Reference Manual
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Rosemount 8732

Integral Mount or Remote Mount Magnetic Flowmeter System with FOUNDATION™ fieldbus

ROSEMOUNT®

EMERSON™ Process Management

Integral Mount or Remote Mount Magnetic Flowmeter System with FOUNDATION™ fieldbus

NOTICE

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.

Rosemount Inc. has two toll-free assistance numbers:

Customer Central
Technical support, quoting, and order-related questions.

United States - 1-800-999-9307 (7:00 am to 7:00 pm CST)

Asia Pacific- 65 777 8211

Europe/ Middle East/ Africa - 49 (8153) 9390

North American Response Center
Equipment service needs.

1-800-654-7768 (24 hours—includes Canada)

Outside of these areas, contact your local Rosemount representative.

⚠CAUTION

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 Rosemount Sales Representative.

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Section 1 Introduction

SYSTEM DESCRIPTION

The Rosemount® 8700 Series Magnetic Flowmeter System consists of a sensor and transmitter, and measures volumetric flow rate by detecting the velocity of a conductive liquid that passes through a magnetic field.

There are four Rosemount magnetic flowmeter sensors:

- Flanged Rosemount 8705
- Flanged High-Signal Rosemount 8707
- Wafer-Style Rosemount 8711
- Sanitary Rosemount 8721

There are two Rosemount magnetic flowmeter transmitters:

- Rosemount 8712
- Rosemount 8732

The sensor is installed in-line with process piping — either vertically or horizontally. Coils located on opposite sides of the sensor create a magnetic field. Electrodes located perpendicular to the coils make contact with the process fluid. A conductive liquid moving through the magnetic field generates a voltage at the two electrodes that is proportional to the flow velocity.

The transmitter drives the coils to generate a magnetic field, and electronically conditions the voltage detected by the electrodes to provide a flow signal. The transmitter can be integrally or remotely mounted from the sensor.

This manual is designed to assist in the installation and operation of the Rosemount 8732 Magnetic Flowmeter Transmitter and the Rosemount 8700 Series Magnetic Flowmeter Sensors.

SAFETY MESSAGES

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Refer to the safety messages listed at the beginning of each section before performing any operations.

⚠WARNING

Attempting to install and operate the Rosemount 8705, 8707 High-Signal, 8711 or 8721 Magnetic Sensors with the Rosemount 8712 or 8732 Magnetic Flowmeter Transmitter without reviewing the instructions contained in this manual could result in personal injury or equipment damage.

SERVICE SUPPORT

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.

⚠ See “Safety Messages” on page D-1 for complete warning information.

Section 2 Installation

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. Please refer to the following safety messages before performing any operation in this section.

SAFETY MESSAGES

⚠ This symbol is used throughout this manual to indicate that special attention to warning information is required.

⚠WARNING

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 that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.

Do not connect a Rosemount 8732 to a non-Rosemount sensor that is located in an explosive atmosphere.

⚠WARNING

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 8732 reference manual for any restrictions associated with a safe installation.

Before connecting a handheld 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.

Electrical shock can result in death or serious injury

Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠WARNING

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.

To avoid possible damage to the sensor liner ends, do not use metallic or spiral-wound gaskets. 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 limits. Failure to observe these instructions could result in severe damage to the sensor lining and possible sensor replacement.

Emerson Process Management can supply lining protectors to prevent liner damage during removal, installation, and excessive bolt torquing.

TRANSMITTER SYMBOLS

Caution symbol — check product documentation for details ⚠

Protective conductor (grounding) terminal ⏚

PRE-INSTALLATION

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

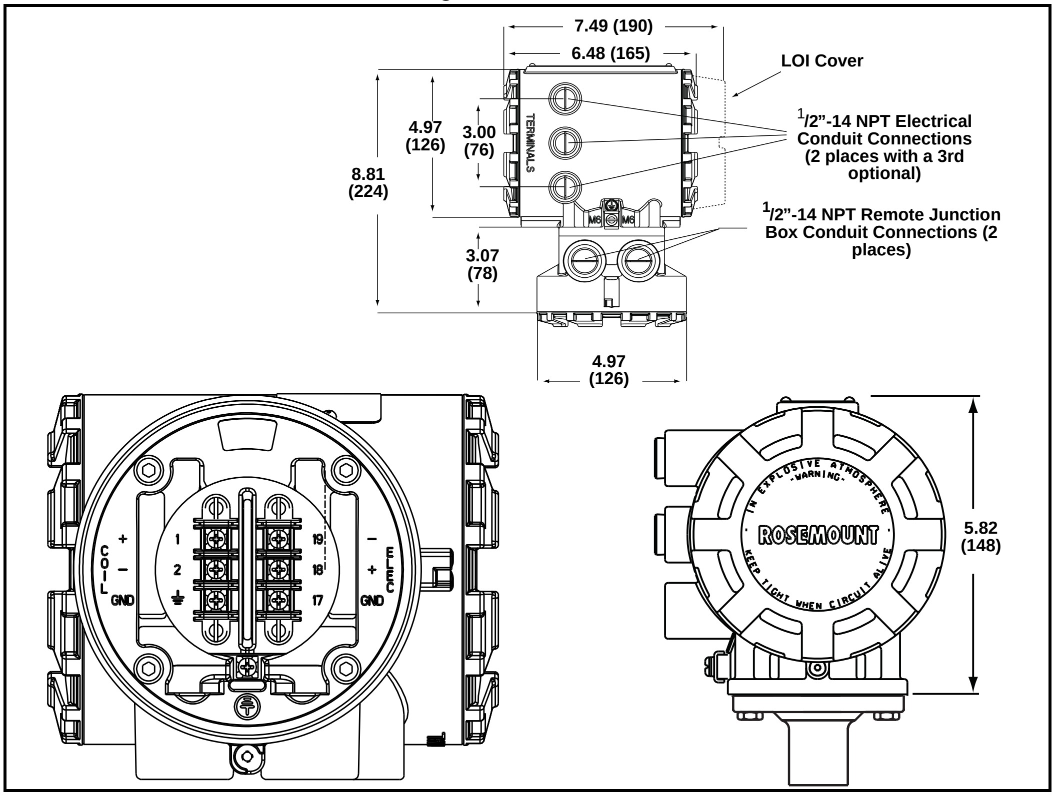
- Identify the options and configurations that apply to your application
- Set the hardware switches if necessary
- Consider mechanical, electrical, and environmental requirements

MECHANICAL CONSIDERATIONS

The mounting site for the 8732 transmitter should provide enough room for secure mounting, easy access to conduit ports, full opening of the transmitter covers, and easy readability of the LOI screen (see Figure 2-1). The transmitter should be mounted in a manner that prevents moisture in conduit from collecting in the transmitter.

If the 8732 is mounted remotely from the sensor, it is not subject to limitations that might apply to the sensor.

