732EM transmitter features a full range of software functions, transmitter configurations, and diagnostic settings. These features can be accessed through the Local Operator Interface (LOI), a handheld Field Communicator, AMS® Device Manager, or a host control system. Configuration variables may be changed at any time; specific instructions are provided through on-screen instructions.

This section covers the basic features of the LOI (optional) and provides general instructions on how to navigate the configuration menus using the optical buttons. The section also covers the use of a Field Communicator and provides menu trees to access each function.

For detailed LOI configuration refer to Section 5: Advanced Configuration Functionality.

4.2 Local operator interface (LOI)

The optional LOI provides a communications center for the 8732EM.

The LOI allows an operator to:

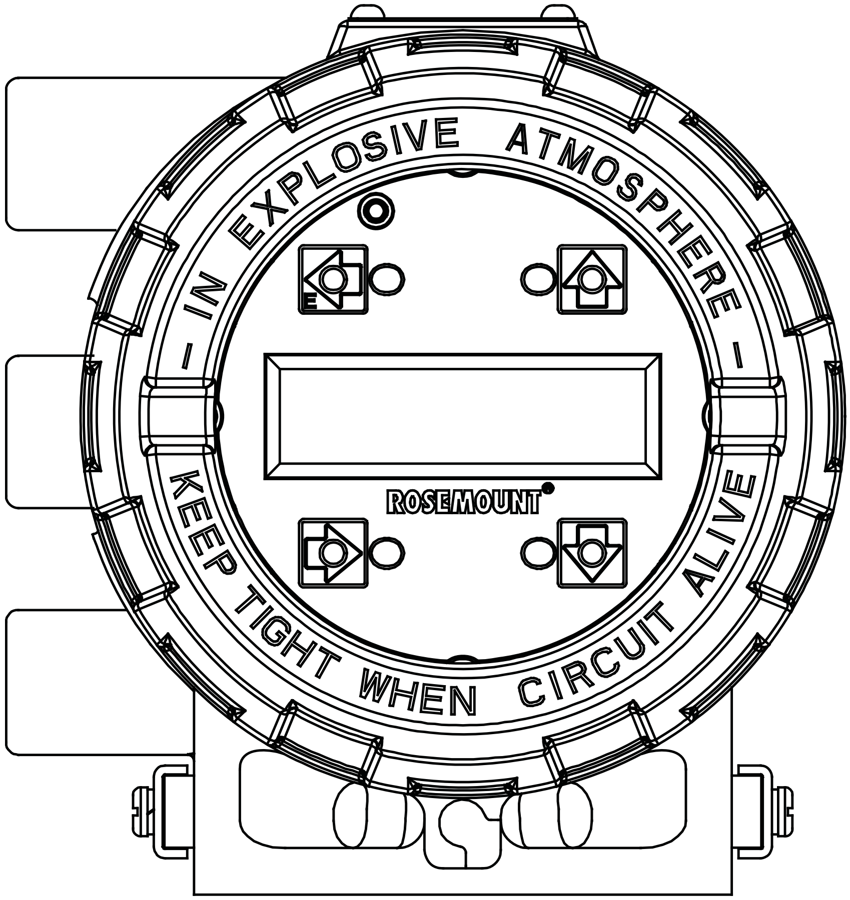
- Change transmitter configuration
- View flow and totalizer values
- Start/stop and reset totalizer values
- Run diagnostics and view the results
- Monitor transmitter status
- Other functions

4.2.1 Basic features

The basic features of the LOI include a display window and four navigational arrow keys (see Figure 4-1).

To activate the LOI, press the **DOWN** arrow two times. Use the **UP**, **DOWN**, **LEFT**, and **RIGHT** arrows to navigate the menu structure. A map of the LOI menu structure is shown on Figure 4-2 and Figure 4-3.

Figure 4-1. Local Operator Interface Keypad and Character Display



4.2.2 Data entry

The LOI keypad does not have alphanumeric keys. Alphanumeric and symbolic data is entered by the following procedure. Use the steps below to access the appropriate functions.

1. Use the arrow keys to navigate the menu structure (Figure 4-2 and Figure 4-3) in order to access the appropriate alphanumeric parameter.

2. Use the **UP**, **DOWN** or **RIGHT** arrow key to begin editing the parameter. (Use the **LEFT** arrow key to go back without changing the value).
   For numerical data, toggle through the digits **0-9, decimal point**, and **dash**. For alphabetical data, toggle through the letters of the alphabet **A-Z,** digits **0-9**, and the symbols **?, &, +, -, *, /, $, @,%,** and the **blank space**.

3. Use the **RIGHT** arrow key to highlight each character you want to change and then use the **UP** or **DOWN** arrow keys to select the value. If you go past a character that you wish to change, keep using the **RIGHT** arrow key to wrap around in order to arrive at the character you want to change.

4. Press "**E**" (the **LEFT** arrow key) when all changes are complete to save the entered values. Press the **LEFT** arrow key again to navigate back to the menu tree.

4.2.3 Data entry examples

Press the **DOWN** arrow key twice to access the menu structures shown in Figure 4-2 and Figure 4-3. Use the arrow keys to navigate to the desired parameters to review/change. Parameter values are classified as table values or select values. Table values are available from a predefined list. For parameters such as line size or flow units. Select values are integers. floating point numbers, or character strings and are entered one character at a time using the arrow keys for parameters such as PV URV and calibration number.

Table value example

Setting the sensor size:

1. Press the **DOWN** arrow key twice to access the menu. See Figure 4-2.
2. Using the arrow keys, select line size from the basic setup menu.
3. Press the **UP**/**DOWN** arrow to increase/decrease the sensor size to the next value.
4. When you reach the desired sensor size, press "**E**" (the left arrow).
5. Set the loop to manual if necessary, and press "**E**" again.

After a moment, the LOI will display VALUE STORED SUCCESSFULLY and then display the selected value.

Select value example

Changing the upper range limit:

1. Press the **DOWN** arrow key twice to access the menu. See Figure 4-2.
2. Using the arrow keys, select PV URV from the basic setup menu.
3. Press **RIGHT** arrow key to position the cursor.
4. Press **UP** or **DOWN** to set the number.
5. Repeat steps 3and 4 until desired number is displayed, press "**E**" (the left arrow).
6. Set the loop to manual if necessary, and press "**E**" again.

After a moment, the LOI will display VALUE STORED SUCCESSFULLY and then display the selected value.

4.2.4 Totalizer functionality

Start totalizer

To start the totalizer, press the **DOWN** arrow to display the totalizer screen and press "**E**" to begin totalization. A symbol will flash in the lower right hand corner indicating that the meter is totalizing.

Pause totalizer

To pause the totalizer, press the **DOWN** arrow to display the totalizer screen and press the **RIGHT** arrow to pause the totalizer. This will hold the current totalizer values on the screen for reading or recording. The totalizer will continue to run even though the values are not changing. To unpause the totalizer, press the **RIGHT** arrow again. The totalizer value will instantly increment to the correct value and continuing running.

Stop totalizer

To stop the totalizer, press the **DOWN** arrow to display the totalizer screen and press "**E**" to end totalization. The flashing symbol will no longer display in the lower right hand corner indicating that the meter has stopped totalizing.

Reset totalizer

To reset the totalizer, press the **DOWN** arrow to display the totalizer screen and follow the procedure above to stop totalization. Once totalization has stopped, press the **RIGHT** arrow key to reset the NET total value to zero. To reset the GROSS, FORWARD, and REVERSE total values, you must change the line size. See "Basic configuration" on page 34 for details on how to change the line size.

4.2.5 Display lock

The 8732EM transmitter has display lock functionality to prevent unintentional configuration changes. The display can be locked manually or configured to automatically lock after a set period of time.

Manual display lock

To activate hold the **UP** arrow for 3 seconds and then following the on-screen instructions. When the display lock is activated, a lock symbol will appear in the lower right hand corner of the display. To deactivate the display lock, hold the **UP** arrow for 3 seconds and follow the on-screen instructions. Once deactivated, the lock symbol will no longer appear in the lower right hand corner of the display.

Auto display lock

1. Press the **DOWN** arrow key twice to access the menu. See Table 4-2.
2. Using the arrow keys, select LOI config from the Detailed Setup menu.
3. Press **DOWN** arrow to highlight disp auto lock and press the **RIGHT** arrow to enter the menu.
4. Press **DOWN** arrow to select the auto lock time.
5. When you reach the desired time, press "**E**" (the left arrow).
6. Set the loop to manual if necessary, and press "**E**" again.

After a moment, the LOI will display VALUE STORED SUCCESSFULLY and then display the selected value.

4.2.6 Diagnostic messages

Diagnostic messages may appear on the LOI. See Table 6-1 on page 111, Table 6-2 on page 126, and Table 6-3 on page 127 for a complete list of messages, potential causes, and corrective actions for these messages.

4.2.7 Display symbols

When certain transmitter functions are active, a symbol will appear in the lower-right corner of the display. The possible symbols include the following:

Display Lock 

Totalizer 

Reverse flow R

Continuous meter verification ✓

Figure 4-2. Local Operator Interface (LOI) Menu Tree (Diagnostics and Basic Setup)

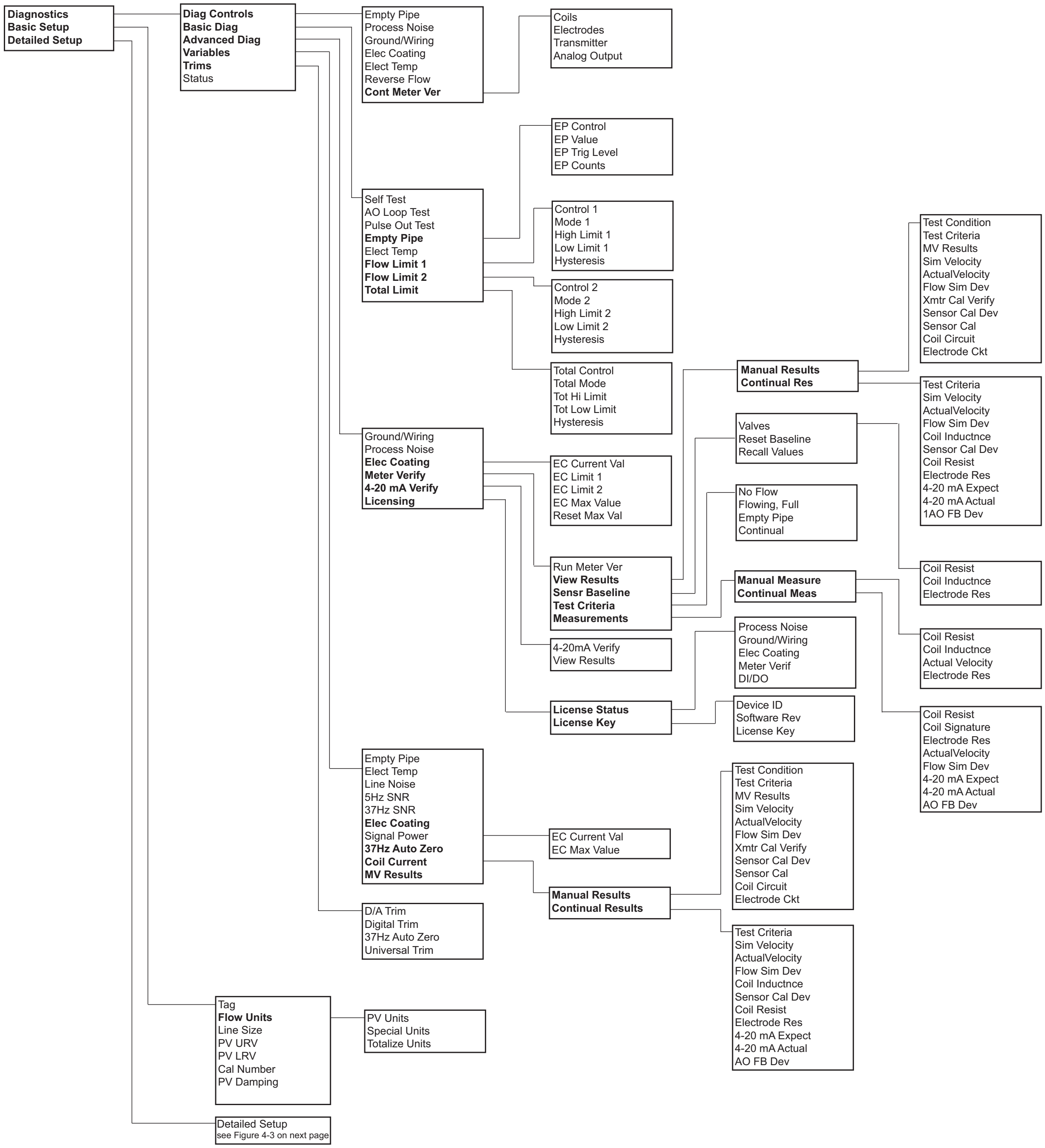
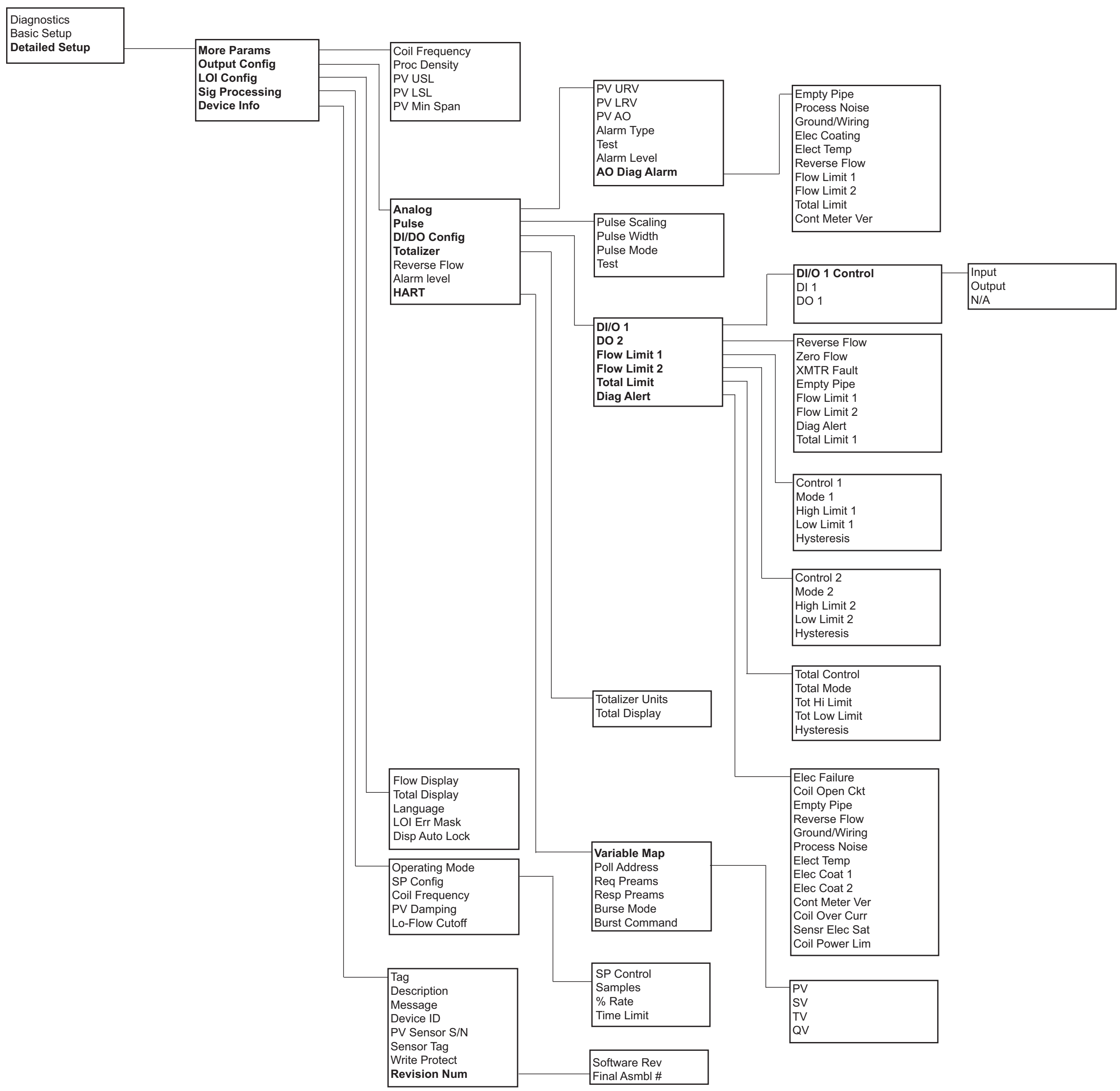


Figure 4-3. Local Operator Interface (LOI) Menu Tree (Detailed Setup)



4.3 Field Communicator interface

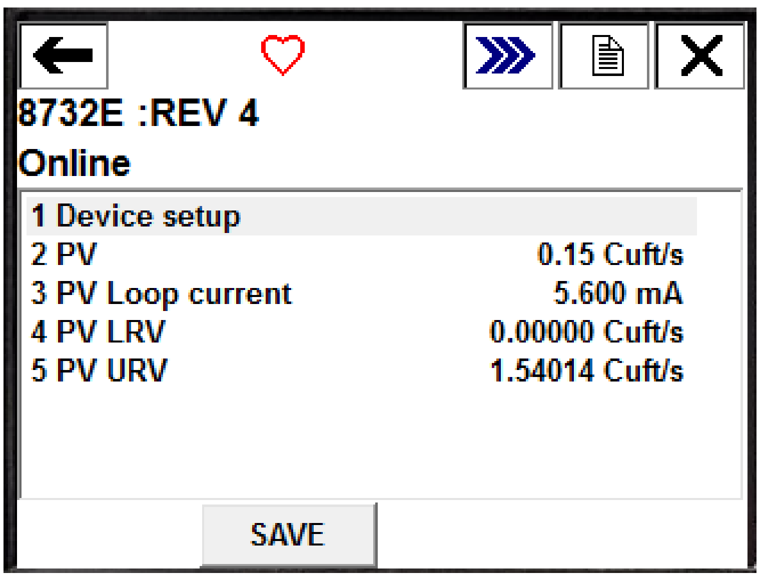
The 8732EM transmitter can be configured with a Field Communicator using HART® Protocol gaining access to the software functions, transmitter configurations, and diagnostic settings. Refer to the Field Communicator Manual for detailed instructions on how to connect to the device.

4.3.1 Field Communicator user interface

The 8732E device driver uses conditional formatting menus. If the diagnostic is not active, the diagnostic will not be displayed as a menu item in the Field Communicator. The Fast Key sequence and menu trees will be resequenced accordingly.

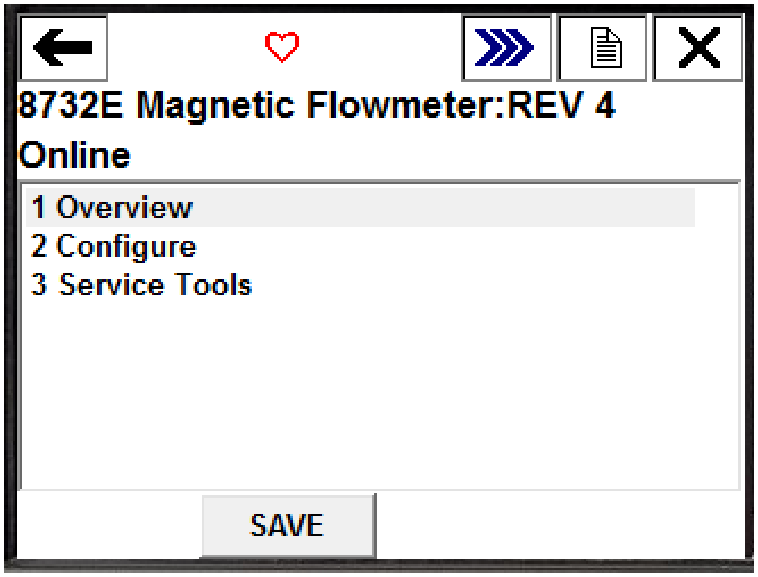
There are two styles of interface available for Field Communicators. The traditional interface is shown in Figure 4-4. The device dashboard interface is shown in Figure 4-5.

Figure 4-4. Traditional Interface



The traditional interface Fast Keys are located in Table 4-1 on page 65. The corresponding menu trees are located Figure 4-6 on page 81 and Figure 4-7 on page 82.

Figure 4-5. Device Dashboard Interface



The device dashboard interface Fast Keys are located in Table 4-2 on page 74. The corresponding menu tree is located Figure 4-8 on page 83 and Figure 4-9 on page 84.

Table 4-1. Traditional Field Communicator Fast Keys

Function	Traditional Fast Keys
Process variables	**1, 1**
Primary Variable (PV)	1, 1, 1
PV Percent of Range (PV % rnge)	1, 1, 2
PV Analog Output (AO) (PV Loop current)	1, 1, 3
Totalizer Setup	1, 1, 4
Totalizer Units	1, 1, 4, 1
Gross Total	1, 1, 4, 2
Net Total	1, 1, 4, 3
Reverse Total	1, 1, 4, 4
Start Totalizer	1, 1, 4, 5
Stop Totalizer	1, 1, 4, 6
Reset Totalizer	1, 1, 4, 7
Pulse Output	1, 1, 5
Diagnostics	**1, 2**
Diag Controls	1, 2, 1
Diagnostic Controls	1, 2, 1, 1
Empty Pipe	1, 2, 1, 1, --(1)
Process Noise	1, 2, 1, 1, --(1)
Grounding/Wiring	1, 2, 1, 1, --(1)
Electrode Coating	1, 2, 1, 1, --(1)

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Electronics Temp	1, 2, 1, 1, --[(1)]
Reverse Flow	1, 2, 1, 2
Continual Ver.	1, 2, 1, 3
Coils	1, 2, 1, 3, 1 --[(1)]
Electrodes	1, 2, 1, 3, 2 --[(1)]
Transmitter	1, 2, 1, 3, 3 --[(1)]
Analog Output	1, 2, 1, 3, 4 --[(1)]
Basic Diagnostics	1, 2, 2
Self Test	1, 2, 2, 1
AO Loop Test	1, 2, 2, 2
4 mA	1, 2, 2, 2, 1
20 mA	1, 2, 2, 2, 2
Simulate Alarm	1, 2, 2, 2, 3
Other	1, 2, 2, 2, 4
End	1, 2, 2, 2, 5
Pulse Output Loop Test	1, 2, 2, 3
Tune Empty Pipe	1, 2, 2, 4
EP Value	1, 2, 2, 4, 1
EP Trig. Level	1, 2, 2, 4, 2
EP Counts	1, 2, 2, 4, 3
Electronics Temp	1, 2, 2, 5
Flow Limit 1	1, 2, 2, 6
Control 1	1, 2, 2, 6, 1
Mode 1	1, 2, 2, 6, 2
High Limit 1	1, 2, 2, 6, 3
Low Limit 1	1, 2, 2, 6, 4
Flow Limit Hysteresis	1, 2, 2, 6, 5
Flow Limit 2	1, 2, 2, 7
Control 2	1, 2, 2, 7, 1
Mode 2	1, 2, 2, 7, 2
High Limit 2	1, 2, 2, 7, 3
Low Limit 2	1, 2, 2, 7, 4
Flow Limit Hysteresis	1, 2, 2, 7, 5
Total Limit	1, 2, 2, 8
Total Control	1, 2, 2, 8, 1
Total Mode	1, 2, 2, 8, 2
Total High Limit	1, 2, 2, 8, 3
Total Low Limit	1, 2, 2, 8, 4

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Total Limit Hysteresis	1, 2, 2, 8, 5
Advanced Diagnostics	1, 2, 3
Electrode Coat	1, 2, 3, 1
EC Value	1, 2, 3, 1, 1
EC Level 1 Limit	1, 2, 3, 1, 2
EC Level 2 Limit	1, 2, 3, 1, 3
Max EC Value	1, 2, 3, 1, 4
Clear Max Electrode	1, 2, 3, 1, 5
8714i Cal Verification	1, 2, 3, 2
Run 8714i Cal Verification	1, 2, 3, 2, 1
View Results	1, 2, 3, 2, 2
Manual Results	1, 2, 3, 2, 2, 1
Test Condition	1, 2, 3, 2, 2, 1, 1
Test Criteria	1, 2, 3, 2, 2, 1, 2
8714i Test Result	1, 2, 3, 2, 2, 1, 3
Simulated Velocity	1, 2, 3, 2, 2, 1, 4
Actual Velocity	1, 2, 3, 2, 2, 1, 5
Velocity Deviation	1, 2, 3, 2, 2, 1, 6
Xmter Cal Test Result	1, 2, 3, 2, 2, 1, 7
Sensor Cal Deviation	1, 2, 3, 2, 2, 1, 8
Sensor Cal Test Result	1, 2, 3, 2, 2, 1, 9
Coil Circuit Test Result(2)	1, 2, 3, 2, 2, 1, 10(2)
Electrode Circuit Test Result(2)	1, 2, 3, 2, 2, 1, 11(2)
Continual Results	1, 2, 3, 2, 2, 2
Continuous Limit	1, 2, 3, 2, 2, 2, 1
Simulated Velocity	1, 2, 3, 2, 2, 2, 2
Actual Velocity	1, 2, 3, 2, 2, 2, 3
Velocity Deviation	1, 2, 3, 2, 2, 2, 4
Coil Signature	1, 2, 3, 2, 2, 2, 5
Sensor Cal Deviation	1, 2, 3, 2, 2, 2, 6
Coil Resistance	1, 2, 3, 2, 2, 2, 7
Electrode Resistance	1, 2, 3, 2, 2, 2, 8
mA Expected	1, 2, 3, 2, 2, 2, 9
mA Actual(2)	1, 2, 3, 2, 2, 2, 10(2)
mA Deviation(2)	1, 2, 3, 2, 2, 2, 11(2)
Sensor Signature	1, 2, 3, 2, 3
Signature Values	1, 2, 3, 2, 3, 1

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Coil Resistance	1, 2, 3, 2, 3, 1, 1
Coil Signature	1, 2, 3, 2, 3, 1, 2
Electrode Resistance	1, 2, 3, 2, 3, 1, 3
Re-Signature Meter	1, 2, 3, 2, 3, 2
Recall Last Saved Values	1, 2, 3, 2, 3, 3
Set Pass/Fail Criteria	1, 2, 3, 2, 4
No Flow Limit	1, 2, 3, 2, 4, 1
Flowing Limit	1, 2, 3, 2, 4, 2
Empty Pipe Limit	1, 2, 3, 2, 4, 3
Continuous Limit	1, 2, 3, 2, 4, 4
Measurements	1, 2, 3, 2, 5
Manual Measurements	1, 2, 3, 2, 5, 1
Coil Resistance	1, 2, 3, 2, 5, 1, 1
Coil Signature	1, 2, 3, 2, 5, 1, 2
Electrode Resistance	1, 2, 3, 2, 5, 1, 3
Continual Measurements	1, 2, 3, 2, 5, 2
Coil Resistance	1, 2, 3, 2, 5, 2, 1
Coil Signature	1, 2, 3, 2, 5, 2, 2
Electrode Resistance	1, 2, 3, 2, 5, 2, 3
Actual Velocity	1, 2, 3, 2, 5, 2, 4
mA Expected	1, 2, 3, 2, 5, 2, 5
mA Actual	1, 2, 3, 2, 5, 2, 6
4-20 mA Verify	1, 2, 3, 3
4-20 mA Verification	1, 2, 3, 3, 1
View Results	1, 2, 3, 3, 2
Licensing	1, 2, 3, 4
License Status	1, 2, 3, 4, 1
Process Noise Detect	1, 2, 3, 4, 1, 1 --[(1)]
Line Noise Detection	1, 2, 3, 4, 1, 2 --[(1)]
Electrode Coating	1, 2, 3, 4, 1, 3 --[(1)]
8714i	1, 2, 3, 4, 1, 4 --[(1)]
Digital I/O	1, 2, 3, 4, 1, 5 --[(1)]
License Key	1, 2, 3, 4, 2
Device ID	1, 2, 3, 4, 2, 1
License Key	1, 2, 3, 4, 2, 2
Diagnostic Variables	1, 2, 4
EP Value	1, 2, 4, 1
Electronics Temp	1, 2, 4, 2

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Line Noise	1, 2, 4, 3
5 Hz SNR	1, 2, 4, 4
37 Hz SNR	1, 2, 4, 5
Electrode Coat	1, 2, 4, 6
EC Value	1, 2, 4, 6, 1
Max EC Value	1, 2, 4, 6, 2
Sig Power	1, 2, 4, 7
8714i Results	1, 2, 4, 8
Manual Results	1, 2, 4, 8, 1
Test Condition	1, 2, 4, 8, 1, 1
Test Criteria	1, 2, 4, 8, 1, 2
8714i Test Result	1, 2, 4, 8, 1, 3
Simulated Velocity	1, 2, 4, 8, 1, 4
Actual Velocity	1, 2, 4, 8, 1, 5
Velocity Deviation	1, 2, 4, 8, 1, 6
Xmtr Cal Test Result	1, 2, 4, 8, 1, 7
Sensor Cal Deviation	1, 2, 4, 8, 1, 8
Sensor Cal Test Result	1, 2, 4, 8, 1, 9
Coil Circuit Test Result	1, 2, 4, 8, 1, 10(2)
Electrode Circuit Test Result	1, 2, 4, 8, 1, 11(2)
Continual Results	1, 2, 4, 8, 2
Continuous Limit	1, 2, 4, 8, 2, 1
Simulated Velocity	1, 2, 4, 8, 2, 2
Actual Velocity	1, 2, 4, 8, 2, 3
Velocity Deviation	1, 2, 4, 8, 2, 4
Coil Signature	1, 2, 4, 8, 2, 5
Sensor Cal Deviation	1, 2, 4, 8, 2, 6
Coil Resistance	1, 2, 4, 8, 2, 7
Electrode Resistance	1, 2, 4, 8, 2, 8
mA Expected	1, 2, 4, 8, 2, 9
mA Actual	1, 2, 4, 8, 2, 10(2)
mA Deviation	1, 2, 4, 8, 2, 11(2)
Auto Zero Offset	1, 2, 4, 9
Trims	1, 2, 5
D/A Trim	1, 2, 5, 1
Scaled D/A Trim	1, 2, 5, 2
Digital Trim	1, 2, 5, 3

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Auto Zero	1, 2, 5, 4
Universal Trim	1, 2, 5, 5
View Status	1, 2, 6
Basic setup	**1, 3**
Tag	1, 3, 1
Flow Units	1, 3, 2
PV Units	1, 3, 2, 1
Special Units	1, 3, 2, 2
Volume Unit	1, 3, 2, 2, 1
Base Volume Unit	1, 3, 2, 2, 2
Conversion Number	1, 3, 2, 2, 3
Base Time Unit	1, 3, 2, 2, 4
Flow Rate Unit	1, 3, 2, 2, 5
Line Size	1, 3, 3
PV URV	1, 3, 4
PV LRV	1, 3, 5
Calibration Number	1, 3, 6
PV Damping	1, 3, 7
Detailed setup	**1, 4**
Additional Parameters	1, 4, 1
Coil Drive Frequency	1, 4, 1, 1
Density Value	1, 4, 1, 2
PV USL	1, 4, 1, 3
PV LSL	1, 4, 1, 4
PV Minimum Span	1, 4, 1, 5
Configure Output	1, 4, 2
Analog Output	1, 4, 2, 1
PV URV	1, 4, 2, 1, 1
PV LRV	1, 4, 2, 1, 2
PV Loop Current	1, 4, 2, 1, 3
AO Alarm Type (PV Alrm typ)	1, 4, 2, 1, 4
AO Loop Test	1, 4, 2, 1, 5
D/A Trim	1, 4, 2, 1, 6
Scaled D/A Trim	1, 4, 2, 1, 7
Alarm Level	1, 4, 2, 1, 8
AO Diagnostic Alarm	1, 4, 2, 1, 9
Empty Pipe	1, 4, 2, 1, 9, 1 --(1)

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Reverse Flow	1, 4, 2, 1, 9, 2 --[(1)]
Ground/Wiring Fault	1, 4, 2, 1, 9, 3 --[(1)]
High Process Noise	1, 4, 2, 1, 9, 4 --[(1)]
Elect Temp Out of Range	1, 4, 2, 1, 9, 5 --[(1)]
Electrode Coat Limit 2	1, 4, 2, 1, 9, 6 --[(1)]
Totalizer Limit 1	1, 4, 2, 1, 9, 7 --[(1)]
Flow Limit 1	1, 4, 2, 1, 9, 8 --[(1)]
Flow Limit 2	1, 4, 2, 1, 9, 9 --[(1)]
Cont. Meter Verification	1, 4, 2, 1, 9, 10 --[(1)]
Pulse Output	1, 4, 2, 2
Pulse Scaling	1, 4, 2, 2, 1
Pulse Width	1, 4, 2, 2, 2
Pulse Mode	1, 4, 2, 2, 3
Pulse Out Loop Test	1, 4, 2, 2, 4
DI/DO Output (Digital I/O)	1, 4, 2, 3
DI/DO 1	1, 4, 2, 3, 1
Configure I/O 1	1, 4, 2, 3, 1, 1
Input	1, 4, 2, 3, 1, 1, 1
Output	1, 4, 2, 3, 1, 1, 2
Not Available/Off	1, 4, 2, 3, 1, 1, 3
DIO 1 Control	1, 4, 2, 3, 1, 2
Digital Input 1	1, 4, 2, 3, 1, 3
Digital Output 1	1, 4, 2, 3, 1, 4
DO 2	1, 4, 2, 3, 2
Flow Limit 1	1, 4, 2, 3, 3
Control 1	1, 4, 2, 3, 3, 1
Mode 1	1, 4, 2, 3, 3, 2
High Limit 1	1, 4, 2, 3, 3, 3
Low Limit 1	1, 4, 2, 3, 3, 4
Flow Limit Hysteresis	1, 4, 2, 3, 3, 5
Flow Limit 2	1, 4, 2, 3, 4
Control 2	1, 4, 2, 3, 4, 1
Mode 2	1, 4, 2, 3, 4, 2
High Limit 2	1, 4, 2, 3, 4, 3
Low Limit 2	1, 4, 2, 3, 4, 4
Flow Limit Hysteresis	1, 4, 2, 3, 4, 5
Total Limit	1, 4, 2, 3, 5
Total Control	1, 4, 2, 3, 5, 1

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Total Mode	1, 4, 2, 3, 5, 2
Total High Limit	1, 4, 2, 3, 5, 3
Total Low Limit	1, 4, 2, 3, 5, 4
Total Limit Hysteresis	1, 4, 2, 3, 5, 5
Diagnostic Status Alert	1, 4, 2, 3, 6
Electronics Failure	1, 4, 2, 3, 6, --[1]
Coil Open Circuit	1, 4, 2, 3, 6, --[1]
Empty Pipe	1, 4, 2, 3, 6, --[1]
Reverse Flow	1, 4, 2, 3, 6, --[1]
Ground/Wiring Fault	1, 4, 2, 3, 6, --[1]
High Process Noise	1, 4, 2, 3, 6, --[1]
Elect Temp Out of Range	1, 4, 2, 3, 6, --[1]
Electrode Coat Limit 1	1, 4, 2, 3, 6, --[1]
Electrode Coat Limit 2	1, 4, 2, 3, 6, --[1]
Cont. Meter Verification	1, 4, 2, 3, 6, --[1]
Reverse Flow	1, 4, 2, 4
Totalizer Setup	1, 4, 2, 5
Totalizer Units	1, 4, 2, 5, 1
Gross Total	1, 4, 2, 5, 2
Net Total	1, 4, 2, 5, 3
Reverse Total	1, 4, 2, 5, 4
Start Totalizer	1, 4, 2, 5, 5
Stop Totalizer	1, 4, 2, 5, 6
Reset Totalizer	1, 4, 2, 5, 7
Alarm Levels	1, 4, 2, 6
Alarm Level	1, 4, 2, 6, 1
Hi Alarm	1, 4, 2, 6, 2
Hi Sat	1, 4, 2, 6, 3
Low Sat	1, 4, 2, 6, 4
Low Alarm	1, 4, 2, 6, 5
HART Output	1, 4, 2, 7
Variable Mapping	1, 4, 2, 7, 1
PV is	1, 4, 2, 7, 1, 1
SV is	1, 4, 2, 7, 1, 2
TV is	1, 4, 2, 7, 1, 3
QV is	1, 4, 2, 7, 1, 4
Poll Address	1, 4, 2, 7, 2
Num Req Preams	1, 4, 2, 7, 3

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Num Resp Preams	1, 4, 2, 7, 4
Burst Mode	1, 4, 2, 7, 5
Burst Option	1, 4, 2, 7, 6
PV	1, 4, 2, 7, 6, --(1)
% Range/Current	1, 4, 2, 7, 6, --(1)
Process Vars/Current	1, 4, 2, 7, 6, --(1)
Dynamic Vars	1, 4, 2, 7, 6, --(1)
LOI Config	1, 4, 3
Language	1, 4, 3, 1
Flowrate Display	1, 4, 3, 2
Totalizer Display	1, 4, 3, 3
Display Lock	1, 4, 3, 4
Meter type	1, 4, 3, 5
LOI Error Mask	1, 4, 3, 6
Signal Processing	1, 4, 4
Operating Mode	1, 4, 4, 1
Man Config DSP	1, 4, 4, 2
Status	1, 4, 4, 2, 1
Samples	1, 4, 4, 2, 2
% Limit	1, 4, 4, 2, 3
Time Limit	1, 4, 4, 2, 4
Coil Drive Freq	1, 4, 4, 3
Low Flow Cutoff	1, 4, 4, 4
PV Damping	1, 4, 4, 5
Universal Trim	1, 4, 5
Device Info	1, 4, 6
Manufacturer	1, 4, 6, 1
Tag	1, 4, 6, 2
Descriptor	1, 4, 6, 3
Message	1, 4, 6, 4
Date	1, 4, 6, 5
Device ID	1, 4, 6, 6
PV Sensor S/N	1, 4, 6, 7
Sensor Tag	1, 4, 6, 8
Write protect	1, 4, 6, 9
Revision No.	1, 4, 6, 10(2)
Universal Rev	1, 4, 6, 10, 1--(2)
Transmitter Rev	1, 4, 6, 10, 2--(2)

Table 4-1. Traditional Field Communicator Fast Keys (continued)

Function	Traditional Fast Keys
Software Rev	1, 4, 6, 10, 3--[(2)]
Final Assembly #	1, 4, 6, 10, 4--[(2)]
Construction Materials	1, 4, 6, 11[(2)]
Flange Type	1, 4, 6, 11,1--[(2)]
Flange Material	1, 4, 6, 11, 2--[(2)]
Electrode Type	1, 4, 6, 11, 3--[(2)]
Electrode Material	1, 4, 6, 11, 4--[(2)]
Liner Material	1, 4, 6, 11, 5--[(2)]
Device Reset	1, 4, 7
Review	**1, 5**

(1) These items are in a list format without numeric labels.
(2) To access these features, you must scroll to this option in the HART Field Communicator.

Table 4-2. Device Dashboard Fast Keys

Function	Fast Keys
Overview	**1**
Device Status	1,1
Flow Rate	1,2
Analog Output Value	1,3
Upper Range Value	1,4
Lower Range Value	1,5
Run Meter Verificaiton	1,6
Meter Verification Results	1,7
Device Information	1,8
Tag	1,8,1,1
Manufacturer	1,8,1,2
Model	1,8,1,3
Final Assembly Number	1,8,1,4
Device ID	1,8,1,5
Date	1,8,1,6
Description	1,8,1,7
Message	1,8,1,8
Universal Revision	1,8,2,1
Device Revision	1,8,2,2
Software Revision	1,8,2,3
Hardware Revision	1,8,2,4
DD Revision	1,8,2,5
Sensor Serial Number	1,8,3,1
Sensor Tag	1,8,3,2
Calibration Number	1,8,3,3
Line Size	1,8,3,4
Lower Sensor Limit	1,8,3,5
Upper Sensor Limit	1,8,3,6
Minimum Span	1,8,3,7

Table 4-2. Device Dashboard Fast Keys (continued)

Function	Fast Keys
Liner Material	1,8,3,8,1
Electrode Type	1,8,3,8,2
Electrode Material	1,8,3,8,3
Flange Type	1,8,3,8,4
Flange Material	1,8,3,8,5
Write Protect	1,8,4,1
Alarm Direction	1,8,4,2
Alarm Type	1,8,4,3
High Alarm	1,8,4,4
High Saturation	1,8,4,5
Low Saturation	1,8,4,6
Low Alarm	1,8,4,7
Licenses	1,8,5
Configure	**2**
Guided Setup	2,1
Initial Setup	2,1,1
Basic Setup	2,1,1,1
Configure Display	2,1,1,2
Special Units	2,1,1,3
Outputs	2,1,2
Analog Output	2,1,2,1
Pulse Output	2,1,2,2
Dicrete Input/Output	2,1,2,3
Totalizer	2,1,2,4
Reverse Flow	2,1,2,5
Burst Mode	2,1,2,7
Variable Mapping	2,1,2,8
Diagnostics	2,1,3
Configure Basic Diagnostics	2,1,3,1
Upgrade License	2,1,3,2
Configure Process Diagnostics	2,1,3,3
Configure Meter Verification	2,1,3,4
Re-Baseline Sensor	2,1,3,5
Alerts	2,1,4
User Alert Conifguration	2,1,4,1
Analog Alarm Configuration	2,1,4,2
Optimize Signal Processing	2,1,5
Manual Setup	2,2
Flow Units	2,2,1,2
Lower Range Value	2,2,1,3,2
Upper Range Value	2,2,1,3,3
Damping	2,2,1,3,4
Calibration Number	2,2,1,4,1
Line Size	2,2,1,4,2
Language	2,2,1,5,1
Flow Display	2,2,1,5,2

Table 4-2. Device Dashboard Fast Keys (continued)

Function	Fast Keys
Totalizer Display	2,2,1,5,3
Display Lock	2,2,1,5,4
Density	2,2,2,1,6
Pulse Mode	2,2,2,2,2
Pulse Scaling	2,2,2,2,3
Pulse Width	2,2,2,2,4
Net Total	2,2,2,3,1
Gross Total	2,2,2,3,2
Reverse Total	2,2,2,3,3
Totalizer Control	2,2,2,3,4
Totalizer Units	2,2,2,3,5
Polling Address	2,2,3,1,1
Burst Option	2,2,3,1,3
Primary Variable	2,2,3,2,1
Secondary Variable	2,2,3,2,2
Third Variable	2,2,3,2,3
Fourth Variable	2,2,3,2,4
Discrete I/O 1 Direction	2,2,4,1,1
Dicrete Input 1	2,2,4,1,2
Discrete Output 1	2,2,4,1,3
Discrete Output 2	2,2,4,2
Flow Limit 1	2,2,4,3
High Limit 1	2,2,4,3,1
Low Limit 1	2,2,4,3,2
Limit 1 Control	2,2,4,3,3
Limit 1 Status Alert	2,2,4,3,4
Flow Limit 2	2,2,4,4
High Limit 2	2,2,4,4,1
Low Limit 2	2,2,4,4,2
Limit 2 Control	2,2,4,4,3
Limit 2 Status Alert	2,2,4,4,4
Flow Hysteresis	2,2,4,6
Totalizer Limit	2,2,4,5
Totalizer High Limit	2,2,4,5,1
Totalizer LowLimit	2,2,4,5,2
Totalizer Limit Control	2,2,4,5,3
Totalizer Limit Status Alert	2,2,4,5,4
Totalizer Hysteresis	2,2,4,7
Diagnostics Status Alert	2,2,4,8
Enable Diagnostics	2,2,5,1
License Status	2,2,5,2
Empty Pipe Value	2,2,5,3,1
Empty Pipe Trigger Level	2,2,5,3,2
Empty Pipe Counts	2,2,5,3,3
Electrode Coating Value	2,2,5,6,1
Electrode Coating Level 1 Limit	2,2,5,6,2
Electrode Coating Level 2 Limit	2,2,5,6,3

Table 4-2. Device Dashboard Fast Keys (continued)

Function	Fast Keys
Electrode Coating Maximum Value	2,2,5,6,4
Reset Maximum Electrode Coating Value	2,2,5,6,5
Diagnostic Analog Alarm	2,2,5,9
Recall Last Baseline	2,2,6,1,5
No Flow Limit	2,2,6,3,1
Flowing Limit	2,2,6,3,2
Empty Pipe Limit	2,2,6,3,3
Continuous Meter Verification Limit	2,2,6,4,1
Enable Continuous Meter Verification Parameters	2,2,6,4,2
Coils	2,2,6,4,2,1
Electrodes	2,2,6,4,2,2
Transmitter	2,2,6,4,2,3
Analog Output (Continuous Meter Verification)	2,2,6,4,2,4
Coil Drive Frequency	2,2,8,3
Auto Zero	2,2,8,4
Digital Signal Processing (DSP) Operation	2,2,8,5
DSP Control	2,2,8,6,1
Number of Samples	2,2,8,6,2
Percent of Rate	2,2,8,6,3
Time Limit	2,2,8,6,4
Tag	2,2,9,1,1
Date	2,2,9,3,1
Description	2,2,9,3,2
Message	2,2,9,3,3
Sensor Serial Number	2,2,9,4,1
Sensor Tag	2,2,9,4,2
Liner Material	2,2,9,4,3,1
Electrode Type	2,2,9,4,3,2
Electrode Material	2,2,9,4,3,3
Flange Type	2,2,9,4,3,4
Flange Material	2,2,9,4,3,5
Alarm Type	2,2,9,5,2
Alert Setup	2,3
Flow/Totalizer Limits	2,3,1
Diagnostics	2,3,2
Flow Limit 1	2,3,3
Flow Limit 2	2,3,4
Totalizer Limit	2,3,5
Analog Alarm	2,3,6
Discrete Output Alert	2,3,7
Calibration	2,4
Universal Trim	2,4,1
Service tools	**3**
Alerts	3,1

Table 4-2. Device Dashboard Fast Keys (continued)

Function	Fast Keys
Refresh Alerts	3,1,1
Active Alerts	3,1,2
Variables	3,2
Flow Rate	3,2,1,1
Pulse Output	3,2,1,2
Analog Output	3,2,1,3
Net Total	3,2,1,4,1
Gross Total	3,2,1,4,2
Reverse Total	3,2,1,4,3
Empty Pipe Value	3,2,2,1
Electronics Temperature	3,2,2,2
Coil Current	3,2,2,3
Line Noise	3,2,3,1
Electrode Coating Value	3,2,3,2
5 Hz Signal-to-Noise Ratio	3,2,3,3,1
37 Hz Signal-to-Noise Ratio	3,2,3,3,2
Signal Power	3,2,3,3,3
Continuous Meter Verification	3,2,4
Baseline Coil Resistance	3,2,4,1,1
Baseline Coil Inductance	3,2,4,1,2
Baseline Electrode Resistance	3,2,4,1,3
Continuous Sensor Measurements	3,2,4,2
Continuous Measured Coil Resistance	3,2,4,2,1
Continuous Measured Coil Inductance	3,2,4,2,2
Continuous Coil Baseline Deviation	3,2,4,2,3
Continuous Measured Electrode Resistance	3,2,4,2,4
Continuous Transmitter Measurements	3,2,4,3
Continuous Simulated Velocity	3,2,4,3,1
Continuous Actual Velocity	3,2,4,3,2
Continuous Velocity Deviation	3,2,4,3,3
Continuous Analog Output Measurements	3,2,4,4
Continuous Expected mA Value	3,2,4,4,1
Continuous Actual mA Value	3,2,4,4,2
Continuous mA Deviation	3,2,4,4,3
Trends	3,3
Flow Rate Trend	3,3,1
Empty Pipe Trend	3,3,2
Electronics Temperature Trend	3,3,3
Line Noise Trend	3,3,4
5 Hz Signal-to-Noise Ratio Trend	3,3,5
37 Hz Signal-to-Noise Ratio Trend	3,3,6
Coil Inductance Trend	3,3,7
Coil Resistance Trend	3,3,8
Electrode Resistance Trend	3,3,9

Table 4-2. Device Dashboard Fast Keys (continued)

Function	Fast Keys
Maintenance	3,4
Re-Baseline Sensor	3,4,1,1,4
Recall Last Baseline	3,4,1,1,5
No Flow Limit	3,4,1,2,1
Flowing Limit	3,4,1,2,2
Empty Pipe Limit	3,4,1,2,3
Manual Sensor Measurements	3,4,1,3
Manual Measured Coil Resistance	3,4,1,3,1
Manual Measured Coil Inductance	3,4,1,3,2
Manual Measured Electrode Resistance	3,4,1,3,3
Run Manual Meter Verification	3,4,1,4
Manual Meter Verification Results	3,4,1,5
Manual Coil Circuit Test Result	3,4,1,5,1,3
Manual Electrode Circuit Test Result	3,4,1,5,1,6
Manual Sensor Deviation	3,4,1,5,2,3
Manual Sensot Test Result	3,4,1,5,2,4
Manual Simulated Velocity	3,4,1,5,3,1
Manual Actual Velocity	3,4,1,5,3,2
Manual Transmitter Deviation	3,4,1,5,3,3
Manual Transmitter Test Result	3,4,1,5,3,4
Manul Test Conditions	3,4,1,5,4,1
Manual Overall Test Result	3,4,1,5,4,2
Continuous Meter Verification Limit	3,4,2,2
Enable Continuous Meter Verification Parameters	3,4,2,3
Coils	3,4,2,3,1
Electrodes	3,4,2,3,2
Transmitter	3,4,2,3,3
Analog Output (Continuous Meter Verification)	3,4,2,3,4
4-20 mA Verification	3,4,3
Run Manual 4-20 mA Verification	3,4,3,1
4 mA Measurement	3,4,3,2
12 mA Measurement	3,4,3,3
20 mA Measurement	3,4,3,4
Low Alarm Measurement	3,4,3,5
High Alarm Measurement	3,4,3,6
Analog D/A Trim	3,4,4,5
Scaled Analog D/A Trim	3,4,4,6
Electronics (Digital) Trim	3,4,5
Master Reset	3,4,6
Simulate	3,5
Analog Loop Test	3,5,1,1
Pulse Loop Test	3,5,2,1

Figure 4-6. Field Communicator Traditional Menu Tree (Basic Setup and Detailed Setup)

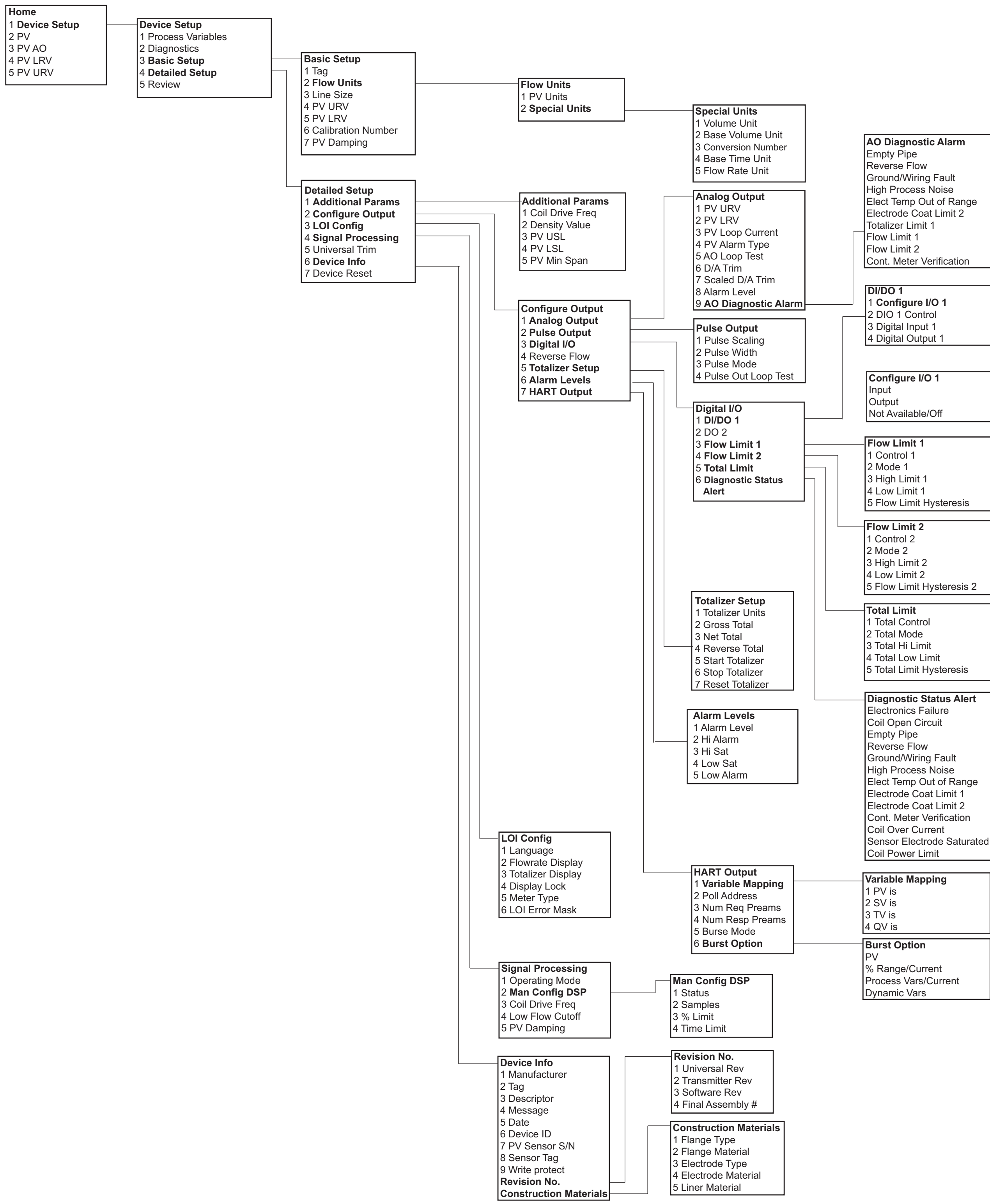


Figure 4-7. Field Communicator Traditional Menu Tree (Process Variables and Diagnostics)