Figure 2-1. Rosemount 8732 Dimensional Drawing



ENVIRONMENTAL CONSIDERATIONS

To ensure maximum transmitter life, avoid temperature extremes and vibration. Typical problem areas include:

- high-vibration lines with integrally mounted transmitters
- warm-climate installations in direct sunlight
- outdoor installations in cold climates.

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

Rosemount 8732 transmitters require external power so there must be access to a suitable power source.

INSTALLATION PROCEDURES

Rosemount 8732 installation includes both detailed mechanical and electrical installation procedures.

Mount the Transmitter

Remote-mounted transmitters may be mounted on a pipe up to two inches in diameter or against a flat surface.

Pipe Mounting

To mount the transmitter on a pipe:

1. Attach the mounting bracket to the pipe using the mounting hardware.
2. Attach the 8732 to the mounting bracket using the mounting screws.

Surface Mounting

To surface mount the transmitter:

1. Attach the 8732 to the mounting location using the mounting screws.

Identify Options and Configurations

The standard application of the Rosemount 8732 includes a FOUNDATION fieldbus output. Be sure to identify options and configurations that apply to your situation, and keep a list of them nearby for consideration during the installation and configuration procedures.

Hardware Switches

The 8732 electronics board is equipped with two user-selectable hardware switches. These switches set the Transmitter Security and Simulate Mode. The standard configuration for these switches when shipped from the factory are as follows:

Transmitter Security:	OFF
Simulate Mode	OFF

Definitions of these switches and their functions are provided below. If you determine that the settings must be changed, see below.

Transmitter Security

The security switch on the 8732 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 function remains active at all times.

With the switch in the *ON* position, you may still access and review any of the operating parameters and scroll through the available choices, but no actual data changes are allowed. Transmitter security is set in the *OFF* position when shipped from the factory.

Simulate Mode

The Simulate Mode switch is used in conjunction with the Analog Input (AI) function block. The switch is used to enable flow measurement simulation. To enable the simulate enable feature, the switch must transition from OFF to ON after power is applied to the transmitter, preventing the transmitter from being accidentally left in simulate mode. Simulate Mode is set in the *OFF* position when shipped from the factory.

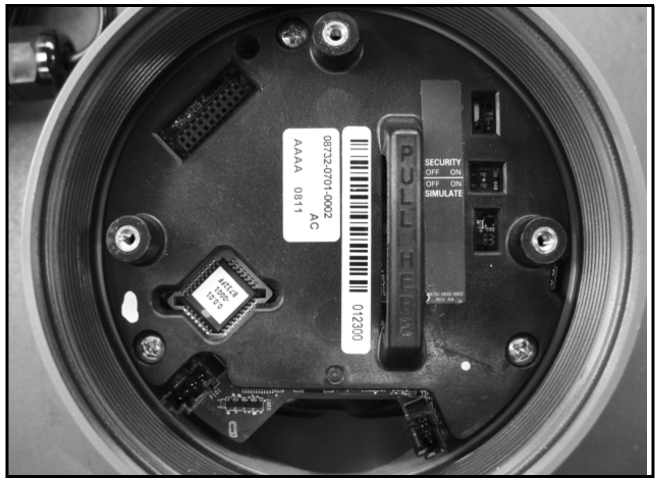
Changing Hardware Switch Settings

In most cases, it is not necessary to change the setting of the hardware switches. If you need 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. Disconnect power to the transmitter.
2. Remove electronics cover.
3. Remove display if applicable.
4. Identify the location of each switch (see Figure 2-2).
5. Change the setting of the desired switches with a small screwdriver.
6. Replace the electronics cover.

Figure 2-2. Rosemount 8732 Electronics Board and Hardware Switches



Conduit Ports and Connections

Both the sensor and transmitter junction boxes have ports for 1/2-inch NPT conduit connections, with optional CM20 and PG 13.5 connections available. These connections should be made in accordance with national, local or plant electrical codes. Unused ports should be sealed with metal plugs and PTFE tape or other thread sealant. Connections should also be made in accordance with area approval requirements, see examples below for details. Proper electrical installation is necessary to prevent errors due to electrical noise and interference. Separate conduits are not necessary for the coil drive and signal cables connecting the transmitter to the sensor, but a dedicated conduit line between each transmitter and sensor is required. A shielded cable must be used.

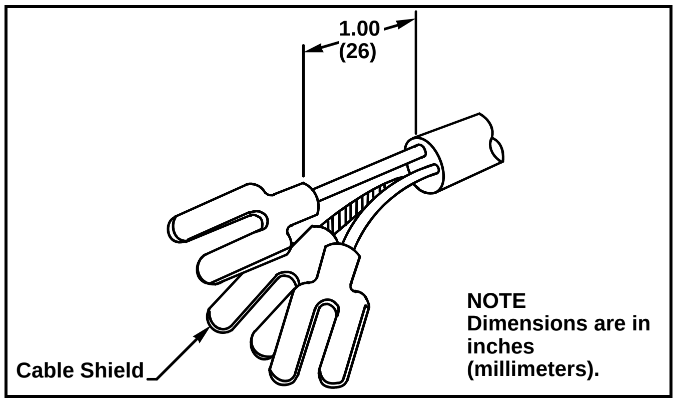
Example 1: Installing flanged sensors into an IP68 area. Sensors must be installed with IP68 cable glands and cable to maintain IP68 rating. Unused conduit connections must be properly sealed to prevent water ingress. For added protection, dielectric gel can be used to pot the sensor terminal block.

Example 2: Installing flowmeters into explosion proof/flameproof areas. Conduit connections and conduit must be rated for use in the hazardous area to maintain flowmeter approval rating.

Conduit Cables

Run the appropriate size cable through the conduit connections in your magnetic flowmeter system. Run the power cable from the power source to the transmitter. Do not run power cables and output signal cables in the same conduit. For remote mount installations, run the coil drive and electrode cables between the flowmeter and transmitter. Refer to Electrical Considerations for wire type. Prepare the ends of the coil drive and electrode cables as shown in Figure 2-3. Limit the unshielded wire length to 1-in. on both the electrode and coil drive cables. Excessive lead length or failure to connect cable shields can create electrical noise resulting in unstable meter readings.

Figure 2-3. Cable Preparation Detail



Electrical Considerations

Before making any electrical connections to the Rosemount 8732, consider the following standards and be sure to have the proper power supply, conduit, and other accessories. When preparing all wire connections, remove only the insulation required to fit the wire completely under the terminal connection. Removal of excessive insulation may result in an unwanted electrical short to the transmitter housing or other wire connections.

Transmitter Input Power

The 8732 transmitter is designed to be powered by 90-250 V AC, 50–60 Hz or 12–42 V DC. The eighth digit in the transmitter model number designates the appropriate power supply requirement.