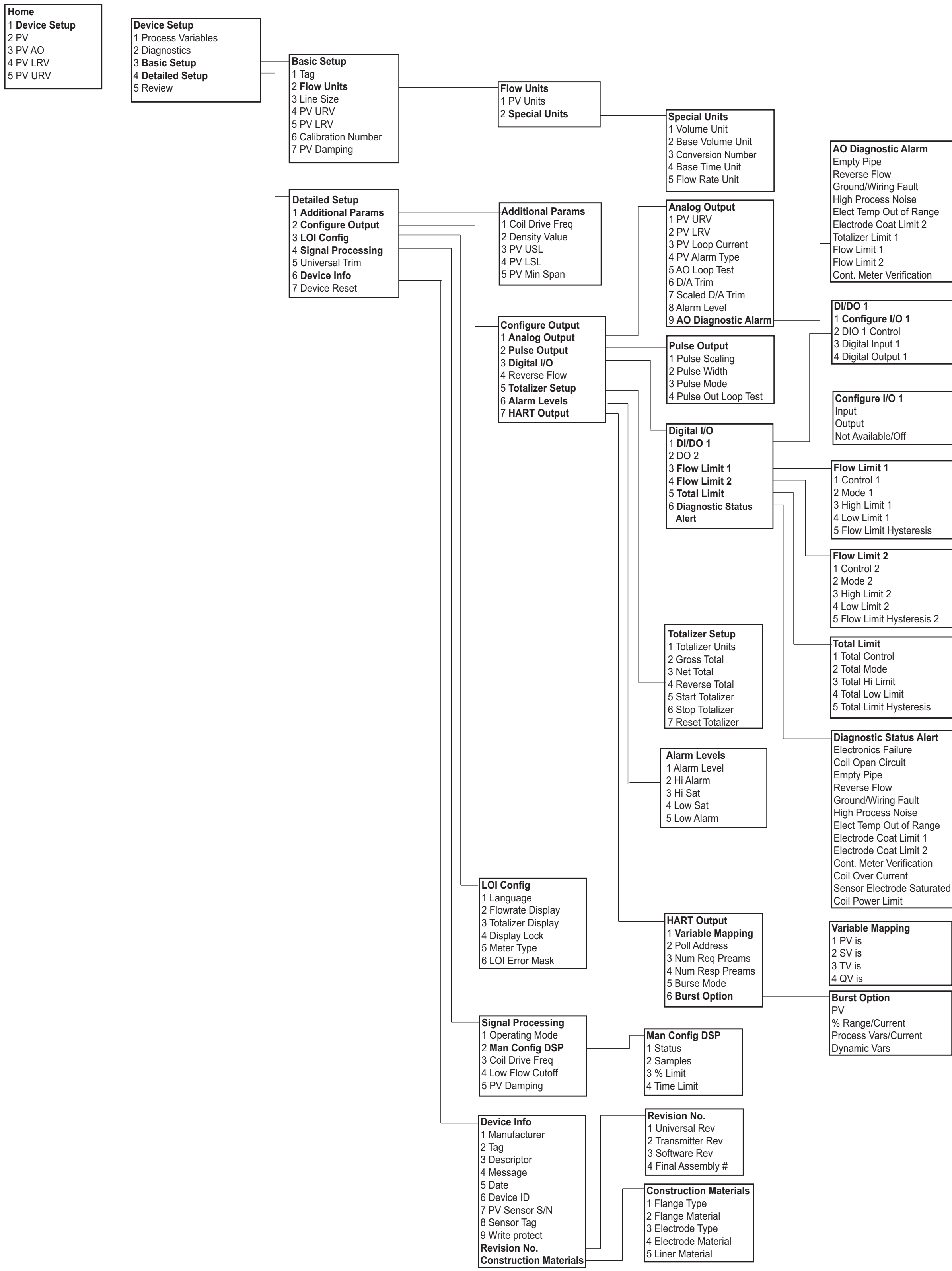


Figure 4-8. Field Communicator Dashboard Menu Tree (Overview and Configuring Guided/Manual Setup)

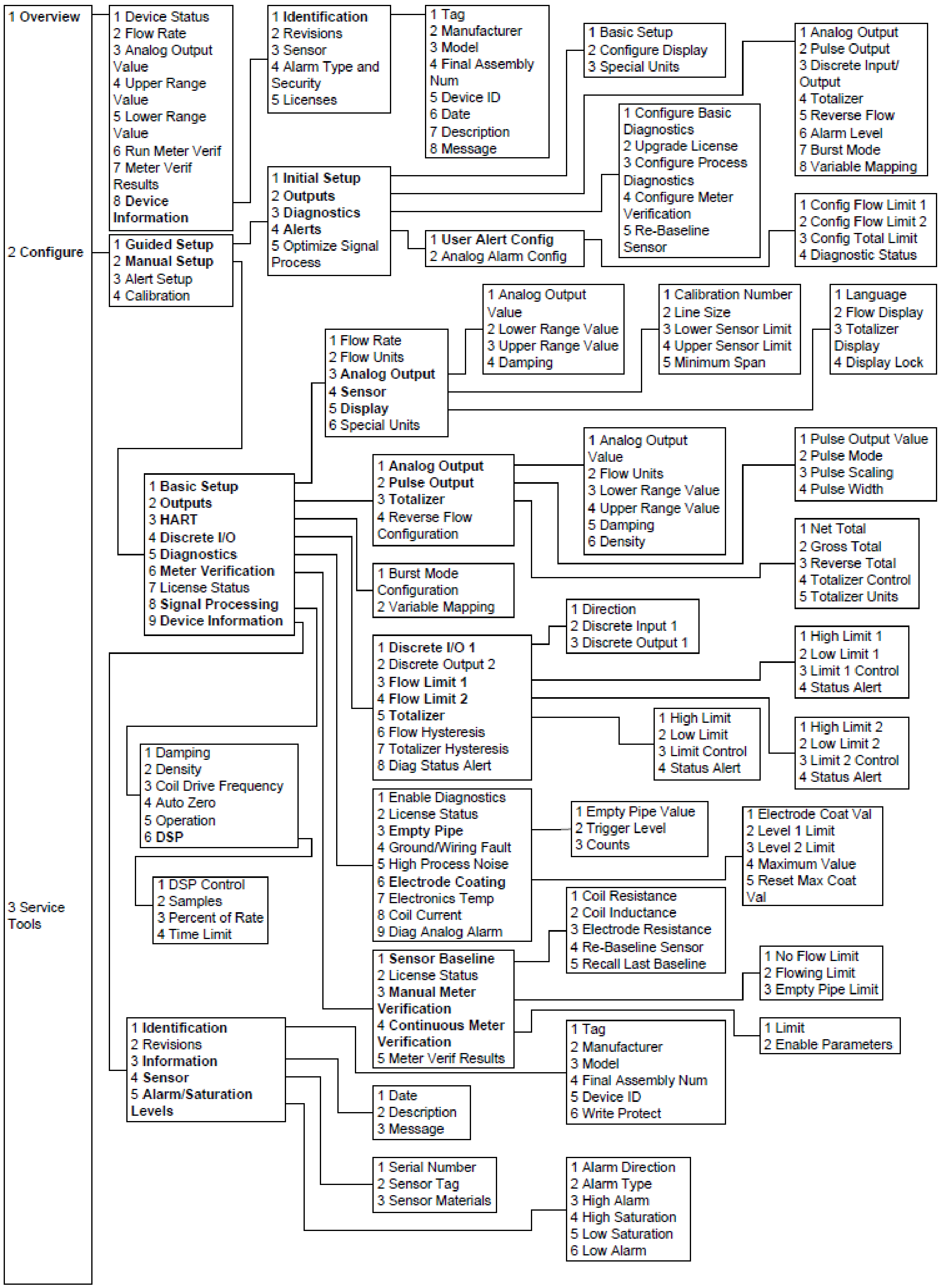
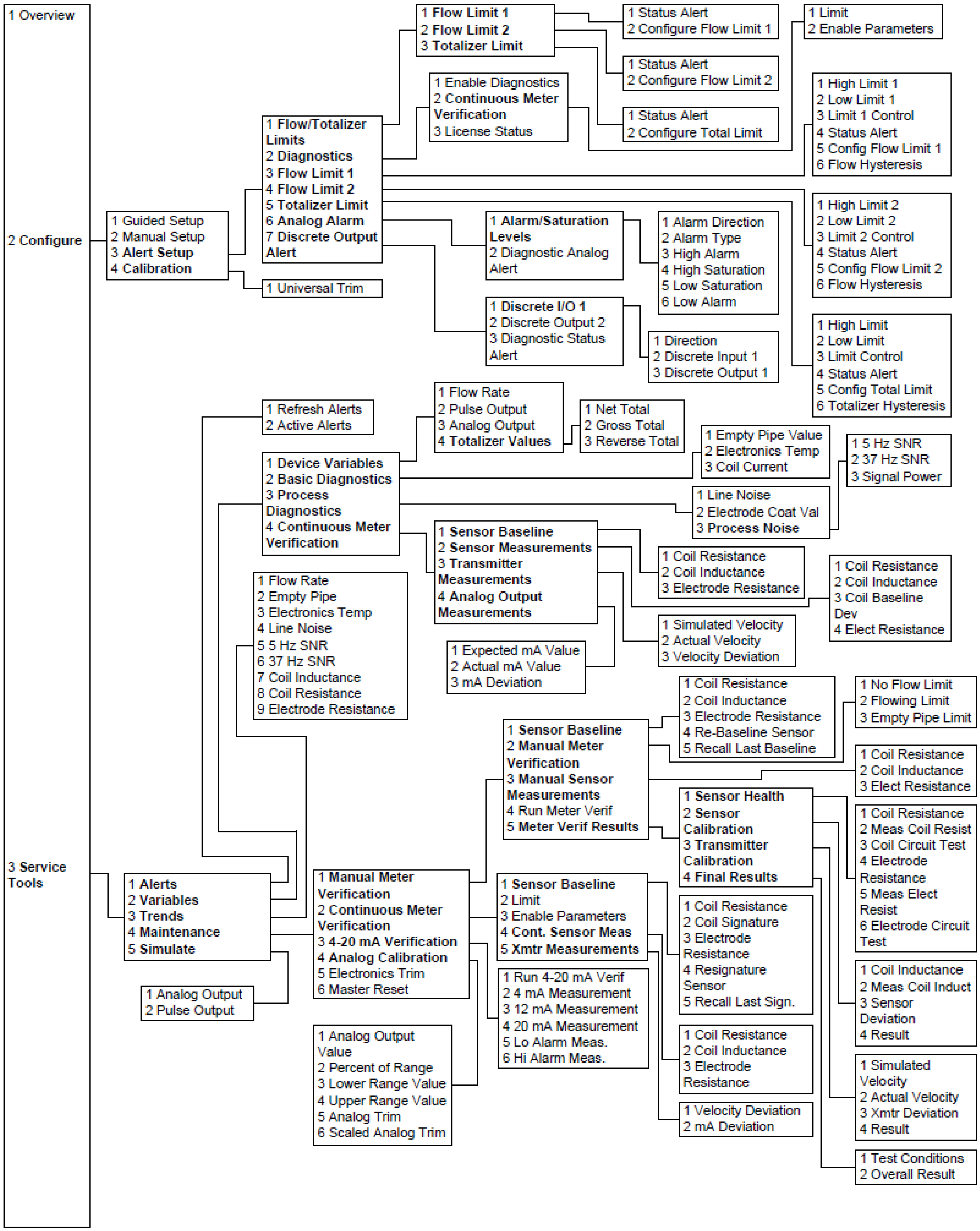


Figure 4-9. Field Communicator Dashboard Menu Tree (Configuring Alert Setup and Service Tools)



4.4 Process variables

LOI menu path	N/A
Traditional Fast Keys	1,1
Device dashboard	1

Process variables are available through the Field Communicator or AMS software suite. These variables display flow in several ways that reflect your needs and the configuration of your flowmeter. When commissioning a flowmeter, review each process variable, its function and output, and take corrective action if necessary before using the flowmeter in a process application.

Primary variable (PV) - The actual measured flow rate of the process fluid. Use the flow units function to select the units for your application.

Percent of range - The process variable as a percentage of the analog output range, provides an indication where the current flow of the meter is within the configured range of the flowmeter. For example, the analog output range may be defined as 0 gal/min to 20 gal/min. If the measured flow is 10 gal/min, the percent of range is 50 percent.

Analog output - The analog output variable provides the analog value for the flow rate. The analog output refers to the industry standard output in the 4-20 mA range. The analog output and 4-20 mA loop can be verified using the Analog Feedback diagnostic capability internal to the transmitter (See “4-20 mA loop verification” on page 119).

Pulse output - The pulse output variable provides the pulse value in terms of a frequency for the flow rate.

4.4.1 PV - Primary variable

LOI menu path	Home screen if configured to display flow
Traditional Fast Keys	1,1,1
Device dashboard	1,2

The primary variable shows the current measured flow rate. This value determines the analog output from the transmitter.

4.4.2 PV - Percent of range

LOI menu path	Home screen if configured to display percent span
Traditional Fast Keys	1,1,2
Device dashboard	3,4,4,2

The PV% range shows where in the flow range the current flow value is as a percentage of the configured span.

4.4.3 PV - Analog output

LOI menu path	N/A
Traditional Fast Keys	1,1,3
Device dashboard	1,3

The PV analog output displays the mA output of the transmitter corresponding to the measured flow rate.

4.4.4 Pulse output

LOI menu path	N/A
Traditional Fast Keys	1,1,5
Device dashboard	3,2,1,2

The pulse output displays the value of the pulse signal.

Section 5 Advanced Configuration Functionality

5.1 Introduction

This section contains information for advanced configuration parameters.

The software configuration settings for the Rosemount 8732EM can be accessed through a HART®-based communicator, Local Operator Interface (LOI), AMS, or through a control system. Before operating the 8732EM in an actual installation, you should review all of the factory set configuration data to ensure that they reflect the current application.

5.2 Configure outputs

LOI menu path	Detailed Setup, Output Config
Traditional fast keys	1,4,2
Device dashboard	2,2,2

The configure outputs functionality is used to configure advanced features that control the analog, pulse, auxiliary, and totalizer outputs of the transmitter.

5.2.1 Analog output

LOI menu path	Detailed Setup, Output Config, Analog
Traditional fast keys	1,4,2,1
Device dashboard	2,2,2,1

The analog output function is used to configure all of the features of the 4-20 mA output.

Upper range value

LOI menu path	Detailed Setup, Output Config, Analog, PV URV
Traditional fast keys	1,4,2,1
Device dashboard	2,2,2,1,4

The upper range value (URV) sets the 20 mA point for the analog output. This value is typically set to full-scale flow. The units that appear will be the same as those selected under the units parameter. The URV may be set between –39.3 ft/s to 39.3 ft/s (–12 m/s to 12 m/s) or the equivalent range based on the selected flow units. There must be at least 1 ft/s (0.3 m/s) span or equivalent between the URV and LRV.

Lower range value

LOI menu path	Detailed Setup, Output Config, Analog, PV LRV
Traditional fast keys	1,4,2,1
Device dashboard	2,2,2,1,3

The lower range value (LRV) sets the 4 mA point for the analog output. This value is typically set to zero flow. The units that appear will be the same as those selected under the units parameter. The LRV may be set between –39.3 ft/s to 39.3 ft/s (–12 m/s to 12 m/s) or the equivalent range based on the selected flow units. There must be at least 1 ft/s (0.3 m/s) span or equivalent between the URV and LRV.

Alarm type

LOI menu path	Detailed Setup, Output Config, Analog, Alarm Type
Traditional fast keys	1,4,2,1,4
Device dashboard	2,2,9,5,1

The analog output alarm type displays the position of the alarm switch on the electronics board. There are two available positions for this switch:

- High
- Low

Alarm level

LOI menu path	Detailed Setup, Output Config, Analog, Alarm Level
Traditional fast keys	1,4,2,1,8 or 1,4,2,6
Device dashboard	2,2,9,5,2

The alarm level configuration will drive the transmitter to preset values if an alarm occurs. There are two options:

- Rosemount Alarm and Saturation Values (see table Table 5-1 for specific values)
- NAMUR-Compliant Alarm and Saturation Values (see Table 5-2 for specific values)

Table 5-1. Rosemount Values

Level	4-20 mA saturation	4-20 mA alarm
Low	3.9 mA	3.75 mA
High	20.8 mA	22.5 mA

Table 5-2. NAMUR Values

Level	4-20 mA saturation	4-20 mA alarm
Low	3.8 mA	3.5 mA
High	20.5 mA	22.6 mA

AO diagnostic alarm

LOI menu path	Detailed Setup, Output Config, Analog, AO Diag Alarm
Traditional fast keys	1,4,2,1,9
Device dashboard	2,2,5,9

There are diagnostics that, when under active conditions, do not drive the analog output to alarm level. The AO diagnostic alarm menu enables selection of these diagnostics to be associated with an analog alarm. If any of the selected diagnostics are active, it will cause the analog output to go to the configured alarm level. For a list of diagnostic alarms that can be configured to drive an analog alarm, see Table 5-3.

Table 5-3. Analog Alarm Diagnostic Options

Diagnostic	LOI Menu Path	Fast Keys	Description
Empty Pipe [1]	Detailed Setup, Output Config, Analog, AO Diag Alarm, Empty Pipe	1,4,2,1,9,1	Drive to an alarm state when empty pipe is detected.
Reverse Flow	Detailed Setup, Output Config, Analog, AO Diag Alarm, Reverse Flow	1,4,2,1,9,2	Drive to an alarm state when reverse flow is detected.
Grounding / Wiring Fault[1]	Detailed Setup, Output Config, Analog, AO Diag Alarm, Ground/Wiring	1,4,2,1,9,3	Drive to an alarm state when grounding or wiring fault is detected.
High Process Noise[1]	Detailed Setup, Output Config, Analog, AO Diag Alarm, Process Noise	1,4,2,1,9,4	Drive to an alarm state when the transmitter detects high levels of process noise.
Electronics Temperature Out of Range[1]	Detailed Setup, Output Config, Analog, AO Diag Alarm, Elect Temp	1,4,2,1,9,5	Drive to an alarm state when the temperature of the electronics exceeds allowable limits
Electrode Coating Limit 2[1]	Detailed Setup, Output Config, Analog, AO Diag Alarm, Elec Coating	1,4,2,1,9,6	Drive to an alarm state when electrode coating reaches a point where it impacts the flow measurement
Totalizer Limit 1	Detailed Setup, Output Config, Analog, AO Diag Alarm, Total Limit	1,4,2,1,9,7	Drive to an alarm state when the totalizer value exceeds the parameters set in the totalizer limit configuration (see page 5-x for more details on this functionality)
Flow Limit 1	Detailed Setup, Output Config, Analog, AO Diag Alarm, Flow Limit 1	1,4,2,1,9,8	Drive to an alarm state when the flow rate exceeds the parameters set in the flow limit 1 configuration (see page 5-x for more details on this functionality)
Flow Limit 2	Detailed Setup, Output Config, Analog, AO Diag Alarm, Flow Limit 2	1,4,2,1,9,9	Drive to an alarm state when the flow rate exceeds the parameters set in the flow limit 2 configuration (see page 5-x for more details on this functionality)
Continuous Meter Verification[1]	Detailed Setup, Output Config, Analog, AO Diag Alarm, Cont Meter Ver	1,4,2,1,9,--[2]	Drive to an alarm state when the continuous meter verification diagnostic detects a failure of one of the tests

(1) See Section 6 for more details on each of the diagnostics
(2) To access these features, you must scroll to this option in the HART Field Communicator.

5.2.2 Pulse output

LOI menu path	Detailed Setup, Output Config, Pulse
Traditional fast keys	1,4,2,2
Device dashboard	2,2,2,2

Under this function the pulse output of the 8732EM can be configured.

Pulse scaling

LOI menu path	Detailed Setup, Output Config, Pulse, Pulse Scaling
Traditional fast keys	1,4,2,2,1
Device dashboard	2,2,2,2,3

Transmitter may be commanded to supply a specified frequency between 1 pulse/ day at 39.37 ft/sec (12 m/s) to 10,000Hz at 1 ft/sec (0.3 m/s).

Note
Line size, special units, and density must be selected prior to configuration of the pulse scaling factor.

The pulse output scaling equates one transistor switch closure pulse to a selectable number of volume units. The volume unit used for scaling pulse output is taken from the numerator of the configured flow units. For example, if gal/min had been chosen when selecting the flow unit, the volume unit displayed would be gallons.

Note
The pulse output scaling is designed to operate between 0 and 10,000Hz. The minimum conversion factor value is found by dividing the minimum span (in units of volume per second) by 10,000Hz.

Note
The maximum pulse scaling frequency for transmitters with an intrinsically safe output (output option code B) is 5000Hz.

When selecting pulse output scaling, the maximum pulse rate is 10,000Hz. With the 110 percent over range capability, the absolute limit is 11,000Hz. For example, if you want the Rosemount 8732EM to pulse every time 0.01 gallons pass through the sensor, and the flow rate is 10,000 gal/min, you will exceed the 10,000Hz full-scale limit:

$$\frac{10{,}000\ gal}{1\ min} \times \frac{1\ min}{60\ sec} \times \frac{1\ pulse}{0.01\ gal} = 16{,}666.7\ Hz$$

The best choice for this parameter depends upon the required resolution, the number of digits in the totalizer, the extent of range required, and the maximum frequency limit of the external counter.

Pulse width

LOI menu path	Detailed Setup, Output Config, Pulse, Pulse Width
Traditional fast keys	1,4,2,2,2
Device dashboard	2,2,2,2,4

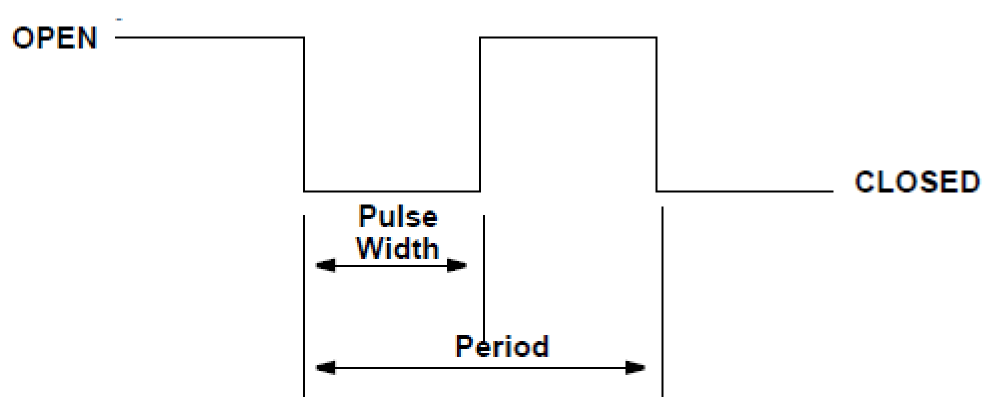
The factory default pulse width is 0.5 ms.

The width, or duration, of the pulse can be adjusted to match the requirements of different counters or controllers (see Figure 5-1). These are typically lower frequency applications (< 1000Hz). The transmitter will accept values from 0.1 ms to 650 ms.

For frequencies higher than 1000Hz, it is recommended to set the pulse mode to 50% duty cycle by setting the pulse mode to frequency output.

The pulse width will limit the maximum frequency output, If the pulse width is set too wide (more than 1/2 the period of the pulse) the transmitter will limit the pulse output. See example below.

Figure 5-1. Pulse Output



Example

If pulse width is set to 100 ms, the maximum output is 5Hz; for a pulse width of 0.5 ms, the maximum output would be 1000Hz (at the maximum frequency output there is a 50% duty cycle).

Pulse width	Minimum period (50% duty cycle)	Maximum frequency
100 ms	200 ms	$\frac{1\ cycle}{200\ ms} = 5\ Hz$
0.5 ms	1.0 ms	$\frac{1\ cycle}{1.0\ ms} = 1000\ Hz$

To achieve the greatest maximum frequency output, set the pulse width to the lowest value that is consistent with the requirements of the pulse output power source, pulse driven external totalizer, or other peripheral equipment.

Example

The maximum flow rate is 10,000 gpm. Set the pulse output scaling such that the transmitter outputs 10,000Hz at 10,000 gpm.

$$Pulse\ Scaling = \frac{Flow\ Rate\ (gpm)}{(60\frac{sec}{min}) \times (frequency)}$$

$$Pulse\ Scaling = \frac{10{,}000\ gpm}{\left(60\frac{sec}{min}\right) \times 10{,}000\ Hz}$$

$$Pulse\ Scaling = 0.0167\frac{gal}{pulse}$$

$$1\ pulse = 0.0167\ gal$$

Note
Changes to pulse width are only required when there is a minimum pulse width required for external counters, relays, etc.

Example

The external counter is ranged for 350 gpm and pulse is set for one gallon. Assuming the pulse width is 0.5 ms, the maximum frequency output is 5.833Hz.

$$Frequency = \frac{Flow\ Rate\ (gpm)}{(60\frac{sec}{min}) \times (pulse\ scaling\ \frac{gal}{pulse})}$$

$$Frequency = \frac{350\ gpm}{\left(60\frac{sec}{min}\right) \times 1\ \frac{gal}{pulse}}$$

$$Frequency = 5.833\ Hz$$

Example

The upper range value (20mA) is 3000 gpm. To obtain the highest resolution of the pulse output, 10,000Hz is scaled to the full scale analog reading.

$$Pulse\ Scaling = \frac{Flow\ Rate\ (gpm)}{(60\frac{sec}{min}) \times (frequency)}$$

$$Pulse\ Scaling = \frac{3{,}000\ gpm}{\left(60\frac{sec}{min}\right) \times 10{,}000\ Hz}$$

$$Pulse\ Scaling = 0.005\frac{gal}{pulse}$$

$$1\ pulse = 0.005\ gal$$

Pulse mode

LOI menu path	Detailed Setup, Output Config, Pulse, Pulse Mode
Traditional fast keys	1,4,2,2,3
Device dashboard	2,2,2,2,2

The pulse mode configures the frequency output of the pulse. It can be set to either 50% duty cycle, or fixed. There are two options that pulse mode can be configured to:

- Pulse Output (user defines a fixed pulse width)
- Frequency Output (pulse width automatically set to 50% duty cycle)

To use pulse width settings, pulse mode must be set to pulse output.

5.2.3 Totalizer

The totalizer provides the total amount of fluid that has passed through the meter. There are three available totalizers:

- Net total - increments with forward flow and decrements with reverse flow (reverse flow must be enabled). Can be reset to zero using the net total reset function.
- Gross/forward total - will only increment with forward flow
- Reverse total - will only increment with reverse flow if reverse flow is enabled

The maximum value for the totalizers is based on 4,294,967,296 (2^{32}) feet or corresponding unit equivalent. If a totalizer reaches this value, it will automatically reset to zero and then continue counting.

The gross/forward and reverse totalizers can be reset by manually changing the line size.

Totalizer units

LOI menu path	Detailed Setup, Output Config, Totalizer, Totalizer Units
Traditional fast keys	1,4,2,5,1
Device dashboard	2,2,2,3,5

Totalizer units is used to configure the units in which the totalized value will be displayed. These units are independent of the flow units. Totalizer units are updated to match the flow units whenever the flow units are written.

Totalizer display

LOI menu path	Detailed Setup, Output Config, Totalizer Setup, Total Display
Traditional fast keys	1,4,3,3
Device dashboard	2,2,1,5,3

The totalizer screen can be configured to display the net and gross totals or the forward and reverse totals.

Note: Gross and forward totals are the same value.

Start totalizer

LOI menu path	On totalizer screen, press “E”
Traditional fast keys	1,4,2,5,5
Device dashboard	2,2,2,3,4

Start totalizer starts the totalizer counting from its current value.

Stop totalizer

LOI menu path	On totalizer screen, press “E”
Traditional fast keys	1,4,2,5,6
Device dashboard	2,2,2,3,4

Stop totalizer interrupts the totalizer count until it is restarted again. This feature is often used during pipe cleaning or other maintenance operations.

Reset totalizer

LOI menu path	On totalizer screen, press right arrow (totalizer must be stopped)
Traditional fast keys	1,4,2,5,7
Device dashboard	2,2,2,3,4

Reset totalizer resets the net totalizer value to zero. The totalizer must be stopped before resetting.

Note
The totalizer value is stored in the non-volatile memory of the electronics every three seconds. If power to the transmitter is interrupted, the totalizer value will start at the last saved value when power is reapplied.

5.2.4 Discrete input/output

This configuration option is only available if the auxiliary output suite (option code AX) was ordered. The auxiliary output suite provides two channels for control. The discrete input can provide positive zero return (PZR) and net totalizer reset. The discrete output control function can be configured to drive an external signal to indicate zero flow, reverse flow, empty pipe, diagnostic status, flow limit, or transmitter status. A complete list and description of the available auxiliary functions is provided below.

Discrete input options (Channel 1 only)

- PZR (Positive Zero Return). When conditions are met to activate the input, the transmitter will force the output to zero flow.
- Net Total Reset - When conditions are met to activate the input, the transmitter will reset the net total value to zero.

Discrete output options

- Reverse Flow - The output will activate when the transmitter detects a reverse flow condition.
- Zero Flow - The output will activate when a no flow condition is detected.
- Transmitter Fault - The output will activate when a transmitter fault condition is detected.
- Empty Pipe - The output will activate when the transmitter detects an empty pipe condition.
- Flow Limit 1 - The output will activate when the transmitter measures a flow rate that meets the conditions established for the flow limit 1 alert.
- Flow Limit 2 - The output will activate when the transmitter measures a flow rate that meets the conditions established for the flow limit 2 alert.
- Diagnostic Status Alert - The output will activate when the transmitter detects a condition that meets the configured criteria of the diagnostic status alert.
- Total Limit - The output will activate when the transmitter net total value meets the conditions established for the total limit alert.

Channel 1

Channel 1 can be configured as either a discrete input (DI) or as a discrete output (DO).

DI/O 1 control

LOI menu path	Detailed Setup, Output Config, DI/DO Config, DI/O 1, DI/O 1 Control
Traditional fast keys	1,4,2,3,1,1
Device dashboard	2,2,4,1,1

This parameter configures the auxiliary output channel 1. It controls whether channel 1 will be a discrete input or discrete output on terminals 5(-) and 6(+). Note that the transmitter must have been ordered with the auxiliary output suite (option code AX) to have access to this functionality.

Discrete input 1

LOI menu path	Detailed Setup, Output Config, DI/DO Config, DI/O 1, DI 1
Traditional fast keys	1,4,2,3,1,1,3
Device dashboard	2,2,4,1,2

This parameter displays the configuration for channel 1 when used as a discrete input. Refer to the list above for available discrete input functions.

Discrete output 1

LOI menu path	Detailed Setup, Output Config, DI/DO Config, DI/O 1, DO 1
Traditional fast keys	1,4,2,3,1,2,4
Device dashboard	2,2,4,1,3

This parameter displays the configuration for channel 1 when used as a discrete output. Refer to the list above for available discrete output functions.

Channel 2

Channel 2 is available as discrete output only.

Discrete output 2

LOI menu path	Detailed Setup, Output Config, DI/DO Config, DO 2
Traditional fast keys	1,4,2,3,2
Device dashboard	2,2,4,2

This parameter displays the configuration for channel 2. Refer to the list above for available discrete output functions.

Flow limit (1 and 2)

LOI menu path	Flow 1: Detailed Setup, Output Config, DI/DO Config, Flow Limit 1 Flow 2: Detailed Setup, Output Config, DI/DO Config, Flow Limit 2
Traditional fast keys	Flow 1: 1,4,2,3,3 Flow 2: 1,4,2,3,4
Device dashboard	Flow 1: 2,2,4,3 Flow 2: 2,2,4,4

There are two configurable flow limits. Configure the parameters that will determine the criteria for activation of a HART alert if the measured flow rate falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain flow conditions are met. This parameter can be configured as a discrete output if the transmitter was ordered with the auxiliary output suite (option code AX) and the outputs are enabled. If a discrete output is configured for flow limit, the discrete output will activate when the conditions defined under mode configuration are met. See "Mode" on page 97 below.

Control

LOI menu path	Flow 1: Detailed Setup, Output Config, DI/DO Config, Flow Limit 1, Control 1 Flow 2: Detailed Setup, Output Config, DI/DO Config, Flow Limit 2, Control 2
Traditional fast keys	Flow 1: 1,4,2,3,3,1 Flow 2: 1,4,2,3,4,1
Device dashboard	Flow 1: 2,2,4,3,4 Flow 2: 2,2,4,4,4

This parameter turns the flow limit HART alert ON or OFF.

ON - The transmitter will generate a HART alert when the defined conditions are met. If a discrete output is configured for flow limit, the discrete output will activate when the conditions for mode are met.

OFF - The transmitter will not generate a HART alert for the flow limit.

Mode

LOI menu path	Flow 1: Detailed Setup, Output Config, DI/DO Config, Flow Limit 1, Mode 1 Flow 2: Detailed Setup, Output Config, DI/DO Config, Flow Limit 2, Mode 2
Traditional fast keys	Flow 1: 1,4,2,3,3,2 Flow 2: 1,4,2,3,4,2
Device dashboard	Flow 1: 2,2,4,3,3 Flow 2: 2,2,4,4,3

The mode parameter sets the conditions under which the flow limit HART alert will activate. High and low limits exist for each channel and can be configured independently.

> High limit - The HART alert will activate when the measured flow rate exceeds the high limit set point.

< Low limit - The HART alert will activate when the measured flow rate falls below the low limit set point.

In range - The HART alert will activate when the measured flow rate is between the high limit and low limit set points.

Out of range - The HART alert will activate when the measured flow rate exceeds the high limit set point or falls below the low limit set point.

High limit

LOI menu path	Flow 1: Detailed Setup, Output Config, DI/DO Config, Flow Limit 1, High Limit 1 Flow 2: Detailed Setup, Output Config, DI/DO Config, Flow Limit 2, High Limit 2
Traditional fast keys	Flow 1: 1,4,2,3,3,3 Flow 2: 1,4,2,3,4,3
Device dashboard	Flow 1: 2,2,4,3,1 Flow 2: 2,2,4,4,1

Set the flow rate value that corresponds to the high limit set point for the flow limit alert.

Low limit

LOI menu path	Flow 1: Detailed Setup, Output Config, DI/DO Config, Flow Limit 1, Low Limit 1 Flow 2: Detailed Setup, Output Config, DI/DO Config, Flow Limit 2, Low Limit 2
Traditional fast keys	Flow 1: 1,4,2,3,3,4 Flow 2: 1,4,2,3,4,4
Device dashboard	Flow 1: 2,2,4,3,2 Flow 2: 2,2,4,4,2

Set the flow rate value that corresponds to the low limit set point for the flow limit alert.

Flow limit hysteresis

LOI menu path	Flow 1: Detailed Setup, Output Config, DI/DO Config, Flow Limit 1, Hysteresis Flow 2: Detailed Setup, Output Config, DI/DO Config, Flow Limit 2, Hysteresis
Traditional fast keys	Flow 1: 1,4,2,3,3,5 Flow 2: 1,4,2,3,4,5
Device dashboard	2,2,4,6

Set the hysteresis band for the flow limit to determine how quickly the transmitter comes out of alert status. The hysteresis value is used for both flow limit 1 and flow limit 2. Changing this parameter under the configuration parameters for one channel will cause it to also change in the other channel.

Total limit

LOI menu path	Detailed Setup, Output Config, Totalizer, Total Limit
Traditional fast keys	1,4,2,3,5
Device dashboard	2,2,4,5

Configure the parameters that will determine the criteria for activating a HART alert if the measured net total falls within a set of configured criteria. This functionality can be used for operating simple batching operations or generating alerts when certain localized values are met. This parameter can be configured as a discrete output if the transmitter was ordered with auxiliary outputs enabled (option code AX). If a digital output is configured for total limit, the digital output will activate when the conditions for total mode are met.

Total control

LOI menu path	Detailed Setup, Output Config, Totalizer, Total Limit, Total Control
Traditional fast keys	1,4,2,3,5,1
Device dashboard	2,2,4,5,4

This parameter turns the total limit HART alert ON or OFF.

ON - The transmitter will generate a HART alert when the defined conditions are met.

OFF - The transmitter will not generate a HART alert for the total limit.

Total mode

LOI menu path	Detailed Setup, Output Config, Totalizer, Total Limit, Total Mode
Traditional fast keys	1,4,2,3,5,2
Device dashboard	2,2,4,5,3

The total mode parameter sets the conditions under which the total limit HART alert will activate. High and low limits exist for each channel and can be configured independently.

> High limit - The HART alert will activate when the totalizer value exceeds the high limit set point.

< Low limit - The HART alert will activate when the totalizer value falls below the low limit set point.

In range - The HART alert will activate when the totalizer value is between the high limit and low limit set points.

Out of range - The HART alert will activate when the totalizer value exceeds the high limit set point or falls below the low limit set point.

Total high limit

LOI menu path	Detailed Setup, Output Config, Totalizer, Total Limit, Tot Hi Limit
Traditional fast keys	1,4,2,3,5,3
Device dashboard	2,2,4,5,1

Set the net total value that corresponds to the high limit set point for the total high limit alert.

Total low limit

LOI menu path	Detailed Setup, Output Config, Totalizer, Total Limit, Tot Low Limit
Traditional fast keys	1,4,2,3,5,4
Device dashboard	2,2,4,5,2

Set the net total value that corresponds to the low limit set point for the total low limit alert.

Total limit hysteresis

LOI menu path	Detailed Setup, Output Config, Totalizer, Total Limit, Hysteresis
Traditional fast keys	1,4,2,3,5,5
Device dashboard	2,2,4,7

Set the hysteresis band for the total limit to determine how quickly the transmitter comes out of alert status.

Diagnostic status alert

LOI menu path	Detailed Setup, Output Config, Totalizer, Diagnostic Status Alert
Traditional fast keys	1,4,2,3,6
Device dashboard	2,2,4,8

The diagnostic status alert is used to turn on or off the diagnostics that will cause this alert to activate.

ON - The diagnostic status alert will activate when a transmitter detects a diagnostic designated as ON.

OFF - The diagnostic status alert will not activate when diagnostics designated as OFF are detected.

Alerts for the following diagnostics can be turned ON or OFF:

- Electronics Failure
- Coil Open Circuit
- Empty Pipe
- Reverse Flow
- Ground/Wiring Fault
- High Process Noise
- Electronics Temperature Out of Range
- Electrode Coat Limit 1
- Electrode Coat Limit 2
- Continuous Meter Verification

5.3 Configure HART

The 8732EM has four HART variables available as outputs. The variables can be configured for dynamic readings including flow, total, and diagnostic values. The HART output can also be configured for burst mode or multi-drop communication if required.

5.3.1 Variable mapping

LOI menu path	Detailed Setup, Output Config, Hart, Variable Map
Traditional fast keys	1,4,2,7,1
Device dashboard	2,2,3,2

Variable mapping allows configuration of the variables that are mapped to the secondary, tertiary and quaternary variables. The primary variable is fixed to output flow and cannot be configured.

Primary variable (PV)

LOI menu path	Detailed Setup, Output Config, Hart, Variable Map, PV
Traditional fast keys	1,4,2,7,1,1
Device dashboard	2,2,3,2,1

The primary variable is configured for flow. This variable is fixed and cannot be configured. The primary variable is tied to the analog output.

Secondary variable (SV)

LOI menu path	Detailed Setup, Output Config, Hart, Variable Map, SV
Traditional fast keys	1,4,2,7,1,2
Device dashboard	2,2,3,2,2

The secondary variable maps the second variable of the transmitter. This variable is a HART only variable and can be read from the HART signal with a HART enabled input card, or can be burst for use with a HART Tri-Loop to convert the HART signal to an analog output. Options available for mapping to this variable can be found in Table 5-4.

Tertiary variable (TV)

LOI menu path	Detailed Setup, Output Config, Hart, Variable Map, TV
Traditional fast keys	1,4,2,7,1,3
Device dashboard	2,2,3,2,3

The tertiary variable maps the third variable of the transmitter. This variable is a HART only variable and can be read from the HART signal with a HART enabled input card, or can be burst for use with a HART Tri-Loop to convert the HART signal to an analog output. Options available for mapping to this variable can be found in Table 5-4.

Quaternary variable (QV)

LOI menu path	Detailed Setup, Output Config, Hart, Variable Map, QV
Traditional fast keys	1,4,2,7,1,4
Device dashboard	2,2,3,2,4

The quaternary variable maps the fourth variable of the transmitter. This variable is a HART only variable and can be read from the HART signal with a HART enabled input card, or can be burst for use with a HART Tri-Loop™ to convert the HART signal to an analog output. Options available for mapping to this variable can be found in Table 5-4.

Table 5-4. Available Variables

Pulse Output	Empty Pipe Value
Gross Total – TV Default	Transmitter Velocity Deviation
Net Total – SV Default	Electrode Coating Value
Reverse Total – QV Default	Electrode Resistance Value
Electronics Temp	Coil Resistance Value
Line Noise Value	Sensor Calibration Deviation Value
5 Hz Signal to Noise Value	mA Loop Deviation Value
37 Hz Signal to Noise Value	

5.3.2 Poll address

LOI menu path	Detailed Setup, Output Config, Hart Output, Poll Address
Traditional fast keys	1,4,2,7,2
Device dashboard	2,2,3,1,1

Poll address enables the poll address to be set for use in a multi-drop configuration. The poll address is used to identify each meter on the multi-drop line. Follow the on-screen instructions to set the poll address at a number from 1 to 15. To set or change the flowmeter address, establish communication with the selected 8732EM in the loop.

Note
The 8732EM poll address is set to zero at the factory, allowing standard operation in a point-to-point manner with a 4-20 mA output signal. To activate multi-drop communication, the transmitter poll address must be changed to a number between 1 and 15. This change deactivates the analog output, sets the output value to 4 mA, and disables the failure mode alarm signal.

5.3.3 Burst mode

LOI menu path	Detailed Setup, Output Config, HART, Burst Mode
Traditional fast keys	1,4,2,7,5
Device dashboard	2,2,3,1,2

The 8732EM includes a burst mode function that can be enabled to broadcast the primary variable or all dynamic variables approximately three to four times per second. Burst mode is a specialized function used in very specific applications. The burst mode function enables you to select the variables that are broadcast while in the burst mode.

Burst mode enables you to set the burst mode as **OFF** or **ON**:

- **OFF -** Turns burst mode off; no data are broadcast over the loop
- **ON -** Turns burst mode on; data selected under burst option are broadcast over the loop

Additional command options may appear that are reserved and do not apply to the 8732EM.

Burst option (burst command)

LOI menu path	Detailed Setup, Output Config, HART, Burst Command
Traditional fast keys	1,4,2,7,6
Device dashboard	2,2,3,1,3

Burst option enables you to select the variable(s) that is broadcast during the transmitter burst. Choose one of the following options:

- **1; PV; Primary Variable -** Selects the primary variable
- **2; % range/current; Percent of Range and Loop Current -** Selects the variable as percent of range and analog output
- **3; Process vars/crnt; All Variables and Loop Current -** Selects all variables and analog output
- **110; Dynamic vars; Dynamic Variables -** Burst all dynamic variables in the transmitter

Request preambles

LOI menu path	Detailed Setup, Output Config, HART, Req Preams
Traditional fast keys	1,4,2,7,3
Device dashboard	N/A

Request preambles is the number of preambles required by the 8732EM for HART communications.

Response preambles

LOI menu path	Detailed Setup, Output Config, HART, Resp Preams
Traditional fast keys	1,4,2,7,4
Device dashboard	N/A

Response preambles is the number of preambles sent by the 8732EM in response to any host request.

5.3.4 Configure LOI

LOI menu path	Detailed Setup, LOI Config
Traditional fast keys	1,4,3
Device dashboard	2,2,1,5

The LOI configuration contains functionality to configure the display of the transmitter.

Flow display

LOI menu path	Detailed Setup, LOI Config, Flow Display
Traditional fast keys	1,4,3,2
Device dashboard	2,2,1,5,2

Use flow display to configure the parameters that will appear on the LOI flowrate screen. The flowrate screen displays two lines of information. Choose one of the following options:

- Flowrate and % of Span
- % of Span and Net Total
- Flowrate and Net Total
- % of Span and Gross Total
- Flowrate and Gross Total

Totalizer display

LOI menu path	Detailed Setup, LOI Config, Total Display
Traditional fast keys	1,4,3,3
Device dashboard	2,2,1,5,3

Use totalizer display to configure the parameters that will appear on the LOI totalizer screen. The totalizer screen has two lines of information. Choose one of the following options:

- Forward Total and Reverse Total
- Net Total and Gross Total

Language

LOI menu path	Detailed Setup, LOI Config, Language
Traditional fast keys	1,4,3,1
Device dashboard	2,2,1,5,1

Use language to configure the display language shown on the LOI. Choose one of the following options:

- English
- Spanish
- Portuguese
- German
- French

LOI error mask

LOI menu path	Detailed Setup, LOI Config, LOI Err Mask
Traditional fast keys	N/A
Device dashboard	N/A

Use LOI error mask to turn off the analog output power error message (AO No Power). This may be desired if the analog output is not being used.

Display auto lock

LOI menu path	Detailed Setup, LOI Config, Disp Auto Lock
Traditional fast keys	1,4,3,4
Device dashboard	2,2,1,5,4

Use display auto lock to configure the LOI to automatically lock the LOI after a set period of time. Choose one of the following options:

- OFF
- 1 Minute
- 10 Minutes (default)

5.4 Additional parameters

The following parameters may be required for detailed configuration settings based on your application.

5.4.1 Coil drive frequency

LOI menu path	Detailed Setup, More Params, Coil Frequency
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,3

Use coil drive frequency to change the pulse rate of the coils. Choose one of the following options:

- **5 Hz -** The standard coil drive frequency is 5 Hz, which is sufficient for nearly all applications.
- **37 Hz -** If the process fluid causes a noisy or unstable output, increase the coil drive frequency to 37.5 Hz. If the 37 Hz mode is selected, perform the auto zero function for optimum performance.

See “Auto zero” on page 135.

5.4.2 Process density

LOI menu path	Detailed Setup, More Params, Proc Density
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,2

Use the process density value to convert from a volumetric flow rate to a mass flow rate using the following equation:

$$Qm = Qv \times p$$

Where:

Qm is the mass flow rate

Qv is the volumetric flow rate, and

p is the fluid density

5.4.3 Reverse flow

LOI menu path	Detailed Setup, Output Config, Reverse Flow
Traditional fast keys	1,4,3,1
Device dashboard	2,2,5,1,5

Use reverse flow to enable or disable the transmitter's ability to read flow in the opposite direction of the flow direction arrow (see Figure 2-4 on page 10). This may occur when the process has bi-directional flow, or when either the electrode wires or the coil wires are reversed (see Troubleshooting 9.3.3: Remote wiring). This also enables the totalizer to count in the reverse direction.

5.4.4 Low flow cutoff

LOI menu path	Detailed Setup, Sig Processing, Low Flow Cutoff
Traditional fast keys	1,4,4,4
Device dashboard	2,2,8,5,2

Low flow cutoff allows the user to set a low flow limit to be specified. The analog output signal is driven to 4mA for flow rates below the set point. The low flow cutoff units are the same as the PV units and cannot be changed. The low flow cutoff value applies to both forward and reverse flows.

5.4.5 PV damping

LOI menu path	Detailed Setup, Sig Processing, PV Damping
Traditional fast keys	1,4,4,5
Device dashboard	2,2,8,1

Primary variable damping allows selection of a response time, in seconds, to a step change in flow rate. It is most often used to smooth fluctuations in output.

5.4.6 Signal processing

LOI menu path	Detailed Setup, Sig Processing
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,6

The 8732EM contains several advanced functions that can be used to stabilize erratic outputs caused by process noise. The signal processing menu contains this functionality.

If the 37 Hz coil drive mode has been set, and the output is still unstable, the damping and signal processing function should be used. It is important to set the coil drive mode to 37 Hz first, so the loop response time is not increased.

The 8732EM provides for a very easy and straightforward start-up, and also incorporates the capability to deal with difficult applications that have previously manifested themselves in a noisy output signal. In addition to selecting a higher coil drive frequency (37 Hz vs. 5 Hz) to isolate the flow signal from the process noise, the 8732EM microprocessor can actually scrutinize each input based on three user-defined parameters to reject the noise specific to the application.

See Section 7 for the detailed description of how the signal processing works.

Operating mode

LOI menu path	Detailed Setup, Sig Processing, Operating Mode
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,5,1

The operating mode function can be set to normal mode or filter mode. If set to normal mode, and the signal is noisy and provides an unstable flow reading, switch to filter mode. Filter mode automatically uses 37 Hz coil drive frequency and activates signal processing at the factory set default values. When using filter mode, perform an auto zero with no flow and a full sensor. Either of the parameters (coil drive mode or signal processing) may still be changed individually. Turning signal processing off or changing the coil drive frequency to 5 Hz will automatically change the operating mode from filter mode to normal mode.

Signal processing control

LOI menu path	Detailed Setup, Sig Processing, SP Control
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,6,1

DSP can be turned on or off. When on is selected, the 8732EM output is derived using a running average of the individual flow inputs. DSP is a software algorithm that examines the quality of the electrode signal against user-specified tolerances. This average is updated at the rate of 10 samples per second with a coil drive frequency of 5 Hz, and 75 samples per second with a coil drive frequency of 37Hz. The three parameters that make up signal processing (number of samples, percent limit, and time limit) are described below.

Number of samples

LOI menu path	Detailed Setup, Sig Processing, SP Control, Samples:
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,6,2

The number of samples sets the amount of time that inputs are collected and used to calculate the average value. Each second is divided into tenths with the number of samples equaling the number of increments used to calculate the average. This parameter can be configured for an integer value between 0 and 125. The default value is 90 samples.

Percent rate

LOI menu path	Detailed Setup, Sig Processing, SP Control, % Rate:
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,6,3

This parameter will set the tolerance band on either side of the running average, referring to percent deviation from the average flow rate. Values within the limit are accepted while values outside the limit are scrutinized to determine if they are a noise spike or an actual flow change. This parameter can be configured for an integer value between 0 and 100 percent. The default value is 2 percent.

Time limit

LOI menu path	Detailed Setup, Sig Processing, SP Control, Time Limit:
Traditional fast keys	1,4,3,1
Device dashboard	2,2,8,6,4

The time limit parameter forces the output and running average values to the new value of an actual flow rate change that is outside the percent limit boundaries. It thereby limits response time to flow changes to the time limit value rather than the length of the running average.

For example, if the number of samples selected is 100, then the response time of the system is 10 seconds. In some cases this may be unacceptable. By setting the time limit, you can force the 8732EM to clear the value of the running average and re-establish the output and average at the new flow rate once the time limit has elapsed. This parameter limits the response time added to the loop. A suggested time limit value of two seconds is a good starting point for most applicable process fluids. This parameter can be configured between 0 and 256 seconds. The default value is 2 seconds.

5.5 Configure special units

Special units are used when the application requires units that are not included in the flow units available from the device. Refer to Table 2-14 for a complete list of the available units.

5.5.1 Base volume unit

LOI menu path	Basic Setup, Flow Units, Special Units, Base Vol Units
Traditional fast keys	1,3,2,2,2
Device dashboard	2,2,1,6

Base volume unit is the unit from which the conversion is being made. Set this variable to the appropriate option.

5.5.2 Conversion factor

LOI menu path	Basic Setup, Flow Units, Special Units, Conv Factor
Traditional fast keys	1,3,2,2,3
Device dashboard	2,2,1,6

The special units conversion factor is used to convert base units to special units. For a straight conversion of units from one unit of measure to a different unit of measure, the conversion factor is the number of base units in the new unit.

For example, if you are converting from gallons to barrels and there are 31 gallons in a barrel, the conversion factor is 31.

5.5.3 Base time unit

LOI menu path	Basic Setup, Flow Units, Special Units, Base Time Unit
Traditional fast keys	1,3,2,2,4
Device dashboard	2,2,1,6

Base time unit provides the time unit from which to calculate the special units.

For example, if your special units is a volume per minute, select minutes.

5.5.4 Special volume unit

LOI menu path	Basic Setup, Flow Units, Special Units, Volume Unit
Traditional fast keys	1,3,2,2,1
Device dashboard	2,2,1,6

Special volume unit enables you to display the volume unit format to which you have converted the base volume units. For example, if the special units are abc/min, the special volume variable is abc. The volume units variable is also used in totalizing the special units flow.

5.5.5 Special flow rate unit

LOI menu path	Basic Setup, Flow Units, Special Units, Rate Unit
Traditional fast keys	1,3,2,2,5
Device dashboard	2,2,1,6

Flow rate unit is a format variable that provides a record of the units to which you are converting. The Handheld Communicator will display a special units designator as the units format for your primary variable. The actual special units setting you define will not appear. Four characters are available to store the new units designation. The 8732EM LOI will display the four character designation as configured.

Example

To display flow in acre-feet per day, and acre-foot is equal to 43560 cubic feet, the procedure would be:

1. Set the volume unit to **ACFT**.
2. Set the base volume unit to **ft3**.
3. Set the conversion factor to **43560**.
4. Set the time base unit to **Day**.
5. Set the flow rate unit to **AF/D**.

Section 6 Advanced Diagnostics Configuration

6.1 Introduction

Rosemount Magnetic Flowmeters provide device diagnostics that detect and warn of abnormal situations throughout the life of the meter - from Installation to Maintenance and Meter Verification. With Rosemount Magnetic Flowmeter diagnostics enabled, plant availability and throughput can be improved, and costs through simplified installation, maintenance and troubleshooting can be reduced.

Table 6-1. Diagnostics Availability

Diagnostic name	Diagnostic category	Product capability
Basic diagnostics		
Tunable Empty Pipe	Process	Standard
Electronics Temperature	Maintenance	Standard
Coil Fault	Maintenance	Standard
Transmitter Fault	Maintenance	Standard
Reverse Flow	Process	Standard
Electrode Saturation	Process	Standard
Coil Current	Maintenance	Standard
Coil Power	Maintenance	Standard
Advanced diagnostics		
High Process Noise	Process	Suite 1 (DA1)
Grounding and Wiring Fault	Installation	Suite 1 (DA1)
Coated Electrode Detection	Process	Suite 1 (DA1)
Commanded Meter Verification	Meter Health	Suite 2 (DA2)
Continuous Meter Verification	Meter Health	Suite 2 (DA2)
4-20 mA Loop Verification	Installation	Suite 2 (DA2)

Options for accessing Rosemount Magmeter Diagnostics

Rosemount Magmeter Diagnostics can be accessed through the Local Operator Interface (LOI), a Field Communicator, and AMS® Device Manager.

Access diagnostics through the LOI for quicker installation, maintenance, and meter verification

Rosemount Magmeter Diagnostics are available through the LOI to make maintenance of every magmeter easier.

Access diagnostics through AMS Device Manager

The value of the diagnostics increases significantly when AMS is used. The user will see simplified screen flow and procedures on how to respond to the diagnostics messages.

6.2 Licensing and enabling

All advanced diagnostics are licensed by ordering option code DA1, DA2, or both. In the event that a diagnostic option is not ordered, advanced diagnostics can be licensed in the field through the use of a license key. Each transmitter has a unique license key specific to the diagnostic option code. A trial license is also available to enable the advanced diagnostics. This temporary functionality will be automatically disabled after 30-days or when power to the transmitter is cycled, whichever occurs first. This trial code can be used a maximum of three times per transmitter. See the detailed procedures below for entering the license key and enabling the advanced diagnostics. To obtain a permanent or trial license key, contact your local Rosemount representative.

6.2.1 Licensing the 8732EM diagnostics

For licensing the advanced diagnostics, follow the steps below.

1. Power up the 8732EM transmitter.
2. Verify the software version is 5.4.4 software or later.

LOI menu path	Detailed Setup, Device Info, Revision Num
Traditional Fast Keys	1,4,6,10, -- [1]
Device dashboard	1,8,2

1. This item is in a list format without numeric labels.

3. Determine the Device ID.

LOI menu path	Detailed Setup, Device Info, Device ID
Traditional Fast Keys	1,4,6,6
Device dashboard	1,8,1,5

4. Obtain a license key from a local Rosemount representative.

5. Enter license key.

LOI menu path	Diagnostics, Advanced Diagnostics, Licensing, License Key, License Key
Traditional Fast Keys	1,2,3,4,2,2
Device dashboard	1,8,5,4

6. Enable Advanced Diagnostics.

LOI menu path	Diagnostics, Diag Controls
Traditional Fast Keys	1,2,3
Device dashboard	2,2,5,1

6.3 Tunable empty pipe detection

The tunable empty pipe detection provides a means of minimizing issues and false readings when the pipe is empty. This is most important in batching applications where the pipe may run empty with some regularity. If the pipe is empty, this diagnostic will activate, set the flow rate to 0, and deliver an alert.

Turning empty pipe on/off

LOI menu path	Diagnostics, Diag Controls, Empty Pipe
Traditional Fast Keys	1,2,1,1
Device dashboard	2,2,5,1,1

The tunable empty pipe detection diagnostic can be turned on or off as required by the application. The empty pipe diagnostic is shipped turned "On" by default.

6.3.1 Tunable empty pipe parameters

The tunable empty pipe diagnostic has one read-only parameter, and two parameters that can be custom configured to optimize the diagnostic performance.

Empty pipe (EP) value

LOI menu path	Diagnostics, Variables, Empty Pipe
Traditional Fast Keys	1,2,2,4,1
Device dashboard	2,2,5,3,1

This parameter shows the current empty pipe value. This is a read-only value. This number is a unit-less number and is calculated based on multiple installation and process variables such as sensor type, line size, process fluid properties, and wiring. If the empty pipe value exceeds the empty pipe trigger level for a specified number of updates, then the empty pipe diagnostic alert will activate.

Empty pipe (EP) trigger level

LOI menu path	Diagnostics, Basic Diagnostics, Empty Pipe, EP Trig Level
Traditional Fast Keys	1,2,2,4,2
Device dashboard	2,2,5,3,2

Limits: 3 to 2000

Empty pipe trigger level is the threshold limit that the empty pipe value must exceed before the empty pipe diagnostic alert activates. The default setting from the factory is 100.

Empty pipe (EP) counts

LOI menu path	Diagnostics, Basic Diagnostics, Empty Pipe, EP Counts
Traditional Fast Keys	1,2,2,4,3
Device dashboard	2,2,5,3,3

Limits: 2 to 50

Empty pipe counts is the number of consecutive updates that the transmitter must receive where the empty pipe value exceeds the empty pipe trigger level before the empty pipe diagnostic alert activates. The default setting from the factory is 5.

6.3.2 Optimizing tunable empty pipe

The tunable empty pipe diagnostic is set at the factory to properly diagnose most applications. If this diagnostic activates, the following procedure can be followed to optimize the empty pipe diagnostic for the application.

Example

1. Record the empty pipe value with a full pipe condition.

   Example: Full reading = 0.2

2. Record the empty pipe value with an empty pipe condition.

   Example: Empty reading = 80.0

3. Set the empty pipe trigger level to a value between the full and empty readings. For increased sensitivity to empty pipe conditions, set the trigger level to a value closer to the full pipe value.

   Example: Set the trigger level to 25.0

4. Set the empty pipe counts to a value corresponding to the desired sensitivity level for the diagnostic. For applications with entrained air or potential air slugs, less sensitivity may be desired.

   Example: Set the counts to 10

6.4 Electronics temperature

The 8732EM continuously monitors the temperature of the internal electronics. If the measured electronics temperature exceeds the operating limits of –40 to 140 °F (–40 to 60 °C) the transmitter will go into alarm and generate an alert.

6.4.1 Turning electronics temperature on/off

LOI menu path	Diagnostics, Diag Controls, Elect Temp
Traditional Fast Keys	1,2,1,1, -- [1]
Device dashboard	2,2,5,1,4

1. This item is in a list format without numeric labels.

The electronics temperature diagnostic can be turned on or off as required by the application.The electronics temperature diagnostic will be turned on by default.

6.4.2 Electronics temperature parameters

The electronics temperature diagnostic has one read-only parameter. It does not have any configurable parameters.

Electronics temperature

LOI menu path	Diagnostics, Variables, Elect Temp
Traditional Fast Keys	1,2,4,2
Device dashboard	2,2,5,7

This parameter shows the current temperature of the electronics. This is a read-only value.

6.5 Ground/wiring fault detection

The transmitter continuously monitors signal amplitudes over a wide range of frequencies. For the ground/wiring fault detection diagnostic, the transmitter specifically looks at the signal amplitude at frequencies of 50 Hz and 60 Hz which are the common AC cycle frequencies found throughout the world. If the amplitude of the signal at either of these frequencies exceeds 5 mV, that is an indication that there is a ground or wiring issue and that stray electrical signals are getting into the transmitter. The diagnostic alert will activate indicating that the ground and wiring of the installation should be carefully reviewed.

The ground/wiring fault detection diagnostic provides a means of verifying installations are done correctly. If the installation is not wired or grounded properly, this diagnostic will activate and deliver an alert. This diagnostic can also detect if the grounding is lost over-time due to corrosion or another root cause.

6.5.1 Turning ground/wiring fault on/off

LOI menu path	Diagnostics, Diag Controls, Ground/Wiring
Traditional Fast Keys	1,2,1,1, -- (1)
Device dashboard	2,2,5,1,3

1. This item is in a list format without numeric labels.

The ground/wiring fault detection diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (DA1 Option) was ordered, then the ground/wiring fault detection diagnostic will be turned on. If DA1 was not ordered or licensed, this diagnostic is not available.

6.5.2 Ground/wiring fault parameters

The ground/wiring fault detection diagnostic has one read-only parameter. It does not have any configurable parameters.

Line noise

LOI menu path	Diagnostics, Variables, Line Noise
Traditional Fast Keys	1,2,4,3
Device dashboard	2,2,5,4,1

The line noise parameter shows the amplitude of the line noise. This is a read-only value. This number is a measure of the signal strength at 50/60 Hz. If the line noise value exceeds 5 mV, then the ground/wiring fault diagnostic alert will activate.

6.6 High process noise detection

The high process noise diagnostic detects if there is a process condition causing an unstable or noisy reading that is not an actual flow variation. A common cause of high process noise is slurry flow, like pulp stock or mining slurries. Other conditions that cause this diagnostic to activate are high levels of chemical reaction or entrained gas in the liquid. If unusual noise or flow variation is seen, this diagnostic will activate and deliver an alert. If this situation exists and is left without remedy, it will add additional uncertainty and noise to the flow reading.

6.6.1 Turning high process noise on/off

LOI menu path	Diagnostics, Diag Controls, Process Noise
Traditional Fast Keys	1,2,1,1, -- (1)
Device dashboard	2,2,5,1,2

1. This item is in a list format without numeric labels.

The high process noise diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (DA1 Option) was ordered, then the high process noise diagnostic will be turned on. If DA1 was not ordered or licensed, this diagnostic is not available.

6.6.2 High process noise parameters

The high process noise diagnostic has two read-only parameters. It does not have any configurable parameters. This diagnostic requires that flow be present in the pipe and the velocity be greater than1 ft/s (0.3 m/s).

5 Hz signal to noise ratio (SNR)

LOI menu path	Diagnostics, Variables, 5Hz SNR
Traditional Fast Keys	1,2,4,4
Device dashboard	2,2,5,5,1

This parameter shows the value of the signal to noise ratio at the coil drive frequency of 5 Hz. This is a read-only value. This number is a measure of the signal strength at 5 Hz relative to the amount of process noise. If the transmitter is operating in 5 Hz mode, and the signal to noise ratio remains below 25 for one minute, then the high process noise diagnostic alert will activate.

37 Hz signal to noise ratio (SNR)

LOI menu path	Diagnostics, Variables, 37Hz SNR
Traditional Fast Keys	1,2,4,5
Device dashboard	2,2,5,5,2

This parameter shows the current value of the signal to noise ratio at the coil drive frequency of 37 Hz. This is a read-only value. This number is a measure of the signal strength at 37 Hz relative to the amount of process noise. If the transmitter is operating in 37 Hz mode, and the signal to noise ratio remains below 25 for one minute, then the high process noise diagnostic alert will activate.

6.7 Coated electrode detection

The coated electrode detection diagnostic provides a means of monitoring insulating coating buildup on the measurement electrodes. If coating is not detected, buildup over time can lead to a compromised flow measurement. This diagnostic can detect if the electrode is coated and if the amount of coating is affecting the flow measurement. There are two levels of electrode coating.

Limit 1 indicates when coating is starting to occur, but has not compromised the flow measurement.

Limit 2 indicates when coating is affecting the flow measurement and the meter should be serviced immediately.

6.7.1 Turning coated electrode detection on/off

LOI menu path	Diagnostics, Diag Controls, Elec Coating
Traditional Fast Keys	1,2,3,1
Device dashboard	2,2,5,1,5

The coated electrode detection diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (DA1 option) was ordered, then the coated electrode detection diagnostic will be turned on. If DA1 was not ordered or licensed, this diagnostic is not available.

6.7.2 Coated electrode parameters

The coated electrode detection diagnostic has four parameters. Two are read-only and two are configurable parameters. The electrode coating parameters need to be initially monitored to accurately set the electrode coating limit levels for each application.

Electrode coating (EC) value

LOI menu path	Diagnostics, Advanced Diag, Elec Coating, EC Current Val
Traditional Fast Keys	1,2,3,1,1
Device dashboard	2,2,5,6,1

The electrode coating value reads the value of the coated electrode detection diagnostic.

Electrode coating (EC) level 1 limit

LOI menu path	Diagnostics, Advanced Diag, Elec Coat, EC Limit 1
Traditional Fast Keys	1,2,3,1,2
Device dashboard	2,2,5,6,2

Set the criteria for the electrode coating limit 1 which indicates when coating is starting to occur, but has not compromised the flow measurement. The default value for this parameter is 1000 k Ohm.

Electrode coating (EC) level 2 limit

LOI menu path	Diagnostics, Advanced Diag, Elec Coat, EC Limit 2
Traditional Fast Keys	1,2,3,1,3
Device dashboard	2,2,5,6,3

Set the criteria for the electrode coating limit 2 which indicates when coating is affecting the flow measurement and the meter should be serviced immediately. The default value for this parameter is 2000 k Ohm.

Maximum electrode coating (EC)

LOI menu path	Diagnostics, Advanced Diag, Elec Coat, EC Max Value
Traditional Fast Keys	1,2,3,1,4
Device dashboard	2,2,5,6,4

The maximum electrode coating value reads the maximum value of the coated electrode detection diagnostic since the last maximum value reset.

Clear maximum electrode value

LOI menu path	Diagnostics, Advanced Diag, Elec Coat, Reset Max Val
Traditional Fast Keys	1,2,3,1,5
Device dashboard	2,2,5,6,5

Use this method to reset the maximum electrode coating value.

6.8 4-20 mA loop verification

The 4-20 mA loop verification diagnostic provides a means of verifying the analog output loop is functioning properly. This is a manually initiated diagnostic test. This diagnostic checks the integrity of the analog loop and provides a health status of the circuit. If the verification does not pass, this will be highlighted in the results given at the end of the check.

The 4-20 mA loop verification diagnostic is useful for testing the analog output when errors are suspected. The diagnostic tests the analog loop at five different mA output levels:

- 4 mA
- 12 mA
- 20 mA
- Low alarm level
- High alarm level

6.8.1 Initiating 4-20 mA loop verification

LOI menu path	Diagnostics, Advanced Diag, 4-20mA Verify, 4-20mA Verify
Traditional Fast Keys	1,2,3,3,1
Device dashboard	3,4,3,1

The 4-20 mA loop verification diagnostic can be initiated as required by the application. If the advanced diagnostics suite 2 (DA2 Option) was ordered, then the 4-20 mA loop verification diagnostic will be available. If DA2 was not ordered or licensed, this diagnostic is not available.

6.8.2 4-20 mA loop verification parameters

The 4-20 mA loop verification diagnostic has five read-only parameters plus an overall test result. It does not have any configurable parameters.

4-20 mA loop verification test result

LOI menu path	Diagnostics, Advanced Diag, 4-20mA Verify, View Results
Traditional Fast Keys	1,2,3,3,2
Device dashboard	3,4,3

Shows the results of the 4-20 mA loop verification test as either passed or failed.

4 mA measurement

LOI menu path	N/A
Traditional Fast Keys	N/A
Device dashboard	3,4,3,2

Shows the measured value of the 4 mA loop verification test.

12 mA measurement

LOI menu path	N/A
Traditional Fast Keys	N/A
Device dashboard	3,4,3,3

Shows the measured value of the 12 mA loop verification test.

20 mA measurement

LOI menu path	N/A
Traditional Fast Keys	N/A
Device dashboard	3,4,3,4

Shows the measured value of the 20 mA loop verification test.

Low alarm measurement

LOI menu path	N/A
Traditional Fast Keys	N/A
Device dashboard	3,4,3,5

Shows the measured value of the low alarm verification test.

High alarm measurement

LOI menu path	N/A
Traditional Fast Keys	N/A
Device dashboard	3,4,3,6

Shows the measured value of the high alarm verification test.

6.9 SMART™ Meter Verification

The SMART Meter Verification diagnostic provides a means of verifying the flowmeter is within calibration without removing the sensor from the process. This diagnostic test provides a review of the transmitter and sensor's critical parameters as a means to document verification of calibration. The results of this diagnostic provide the deviation amount from expected values and a pass/fail summary against user-defined criteria for the application and conditions. The SMART Meter Verification diagnostic can be configured to run continuously in the background during normal operation, or it can be manually initiated as required by the application.

6.9.1 Sensor baseline (signature) parameters

The SMART Meter Verification diagnostic functions by taking a baseline sensor signature and then comparing measurements taken during the verification test to these baseline results.

The sensor signature describes the magnetic behavior of the sensor. Based on Faraday's law, the induced voltage measured on the electrodes is proportional to the magnetic field strength. Thus, any changes in the magnetic field will result in a calibration shift of the sensor. Having the transmitter take an initial sensor signature when first installed will provide the baseline for the verification tests that are done in the future. There are three specific measurements that are stored in the transmitter's non-volatile memory that are used when performing the calibration verification.

Coil circuit resistance

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Sensr Baseline, Values, Coil Resist
Traditional Fast Keys	1,2,3,2,3,1,1
Device dashboard	2,2,6,1,1

The coil circuit resistance is a measurement of the coil circuit health. This value is used as a baseline to determine if the coil circuit is still operating correctly.

Coil inductance (signature)

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Sensr Baseline, Values, Inductnce
Traditional Fast Keys	1,2,3,2,3,1,2
Device dashboard	2,2,6,1,2

The coil inductance is a measurement of the magnetic field strength. This value is used as a baseline to determine if a sensor calibration shift has occurred.

Electrode circuit resistance

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Sensr Baseline, Values, Electrode Res
Traditional Fast Keys	1,2,3,2,3,1,3
Device dashboard	2,2,6,1,3

The electrode circuit resistance is a measurement of the electrode circuit health. This value is used as a baseline to determine if the electrode circuit is still operating correctly.

6.9.2 Establishing the sensor baseline (signature)

The first step in running the SMART Meter Verification test is establishing the reference signature that the test will use as the baseline for comparison. This is accomplished by having the transmitter take a signature of the sensor.

Reset baseline (re-signature meter)

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Sensr Baseline, Reset Baseline
Traditional Fast Keys	1,2,3,2,3,2
Device dashboard	2,2,6,1,4

Having the transmitter take an initial sensor signature when first installed will provide the baseline for the verification tests that are done in the future. The sensor signature should be taken during the start-up process when the transmitter is first connected to the sensor, with a full line, and ideally with no flow in the line. Running the sensor signature procedure when there is flow in the line is permissible, but this may introduce some noise into the electrode circuit resistance measurement. If an empty pipe condition exists, then the sensor signature should only be run for the coils.

Once the sensor signature process is complete, the measurements taken during this procedure are stored in non-volatile memory to prevent loss in the event of a power interruption to the meter. This initial sensor signature is required for both manual and continuous SMART Meter Verification.

Recall values (recall last saved)

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Sensr Baseline, Recall Values
Traditional Fast Keys	1,2,3,2,3,3
Device dashboard	2,2,6,1,5

In the event that the sensor baseline was reset accidentally or incorrectly, this function will restore the previously saved sensor baseline values.

6.9.3 SMART Meter Verification test criteria

The Smart Meter Verification diagnostic provides the ability to customize the test criteria to which the verification must be tested. The test criteria can be set for each of the flow conditions discussed above.

No flow limit

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Test Criteria, No Flow
Traditional Fast Keys	1,2,3,2,4,1
Device dashboard	2,2,6,3,1

Set the test criteria for the no flow condition. The factory default for this value is set to five percent with limits configurable between one and ten percent. This parameter applies to manually initiated test only.

Flowing full limit

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Test Criteria, Flowing Full
Traditional Fast Keys	1,2,3,2,4,2
Device dashboard	2,2,6,3,2

Set the test criteria for the flowing, full condition. The factory default for this value is set to five percent with limits configurable between one and ten percent. This parameter applies to manually initiated tests only.

Empty pipe limit

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Test Criteria, Empty Pipe
Traditional Fast Keys	1,2,3,2,4,3
Device dashboard	2,2,6,3,3

Set the test criteria for the empty pipe condition. The factory default for this value is set to five percent with limits configurable between one and ten percent. This parameter applies to manually initiated test only.

Continuous limit

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Test Criteria, Continual
Traditional Fast Keys	1,2,3,2,4,4
Device dashboard	2,2,6,4,1

Set the test criteria for the continuous SMART Meter Verification diagnostic. The factory default for this value is set to five percent with limits configurable between two and ten percent. If the tolerance band is set too tightly, under empty pipe conditions or noisy flowing conditions, a false failure of the transmitter test may occur.

6.10 Run manual SMART Meter Verification

LOI menu path	Diagnostics, Advanced Diag, Meter Verify, Run Meter Ver
Traditional Fast Keys	1,2,3,2,1
Device dashboard	1,6

The SMART Meter Verification diagnostic will be available if the advanced diagnostic suite (DA2) was ordered. If DA2 was not ordered or licensed, this diagnostic will not be available. This method will initiate the manual meter verification test.

6.10.1 Test conditions

SMART Meter Verification can be initiated under three possible test conditions. This parameter is set at the time that the sensor baseline or SMART Meter Verification test is manually initiated.

No flow

Run the SMART Meter Verification test with a full pipe and no flow in the line. Running the SMART Meter Verification test under this condition provides the most accurate results and the best indication of magnetic flowmeter health.

Flowing full

Run the SMART Meter Verification test with a full pipe and flow in the line. Running the SMART Meter Verification test under this condition provides the ability to verify the magnetic flowmeter health without shutting down the process flow in applications when a shutdown is not possible. Running the diagnostic under flowing conditions can cause a false test failure if there is significant process noise present.

Empty pipe

Run the SMART Meter Verification test with an empty pipe. Running the SMART Meter Verification test under this condition provides the ability to verify the magnetic flowmeter health with an empty pipe. Running the verification diagnostic under empty pipe conditions will not check the electrode circuit health.

6.10.2 Test scope

The manually initiated SMART Meter Verification test can be used to verify the entire flowmeter installation or individual parts such as the transmitter or sensor. This parameter is set at the time that the SMART Meter Verification test is manually initiated. There are three test scopes from which to choose.

All

Run the SMART Meter Verification test and verify the entire flowmeter installation. This parameter results in the diagnostic performing the transmitter calibration verification, sensor calibration verification, coil health check, and electrode health check. Transmitter calibration and sensor calibration are verified to the percentage associated with the test condition selected when the test was initiated. This setting applies to manually initiated tests only.

Transmitter

Run the SMART Meter Verification test on the transmitter only. This results in the verification test only checking the transmitter calibration to the limits of the test criteria selected when the verification test was initiated. This setting applies to manually initiated tests only.

Sensor

Run the SMART Meter Verification test on the sensor only. This results in the verification test checking the sensor calibration to the limits of the test criteria selected when the SMART Meter Verification test was initiated, verifying the coil circuit health, and the electrode circuit health. This setting applies to manually initiated tests only.

6.11 Continuous SMART Meter Verification

LOI menu path	Diagnostics, Diag Controls, Cont Meter Ver
Traditional Fast Keys	1,2,1,3
Device dashboard	2,2,6,4

Continuous SMART Meter Verification can be used to monitor and verify the health of the flowmeter system. The continuous SMART Meter Verification will not report results until 30 minutes after powering up to ensure the system is stable and to avoid false failures.

6.11.1 Test scope

Continuous SMART Meter Verification can be configured to monitor the sensor coils, electrodes, transmitter calibration, and analog output. All of these parameters can be individually enabled or disabled. These parameters apply to continuous SMART Meter Verification only.

Coils

LOI menu path	Diagnostics, Diag Controls, Cont Meter Ver, Coils
Traditional Fast Keys	1,2,1,3,1
Device dashboard	2,2,6,4,2,1

Continuously monitor the sensor coil circuit by enabling this continuous SMART Meter Verification parameter.

Electrodes

LOI menu path	Diagnostics, Diag Controls, Cont Meter Ver, Electrodes
Traditional Fast Keys	1,2,1,3,2
Device dashboard	2,2,6,4,2,2

Continuously monitor the electrode resistance by enabling this continuous SMART Meter Verification parameter.

Transmitter

LOI menu path	Diagnostics, Diag Controls, Cont Meter Ver, Transmitter
Traditional Fast Keys	1,2,1,3,3
Device dashboard	2,2,6,4,2,3

Continuously monitor the transmitter calibration by enabling this continuous SMART Meter Verification parameter.

Analog output

LOI menu path	Diagnostics, Diag Controls, Cont Meter Ver, Analog Output
Traditional Fast Keys	1,2,1,3,4
Device dashboard	2,2,6,4,2,4

Continuously monitor the analog output signal by enabling this continuous SMART Meter Verification parameter.

6.12 SMART Meter Verification test results

If the SMART Meter Verification test is manually initiated, the transmitter will make several measurements to verify the transmitter calibration, sensor calibration, coil circuit health, and electrode circuits health. The results of these tests can be reviewed and recorded on the Manual Calibration Verification Results form found on page 132. Print the "Manual Calibration Verification Results" form and enter the test results as you view them. The completed form can be used to validate that the meter is within the required calibration limits to comply with governmental regulatory agencies.

Depending on the method used to view the results, they will be displayed in either a menu structure, as a method, or in the report format. When using the HART® Field Communicator, each individual parameter can be viewed as a menu item. When using the LOI, the parameters are viewed as a method using the left arrow key to cycle through the results. In AMS, the calibration verification report is populated with the necessary data eliminating the need to manually complete the form found on page 132.

When using AMS there are two possible methods that can be used to print the report:

- Method one involves using the print functionality within the EDDL screen. This print functionality essentially prints a screen shot of the report.
- Method two involves using the print feature within AMS while on the Maintenance Service Tools screen. This will result in a printout of all of the maintenance information. Page one of the report contains the meter verification result data.

The results are displayed in the order found in the table below. Each parameter displays a value used by the diagnostic to evaluate meter health.

Table 6-2. Manual Smart Meter Verification Test Parameters

	Parameter	LOI menu path (Diagnostics, Variables, MV Results, Manual Results)	Traditional Fast keys	Device Dashboard Fast keys
1	Test Condition	Test Condition	1,2,3,2,2,1,1	3,4,1,5,4,1
2	Test Criteria	Test Criteria	1,2,3,2,2,1,2	3,4,1,3
3	8714i Test Result	MV Results	1,2,3,2,2,1,3	3,4,1,5,4,2
4	Simulated Velocity	Sim Velocity	1,2,3,2,2,1,4	3,4,1,5,3,1
5	Actual Velocity	ActualVelocity	1,2,3,2,2,1,5	3,4,1,5,3,2
6	Velocity Deviation	Flow Sim Dev	1,2,3,2,2,1,6	3,4,1,5,3,3
7	Xmtr Cal Test Result	Xmtr Cal Verify	1,2,3,2,2,1,7	3,4,1,5,3,4
8	Sensor Cal Deviation	Sensor Cal Dev	1,2,3,2,2,1,8	3,4,1,5,2,3
9	Sensor Cal Test Result	Sensor Cal	1,2,3,2,2,1,9	3,4,1,5,2,4
10	Coil Circuit Test Result	Coil Circuit	1,2,3,2,2,1,--(1)	3,4,1,5,1,3
11	Electrode Circuit Test Result	Electrode Ckt	1,2,3,2,2,1,--(1)	3,4,1,5,1,6

1. To get to this value, use the down arrow to scroll through the menu list.

Table 6-3. Continuous SMART Meter Verification Test Parameters

	Parameter	LOI menu path (Diagnostics, Variables, MV Results, Continual Res,...)	Traditional Fast keys	Device Dashboard Fast keys
1	Continuous Limit	Test Criteria	1,2,3,2,2,2,1	3,4,2,2
2	Simulated Velocity	Sim Velocity	1,2,3,2,2,2,2	3,2,4,3,1
3	Actual Velocity	ActualVelocity	1,2,3,2,2,2,3	3,2,4,3,2
4	Velocity Deviation	Flow Sim Dev	1,2,3,2,2,2,4	3,2,4,3,3
5	Coil Signature	Coil Inductnce	1,2,3,2,2,2,5	3,2,4,2,2
6	Sensor Cal Deviation	Sensor Cal Dev	1,2,3,2,2,2,6	3,2,4,2,3
7	Coil Resistance	Coil Resist	1,2,3,2,2,2,7	3,2,4,2,1
8	Electrode Resistance	Electrode Res	1,2,3,2,2,2,8	3,2,4,2,4
9	mA Expected	4-20 mA Expect	1,2,3,2,2,2,9	3,2,4,4,1
10	mA Actual	4-20 mA Actual	1,2,3,2,2,2,--[(1)]	3,2,4,4,2
11	mA Deviation	AO FB Dev	1,2,3,2,2,2,--[(1)]	3,2,4,4,3

1. To get to this value, use the down arrow to scroll through the menu list.

6.13 SMART Meter Verification measurements

The SMART Meter Verification test will make measurements of the coil resistance, coil signature, and electrode resistance and compare these values to the values taken during the sensor signature process to determine the sensor calibration deviation, the coil circuit health, and the electrode circuit health. In addition, the measurements taken by this test can provide additional information when troubleshooting the meter.

Coil circuit resistance

LOI menu path	Manual: Diagnostics, Advanced Diag, Meter Verify, Measurements, Manual Measure, Coil Resist
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, Coil Resist
Traditional Fast Keys	Manual: 1,2,3,2,5,1,1
	Continuous: 1,2,3,2,5,2,1
Device dashboard	Manual: 3,4,1,3,1
	Continuous: 3,2,4,2,1

The coil circuit resistance is a measurement of the coil circuit health. This value is compared to the coil circuit resistance baseline measurement taken during the sensor signature process to determine coil circuit health. This value can be continuously monitored using continuous SMART Meter Verification.

Coil signature

LOI menu path	Manual: Diagnostics, Advanced Diag, Meter Verify, Measurements, Manual Measure, Coil Inductnce
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, Coil Inductnce
Traditional Fast Keys	Manual: 1,2,3,2,5,1,2
	Continuous: 1,2,3,2,5,2,2
Device dashboard	Manual: 3,4,1,3,2
	Continuous: 3,2,4,2,2

The coil signature is a measurement of the magnetic field strength. This value is compared to the coil signature baseline measurement taken during the sensor signature process to determine sensor calibration deviation. This value can be continuously monitored using continuous SMART Meter Verification.

Electrode circuit resistance

LOI menu path	Manual: Diagnostics, Advanced Diag, Meter Verify, Measurements, Manual Measure, Electrode Res
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, Electrode Res
Traditional Fast Keys	Manual: 1,2,3,2,5,1,3
	Continuous: 1,2,3,2,5,2,3
Device dashboard	Manual: 3,4,1,3,3
	Continuous: 3,2,4,2,4

The electrode circuit resistance is a measurement of the electrode circuit health. This value is compared to the electrode circuit resistance baseline measurement taken during the sensor signature process to determine electrode circuit health. This value can be continuously monitored using continuous SMART Meter Verification.

Actual velocity

LOI menu path	Manual: Diagnostics, Advanced Diag, Meter Verify, Measurements, Manual Measure, Actual Velocity
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, Actual Velocity
Traditional Fast Keys	Manual: 1,2,3,2,2,1,5
	Continuous: 1,2,3,2,5,2,4
Device dashboard	Manual: 3,4,1,5,3,2
	Continuous: 3,2,4,3,2

The actual velocity is a measurement of the simulated velocity signal. This value is compared to the simulated velocity to determine transmitter calibration deviation. This value can be continuously monitored using continuous SMART Meter Verification.

Flow simulation deviation

LOI menu path	Manual: Diagnostics, Variables, MV Results, Manual Results, Flow Sim Dev
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, Flow Sim Dev
Traditional Fast Keys	Manual: 1,2,3,2,2,1,6
	Continuous: 1, 2, 3, 2, 2, 2, 4
Device dashboard	Manual: 3,4,1,5,3,3
	Continuous: 3,2,4,3,3

The flow simulation deviation is a measurement of the percent difference between the simulated velocity and the actual measured velocity from the transmitter calibration verification test. This value can be continuously monitored using continuous SMART Meter Verification.

4-20 mA expected value

LOI menu path	Manual: Diagnostics, Advanced Diag, 4-20 mA Verify, View Results
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, 4-20 mA Expect
Traditional Fast Keys	Manual: 1,2,3,3,2
	Continuous: 1,2,3,2,5,2,5
Device dashboard	Manual: N/A
	Continuous: 3,2,4,4,1

The 4-20 mA expected value is the simulated analog signal used for the 4-20 mA meter verification test. This value is compared to the actual analog signal to determine analog output deviation. This value can be continuously monitored using continuous SMART Meter Verification.

4-20 mA actual value

LOI menu path	Manual: Diagnostics, Advanced Diag, 4-20 mA Verify, View Results
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, 4-20 mA Actual
Traditional Fast Keys	Manual: 1,2,3,3,2
	Continuous: 1,2,3,2,5,2,6
Device dashboard	Manual: N/A
	Continuous: 3,2,4,4,1

The 4-20 mA actual value is the measured analog signal used for the 4-20 mA meter verification test. This value is compared to the simulated analog signal to determine analog output deviation. This value can be continuously monitored using continuous SMART Meter Verification.

4-20 mA deviation

LOI menu path	Manual: Diagnostics, Advanced Diag, 4-20 mA Verify, View Results
	Continuous: Diagnostics, Advanced Diag, Meter Verify, Measurements, Continual Meas, AO FB Dev
Traditional Fast Keys	Manual: 1,2,3,3,2
	Continuous: 1,2,3,2,2,2, --[1]
Device dashboard	Manual: N/A
	Continuous: 3,2,4,4,1

1. To get to this value, the down arrow must be used to scroll through the menu list

The 4-20 mA deviation is a measurement of the percent difference between the simulated analog signal and the actual measured analog signal from the analog output verification test. This value can be continuously monitored using continuous SMART Meter Verification.

6.14 Optimizing the SMART Meter Verification

The SMART Meter Verification diagnostic can be optimized by setting the test criteria to the desired levels necessary to meet the compliance requirements of the application. The following examples below will provide some guidance on how to set these levels.

Example

An effluent meter must be certified annually to comply with environmental regulations. This example regulation requires that the meter be certified to five percent.

Since this is an effluent meter, shutting down the process may not be viable. In this instance the SMART Meter Verification test will be performed under flowing conditions. Set the test criteria for flowing, full to five percent to meet the requirements of the governmental agencies.

Example

A pharmaceutical company requires bi-annual verification of meter calibration on a critical feed line for one of their products. This is an internal standard, and the plant requires a calibration record be kept on-hand. Meter calibration on this process must meet two percent. The process is a batch process so it is possible to perform the calibration verification with the line full and with no flow.

Since the SMART Meter Verification test can be run under no flow conditions, set the test criteria for no flow to two percent to comply with the necessary plant standards.

Example

A food and beverage company requires an annual calibration of a meter on a product line. The plant standard calls for the accuracy to be three percent or better. They manufacture this product in batches, and the measurement cannot be interrupted when a batch is in process. When the batch is complete, the line goes empty.

Since there is no means of performing the SMART Meter Verification test while there is product in the line, the test must be performed under empty pipe conditions. The test criteria for empty pipe should be set to three percent, and it should be noted that the electrode circuit health cannot be verified.

6.14.1 Optimizing continuous SMART Meter Verification

Example

For continuous SMART Meter Verification, there is only one test criteria value to configure, and it will be used for all flow conditions. The factory default is set to five percent to minimize the potential for false failures under empty pipe conditions. For best results, set the criteria to match the maximum value of the three test criteria set during manual meter verification (no flow, flowing full, and empty pipe).

For example, a plant might set the following manual meter verification test criteria: two percent for no flow, three percent for flowing full, and four percent for empty pipe. In this case, the maximum test criterion is four percent, so the test criteria for continuous SMART Meter Verification should be set to four percent. If the tolerance band is set too tightly, under empty pipe conditions or noisy flowing conditions, a false failure of the transmitter test may occur.

Manual Calibration Verification Results

Report parameters	
User Name: ______________________________	Calibration Conditions: ❑ Internal ❑ External
Tag #:______________________________	Test Conditions: ❑ Flowing ❑ No Flow, Full Pipe ❑ Empty Pipe
Flowmeter information and configuration	
Software Tag:	PV URV (20 mA scale):______________________
Calibration Number:	PV LRV (4 mA scale):______________________
Line Size:	PV Damping:______________________
Transmitter calibration verification results	**Sensor calibration verification results**
Simulated Velocity:	Sensor Deviation %:______________________
Actual Velocity:	Sensor Test: ❑ PASS / ❑ FAIL / ❑ NOT TESTED
Deviation %:	Coil Circuit Test: ❑ PASS / ❑ FAIL / ❑ NOT TESTED
Transmitter: ❑ PASS / ❑ FAIL / ❑ NOT TESTED	Electrode Circuit Test: ❑ PASS / ❑ FAIL / ❑ NOT TESTED
Summary of Calibration Verification results	
Verification Results: The result of the flowmeter verification test is: ❑ PASSED / ❑ FAILED	
Verification Criteria: This meter was verified to be functioning within ________ % of deviation from the original test parameters.	
Signature:______________________________	Date:______________________________

Section 7 Digital Signal Processing

7.1 Introduction

Magmeters are used in applications that can create noisy flow readings. The Rosemount 8732EM has the capability to deal with difficult applications that have previously manifested themselves in a noisy output signal. In addition to selecting a higher coil drive frequency (37 Hz vs. 5 Hz) to isolate the flow signal from the process noise, the 8732EM microprocessor has digital signal processing that is capable of rejecting the noise specific to the application. This section explains the different types of process noise, provides instructions for optimizing the flow reading in noisy applications, and provides a detailed description of the digital signal processing functionality.

7.2 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Read the following safety messages before performing any operation described in this section.

⚠ WARNING

Explosions could result in death or serious injury.

- Verify the operating atmosphere of the sensor and transmitter is consistent with the appropriate hazardous locations certifications.
- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

Failure to follow safe installation and servicing guidelines could result in death or serious injury.

- Installation should be performed by qualified personnel only.
- Do not perform any service other than those contained in this manual.
- Process leaks may result in death or serious injury.
- The electrode compartment may contain line pressure; it must be depressurized before the cover is removed.

High voltage that may be present on leads could cause electrical shock.

- Avoid contact with leads and terminals.

7.3 Process noise profiles

1/f noise

This type of noise has higher amplitudes at lower frequencies, but generally degrades over increasing frequencies. Potential sources of 1/f noise include chemical mixing and slurry flow particles rubbing against the electrodes.

Spike noise

This type of noise generally results in a high amplitude signal at specific frequencies which can vary depending on the source of the noise. Common sources of spike noise include chemical injections directly upstream of the flowmeter, hydraulic pumps, and slurry flows with low concentrations of particles in the stream. The particles bounce off of the electrode generating a "spike" in the electrode signal. An example of this type of flow stream would be a recycle flow in a paper mill.

White noise

This type of noise results in a high amplitude signal that is relatively constant over the frequency range. Common sources of white noise include chemical reactions or mixing that occurs as the fluid passes through the flowmeter and high concentration slurry flows where the particulates are constantly passing over the electrode head. An example of this type of flow stream would be a basis weight stream in a paper mill.

7.4 High process noise diagnostic

The transmitter continuously monitors signal amplitudes over a wide range of frequencies. For the high process noise diagnostic, the transmitter specifically looks at the signal amplitude at frequencies of 2.5 Hz, 7.5 Hz, 32.5 Hz, and 42.5 Hz. The transmitter uses the values from 2.5 and 7.5 Hz and calculates an average noise level. This average is compared to the amplitude of the signal at 5 Hz. If the signal amplitude is not 25 times greater than the noise level, and the coil drive frequency is set at 5 Hz, the high process noise diagnostic will trip indicating that the flow signal may be compromised. The transmitter performs the same analysis around the 37.5 Hz coil drive frequency using the 32.5 Hz and 42.5 Hz values to establish a noise level.

7.5 Optimizing flow reading in noisy applications

If the flow reading of the 8732EM is unstable, first check the wiring, grounding, and process reference associated with the magnetic flowmeter system. Ensure that the following conditions are met:

- Ground straps are attached to the adjacent flange or ground ring
- Grounding rings, lining protectors, or a process reference electrode are being used in lined or non-conductive piping

The causes of unstable transmitter output can usually be traced to extraneous voltages on the measuring electrodes. This "process noise" can arise from several causes including electro-chemical reactions between the fluid and the electrode, chemical reactions in the process itself, free ion activity in the fluid, or some other disturbance of the fluid/electrode capacitive layer. In such noisy applications, an analysis of the frequency spectrum reveals process noise that typically becomes significant below 15 Hz.

In some cases, the effects of process noise may be sharply reduced by elevating the coil drive frequency above the 15 Hz region. The Rosemount 8732EM coil drive mode is selectable between the standard 5 Hz and the noise-reducing 37 Hz.

7.5.1 Coil drive frequency

LOI menu path	Device Setup, Detailed Setup, Additional Params, Coil Drive Freq
Traditional fast keys	1,4,1,1
Device dashboard	2,2,8,3

This parameter changes the pulse rate of the magnetic coils.

5 Hz

The standard coil drive frequency is 5 Hz, which is sufficient for nearly all applications.

37 Hz

If the process fluid causes a noisy or unstable flow reading, increase the coil drive frequency to 37 Hz. If the 37 Hz mode is selected, perform the auto zero function for optimum performance.

7.5.2 Auto zero

LOI menu path	Device Setup, Diagnostics, Trims, Auto Zero
Traditional fast keys	1,2,5,4
Device dashboard	2,2,8,4

To ensure optimum accuracy when using 37 Hz coil drive mode, there is an auto zero function that should be initiated. When using 37 Hz coil drive mode it is important to zero the system for the specific application and installation.

The auto zero procedure should be performed only under the following conditions:

- With the transmitter and sensor installed in their final positions. This procedure is not applicable on the bench.
- With the transmitter in 37 Hz coil drive mode. Never attempt this procedure with the transmitter in 5 Hz coil drive mode.
- With the sensor full of process fluid at zero flow.

These conditions should cause an output equivalent to zero flow.

Set the loop to manual if necessary and begin the auto zero procedure. The transmitter completes the procedure automatically in about 90 seconds. A clock symbol will appear in the lower right-hand corner of the display to indicate that the procedure is running.

Note
Failure to complete an auto zero may result in a flow velocity error of 5 to10% at1 ft/s (0.3 m/s). While the output level will be offset by the error, the repeatability will not be affected.

7.5.3 Digital signal processing (DSP)

LOI menu path	Device Setup, Detailed Setup, Signal Processing
Traditional fast keys	1,4,4
Device dashboard	2,2,8,6

The 8732EM contains several advanced functions that can be used to stabilize erratic outputs caused by process noise. The signal processing menu contains this functionality.

If the 37 Hz coil drive frequency has been set, and the output is still unstable, the damping and signal processing function should be used. It is important to set the coil drive frequency to 37 Hz to increase the flow sampling rate.

The 8732EM provides an easy and straightforward start-up, and also incorporates the capability to deal with difficult applications that have previously manifested themselves in a noisy output signal. In addition to selecting a higher coil drive frequency (37 Hz vs. 5 Hz) to isolate the flow signal from the process noise, the 8732EM microprocessor can actually scrutinize each input based on three user-defined parameters to reject the noise specific to the application.

Operating mode

LOI menu path	Device Setup, Detailed Setup, Signal Processing, Operating Mode
Traditional fast keys	1,4,4,1
Device dashboard	2,2,8,5

The operating mode should be used only when the signal is noisy and gives an unstable output. Filter mode automatically uses 37 Hz coil drive mode and activates signal processing at the factory set default values. When using filter mode, perform an auto zero with no flow and a full sensor. Either of the parameters, coil drive mode or signal processing, may still be changed individually. Turning signal processing off or changing the coil drive frequency to 5 Hz will automatically change the operating mode from filter mode to normal mode.

This software technique, known as signal processing, “qualifies” individual flow signals based on historic flow information and three user-definable parameters, plus an on/off control. These parameters are described below.

Status

LOI menu path	Device Setup, Detailed Setup, Signal Processing, Main Config DSP, Status
Traditional fast keys	1,4,4,2,1
Device dashboard	2,2,8,6,1

Enable or disable the DSP capabilities. When ON is selected, the Rosemount 8732EM output is derived using a running average of the individual flow inputs. Signal processing is a software algorithm that examines the quality of the electrode signal against user-specified tolerances. The three parameters that make up signal processing (number of samples, maximum percent limit, and time limit) are described below.

Number of samples

LOI menu path	Device Setup, Detailed Setup, Signal Processing, Main Config DSP, Samples
Traditional fast keys	1,4,4,2,2
Device dashboard	2,2,8,6,2

The number of samples sets the amount of time that inputs are collected and used to calculate the average value. Each second is divided into tenths with the number of samples equaling the number of increments used to calculate the average. This parameter can be configured for an integer value between 1 and 125. The default value is 90 samples.

For example:

- A value of 1 averages the inputs over the past $^{1}/_{10}$ second
- A value of 10 averages the inputs over the past 1 second
- A value of 100 averages the inputs over the past 10 seconds
- A value of 125 averages the inputs over the past 12.5 seconds

Percent limit

LOI menu path	Device Setup, Detailed Setup, Signal Processing, Main Config DSP, % Limit
Traditional fast keys	1,4,4,2,3
Device dashboard	2,2,8,6,3

This parameter will set the tolerance band on either side of the running average, referring to percent deviation from the average. Values within the limit are accepted while value outside the limit are scrutinized to determine if they are a noise spike or an actual flow change. This parameter can be configured for an integer value between 0 and 100 percent. The default value is 2 percent.

Time limit

LOI menu path	Device Setup, Detailed Setup, Signal Processing, Main Config DSP, Time Limit
Traditional fast keys	1,4,4,2,4
Device dashboard	2,2,8,6,4

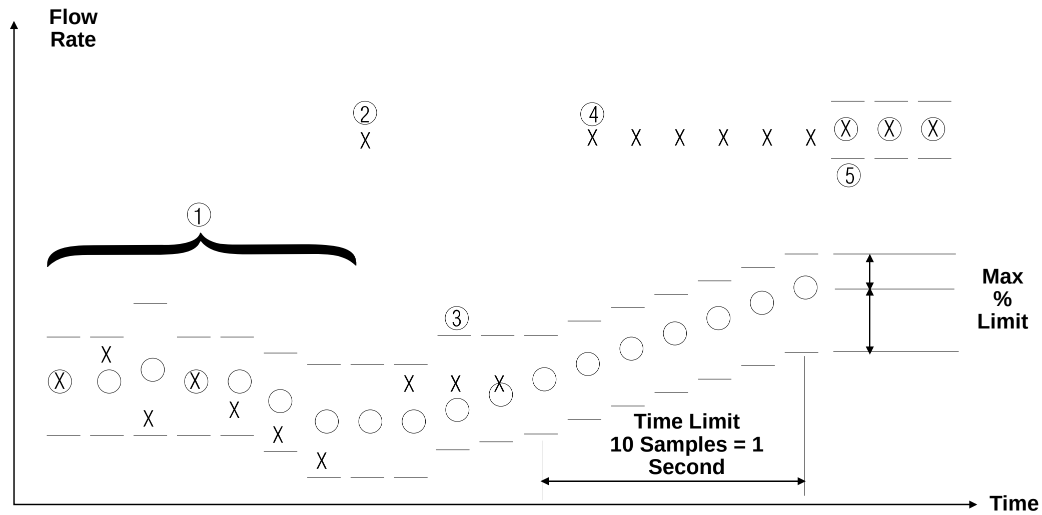
The time limit parameter forces the output and running average values to the new value of an actual flow rate change that is outside the percent limit boundaries. It thereby limits response time to flow changes to the time limit value rather than the length of the running average.

If the number of samples selected is 100, then the response time of the system is 10 seconds. In some cases this may be unacceptable. Setting the time limit forces the 8732EM to clear the value of the running average and re-establish the output and average at the new flow rate once the time limit has elapsed. This parameter limits the response time added to the loop. A suggested time limit value of two seconds is a good starting point for most applicable process fluids. This parameter can be configured for a value between 0.6 and 256 seconds. The default value is 2 seconds.

7.6 Explanation of signal processing algorithm

An example plotting flow rate versus time is given below to help visualize the signal processing algorithm.

Figure 7-1. Signal Processing Functionality



X: Input flow signal from sensor.

O: Average flow signals and transmitter output, determined by the number of samples parameter.

Tolerance band, determined by the percent limit parameter.

- Upper value = average flow + [(percent limit/100) average flow]

- Lower value = average flow - [(percent limit/100) average flow]

1. This scenario is that of a typical non-noisy flow. The input flow signal is within the percent limit tolerance band, therefore qualifying itself as a good input. In this case the new input is added directly into the running average and is passed on as a part of the average value to the output.

2. This signal is outside the tolerance band and therefore is held in memory until the next input can be evaluated. The running average is provided as the output.

3. The previous signal currently held in memory is simply rejected as a noise spike since the next flow input signal is back within the tolerance band. This results in complete rejection of noise spikes rather than allowing them to be "averaged" with the good signals as occurs in the typical analog damping circuits.

4. As in number 2 above, the input is outside the tolerance band. This first signal is held in memory and compared to the next signal. The next signal is also outside the tolerance band (in the same direction), so the stored value is added to the running average as the next input and the running average begins to slowly approach the new input level.

5. To avoid waiting for the slowly incrementing average value to catch up to the new level input, an algorithm is provided. This is the “time limit” parameter. The user can set this parameter to eliminate the slow ramping of the output toward the new input level.

Section 8 Maintenance

8.1 Introduction

This section covers basic transmitter maintenance. Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Read the following safety messages before performing any operation described in this section. Refer to these warnings when appropriate throughout this section.

8.2 Safety information

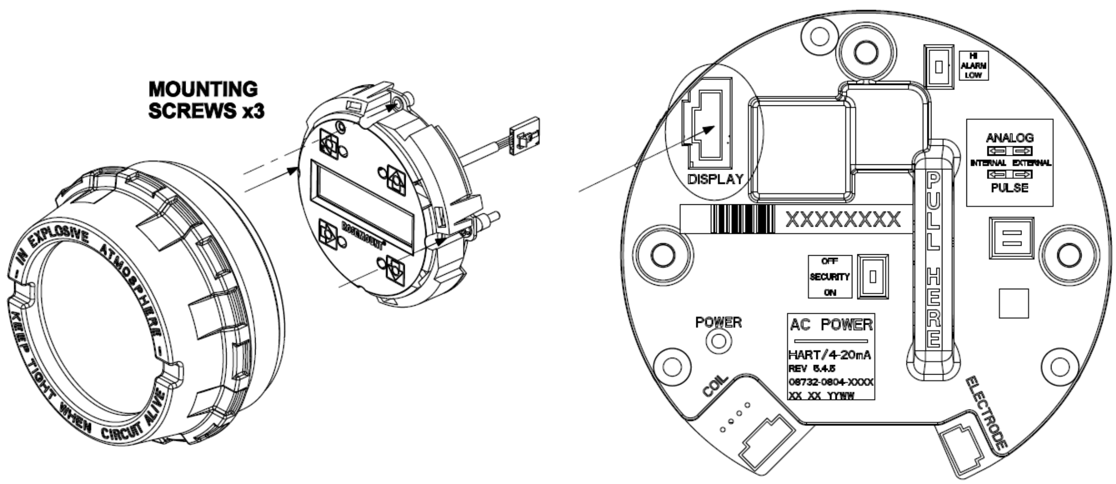
⚠ WARNING

Failure to follow these maintenance guidelines could result in death or serious injury.

- Installation and servicing instructions should be performed by qualified personnel only.
- Do not perform any servicing other than that contained in the operating instructions.
- Verify the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.
- Do not connect a Rosemount 8732EM to a non-Rosemount sensor that is located in an explosive atmosphere.
- Mishandling products exposed to a hazardous substance may result in death or serious injury.
- If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

8.3 Installing a Local Operator Interface (LOI)

Figure 8-1. Installing a Local Operator Interface (LOI)



1. If the transmitter is installed in a control loop, secure the loop.
2. Remove power from the transmitter.
3. Remove the cover on the electronics compartment of the transmitter housing. If the cover has a cover jam screw, loosen it before removing the cover. See "Cover jam screw" on page 33 for details on the cover jam screw.
4. On the electronics stack, locate the serial connection labeled "DISPLAY". See Figure 8-1.
5. Plug the serial connector from the back of the LOI into the receptacle on the electronics stack. The LOI can be rotated in 90 degree increments to provide the best viewing position. Rotate the LOI to the desired orientation, taking care to not exceed 360 degrees of rotation. Exceeding 360 degrees of rotation could damage the LOI cable and/or connector.
6. Once the serial connector is installed on the electronics stack, and the LOI is oriented in the desired position, tighten the three mounting screws.
7. Install the extended cover with the glass viewing pane and tighten to metal-to-metal contact. If the cover has a cover jam screw, this must be tightened to comply with installation requirements. Return power to the transmitter and verify that it is functioning correctly and reporting the expected flow rate.
8. If installed in a control loop, return the loop to automatic control.

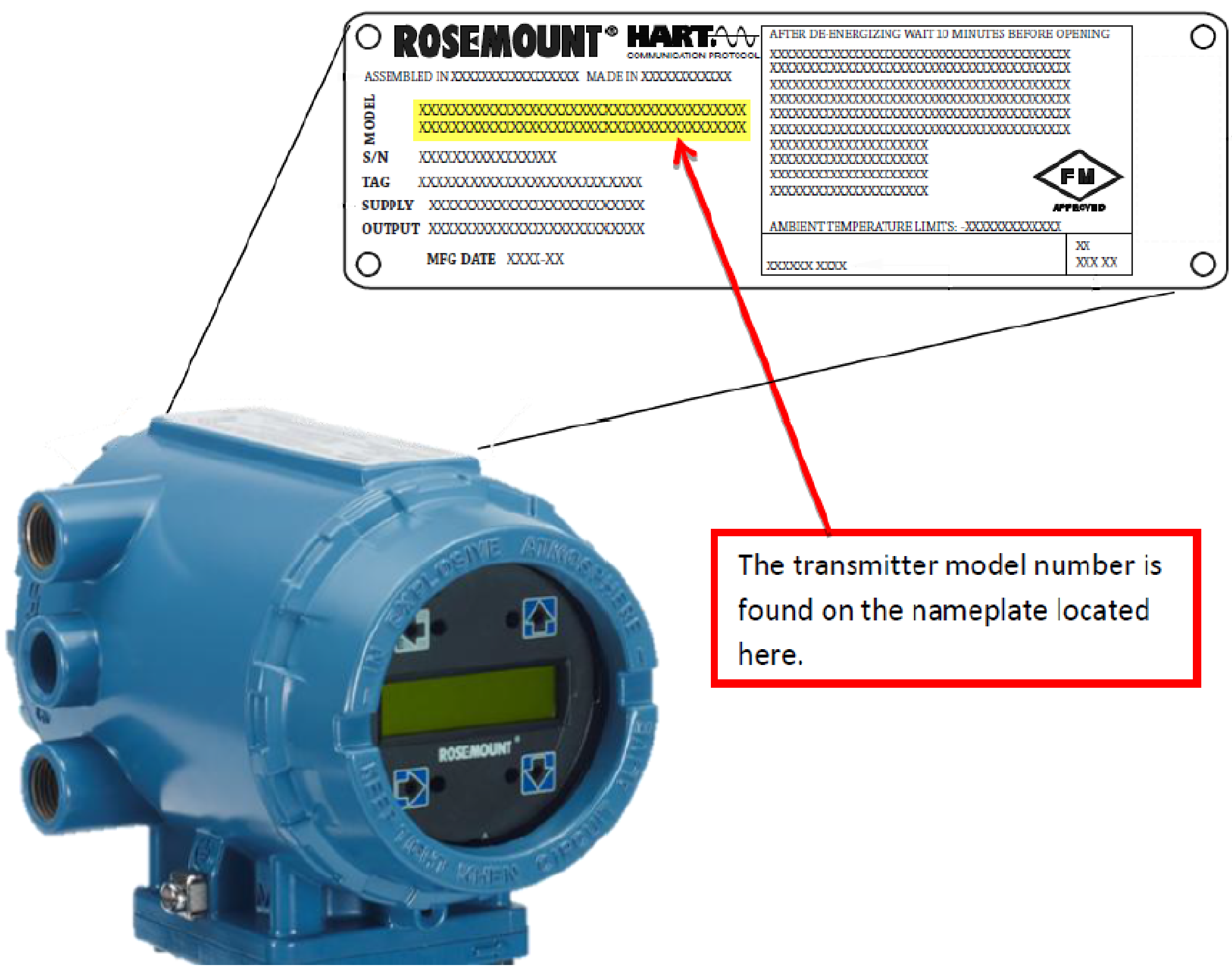
8.4 Replacing 8732EM revision 4 electronics stack

Prior to installing the replacement electronics stack, it is important to verify that the transmitter housing you have is of the correct design to accept the Revision 4 electronics.

Follow the steps below to confirm the transmitter housing is compatible with this electronics kit.

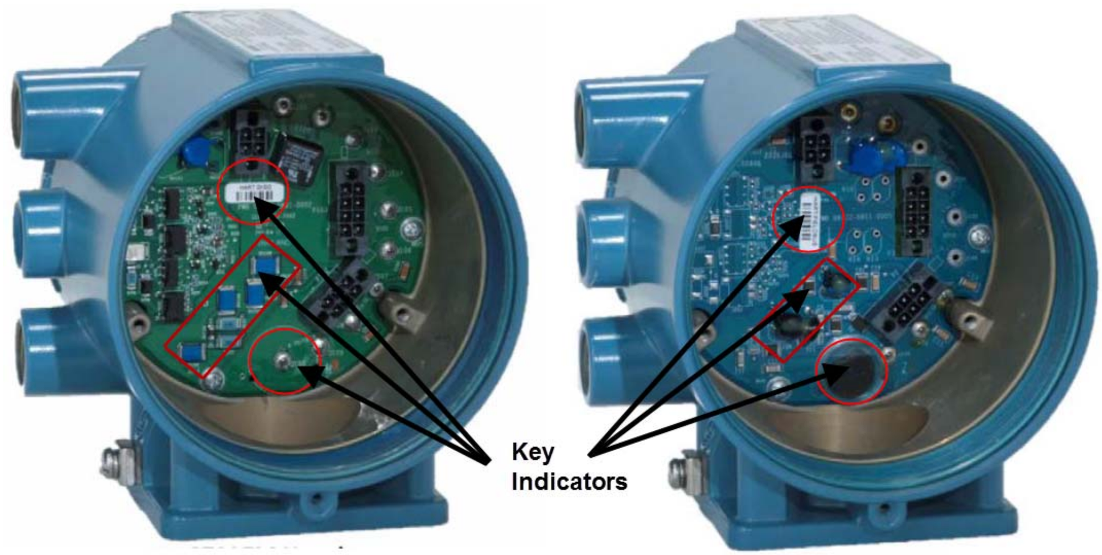
1. Verify the model number is 8732EM. If the transmitter model is not 8732EM, then these electronics are not compatible. See Figure 8-2 for the location of the model number. If the model is 8732C, 8742C, 8732ES, or some other model, then these electronics are not compatible with the enclosure. If you have one of these transmitters, a full replacement transmitter will be required. Consult the 8700M Product Data Sheet (00813-0100-4444) for details on ordering a new transmitter.