Model Number	Power Supply Requirement
1	90-250 V AC
2	12-42 V DC

Supply Wire Temperature Rating
Use 12 to 18 AWG wire. For connections in ambient temperatures exceeding 140 °F (60 °C), use wire rated to at least 194 °F (90 °C).

Disconnects
Connect the device through an external disconnect or circuit breaker. Clearly label the disconnect or circuit breaker and locate it near the transmitter.

Requirements for 90-250 V AC Power Supply

Wire the transmitter according to national, local, and plant electrical requirements for the supply voltage. In addition, follow the supply wire and disconnect requirements on page 2-7.

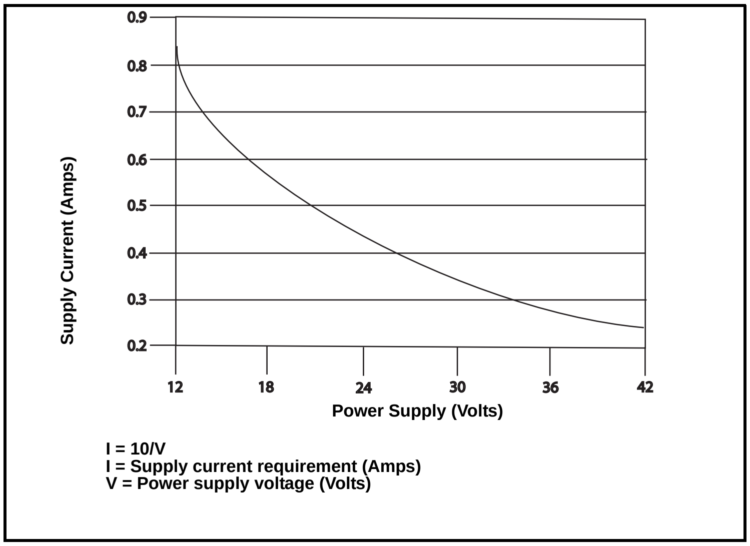
Requirements for 12-42 V DC Power Supply

Units powered with 12-42 V DC may draw up to 1 amp of current. As a result, the input power wire must meet certain gauge requirements.

Figure 2-4 shows the supply current for each corresponding supply voltage. For combinations not shown, you can calculate the maximum distance given the supply current, the voltage of the source, and the minimum start-up voltage of the transmitter, 12 V DC, using the following equation:

$$MaximumResistance = \frac{SupplyVoltage - 12VDC}{1amp}$$

Figure 2-4. Supply Current versus Input Voltage



Installation Category

The installation category for the Rosemount 8732 is (overvoltage) Category II.

Overcurrent Protection

The Rosemount 8732 Flowmeter Transmitter requires overcurrent protection of the supply lines. Maximum ratings of overcurrent devices are as follows:

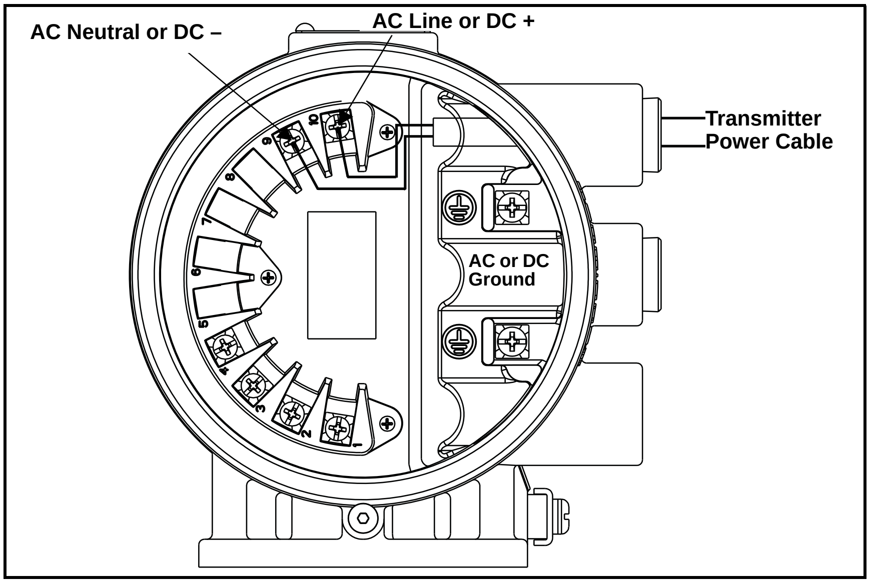
Power System	Fuse Rating	Manufacturer
110 V AC	250 V; 1 Amp, Quick Acting	Bussman AGCI or Equivalent
220 V AC	250 V; 2 Amp, Quick Acting	Bussman AGCI or Equivalent
42 V DC	50 V, 3 Amp, Quick Acting	Bussman AGCI or Equivalent

Connect Transmitter Power

To connect power to the transmitter, complete the following steps.

1. Ensure that the power source and connecting cable meet the requirements outlined on page 2-8.
2. Turn off the power source.
3. Open the power terminal cover.
4. Run the power cable through the conduit to the transmitter.
5. Connect the power cable leads as shown in Figure 2-5.
   a. Connect AC Neutral or DC- to terminal 9.
   b. Connect AC Line or DC+ to terminal 10.
   c. Connect AC Ground or DC Ground to the ground screw mounted inside the transmitter enclosure.

Figure 2-5. AC Transmitter Power Connections



Connect FOUNDATION fieldbus Wiring

The FOUNDATION fieldbus signal provides the output information from the transmitter.

Transmitter Communication Input

The FOUNDATION fieldbus communication requires a minimum of 9 V dc and a maximum of 32 V dc at the transmitter communication terminals.

NOTES

- **Do not** exceed 32 V dc at the transmitter communication terminals.
- **Do not** apply ac line voltage to the transmitter communication terminals.

Improper supply voltage can damage the transmitter.

Power Conditioning

Each fieldbus power supply **requires** a power conditioner to decouple the power supply output from the fieldbus wiring segment.

Field Wiring

⚠ Power independent of the coil power supply must be supplied for FOUNDATION fieldbus communications. Use shielded, twisted pair for best results. For new installations or to get maximum performance, twisted pair cable designed especially for fieldbus should be used. Table 2-1 details cable characteristics and ideal specifications.

Table 2-1.
Ideal Cable Specifications for Fieldbus Wiring

Characteristic	Ideal Specification
Impedance	100 Ohms ± 20% at 31.25 kHz
Wire Size	18 AWG (0,8 mm^2)
Shield Coverage	90%
Attenuation	3 db/km
Capacitive Unbalance	2 nF/km

⚠ See “Safety Messages” on page 2-1 for complete warning information.

NOTE
The number of devices on a fieldbus segment is limited by the power supply voltage, the resistance of the cable, and the amount of current drawn by each device.

Transmitter Wiring Connection

To connect the 8732 to the FOUNDATION fieldbus (FF) segment, complete the following steps.