Figure 8-2. Transmitter Nameplate Location



2. Verify the electronics board inside the housing is green and looks like the board pictured on the left in Figure 8-3. If the board is not green, or does not look like the board pictured, then the electronics are not compatible.

Figure 8-3. Transmitter Housing Electronics Board Identification



8732EM housing
Correct housing

8732ES housing
Incorrect housing

3. Confirm the electronics stack is for an 8732EM transmitter. Refer to the picture on the left in Figure 8-4.

Figure 8-4. Electronics Stack Identification

8732EM stack board

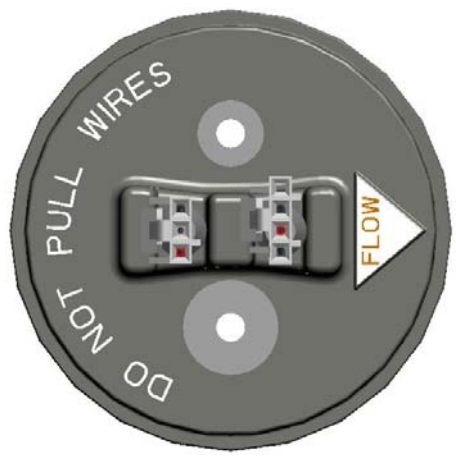
8732ES electronics stack

8.5 Replacing socket module

The socket module connects the sensor adapter to the transmitter. There are two versions of the socket module - one for integral mount transmitters and one for remote mount transmitters. The socket module is a replaceable component.

To remove the socket module, loosen the two mounting screws and pull up on the socket module from the base. When removing the socket module, do not pull on the wires. See Figure 8-5.

Figure 8-5. Socket Module Warning



8.5.1 Integral mount socket module

The integral mount socket module is shown in Figure 8-6. To gain access to the socket module, the transmitter must be removed from the sensor adapter.

Figure 8-6. Socket Module—Integral Mount

Removing integral mount socket module

1. Disconnect power.
2. Remove electronics cover to gain access to the coil and electrode cables.
3. If the transmitter has an LOI, it will need to be removed to gain access to the coil and electrode cables.
4. Disconnect the coil and electrode cables.
5. Remove the four transmitter mounting screws.
6. Lift the transmitter off of the sensor adapter.
7. To remove the socket module, loosen the two mounting screws and pull up on the socket module from the base.
8. When removing the socket module, do not pull on the wires. See Figure 8-5.

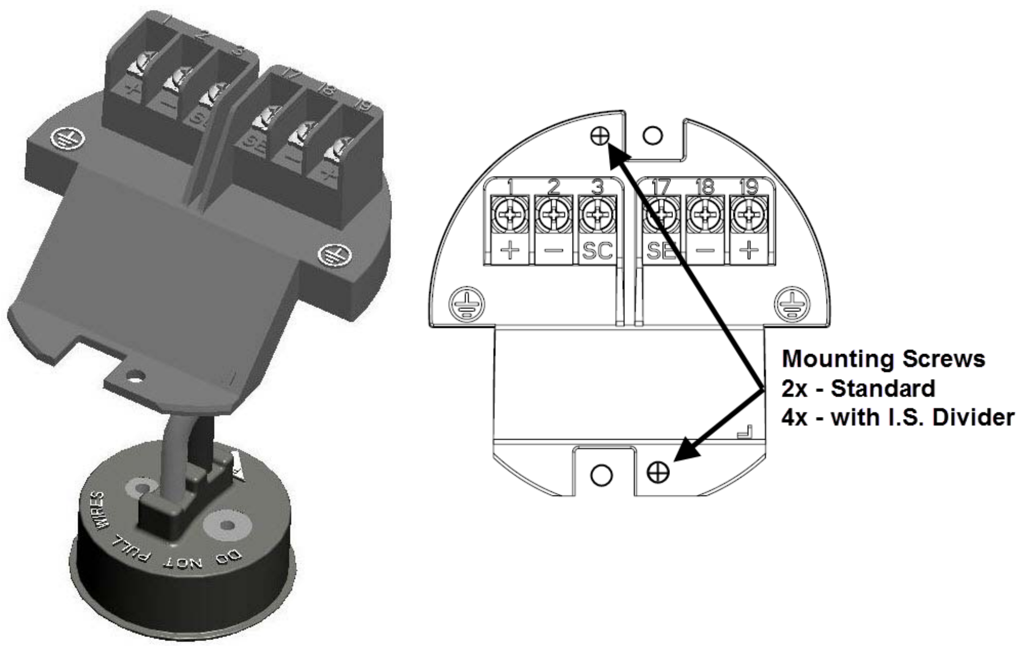
Installing integral mount socket module

1. To insert a new integral mount socket module, press the base into its keyed position and tighten the two mounting screws.
2. The coil and electrode cables are fed through the bottom opening of the transmitter and plugged into the face of the electronics.
3. The coil and electrode cables are keyed so they will only fit into their dedicated location.
4. If the transmitter has an LOI, it will need to be removed to access the coil and electrode ports.
5. Once the connections are made, the transmitter can be secured to the sensor adapter using the four mounting bolts.

8.5.2 Replacing terminal block socket module

The terminal block socket module is shown in Figure 8-7. To gain access to the socket module, remove the junction box from the sensor adapter.

Figure 8-7. Socket Module—Terminal Block



Removing terminal block socket module

1. Disconnect power to the transmitter and the remote cabling connected to the terminal block.
2. Remove the junction box cover to gain access to the remote cabling.
3. To disconnect the terminal block from the junction box housing, remove the two mounting screws and the two divider mounting screws (if applicable).
4. Pull up on the terminal block to expose the socket module base.
5. To remove the socket module, loosen the two mounting screws and pull up on the socket module from the base.
6. When removing the socket module, do not pull on the wires. See Figure 8-5.

Installing terminal block socket module

1. Insert the new terminal block socket module, press the base into its keyed position, and tighten the two mounting screws.
2. Connect the terminal block to the junction box housing by tightening the two mounting screws. Install the divider with the two mounting screws if applicable.
3. Reconnect remote cabling and power and replace junction box cover.

8.6 Trims

LOI menu path	Diagnostics, Trims
Traditional fast keys	1,2,5
Device dashboard	3,4

Trims are used to calibrate the analog loop, calibrate the transmitter, re-zero the transmitter, and calibrate the transmitter with another manufacturer's sensor. Proceed with caution whenever performing a trim function.

8.6.1 D/A trim

LOI menu path	Diagnostics, Trims, D/A Trim
Traditional fast keys	1,2,5,1
Device dashboard	3,4,4,5

The D/A trim is used to calibrate the 4-20mA analog loop output from the transmitter. For maximum accuracy, the analog output should be trimmed for your system loop. Use the following steps to complete the output trim function.

1. Set the loop to manual, if necessary.
2. Connect a precision ammeter in the 4-20mA loop.
3. Initiate the D/A trim function with the LOI or Handheld Communicator.
4. Enter the 4mA meter value when prompted.
5. Enter the 20mA meter value when prompted.
6. Return the loop to automatic control, if necessary.

The 4-20mA trim is now complete. The D/A trim can be repeated to check the results. Alternatively, the analog output test can also be used to verify loop performance.

8.6.2 Scaled D/A trim

LOI menu path	Diagnostics, Trims, Scaled D/A Trim
Traditional fast keys	1,2,5,2 or 1,4,2,1,7
Device dashboard	3,4,4,6

A scaled D/A trim enables calibration of the flowmeter analog output using a different scale than the standard 4-20mA output scale. Non-scaled D/A trimming (described above), is typically performed using an ammeter where calibration values are entered in units of milliamperes. Scaled D/A trimming enables trimming of the flowmeter using a scale that may be more convenient based upon the method of measurement.

For example, it may be more convenient to make current measurements by direct voltage readings across the loop resistor. If the loop resistor is 500 ohms, and calibration of the meter will be done using voltage measurements across this resistor, the trim points can be rescaled from 4-20mA to 4-20mA x 500 ohm or 2-10VDC. Once the scaled trim points have been entered as 2 and 10, calibration of the flowmeter can be done by entering voltage measurements directly from the voltmeter.

8.6.3 Digital trim

LOI menu path	Device Setup, Diagnostics, Trims, Digital Trim
Traditional fast keys	1,2,5,3
Device dashboard	3,4,5

Digital trim is the function by which the factory calibrates the transmitter. This procedure is rarely needed by users. It is only necessary if the Rosemount 8732EM is suspected to be no longer accurate. A Rosemount 8714D Calibration Standard is required to complete a digital trim. Attempting a digital trim without a Rosemount 8714D Calibration Standard may result in an inaccurate transmitter or an error message. The digital trim must be performed with the coil drive mode set to 5Hz and with a nominal sensor calibration number stored in the memory.

Note
Attempting a digital trim without a Rosemount 8714D Calibration Standard may result in an inaccurate transmitter, or a "DIGITAL TRIM FAILURE" message may appear. If this message occurs, no values were changed in the transmitter. Simply cycle power on the Rosemount 8732EM to clear the message.

To simulate a nominal sensor with the Rosemount 8714D Calibration Standard, change/verify the following five parameters in the Rosemount 8732EM:

- Calibration Number-1000015010000000
- Units-ft/s
- PV URV-20mA = 30.00 ft/s
- PV LRV-4mA = 0 ft/s
- Coil Drive Frequency-5Hz

Note
Before changing any of the configuration parameters, be sure to record the original values so that the transmitter can be returned to the original configuration prior to being placed back into operation. Failure to return the settings to the original configuration will result in incorrect flow and totalizer readings.

The instructions for changing the calibration number, units, PV URV, and PV LRV are located in "Basic setup" on page 34. Instructions for changing the coil drive frequency can be found on "Coil drive frequency" on page 135.

Set the loop to manual (if necessary) and then complete the following steps:

1. Power down the transmitter.
2. Connect the transmitter to a Rosemount 8714D Calibration Standard.
3. Power up the transmitter with the Rosemount 8714D connected and read the flow rate. The electronics need about a 5-minute warm-up time to stabilize.
4. Set the 8714D Calibration Standard to the 30 ft/s (9.1 m/s) setting.
5. The flow rate reading after warm-up should be between 29.97 (9.1 m/s) and 30.03 ft/s (9.2 m/s).
6. If the reading is within the range, return the transmitter to the original configuration parameters.
7. If the reading is not within this range, initiate a digital trim with the LOI or Handheld Communicator. The digital trim takes about 90 seconds to complete. No transmitter adjustments are required.

8.6.4 Universal trim

LOI menu path	Device Setup, Diagnostics, Trims, Universal Trim
Traditional fast keys	1,2,5,5
Device dashboard	2,4,1

The universal auto trim function enables the Rosemount 8732EM to calibrate sensors that were not calibrated at the Rosemount factory. The function is activated as one step in a procedure known as in-process calibration. If a Rosemount sensor has a 16-digit calibration number, in-process calibration is not required. If it does not, or if the sensor is made by another manufacturer, complete the following steps for in-process calibration. Refer to Appendix D Implementing a Universal Transmitter.

1. Determine the flow rate of the process fluid in the sensor.

Note
The flow rate in the line can be determined by using another sensor in the line, by counting the revolutions of a centrifugal pump, or by performing a bucket test to determine how fast a given volume is filled by the process fluid.

2. Complete the universal auto trim function.

When the routine is completed, the sensor is ready for use.

8.7 Review

LOI menu path	Device Setup, Review
Traditional fast keys	1,5
Device dashboard	N/A

The 8732EM includes a capability to review the configuration variable settings.

The flowmeter configuration parameters set at the factory should be reviewed to ensure accuracy and compatibility with the particular application of the flowmeter.

Note
If the LOI is used to review variables, each variable must be accessed as if changing its setting. The value displayed on the LOI screen is the configured value of the variable.

Section 9 Troubleshooting

9.1 Introduction

This section covers basic transmitter and sensor troubleshooting. Problems in the magnetic flowmeter system are usually indicated by incorrect output readings from the system, error messages, or failed tests. Consider all sources when identifying a problem in the system. If the problem persists, consult the local Rosemount representative to determine if the material should be returned to the factory. Emerson Process Management offers several diagnostics that aid in the troubleshooting process. Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Read the following safety messages before performing any operation described in this section. Refer to these warnings when appropriate throughout this section.

The Rosemount 8732EM performs self-diagnostics on the entire magnetic flowmeter system: the transmitter, the sensor, and the interconnecting wiring. By sequentially troubleshooting each individual piece of the magmeter system, it becomes easier to identify the problem and make the appropriate adjustments.

If there are problems with a new magmeter installation, see 9.3 Installation check and guide below for a quick guide to solve the most common installation problems. For existing magmeter installations, Table on page 166 lists the most common magmeter problems and corrective actions.

9.2 Safety information

⚠ WARNING

Failure to follow these troubleshooting guidelines could result in death or serious injury.

- Installation and servicing instructions should be performed by qualified personnel only.
- Do not perform any servicing other than that contained in the operating instructions.
- Verify that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.
- Do not connect a Rosemount 8732EM to a non-Rosemount sensor that is located in an explosive atmosphere.
- Mishandling products exposed to a hazardous substance may result in death or serious injury.
- If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

9.3 Installation check and guide

Use this guide to check new installations of Rosemount magnetic flowmeter systems that appear to malfunction.

9.3.1 Transmitter

Before applying power to the magnetic flowmeter system, make the following transmitter checks:

1. Record the transmitter model number and serial number.
2. Visually inspect the transmitter for any damage including the terminal block.
3. Verify the proper wiring connections have been made for the power and outputs.

Apply power to the magnetic flowmeter system before making the following transmitter checks:

1. Check for an active error message or status alert. Refer to 9.4 Diagnostic messages.
2. Verify the correct sensor calibration number is entered in the transmitter. The calibration number is listed on the sensor nameplate.
3. Verify the correct sensor line size is entered in the transmitter. The line size value is listed on the sensor nameplate.
4. Verify the analog range of the transmitter matches the analog range in the control system.
5. Verify the forced analog output and forced pulse output of the transmitter produces the correct output at the control system.
6. If desired, use a Rosemount 8714D to verify the transmitter calibration.

9.3.2 Sensor

Be sure that power to magnetic flowmeter system is removed before beginning the following sensor checks:

1. Record the sensor model number and serial number.
2. Visually inspect the sensor for any damage including inside the remote junction box, if applicable.
3. For horizontal flow installations, ensure that the electrodes remain covered by process fluid. For vertical or inclined installations, ensure that the process fluid is flowing up into the sensor to keep the electrodes covered by process fluid.
4. Verify the flow arrow is pointing in the same direction as forward flow.
5. Ensure the grounding straps on the sensor are connected to grounding rings, lining protectors, or the adjacent pipe flanges. Improper grounding will cause erratic operation of the system. Sensors with a ground electrode will not require the grounding straps to be connected.

9.3.3 Remote wiring

1. The electrode signal and coil drive wires must be separate cables, unless Rosemount specified combo cable is used. See 2.12 Wiring the transmitter.
2. The electrode signal wire and coil drive wire must be twisted shielded cable. Rosemount recommends 20 AWG twisted shielded cable for the electrode signal and 14 AWG twisted shielded cable for the coil drive. See 2.12 Wiring the transmitter.
3. See Appendix B Product Certifications regarding wiring installation requirements.
4. See Appendix C Wiring Diagrams for component and/or combination cable wiring.
5. Verify there is minimal exposed wiring and shielding. Less than 1 inch (25 mm) is recommended.
6. The single conduit that houses both the electrode signal and coil drive cables should not contain any other wires. This includes wires from other magmeters.

Note
For installations requiring intrinsically safe electrodes, the signal and coil drive cables must be run in Individual conduits.

9.3.4 Process fluid

1. The process fluid should have a minimum conductivity of 5 microSiemens/cm (5 micro mhos/cm).
2. The process fluid must be free of air and gas.
3. The sensor must be full of process fluid.
4. The process fluid must be compatible with the wetted materials - liner, electrodes, ground rings, and lining protectors. Refer to the "Rosemount Magnetic Flowmeter Material Selection Guide" (00816-0100-3033) Technical Note for details.
5. If the process is electrolytic or has cathodic protection, refer to the "Installation and Grounding of Magmeters in Typical and Special Applications" (00840-2400-4727) Technical Note for special installation requirements.

9.4 Diagnostic messages

Problems in the magnetic flowmeter system are usually indicated by incorrect output readings from the system, error messages, or failed tests. Consider all sources in identifying a problem in the system.

Table 9-1. Basic Diagnostic Messages

Error message	Potential cause	Corrective action
Empty Pipe	Empty pipe	• None - message will clear when pipe is full
	Wiring error	• Check that wiring matches appropriate wiring diagrams
	Electrode error	• Perform sensor tests - see Table 9-8 on page 172
	Conductivity less than 5 microSiemens per cm	• Increase conductivity to greater than or equal to 5 microSiemens per cm
	Intermittent diagnostic	• Adjust tuning of empty pipe parameters - see Section 8.4.1
Coil Open Circuit	Improper wiring	• Check coil drive wiring and sensor coils Perform sensor tests - see Table 9-8 on page 172
	Other manufacturer's sensor	• Change coil current to 75 mA - set calibration numbers to 1000055010000030 • Perform a universal auto-trim to select the proper coil current
	Electronics board failure	• Replace 8732EM electronics stack
	Coil circuit open fuse	• Return the unit to the factory for fuse replacement
Auto Zero Failure	Flow is not set to zero	• Force flow to zero, perform auto zero trim
	Unshielded cable in use	• Change wire to shielded cable
	Moisture problems	• See Table 9-8 on page 172
Auto-Trim Failure	No flow in pipe while performing Universal Auto Trim	• Establish a known flow rate, and perform universal auto-trim calibration
	Wiring error	• Check that wiring matches appropriate wiring diagrams - see Implementing a Universal Transmitter on page 237
	Flow rate is changing in pipe while performing Universal Auto-Trim routine	• Establish a constant flow rate, and perform universal auto-trim calibration
	Flow rate through sensor is significantly different than value entered during Universal Auto-Trim routine	• Verify flow in sensor and perform universal auto-trim calibration
	Incorrect calibration number entered into transmitter for Universal Auto-Trim routine	• Replace sensor calibration number with 1000005010000000
	Wrong sensor size selected	• Correct sensor size setting - see Line size on page 34
	Sensor failure	• Perform sensor tests - see Table 9-8 on page 172
Electronics Failure	Electronics self check failure	• Cycle power to see if diagnostic message clears • Replace Electronics stack
Electronics Temp Fail	Ambient temperature exceeded the electronics temperature limits	• Move transmitter to a location with an ambient temperature range of -40 to 140 °F (-40 to 60 °C)
Reverse Flow	Electrode or coil wires reverse	• Verify wiring between sensor and transmitter
	Flow is reverse	• Turn ON Reverse Flow Enable to read flow
	Sensor installed backwards	• Install sensor correctly, or switch either the electrode wires (18 and 19) or the coil wires (1 and 2)
PZR Activated (Positive Zero Return)	External voltage applied to terminals 5 and 6	• Remove voltage to turn PZR off

Table 9-1. Basic Diagnostic Messages (continued)

Error message	Potential cause	Corrective action
Pulse Out of Range	The transmitter is trying to generate a frequency greater than allowed	• Standard pulse - increase pulse scaling to prevent pulse output from exceeding 11,000 Hz • Intrinsically safe pulse - Increase pulse scaling to prevent pulse output from exceeding 5,500 Hz • Pulse output is in fixed pulse mode and is trying to generate a frequency greater than the pulse width can support - see Pulse width on page 91 • Verify the sensor calibration number and line size are correctly entered in the electronics
Analog Out of Range	Flow rate is greater than analog output range	• Reduce flow, adjust URV and LRV values • Verify the sensor calibration number and line sizes are correctly entered in the electronics
Flowrate > 43 ft/sec	Flow rate is greater than 43 ft/sec	• Lower flow velocity, increase pipe diameter
	Improper wiring	• Check coil drive wiring and sensor coils • Perform sensor tests - see Table 9-8 on page 172
Digital Trim Failure (Cycle power to clear messages, no changes were made)	The calibrator (8714B/C/D) is not connected properly	• Review calibrator connections
	Incorrect calibration number entered into transmitter	• Replace sensor calibration number with 1000015010000000
	Calibrator is not set to 30 FPS	• Change calibrator setting to 30 FPS
	Bad calibrator or calibrator cable	• Replace calibrator and/or calibrator cable
Coil Over Current	Improper wiring	• Check coil drive wiring and sensor coils Perform sensor tests - see Table 9-8 on page 172
	Transmitter failure	• Replace the electronics stack
Coil Power Limit	Improper wiring	• Check coil drive wiring and sensor coils Perform sensor tests - see Table 9-8 on page 172
	Incorrect calibration number	• Verify configured calibration number matches sensor tag
	Transmitter connected to other manufacturer's sensor	• Change coil current to 75 mA - set calibration number to 10000550100000030 • Perform a universal auto-trim to select the proper coil current
	Coil drive frequency set to 37 Hz	• Sensor may not be compatible with 37 Hz. Switch coil drive frequency to 5 Hz.
	Sensor failure	• Perform sensor tests - see Table 9-8 on page 172
No AO Power	Improper wiring	• Check the analog loop wiring - see Wiring the transmitter on page 23
	No external loop power	• Verify the analog power switch position (internal/external) • For externally powered loop, verify power supply requirements - see Powering the transmitter on page 31
	No loop resistance (open loop)	• Install resistance across the analog output terminals • Disable message using *LOI Error Mask* parameter
	Transmitter failure	• Replace the electronics stack
Electrode Saturation	Improper wiring	• See Wiring the transmitter on page 23
	Improper process reference	• See Process reference connection on page 19
	Improper earth grounding	• Verify earth ground connections - see Wiring the transmitter on page 23
	Application requires special transmitter	• Replace transmitter with transmitter that includes special option F0100

Table 9-2. Advanced Process Diagnostic Messages

Error message	Potential cause	Corrective action
Grounding/Wiring Fault	Improper installation of wiring	• See Wiring the transmitter on page 23
	Coil/electrode shield not connected	• See Wiring the transmitter on page 23
	Improper process grounding	• See Process reference connection on page 19
	Faulty ground connection	• Check wiring for corrosion, moisture in the terminal block -see Process reference connection on page 19
	Sensor not full	• Verify sensor is full • Enable empty pipe detection
High Process Noise	Slurry flows - mining/pulp stock	• Decrease the flow rate below 10 ft/s (3 m/s) • Complete the possible solutions listed under Troubleshooting high process noise on page 163
	Chemical additives upstream of the sensor	• Move injection point downstream of the sensor or move the sensor to a new location • Complete the possible solutions listed under Troubleshooting high process noise on page 163
	Electrode not compatible with the process fluid	• Refer to the Rosemount Magnetic Flowmeter Material Selection Guide (00816-0100-3033)
	Gas/air in line	• Move the sensor to another location in the process line to ensure that it is full under all conditions
	Electrode coating	• Enable coated electrode etection diagnostic • Use bullet-nose electrodes • Downsize sensor to increase flowrate above 3 ft/s (1 m/s) • Periodically clean sensor
	Styrofoam or other insulating particles	• Complete the possible solutions listed under Troubleshooting high process noise on page 163 • Consult factory
	Low conductivity fluids (below 10 microsiemens/cm)	• Trim electrode and coil wires - see Sensor installation on page 12 • Use integral mount transmitter • Set coil drive frequency to 37Hz
Electrode Coating Level 1	Coating is starting to buildup on electrode and interfering with measurement signal	• Schedule maintenance to clean electrode • Use bullet nose electrodes • Downsize sensor to increase flow rate above 3ft/s (1ms)
	Process fluid conductivity has changed	• Verify process fluid conductivity
Electrode Coating Level 2	Coating has built-up on electrode and is interfering with measurement signal	• Schedule maintenance to clean electrode • Use bullet nose electrodes • Downsize sensor to increase flow rate above 3ft/s (1ms)
	Process fluid conductivity has changed	• Verify process fluid conductivity

Table 9-3. Advanced Meter Verification Messages

Error message	Potential cause	Corrective action
8714i Failed	Transmitter calibration verification test failed	• Verify pass/fail criteria • Rerun SMART™ Meter Verification (8714i) under no flow conditions • Verify calibration using 8714 Calibration Standard • Perform digital trim • Replace electronics board
	Sensor calibration test failed	• Verify pass/fail criteria • Rerun SMART Meter Verification (8714i) • Perform sensor tests - see Table 9-8 on page 172
	Sensor coil circuit test failed	• Verify pass/fail criteria • Rerun SMART Meter Verification (8714i) • Perform sensor tests - see Table 9-8 on page 172
	Sensor electrode circuit test failed	• Verify electrode resistance has a baseline (signature) value from a full pipe baseline • Verify test condition was selected properly • Verify pass/fail criteria • Rerun SMART Meter Verification (8714i) • Perform sensor tests - see Table 9-8 on page 172
4-20 mA loop verification failed	Analog loop not powered	• Check 4-20 mA internal/external loop power switch - see Internal/external analog power on page 40 • Check external supply voltage to the transmitter • Check for parallel paths in the current loop
	Transmitter failure	• Perform transmitter self test • Perform manual analog loop test and D/A trim if necessary • Replace the electronics board
Continuous Meter Verification Error	Transmitter calibration verification test failed	• Verify pass/fail criteria • Run manual SMART Meter Verification (8714i) under no flow conditions • Verify calibration using 8714D Calibration Standard • Perform digital trim • Replace electronics stack
	Sensor calibration test failed	• Run manual SMART Meter Verification (8714i) • Perform sensor tests - see Table 9-8 on page 172
	Sensor coil circuit test failed	• Run manual SMART Meter Verification (8714i) • Perform sensor tests - see Table 9-8 on page 172
	Sensor electrode circuit test failed	• Run manual SMART Meter Verification (8714i) • Perform sensor tests - see Table 9-8 on page 172 • Verify electrode resistance has a signature value from a full pipe baseline
Simulated Velocity Out of Spec	Unstable flow rate during the verification test or noisy process	• Run manual transmitter verification test with no flow and a full pipe
	Transmitter drift or faulty electronics	• Verify transmitter electronics with 8714D Calibration Standard. The dial on the 8714D should be set to 30 ft/s (9.14 m/s). The transmitter should be set up with the nominal calibration number (1000015010000000) and 5 Hz coil drive frequency. • Perform an electronics trim using the 8714 • If the electronics trim doesn't correct the issue, replace the electronics
Coil Resistance Out of Spec	Moisture in the terminal block of the sensor or shorted coil	• Perform sensor tests - see Table 9-8 on page 172 • If the problem persists, replace the sensor
Coil Signature Out of Spec	Moisture in the terminal block of the sensor or shorted coil	• Perform sensor tests - see Table 9-8 on page 172 • If the problem persists, replace the sensor
	Calibration shift caused by heat cycling or vibration	• Perform sensor tests - see Table 9-8 on page 172 • If the problem persists, replace the sensor

Table 9-3. Advanced Meter Verification Messages (continued)

Error message	Potential cause	Corrective action
Electrode Resistance Out of Spec	Moisture in the terminal block of the sensor	• Perform sensor tests - see Table 9-8 on page 172 • If the problem persists, replace the sensor
	Electrode coating	• Enable coated electrode detection diagnostic • Use bullet-nose electrodes • Downsize sensor to increases flowrate above 3 ft/s (1 m/s) • Periodically clean sensor
	Shorted electrodes	• Perform sensor tests - see Table 9-8 on page 172 • If the problem persists, replace the sensor
Analog Output Out of Spec	Unstable flow rate during the verification test or noisy process	• Run manual transmitter verification test with no flow and a full pipe
	Analog output is no longer within accuracy specifications	• Check the analog loop wiring. Excessive loop resistance can cause an invalid test

9.4.1 Troubleshooting empty pipe

The following actions can be taken if empty pipe detection is unexpected:

1. Verify the sensor is full.
2. Verify the sensor has not been installed with a measurement electrode at the top of the pipe.
3. Decrease the sensitivity by setting the *empty pipe trigger level* to a value of at least 20 counts above the *empty pipe value* read with a full pipe.
4. Decrease the sensitivity by increasing the *empty pipe counts* to compensate for process noise. The *empty pipe counts* is the number of consecutive *empty pipe value* readings above the *empty pipe trigger level* required to set the *empty pipe diagnostic*. The count range is 2-50, factory default set at 5.
5. Increase process fluid conductivity above 50 microsiemens/cm.
6. Properly connect the wiring between the sensor and the transmitter. Corresponding terminal block numbers in the sensor and transmitter must be connected.
7. Perform the sensor electrical resistance tests. For more detailed information, consult Table 9-8 on page 172.

9.4.2 Troubleshooting ground/wiring fault

If transmitter detects high levels (greater than 5mV) 50/60 Hz noise caused by improper wiring or poor process grounding:

1. Verify the transmitter is earth grounded.
2. Connect ground rings, grounding electrode, lining protector, or grounding straps. Grounding diagrams can be found in Process reference connection on page 19.
3. Verify the sensor is full.
4. Verify wiring between sensor and transmitter is prepared properly. Shielding should be stripped back less than 1 inch (25 mm).
5. Use separate shielded twisted pairs for wiring between sensor and transmitter.
6. Properly connect the wiring between the sensor and the transmitter. Corresponding terminal block numbers in the sensor and transmitter must be connected.

9.4.3 Troubleshooting high process noise

The transmitter detected high levels of process noise. If the signal to noise ratio is less than 25 while operating in 5 Hz mode, proceed with the following steps:

1. Increase transmitter coil drive frequency to 37 Hz (refer to Coil drive frequency on page 135) and, if possible, perform auto zero function (Auto zero on page 135).
2. Verify sensor is electrically connected to the process with process reference electrode, grounding rings with grounding straps, or lining protector with grounding straps.
3. If possible, redirect chemical additions downstream of the magmeter.
4. Verify process fluid conductivity is above 10 microSiemens/cm.

If the signal to noise ratio is less than 25 while operating in 37 Hz mode, proceed with the following steps:

1. Turn on the Digital Signal Processing (DSP) technology and follow the setup procedure (see Section 7 Digital Signal Processing). This will minimize the level of damping in the flow measurement and control loop while also stabilizing the reading to minimize valve actuation.
2. Increase damping to stabilize the signal (refer to PV damping on page 35). This will add response time to the control loop.
3. Move to a Rosemount High-Signal flowmeter system. This flowmeter will deliver a stable signal by increasing the amplitude of the flow signal by ten times to increase the signal to noise ratio. For example if the signal to noise ratio (SNR) of a standard magmeter is 5, the High-Signal would have a SNR of 50 in the same application. The Rosemount High-Signal system is comprised of the 8707 sensor which has modified coils and magnetics and the 8712H High-Signal transmitter.

Note
In applications where very high levels of noise are a concern, it is recommended that a dual-calibrated Rosemount High-Signal 8707 sensor be used. These sensors can be calibrated to run at lower coil drive current supplied by the standard Rosemount transmitters, but can also be upgraded by changing to the 8712H High-Signal transmitter.

1/f noise

This type of noise has higher amplitudes at lower frequencies, but generally degrades over increasing frequencies. Potential sources of 1/f noise include chemical mixing and slurry flow particles rubbing against the electrodes. This type of noise can be mitigated by switching to the 37Hz coil drive frequency.

Spike noise

This type of noise generally results in a high amplitude signal at specific frequencies which can vary depending on the source of the noise. Common sources of spike noise include chemical injections directly upstream of the flowmeter, hydraulic pumps, and slurry flows with low concentrations of particles in the stream. The particles bounce off of the electrode generating a “spike” in the electrode signal. An example of this type of flow stream would be a recycle flow in a paper mill. The type of noise can be mitigated by switching to the 37Hz coil drive frequency and enabling the digital signal processing.

White noise

This type of noise results in a high amplitude signal that is relatively constant over the frequency range. Common sources of white noise include chemical reactions or mixing that occurs as the fluid passes through the flowmeter and high concentration slurry flows where the particulates are constantly passing over the electrode head. An example of this type of flow stream would be a basis weight stream in a paper mill. This type of noise can be mitigated by switching to the 37Hz coil drive frequency and enabling the digital signal processing.

9.4.4 Troubleshooting coated electrode detection

In the event that electrode coating is detected, use the following table to determine the appropriate course of action.

Table 9-4. Troubleshooting the Electrode Coating Diagnostic

Error message	Potential causes of error	Steps to correct
Electrode Coating Level 1	• Insulating coating is starting to build up on the electrode and may interfere with the flow measurement signal • Process fluid conductivity has decreased to a level close to operational limits of the meter	• Verify process fluid conductivity • Schedule maintenance to clean the electrodes • Use bullet nose electrodes • Replace the meter with a smaller diameter meter to increase the flow velocity to above 3 ft/s (1 m/s)
Electrode Coating Level 2	• Insulating coating has built up on the electrodes and is interfering with the flow measurement signal • Process fluid conductivity has decreased to a level below the operational limits of the meter	• Verify process fluid conductivity • Schedule maintenance to clean the electrodes • Use bullet nose electrodes • Replace the meter with a smaller diameter meter to increase the flow velocity to above 3 ft/s (1 m/s)

9.4.5 Troubleshooting 4-20 mA loop verification

In the event that the 4-20 mA Loop Verification fails, use the following table to determine the appropriate course of action.

Table 9-5. Troubleshooting the Analog Loop Verification Diagnostic

Test	Potential cause	Corrective action
4-20 mA Loop Verification Failure	• Analog loop not powered	• Check analog loop wiring • Check loop resistance • Check analog loop power switch – see Internal/external analog power on page 40 • Check external supply voltage to the transmitter • Check for parallel paths in the current loop
	• Analog drift	• Perform D/A trim
	• Transmitter failure	• Perform transmitter self-test • Perform manual analog loop test • Replace the electronics stack

9.4.6 Troubleshooting the SMART Meter Verification test

If the SMART Meter Verification test fails, use the following table to determine the appropriate course of action. Begin by reviewing the SMART Meter Verification results to determine the specific test that failed.

Table 9-6. Troubleshooting the SMART Meter Verification Diagnostic

<table>
<tr><th>Test</th><th>Potential cause</th><th>Corrective action</th></tr>
<tr><td>Transmitter Verification Test</td><td>• Unstable flow reading during the test
• Noise in the process
• Transmitter drift
• Faulty electronics</td><td>• Rerun SMART Meter Verification (8714i) under No Flow conditions
• Check the transmitter calibration with the 8714D Calibration Standard
• Perform a digital trim
• Replace the electronics stack</td></tr>
<tr><td>Sensor Calibration Verification</td><td>• Moisture in the sensor terminal block
• Calibration shift caused by heat cycling or vibration</td><td rowspan="3">• Rerun SMART Meter Verification (8714i)
• Perform the sensor checks detailed in 9.6 Sensor troubleshooting.
• Remove the sensor and send back for evaluation and / or recalibration</td></tr>
<tr><td>Coil Circuit Health</td><td>• Moisture in the sensor terminal block
• Shorted Coil</td></tr>
<tr><td>Electrode Circuit Health</td><td>• Electrode resistance baseline was not taken after installation
• Test condition was not selected properly
• Moisture in the sensor terminal block
• Coated electrodes
• Shorted electrodes</td></tr>
</table>

9.5 Basic troubleshooting

When troubleshooting a magmeter, it is important to identify the issue. Table 9-7 provides common symptoms displayed by a magmeter that is not functioning properly. This table provides potential causes and suggested corrective actions for each symptom.

Table 9-7. Common Magmeter Issue

Symptom	Potential cause	Corrective action
Output at 0 mA	• No power to transmitter	• Check power source and connections to the transmitter
	• Analog output improperly configured	• Check the analog power switch position • Verify wiring and analog power
	• Electronics failure	• Verify transmitter operation with an 8714D Calibration Standard or replace the electronic stack
	• Blown fuse	• Check the fuse and replace with an appropriately rated fuse, if necessary
Output at 4 mA	• Transmitter in multidrop mode	• Configure Poll Address to 0 to take transmitter out of multidrop mode
	• Low Flow Cutoff set too high	• Configure Low Flow Cutoff to a lower setting or increase flow to a value above the low flow cutoff
	• PZR Activated	• Open PZR switch at terminals 5 and 6 to deactivate the PZR
	• Flow is in reverse direction	• Enable Reverse Flow function
	• Shorted coil	• Coil check – perform sensor test
	• Empty pipe	• Fill pipe
	• Electronics failure	• Verify transmitter operation with an 8714D Calibration Standard or replace the electronics stack
Output will not reach 20 mA	• Loop resistance is greater than 600 ohms	• Reduce loop resistance to less than 600 ohms • Perform analog loop test
	• Insufficient supply voltage to analog output	• Verify analog output supply voltage • Perform analog loop test
Output at 20.8 mA	• Transmitter not ranged properly	• Reset the transmitter range values – see Upper Range Value (URV) on page 34 • Check tube size setting in transmitter and make sure it matches the actual tube size – see Line size on page 34
Output at alarm level	• Electronics failure	• Cycle power. If alarm is still present, verify transmitter operation with an 8714 D Calibration Standard or replace the electronics stack
	• Open coil circuit	• Check coil drive circuit connections at the sensor and at the transmitter
	• Analog output diagnostic alarm is active	• See AO diagnostic alarm on page 89
	• Coil power or coil current is over limit	• Check coil drive circuit connections at the sensor and at the transmitter • Cycle power. If alarm is still present, verify transmitter operation with an 8714 D Calibration Standard or replace the electronics stack
	• Connected to incompatible sensor	• See Implementing a Universal Transmitter on page 237

Table 9-7. Common Magmeter Issue (continued)

Symptom	Potential cause	Corrective action
Pulse output at zero, regardless of flow	• Wiring error	• Check pulse output wiring at terminals 3 and 4. Refer to wiring diagram for pulse counter and pulse output. See Connect pulse output on page 41.
	• PZR activated	• Remove signal at terminals 5 and 6 to deactivate the PZR.
	• No power to transmitter	• Check pulse output wiring at terminals 3 and 4. Refer to wiring diagram for pulse counter and pulse output. • Power the transmitter
	• Reverse flow	• Enable Reverse Flow function
	• Electronics failure	• Verify transmitter operation with an 8714D Calibration Standard or replace the electronics stack
	• Pulse output incorrectly configured	• Review configuration and correct as necessary
Communication problems with the Handheld Communicator	• 4–20 mA output configuration	• Check analog power switch (internal/external). The Handheld Communicator requires a 4–20 mA output to function.
	• Communication interface wiring problems	• Incorrect load resistance (250 Ohm minimum, 600 Ohm maximum) Check appropriate wiring diagram
	• Low batteries in the Handheld Communicator	• Replace the batteries in the Handheld Communicator – see the communicator manual for instructions
	• Old revision of software in the Handheld Communicator	• Consult your local sales office about updating to the latest revision of software
Error Messages on LOI or Handheld Communicator	• Many possible causes depending upon the message	• See Table 9-1 on page 157, Table 9-2 on page 159, and Table 9-3 on page 160 for the LOI or Handheld Communicator messages
Discrete input does not register	• Input signal does not provide enough counts	• Verify that the discrete input provided meets the requirements in Section 3.4.3 Connect discrete input • Perform a loop test to validate the analog control loop • Perform a D/A trim. This allows the calibration of the analog output with an external reference at operating endpoints of the analog output.

Table 9-7. Common Magmeter Issue (continued)

Symptom	Potential cause	Corrective action

Reading does not appear to be within rated accuracy	• Transmitter, control system, or other receiving device not configured properly	• Check all configuration variables for the transmitter, sensor, communicator, and/or control system
		• Check these other transmitter settings:
		  • Sensor calibration number
		  • Units
		  • Line size
		• Perform a loop test to check the integrity of the circuit

	• Electrode Coating	• Enable Coated Electrode Detection diagnostic • Use bullet-nose electrodes • Downsize sensor to increase flow rate above 3 ft/s • Periodically clean sensor
	• Gas/air in line	• Move the sensor to another location in the process line to ensure it is full under all conditions
	• Moisture problem	• Perform the sensor tests - see Table 9-8 on page 172
	• Insufficient upstream/downstream pipe diameter	• Move sensor to a new location with 5 pipe diameters upstream and 2 pipe diameters downstream if possible
	• Cables for multiple magmeters run through same conduit	• Use dedicated conduit run for each sensor and transmitter
	• Improper wiring	• If electrode shield and electrode signal wires are switched, flow indication will be about half of what is expected. Check wiring diagrams.
	• Flow rate is below 1 ft/s (specification issue)	• See accuracy specification for specific transmitter and sensor
	• Auto zero was not performed when the coil drive frequency was changed from 5 Hz to 37 Hz	• Set the coil drive frequency to 37 Hz, verify the sensor is full, verify there is no flow, and perform the auto zero function
	• Sensor failure–shorted electrode	• Perform the sensor tests - see Table 9-8 on page 172
	• Sensor failure–shorted or open coil	• Perform the sensor tests - see Table 9-8 on page 172
	• Transmitter failure	• Verify transmitter operation with an 8714 Calibration Standard or replace the electronics board
Noisy Process	• Chemical additives upstream of magnetic flowmeter	• See Troubleshooting high process noise on page 163 • Move injection point downstream of magnetic flowmeter, or move magnetic flowmeter
	• Sludge flows–mining/coal/ sand/slurries (other slurries with hard particles)	• Decrease flow rate below 10 ft/s
	• Styrofoam or other insulating particles in process	• See Troubleshooting high process noise on page 163 • Consult factory
	• Electrode coating	• Enable Coated Electrode Detection diagnostic • Use a smaller sensor to increase flow rate above 3 ft/s • Periodically clean sensor
	• Gas/air in line	• Move the sensor to another location in the process line to ensure it is full under all conditions
	• Low conductivity fluids (below 10 microsiemens/cm)	• Trim electrode and coil wires – see Cable preparation on page 27 • Keep flow rate below 3 FPS • Integral mount transmitter • Use component cable - see Table 2-11 on page 25

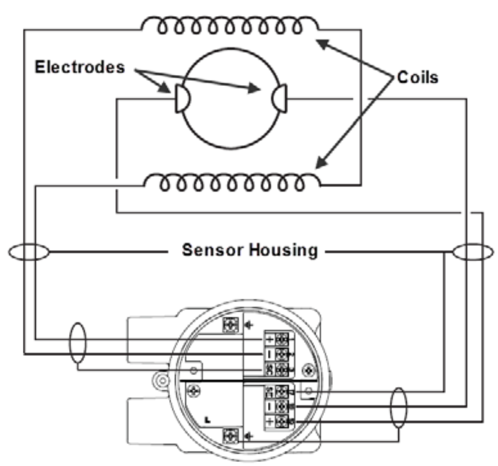
Table 9-7. Common Magmeter Issue (continued)

Symptom	Potential cause	Corrective action
Meter output is unstable	• Medium to low conductivity fluids (10–25 microsiemens/cm) combined with cable vibration or 60 Hz interference	• Eliminate cable vibration • Move cable to lower vibration run • Tie down cable mechanically • Use an integral mount • Trim electrode and coil wires - see Cable preparation on page 27 • Route cable line away from other equipment powered by 60 Hz • Use component cable - see Table 2-11 on page 25
	• Electrode incompatibility	• Check the Technical Data Sheet, Magnetic Flowmeter Material Selection Guide (document number 00816-0100-3033), for chemical compatibility with electrode material
	• Improper grounding	• Check ground wiring – see Process reference connection on page 19 for wiring and grounding procedures
	• High local magnetic or electric fields	• Move magnetic flowmeter (20–25 ft away is usually acceptable)
	• Control loop improperly tuned	• Check control loop tuning
	• Sticky valve (look for periodic oscillation of meter output)	• Service valve
	• Sensor failure	• Perform the sensor tests (See Table 9-8 on page 172)
	• Analog output loop problem	• Check that the 4 to 20 mA loop matches the digital value Perform analog output test

9.6 Sensor troubleshooting

This section describes manual tests that can be performed on the sensor to verify the health of individual components. The tests will require the use of a digital multimeter capable of measuring conductance in nanoSiemens and an LCR meter. A sensor circuit diagram is shown in Figure 9-1. The tests described below will check for continuity or isolation of the internal components of the sensor.

Figure 9-1. Sensor Circuit Diagram (Simplified)

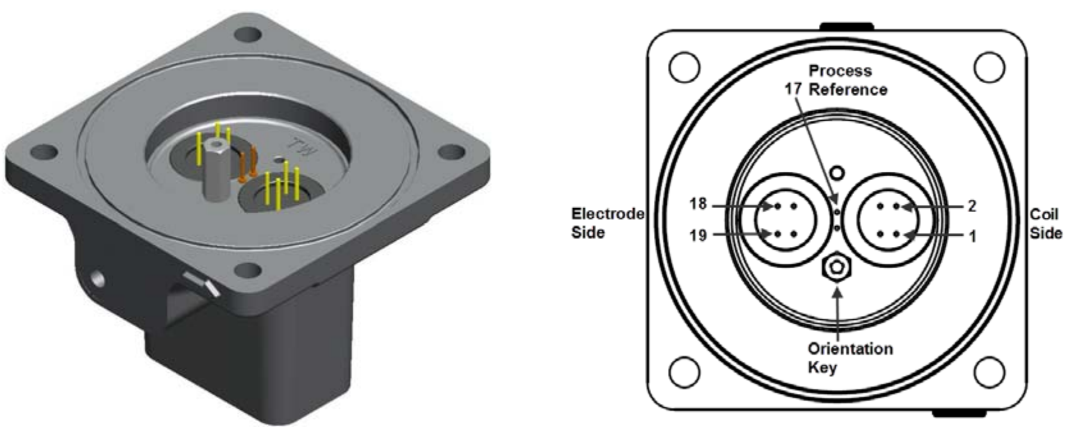


9.6.1 Sensor adapter

The sensor adapter is the part of the sensor that provides the internal connection feed-through wiring from the internal sensor components to the socket module connections. The top of the adapter has 10 pins - four pins for the coils, four pins for the electrodes, and two pins for the process reference. Each connection point has two pins associated for redundant continuity. See Figure 9-2.

The best location for testing the sensor components is taking measurements directly on the feed-through pins. Direct measurement on the pins eliminates the possibility of an erroneous measurement caused by a bad socket module or remote wiring. The figure below shows the feed-through pin connections as they relate to the terminal connections described in the tests.

Figure 9-2. Sensor Adapter Feed-through Pins



9.6.2 Socket module

The socket module connects the sensor adapter to the transmitter. There are two versions of the socket module—one for integral mount transmitters and one for remote mount transmitters. Refer to Figure 9-3 and Figure 9-4. The socket module is a replaceable component. If test measurements taken through the socket module show a failure, remove the socket module and confirm measurements directly on the feed-through pins of the sensor adapter. To remove the socket module, refer to Section 8: Maintenance.

Figure 9-3. IIntegral Mount Socket Module

Figure 9-4. Remote Mount Socket Module

9.6.3 Installed sensor tests

If a problem with an installed sensor is identified, refer to Table 9-8 on page 172 to assist in troubleshooting the sensor. Disconnect or turn off power to the transmitter before performing any of the sensor tests. Always check the operation of test equipment before each test.

If possible, take all readings from feed-through pins in the sensor adapter. If the pins in the sensor adapter are inaccessible, take measurements at the sensor terminal block or through remote cabling as close to the sensor as possible. Readings taken through remote cabling that is more than 100 feet (30 meters) in length may provide incorrect or inconclusive information and should be avoided.

The expected values in the test below assume the measurements have been taken directly at the pins.

Table 9-8. Sensor Tests and Expected Values

Test	Sensor location	Required equipment	Measuring at connections	Expected value	Potential cause	Corrective action
A. Sensor coil	Installed or uninstalled	Multimeter	1 and 2 = R	$2\Omega \leq R \leq 18\Omega$	• Open or shorted coil	• Remove and replace sensor
B. Shields to case	Installed or uninstalled	Multimeter	17 and 3 3 and case ground 17 and case ground	$< 0.3\Omega$	• Moisture in terminal block • Leaky electrode • Process behind liner	• Clean terminal block • Remove sensor
C. Coil to coil shield	Installed or uninstalled	Multimeter	1 and 3 2 and 3	$\infty\Omega$ (< 1nS) $\infty\Omega$ (< 1nS)	• Process behind liner • Leaky electrode • Moisture in terminal block	• Remove sensor and dry • Clean terminal block • Confirm with sensor coil test
D. Electrode to electrode shield	Installed	LCR (Set to Resistance and 120 Hz)	18 and 17 = R_1 19 and 17 = R_2	R_1 and R_2 should be stable $\lvert R_1 - R_2 \rvert \leq 300\Omega$	• Unstable R_1 or R_2 values confirm coated electrode • Shorted electrode • Electrode not in contact with process • Empty pipe • Low conductivity • Leaky electrode • Process reference ground not connected properly	• Remove coating from sensor wall • Use bullet-nose electrodes • Repeat measurement • Remove sensor and complete tests in Table 9-9 • Connect process reference ground per 2.11 Process reference connection
E. Electrode to Electrode	Installed	LCR (set to resistance and 120 Hz)	18 and 19	Should be stable and same relative magnitude of R_1 and R_2 from Test D	• See Test D above	• See Test D above

To test the sensor, a multimeter capable of measuring conductance in nanoSiemens is preferred. Conductance is the reciprocal of resistance.

Or:

$$1\ nanosiemens = \frac{1}{1\ gigaohm} \qquad 1\ nanosiemens = \frac{1}{1\ x\ 10^9\ ohm}$$

9.6.4 Uninstalled sensor tests

Sensor troubleshooting can also be performed on an uninstalled sensor. If test results from installed sensor tests are inconclusive, the next step is remove the sensor and perform the tests outlined in Table 9-9. Take measurements from the feed-through pins and directly on the electrode head inside the sensor. The measurement electrodes, 18 and 19, are on opposite sides in the inside diameter of the sensor. If applicable, the third process reference electrode is between the two measurement electrodes.

The expected values in the test below assume the measurements have been taken directly at the pins.

Table 9-9. Uninstalled Sensor Tests and Expected Values

Test	Sensor location	Required equipment	Measuring at connections	Expected value	Potential cause	Corrective action
A. Terminal to front electrode	Uninstalled	Multimeter	18 and electrode 18[1]	$\leq 1\ \Omega$	• Shorted electrode • Open electrode • Coated electrode	• Replace sensor • Remove coating from sensor wall
B. Terminal to back electrode	Uninstalled	Multimeter	19 and electrode 19[1]	$\leq 1\ \Omega$	• Shorted electrode • Open electrode • Coated electrode	• Replace sensor • Remove coating from sensor wall
C. Terminal to reference electrode	Uninstalled	Multimeter	17 and process reference electrode[2]	$\leq 0.3\ \Omega$	• Shorted electrode • Open electrode • Coated electrode	• Replace sensor • Remove coating from sensor wall
D. Terminal to case ground	Uninstalled	Multimeter	17 and safety ground	$\leq 0.3\ \Omega$	• Moisture in terminal block • Leaky electrode • Process behind liner	• Clean terminal block • Replace terminal block • Replace sensor
E. Electrode to electrode shield	Uninstalled	Multimeter	18 and 17	$\infty\Omega$ (<1 nS)	• Shorted electrode • Leaky electrode • Moisture in terminal block	• Replace sensor • Clean terminal block • Replace terminal block
			19 and 17	$\infty\Omega$ (<1 nS)	• Shorted electrode • Leaky electrode • Moisture in terminal block	• Replace sensor • Clean terminal block • Replace terminal block
F. Electrode shield to coil	Uninstalled	Multimeter	17 and 1	$\infty\Omega$ (<1 nS)	• Process in coil housing • Moisture in terminal block	• Replace sensor • Clean terminal block • Replace terminal block

1. When the connection head is in the vertical upright position and the flow arrow (see Figure 2-4 on page 10) on the connection head flange points to the right, the front of the meter will be facing towards you. Electrode 18 is on the front of the meter. If you cannot determine the front of the meter, measure both electrodes. One electrode should result in an open reading, while the other electrode should be less than 0.3 ohm.
2. Only valid if the sensor has a process reference electrode.

9.7 Technical support

Email addresses:

Worldwide: flow.support@emerson.com

Asia-Pacific: APflow.support@emerson.com

Middle East and Africa: FlowTechnicalSupport@emerson.com

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) 318 495 555	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 3238 3677	Italy	8008 77334	China	+86 21 2892 9000
Venezuela	+58 26 1731 3446	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		

9.8 Service

To expedite the return process outside the United States, contact the nearest Rosemount representative.

Within the United States and Canada, call the North American Response Center using the 800-654-RSMT (7768) toll-free number. The Response Center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product, model, and serial numbers and will provide a Return Material Authorization (RMA) number. The center will also ask for the name of the process material to which the product was last exposed.

Mishandling products exposed to a hazardous substance may result in death or serious injury. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

The North American Response Center will detail the additional information and procedures necessary to return goods exposed to hazardous substances.

Appendix A Specifications and Reference Data

A.1 Rosemount 8732EM Transmitter specifications

A.1.1 Functional specifications

Sensor compatibility

Compatible with Rosemount 8705, 8711, and 8721 sensors. Compatible with AC and DC powered sensors of other manufacturers.

Transmitter coil drive current

500mA

Flow rate range

Capable of processing signals from fluids that are traveling between 0.04 and 39 ft/s (0.01 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between –39 and 39 ft/s (–12 to 12 m/s).

Conductivity limits

Process liquid must have a conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater.

Power supply

90 - 250VAC, 50/60Hz or 12 - 42VDC

Line power fuses

90-250VAC systems

1A, 250V, $I^2t \geq 1.5\ A^2s$ Rating, Fast Acting

Bussman AGC-1, Littelfuse 31201.5HXP

12-42VDC systems

3 Amp, 250V, $I^2t \geq 14\ A^2s$ Rating, Fast Acting

Bel Fuse 3AG 3-R, Littelfuse 312003P, Schurter 0034.5135

Power consumption

15W maximum - DC

40VA maximum - AC

Switch-on current

AC: Maximum 35.7A (< 5ms) at 250VAC

DC: Maximum 42A (< 5ms) at 42VDC

AC power supply requirements

Units powered by 90 - 250VAC have the following power requirements.

Figure A-1. AC Current Requirements

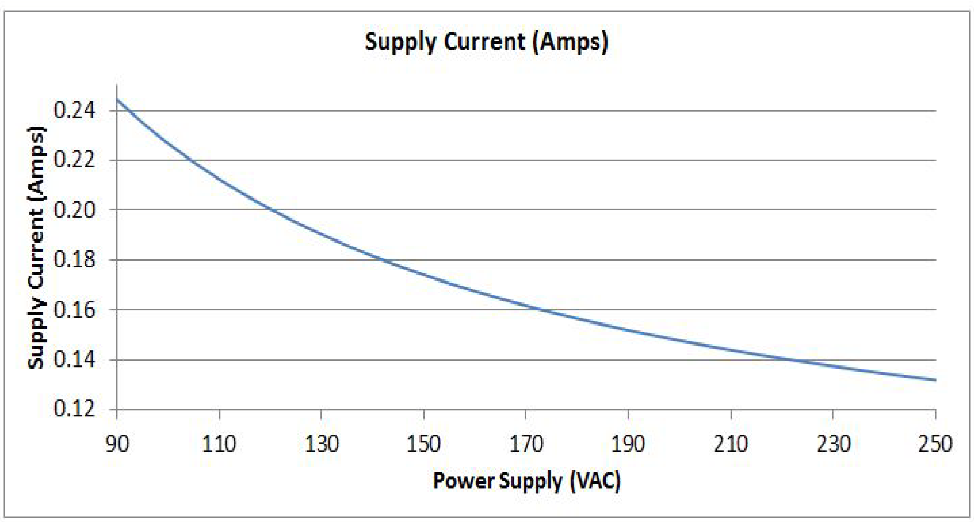
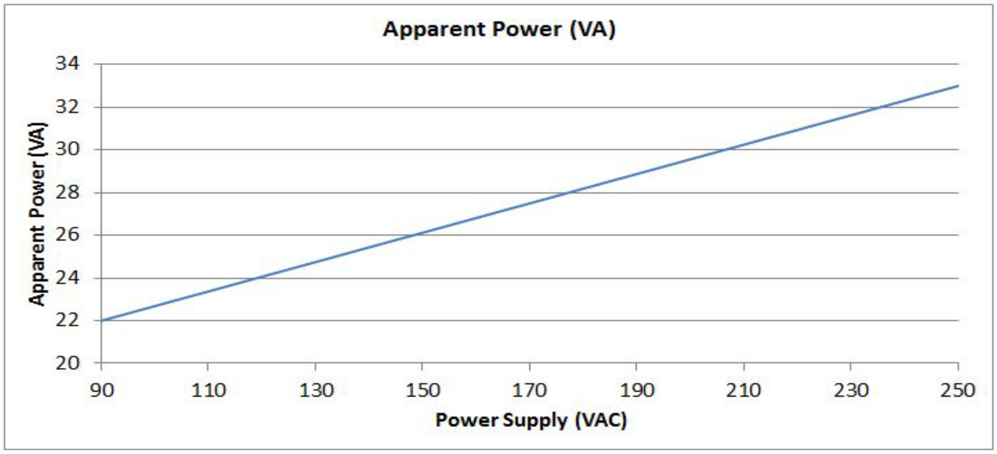


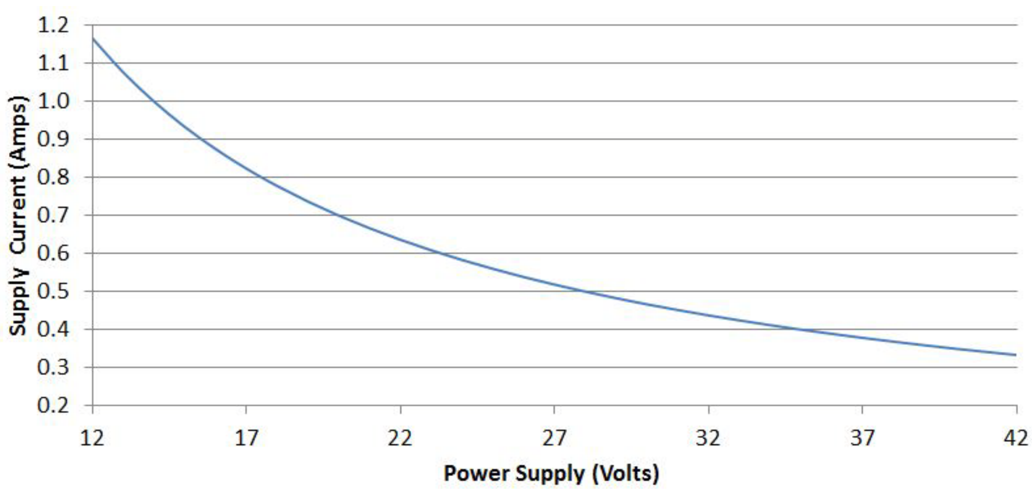
Figure A-2. Apparent Power



DC supply current requirements

Units powered by 12VDC power supply may draw up to 1.2A of current steady state.

Figure A-3. DC Current Requirements



Ambient temperature limits

Operating

–40 to 140 °F (–40 to 60 °C) without local operator interface

–4 to 140 °F (–20 to 60 °C) with local operator interface

The Local Operator Interface (LOI) will not display at temperatures below -20°C

Storage

−40 to 185 °F (−40 to 85 °C) without local operator interface

−22 to 176 °F (−30 to 80 °C) with local operator interface[(1)]

Humidity limits

0–95% RH to 140 °F (60 °C)

Altitude

2000 meters maximum

Enclosure rating

Type 4X, IEC 60529, IP66 (transmitter)

Transient protection rating

Built in transient protection that conforms to:

IEC 61000-4-4 for burst currents

IEC 61000-4-5 for surge currents.

IEC 611185-2.2000, Class 3 up to 2kV and up to 2kA protection.

Turn-on time

Five minutes to rated accuracy from power up

Five seconds from power interruption

Start-up time

50ms from zero flow

Low flow cut-off

Adjustable between 0.01 and 38.37 ft/s (0.003 and 11.7 m/s). Below selected value, output is driven to the zero flow rate signal level.

Overrange capability

Signal output will remain linear until 110% of upper range value or 44 ft/s (13 m/s). The signal output will remain constant above these values. Out of range message displayed on LOI and the Field Communicator.

Damping

Adjustable between 0 and 256 seconds

A.1.2 Advanced diagnostics capabilities

Basic

Self test
Transmitter faults
Analog output test
Pulse output test
Tunable empty pipe
Reverse flow
Coil circuit fault
Electronics temperature

Process diagnostics (DA1)

Ground/wiring fault
High process noise

Electrode coating diagnostic

Smart meter verification (DA2)

SMART™ Meter Verification (continuous or on-demand)
4-20mA loop verification

A.1.3 Output signals

Analog output adjustment[1]

4–20mA, switch-selectable as internally or externally powered.

Analog loop load limitations

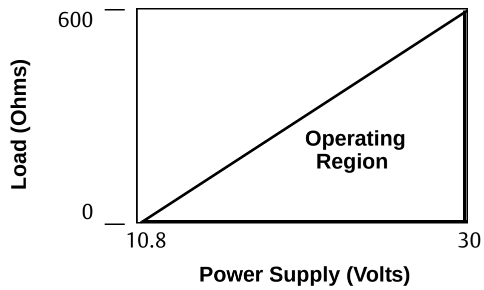
Internally powered 24VDC max, 500 ohms max loop resistance

Externally powered 10.8 - 30VDC max.

Loop resistance is determined by the voltage level of the external power supply at the transmitter terminals.

(1) For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.

Figure A-4. Analog Loop Load Limitations



R_{max} = 31.25 (V_{ps} – 10.8)
V_{ps} = Power Supply Voltage (Volts)
R_{max} = Maximum Loop Resistance (Ohms)

The analog output is automatically scaled to provide 4mA at lower range value and 20mA at upper range value. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications is a digital flow signal. The digital signal is superimposed on the 4–20mA signal and is available for the control system interface. A minimum of 250 Ohms loop resistance is required for HART communications.

Scalable pulse frequency adjustment(1)(2)

0-10,000Hz, switch-selectable as internally or externally powered. Pulse value can be set to equal desired volume in selected engineering units. Pulse width adjustable from 0.1 to 650 ms.

Internally powered: Outputs up to 12VDC

Externally powered: Input 5 - 28VDC

Output testing

Analog output test(3)

Transmitter may be commanded to supply a specified current between 3.5 and 23mA.

Pulse output test(4)

Transmitter may be commanded to supply a specified frequency between 1 and 10,000Hz.

Optional discrete output function (AX option)

Externally powered at 5 - 28VDC, 240mA max, solid state switch closure to indicate either:

Reverse flow

Activates switch closure output when reverse flow is detected.

(1) *For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.*
(2) *For transmitters with intrinsically safe outputs (option code B), frequency range is limited to 0-5000Hz.*
(3) *For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.*
(4) *For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.*

Zero flow

Activates switch closure output when flow goes to 0 ft/s or below low flow cutoff.

Empty pipe

Activates switch closure output when an empty pipe condition is detected.

Transmitter faults

Activates switch closure output when a transmitter fault is detected.

Flow limit 1, Flow limit 2

Activates switch closure output when the transmitter measures a flow rate that meets the conditions established for this alert. There are two independent flow limit alerts that can be configured as discrete outputs.

Totalizer limit

Activates switch closure output when the transmitter measures a total flow that meets the conditions established for this alert.

Diagnostic status

Activates switch closure output when the transmitter detects a condition that meets the configured criteria of this output.

Optional discrete input function (AX option)

Externally powered at 5 - 28VDC, 1.4 - 20mA to activate switch closure to indicate either:

Net total reset

Resets the net totalizer value to zero.

Positive zero return (PZR)

Forces outputs of the transmitter to zero flow.

Security lockout

Security lockout switch on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change.

LOI lockout

The display can be manually locked to prevent unintentional configuration changes. The display lock can be activated through a HART® communication device, or by holding the UP arrow for 3 seconds and then following the on-screen instructions. When the display lock is activated, a lock symbol will appear in the lower right hand corner of the display. To deactivate the display lock, hold the UP arrow for 3 seconds and follow the on-screen instructions.

Display auto lock can be configured from the LOI with the following settings: OFF, 1 Minute, or 10 Minutes

A.1.4 Sensor compensation

Rosemount sensors are calibrated in a flow lab at the factory and are assigned a calibration number. The calibration number must be entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.

8732EM transmitters and other manufacturers' sensors can be calibrated at known process conditions or at the Rosemount NIST-Traceable Flow Facility. Transmitters calibrated on site require a two-step procedure to match a known flow rate. This procedure can be found in the operations manual.

A.1.5 Performance specifications

System specifications are given using the frequency output and with the unit at reference conditions.

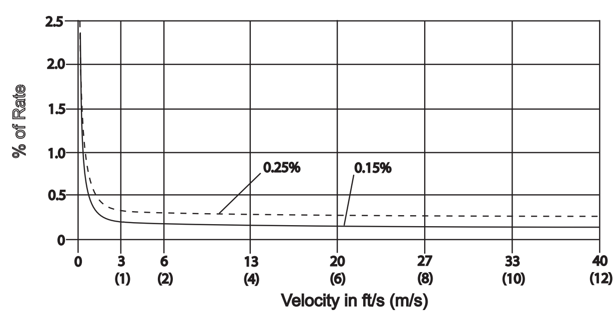
Accuracy

Includes the combined effects of linearity, hysteresis, and repeatability.

Rosemount 8705-M Sensor

Standard system accuracy is ±0.25% of rate ±1.0 mm/sec from 0.04 to 6 ft/s (0.01 to 2 m/s); above 6 ft/s (2 m/s), the system has an accuracy of ±0.25% of rate ±1.5 mm/sec.

Optional high accuracy is ±0.15% of rate ±1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of ±0.18% of rate.(1)

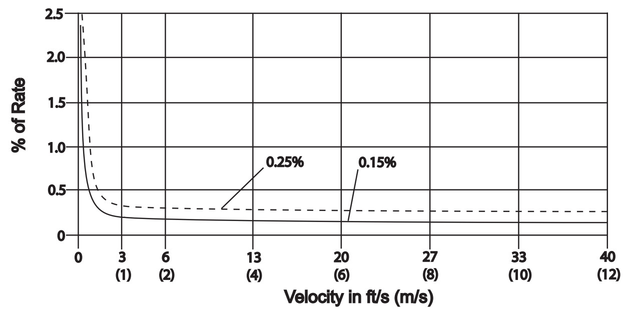


(1) *For sensor sizes greater than 12 in. (300 mm) the high accuracy is ±0.25% of rate from 3 to 39 ft/sec (1 to 12 m/sec).*

Rosemount 8711-M/L Sensor

Standard system accuracy is ±0.25% of rate ±2.0 mm/sec from 0.04 to 39 ft/s (0.01 to 12 m/s).

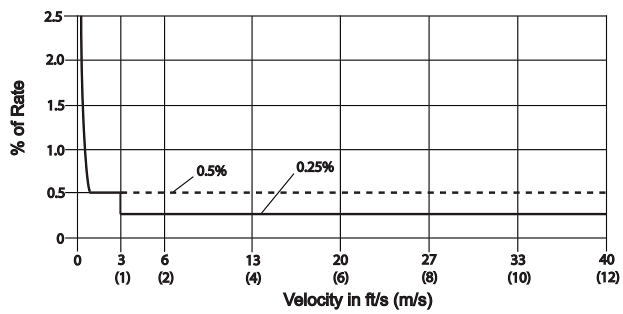
Optional high accuracy is ±0.15% of rate ±1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of ±0.18% of rate.



Rosemount 8721 Sensor

Standard system accuracy is ±0.5% of rate from 1 to 39 ft/s (0.3 to 12 m/s); between 0.04 and 1.0 ft/s (0.01 and 0.3 m/s), the system has an accuracy of ±0.005 ft/s (0.0015 m/s).

Optional high accuracy is ±0.25% of rate from 3 to 39 ft/s (1 to 12 m/s).



Other manufacturers' sensors

When calibrated in the Rosemount Flow Facility, system accuracies as good as 0.5% of rate can be attained.

There is no accuracy specification for other manufacturers' sensors calibrated in the process line.

A.1.6 Analog output effects

Analog output has the same accuracy as frequency output plus an additional ±4µA at room temperature.

Repeatability

±0.1% of reading

Response time (analog output)

20 ms max response time to step change in input

Stability

±0.1% of rate over six months

Ambient temperature effect

±0.25% change over operating temperature range

A.1.7 Physical specifications

Materials of construction

Standard housing

Low copper aluminum

Type 4X and IEC 60529 IP66

Paint

Polyurethane coat (1.3 to 5 mils thick)

Optional housing

316/316L unpainted, option code SH

Type 4X and IEC 60529 IP66

Cover gasket

Buna-N

Electrical connections

Conduit entries: 1/2-in. NPT or M20.

Terminal block screws: 6-32 (No. 6) suitable for up to 14 AWG wire.

Safety grounding screws: external stainless assembly, M5; internal 8-32 (No. 8)

Vibration rating

3G per IEC 61298

Dimensions

See Product Data Sheet.

Weight

Aluminum - approximately 7 lbs. (3.2 kg).

316 stainless steel - approximately 23 lbs. (10.5 kg).

Add 1 pound (0.5 kg) for display option code M4 or M5.

A.1.8 F0875 Low Power Software Option

Available with DC power supply (2) and intrinsically safe outputs (B) only. This software option lowers the coil drive current from 500mA to 75mA in order to conserve power for applications where battery packs or solar panels are the primary power source. The coils are still driven in a continuous manner, optimizing measurement performance. Power consumption of the transmitter is reduced to approximately 2W. Use of the analog output results in a maximum of 1W of additional power consumption under a high alarm condition (23.5mA) and 24VDC supply. Power consumption of the output loop can be minimized by utilizing the pulse output or pulling information off of the HART signal. Both the pulse loop and the analog loop require external power source to be applied. Flow performance reference accuracy is 1.0% of rate.

To ensure the sensor is calibrated with a low power calibration number, Option Code D3 has been established. This code must appear in the transmitter and sensor model number. Sample model numbers for lower power are:

8732EMT2B1N5M4DA1DA2D3F0875

8705THA020C7M0N5B3D3

A.2 Rosemount 8705-M Flanged Sensor specifications

A.2.1 Functional specifications

Service

Conductive liquids and slurries

Line sizes

$^{1}/_{2}$–in. to 36-in. (15 mm to 900 mm) for Rosemount 8705

Sensor coil resistance

7 - 16 Ω

Interchangeability

Rosemount 8705-M sensors are interchangeable with 8732EM transmitters. System accuracy is maintained regardless of line size or optional features. Each sensor nameplate has a 16-digit calibration number that can be entered into a transmitter through the Local Operator Interface (LOI) or the Field Communicator.

Upper range limit

39.37 ft/s (12 m/s)

Process temperature limits

PTFE lining

–20 to 350 °F (–29 to 177 °C)

ETFE lining

–20 to 300 °F (–29 to 149 °C)

PFA lining

-20 to 350 °F (-29 to 177 °C)

Polyurethane lining

0 to 140 °F (–18 to 60 °C)

Neoprene lining

0 to 176 °F (–18 to 80 °C)

Linatex lining

0 to 158 °F (–18 to 70 °C)

Adiprene lining

0 to 200 °F (–18 to 93 °C)

Ambient temperature limits

–20 to 140 °F (–29 to 60 °C)

Pressure limits

See Table A-1, Table A-2 and Table A-3

Vacuum limits

PTFE lining

Full vacuum to 350 °F (177 °C) through 4-in. (100 mm) line sizes. Consult factory for vacuum applications with line sizes of 6 in. (150 mm) or larger.

All other standard sensor lining materials

Full vacuum to maximum material temperature limits for all available line sizes.

Submergence protection (IP68)

The remote mount 8705-M sensor is rated IP68 for submergence to a depth of 33 ft. (10 m) for a period of 48 hours. IP68 rating requires the transmitter must be remote mount. Installer must use IP68 approved cable glands, conduit connections, and/or conduit plugs. For more details on proper installation techniques for IP68 submersible application, reference Rosemount Technical Note 00840-0100-4750 available on www.rosemount.com.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater.

Table A-1. Temperature vs. Pressure Limits[1]

Sensor temperature vs. pressure limits for ASME B16.5 class flanges (1/2-in. to 36-in. line sizes)[2]					
		Pressure			
Flange material	**Flange rating**	**@ -20 to 100 °F (-29 to 38 °C)**	**@ 200 °F (93 °C)**	**@ 300 °F (149 °C)**	**@ 350 °F (177 °C)**
Carbon Steel	Class 150	285 psi	260 psi	230 psi	215 psi
	Class 300	740 psi	675 psi	655 psi	645 psi
	Class 600[3]	1000 psi	800 psi	700 psi	650 psi
	Class 600[4]	1480 psi	1350 psi	1315 psi	1292 psi
	Class 900	2220 psi	2025 psi	1970 psi	1935 psi
	Class 1500	3705 psi	3375 psi	3280 psi	3225 psi
	Class 2500	6170 psi	5625 psi	5470 psi	5375 psi
304 Stainless Steel	Class 150	275 psi	235 psi	205 psi	190 psi
	Class 300	720 psi	600 psi	530 psi	500 psi
	Class 600 [5]	1000 psi	800 psi	700 psi	650 psi
	Class 600 [6]	1440 psi	1200 psi	1055 psi	997 psi
	Class 900	2160 psi	1800 psi	1585 psi	1497 psi
	Class 1500	3600 psi	3000 psi	2640 psi	2495 psi
	Class 2500	6000 psi	5000 psi	4400 psi	4160 psi

1. Liner temperature limits must also be considered.
2. 30-in. and 36-in. AWWA C207 Class D rated to 150 psi at atmospheric temperature.
3. Option Code C6.
4. Option Code C7.
5. Option Code S6.
6. Option Code S7.

Table A-2. Temperature vs. Pressure Limits[1]

Sensor temperature vs. pressure limits for AS2129 Table D and E flanges (4-in. to 24-in. line sizes)					
		Pressure			
Flange material	**Flange rating**	**@ -29 to 50 °C (-20 to 122 °F)**	**@ 100 °C (212 °F)**	**@ 150 °C (302 °F)**	**@ 200 °C (392 °F)**
Carbon Steel	D	101.6 psi	101.6 psi	101.6 psi	94.3 psi
	E	203.1 psi	203.1 psi	203.1 psi	188.6 psi

1. Liner temperature limits must also be considered.

Table A-3. Temperature vs. Pressure Limits[1]

Sensor temperature vs. pressure limits for EN 1092-1 flanges (15 mm to 600 mm line sizes)					
		Pressure			
Flange material	**Flange rating**	**@ -29 to 50 °C (-20 to 122 °F)**	**@ 100 °C (212 °F)**	**@ 150°C (302 °F)**	**@ 175°C (347 °F)**
Carbon Steel	PN 10	10 bar	10 bar	9.7 bar	9.5 bar
	PN 16	16 bar	16 bar	15.6 bar	15.3 bar
	PN 25	25 bar	25 bar	24.4 bar	24.0 bar
	PN 40	40 bar	40 bar	39.1 bar	38.5 bar

Table A-3. Temperature vs. Pressure Limits[1] (continued)

Sensor temperature vs. pressure limits for EN 1092-1 flanges (15 mm to 600 mm line sizes)					
		Pressure			
Flange material	Flange rating	@ -29 to 50 °C (-20 to 122 °F)	@ 100 °C (212 °F)	@ 150°C (302 °F)	@ 175°C (347 °F)
304 Stainless Steel	PN 10	9.1 bar	7.5 bar	6.8 bar	6.5 bar
	PN 16	14.7 bar	12.1 bar	11.0 bar	10.6 bar
	PN 25	23 bar	18.9 bar	17.2 bar	16.6 bar
	PN 40	36.8 bar	30.3 bar	27.5 bar	26.5 bar

1. Liner temperature limits must also be considered.

A.2.2 Physical specifications

Non-wetted materials

Sensor pipe

Type 304/304L SST or Type 316/316L SST

Flanges

Carbon steel, Type 304/304L SST, or Type 316/316L SST

Coil housing

Rolled carbon steel

Paint

Polyurethane coat (1.3 to 5 mils thick)

Optional coil housing

316/316L unpainted, option code SH

Process wetted materials

Lining

PTFE, ETFE, PFA, Polyurethane, Neoprene, Linatex, Adiprene, PFA+

Electrodes

316L SST, Nickel Alloy 276 (UNS N10276), Tantalum, 80% Platinum-20% Iridium, Titanium

Flat-faced flanges

Flat-faced flanges are manufactured with full-face liners. Available in Neoprene and Linatex only.

Process connections

ASME B16.5

1/2-in. to 24-in. (Class 150, 300, 600[(1)])

1-in. to 12-in. (Class 900)[(2)]

1 1/2-in. to 12-in. (Class 1500)[(2)]

1 1/2-in. to 6-in. (Class 2500)[(2)]

ASME B16.47

30-in. to 36-in. (Class 150)

30-in. to 36-in. (Class 300)

AWWA C207 Class D

30-in. and 36-in.

MSS SP44

30-in. to 36-in. (Class 150)

EN 1092-1

200 mm to 900 mm (8-in. to 36-in.) PN10

100 mm to 900 mm (4 -in. to 36-in.) PN16

200 mm to 900 mm (8-in. to 36-in.) PN 25

15 mm to 900 mm (1/2-in. to 36-in.) PN40

AS2129

15 mm to 900 mm (1/2-in. to 36-in.) Table D and E

AS4087

50 mm to 600 mm (2-in. to 24-in.) PN16, PN21, PN35

JIS B2220

15 mm to 200 mm (1/2-in. to 8-in.) 10K, 20K, 40K

(1) For PTFE and ETFE, maximum working pressure is derated to 1000 psig.
(2) For Class 900 and higher flange ratings, liner selection is limited to resilient liners.

Electrical connections

Conduit entries: 1/2 in. NPT or M20.

Terminal block screws: 6-32 (No. 6) suitable for up to 14 AWG wire.

Safety grounding screws: external stainless assembly, M5; internal 8-32 (No. 8)

Process reference electrode (optional)

A process reference electrode can be installed similarly to the measurement electrodes through the sensor lining on 8705 sensors. It will be made of the same material as the measurement electrodes.

Grounding rings (optional)

Grounding rings can be installed between the flange and the sensor face on both ends of the sensor. Single ground rings can be installed on either end of the sensor. They have an I.D. slightly larger than the sensor I.D. and an external tab to attach ground wiring. Grounding rings are available in 316L SST, Nickel Alloy 276 (UNS N10276), Titanium, and Tantalum. See Product Data Sheet.

Lining protectors (optional)

Lining protectors can be installed between the flange and the sensor face on both ends of the sensor. The leading edge of lining material is protected by the lining protector; lining protectors cannot be removed once they are installed. Lining protectors are available in 316L SST, Nickel Alloy 276 (UNS N10276), and Titanium. See Product Data Sheet.

Dimensions

See the Product Data Sheet.

Weight

See the Product Data Sheet.

A.3 Rosemount 8711-M/L Wafer Sensor specifications

A.3.1 Functional specifications

Service

Conductive liquids and slurries

Line sizes

1.5-in. to 8-in. (4 mm to 200 mm)

Sensor coil resistance

10 - 18 Ω

Interchangeability

Rosemount 8711-M/L sensors are interchangeable with 8732EM transmitter. System accuracy is maintained regardless of line size or optional features. Each sensor nameplate has a sixteen-digit calibration number that can be entered into a transmitter through the Local Operator Interface (LOI) or the Field Communicator.

Upper range limit

39.37 ft/s (12 m/s)

Process temperature limits

ETFE lining

-20 to 300 °F (–29 to 149 °C)

PTFE lining

-20 to 350 °F (-29 to 177 °C)

PFA Lining

-20 to 200 °F (-29 to 93 °C)

Ambient temperature limits

–20 to 140 °F (–29 to 60 °C)

Maximum safe working pressure at 100 °F (38 °C)

ETFE lining

Full vacuum to 740 psi (5.1 MPa)

PTFE lining

Full vacuum through 4-in. (100 mm) line sizes. Consult factory for vacuum applications with line sizes of 6-in. (1450 mm) or larger.

PFA lining

Full vacuum to 285 psi (1.96 MPa)

Submergence protection (IP68)

The remote mount 8711-M/L sensor is rated IP68 for submergence to a depth of 33 ft. (10 m) for a period of 48 hours. IP68 rating requires the transmitter must be remote mount. Installer must use IP68 approved cable glands, conduit connections, and/or conduit plugs. For more details on proper installation techniques for IP68 submersible application, reference Rosemount Technical Note 00840-0100-4750 available on www.rosemount.com.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater for 8711.

A.3.2 Physical specifications

Non-wetted materials

Sensor body

303 SST

CF3M or CF8M

Type 304/304L

Coil housing

Rolled carbon steel

Paint

Polyurethane coat (1.3 to 5 mils thick)

Process-wetted materials

Lining

ETFE, PTFE

Electrodes

316L SST, Nickel Alloy 276 (UNS N10276), Tantalum, 80% Platinum—20% Iridium, Titanium

Process connections

Mounts between these flange configurations

ASME B16.5: Class 150, 300

EN 1092-1: PN10, PN16, PN25, PN40

JIS B2220: 10K, 20K,

AS4087: PN16, PN21, PN35

Studs, nuts, and washers

MK2–Carbon Steel

ASME B16.5

Studs, full thread: CS, ASTM A193, Grade B7

Hex nuts: ASTM A194 Grade 2H;

Flat washers: CS, Type A, Series N, SAE per ANSI B18.2.1

All items clear, chromate zinc-plated

EN 1092-1

Studs, full thread: CS, ASTM A193, Grade B7

Hex nuts: ASTM A194 Grade 2H; DIN 934 H = D

Flat washers: CS, DIN 125

All items yellow zinc-plated

MK3–316 SST

ASME B16.5

Studs, full thread: ASTM A193, Grade B8M Class 1

Hex nuts: ASTM A194 Grade 8M;

Flat washers: 316 SST, Type A, Series N, SAE per ANSI B18.2.1

EN 1092-1

Studs, full thread: ASTM A193, Grade B8M Class 1

Hex nuts: ASTM A194 Grade 8M; DIN 934 H = D

Flat washers: 316 SST, DIN 125

Electrical connections

Conduit entries: 1/2 in. NPT or M20 standard

Terminal block screws: 6-32 (No. 6) suitable for up to 14 AWG wire

Safety grounding screws: external stainless assembly, M5; internal 8-32 (No. 8)

Process reference electrode (optional)

A process reference electrode can be installed similarly to the measurement electrodes through the sensor lining. It will be made of the same material as the measurement electrodes.

Grounding rings (optional)

Grounding rings can be installed between the flange and the sensor face on both ends of the sensor. They have an I.D. slightly smaller than the sensor I.D. and an external tab to attach ground wiring. Grounding rings are available in 316L SST, Nickel Alloy 276 (UNS N10276), titanium, and tantalum. See Product Data Sheet.

Dimensions

See the Product Data Sheet.

Weight

See the Product Data Sheet.

A.4 Rosemount 8721 Hygienic (Sanitary) Sensor specifications

A.4.1 Functional specifications

Service

Conductive liquids and slurries

Line sizes

$^{1}/_{2}$-in. to 4-in. (15 mm to100 mm)

Sensor coil resistance

5 -10Ω

Interchangeability

The Rosemount 8721 sensors are interchangeable with Rosemount 8732EM transmitters. System accuracy is maintained regardless of line size or optional features.

Each sensor label has a 16 digit calibration number that can be entered into the transmitter through the Local Operator Interface (LOI) or the Field Communicator.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater. Excludes the effect of interconnecting cable length in remote mount transmitter installations.

Flow rate range

Capable of processing signals from fluids that are traveling between 0.04 and 39 ft/s (0.01 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between –39 and 39 ft/s (–12 to 12 m/s).

Sensor ambient temperature limits

14 to 140 °F (–15 to 60 °C)

Process temperature limits

PFA lining

-20 to 350 °F (-29 to 177 °C)

Table A-4. Pressure limits

Line size in. (mm)	Max working pressure	CE Mark max. working pressure
1/2 (15)	300 psi (20.7 bar)	300 psi (20.7 bar)
1 (25)	300 psi (20.7 bar)	300 psi (20.7 bar)
1 1/2 (40)	300 psi (20.7 bar)	300 psi (20.7 bar)
2 (50)	300 psi (20.7 bar)	300 psi (20.7 bar)
2 1/2 (65)	300 psi (20.7 bar)	240 psi (16.5 bar)
3 (80)	300 psi (20.7 bar)	198 psi (13.7 bar)
4 (100)	210 psi (14.5 bar)	148 psi (10.2 bar)

Vacuum limits

Full vacuum at maximum lining material temperature; consult factory.

Submergence protection (IP68)

The remote mount 8721 sensor is rated IP68 for submergence to a depth of 33 ft. (10 m) for a period of 48 hours. IP68 rating requires the transmitter must be remote mount. Installer must use IP68 approved cable glands, conduit connections, and/or conduit plugs. For more details on proper installation techniques for IP68 submersible application, reference Rosemount Technical Note 00840-0100-4750 available on www.rosemount.com.

A.4.2 Physical specifications

Mounting

Integrally mounted transmitters are factory-wired and do not require interconnecting cables. The transmitter can rotate in 90° increments. Remote mounted transmitters require only a single conduit connection to the sensor.

Non-wetted materials

Sensor

304 Stainless Steel (wrapper), 304 Stainless Steel (pipe)

Terminal junction box

Low copper aluminum
Optional: 304 Stainless Steel

Weight

Table A-5. 8721 Sensor weight

Line size in. (mm)	Sensor only	008721-0350 Tri Clamp fitting (each)
1/2 (15)	4.84 lbs (2.20 kg)	0.58 lbs (0.263 kg)
1 (25)	4.52 lbs (2.05 kg)	0.68 lbs (0.309 kg)
1 1/2 (40)	5.52 lbs (2.51 kg)	0.88 lbs (0.400 kg)
2 (50)	6.78 lbs (3.08 kg)	1.30 lbs (0.591 kg)
2 1/2 (65)	8.79 lbs (4.00 kg)	1.66 lbs (0.727 kg)
3 (80)	13.26 lbs (6.03 kg)	2.22 lbs (1.01 kg)
4 (100)	21.04 lbs (9.56 kg)	3.28 lbs (1.49 kg)

Aluminum remote junction box

Approximately 1 lb. (0.45 kg)

Paint - Polyurethane (1.3 to 5 mils)

SST remote junction box

Approximately 2.5 lbs. (1.13 kg)

Unpainted

Process wetted materials (sensor)

Liner

PFA with Ra < 32µ in. (0.81 µm)

Electrodes

316L SST with Ra < 15µ in. (0.38 µm)

Nickel Alloy 276 (UNS N10276) with Ra < 15µ in. (0.38 µm)

80% Platinum-20% Iridium with Ra < 15µ in. (0.38 µm)

Process connections

The Rosemount 8721 sanitary sensor is designed using a standard IDF fitting as the basis for providing a flexible, hygienic interface for a variety of process connections. The Rosemount 8721 Sensor has the threaded or "male" end of the IDF fitting on the ends of the base sensor. The sensor can be directly connected with user supplied IDF fittings and gaskets. If other process connections are needed, the IDF fittings and gaskets can be provided and welded directly into the sanitary process tubing, or can be supplied with adapters to standard Tri Clamp process connections. All connections are PED compliant for group 2 fluids.

Tri Clamp Sanitary Coupling

IDF Sanitary Coupling (screw type)

IDF specification per BS4825 part 4

ANSI Weld Nipple

DIN 11850 Weld Nipple

DIN 11851 (Imperial and Metric)

DIN 11864-1 form A

DIN 11864-2 form A

SMS 1145

Cherry-Burrell I-Line

Process connection material

316L Stainless Steel with Ra < 32µ in. (0.81µm)

Optional electropolished surface finish with Ra < 15µ in. (0.38µ m)

Process connection gasket material

Silicone

EPDM

Viton®

Electrical connections

Conduit entries: $^{1}/_{2}$ in. NPT standard.

Terminal block screws: M3

Safety grounding screws: external stainless assembly, M5; internal 6-32 (No. 6)

Dimensions

See the Product Data Sheet.

Appendix B Product Certifications

B.1 Product certifications

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Rosemount 8700M Magnetic Flowmeter Platform

Order Code	8732EM Transmitter Rating	8705M and 8711M/L Flowtube Rating	Region	Agency	Certification Number
-	Ordinary Locations *	Ordinary Location *	USA EU	FM	3048793
N5	FM Non-Incendive Class I Div 2; DIP	FM Non-Incendive with Intrinsically Safe Electrodes Class I Div 2; DIP	USA	FM	3048793
K5	FM Explosion-Proof Class I Div 1; DIP	FM Explosion-Proof with Intrinsically Safe Electrodes Class I Div 1; DIP	USA	FM	3048793
N6	CSA Non-Incendive Class I Div 2; DIP	CSA Non-Incendive with Intrinsically Safe Electrodes Class I Div 2; DIP	USA & Canada	CSA	70030489
KU	CSA Explosion-Proof Class I Div 1; DIP	CSA Explosion-Proof with Intrinsically Safe Electrodes Class I Div 1; DIP	USA	CSA	70030489
K6	CSA Flameproof, Increased Safety, and Dust. Zone 0 & 1	CSA Increased Safety with Intrinsically Safe Electrodes and Dust. Zone 0 & 1	Canada	CSA	***
ND	ATEX Dust	ATEX Dust	EU	DEKRA	14ATEX0071 X
N1	ATEX Non-Sparking ATEX Dust	ATEX Non-Sparking with Intrinsically Safe Electrodes ATEX Dust	EU	DEKRA	14ATEX0071 X
K1	ATEX Flameproof with Increased Safety ATEX Dust	ATEX Increased Safety with Intrinsically Safe Electrodes ATEX Dust	EU	DEKRA	14ATEX0071 X
NF	IECEx Dust	IECEx Dust	Global	DEKRA	IECEx DEK14.0031X
N7	IECEx Non-Sparking IECEx Dust	IECEx Non-Sparking with Intrinsically Safe Electrodes IECEx Dust	Global	DEKRA	IECEx DEK14.0031X
K7	IECEx Flameproof with Increased Safety IECEx Dust	IECEx Increased Safety with Intrinsically Safe Electrodes IECEx Dust	Global	DEKRA	IECEx DEK14.0031X
N8	EAC Non-Sparking EAC Dust	EAC Non-Sparking with Intrinsically Safe Electrodes EAC Dust	Russia **	***	***
K8	EAC Flameproof with Increased Safety EAC Dust	EAC Increased Safety with Intrinsically Safe Electrodes EAC Dust	Russia **	***	***
N2	INMETRO Non-Sparking INMETRO Dust	INMETRO Non-Sparking with Intrinsically Safe Electrodes INMETRO Dust	Brazil	DEKRA - INMETRO	DEKRA 15.0007 X
K2	INMETRO Flameproof with Increased Safety INMETRO Dust	INMETRO Increased Safety with Intrinsically Safe Electrodes INMETRO Dust	Brazil	DEKRA - INMETRO	DEKRA 15.0007 X
N9	KOSHA Non-Sparking KOSHA Dust	KOSHA Non-Sparking with Intrinsically Safe Electrodes KOSHA Dust	Korea	***	***
K9	KOSHA Flameproof with Increased Safety KOSHA Dust	KOSHA Increased Safety with Intrinsically Safe Electrodes KOSHA Dust	Korea	***	***
N3	NEPSI Non-Sparking NEPSI Dust	NEPSI Non-Sparking with Intrinsically Safe Electrodes NEPSI Dust	China	NEPSI	GYJ15.1180X
K3	NEPSI Flameproof with Increased Safety NEPSI Dust	NEPSI Increased Safety with Intrinsically Safe Electrodes NEPSI Dust	China	NEPSI	GYJ15.1180X
KN	CCOE Flameproof with Increased Safety	CCOE Increased Safety with Intrinsically Safe Electrodes	India	PESO	P354747/1
*	Complies with only the local country product safety, electromagnetic, pressure and other applicable regulations. Cannot be used in a classified or zoned hazardous location environment. No ordering code required.				
**	Customs Union (Russia, Belarus and Kazakhstan)				
***	Planned submittal or in process with Agency.				

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Approval Markings and Logos

Symbol	Marking or Symbol Name	Region	Meaning of Marking or Symbol
CE	CE	European Union	Compliance with all applicable European Union Directives.
Ex	ATEX	European Union	Compliance with Equipment and Protective systems intended for use in Potentially Explosive Atmospheres directive (ATEX) (94/9/EC)
N96	C-tick	Australia	Compliance with Australian applicable electromagnetic compatibility standards
FM APPROVED	FM Approved	United States	Compliance with the applicable ANSI standards.
C SP® US	CSA	US = United States C = Canada	Indicates that the product was tested and has met the applicable certification requirements for the noted countries.
EAC	Eurasian Conformity (EAC)	Eurasian Customs Union (Russia, Belarus and Kazakhstan)	Compliance with all of the applicable technical regulations of the EAC Customs Union
Ex	EAC Hazardous Location	Eurasian Customs Union (Russia, Belarus and Kazakhstan)	Compliance with Technical regulation, (TR CU 012/2011) – The safety of equipment for use in explosive environments.
Segurança INMETRO DEKRA OCP 0089	INMETRO	Brazil	Compliance with all of the applicable technical regulations of Brazil.
Ex NEPSI	NEPSI	China	Compliance with all of the applicable technical regulations of China.
KCs	KCS	Korea	Compliance with all of the applicable technical regulations of Korea.

Ordinary Location labels will be marked with CE, C-tick, FM, CSA and EAC logos.

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European Directive Information

A copy of the EC Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EC Declaration of Conformity can be found at www.rosemount.com.

Electro Magnetic Compatibility (EMC) (2004/108/EC)
Transmitter and Flowtube: EN 61326-1: 2013
Transmitters with output code "B" require shielded cable for the 4-20mA output, with shield terminated at the transmitter.

Low Voltage Directive (LVD) (2006/95/EC)
EN 61010-1: 2010

Ingress Protection Rating for dust and water per EN 60079-0 and EN 60529 – **IP66/68** (The IP68 rating only applies to the flowtube and the remote junction box when the transmitter is remotely mounted. The IP68 rating does not apply to the transmitter. The IP68 rating is only valid at a depth of 10 meters for 48 hours)

European Pressure Equipment Directive (PED) (97/23/EC)
PED Certification requires the "PD" option code.
CE marked models that are ordered without the "PD" option will be marked "Not Complaint to (97/23/EC)"

Mandatory CE-marking with notified body number 0575, for all flowtubes is located on the flowmeter label.
Category I assessed for conformity per module A procedures.
Categories II – III assessed for conformity per module H procedures.
QS Certificate of Assessment
EC No. 4741-2014-CE-HOU-DNV
Module H Conformity Assessment

8705 M Flanged Flowtubes
Line size 40mm to 900mm (1½-in to 36-in)
EN 1092-1 flanges and ASME B16.5 class 150 and ASME B16.5 Class 300 flanges.
Also available in ASME B16.5 Class 600 flanges in limited line sizes.

8711 Wafer Flowtubes
Line size 40mm to 200mm (1½-in to 8-in)

All other Rosemount Flowtubes – line sizes of 25mm (1-in) and less: Sound Engineering Practice (SEP).
Flowtubes that are SEP are outside the scope of PED and cannot be marked for compliance with PED.

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Certifications

Factory Mutual (FM)

Ordinary Location Certification for FM Approvals
As standard, the transmitter and flowtube have been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM Approvals, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

8732EM Transmitter
Note: For Intrinsically Safe (IS) 4-20mA and Pulse Outputs on the 8732EM, output code "B" must be selected.

N5 Non-Incendive for Class I, Division 2, Groups ABCD: T4
Dust-Ignition Proof for Class II/III, Division 1, Groups EFG: T5
-40°C ≤ Ta ≤ 60°C
Enclosure Type 4X, IP66
Install per drawing 08732-2062

Special Conditions for Safe Use (X):
1. *Units marked with "Warning: Electrostatic Charging Hazard" may either use non-conductive paint thicker than 0.2 mm or non-metallic labeling. Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.*
2. *The intrinsically safe 4-20mA and pulse output cannot withstand the 500V isolation test due to integral transient protection. This must be taken into consideration upon installation.*
3. *Conduit entries must be installed to maintain the enclosure ingress rating of IP66.*
4. *Unused conduit entries must use either used the Rosemount-supplied blanking plugs, or blanking plugs certified in accordance with the protection type.*

K5 Explosion-Proof for Class I Division 1, Groups CD: T6
Non-Incendive for Class I, Division 2, Groups ABCD: T4
Dust-Ignition Proof for Class II/III, Division 1, Groups EFG: T5
-40°C ≤ Ta ≤ 60°C
Enclosure Type 4X, IP66
Install per drawing 08732-2062

Special Conditions for Safe Use (X):
1. *Units marked with "Warning: Electrostatic Charging Hazard" may either use non-conductive paint thicker than 0.2 mm or non-metallic labeling. Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.*
2. *The intrinsically safe 4-20mA and pulse output cannot withstand the 500V isolation test due to integral transient protection. This must be taken into consideration upon installation.*
3. *Conduit entries must be installed to maintain the enclosure ingress rating of IP66.*
4. *Unused conduit entries must use either used the Rosemount-supplied blanking plugs, or blanking plugs certified in accordance with the protection type.*

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8705-M and 8711-M/L Flowtube

Note: When used in hazardous (classified) locations:
The 8705-M and 8711-M/L may only be used with a certified 8732EM transmitter.

N5 Non-Incendive with Intrinsically Safe Electrodes
for Class I, Division 2, Groups ABCD: T3…T5
Dust-Ignition Proof for Class II/III, Division 1, Groups EFG: T2…T5
-29°C ≤ Ta ≤ 60°C
Enclosure Type 4X, IP66/68 (IP68 remote mount only)
Install per drawing 08732-2062

Special Conditions for Safe Use (X):

1. *Units marked with "Warning: Electrostatic Charging Hazard" may either use non-conductive paint thicker than 0.2 mm or non-metallic labeling. Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.*
2. *If used with flammable process fluid, the electrode circuit must be installed as intrinsically safe (Ex ia).*
3. *Conduit entries must be installed to maintain a minimum enclosure ingress rating of IP66.*
4. *Unused conduit entries must use either used the Rosemount-supplied blanking plugs, or blanking plugs certified in accordance with the protection type.*

K5 Explosion-Proof with Intrinsically Safe Electrodes
for Class I Division 1, Groups CD: T3…T6
Non-Incendive with Intrinsically Safe Electrodes
for Class I, Division 2, Groups ABCD: T3…T5
Dust-Ignition Proof for Class II/III, Division 1, Groups EFG: T2…T5
-29°C ≤ Ta ≤ 60°C
Enclosure Type 4X, IP66/68 (IP68 remote mount only)
Install per drawing 08732-2062

Special Conditions for Safe Use (X):

1. *Units marked with "Warning: Electrostatic Charging Hazard" may either use non-conductive paint thicker than 0.2 mm or non-metallic labeling. Precautions shall be taken to avoid ignition due to electrostatic charge on the enclosure.*
2. *If used with flammable process fluid, or if installed in a Class I Division I area, the electrode circuit must be installed as intrinsically safe (Ex ia).*
3. *Conduit entries must be installed to maintain a minimum enclosure ingress rating of IP66.*
4. *Unused conduit entries must use either used the Rosemount-supplied blanking plugs, or blanking plugs certified in accordance with the protection type.*

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Canadian Standards Association (CSA)

CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations – To Canadian Requirements.

N6 **Class I, Groups A, B, C and D (Intrinsically Safe Output and Electrode circuit)**
N6 **Class I, Division 2, Groups A, B, C and D (Non-Incendive)**
N6 **Class II, Division 1, Groups E, F and G (Dust Ignition Proof)**

Magnetic Flow Meter – Model 8732EM Transmitter with integral or remote mount to Model 8705M or Model 8711M/L Magnetic Flow Tubes. Enclosure Type 4X and IP 66 Rated.

For Remote Mount Configuration – Temperature Code T4 with an Ambient Operating Temperature Range: -40°C ≤ Ta ≤ +60°C, with or without LCD meter, with or without digital I/O and/or pulse outputs when installed per Rosemount Drawing 08732-2061.

For Integral Mount Configuration – Ambient Operating Temperature Range: -29°C ≤ Ta ≤ +60°C. Temperature Code T3-T6 dependent on line size of Flow Tubes for Process Temperature. The T-Code is defined as per Rosemount Drawing 08705-00CS and 08732-00CS for 'N6' option or 'KU' option.

CLASS 2258 82 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations –To US Requirements

KU **Class I, Division 1, Groups C and D (Explosion Proof)**
N6, KU **Class I, Groups A, B, C and D (Intrinsically Safe Output and Electrode circuit**
N6, KU **Class I, Division 2, Groups A, B, C and D (Non-Incendive)**
N6, KU **Class II, Division 1, Groups E, F and G (Dust Ignition Proof)**

Magnetic Flow Meter – Model 8732EM Transmitter with integral or remote mount to Model 8705M or Model 8711M/L Magnetic Flow Tubes. Enclosure Type 4X and IP 66 Rated.

For Remote Mount Configuration – Temperature Code T6 for Explosion Proof, T5 for Dust Ignition Proof, and T4 for Non-Incendive. Ambient Operating Temperature Range: -40°C ≤ Ta ≤ +60°C, with or without LCD meter, with or without digital I/O and/or pulse outputs when installed per Rosemount Drawing 08732-2061.

For Integral Mount Configuration – Ambient Operating Temperature Range: -29°C ≤ Ta ≤ +60°C. Temperature Code T3-T6 dependent on line size of Flow Tubes for Process Temperature. The T-Code is defined as per Rosemount Drawing 08705-00CS and 08732-00CS for 'N6' option or 'KU' option.

Special Conditions of Safe Use:

1. For use with the appropriate 8705M and 8711M/L Flow tubes only.
2. When the 8732EM transmitter is integrally mounted to 8705M or 8711M/L Flow Tubes, the ambient temperature ranges marked on each product need to be taken into consideration before installation. The Ambient temperature range for 8732EM transmitter is -40°C ≤ Ta ≤ +60°C and the ambient temperature range for 8705M or 8711M/L Flow Tubes is -29°C ≤ Ta ≤ +60°C . Therefore, the -29°C rating of the flow tubes will limit the overall cold temperature range of the complete system unless other approved temperature control methods are employed.

Rosemount 8700M Magnetic Flowmeter Platform
IEC EX & ATEX Approval Document

January 29, 2015,
08732-AP02, Rev AB

1. Equipment Markings – See section VI in the tables on the following pages
    a. EC-Type Examination Certificate (ATEX): DEKRA 14ATEX0071_X
    b. Certificate of Conformity (IEC Ex): IEC Ex DEK 14.0031X
2. Required Documentation:
    a. 08732-2060 Installation Drawing Model 8732EM, 8705M, 8711-M/L ATEX/IEC Ex Hazardous (Ex) Locations
    b. 08732-1504 Installation Drawing, 8732EM Transmitter Wiring
3. Referenced Documentation:
    a. 00825-0100-4444.pdf(Hart) & 00825-0400-4444(Modbus), Quick Installation Guide
    b. 00809-0100-4444.pdf, Reference Manual
    c. 08732-AP01, Approvals Document
4. The Required and Referenced Documents listed above address the following items:
    a. Instructions for safety i.e.
        i. Putting into service
        ii. Use
        iii. Assembling and dismantling
        iv. Maintenance, overhaul and repair
        v. Installation
        vi. Adjustment
    b. Where necessary, training instructions
    c. Details which allow a decision to be made as to whether the equipment can be used safely in the intended area under the expected operating conditions
    d. Electrical parameters, maximum surface temperatures and other limit values
        i. Electrical –
            1. See document 08732-2060
            2.

Rosemount 8732EM Flow Transmitter		
Power input	*90 - 250VAC, 0.45A, 40VA* *12 - 42VDC, 1.2A, 15W*	
Pulsed circuit	*Internally powered (Active): Outputs up to 12VDC, 12.1mA, 73mW Externally powered (Passive): Input up to 28VDC, 100mA, 1W*	
4-20mA output circuit	*Internally Powered (Active): Outputs up to 25mA, 24VDC, 600mW Externally Powered (Passive): Input up to 25mA, 30VDC, 750mW*	
MODBUS	*Internally Powered (Active): Outputs up to 100mA, 3.3VDC, 100mW*	
Um	*250V*	
Coil excitation output	*500mA, 40V max, 9W max*	
Rosemount 8705-M and 8711-M/L Flowtube(1)		
Coil excitation input	*500mA, 40V max, 20W max*	
Electrode circuit	*5V, 200uA, 1mW*	

(1) Provided by the transmitter

Rosemount 8700M Magnetic Flowmeter Platform
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e. Special Conditions for Safe Use (X):
   i. For processes requiring EPL Ga and Gb, rated equipment: electrode, grounding ring, and lining protector materials Titanium and Zirconium are not allowed.
   ii. When “Special Paint Systems” are applied, instructions for safe use regarding potential electrostatic charging hazard have to be followed.
   iii. Terminals 1,2,3,4, for data communication, cannot withstand the 500 V isolation test between signal and ground, due to integral transient protection. This must be taken into account upon installation.
   iv. Conduit entries must be installed to maintain the enclosure ingress rating of IP66.
   v. In order to maintain the ingress protection level on the M3 and M4 electrode housing, the copper crush washer that seals the electrode access plug shall be replaced when the plug is reinstalled. The copper crush washer is one time use only.
   vi. The flow tube and transmitter are not allowed to be thermally insulated.
   vii. The property class of the special fasteners which attach the Magnetic Flow Tube or Transmitter Remote Junction Box to the Magnetic Transmitter is A2-70 or A4-70 SST.
   viii. For information on the dimensions of the flameproof joints the manufacturer shall be contacted.
   ix. The Magnetic Flow Meter Tube contains nonconductive liners over the grounded tube. For process requiring EPL Ga, precautions shall be taken to avoid the liner being charged by the flow of nonconductive media.

f. Where necessary, the essential characteristics of tools which may be fitted to the equipment

g. List of the standards, including the issue date, with which the equipment is declared to comply:
   i. ATEX - EN 60079-0: 2012 +A11, EN 60079-1: 2007, EN 60079-7: 2007. EN 60079-11: 2012, EN 60079-15: 2010, EN 60079-26: 2007, EN 60079-31: 2014
   ii. IEC EX - IEC 60079-0: 2011, IEC 60079-1: 2007, IEC 60079-7: 2006 IEC 60079-11: 2011, IEC 60079-15: 2010, IEC 60079-26: 2006, IEC 60079-31: 2013

h. Supply wire requirements;
   Use 10 - 18 AWG wire rated for the proper temperature of the application. For wire 10 - 14 AWG use lugs or other appropriate connectors. For connections in ambient temperatures above 122°F (50 °C), use a wire rated for 194 °F (90 °C).

i. Contact address;
   i. Rosemount Inc.
      12001 Technology Drive
      Eden Prairie
      MN 55344
      United States of America

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IEC EX & ATEX Approval Document

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Nomenclature Magnetic Flow Transmitter Model 8732EM and electrical data

8732EM	R	1	B	2	K1	…	M4	RT50	…	SH	…	V2	…	F090…
I	II	III	IV	V	VI		VII	VIII		IX				X

Desig-nation	Explanation	Value	Explanation
I	Model	8732EM	Magnetic Flow Transmitter – Field Mount
II	Transmitter Mount	R T	Remote Mount Integral Mount
III	Transmitter Power Supply	1 2	AC (90 - 250 Vac, 50 / 60 Hz), not for Ex nA DC (12 - 42 Vdc)
IV	Outputs	A B M	4 - 20 mA with digital HART Protocol & Scalable Pulse Output 4 - 20 mA Intrinsically Safe Output with digital HART Protocol & Intrinsically Safe Scalable Pulse Output Modbus RS-485
V	Conduit entries	1 or 4 2 or 5	½-14 NPT female CM20, M20 female
VI	Safety Approval Option	K1 ATEX	(Ex) II 2 (1) G Ex d e [ia Ga] IIC T6…T3 Gb (Ex) II 2 D Ex tb IIIC T80 °C…T200 °C Db
			(Ex) II 2 (1) G Ex d [ia Ga] IIC T6…T3 Gb * (Ex) II 2 D Ex tb IIIC T80 °C…T200 °C Db
		K7 IECEx	Ex d e [ia Ga] IIC T6…T3 Gb Ex tb IIIC T80 °C…T200 °C Db
			Ex d [ia Ga] IIC T6…T3 Gb * Ex tb IIIC T80 °C…T200 °C Db
		N1 ATEX	(Ex) II 3 (1) G Ex nA [ia Ga] IIC T4…T3 Gc *** (Ex) II 2 D Ex tb IIIC T80 °C…T200 °C Db
		N7 IECEx	Ex nA [ia Ga] IIC T4…T3 Gc *** Ex tb IIIC T80 °C…T200 °C Db
		ND ATEX	(Ex) II 2 D Ex tb IIIC T80 °C…T200 °C Db
			(Ex) II 2 D Ex tb IIIC T80 °C…T200 °C Db (Ex) II (1) G [Ex ia Ga] IIC **
		NF IECEx	Ex tb IIIC T80 °C…T200 °C Db
			Ex tb IIIC T80 °C…T200 °C Db [Ex ia Ga] IIC **
			NOTE: * Integral Mount (see II) option only ** Intrinsically Safe Output (see IV) option only *** DC Transmitter Power Supply only (12 - 42 Vdc)
VII	Display Option	M4 M5	LOI Display
VIII	Remote Cable Option	RTxx **** RHxx ****	Standard Temperature Component Extended Temperature Component
			NOTE: **** Length = xx x 10 ft, max. 500 ft
IX	Options	-- SH Vx	Aluminum, standard paint Stainless Steel Electronics Housing Special Paint Systems *****
X	Specials	F090x	Special Paint Systems *****
			NOTE: ***** Subject to special conditions for safe use.