1. Ensure that the power source and connecting cable meet the requirements outlined above and in "Field Wiring" on page 2-8.
2. Turn off the transmitter and power sources.
3. Run the FOUNDATION fieldbus cable into the transmitter.
4. Connect -FF to Terminal 1.
5. Connect +FF to Terminal 2.

NOTE
Foundation fieldbus signal wiring for the 8732 is not polarity sensitive.

Refer to Figure 2-6 on page 2-9.

Figure 2-6. FOUNDATION fieldbus Signal Connections

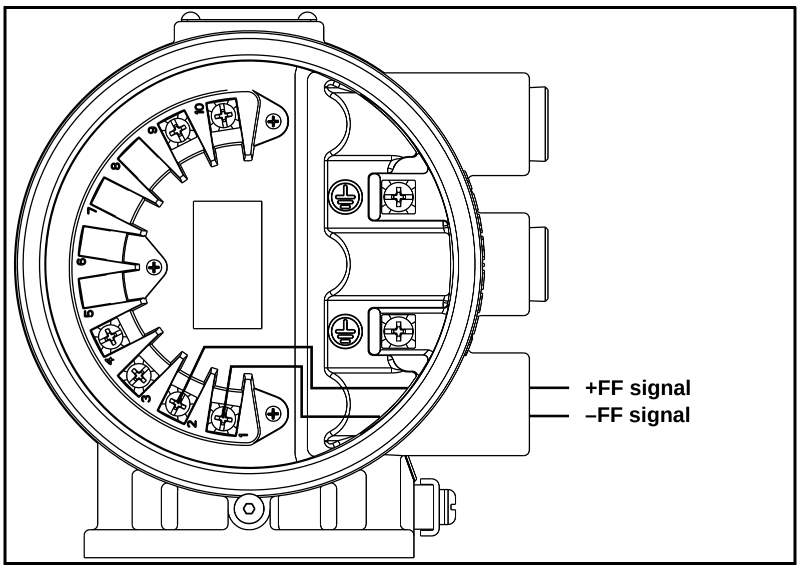
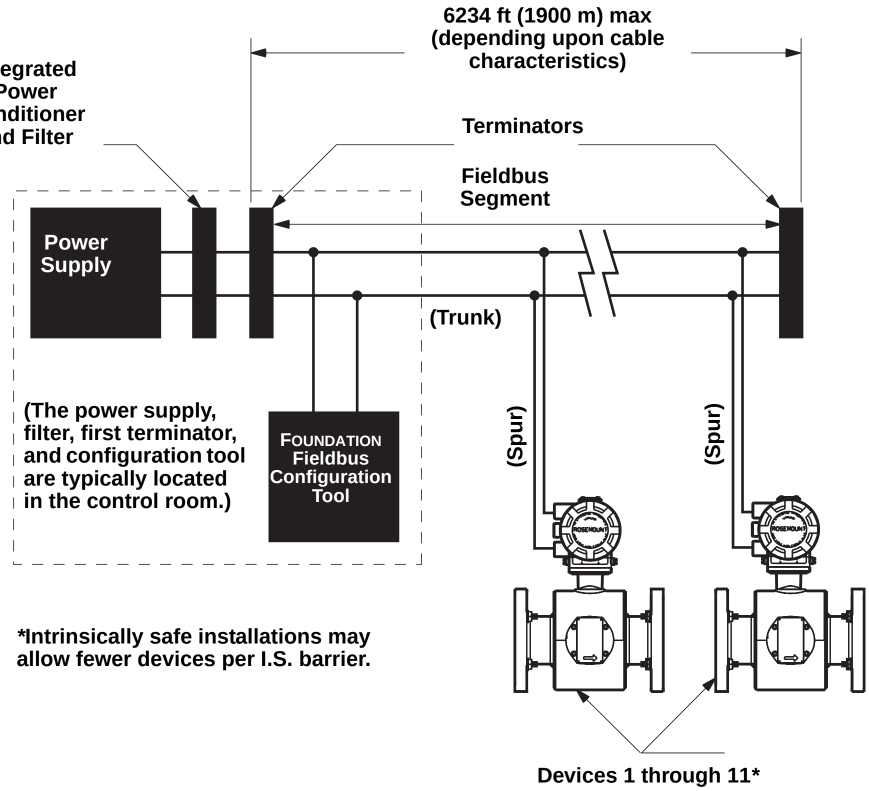


Figure 2-7. Rosemount 8732 Transmitter Field Wiring



SENSOR CONNECTIONS

This section covers the steps required to physically install the transmitter including wiring and calibration.

Rosemount Sensors

To connect the transmitter to a non-Rosemount sensor, refer to the appropriate wiring diagram in “Universal Sensor Wiring Diagrams” on page E-1. The calibration procedure listed is not required for use with Rosemount sensors.

Transmitter to Sensor Wiring

Flanged and wafer sensors have two conduit ports as shown in Figure 2-8. Either one may be used for both the coil drive and electrode cables. Use the stainless steel plug that is provided to seal the unused conduit port. Use Teflon tape or thread sealant appropriate for the installation when sealing the conduit.

A single dedicated conduit run for the coil drive and electrode cables is needed between a sensor and a remote transmitter. Bundled cables in a single conduit are likely to create interference and noise problems in your system. Use one set of cables per conduit run. See Figure 2-8 for proper conduit installation diagram and Table 2-2 for recommended cable. For integral and remote wiring diagrams refer to Figure 2-10.

Figure 2-8. Conduit Preparation

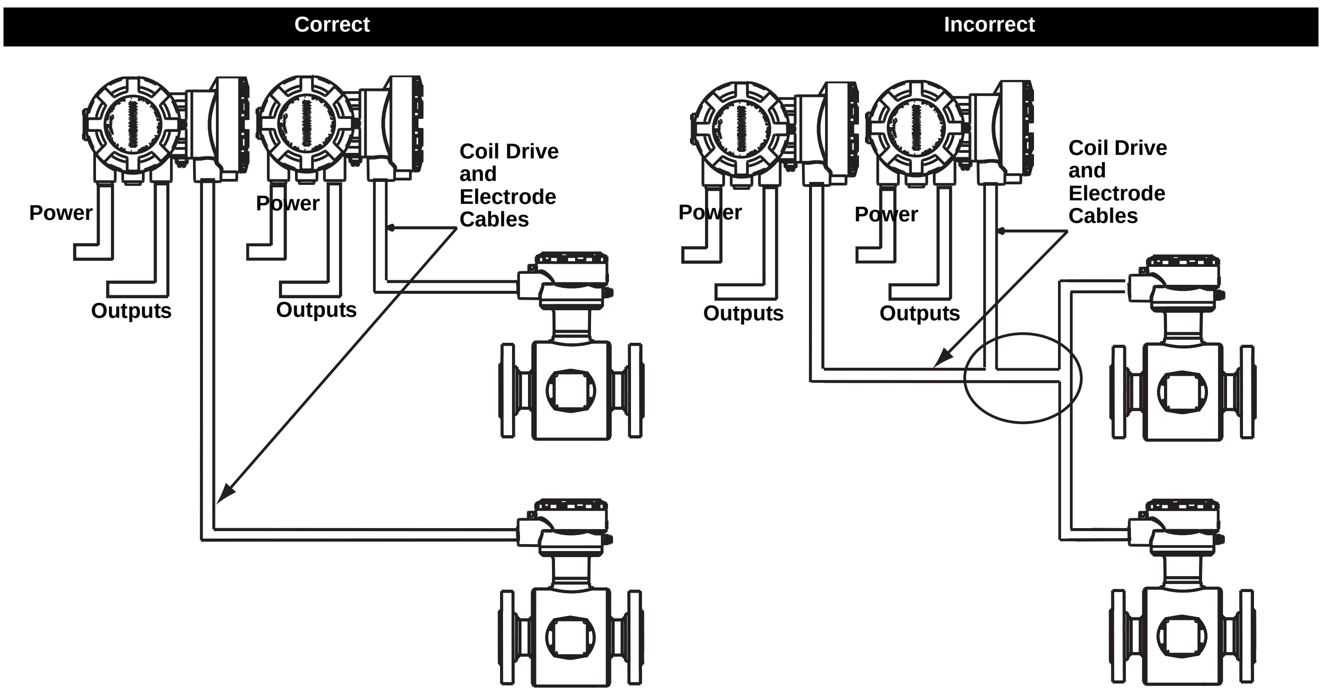


Table 2-2. Cable Requirements

Description	Units	Part Number
Signal Cable (20 AWG) Belden 8762, Alpha 2411 equivalent	ft m	08712-0061-0001 08712-0061-0003
Coil Drive Cable (14 AWG) Belden 8720, Alpha 2442 equivalent	ft m	08712-0060-0001 08712-0060-0003
Combination Signal and Coil Drive Cable (18 AWG)(1)	ft m	08712-0752-0001 08712-0752-0003

(1) *Combination signal and coil drive cable is not recommended for high-signal magmeter system. For remote mount installations, combination signal and coil drive cable should be limited to less than 330 ft. (100 m).*

Rosemount recommends using the combination signal and coil drive for N5, E5 approved sensors for optimum performance.

Remote transmitter installations require equal lengths of signal and coil drive cables. Integrally mounted transmitters are factory wired and do not require interconnecting cables.

Lengths from 5 to 1,000 feet (1.5 to 300 meters) may be specified, and will be shipped with the sensor.

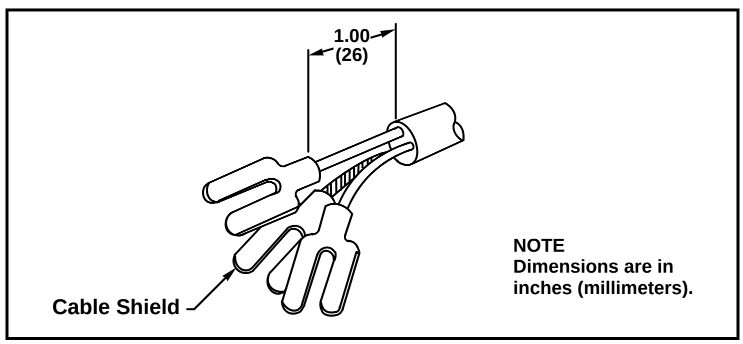
Conduit Cables

Run the appropriate size cable through the conduit connections in your magnetic flowmeter system. Run the power cable from the power source to the transmitter. Run the coil drive and electrode cables between the sensor and transmitter.

Prepare the ends of the coil drive and electrode cables as shown in Figure 2-9. Limit the unshielded wire length to 1-inch on both the electrode and coil drive cables.

NOTE
Excessive lead length or failure to connect cable shields can create electrical noise resulting in unstable meter readings.

Figure 2-9. Cable Preparation Detail

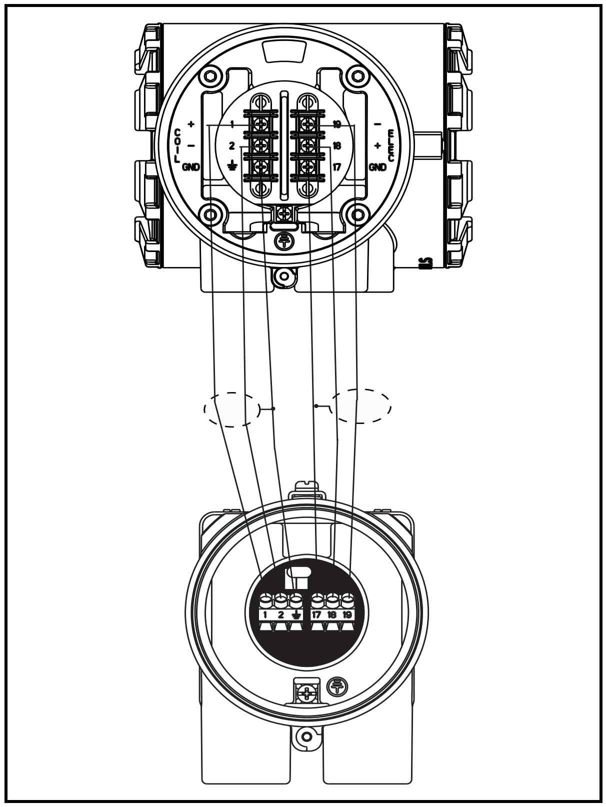


Sensor to Remote Mount Transmitter Connections

Connect coil drive and electrode cables as shown in Figure 2-10.

⚠ **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.

Figure 2-10. Wiring Diagram



Rosemount 8732 Transmitter	Rosemount 8705/8707/8711/8721 Sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

Section 3 Configuration

INTRODUCTION

This section covers basic operation, software functionality, and configuration procedures for the Rosemount 8732 Magnetic Flowmeter Transmitter. For information on connecting another manufacturer's flowtube sensor, refer to "Universal Sensor Wiring Diagrams" on page E-1.

The Rosemount 8732 features a full range of software functions for configuration of output from the transmitter. Software functions are accessed through the LOI, AMS, a Handheld Communicator, or a control system. Configuration variables may be changed at any time and specific instructions are provided through on-screen instructions.