ROSEMOUNT

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Rosemount 8700M Magnetic Flowmeter Platform
IEC EX & ATEX Approval Document

January 29, 2015,
08732-AP02, Rev AB

Nomenclature Magnetic Flow Tube Model 8705-M and electrical data

8705	…	S	A	005	…	M4	K1	…	G1	L1	B3	…	J1	SJ	…	V1	…	SH	…	F090x
I		II	III	IV		V	VI		VII	VIII	IX		X	XI		XII		XIII		XIV

Designation	Explanation	Value	Explanation
I	Model	8705	Magnetic Flowtube
II	Electrode Material	Custom	See special conditions for safe use
III	Electrode Types	Custom	Seal of electrodes comply with IEC 61010-1
IV	Line Size	005 to 360	½" NPS (15 mm) to 36" NPS (900 mm)
V	Electrode Housing *	M0 M1 M2 M3 M4	Category 2 G or 3 G, EPL Gb or Gc Category 2 G or 3 G, EPL Gb or Gc Category 1/2 G or 1/3 G, EPL Ga/Gb or Ga/Gc Category 1/2 G or 1/3 G, EPL Ga/Gb or Ga/Gc Category 1/2 G or 1/3 G, EPL Ga/Gb or Ga/Gc
VI	Safety Approvals	K1 ATEX	II 1/2 G Ex e ia IIC T5…T3 Ga/Gb * II 2 D Ex tb IIIC T 80 °C…T 200 °C Db II 2 G Ex e ib IIC T5…T3 Gb ** II 2 D Ex tb IIIC T 80 °C…T 200 °C Db
		K7 IECEx	Ex e ia IIC T5…T3 Ga/Gb * Ex tb IIIC T 80 °C…T 200 °C Db Ex e ib IIC T5…T3 Gb ** Ex tb IIIC T 80 °C…T 200 °C Db
		N1 ATEX	II 1/3 G Ex nA ia IIC T5…T3 Ga/Gc * [line sizes 8"- 36"] II 2 D Ex tb IIIC T 80 °C…T 200 °C Db II 3 G Ex nA ic IIC T5…T3 Gc * [line sizes 0.5" – 6" /] ** II 2 D Ex tb IIIC T 80 °C…T 200 °C Db
		N7 IECEx	Ex nA ia IIC T5…T3 Ga/Gc * [line sizes 8"- 36"] Ex tb IIIC T 80 °C…T 200 °C Db Ex nA ic IIC T5…T3 Gc * [line sizes 0.5" – 6" /] ** Ex tb IIIC T 80 °C…T 200 °C Db
		ND ATEX	II 2 D Ex tb IIIC T 80 °C…T 200 °C Db
		NF IECEx	Ex tb IIIC T 80 °C…T 200 °C Db
			NOTE: * Electrode Housing M2, M3 and M4 only ** Electrode Housing M0 and M1 only
VII	Grounding rings material	Custom	See special conditions for safe use
VIII	Lining protector material	Custom	See special conditions for safe use
IX	Mounting Configuration	B3	Integral Mount with Model 8732EM
X	Optional conduit entries	J1	CM20, M20 female
XI	Remote Junction Box (RJB) material	-- SJ	Aluminum, Standard Paint 316 Stainless Steel
XII	Special paint options	Vx	Special Paint Systems ***
XIII	Wrapper (housing) material	-- SH	Carbon Steel (w. Aluminum RJB), Standard Paint 316 Stainless Steel (w. Stainless Steel RJB)
XIV	Specials	F090x	Special Paint Systems *** NOTE: *** Subject to special conditions for safe use.

ROSEMOUNT

EMERSON Process Management

Rosemount 8700M Magnetic Flowmeter Platform
IEC EX & ATEX Approval Document

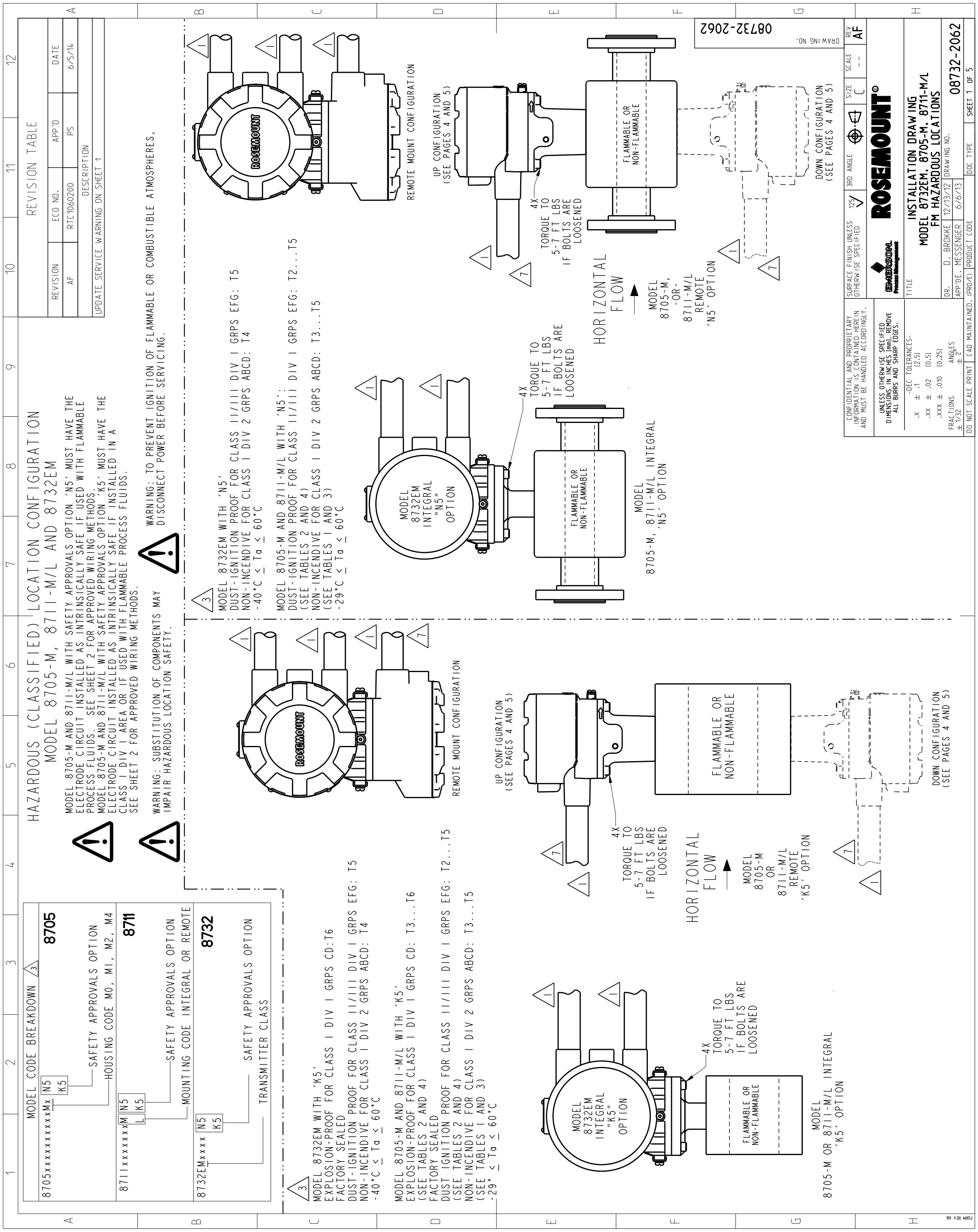
January 29, 2015,
08732-AP02, Rev AB

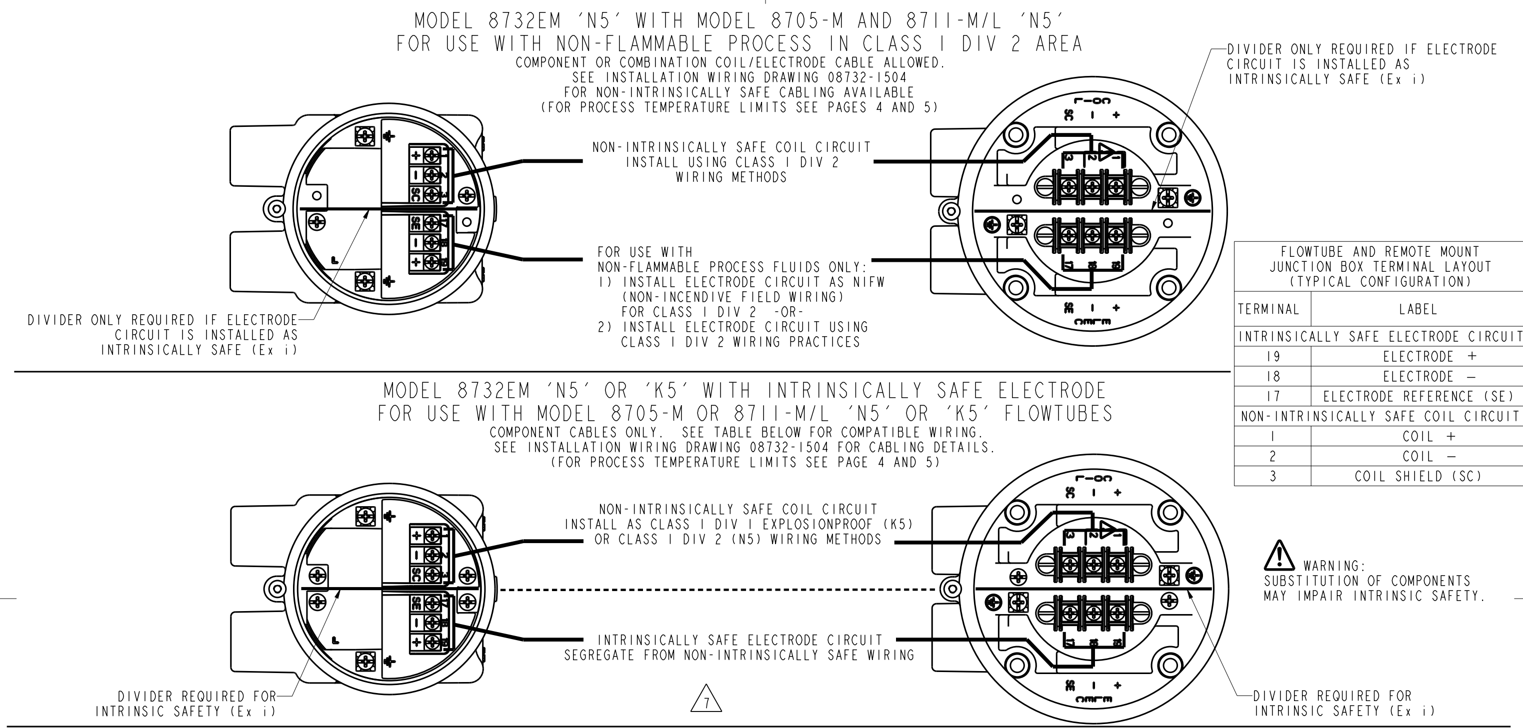
Nomenclature Magnetic Flow Tube Model 8711-M/L and electrical data

8711	…	S	A	15F	L	…	K1	…	G1	…	J1	SJ	…	V1	…	F090x
I		II	III	IV	V		VI		VII		VIII	IX		X		XI

Designation	Explanation	Value	Explanation
I	Model	8711	Magnetic Flow Tube
II	Electrode Material	Custom	See special conditions for safe use
III	Electrode Types	Custom	Seal of electrodes comply with IEC 61010-1.
IV	Line Size	015 to 080	1½" NPS (40 mm) to 8" NPS (900 mm)
V	Mounting Configuration	L M	Remote Mount from Transmitter Integral Mount with Transmitter
VI	Safety Approvals	K1 ATEX	Ex II 2 G Ex e ib IIC T5…T3 Gb Ex II 2 D Ex tb IIIC T 80 °C…T 200 °C Db
		K7 IECEx	Ex e ib IIC T5…T3 Gb Ex tb IIIC T 80 °C…T 200 °C Db
		N1 ATEX	Ex II 3 G Ex nA ic IIC T5…T3 Gc Ex II 2 D Ex tb IIIC T 80 °C…T 200 °C Db
		N7 IECEx	Ex nA ic IIC T5…T3 Gc Ex tb IIIC T 80 °C…T 200 °C Db
		ND ATEX	Ex II 2 D Ex tb IIIC T 80 °C…T 200 °C Db
		NF IECEx	Ex tb IIIC T 80 °C…T 200 °C Db
VII	Grounding rings material	Custom	See special conditions for safe use
VIII	Optional conduit entries	J1	CM20, M20 female
IX	Remote Junction Box material	-- SJ	Aluminum, Standard Paint * 316 Stainless Steel * NOTE:* Flowtube with Carbon Steel Wrapper (housing)
X	Special paint options	Vx	Special Paint Systems **
XI	Specials	F090x	Special Paint Systems ** NOTE: ** Subject to special conditions for safe use.

B.2 FM hazardous locations





FLOWTUBE AND REMOTE MOUNT JUNCTION BOX TERMINAL LAYOUT (TYPICAL CONFIGURATION)

TERMINAL	LABEL
INTRINSICALLY SAFE ELECTRODE CIRCUIT	
19	ELECTRODE +
18	ELECTRODE −
17	ELECTRODE REFERENCE (SE)
NON-INTRINSICALLY SAFE COIL CIRCUIT	
1	COIL +
2	COIL −
3	COIL SHIELD (SC)

SYSTEM APPROVAL FOR INTRINSICALLY SAFE OR NIFW (NON-INCENDIVE FIELD WIRING) ELECTRODE INSTALLATION

THE MODEL 8732EM AND MODEL 8705-M OR MODEL 8711-M/L MAGNETIC FLOWMETER REFERENCING CONTROL DRAWING 08732-2062 MAY USE UP TO 500 FEET (150 METERS) OF ROSEMOUNT SUPPLIED ELECTRODE CABLING FOR INTERCONNECTION OF THE DEVICES. THE CORRECT CABLING IS SUPPLIED AS PART OF THE FOLLOWING ROSEMOUNT CABLING KITS:

COIL AND INTRINSICALLY SAFE ELECTRODE:

ROSEMOUNT PART NO.	UNIT OF MEASURE	TEMPERATURE RANGE	SEE NOTE
08705-0065-0003	FEET	-20°C TO 75°C	16
08705-0065-0004	METERS	-20°C TO 75°C	
08705-0065-1003	FEET	-50°C TO 125°C	
08705-0065-1004	METERS	-50°C TO 125°C	

INDIVIDUAL OR REPLACEMENT ELECTRODE INTRINSICALLY SAFE CABLES:

ROSEMOUNT PART NO.	UNIT OF MEASURE	TEMPERATURE RANGE	SEE NOTE
08705-0061-0003	FEET	-20°C TO 75°C	16
08705-0061-0004	METERS	-20°C TO 75°C	
08705-0061-1003	FEET	-50°C TO 125°C	
08705-0061-1004	METERS	-50°C TO 125°C	

ENTITY CONCEPT FOR INTRINSICALLY SAFE OR NIFW (NON-INCENDIVE FIELD WIRING) ELECTRODE INSTALLATION 16

TERMINALS 19, 18, AND 17 CONTAIN TWO CHANNELS OF AN INTRINSICALLY SAFE CIRCUIT WITH A COMMON RETURN. ENTITY PARAMETERS SHOWN BELOW ARE THE SUMMATION OF BOTH CHANNELS.

TRANSMITTER ENTITY PARAMETERS
MODEL 8732EM INTRINSICALLY SAFE OR NIFW (NON-INCENDIVE FIELD WIRING) ELECTRODE CIRCUIT
REMOTE JUNCTION BOX TERMINALS 19,18,17

- Uo = 28.56V
- Io = 5.77mA
- Po = 165mW
- Co = 61.7nF
- Lo = 1.0H

FLOW TUBE ENTITY PARAMETERS
MODEL 8705-M, 8711-M/L INTRINSICALLY SAFE OR NIFW (NON-INCENDIVE FIELD WIRING) ELECTRODE CIRCUIT
REMOTE JUNCTION BOX TERMINALS 19,18,17

- Ui = 30V
- Ii = 50mA
- Pi = 1.0W
- Ci = 1.9nF
- Li = 630µH

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF ASSOCIATED APPARATUS AND INTRINSICALLY SAFE APPARATUS WHEN THE FOLLOWING IS TRUE: $U_o \le U_i$, $I_o \le I_i$, $P_o \le P_i$, $C_o \ge C_i + C_{cable}$, $L_o \ge L_i + L_{cable}$

THE ALLOWED CAPACITANCE, Co IS SHARED BETWEEN THE CIRCUITS OF TERMINALS 19, 18, AND 17. CABLE CAPACITANCE MUST BE ASSESSED AS TWICE THE MEASURED VALUE PER LENGTH OF CABLE.

EXAMPLE 1: THE HIGHEST MEASURED CAPACITANCE OF A 3 CONDUCTOR, SHIELDED CABLE IS 58pF/ft WHEN MEASURED CONDUCTOR TO CONDUCTOR TIED TO SHIELD.

Ccable = 2 x 58pF/ft x FEET OF CABLE
Ci + Ccable < Co
CABLE LENGTH MUST BE UNDER 515 FEET

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.	SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125	3RD ANGLE	SIZE C / SCALE -- / REV AF
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. -DEC TOLERANCES- .X ± .1 [2.5] .XX ± .02 [0.5] .XXX ± .010 [0.25] FRACTIONS ± 1/32 ANGLES ± 2°	EMERSON. Process Management	ROSEMOUNT®	
TITLE	INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L FM HAZARDOUS LOCATIONS		
DR. D. BROKKE 12/13/12	APP'DE. MESSENGER 6/6/13	DRAWING NO. 08732-2062	
DO NOT SCALE PRINT	CAD MAINTAINED. (PRO/E)	PRODUCT CODE	DOC TYPE / SHEET 2 OF 5

DRAWING NO. 08732-2062

FORM REV AB

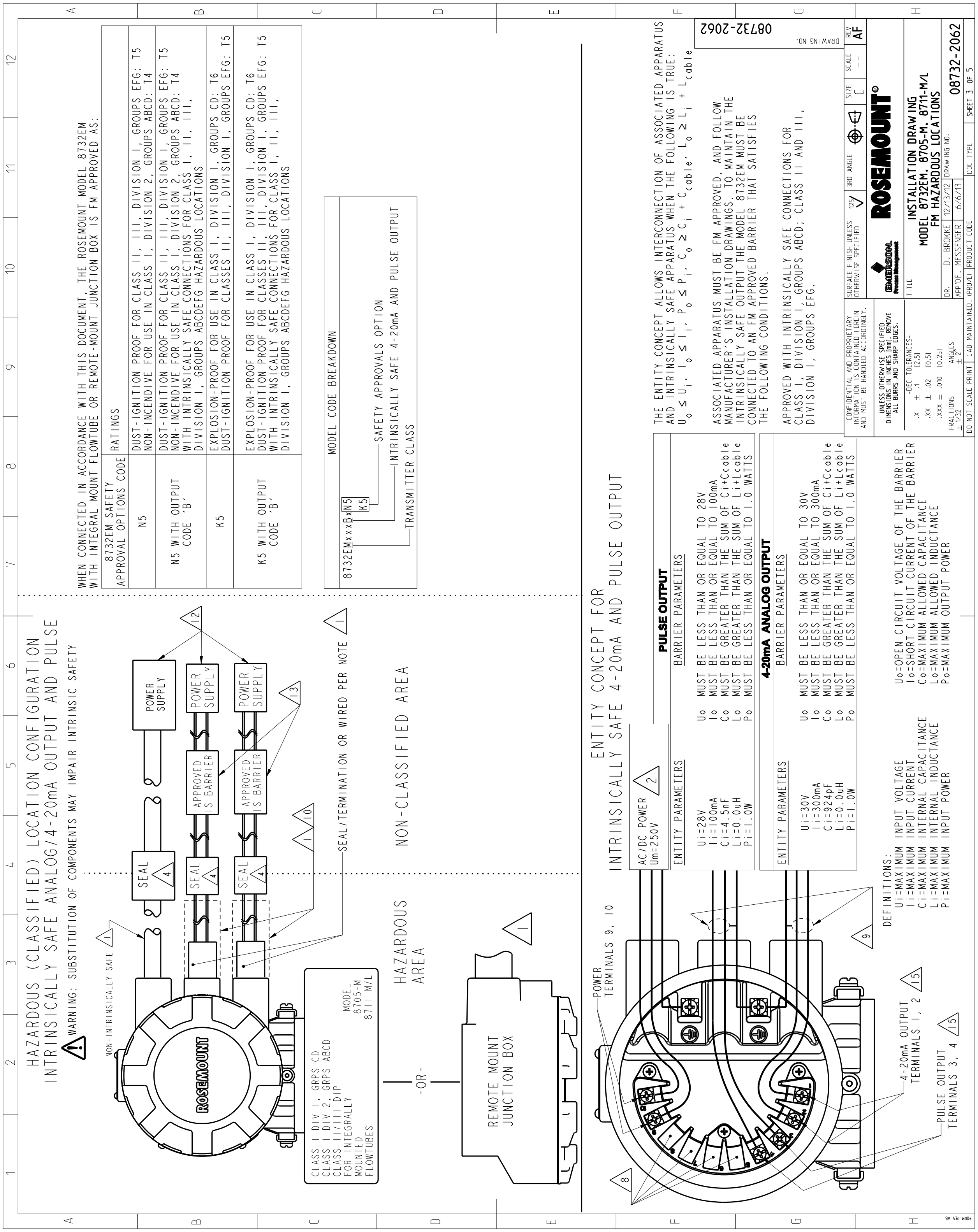

HAZARDOUS (CLASSIFIED) LOCATION CONFIGURATION
INTRINSICALLY SAFE ANALOG/4-20mA OUTPUT AND PULSE
WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY
NON-INTRINSICALLY SAFE
SEAL
POWER SUPPLY
APPROVED IS BARRIER
ROSEMOUNT
CLASS I DIV 1, GRPS CD
CLASS I DIV 2, GRPS ABCD
CLASS II/III DIP
FOR INTEGRALLY MOUNTED FLOWTUBES
MODEL 8705-M 8711-M/L
SEAL/TERMINATION OR WIRED PER NOTE 1
-OR-
HAZARDOUS AREA
NON-CLASSIFIED AREA
REMOTE MOUNT JUNCTION BOX
WHEN CONNECTED IN ACCORDANCE WITH THIS DOCUMENT, THE ROSEMOUNT MODEL 8732EM
WITH INTEGRAL MOUNT FLOWTUBE OR REMOTE-MOUNT JUNCTION BOX IS FM APPROVED AS:
8732EM SAFETY APPROVAL OPTIONS CODE | RATINGS
N5 | DUST-IGNITION PROOF FOR CLASS II, III, DIVISION 1, GROUPS EFG: T5 NON-INCENDIVE FOR USE IN CLASS I, DIVISION 2, GROUPS ABCD: T4
N5 WITH OUTPUT CODE 'B' | DUST-IGNITION PROOF FOR CLASS II, III, DIVISION 1, GROUPS EFG: T5 NON-INCENDIVE FOR USE IN CLASS I, DIVISION 2, GROUPS ABCD: T4 WITH INTRINSICALLY SAFE CONNECTIONS FOR CLASS I, II, III, DIVISION 1, GROUPS ABCDEFG HAZARDOUS LOCATIONS
K5 | EXPLOSION-PROOF FOR USE IN CLASS I, DIVISION 1, GROUPS CD: T6 DUST-IGNITION PROOF FOR CLASSES II, III, DIVISION 1, GROUPS EFG: T5
K5 WITH OUTPUT CODE 'B' | EXPLOSION-PROOF FOR USE IN CLASS I, DIVISION 1, GROUPS CD: T6 DUST-IGNITION PROOF FOR CLASSES II, III, DIVISION 1, GROUPS EFG: T5 WITH INTRINSICALLY SAFE CONNECTIONS FOR CLASS I, II, III, DIVISION 1, GROUPS ABCDEFG HAZARDOUS LOCATIONS
MODEL CODE BREAKDOWN
8732EMxxxBxN5
K5
SAFETY APPROVALS OPTION
INTRINSICALLY SAFE 4-20mA AND PULSE OUTPUT
TRANSMITTER CLASS
POWER TERMINALS 9, 10
ENTITY CONCEPT FOR
INTRINSICALLY SAFE 4-20mA AND PULSE OUTPUT
AC/DC POWER Um=250V
PULSE OUTPUT
ENTITY PARAMETERS
Ui=28V
Ii=100mA
Ci=4.5nF
Li=0.0uH
Pi=1.0W
BARRIER PARAMETERS
Uo MUST BE LESS THAN OR EQUAL TO 28V
Io MUST BE LESS THAN OR EQUAL TO 100mA
Co MUST BE GREATER THAN THE SUM OF Ci+Ccable
Lo MUST BE GREATER THAN THE SUM OF Li+Lcable
Po MUST BE LESS THAN OR EQUAL TO 1.0 WATTS
4-20mA ANALOG OUTPUT
ENTITY PARAMETERS
Ui=30V
Ii=300mA
Ci=924pF
Li=0.0uH
Pi=1.0W
BARRIER PARAMETERS
Uo MUST BE LESS THAN OR EQUAL TO 30V
Io MUST BE LESS THAN OR EQUAL TO 300mA
Co MUST BE GREATER THAN THE SUM OF Ci+Ccable
Lo MUST BE GREATER THAN THE SUM OF Li+Lcable
Po MUST BE LESS THAN OR EQUAL TO 1.0 WATTS
THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF ASSOCIATED APPARATUS AND INTRINSICALLY SAFE APPARATUS WHEN THE FOLLOWING IS TRUE:
Uo ≤ Ui, Io ≤ Ii, Po ≤ Pi, Co ≥ Ci + Ccable, Lo ≥ Li + Lcable
ASSOCIATED APPARATUS MUST BE FM APPROVED, AND FOLLOW MANUFACTURER'S INSTALLATION DRAWINGS. TO MAINTAIN THE INTRINSICALLY SAFE OUTPUT THE MODEL 8732EM MUST BE CONNECTED TO AN FM APPROVED BARRIER THAT SATISFIES THE FOLLOWING CONDITIONS.
APPROVED WITH INTRINSICALLY SAFE CONNECTIONS FOR CLASS I, DIVISION 1, GROUPS ABCD; CLASS II AND III, DIVISION 1, GROUPS EFG.
4-20mA OUTPUT TERMINALS 1, 2
PULSE OUTPUT TERMINALS 3, 4
DEFINITIONS:
Ui=MAXIMUM INPUT VOLTAGE
Ii=MAXIMUM INPUT CURRENT
Ci=MAXIMUM INTERNAL CAPACITANCE
Li=MAXIMUM INTERNAL INDUCTANCE
Pi=MAXIMUM INPUT POWER
Uo=OPEN CIRCUIT VOLTAGE OF THE BARRIER
Io=SHORT CIRCUIT CURRENT OF THE BARRIER
Co=MAXIMUM ALLOWED CAPACITANCE
Lo=MAXIMUM ALLOWED INDUCTANCE
Po=MAXIMUM OUTPUT POWER
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.
SURFACE FINISH UNLESS OTHERWISE SPECIFIED
3RD ANGLE
SIZE C
SCALE --
REV AF
ROSEMOUNT
TITLE
INSTALLATION DRAWING
MODEL 8732EM, 8705-M, 8711-M/L
FM HAZARDOUS LOCATIONS
DR. D. BROKKE 12/13/12
APP'DE. MESSENGER 6/6/13
DRAWING NO. 08732-2062
DO NOT SCALE PRINT
CAD MAINTAINED. (PRO/E)
SHEET 3 OF 5

TABLE 1

8705-M: CLASS I DIVISION 2 MAXIMUM ALLOWABLE PROCESS TEMPERATURE VS. TEMPERATURE CODE AND TRANSMITTER MOUNTING CONFIGURATION

Line Size	Maximum Allowable Process Temperature (°C)	Temperature Code	Transmitter Mounting Configuration
1/2"	60	T5	Integral/Remote
	120	T4	Integral/Remote
	180	T3	Remote
1"	60	T5	Integral/Remote
	120	T4	Integral/Remote
	180	T3	Remote
1.5"	60	T5	Integral/Remote
	105	T4	Integral/Remote
	170	T3	Remote
2"	60	T5	Integral/Remote
	105	T4	Integral/Remote
	170	T3	Remote
2.5"	60	T5	Integral/Remote
	110	T4	Remote
	170	T3	Remote
3"	60	T5	Integral/Remote
	115	T4	Remote
	175	T3	Remote
4"	60	T5	Integral/Remote
	115	T4	Remote
	175	T3	Remote
5"	60	T5	Integral/Remote
	120	T4	Remote
	175	T3	Remote
6"	60	T5	Integral/Remote
	120	T4	Remote
	180	T3	Remote
8-36"	60	T5	Integral/Remote
	120	T4	Remote
	180	T3	Remote**

**LINE SIZE 8" AND GREATER WITH HORIZONTAL FLOW SHOULD BE MOUNTED WITH REMOTE JUNCTION BOX (RJB) DOWN OR TO THE SIDE

TABLE 2

8705-M: EXPLOSION-PROOF AND DUST IGNITION-PROOF MAXIMUM ALLOWABLE PROCESS TEMPERATURE VS. TEMPERATURE CODE AND TRANSMITTER MOUNTING CONFIGURATION

Line Size	Maximum Allowable Process Temperature (°C)	Explosion-Proof Temperature Code	Dust Temperature Code	Transmitter Mounting Configuration
1/2"	60	T6	T5	Integral/Remote
	90	T5	T4	Integral/Remote
	120	T4	T3	Integral/Remote
	180	T3	T2	Remote
1"	60	T6	T5	Integral/Remote
	90	T5	T4	Integral/Remote
	120	T4	T3	Integral/Remote
	180	T3	T2	Remote
1.5"	60	T6	T5	Integral/Remote
	90	T5	T4	Integral/Remote
	105	T4	T3	Integral/Remote
	170	T3	T2	Remote
2"	60	T6	T5	Integral/Remote
	90	T5	T4	Integral/Remote
	105	T4	T3	Integral/Remote
	170	T3	T2	Remote
2.5"	60	T6	T5	Integral/Remote
	90	T5	T4	Integral/Remote
	110	T4	T3	Remote
	170	T3	T2	Remote
3"	60	T6	T5	Integral/Remote
	90	T5	T4	Remote
	115	T4	T3	Remote
	175	T3	T2	Remote
4"	60	T6	T5	Integral/Remote
	90	T5	T4	Remote
	115	T4	T3	Remote
	175	T3	T2	Remote
5"	60	T6	T5	Integral/Remote
	90	T5	T4	Remote
	120	T4	T3	Remote
	175	T3	T2	Remote
6"	60	T6	T5	Integral/Remote
	90	T5	T4	Remote
	120	T4	T3	Remote
	180	T3	T2	Remote
8-36"	60	T6	T5	Integral/Remote
	90	T5	T4	Remote
	120	T4	T3	Remote
	180	T3	T2	Remote**

**LINE SIZES 8" AND GREATER WITH HORIZONTAL FLOW SHOULD BE MOUNTED WITH REMOTE JUNCTION BOX (RJB) DOWN OR TO THE SIDE

DRAWING NO. 08732-2062

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.

-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32
ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 | 3RD ANGLE | SIZE C | SCALE -- | REV AF

EMERSON. Process Management — ROSEMOUNT®

TITLE: INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L FM HAZARDOUS LOCATIONS

DR. D. BROKKE 12/13/12
APP'DE. MESSENGER 6/6/13
DRAWING NO. 08732-2062

DO NOT SCALE PRINT | CAD MAINTAINED. (PRO/E) | PRODUCT CODE | DOC TYPE | SHEET 4 OF 5

TABLE 3

8711-M/L: CLASS I DIVISION 2 MAXIMUM ALLOWABLE PROCESS TEMPERATURE
VS.
TEMPERATURE CODE AND TRANSMITTER MOUNTING CONFIGURATION

Line Size	Maximum Allowable Process Temperature (°C)	Temperature Code	Remote Junction Box Orientation	Transmitter Mounting Configuration
1.5"	60	T5	Any	Integral/Remote
	100	T4	Any	Remote
	160	T3	Down Or To The Side Only	Remote
2"	60	T5	Any	Integral/Remote
	100	T4	Any	Remote
	160	T3	Down Or To The Side Only	Remote
3"	60	T5	Any	Integral/Remote
	110	T4	Any	Remote
	170	T3	Down Or To The Side Only	Remote
4"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	175	T3	Down Or To The Side Only	Remote
6"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	180	T3	Down Or To The Side Only	Remote
8"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	180	T3	Down Or To The Side Only	Remote

TABLE 4

8711-M/L: EXPLOSION-PROOF AND DUST IGNITION-PROOF MAXIMUM ALLOWABLE PROCESS TEMPERATURE
VS.
TEMPERATURE CODE AND TRANSMITTER MOUNTING CONFIGURATION

Line Size	Maximum Allowable Process Temperature (°C)	Explosion-Proof Temperature Code	Dust Temperature Code	Remote Junction Box Orientation	Transmitter Mounting Configuration
1.5"	60	T6	T5	Any	Integral/Remote
	80	T5	T4	Any	Remote
	100	T4	T3	Any	Remote
	160	T3	T2	Down Or To The Side Only	Remote
2"	60	T6	T5	Any	Integral/Remote
	80	T5	T4	Any	Remote
	100	T4	T3	Any	Remote
	160	T3	T2	Down Or To The Side Only	Remote
3"	60	T6	T5	Any	Integral/Remote
	80	T5	T4	Any	Remote
	110	T4	T3	Any	Remote
	170	T3	T2	Down Or To The Side Only	Remote
4"	60	T6	T5	Any	Integral/Remote
	80	T5	T6	Any	Remote
	115	T4	T3	Any	Remote
	175	T3	T2	Down Or To The Side Only	Remote
6"	60	T6	T5	Any	Integral/Remote
	80	T5	T4	Any	Remote
	115	T4	T3	Any	Remote
	180	T3	T2	Down Or To The Side Only	Remote
8"	60	T6	T5	Any	Integral/Remote
	80	T5	T4	Any	Remote
	115	T4	T3	Any	Remote
	180	T3	T2	Down Or To The Side Only	Remote

16. THE ROSEMOUNT CABLING KITS SHOWN INCLUDE A CERTIFICATE OF CONFORMITY (COC) FROM THE MANUFACTURER FOR CAPACITANCE PER FOOT & INDUCTANCE PER FOOT. THESE PARAMETERS ARE ONLY REQUIRED FOR THE ENTITY CONCEPT METHOD OF INSTALLATION.

15. THIS EQUIPMENT IS NOT CAPABLE OF PASSING THE 500V ISOLATION TEST DUE TO INTEGRAL TRANSIENT PROTECTION. THIS MUST BE TAKEN INTO ACCOUNT UPON INSTALLATION.

14. NO REVISION TO THIS DRAWING WITHOUT PRIOR FM APPROVAL.

13. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

12. CONTROL EQUIPMENT CONNECTED TO BARRIER MUST NOT USE OR GENERATE MORE THAN 250V.

10. INSTALLATION SHOULD BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), NFPA-70, AND ANSI/ISA-RP12.06.01. "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS".

9. THE INTRINSICALLY SAFE 4-20mA OUTPUT MUST USE TWISTED PAIR WITH AN INDIVIDUAL SHIELD FOR THE PAIR. IT IS ALSO RECOMMENDED TO USE SHIELDED TWISTED PAIR FOR PULSE OUTPUT.

8. DI/DO TERMINALS 5,6,7,8 ARE NOT POPULATED. THE DI/DO OPTION (AX) IS NOT AVAILABLE WITH THE INTRINSICALLY SAFE 4-20mA AND PULSE OPTION.

7. THE ELECTRODE CIRCUIT AND WIRING MUST BE INSTALLED AS INTRINSICALLY SAFE WHEN THE FLOWTUBE IS INSTALLED IN A CLASS I DIV I AREA WITH THE 'K5' OPTION, OR WHEN THE 'K5' OR 'N5' IS USED WITH FLAMMABLE PROCESS FLUIDS.

4. CONDUIT SEAL APPROVED FOR USE IN APPROPRIATE CLASS AND DIVISION.

3. COMPONENTS REQUIRED TO HAVE HAZARDOUS LOCATION APPROVAL MUST BE APPROVED FOR THE GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.

2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250V.

1. WIRING METHOD SUITABLE FOR APPROPRIATE CLASS AND DIVISION.

NOTES:

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UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.

-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32
ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125
3RD ANGLE
SIZE C
SCALE --
REV AF

EMERSON. Process Management
ROSEMOUNT®

TITLE
INSTALLATION DRAWING
MODEL 8732EM, 8705-M, 8711-M/L
FM HAZARDOUS LOCATIONS

DR. D. BROKKE 12/13/12
APP'DE. MESSENGER 6/6/13
DRAWING NO. 08732-2062
DO NOT SCALE PRINT | CAD MAINTAINED. (PRO/E) | PRODUCT CODE | DOC TYPE | SHEET 5 OF 5

FORM REV AB

B.3 ATEX/IECEx hazardous locations

REVISION	ECO NO.	APP'D	DATE
AA	RTC1061605	MJM	12/11/14
DESCRIPTION			
INITIAL RELEASE			

HAZARDOUS (Ex) LOCATION CONTROL AND INSTALLATION DRAWING
MODEL 8732EM MAGNETIC FLOWTUBE TRANSMITTER
MODEL 8705-M AND 8711-M/L MAGNETIC FLOWTUBES

TABLE OF CONTENTS

PAGE	SAFETY APPROVAL OPTION	DESCRIPTION/PROTECTION TYPE
2	K1/K7	TRANSMITTER: Ex de [ia] FLAMEPROOF/INCREASED SAFETY WITH INTRINSICALLY SAFE ELECTRODE OUTPUT FLOWTUBE: Ex e ia OR Ex e ib INCREASED SAFETY WTIH INTRINSICALLY SAFE ELECTRODES
3	K1/K7	TABLE 1: MODEL 8705-M ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE TABLE 2: MODEL 8711-M/L ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE
4	N1/N7	TRANSMITTER: Ex nA [ia] TYPE 'n' WITH INTRINSICALLY SAFE ELECTRODE OUTPUT FLOWTUBE: Ex nA ia OR Ex nA ic TYPE 'n' WITH INTRINSICALLY SAFE ELECTRODES
5	N1/N7	TABLE 3: MODEL 8705-M ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE TABLE 4: MODEL 8711-M/L ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE
6	ND/NF	TRANSMITTER: Ex tb IIIC DUST-IGNITION PROOF HOUSING FLOWTUBE: Ex tb IIIC DUST-IGNITION PROOF HOUSING
7	ND/NF	TABLE 5: MODEL 8705-M ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE TABLE 6: MODEL 8711-M/L ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE
8	K1/K7/N1/N7	INTRINSICALLY SAFE ELECTRODE INSTALLATION
9	OUTPUT CODE 'B'	INTRINSICALLY SAFE 4-20mA / PULSE OUTPUT INSTALLATION

1. WIRING METHOD SUITABLE FOR APPROPRIATE ZONE AND PROTECTION TYPE.
2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250V.
3. COMPONENTS REQUIRED TO HAVE HAZARDOUS (Ex) LOCATION APPROVAL MUST BE APPROVED FOR THE GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.
4. SEAL APPROVED FOR USE IN APPROPRIATE ZONE AND GAS GROUP.
5. THE ELECTRODE CIRCUIT AND WIRING MUST BE INSTALLED AS INTRINSICALLY SAFE WHEN THE FLOWTUBE IS INSTALLED IN A HAZARDOUS (Ex) AREA WITH MINIMUM EXPLOSION PROTECTION LEVEL (EPL) OF Gb (Ex ib) WHEN USED WITH THE K1 OR K7 OPTION, AND AN EPL OF Gc WITH THE N1 OR N7 OPTION. FLAMMABLE PROCESS FLUID MAY REQUIRE AN EPL OF Ga (Ex ia) FOR THE ELECTRODE CIRCUIT: SEE PAGES 2,4 FOR HOUSING OPTIONS ON THE 8705-M THAT COMPLY WITH THE EPL Ga PROCESS SEALING REQUIREMENTS.
6. THE INTRINSICALLY SAFE 4-20mA OUTPUT MUST USE TWISTED PAIR WITH AN INDIVIDUAL SHIELD FOR THE PAIR. IT IS ALSO RECOMMENDED TO USE SHIELDED TWISTED PAIR FOR THE PULSE OUTPUT.
7. INSTALLATION SHOULD BE IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODE, EN 60079-14 OR IEC 60079-14 "ELECTRICAL INSTALLATIONS DESIGN, SELECTION, AND ERECTION".
8. CONTROL EQUIPMENT CONNECTED TO BARRIER MUST NOT USE OR GENERATE MORE THAN 250V.
9. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
10. THE TRANSMITTER IS NOT CAPABLE OF PASSING THE 500V ISOLATION TEST ON TERMINALS 1-10 DUE TO INTEGRAL TRANSIENT PROTECTION. THIS MUST BE TAKEN INTO ACCOUNT UPON INSTALLATION.
11. THE ROSEMOUNT CABLING KITS, FOR INTRINSICALLY SAFE ELECTRODES, INCLUDE A CERTIFICATE OF CONFORMITY (COC) FROM THE MANUFACTURER FOR CAPACITANCE PER FOOT & INDUCTANCE PER FOOT. THESE PARAMETERS ARE ONLY REQUIRED FOR THE ENTITY CONCEPT METHOD OF INSTALLATION.
12. FOR ALL INSTALLATIONS MAXIMUM TERMINAL TIGHTENING TORQUE IS 10.6 IN LBS.

DRAWING NO. 08732-2060

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-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 | 3RD ANGLE | SIZE C | SCALE - | REV AA

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TITLE INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L ATEX/IECEx HAZARDOUS (Ex) LOCATIONS

DR. N. BOND 2/18/14 | DRAWING NO. 08732-2060
APP'DE. MESSENGER 6/13/14
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FORM REV AB

MODEL CODE BREAKDOWN (3)

8732EMxxxx K1 / K7 — **8732EM**
- SAFETY APPROVALS OPTION
- TRANSMITTER CLASS

8705xxxxxxxxxxMx K1 / K7 — **8705-M**
- SAFETY APPROVALS OPTION
- HOUSING CODE M0, M1, M2, M3, M4

8711xxxxxxxM/L K1 / K7 — **8711-M/L**
- SAFETY APPROVALS OPTION
- MOUNTING CODE INTEGRAL OR REMOTE

HAZARDOUS (Ex) LOCATION CONFIGURATION
MODEL 8705-M, 8711-M/L AND 8732EM

⚠ MODEL 8705-M AND 8711-M/L FLOWTUBES WITH SAFETY APPROVALS OPTIONS K1, K7 MUST HAVE THE ELECTRODE CIRCUIT INSTALLED AS INTRINSICALLY SAFE USING ONLY APPROVED TRANSMITTERS. SEE APPROVED TRANSMITTER CONFIGURATIONS BELOW. SEE PAGE 8 FOR APPROVED WIRING METHODS FOR REMOTE MOUNT CONFIGURATIONS.

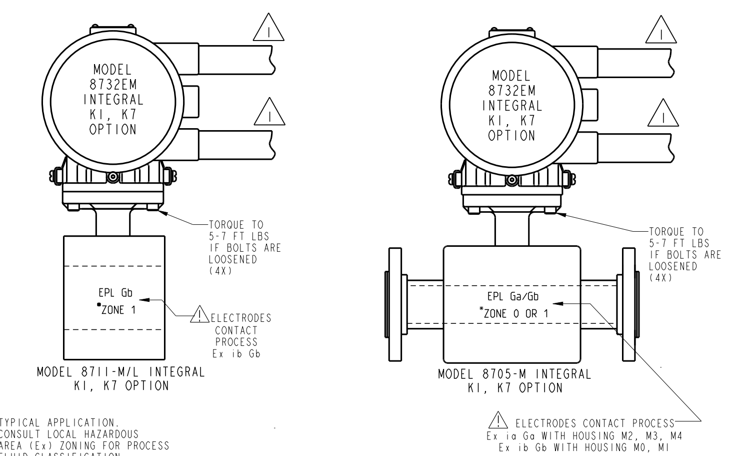
⚠ WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR HAZARDOUS LOCATION (Ex) SAFETY.

MODEL 8732EM WITH SAFETY APPROVALS OPTION 'K1' OR K7':
Ex de [ia Ga] IIC T6...T3 Gb - FLAMEPROOF ELECTRONICS HOUSING, INCREASED SAFETY TERMINAL BLOCK WITH INTRINSICALLY SAFE ELECTRODE OUTPUT, INCREASED SAFETY REMOTE JUNCTION BOX
(SEE PAGE 8 FOR ELECTRODE INSTALLATION)
(-50°C ≤ Ta ≤ 60°C)

MODEL 8705-M WITH SAFETY APPROVALS 'K1' OR 'K7':
INCREASED SAFETY WITH INTRINSICALLY SAFE ELECTRODES
Ex e ia IIC T5...T3 Ga/Gb (WITH HOUSING CODE M2, M3, M4)
Ex e ib IIC T5...T3 Gb (WITH HOUSING CODE M0, M1)
SEE TABLE 1 FOR PROCESS TEMPERATURE LIMITS AND ALLOWED MOUNTING CONFIGURATIONS
WITH CARBON STEEL HOUSING: (-29°C ≤ Ta ≤ 60°C)
WITH STAINLESS STEEL HOUSING: (-50°C ≤ Ta ≤ 60°C)
DUAL SEAL PER ANSI/ISA 12.27.01 WITH HOUSING CODE M2, M3, M4

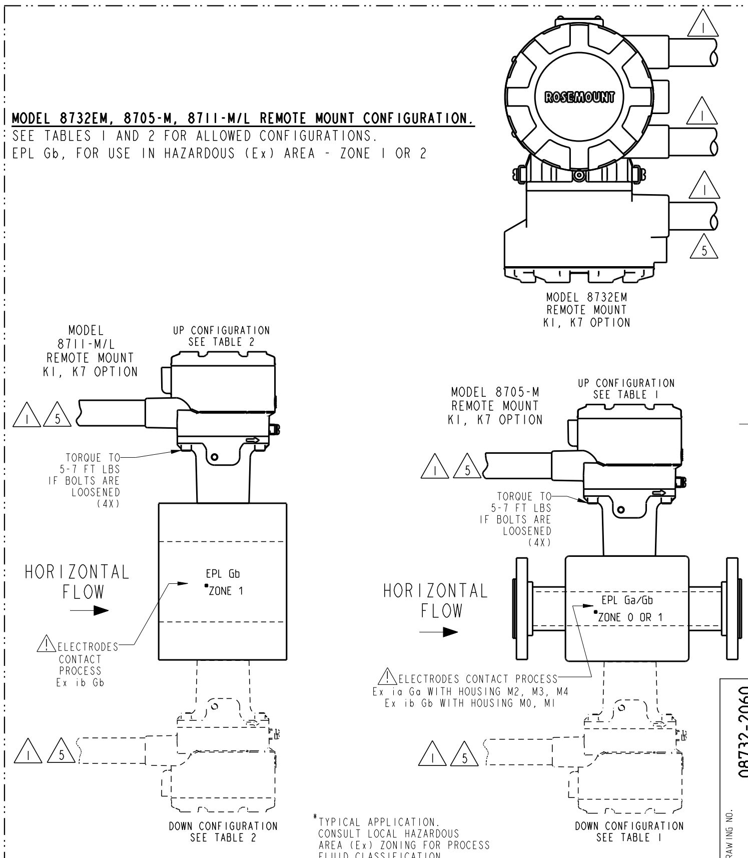
MODEL 8711-M/L WITH SAFETY APPROVALS 'K1' OR 'K7':
INCREASED SAFETY WITH INTRINSICALLY SAFE ELECTRODES
Ex e ib IIC T5...T3 Gb. SEE TABLE 2 FOR PROCESS TEMPERATURE LIMITS AND ALLOWED MOUNTING CONFIGURATIONS
WITH CARBON STEEL HOUSING: (-29°C ≤ Ta ≤ 60°C)
WITH STAINLESS STEEL HOUSING: (-50°C ≤ Ta ≤ 60°C)

MODEL 8732EM, 8705-M, 8711-M/L INTEGRAL MOUNT CONFIGURATION.
SEE TABLES 1 AND 2 FOR ALLOWED CONFIGURATIONS.
EPL Gb, FOR USE IN HAZARDOUS (Ex) AREA - ZONE 1 OR 2



*TYPICAL APPLICATION. CONSULT LOCAL HAZARDOUS AREA (Ex) ZONING FOR PROCESS FLUID CLASSIFICATION.

MODEL 8732EM, 8705-M, 8711-M/L REMOTE MOUNT CONFIGURATION.
SEE TABLES 1 AND 2 FOR ALLOWED CONFIGURATIONS.
EPL Gb, FOR USE IN HAZARDOUS (Ex) AREA - ZONE 1 OR 2



*TYPICAL APPLICATION. CONSULT LOCAL HAZARDOUS AREA (Ex) ZONING FOR PROCESS FLUID CLASSIFICATION.