Table 3-1. Parameters

Basic Set-up Parameters	Page
Review	page 3-5
Process Variables	page 3-5
Basic Setup	page 3-7
Flow Units	page 3-7
Range Values	page 3-10
PV Sensor/Flowtube Sensor Calibration Number	page 3-11
Totalizer Setup	page 3-6

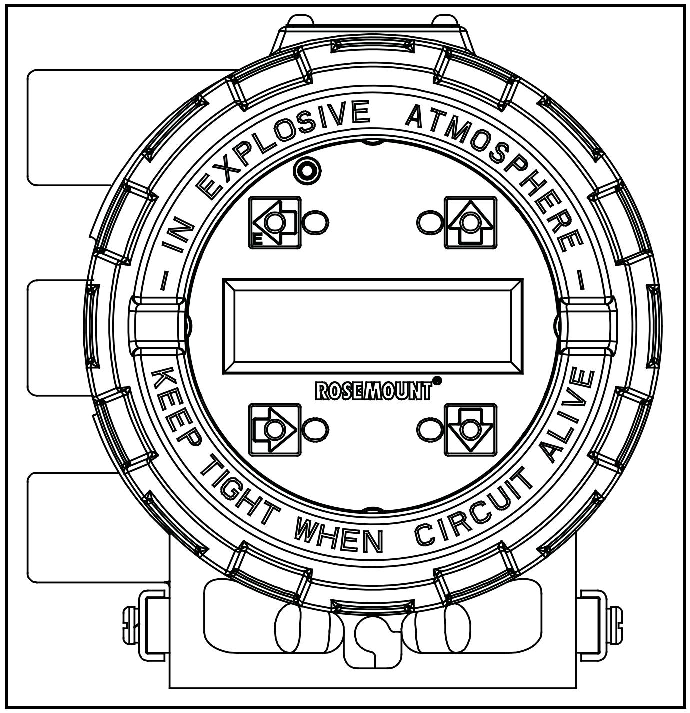
LOCAL OPERATOR INTERFACE

The optional Local Operator Interface (LOI) provides an operator communications center for the 8732. By using the LOI, the operator can access any transmitter function for changing configuration parameter settings, checking totalized values, or other functions. The LOI is integral to the transmitter electronics.

BASIC FEATURES

The basic features of the LOI include 4 navigational arrow keys that are used to access the menu structure. See Figure 3-1.

Figure 3-1. Local Operator Interface Keypad



Data Entry

The LOI keypad does not have numerical keys. Numerical data is entered by the following procedure.

1. Access the appropriate function.
2. Use the **RIGHT ARROW** key to move to the value to change.
3. Use the **UP** and **DOWN ARROWS** to change the highlighted 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**.
4. Use the **RIGHT ARROWS** to highlight other digits you want to change and change them.
5. Press **"E"** (the left arrow key) when all changes are complete to save the entered values.

LOI EXAMPLES

Use the **DOWN ARROW** to access the menu structure in Table 3-2. Use the **ARROW KEYS** to select the desired parameters to review/change. Parameters are set in one of two ways, Table Values or Select Values.

Table Values:
Parameters such as units, that are available from a predefined list

Select Values:
Parameters that consist of a user-created number or character string, such as calibration number; values are entered one character at a time using the **ARROW KEYS**.

Table Value Example

Setting the TUBE SIZE:

1. Press the **DOWN** arrow to access the menu.
2. Select line size from the Basic set-up menu.
3. Press the **UP** or **DOWN** arrow to increase/decrease (incrementally) the tube size to the next value.
4. When you reach the desired size, press **“E”** (the left arrow).
5. Set the loop to manual if necessary, and press **“E”** again.

After a moment, the LCD will display the new tube size and the maximum flow rate.

Select Value Example

Changing the ANALOG OUTPUT RANGE:

1. Press the **DOWN** arrow to access the menu.
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 2 and 3 until desired number is displayed.
6. Press “**E”**.

After a moment, the LCD will display the new analog output range.

Display Lock

The display can be locked to prevent unintentional configuration changes. The display lock can be activated through a HART communication device, or by holding the UP arrow for 10 seconds. When the display lock is activated, DL will appear in the lower left hand corner of the display. To deactivate the display lock (DL), hold the UP arrow for 10 seconds. Once deactivated, the DL will no longer appear in the lower left hand corner of the display.

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.

Stop Totalizer

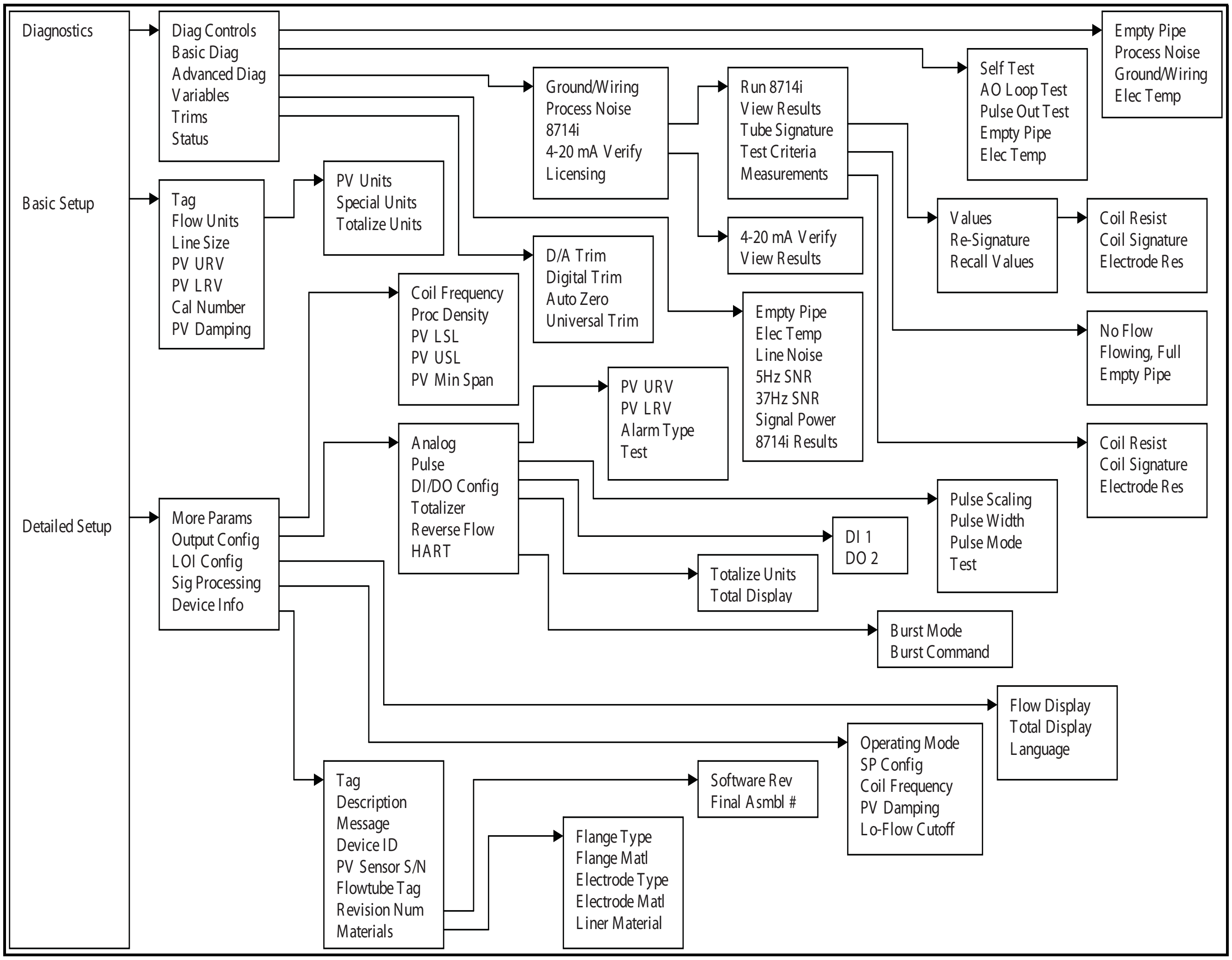
To stop the totalizer, press the **DOWN** arrow to display the totalizer screen and press “E” to end totalization. The flashing symbol will no longer display in the lower right hand corner indicating that the meter has stopped totalizing.