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UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.
-DEC TOLERANCES- .X ± .1 [2.5] .XX ± .02 [0.5] .XXX ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°
SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 | 3RD ANGLE | SIZE C | SCALE - | REV AA
EMERSON Process Management ROSEMOUNT®
TITLE: INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L ATEX/IECEx HAZARDOUS (Ex) LOCATIONS
DR. N. BOND 2/18/14 | APP'DE. MESSENGER 6/13/14 | DRAWING NO. 08732-2060
DO NOT SCALE PRINT | CAD MAINTAINED. (PRO/E) | PRODUCT CODE | DOC TYPE | SHEET 2 OF 9
DRAWING NO. 08732-2060

TABLE 1 - 8705-M: Ex e - PROTECTION TYPE 'INCREASED SAFETY' OPTIONS 'K1' AND 'K7' - ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE

Line Size	Maximum Process Temperature (°C)	Temperature Code	Transmitter Mounting
0.5"	60	T5	Integral/Remote
	120	T4	Integral/Remote
	150	T3	Remote
1"	60	T5	Integral/Remote
	120	T4	Integral/Remote
	150	T3	Remote
1.5"	60	T5	Integral/Remote
	105	T4	Integral/Remote
	140	T3	Remote
2"	60	T5	Integral/Remote
	105	T4	Integral/Remote
	140	T3	Remote
2.5"	60	T4	Integral/Remote
	110	T4	Remote
	150	T3	Remote
3"	60	T5	Integral/Remote
	115	T4	Remote
	150	T3	Remote
4"	60	T5	Integral/Remote
	115	T4	Remote
	155	T3	Remote
5"	60	T5	Integral/Remote
	120	T4	Remote
	155	T3	Remote
6"	60	T5	Integral/Remote
	120	T4	Remote
	155	T3	Remote
8-36"	60	T5	Integral/Remote
	120	T4	Remote
	155	T3	Remote**

**LINE SIZES 8" AND GREATER SHOULD BE MOUNTED WITH REMOTE JUNCTION BOX (RJB) DOWN OR TO THE SIDE

TABLE 2 - 8711-M/L: Ex e - PROTECTION TYPE 'INCREASED SAFETY' - OPTIONS 'K1 AND 'K7' ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE

Line Size	Maximum Process Temperature (°C)	Temperature Code	Junction Box Orientation	Transmitter Mounting
1.5"	60	T5	Any	Integral/Remote
	100	T4	Any	Remote
	140	T3	Down	Remote
2"	60	T5	Any	Integral/Remote
	100	T4	Any	Remote
	140	T3	Down	Remote
3"	60	T4	Any	Integral/Remote
	110	T4	Any	Remote
	150	T3	Down	Remote
4"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	155	T3	Down	Remote
6"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	155	T3	Down	Remote
8"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	160	T3	Down	Remote

DRAWING NO. 08732-2060

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-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 | 3RD ANGLE | SIZE C | SCALE - | REV AA

EMERSON. Process Management ROSEMOUNT®

TITLE INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L ATEX/IECEx HAZARDOUS (Ex) LOCATIONS

DR. N. BOND 2/18/14 | APP'DE. MESSENGER 6/13/14 | DRAWING NO. 08732-2060

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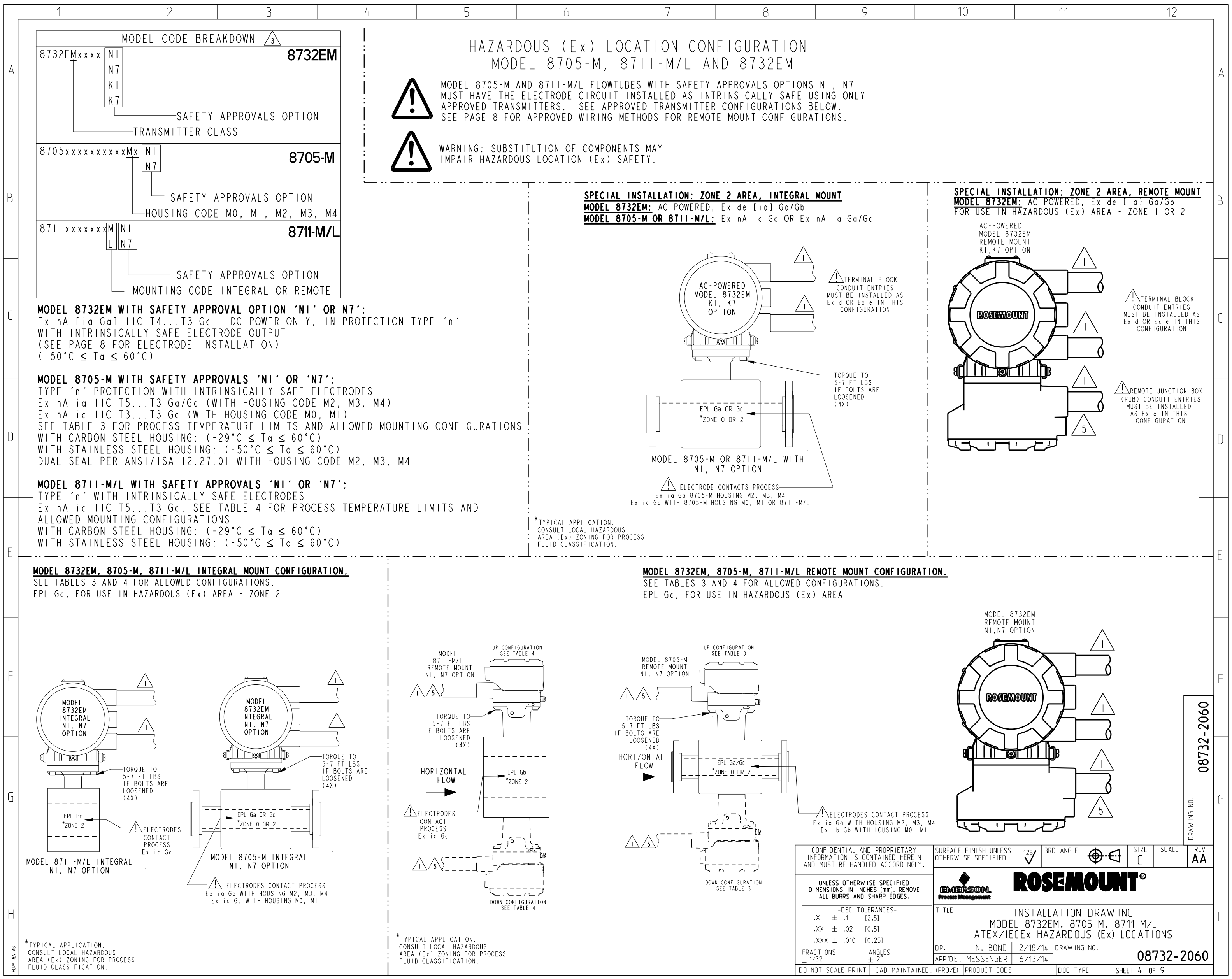
MODEL CODE BREAKDOWN 3
8732EMxxxx NI N7 K1 K7
8732EM
SAFETY APPROVALS OPTION
TRANSMITTER CLASS
8705xxxxxxxxxxMx NI N7
8705-M
SAFETY APPROVALS OPTION
HOUSING CODE M0, M1, M2, M3, M4
8711xxxxxxxM L NI N7
8711-M/L
SAFETY APPROVALS OPTION
MOUNTING CODE INTEGRAL OR REMOTE
HAZARDOUS (Ex) LOCATION CONFIGURATION
MODEL 8705-M, 8711-M/L AND 8732EM
MODEL 8705-M AND 8711-M/L FLOWTUBES WITH SAFETY APPROVALS OPTIONS N1, N7 MUST HAVE THE ELECTRODE CIRCUIT INSTALLED AS INTRINSICALLY SAFE USING ONLY APPROVED TRANSMITTERS. SEE APPROVED TRANSMITTER CONFIGURATIONS BELOW. SEE PAGE 8 FOR APPROVED WIRING METHODS FOR REMOTE MOUNT CONFIGURATIONS.
WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR HAZARDOUS LOCATION (Ex) SAFETY.
MODEL 8732EM WITH SAFETY APPROVAL OPTION 'N1' OR N7':
Ex nA [ia Ga] IIC T4...T3 Gc - DC POWER ONLY, IN PROTECTION TYPE 'n'
WITH INTRINSICALLY SAFE ELECTRODE OUTPUT
(SEE PAGE 8 FOR ELECTRODE INSTALLATION)
(-50°C ≤ Ta ≤ 60°C)
MODEL 8705-M WITH SAFETY APPROVALS 'N1' OR 'N7':
TYPE 'n' PROTECTION WITH INTRINSICALLY SAFE ELECTRODES
Ex nA ia IIC T5...T3 Ga/Gc (WITH HOUSING CODE M2, M3, M4)
Ex nA ic IIC T3...T3 Gc (WITH HOUSING CODE M0, M1)
SEE TABLE 3 FOR PROCESS TEMPERATURE LIMITS AND ALLOWED MOUNTING CONFIGURATIONS
WITH CARBON STEEL HOUSING: (-29°C ≤ Ta ≤ 60°C)
WITH STAINLESS STEEL HOUSING: (-50°C ≤ Ta ≤ 60°C)
DUAL SEAL PER ANSI/ISA 12.27.01 WITH HOUSING CODE M2, M3, M4
MODEL 8711-M/L WITH SAFETY APPROVALS 'N1' OR 'N7':
TYPE 'n' WITH INTRINSICALLY SAFE ELECTRODES
Ex nA ic IIC T5...T3 Gc. SEE TABLE 4 FOR PROCESS TEMPERATURE LIMITS AND ALLOWED MOUNTING CONFIGURATIONS
WITH CARBON STEEL HOUSING: (-29°C ≤ Ta ≤ 60°C)
WITH STAINLESS STEEL HOUSING: (-50°C ≤ Ta ≤ 60°C)
SPECIAL INSTALLATION: ZONE 2 AREA, INTEGRAL MOUNT
MODEL 8732EM: AC POWERED, Ex de [ia] Ga/Gb
MODEL 8705-M OR 8711-M/L: Ex nA ic Gc OR Ex nA ia Ga/Gc
AC-POWERED MODEL 8732EM K1, K7 OPTION
TERMINAL BLOCK CONDUIT ENTRIES MUST BE INSTALLED AS Ex d OR Ex e IN THIS CONFIGURATION
TORQUE TO 5-7 FT LBS IF BOLTS ARE LOOSENED (4X)
EPL Ga OR Gc *ZONE 0 OR 2
MODEL 8705-M OR 8711-M/L WITH N1, N7 OPTION
ELECTRODE CONTACTS PROCESS
Ex ia Ga 8705-M HOUSING M2, M3, M4
Ex ic Gc WITH 8705-M HOUSING M0, M1 OR 8711-M/L
*TYPICAL APPLICATION. CONSULT LOCAL HAZARDOUS AREA (Ex) ZONING FOR PROCESS FLUID CLASSIFICATION.
SPECIAL INSTALLATION: ZONE 2 AREA, REMOTE MOUNT
MODEL 8732EM: AC POWERED, Ex de [ia] Ga/Gb
FOR USE IN HAZARDOUS (Ex) AREA - ZONE 1 OR 2
AC-POWERED MODEL 8732EM REMOTE MOUNT K1,K7 OPTION
TERMINAL BLOCK CONDUIT ENTRIES MUST BE INSTALLED AS Ex d OR Ex e IN THIS CONFIGURATION
REMOTE JUNCTION BOX (RJB) CONDUIT ENTRIES MUST BE INSTALLED AS Ex e IN THIS CONFIGURATION
MODEL 8732EM, 8705-M, 8711-M/L INTEGRAL MOUNT CONFIGURATION.
SEE TABLES 3 AND 4 FOR ALLOWED CONFIGURATIONS.
EPL Gc, FOR USE IN HAZARDOUS (Ex) AREA - ZONE 2
MODEL 8732EM INTEGRAL N1, N7 OPTION
TORQUE TO 5-7 FT LBS IF BOLTS ARE LOOSENED (4X)
EPL Gc *ZONE 2
ELECTRODES CONTACT PROCESS Ex ic Gc
MODEL 8711-M/L INTEGRAL N1, N7 OPTION
EPL Ga OR Gc *ZONE 0 OR 2
MODEL 8705-M INTEGRAL N1, N7 OPTION
ELECTRODES CONTACT PROCESS
Ex ia Ga WITH HOUSING M2, M3, M4
Ex ic Gc WITH HOUSING M0, M1
*TYPICAL APPLICATION. CONSULT LOCAL HAZARDOUS AREA (Ex) ZONING FOR PROCESS FLUID CLASSIFICATION.
MODEL 8732EM, 8705-M, 8711-M/L REMOTE MOUNT CONFIGURATION.
SEE TABLES 3 AND 4 FOR ALLOWED CONFIGURATIONS.
EPL Gc, FOR USE IN HAZARDOUS (Ex) AREA
MODEL 8711-M/L REMOTE MOUNT N1, N7 OPTION
UP CONFIGURATION SEE TABLE 4
HORIZONTAL FLOW
EPL Gb *ZONE 2
ELECTRODES CONTACT PROCESS Ex ic Gc
DOWN CONFIGURATION SEE TABLE 4
MODEL 8705-M REMOTE MOUNT N1, N7 OPTION
UP CONFIGURATION SEE TABLE 3
EPL Ga/Gc *ZONE 0 OR 2
DOWN CONFIGURATION SEE TABLE 3
ELECTRODES CONTACT PROCESS
Ex ia Ga WITH HOUSING M2, M3, M4
Ex ib Gb WITH HOUSING M0, M1
MODEL 8732EM REMOTE MOUNT N1,N7 OPTION
ROSEMOUNT
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SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125
3RD ANGLE
SIZE C
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EMERSON. Process Management
TITLE
INSTALLATION DRAWING
MODEL 8732EM, 8705-M, 8711-M/L
ATEX/IECEx HAZARDOUS (Ex) LOCATIONS
DR. N. BOND 2/18/14
APP'DE. MESSENGER 6/13/14
DRAWING NO. 08732-2060
DO NOT SCALE PRINT
CAD MAINTAINED. (PRO/E)
PRODUCT CODE
DOC TYPE
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FORM REV AB

TABLE 3 - 8705-M: Ex nA - PROTECTION TYPE 'n' - OPTIONS 'N1' AND 'N7'
ALLOWED TRANSMITTER MOUNTING AND
TEMPERATURE CODE VS. PROCESS TEMPERATURE

Line Size	Maximum Process Temperature (°C)	Temperature Code	Transmitter Mounting
0.5"	60	T5	Integral/Remote
	120	T4	Integral/Remote
	180	T3	Remote
1"	60	T5	Integral/Remote
	120	T4	Integral/Remote
	180	T3	Remote
1.5"	60	T5	Integral/Remote
	105	T4	Integral/Remote
	170	T3	Remote
2"	60	T5	Integral/Remote
	105	T4	Integral/Remote
	170	T3	Remote
2.5"	60	T5	Integral/Remote
	110	T4	Remote
	170	T3	Remote
3"	60	T5	Integral/Remote
	115	T4	Remote
	175	T3	Remote
4"	60	T5	Integral/Remote
	115	T4	Remote
	175	T3	Remote
5"	60	T5	Integral/Remote
	120	T4	Remote
	175	T3	Remote
6"	60	T5	Integral/Remote
	120	T4	Remote
	180	T3	Remote
8-36"	60	T5	Integral/Remote
	120	T4	Remote
	180	T3	Remote**

**LINE SIZES 8" AND GREATER SHOULD BE MOUNTED WITH REMOTE JUNCTION BOX (RJB) DOWN OR TO THE SIDE

TABLE 4 - 8711-M/L: Ex nA - PROTECTION TYPE 'n' - OPTIONS 'N1' AND 'N7'
ALLOWED TRANSMITTER MOUNTING AND
TEMPERATURE CODE VS. PROCESS TEMPERATURE

Line Size	Maximum Process Temperature (°C)	Temperature Code	Junction Box Orientation	Transmitter Mounting
1.5"	60	T5	Any	Integral/Remote
	100	T4	Any	Remote
	160	T3	Down	Remote
2"	60	T5	Any	Integral/Remote
	100	T4	Any	Remote
	160	T3	Down	Remote
3"	60	T5	Any	Integral/Remote
	110	T4	Any	Remote
	170	T3	Down	Remote
4"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	175	T3	Down	Remote
6"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	180	T3	Down	Remote
8"	60	T5	Any	Integral/Remote
	115	T4	Any	Remote
	180	T3	Down	Remote

DRAWING NO. 08732-2060

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.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125
3RD ANGLE | SIZE C | SCALE - | REV AA

EMERSON. Process Management | ROSEMOUNT®

TITLE
INSTALLATION DRAWING
MODEL 8732EM, 8705-M, 8711-M/L
ATEX/IECEx HAZARDOUS (Ex) LOCATIONS

DR. N. BOND 2/18/14 | DRAWING NO. 08732-2060
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DO NOT SCALE PRINT | CAD MAINTAINED. (PRO/E) | PRODUCT CODE | DOC TYPE | SHEET 5 OF 9

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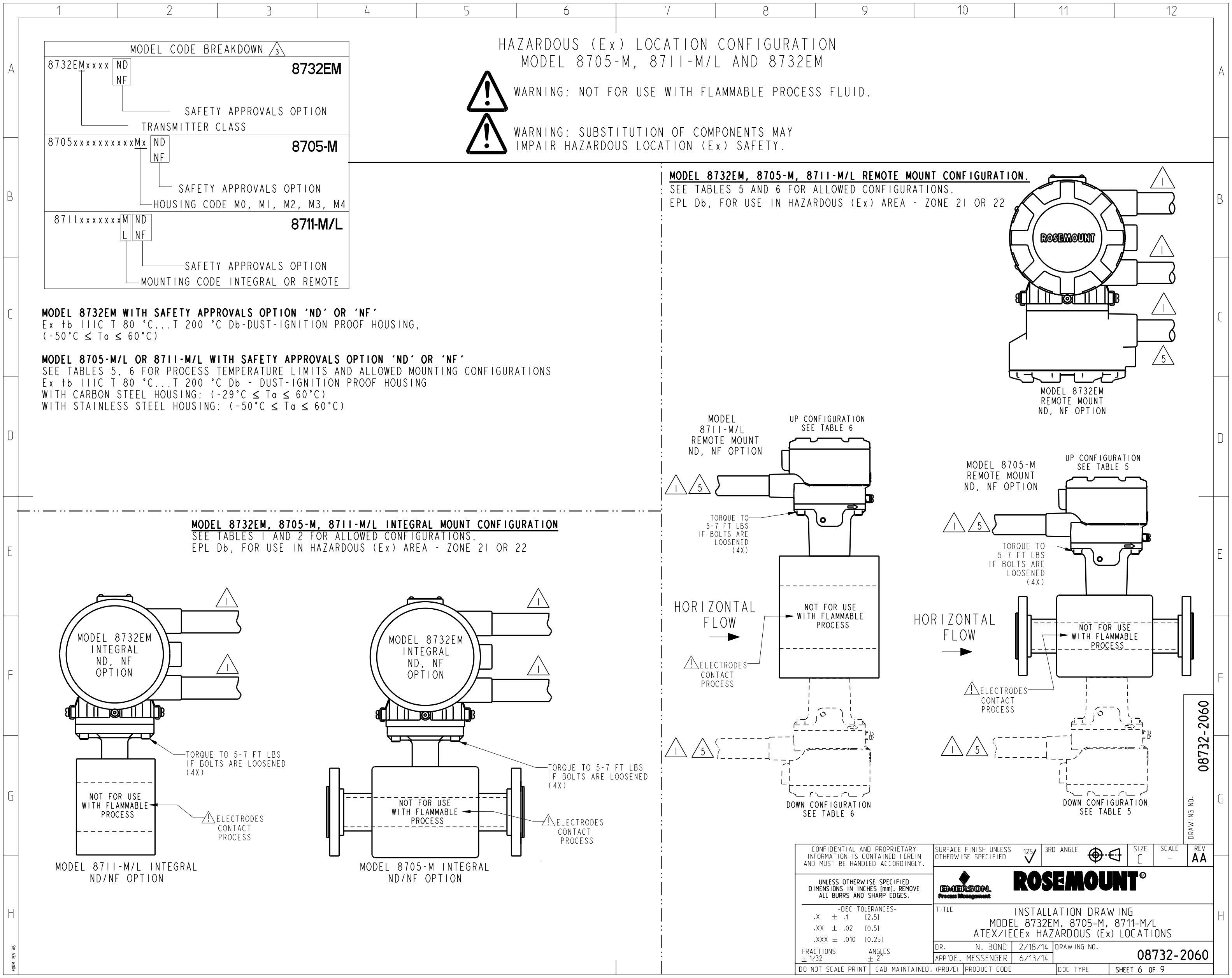
MODEL CODE BREAKDOWN 3
8732EMxxxx ND NF 8732EM
SAFETY APPROVALS OPTION
TRANSMITTER CLASS
8705xxxxxxxxxxMx ND NF 8705-M
SAFETY APPROVALS OPTION
HOUSING CODE M0, M1, M2, M3, M4
8711xxxxxxM L ND NF 8711-M/L
SAFETY APPROVALS OPTION
MOUNTING CODE INTEGRAL OR REMOTE
HAZARDOUS (Ex) LOCATION CONFIGURATION
MODEL 8705-M, 8711-M/L AND 8732EM
WARNING: NOT FOR USE WITH FLAMMABLE PROCESS FLUID.
WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR HAZARDOUS LOCATION (Ex) SAFETY.
MODEL 8732EM WITH SAFETY APPROVALS OPTION 'ND' OR 'NF'
Ex tb IIIC T 80 °C...T 200 °C Db-DUST-IGNITION PROOF HOUSING,
(-50°C ≤ Ta ≤ 60°C)
MODEL 8705-M/L OR 8711-M/L WITH SAFETY APPROVALS OPTION 'ND' OR 'NF'
SEE TABLES 5, 6 FOR PROCESS TEMPERATURE LIMITS AND ALLOWED MOUNTING CONFIGURATIONS
Ex tb IIIC T 80 °C...T 200 °C Db - DUST-IGNITION PROOF HOUSING
WITH CARBON STEEL HOUSING: (-29°C ≤ Ta ≤ 60°C)
WITH STAINLESS STEEL HOUSING: (-50°C ≤ Ta ≤ 60°C)
MODEL 8732EM, 8705-M, 8711-M/L REMOTE MOUNT CONFIGURATION.
SEE TABLES 5 AND 6 FOR ALLOWED CONFIGURATIONS.
EPL Db, FOR USE IN HAZARDOUS (Ex) AREA - ZONE 21 OR 22
ROSEMOUNT
MODEL 8732EM REMOTE MOUNT ND, NF OPTION
MODEL 8711-M/L REMOTE MOUNT ND, NF OPTION
UP CONFIGURATION SEE TABLE 6
TORQUE TO 5-7 FT LBS IF BOLTS ARE LOOSENED (4X)
HORIZONTAL FLOW
NOT FOR USE WITH FLAMMABLE PROCESS
ELECTRODES CONTACT PROCESS
DOWN CONFIGURATION SEE TABLE 6
MODEL 8705-M REMOTE MOUNT ND, NF OPTION
UP CONFIGURATION SEE TABLE 5
TORQUE TO 5-7 FT LBS IF BOLTS ARE LOOSENED (4X)
HORIZONTAL FLOW
NOT FOR USE WITH FLAMMABLE PROCESS
ELECTRODES CONTACT PROCESS
DOWN CONFIGURATION SEE TABLE 5
MODEL 8732EM, 8705-M, 8711-M/L INTEGRAL MOUNT CONFIGURATION
SEE TABLES 1 AND 2 FOR ALLOWED CONFIGURATIONS.
EPL Db, FOR USE IN HAZARDOUS (Ex) AREA - ZONE 21 OR 22
MODEL 8732EM INTEGRAL ND, NF OPTION
TORQUE TO 5-7 FT LBS IF BOLTS ARE LOOSENED (4X)
NOT FOR USE WITH FLAMMABLE PROCESS
ELECTRODES CONTACT PROCESS
MODEL 8711-M/L INTEGRAL ND/NF OPTION
MODEL 8732EM INTEGRAL ND, NF OPTION
TORQUE TO 5-7 FT LBS IF BOLTS ARE LOOSENED (4X)
NOT FOR USE WITH FLAMMABLE PROCESS
ELECTRODES CONTACT PROCESS
MODEL 8705-M INTEGRAL ND/NF OPTION
DRAWING NO. 08732-2060
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.
-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32
ANGLES ± 2°
SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125
3RD ANGLE
SIZE C
SCALE -
REV AA
EMERSON. Process Management
ROSEMOUNT®
TITLE
INSTALLATION DRAWING
MODEL 8732EM, 8705-M, 8711-M/L
ATEX/IECEx HAZARDOUS (Ex) LOCATIONS
DR. N. BOND 2/18/14
APP'DE. MESSENGER 6/13/14
DRAWING NO. 08732-2060
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PRODUCT CODE
DOC TYPE
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TABLE 5 - 8705-M: Ex tb - DUST IGNITION PROOF HOUSING - OPTIONS 'ND' AND 'NF' - ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE

Line Size	Maximum Process Temperature (°C)	Dust Temperature Code	Transmitter Mounting
0.5"	60	T 80°C	Integral/Remote
	90	T 110°C	Integral/Remote
	120	T 140°C	Integral/Remote
	180	T 200°C	Remote
1"	60	T 80°C	Integral/Remote
	90	T 110°C	Integral/Remote
	120	T 140°C	Integral/Remote
	180	T 200°C	Remote
1.5"	60	T 80°C	Integral/Remote
	90	T 110°C	Integral/Remote
	105	T 125°C	Integral/Remote
	170	T 190°C	Remote
2"	60	T 80°C	Integral/Remote
	90	T 110°C	Integral/Remote
	105	T 125°C	Integral/Remote
	170	T 190°C	Remote
2.5"	60	T 80°C	Integral/Remote
	90	T 110°C	Integral/Remote
	110	T 130°C	Remote
	170	T 190°C	Remote
3"	60	T 80°C	Integral/Remote
	90	T 110°C	Remote
	115	T 135°C	Remote
	175	T 195°C	Remote
4"	60	T 80°C	Integral/Remote
	90	T 110°C	Remote
	115	T 135°C	Remote
	175	T 195°C	Remote
5"	60	T 80°C	Integral/Remote
	90	T 110°C	Remote
	120	T 140°C	Remote
	175	T 195°C	Remote
6"	60	T 80°C	Integral/Remote
	90	T 110°C	Remote
	120	T 140°C	Remote
	180	T 200°C	Remote
8-36"	60	T 80°C	Integral/Remote
	90	T 110°C	Remote
	120	T 140°C	Remote
	180	T 200°C	Remote**

**LINE SIZES 8" AND GREATER SHOULD BE MOUNTED WITH REMOTE JUNCTION BOX (RJB) DOWN OR TO THE SIDE

TABLE 6 - 8711-M/L: Ex tb - DUST IGNITION PROOF HOUSING - OPTIONS 'ND' AND 'NF' ALLOWED TRANSMITTER MOUNTING AND TEMPERATURE CODE VS. PROCESS TEMPERATURE

Line Size	Maximum Process Temperature (°C)	Dust Temperature Code	Junction Box Orientation	Transmitter Mounting
1.5"	60	T 80°C	Any	Integral/Remote
	80	T 100°C	Any	Remote
	100	T 120°C	Any	Remote
	160	T 180°C	Down Only	Remote
2"	60	T 80°C	Any	Integral/Remote
	80	T 100°C	Any	Remote
	100	T 120°C	Any	Remote
	160	T 180°C	Down Only	Remote
3"	60	T 80°C	Any	Integral/Remote
	80	T 100°C	Any	Remote
	110	T 130°C	Any	Remote
	170	T 190°C	Down Only	Remote
4"	60	T 80°C	Any	Integral/Remote
	80	T 100°C	Any	Remote
	115	T 135°C	Any	Remote
	175	T 195°C	Down Only	Remote
6"	60	T 80°C	Any	Integral/Remote
	80	T 100°C	Any	Remote
	115	T 135°C	Any	Remote
	180	T 200°C	Down Only	Remote
8"	60	T 80°C	Any	Integral/Remote
	80	T 100°C	Any	Remote
	115	T 135°C	Any	Remote
	180	T 200°C	Down Only	Remote

DRAWING NO. 08732-2060

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UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.

-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 | 3RD ANGLE | SIZE C | SCALE - | REV AA

EMERSON. Process Management ROSEMOUNT®

TITLE INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L ATEX/IECEx HAZARDOUS (Ex) LOCATIONS

DR. N. BOND 2/18/14 | APP'DE. MESSENGER 6/13/14 | DRAWING NO. 08732-2060

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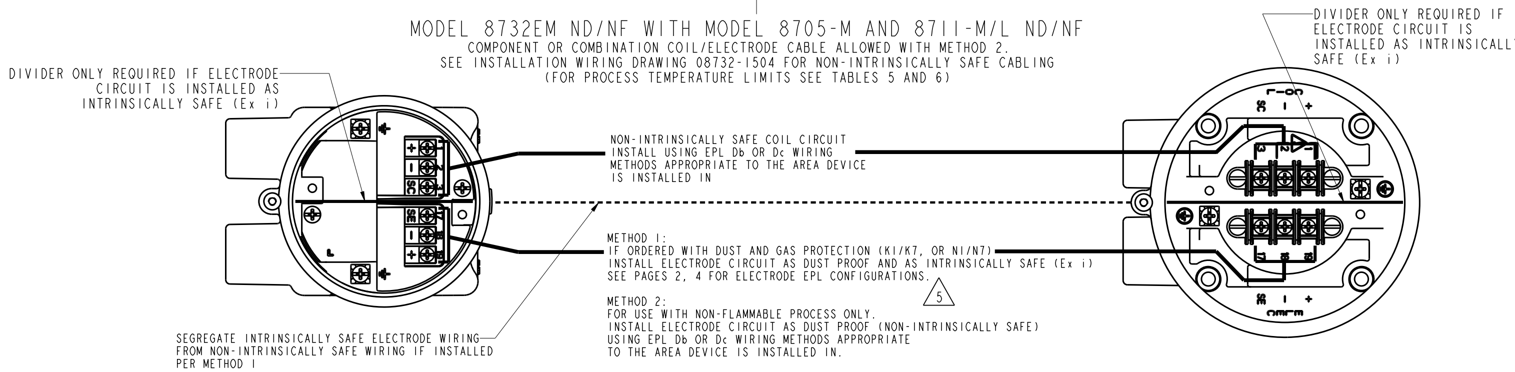
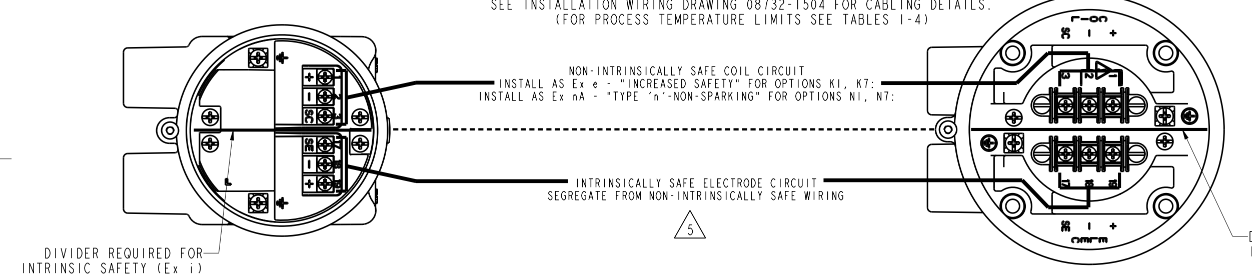
MODEL 8732EM ND/NF WITH MODEL 8705-M AND 8711-M/L ND/NF

COMPONENT OR COMBINATION COIL/ELECTRODE CABLE ALLOWED WITH METHOD 2.
SEE INSTALLATION WIRING DRAWING 08732-1504 FOR NON-INTRINSICALLY SAFE CABLING
(FOR PROCESS TEMPERATURE LIMITS SEE TABLES 5 AND 6)



MODEL 8732EM K1, K7, N1, N7 WITH INTRINSICALLY SAFE ELECTRODE FOR USE WITH MODEL 8705-M OR 8711-M/L K1, K7, N1, N7 FLOWTUBES

COMPONENT CABLES ONLY. SEE TABLE BELOW FOR COMPATIBLE WIRING.
SEE INSTALLATION WIRING DRAWING 08732-1504 FOR CABLING DETAILS.
(FOR PROCESS TEMPERATURE LIMITS SEE TABLES 1-4)



FLOWTUBE AND REMOTE MOUNT JUNCTION BOX TERMINAL LAYOUT (TYPICAL CONFIGURATION)

TERMINAL	LABEL
INTRINSICALLY SAFE ELECTRODE CIRCUIT	
19	ELECTRODE +
18	ELECTRODE −
17	ELECTRODE REFERENCE (SE)
NON-INTRINSICALLY SAFE COIL CIRCUIT	
1	COIL +
2	COIL −
3	COIL SHIELD (SC)

SYSTEM APPROVAL FOR INTRINSICALLY SAFE ELECTRODE INSTALLATION

THE MODEL 8732EM AND MODEL 8705-M OR MODEL 8711-M/L MAGNETIC FLOWMETER REFERENCING CONTROL DRAWING 08732-2060 MAY USE UP TO 500 FEET (150 METERS) OF ROSEMOUNT SUPPLIED ELECTRODE CABLING FOR INTERCONNECTION OF THE DEVICES. THE CORRECT CABLING IS SUPPLIED AS PART OF THE FOLLOWING ROSEMOUNT CABLING KITS:

COIL AND INTRINSICALLY SAFE ELECTRODE CABLES:

ROSEMOUNT PART NO.	UNIT OF MEASURE	TEMPERATURE RANGE	SEE NOTE
08705-0065-0003	FEET	-20°C TO 75°C	11
08705-0065-0004	METERS	-20°C TO 75°C	
08705-0065-1003	FEET	-50°C TO 125°C	
08705-0065-1004	METERS	-50°C TO 125°C	

INDIVIDUAL OR REPLACEMENT INTRINSICALLY SAFE ELECTRODE CABLES:

ROSEMOUNT PART NO.	UNIT OF MEASURE	TEMPERATURE RANGE	SEE NOTE
08705-0061-0003	FEET	-20°C TO 75°C	11
08705-0061-0004	METERS	-20°C TO 75°C	
08705-0061-1003	FEET	-50°C TO 125°C	
08705-0061-1004	METERS	-50°C TO 125°C	

ENTITY CONCEPT FOR INTRINSICALLY SAFE ELECTRODE INSTALLATION (11)

TERMINALS 19, 18, AND 17 CONTAIN TWO CHANNELS OF AN INTRINSICALLY SAFE CIRCUIT WITH A COMMON RETURN. ENTITY PARAMETERS SHOWN BELOW ARE THE SUMMATION OF BOTH CHANNELS.

TRANSMITTER ENTITY PARAMETERS
MODEL 8732EM
INTRINSICALLY SAFE ELECTRODE CIRCUIT
REMOTE JUNCTION BOX TERMINALS 19,18,17
U_o = 28.56V
I_o = 5.77mA
P_o = 165mW
C_o = 61.7nF
L_o = 1.0H

FLOW TUBE ENTITY PARAMETERS
MODEL 8705-M, 8711-M/L
INTRINSICALLY SAFE ELECTRODE CIRCUIT
REMOTE JUNCTION BOX TERMINALS 19,18,17
U_i = 30V
I_i = 50mA
P_i = 1.0W
C_i = 1.9nF
L_i = 630μH

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF ASSOCIATED APPARATUS AND INTRINSICALLY SAFE APPARATUS WHEN THE FOLLOWING IS TRUE:
$U_o \leq U_i$, $I_o \leq I_i$, $P_o \leq P_i$, $C_o \geq C_i + C_{cable}$, $L_o \geq L_i + L_{cable}$
THE ALLOWED CAPACITANCE, Co IS SHARED BETWEEN THE CIRCUITS OF TERMINALS 19, 18, AND 17. CABLE CAPACITANCE MUST BE ASSESSED AS TWICE THE MEASURED VALUE PER LENGTH OF CABLE.

EXAMPLE 1: THE HIGHEST MEASURED CAPACITANCE OF A 3 CONDUCTOR, SHIELDED CABLE IS 58pF/ft WHEN MEASURED CONDUCTOR TO CONDUCTOR TIED TO SHIELD.

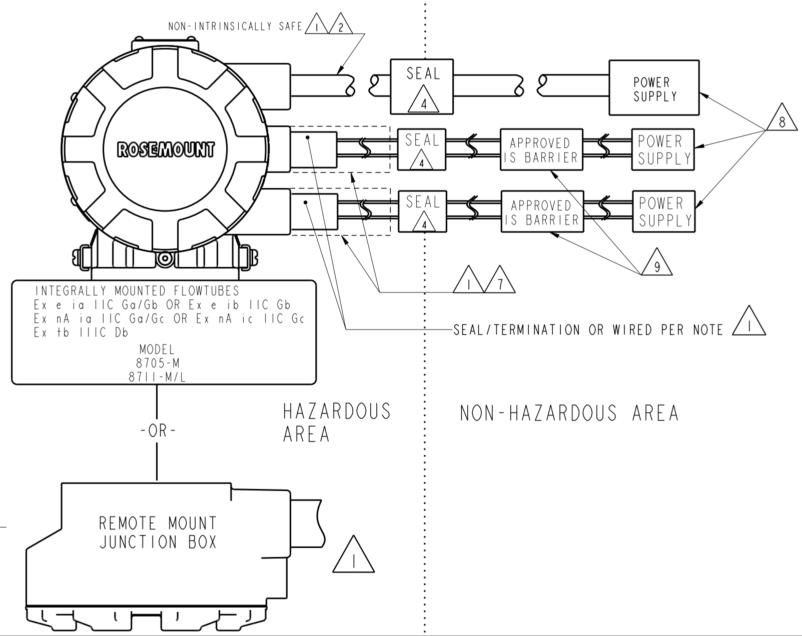
C_{cable} = 2 x 58pF/ft x FEET OF CABLE
$C_i + C_{cable} < C_o$
CABLE LENGTH MUST BE UNDER 515 FEET

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.	SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 / 3RD ANGLE / SIZE C / SCALE - / REV AA
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.	EMERSON Process Management ROSEMOUNT®
-DEC TOLERANCES- .X ± .1 [2.5] .XX ± .02 [0.5] .XXX ± .010 [0.25] FRACTIONS ± 1/32 ANGLES ± 2°	TITLE INSTALLATION DRAWING MODEL 8732EM, 8705-M, 8711-M/L ATEX/IECEx HAZARDOUS (Ex) LOCATIONS
DR. N. BOND 2/18/14 APP'DE. MESSENGER 6/13/14	DRAWING NO. 08732-2060
DO NOT SCALE PRINT / CAD MAINTAINED. (PRO/E) / PRODUCT CODE	DOC TYPE / SHEET 8 OF 9

DRAWING NO. 08732-2060

HAZARDOUS (Ex) LOCATION CONFIGURATION
INTRINSICALLY SAFE ANALOG/4-20mA OUTPUT AND PULSE

⚠ WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY



WHEN CONNECTED IN ACCORDANCE WITH THIS DOCUMENT, THE ROSEMOUNT MODEL 8732EM WITH INTEGRAL MOUNT FLOWTUBE OR REMOTE-MOUNT JUNCTION BOX IS APPROVED AS:

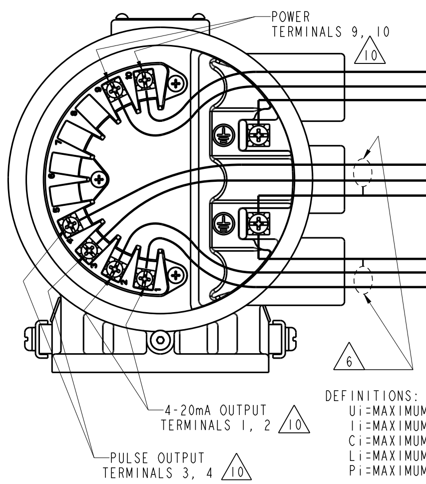
8732EM SAFETY APPROVAL OPTIONS CODE	RATINGS
N1/N7	Ex nA [ia Ga] IIC T4...T3 Gc DC POWER ONLY TYPE n WITH INTRINSICALLY SAFE ELECTRODE CONNECTIONS
N1/N7 WITH OUTPUT CODE 'B'	Ex nA [ia Ga] IIC T4...T3 Gc DC POWER ONLY TYPE n WITH INTRINSICALLY SAFE ELECTRODE CONNECTIONS AND INTRINSICALLY SAFE 4-20 mA/PULSE OUTPUTS
K1/K7	Ex de [ia Ga] IIC T6...T3 Gb AC or DC POWER FLAMEPROOF WITH INCREASED SAFETY TERMINAL BLOCK/REMOTE JUNCTION BOX WITH INTRINSICALLY SAFE ELECTRODE CONNECTIONS
K1/K7 WITH OUTPUT CODE 'B'	Ex de [ia Ga] IIC T6...T3 Gb AC OR DC POWER FLAMEPROOF WITH INCREASED SAFETY TERMINAL BLOCK/REMOTE JUNCTION BOX WITH INTRINSICALLY SAFE ELECTRODE CONNECTIONS AND INTRINSICALLY SAFE 4-20mA/PULSE OUTPUTS
ND/NF	Ex tb IIIC T 80°C...T 200°C Db DUST-IGNITION PROOF HOUSING
ND/NF WITH OUTPUT CODE 'B'	Ex tb IIIC T 80°C...T 200°C Db [Ex ia IIC Ga] DUST-IGNITION PROOF HOUSING WITH INTRINSICALLY SAFE 4-20mA/PULSE OUTPUTS

MODEL CODE BREAKDOWN

8732EMxxxBxK1 / K7 / N1 / N7 / ND / NF

- K1, K7, N1, N7, ND, NF — SAFETY APPROVALS OPTION
- B — INTRINSICALLY SAFE 4-20mA AND PULSE OUTPUT
- 8732EM — TRANSMITTER CLASS

ENTITY CONCEPT FOR
INTRINSICALLY SAFE 4-20mA AND PULSE OUTPUT



AC INPUT POWER 90-250 VAC RMS, 50/60Hz
DC INPUT POWER 12-42 VDC
2 Um = 250V

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF ASSOCIATED APPARATUS AND INTRINSICALLY SAFE APPARATUS WHEN THE FOLLOWING IS TRUE:
$U_o \le U_i$, $I_o \le I_i$, $P_o \le P_i$, $C_o \ge C_i + C_{cable}$, $L_o \ge L_i + L_{cable}$

PULSE OUTPUT

ENTITY PARAMETERS	BARRIER PARAMETERS
Ui=28V	Uo MUST BE LESS THAN OR EQUAL TO 28V
Ii=100mA	Io MUST BE LESS THAN OR EQUAL TO 100mA
Ci=4.5nF	Co MUST BE GREATER THAN THE SUM OF Ci+Ccable
Li=0.0uH	Lo MUST BE GREATER THAN THE SUM OF Li+Lcable
Pi=1.0W	Po MUST BE LESS THAN OR EQUAL TO 1.0 WATTS

4-20mA ANALOG OUTPUT

ENTITY PARAMETERS	BARRIER PARAMETERS
Ui=30V	Uo MUST BE LESS THAN OR EQUAL TO 30V
Ii=300mA	Io MUST BE LESS THAN OR EQUAL TO 300mA
Ci=924pF	Co MUST BE GREATER THAN THE SUM OF Ci+Ccable
Li=0.0uH	Lo MUST BE GREATER THAN THE SUM OF Li+Lcable
Pi=1.0W	Po MUST BE LESS THAN OR EQUAL TO 1.0 WATTS

DEFINITIONS:
Ui=MAXIMUM INPUT VOLTAGE
Ii=MAXIMUM INPUT CURRENT
Ci=MAXIMUM INTERNAL CAPACITANCE
Li=MAXIMUM INTERNAL INDUCTANCE
Pi=MAXIMUM INPUT POWER

Uo=OPEN CIRCUIT VOLTAGE OF THE BARRIER
Io=SHORT CIRCUIT CURRENT OF THE BARRIER
Co=MAXIMUM ALLOWED CAPACITANCE
Lo=MAXIMUM ALLOWED INDUCTANCE
Po=MAXIMUM OUTPUT POWER

DRAWING NO. 08732-2060

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UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES.
-DEC TOLERANCES-
.X ± .1 [2.5]
.XX ± .02 [0.5]
.XXX ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°

SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125 | 3RD ANGLE | SIZE C | SCALE - | REV AA

EMERSON Process Management ROSEMOUNT®

TITLE INSTALLATION DRAWING
MODEL 8732EM, 8705-M, 8711-M/L
ATEX/IECEx HAZARDOUS (Ex) LOCATIONS

DR. N. BOND 2/18/14 | APP'DE. MESSENGER 6/13/14 | DRAWING NO. 08732-2060

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FORM REV AB

B.4 EC Declaration of Conformity

Approvals Document
July 24, 2015
08732-AP01, Rev AF

EMERSON. Process Management

ROSEMOUNT

CE

EC Declaration of Conformity

No: RFD 1094 Rev. E

We,

Emerson Process Management
Rosemount Flow
12001 Technology Drive
Eden Prairie, MN 55344
USA

declare under our sole responsibility that the product(s),

Rosemount 8700M
Magnetic Flowmeter Platform

to which this declaration relates, is in conformity with the provisions of the European Community Directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of harmonized or applicable technical standards and, when applicable or required, a European Community notified body certification, as shown in the attached schedule.

(signature)

22 July 2015
(date of issue)

Mark Fleigle
(name - printed)

Vice President Technology and New Products
(function name - printed)

FILE ID: 8700M CE Marking | Page 1 of 3 | RFD1094.docx

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July 24, 2015
08732-AP01, Rev AF

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CE

Schedule
EC Declaration of Conformity RFD 1094 Rev. E

EMC Directive (2004/108/EC)

All Models
EN 61326-1: 2013

LVD Directive (2006/95/EC)

All Models
EN 61010-1: 2010

PED Directive (97/23/EC)

Equipment without the 'PD' option is NOT PED compliant and cannot be used in the EEA without further assessment unless the installation is exempt under Article 1, paragraph 3 of the PED Directive (97/23/EC)

Model 8705-M Magnetic Flowtube with Option "PD", in Line Sizes 1.5"- 36"

QS Certificate of Assessment - EC No. 4741-2014-CE-HOU-DNV
Module H Conformity Assessment
ASME B31.3: 2010

Model 8705-M with Option "PD", in Line Sizes .5" – 1.0"
Sound Engineering Practice
ASME B31.3: 2010

Model 8711-M/L Magnetic Flowmeter with Option "PD", in Line Sizes 1.5"- 8"

QS Certificate of Assessment - EC No. 4741-2014-CE-HOU-DNV
Module H Conformity Assessment
ASME B31.3: 2010

Model 8721 Magnetic Flowmeter, all sizes:
Sound Engineering Practice
ASME B31.3: 2010

FILE ID: 8700M CE Marking Page 2 of 3 RFD1094.docx

Approvals Document
July 24, 2015
08732-AP01, Rev AF

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Schedule
EC Declaration of Conformity RFD 1094 Rev. E

ATEX Directive (94/9/EC)

Magnetic Flow Transmitter and Flow Tubes,
Model 8732EM and Models 8705-M and 8711-M/L

DEKRA 14ATEX0071 X – CERTIFICATE
Equipment Marking Summary:

II 2 (1) G	Ex d e [ia Ga] IIC T6…T3 Gb
II 2 (1) G	Ex d [ia Ga] IIC T6…T3 Gb
II 3 (1) G	Ex nA [ia Ga] IIC T4…T3 Gc
II (1) G	[Ex ia Ga] IIC
II 1/2 G	Ex e ia IIC T5…T3 Ga/Gb
II 2 G	Ex e ib IIC T5…T3 Gb
II 1/3 G	Ex nA ia IIC T5…T3 Ga/Gc
II 3 G	Ex nA ic IIC T5…T3 Gc
II 2 D	Ex tb IIIC T 80 °C…T 200 °C Db

EN 60079-0 : 2012 +A11: 2013   EN 60079-1 : 2007
EN 60079-7 : 2007   EN 60079-11 : 2012
EN 60079-15 : 2010   EN 60079-26 : 2007
EN 60079-31 : 2014

PED Notified Body

DNV GL [Notified Body Number: 0575]
Veritasveien 1, N-1322
Hovik, Norway

ATEX Notified Body

DEKRA Certification B.V. [Notified Body Number: 0344]
Meander 1051, 6825 MJ Arnhem
P.O. Box 5185, 6802 ED Arnhem
The Netherlands

ATEX Quality Assurance Notified Body

DNV GL [Notified Body Number: 0575]
Veritasveien 1, N-1322
Hovik, Norway

FILE ID: 8700M CE Marking   Page 3 of 3   RFD1094.docx

Appendix C Wiring Diagrams

C.1 8732EM wiring diagrams

Figure C-1. 8732EM Wiring Diagram—Component Cables

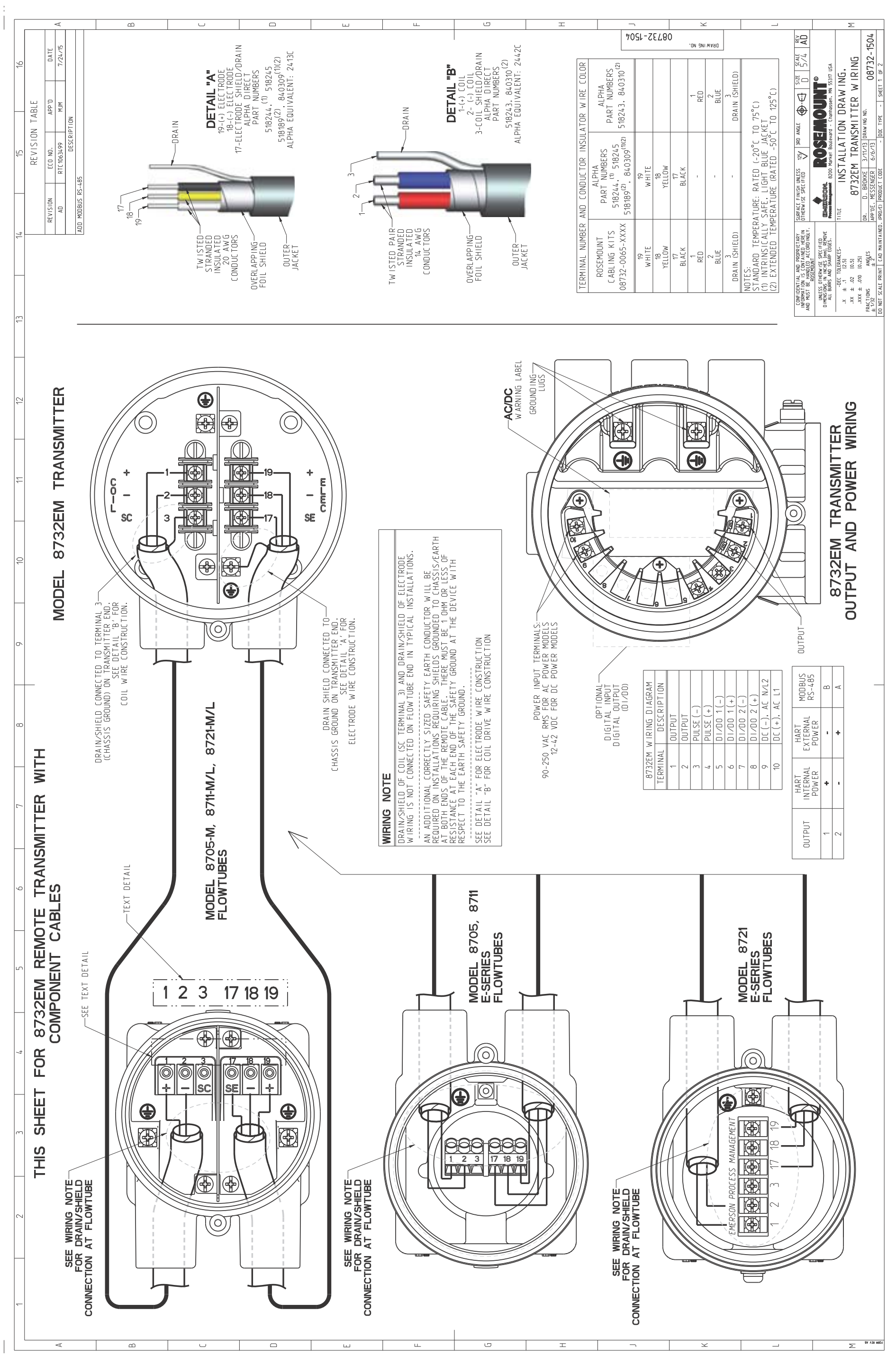
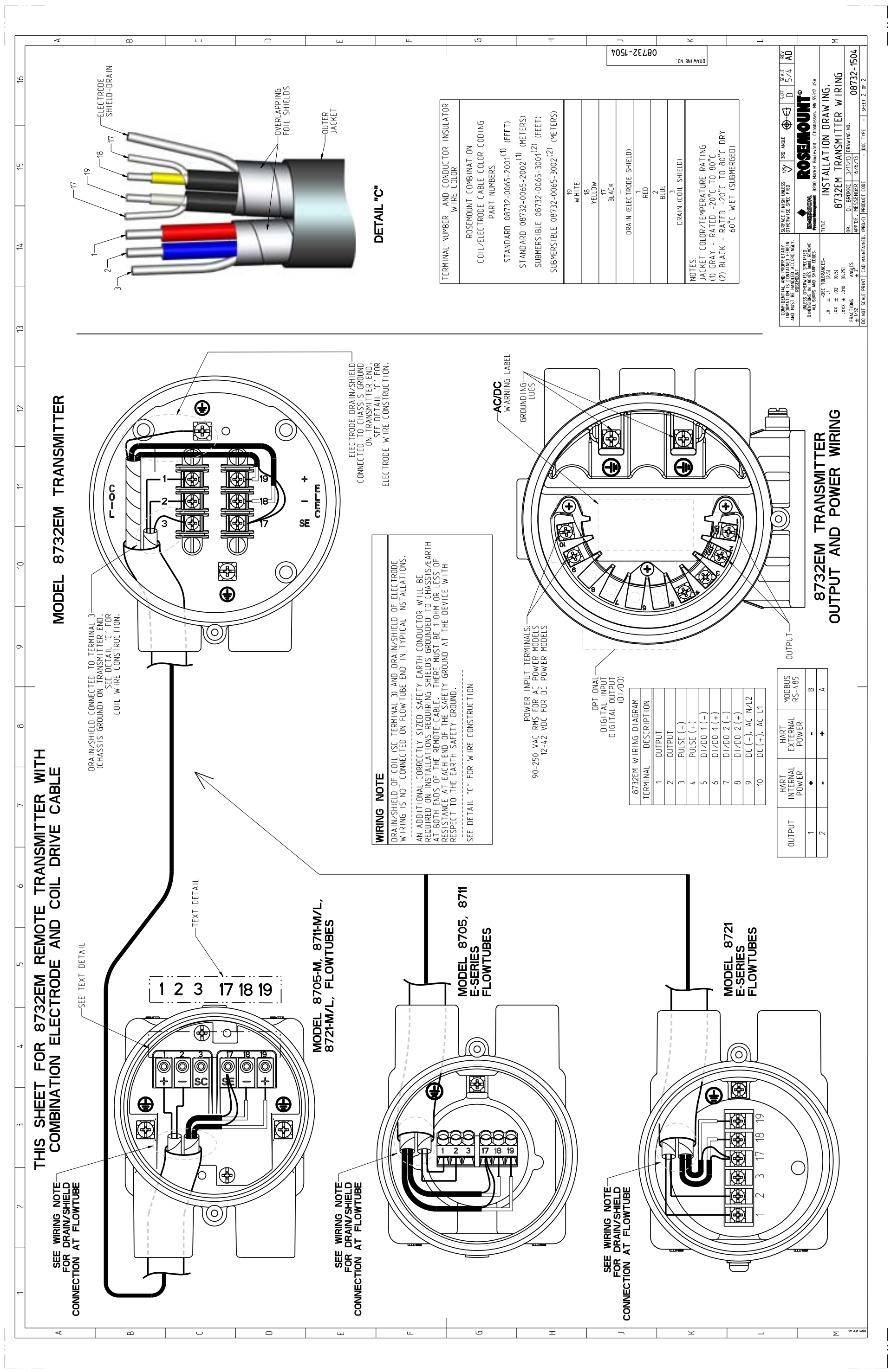


Figure C-2. 8732EM Wiring Diagram—Combination Cable



C.2 775 Smart Wireless THUM™ Adapter wiring diagrams

Figure C-3. Wiring Diagram—775 Smart Wireless THUM Adapter with 8732EM Internal Analog Power

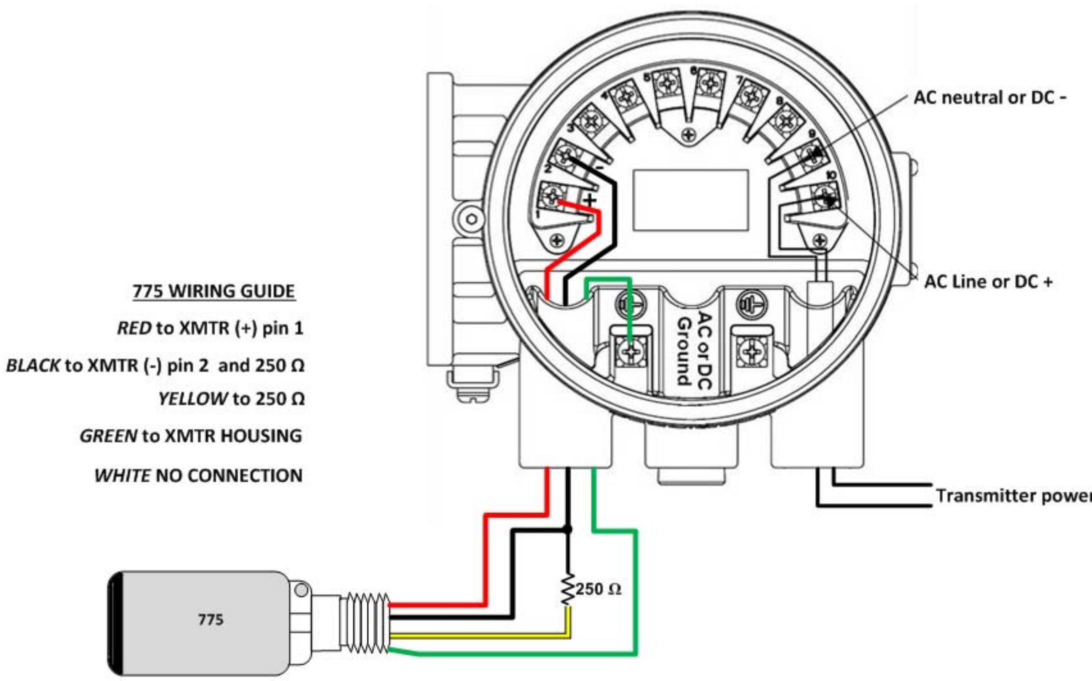
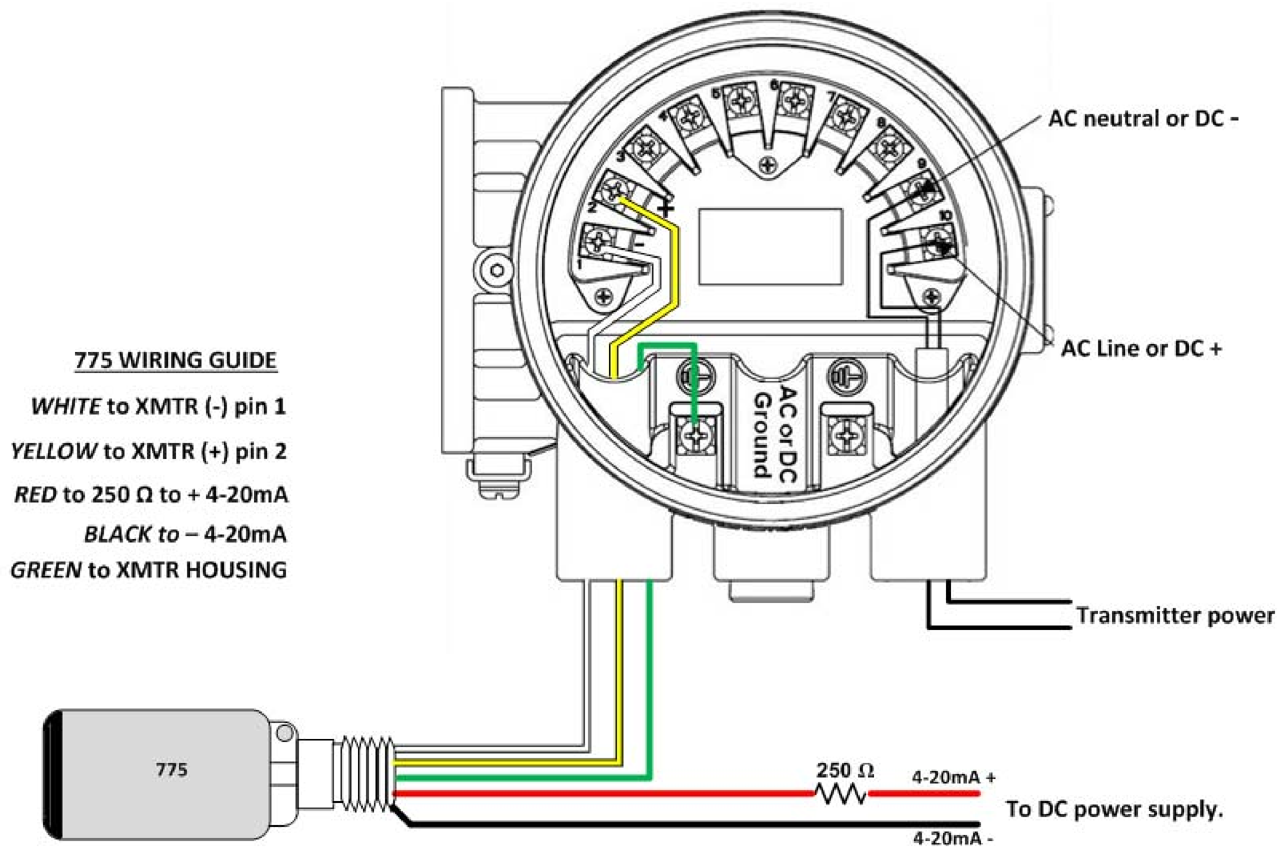