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 total value, you must change the line size. See “Line Size” on page 3-9 for details on how to change the line size.

Table 3-2. LOI Menu Tree



DIAGNOSTIC MESSAGES

The following error messages may appear on the LOI screen. See Table 6-4 on page 6-5 for potential causes and corrective actions for these errors:

- Electronics Failure
- Coil open circuit
- Digital trim failure
- Auto zero failure
- Auto trim failure
- Flowrate > sensor limit
- Analog out of range
- PZR activated
- Electronics Temp Fail
- Pulse out of range
- Empty pipe
- Reverse flow
- Electronics temp out of range

The following error messages may appear on the LOI screen. See Table 6-4 on page 6-5 for potential causes and corrective actions for these errors:

- High Process Noise
- Grounding/Wiring Fault
- 4-20 mA Loop Verification Failed
- 8714i Failed

Review

Fast Keys	1, 5

The 8732 includes a capability that enables you to review the configuration variable settings.

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

NOTE
If you are using the LOI to review variables, each variable must be accessed as if you were going to change its setting. The value displayed on the LOI screen is the configured value of the variable.

PROCESS VARIABLES

Fast Keys	1, 1

The *process variables* measure 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

Process Variable (PV) – The actual measured flow rate in the line. Use the Process Variable 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 “8714i Meter Verification” on page C-8).

Totalizer Setup – Provides a reading of the total flow of the flowmeter since the totalizer was last reset. The totalizer value should be zero during commissioning on the bench, and the units should reflect the volume units of the flow rate. If the totalizer value is not zero, it may need to be reset. This function also allows for configuration of the totalizer parameters.

Pulse Output – The pulse output variable provides the pulse value for the flow rate.

PV - Primary Variable

Fast Keys	1, 1, 1

The *Primary Variable* shows the current measured flow rate. This value determines the analog output from the transmitter.

PV -% Range

Fast Keys	1, 1, 2

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

PV - Analog Output

Fast Keys	1, 1, 3

The *PV Analog Output* displays the mA output of the transmitter corresponding to the measured flow rate.

Totalizer Setup

Fast Keys	1, 1, 4

The *Totalizer Setup* menu allows for the viewing and configuration of the totalizer parameters.

Totalizer Units

Fast Keys	1, 1, 4, 1

Totalizer units allow for the configuration of the units that the totalized value will be displayed as. These units are independent of the flow units.

Measured Gross Total

Fast Keys	1, 1, 4, 2

Measured gross total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter since the totalizer was last reset.

NOTE
To reset the measured gross total value, the line size must be changed.

Measured Net Total

Fast Keys	1, 1, 4, 3

Measured net total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter since the totalizer was last reset. When reverse flow is enabled, the net total represents the difference between the total flow in the forward direction less the total flow in the reverse direction.

Measured Reverse Total

Fast Keys	1, 1, 4, 4

Measured reverse total provides the output reading of the totalizer. This value is the amount of process fluid that has passed through the flowmeter in the reverse direction since the totalizer was last reset. This value is only totalized when reverse flow is enabled.

Start Totalizer

Fast Keys	1, 1, 4, 5

Start totalizer starts the totalizer counting from its current value.

Stop Totalizer

Fast Keys	1, 1, 4, 6

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

Fast Keys	1, 1, 4, 7

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

NOTE
The totalizer value is saved in the Non-Volatile memory of the electronics every three seconds. Should power to the transmitter be interrupted, the totalizer value will start at the last saved value when power is re-applied.

Pulse Output

Fast Keys	1, 1, 5

The *Pulse Output* displays the current value of the pulse signal.

BASIC SETUP

Fast Keys	1, 3

The basic configuration functions of the Rosemount 8732 must be set for all applications of the transmitter in a magnetic flowmeter system. If your application requires the advanced functionality features of the Rosemount 8732, see Section 4 "Operation" of this manual.

Tag

Fast Keys	1, 3, 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

Fast Keys	1, 3, 2

Flow Units set the output units for the Primary Variable which controls the analog output of the transmitter.

Primary Variable Units

Fast Keys	1, 3, 2, 1

The *Primary Variable Units* specifies the format in which the flow rate will be displayed. Units should be selected to meet your particular metering needs.

Options for Flow Rate Units

• ft/sec	• B31/sec (1 Barrel = 31.5 gallons)
• m/sec	• B31/min (1 Barrel = 31.5 gallons)
• gal/sec	• B31/hr (1 Barrel = 31.5 gallons)
• gal/min	• B31/day (1 Barrel = 31.5 gallons)
• gal/hr	• lbs/sec
• gal/day	• lbs/min
• l/sec	• lbs/hr
• l/min	• lbs/day
• l/hr	• kg/sec
• l/day	• kg/min
• ft^3/sec	• kg/hr
• ft^3/min	• kg/day
• ft^3/hr	• (s)tons/min
• ft^3/day	• (s)tons/hr
• m^3/sec	• (s)tons/day
• m^3/min	• (m)tons/min
• m^3/hr	• (m)tons/hr
• m^3/day	• (m)tons/day
• Impgal/sec	• Special (User Defined, see "Special Units" on page 3-8)
• Impgal/min	
• Impgal/hr	
• Impgal/day	
• B42/sec (1 Barrel = 42 gallons)	
• B42/min (1 Barrel = 42 gallons)	
• B42/hr (1 Barrel = 42 gallons)	
• B42/day (1 Barrel = 42 gallons)	

Special Units

Fast Keys	1, 3, 2, 2

The Rosemount 8732 provides a selection of standard unit configurations that meet the needs of most applications (see "Flow Units" on page 3-7). If your application has special needs and the standard configurations do not apply, the Rosemount 8732 provides the flexibility to configure the transmitter in a custom-designed units format using the *special units* variable.