Figure C-4. Wiring Diagram—775 Smart Wireless THUM Adapter with 8732EM External Analog Power



C.3 475 Field Communicator wiring diagrams

Figure C-5. Wiring Diagram—475 Field Communicator with 8732EM Internal Analog Power

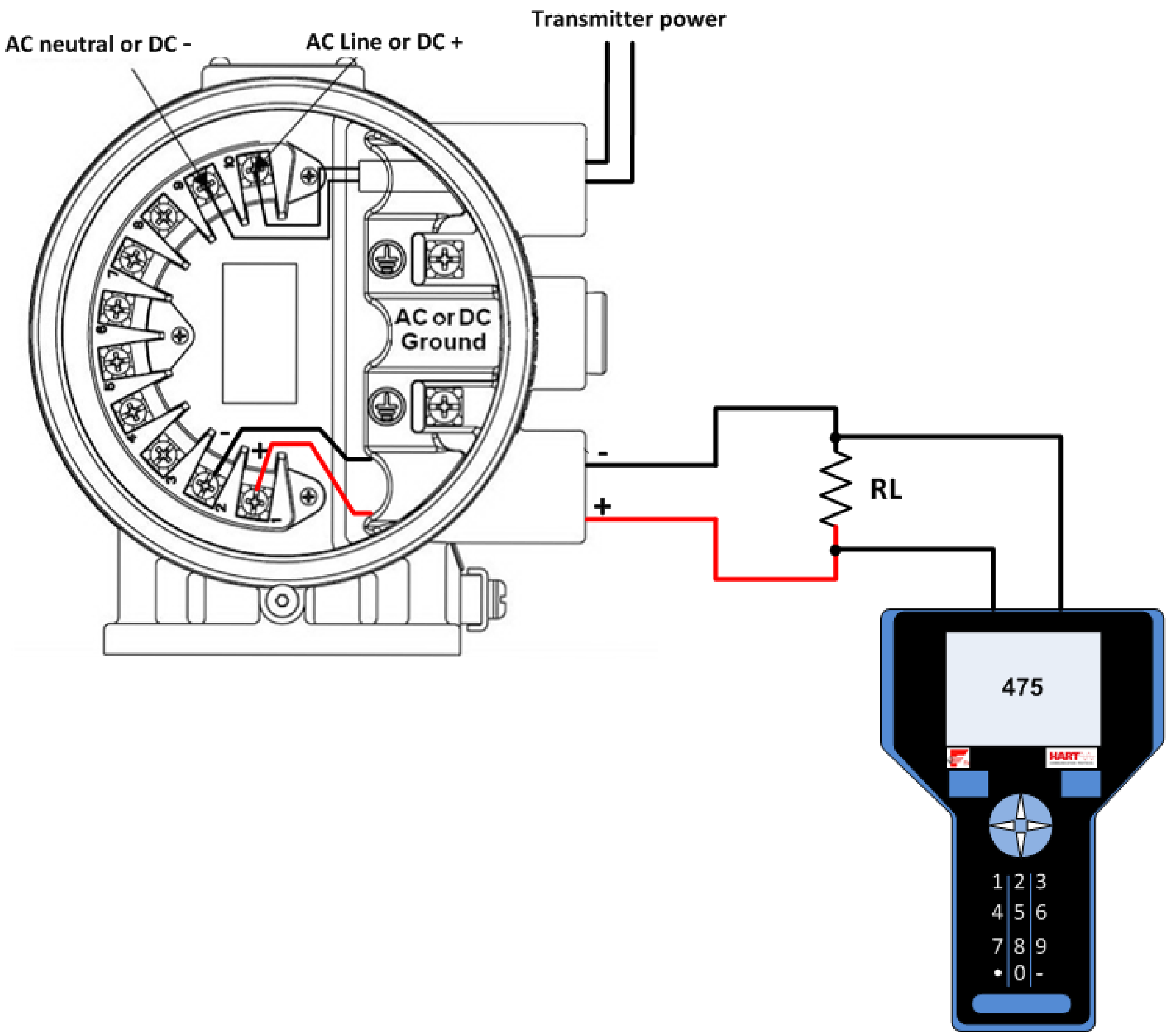
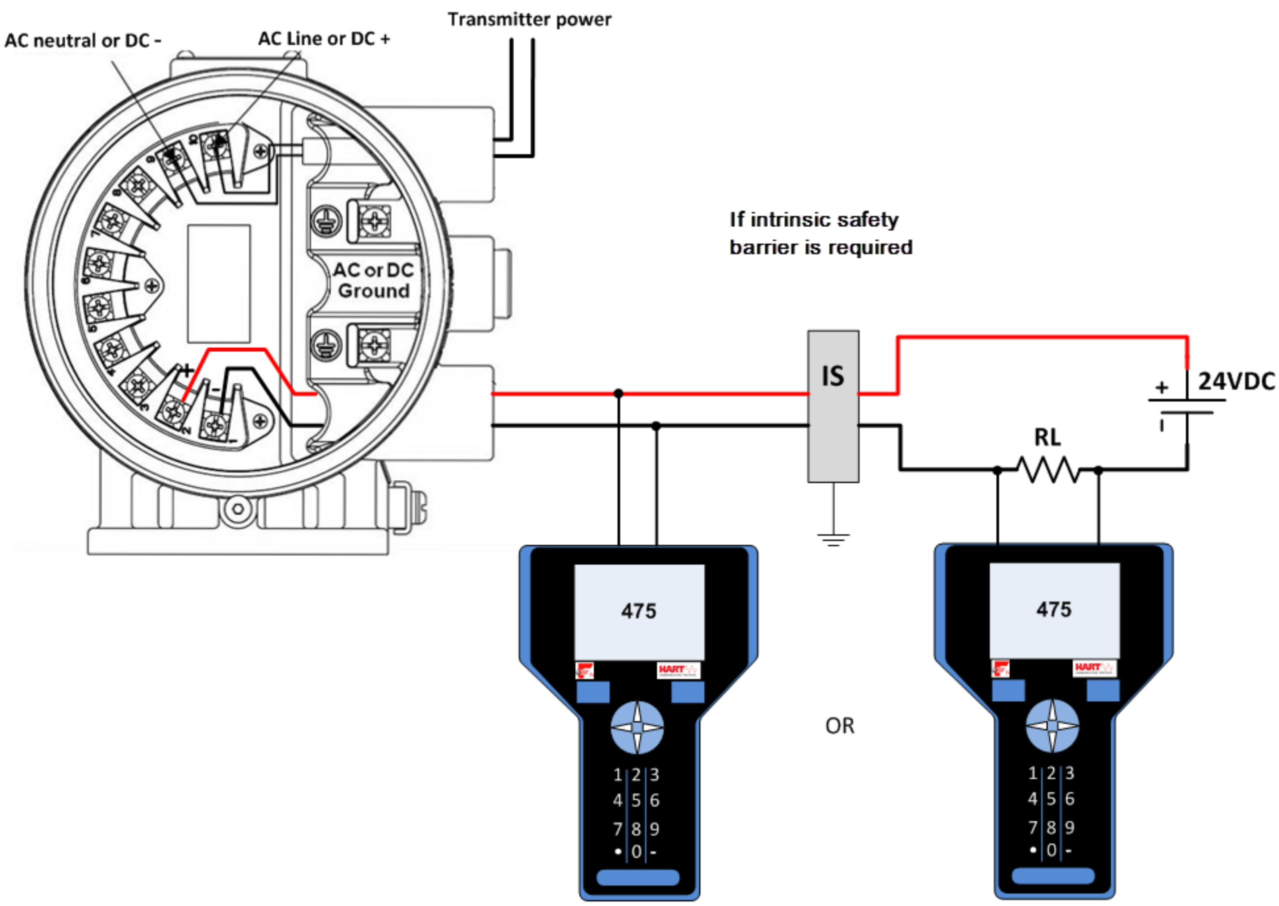


Figure C-6. Wiring Diagram—475 Field Communicator with 8732EM External Analog Power



Appendix D Implementing a Universal Transmitter

D.1 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please read the following safety messages before performing any operation described in this section.

⚠ WARNING

- The Rosemount 8732EM Transmitter has not been evaluated for use with other manufacturers' magnetic flowmeter sensors in hazardous (Ex or Classified) areas.
- Special care should be taken by the end-user and installer to ensure the 8732EM transmitter meets the safety and performance requirements of the other manufacturer's equipment.

D.2 Universal capability

The 8732EM transmitter has the ability to drive other manufacturers' sensors and report a flow rate. In addition to providing a flow measurement, all of the diagnostic functionality is also available in a universal application. This capability can provide additional information into the installation, process, and meter health, in addition to enabling a common maintenance practice for all magnetic flowmeter installations and helping to reduce spares inventory of magnetic flowmeter transmitters.

This section details how to wire the transmitter to other manufacturers' sensors and configure the universal capabilities.

D.2.1 Implementation

There are three easy steps when implementing a universal transmitter.

1. Review the existing application. Verify the existing sensor is in good working order, and that it is compatible with a universal transmitter. Use Table D-1to help verify if the Rosemount universal transmitter is compatible with the existing sensor. Verifying the sensor is functioning correctly. While the universal transmitter may be able to drive the existing sensor, if the sensor is not in good working order the universal transmitter may not function correctly.

2. Connect the universal transmitter to the existing sensor using the wiring diagrams in this appendix. If the existing sensor is not listed in this appendix, contact Rosemount technical support for more details on the application of the universal capabilities.

3. Configure the transmitter following the guidelines in Section 4 and Section 5, setting up parameters as needed. One of the key configuration parameters is the sensor calibration number. There are several methods to determine the calibration number, but the most common method will be to use the universal trim capability. This functionality is detailed in this appendix. Accuracy of the meter when the universal trim is used to determine the calibration number will be dependent on the accuracy of the known flow rate used in the trim process.

In addition to the universal trim, there are two other methodologies for determining a calibration number for the sensor.

Method 1: Have the sensor sent to a Rosemount service center for determination of a calibration number compatible with the universal transmitter. This is the most accurate method for determining the calibration number and will provide a ±0.5% of rate measurement accuracy from 3 to 40 fps (1-10 m/s).

Method 2: Involves the conversion of the existing sensor calibration number/meter factors to an equivalent Rosemount 16-digit calibration number. Accuracy of the meter using this methodology is estimated to be in the range of 2-3%. Contact the Rosemount technical support for more information on this method or to determine a calibration number for the existing sensor.

Once these steps are completed, the meter will begin measuring flow. Verify the measured flow rate is within the expected range and that the mA output correctly corresponds to the measured flow rate. Also verify the reading in the control system matches the reading at the transmitter. Once these items have been verified, the loop can be placed into automatic control as needed.

Universal trim

LOI menu path	Diagnostics, Trims, Universal Trim
Fast keys	1, 2, 5, 5

The universal auto trim function enables the Rosemount 8732 to determine a calibration number for sensors that were not calibrated at the Rosemount factory. The function is activated as one step in a procedure known as in-process calibration. If the sensor has a 16-digit Rosemount calibration number, in-process calibration is not required.

1. Determine the flow rate of the process fluid in the sensor.

Note
The flow rate in the line can be determined by using another sensor in the line, by counting the revolutions of a centrifugal pump, or by performing a bucket test to determine how fast a given volume is filled by the process fluid.

2. Complete the universal auto trim function.
3. When the routine is completed, the sensor is ready for use.

Wiring the universal transmitter

The wiring diagrams in this section illustrate the proper connections between the transmitter and most sensors currently on the market. Specific diagrams are included for most models, and where information for a particular model of a manufacturer is not available, a generic drawing pertaining to that manufacturer's sensors is provided. If the manufacturer for the existing sensor is not included, see the drawing for generic connections.

Table D-1. Transmitter and Sensor Reference

Rosemount transmitter	Sensor manufacturer	Page number
Rosemount		
Rosemount 8732	Rosemount 8705, 8707, 8711	page 240
Rosemount 8732	Rosemount 8701	page 241
Brooks		
Rosemount 8732	Model 5000	page 243
Rosemount 8732	Model 7400	page 244
Endress and Hauser		
Rosemount 8732	Generic Wiring for Sensor	page 245
Fischer and Porter		
Rosemount 8732	Model 10D1418	page 246
Rosemount 8732	Model 10D1419	page 247
Rosemount 8732	Model 10D1430 (Remote)	page 248
Rosemount 8732	Model 10D1430	page 249
Rosemount 8732	Model 10D1465, 10D1475 (Integral)	page 250
Rosemount 8732	Generic Wiring for Sensors	page 251
Foxboro		
Rosemount 8732	Series 1800	page 252
Rosemount 8732	Series 1800 (Version 2)	page 253
Rosemount 8732	Series 2800	page 254
Rosemount 8732	Generic Wiring for Sensors	page 255
Kent		
Rosemount 8732	Veriflux VTC	page 256
Rosemount 8732	Generic Wiring for Sensors	page 257
Krohne		
Rosemount 8732	Generic Wiring for Sensors	page 258
Taylor		
Rosemount 8732	Series 1100	page 260
Rosemount 8732	Generic Wiring for Sensors	page 260
Yamatake Honeywell		
Rosemount 8732	Generic Wiring for Sensors	page 261
Yokogawa		
Rosemount 8732	Generic Wiring for Sensors	page 262
Generic Manufacturer Wiring		
Rosemount 8732	Generic Wiring for Sensors	page 263

D.3 Rosemount sensors

D.3.1 8705/8707/8711/8721 sensors to 8732 Transmitter

To connect a Rosemount 8705/8707/8711/8721 Sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-1 on page 240.

Figure D-1. Wiring Diagram to a Rosemount 8732 Transmitter

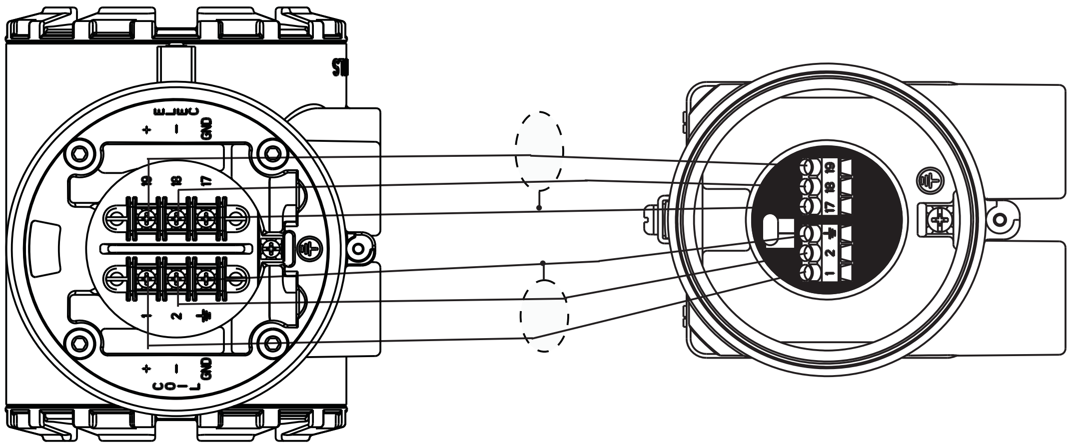


Table D-2. Rosemount 8705/8707/8711/8721 Sensor Wiring Connections

Rosemount 8732 transmitters	Rosemount 8705/8707/8711/8721 sensors
1	1
2	2
3	3
17	17
18	18
19	19

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.3.2 8701 sensor to 8732 Transmitter

To connect a Rosemount 8701 Sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-2.

Figure D-2. Wiring Diagram for Rosemount 8701 Sensor and Rosemount 8732 Transmitter

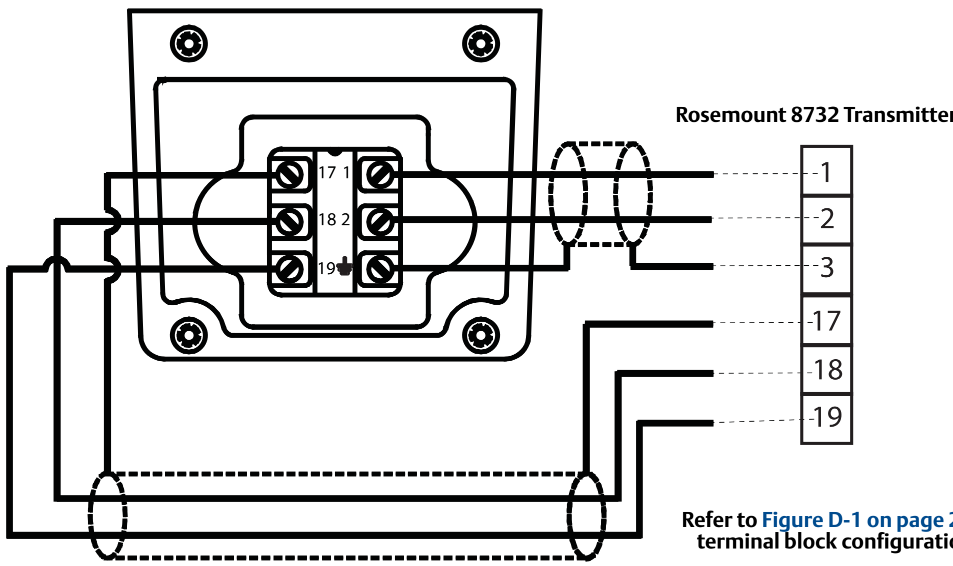


Table D-3. Rosemount 8701 Sensor Wiring Connections

Rosemount 8732	Rosemount 8701 sensors
1	1
2	2
3	3
17	17
18	18
19	19

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.3.3 Connecting sensors of other manufacturers

Before connecting another manufacturer's sensor to the transmitter, it is necessary to perform the following functions.

1. Turn off the AC power to the sensor and transmitter. Failure to do so could result in electrical shock or damage to the transmitter.
2. Verify the coil drive cables between the sensor and the transmitter are not connected to any other equipment.
3. Label the coil drive cables and electrode cables for connection to the transmitter.
4. Disconnect the wires from the existing transmitter.
5. Remove the existing transmitter. Mount the new transmitter. See "Installation" on page 3.
6. Verify the sensor coil is configured for series connection. Other manufacturers sensors may be wired in either a series or parallel circuit. All Rosemount magnetic sensors are wired in a series circuit. (Other manufacturers AC sensors (AC coils) wired for 220VAC operation are typically wired in parallel and must be rewired in series.)
7. Verify the sensor is in good working condition. Use the manufacturer's recommended test procedure for verification of sensor condition. Perform the basic checks:
   a. Check the coils for shorts or open circuits.
   b. Check the sensor liner for wear or damage.
   c. Check the electrodes for shorts, leaks, or damage.
   d. Connect the sensor to the transmitter in accordance with reference wiring diagrams. See Appendix A: Implementing a Universal Transmitter for specific drawings.
   e. Connect and verify all connections between the sensor and the transmitter, then apply power to the transmitter.
   f. Perform the Universal Auto Trim function.

CAUTION

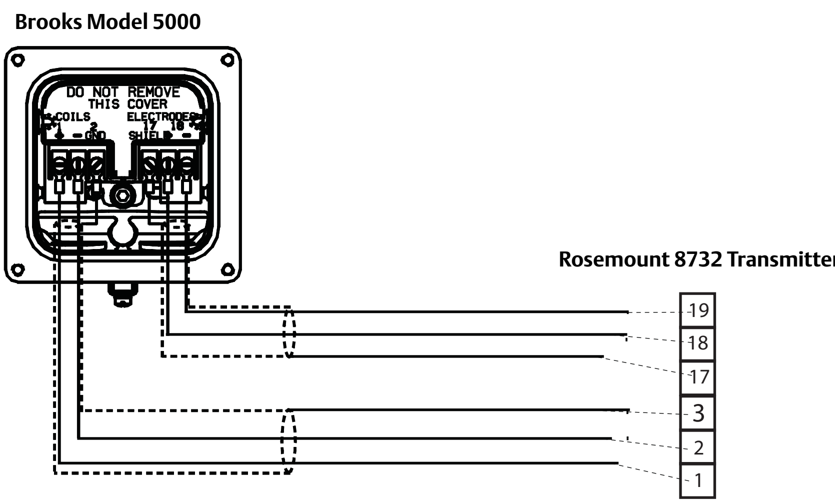
Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.4 Brooks sensors

D.4.1 Model 5000 sensor to 8732 Transmitter

To connect a Model 5000 sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-3.

Figure D-3. Wiring Diagram for Brooks Sensor Model 5000 and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-4. Brooks Model 5000 Sensor Wiring Connections

Rosemount 8732	Brooks sensors Model 5000
1	1
2	2
3	3
17	17
18	18
19	19

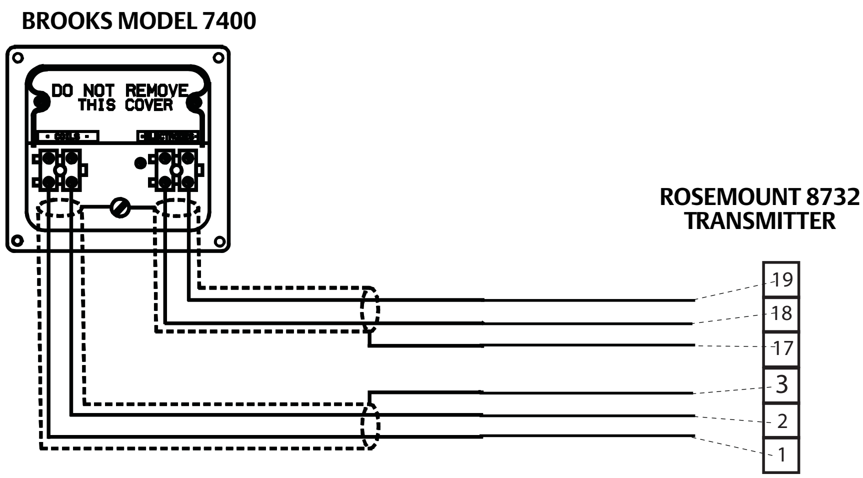
⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.4.2 Model 7400 sensor to 8732 Transmitter

To connect a Model 7400 sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-4.

Figure D-4. Wiring Diagram for Brooks Sensor Model 7400 and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-5. Brooks Model 7400 sensor Wiring Connections

Rosemount 8732	Brooks Sensors Model 7400
1	Coils +
2	Coils –
3	3
17	Shield
18	Electrode +
19	Electrode –

⚠ CAUTION

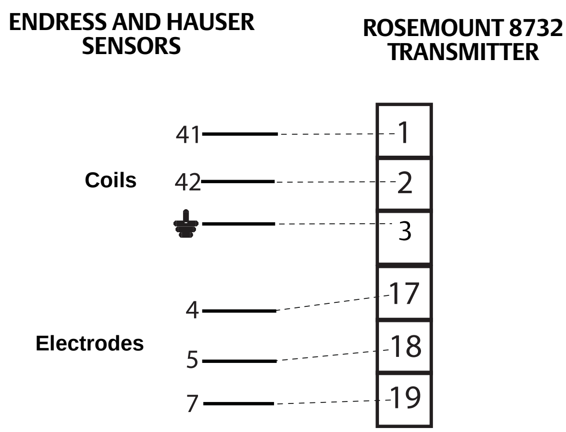
Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.5 Endress and Hauser sensors

D.5.1 Endress and Hauser sensor to 8732 Transmitter

To connect an Endress and Hauser sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-5.

Figure D-5. Wiring Diagram for Endress and Hauser Sensors and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-6. Endress and Hauser Sensor Wiring Connections

Rosemount 8732	Endress and Hauser sensors
1	41
2	42
3	14
17	4
18	5
19	7

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.6 Fischer and Porter sensors

D.6.1 Model 10D1418 sensor to 8732 transmitter

To connect a Model 10D1418 sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-6.

Figure D-6. Wiring Diagram for Fischer and Porter Sensor Model 10D1418 and Rosemount 8732

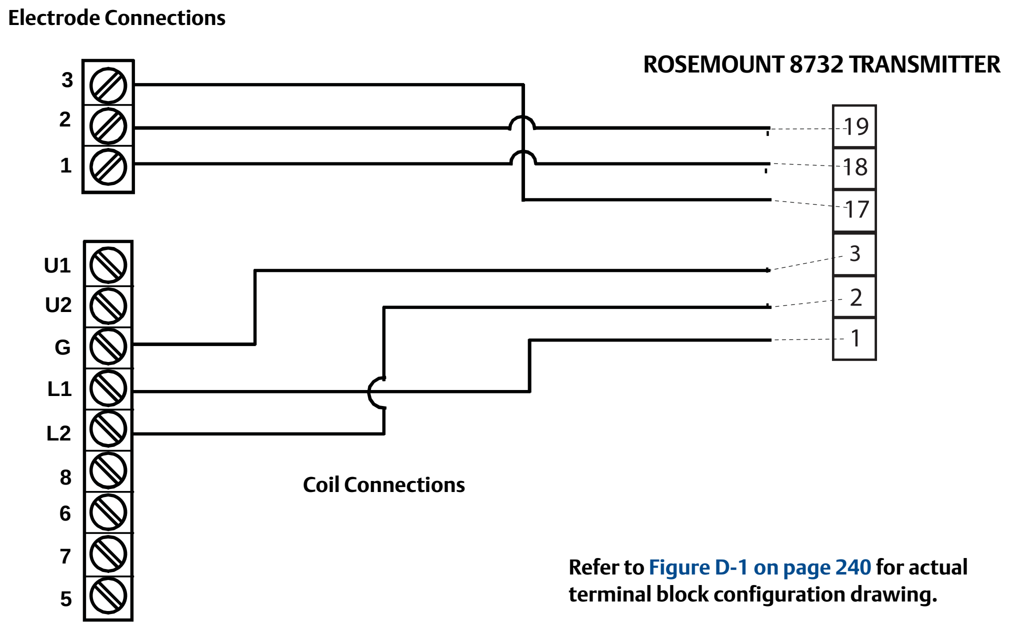


Table D-7. Fischer and Porter Model 10D1418 Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1418 sensors
1	L1
2	L2
3	Chassis Ground
17	3
18	1
19	2

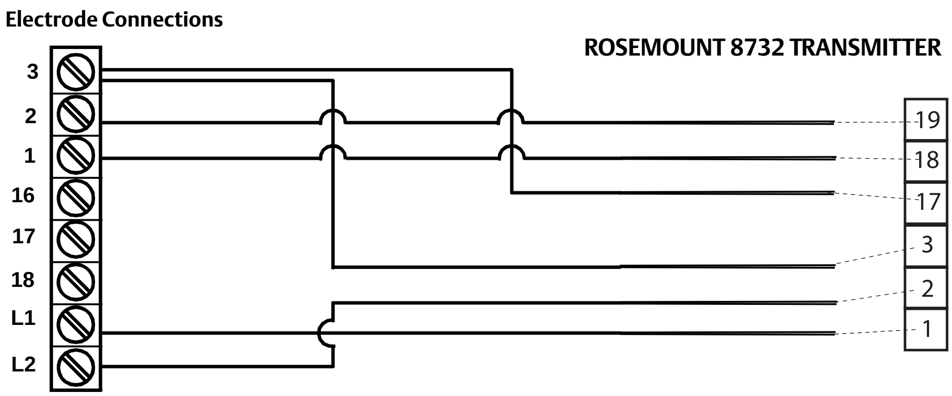
⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.6.2 Model 10D1419 sensor to 8732 Transmitter

To connect a Model 10D1419 sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-7.

Figure D-7. Wiring Diagram for Fischer and Porter Sensor Model 10D1419 and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-8. Fischer and Porter Model 10D1419 Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1419 sensors
1	L1
2	L2
3	3
17	3
18	1
19	2

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.6.3 Model 10D1430 sensor to 8732 Transmitter

To connect a Model 10D1430 sensor (Remote) to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-8.

Figure D-8. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Remote) and Rosemount 8732

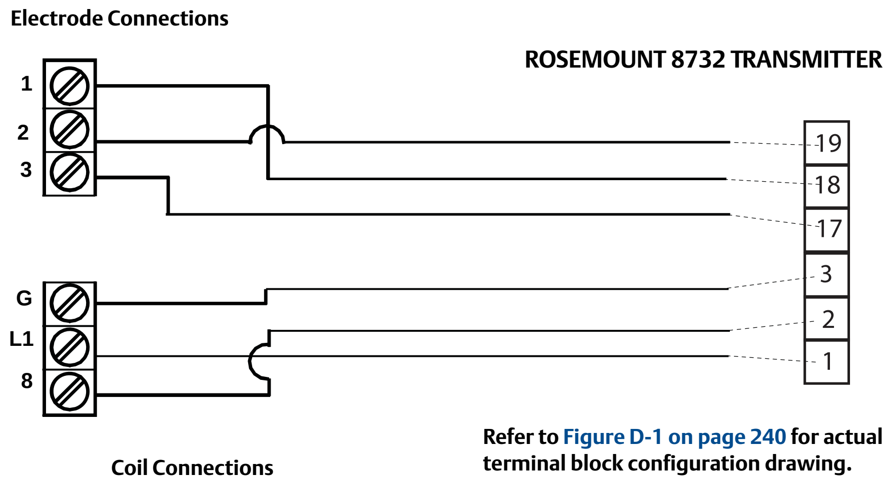


Table D-9. Fischer and Porter Model 10D1430 (Remote) Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1430 (Remote) sensors
1	L1
2	8
3	G
17	3
18	1
19	2

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.6.4 Model 10D1430 sensor to 8732 Transmitter

To connect a Model 10D1430 sensor (integral) to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-9.

Figure D-9. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Integral) and Rosemount 8732

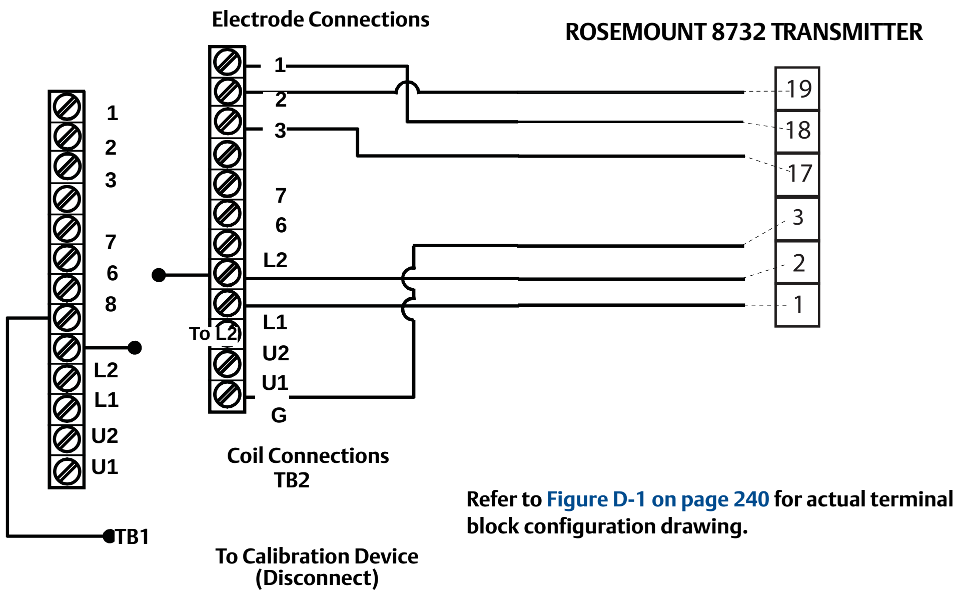


Table D-10. Fischer and Porter Model 10D1430 (integral) Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1430 (Integral) sensors
1	L1
2	L2
3	G
17	3
18	1
19	2

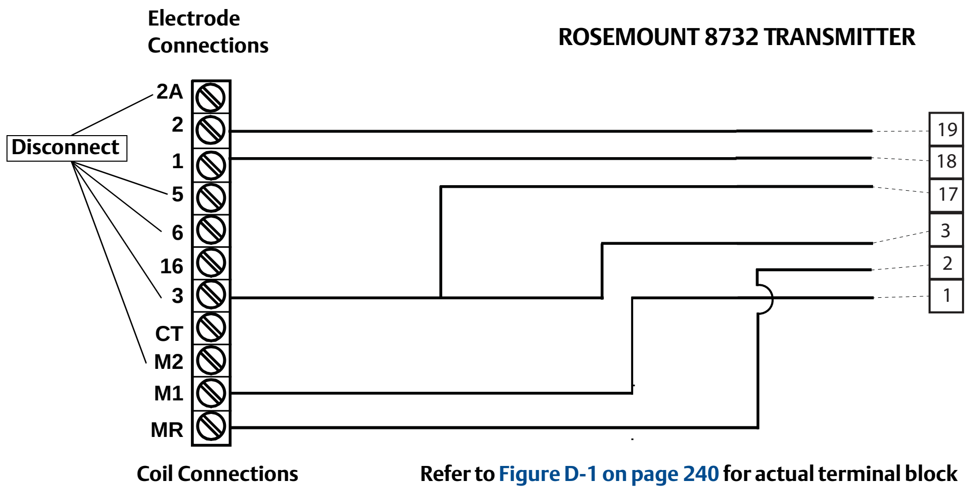
⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.6.5 Model 10D1465/10D1475 sensors to 8732 Transmitter

To connect a Model 10D1465 or 10D1475 sensor (integral) to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-10.

Figure D-10. Wiring Diagram for Fischer and Porter Sensor Model 10D1465 and Model 10D1475 (integral) and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-11. Fischer and Porter Model 10D1465 and 10D1475 Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1465 and 10D1475 sensors
1	M1
2	MR
3	3
17	3
18	1
19	2

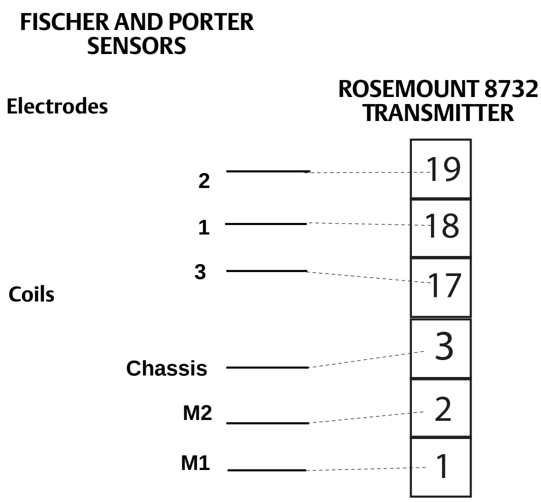
⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.6.6 Fischer and Porter sensor to 8732 Transmitter

To connect a Fischer and Porter sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-11.

Figure D-11. Generic Wiring Diagram for Fischer and Porter Sensors and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-12. Fischer and Porter Generic Sensor Wiring Connections

Rosemount 8732	Fischer and Porter sensors
1	M1
2	M2
3	Chassis Ground
17	3
18	1
19	2

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.7 Foxboro sensors

D.7.1 Series 1800 sensor to 8732 Transmitter

To connect a Series 1800 sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-12.

Figure D-12. Wiring Diagram for Foxboro Series 1800 and Rosemount 8732

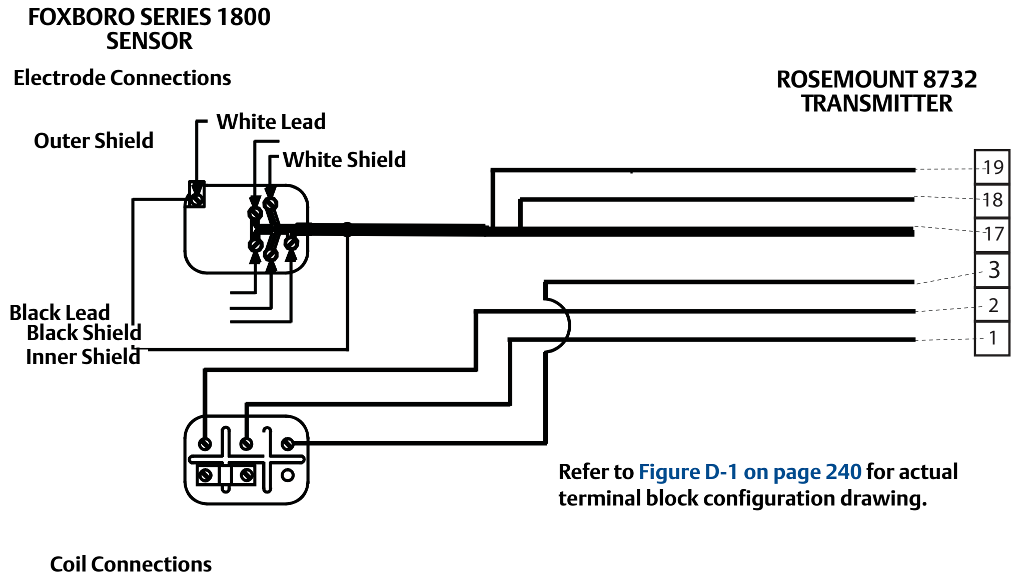


Table D-13. Foxboro Series1800 Sensor Wiring Connections

Rosemount 8732	Foxboro Series 1800 sensors
1	L1
2	L2
3	Chassis Ground
17	Any Shield
18	Black
19	White

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.7.2 Series 1800 sensor to 8732 Transmitter

To connect a Series 1800 (version 2) sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-13.

Figure D-13. Wiring Diagram for Foxboro Series 1800 (Version 2) and Rosemount 8732

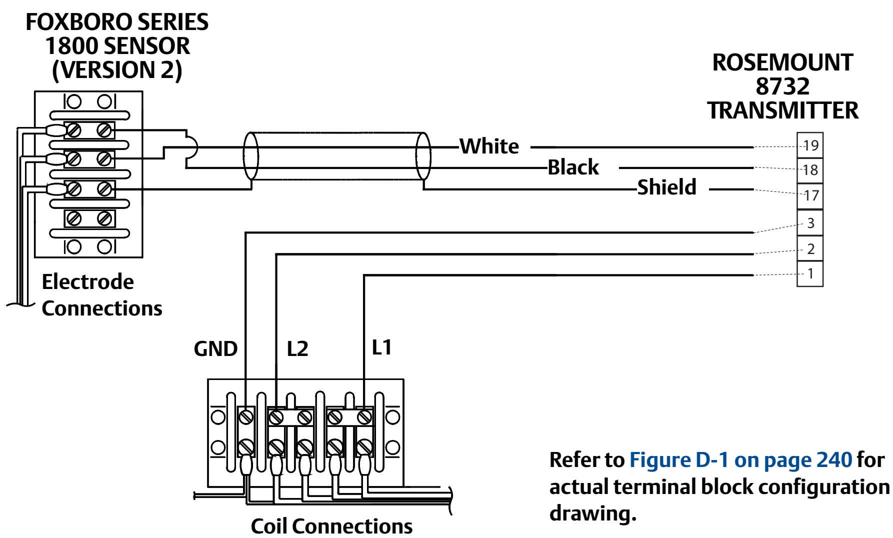


Table D-14. Foxboro Series 1800 (Version 2) Sensor Wiring Connections

Rosemount 8732	Foxboro Series 1800 sensors
1	L1
2	L2
3	Chassis Ground
17	Any Shield
18	Black
19	White

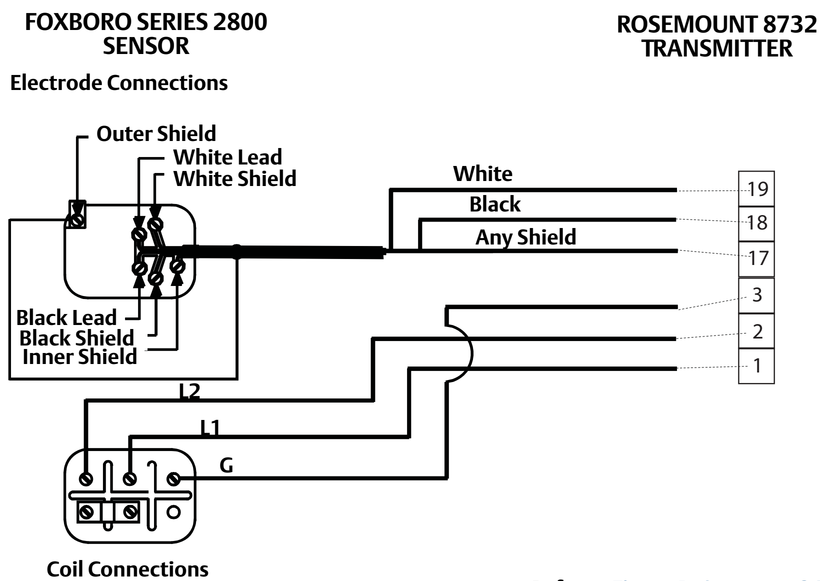
⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.7.3 Series 2800 Sensor to 8732 Transmitter

To connect a Series 2800 Sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-14.

Figure D-14. Wiring Diagram for Foxboro Series 2800 and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-15. Foxboro Series 2800 Sensor Wiring Connections

Rosemount 8732	Foxboro Series 2800 Sensors
1	L1
2	L2
3	Chassis Ground
17	Any Shield
18	Black
19	White

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.7.4 Foxboro Sensor to 8732 Transmitter

To connect a Foxboro Sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-15.

Figure D-15. Generic Wiring Diagram for Foxboro Sensors and Rosemount 8732

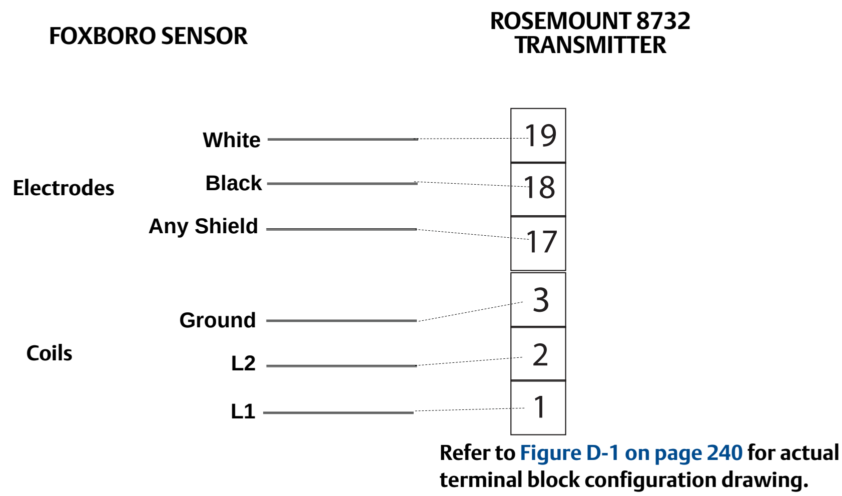


Table D-16. Foxboro Generic Sensor Wiring Connections

Rosemount 8732	Foxboro sensors
1	L1
2	L2
3	Chassis Ground
17	Any Shield
18	Black
19	White

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.8 Kent Veriflux VTC sensor

D.8.1 Veriflux VTC sensor to 8732 Transmitter

To connect a Veriflux VTC sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-16.

Figure D-16. Wiring Diagram for Kent Veriflux VTC Sensor and Rosemount 8732

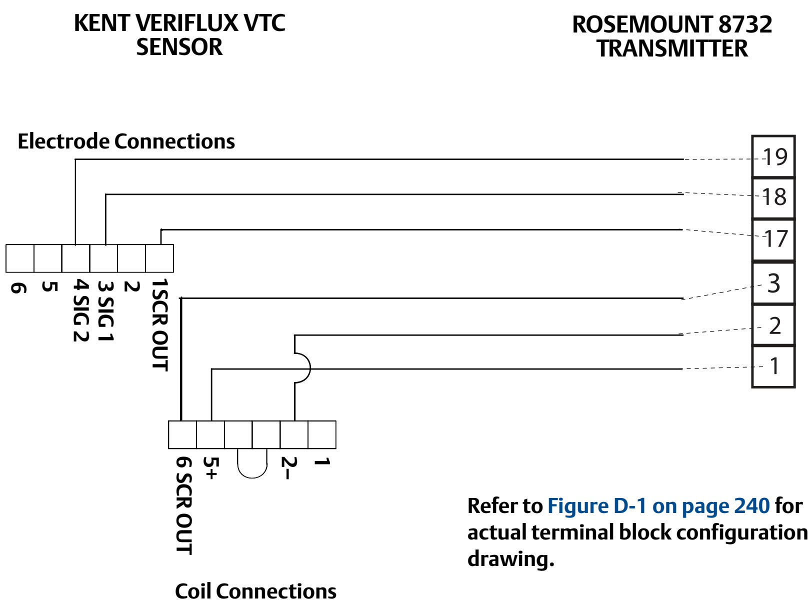


Table D-17. Kent Veriflux VTC Sensor Wiring Connections

Rosemount 8732	Kent Veriflux VTC sensors
1	2
2	1
3	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.9 Kent sensors

D.9.1 Kent sensor to 8732 Transmitter

To connect a Kent sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-17.

Figure D-17. Generic Wiring Diagram for Kent Sensors and Rosemount 8732

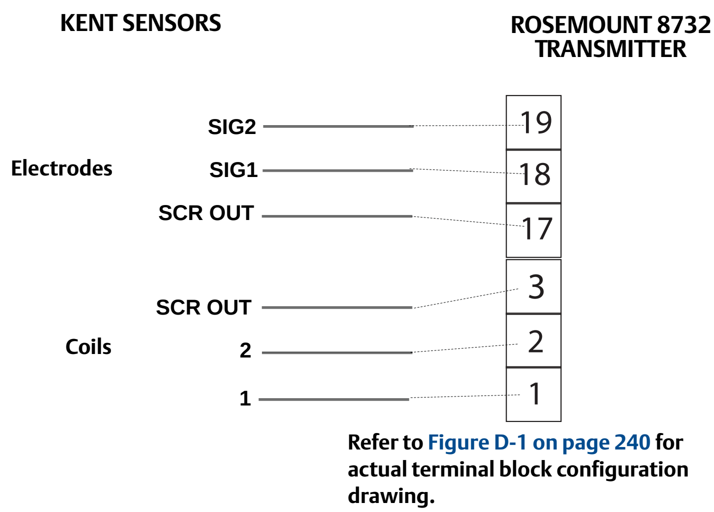


Table D-18. Kent Sensor Wiring Connections

Rosemount 8732	Kent sensors
1	1
2	2
3	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.10 Krohne sensors

D.10.1 Krohne sensor to 8732 Transmitter

To connect a Krohne sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-18.

Figure D-18. Generic Wiring Diagram for Krohne Sensors and Rosemount 8732

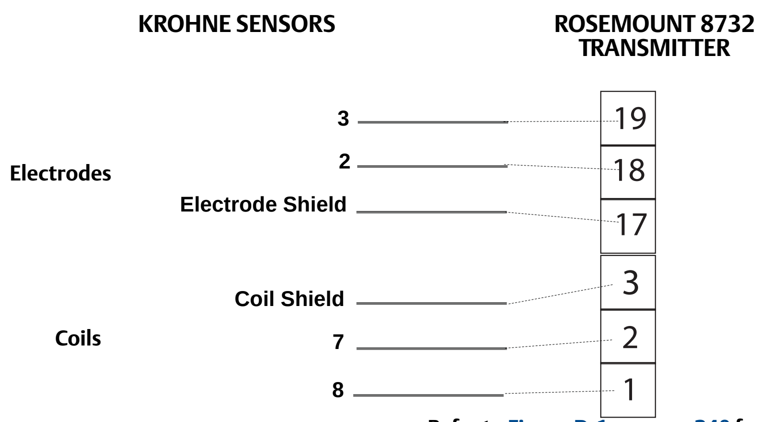


Table D-19. Krohne Sensor Wiring Connections

Rosemount 8732	Krohne sensors
1	8
2	7
3	Coil Shield
17	Electrode Shield
18	2
19	3

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.11 Taylor sensors

D.11.1 Series 1100 sensor to 8732 Transmitter

To connect a Series 1100 sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-19.

Figure D-19. Wiring Diagram for Taylor Series 1100 Sensors and Rosemount 8732

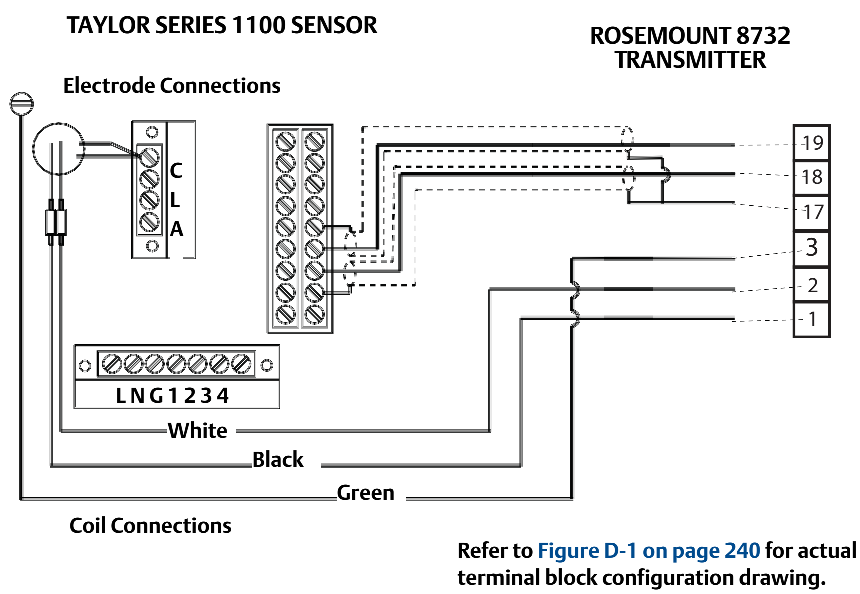


Table D-20. Taylor Series 1100 Sensor Wiring Connections

Rosemount 8732	Taylor Series 1100 sensors
1	Black
2	White
3	Green
17	S1 and S2
18	E1
19	E2

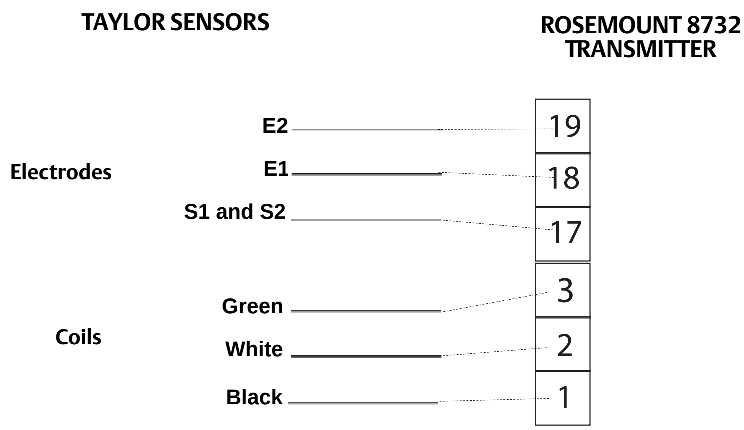
⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.11.2 Taylor sensor to 8732 Transmitter

To connect a Taylor sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-20.

Figure D-20. Generic Wiring Diagram for Taylor Sensors and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-21. Taylor Sensor Wiring Connections

Rosemount 8732	Taylor sensors
1	Black
2	White
3	Green
17	S1 and S2
18	E1
19	E2

⚠ CAUTION

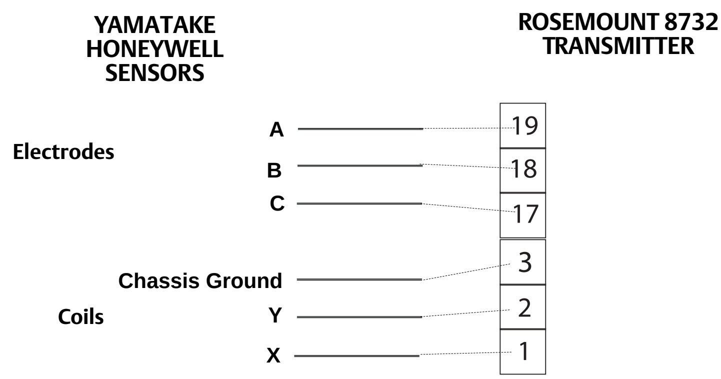
Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.12 Yamatake Honeywell sensors

D.12.1 Yamatake Honeywell sensor to 8732 Transmitter

To connect a Yamatake Honeywell sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-21.

Figure D-21. Generic Wiring Diagram for Yamatake Honeywell Sensors and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-22. Yamatake Honeywell Sensor Wiring Connections

Rosemount 8732	Yamatake Honeywell sensors
1	X
2	Y
3	Chassis Ground
17	C
18	B
19	A

⚠ CAUTION

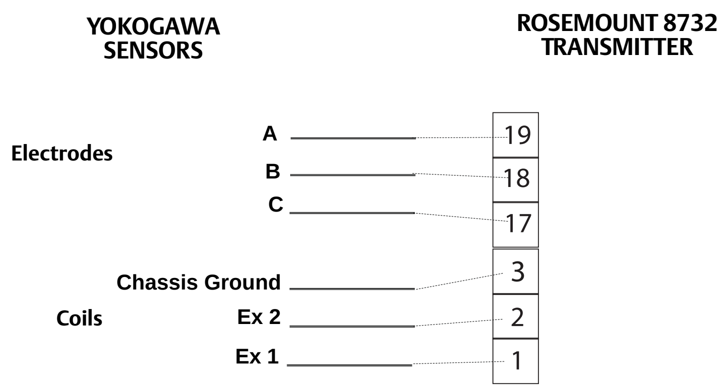
Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.13 Yokogawa sensors

D.13.1 Yokogawa sensor to 8732 Transmitter

To connect a Yokogawa sensor to a Rosemount 8732 Transmitter, connect coil drive and electrode cables as shown in Figure D-22.

Figure D-22. Generic Wiring Diagram for Yokogawa Sensors and Rosemount 8732



Refer to Figure D-1 on page 240 for actual terminal block configuration drawing.

Table D-23. Yokogawa Sensor Wiring Connections

Rosemount 8732	Yokogawa sensors
1	EX1
2	EX2
3	Chassis Ground
17	C
18	B
19	A

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

D.14 Generic manufacturer sensor to 8732 Transmitter

D.14.1 Identify the terminals

First check the sensor manufacturer's manual to identify the appropriate terminals. Otherwise, perform the following procedure.

Identify coil and electrode terminals

1. Select a terminal and touch an ohmmeter probe to it.
2. Touch the second probe to each of the other terminals and record the results for each terminal.
3. Repeat the process and record the results for every terminal.

Coil terminals will have a resistance of approximately 3-300 ohms.

Electrode terminals will have an open circuit.

Identify a chassis ground

1. Touch one probe of an ohmmeter to the sensor chassis.
2. Touch the other probe to the each sensor terminal and the record the results for each terminal.

The chassis ground will have a resistance value of one ohm or less.

D.14.2 Wiring connections

Connect the electrode terminals to Rosemount 8732 terminals 18 and 19. The electrode shield should be connected to terminal 17.

Connect the coil terminals to Rosemount 8732 terminals 1, 2, and 3.

If the Rosemount 8732 Transmitter indicates a reverse flow condition, switch the coil wires connected to terminals 1 and 2.

⚠ CAUTION

Do not connect mains or line power to the magnetic flowtube sensor or to the transmitter coil excitation circuit.

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