Special Volume Unit

Fast Keys	1, 3, 2, 2, 1

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.

Base Volume Unit

Fast Keys	1, 3, 2, 2, 2

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

Conversion Number

Fast Keys	1, 3, 2, 2, 3

The special units *conversion number* is used to convert base units to special units. For a straight conversion of volume units from one to another, the conversion number 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.

Base Time Unit

Fast Keys	1, 3, 2, 2, 4

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.

Special Flow Rate Unit

Fast Keys	1, 3, 2, 2, 5

Special 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 8732 LOI will display the four character designation as configured.

Example

To display flow in barrels per hour, and one barrel is equal to 31.0 gallons, the procedure would be:

Set the Volume Unit to BARL.
Set the Base Volume Unit to gallons.
Set the Input Conversion Number to 31.
Set the Time Base to Hour.
Set the Rate Unit to BR/H.

Line Size

Fast Keys	1, 3, 3

The *line size* (flowtube sensor size) must be set to match the actual flowtube sensor connected to the transmitter. The size must be specified in inches according to the available sizes listed below. If a value is entered from a control system or Handheld Communicator that does not match one of these figures, the value will go to the next highest option.

The line size (inches) options are as follows:

0.1, 0.15, 0.25, 0.30, 0.50, 0.75, 1, 1.5, 2, 2.5, 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 30, 32, 36, 40, 42, 44, 48, 54, 56, 60, 64, 72, 80

PV URV (Upper Range Value)

Fast Keys	1, 3, 4

The *upper range value* (URV), or analog output range, is preset to 30 ft/s at the factory. The units that appear will be the same as those selected under the units parameter.

The URV (20 mA point) can be set for both forward or reverse flow rate. Flow in the forward direction is represented by positive values and flow in the reverse direction is represented by negative values. The URV can be any value from –39.3 ft/s to +39.3 ft/s (-12 m/s to +12 m/s), as long as it is at least 1 ft/s (0.3 m/s) from the lower range value (4 mA point). The URV can be set to a value less than the lower range value. This will cause the transmitter analog output to operate in reverse, with the current increasing for lower (or more negative) flow rates.

NOTE
Line size, special units, and density must be selected prior to configuration of URV and LRV.

PV LRV (Lower Range Value)

Fast Keys	1, 3, 5

Set the *lower range value* (LRV), or analog output zero, to change the size of the range (or span) between the URV and LRV. Under normal circumstances, the LRV should be set to a value near the minimum expected flow rate to maximize resolution. The LRV must be between –39.3 ft/s to +39.3 ft/s (-12 m/s to +12 m/s).

NOTE
Line size, special units, and density must be selected prior to configuration of URV and LRV.

Example

If the URV is greater than the LRV, the analog output will saturate at 3.9 mA when the flow rate falls below the selected 4 mA point.

The minimum allowable span between the URV and LRV is 1 ft/s (0.3 m/s). Do not set the LRV within 1 ft/s (0.3 m/s) of the 20 mA point. For example, if the URV is set to 15.67 ft/s (4.8 m/s) and if the desired URV is greater than the LRV, then the highest allowable analog zero setting would be 14.67 ft/s (4.5 m/s). If the desired URV is less than the LRV, then the lowest allowable LRV would be 16.67 ft/s (5.1 m/s).

Calibration Number

Fast Keys	1, 3, 6

The tube *calibration number* is a 16-digit number used to identify flowtube sensors calibrated at the Rosemount factory. The calibration number is also printed inside the flowtube sensor terminal block or on the flowtube sensor name plate. The number provides detailed calibration information to the Rosemount 8732. To function properly within accuracy specifications, the number stored in the transmitter must match the calibration number on the flowtube sensor exactly.

NOTE
Flowtube Sensors from manufacturers other than Rosemount Inc. can also be calibrated at the Rosemount factory. Check the tube for Rosemount calibration tags to determine if a 16-digit tube calibration number exists for your flowtube sensor.

NOTE
Be sure the calibration number reflects a calibration to a Rosemount reference transmitter. If the calibration number was generated by a means other than a certified Rosemount flow lab, accuracy of the system may be compromised.

If your flowtube sensor is not a Rosemount flowtube sensor and was not calibrated at the Rosemount factory, contact your Rosemount representative for assistance.

If your flowtube sensor is imprinted with an eight-digit number or a k-factor, check in the flowtube sensor wiring compartment for the sixteen-digit calibration number. If there is no serial number, contact the factory for a proper conversion.

PV Damping

Fast Keys	1, 3, 7

Adjustable between 0.0 and 256 seconds

PV 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.

Section 4 Operation

INTRODUCTION

This section contains information for advanced configuration parameters and diagnostics.

The software configuration settings for the Rosemount 8732 can be accessed through a 375 Field Communicator or through a control system. The software functions for the 375 Field Communicator are described in detail in this section of the manual. It provides an overview and summary of communicator functions. For more complete instructions, see the communicator manual. Before operating the Rosemount 8732 in an actual installation, you should review all of the factory set configuration data to ensure that they reflect the current application.

DIAGNOSTICS

375	Transducer Block

Diagnostics are used to verify that the transmitter is functioning properly, to assist in troubleshooting, to identify potential causes of error messages, and to verify the health of the transmitter and sensor. Diagnostic tests can be initiated through the use of a 375 Field Communicator or through the control system.

Rosemount offers several different diagnostic suites providing various functionality.

Standard diagnostics included with every Rosemount 8732 transmitter are Empty Pipe detection, Electronics Temperature monitoring, Coil Fault detection, and various loop and transmitter tests.

Advanced diagnostics suite option one (D01 option) contains advanced diagnostics for High Process Noise detection and Grounding and Wiring fault detection.

Advanced diagnostics suite option two (D02 option) contains advanced diagnostics for the 8714i Meter Verification. This diagnostic is used to verify the accuracy and performance of the magnetic flow meter installation.

Diagnostic Controls

375	Transducer Block, Diagnostics

The diagnostic controls menu provides a centralized location for enabling or disabling each of the diagnostics that are available. Note that for some diagnostics to be available, a diagnostics suite package is required.

Empty Pipe Detection

Turn the empty pipe diagnostic on or off as required by the application. For more details on the empty pipe diagnostic, see Appendix C: Diagnostics.

Electronics Temperature Out of Range

Turn the electronics temperature diagnostic on or off as required by the application. For more details on the electronics temperature diagnostic, see Appendix C: Diagnostics.

High Process Noise Detection

Turn the high process noise diagnostic on or off as required by the application. For more details on the high process noise diagnostic, see Appendix C: Diagnostics.

Grounding / Wiring Fault Detection

Turn the grounding / wiring diagnostic on or off as required by the application. For more details on the grounding / wiring diagnostic, see Appendix C: Diagnostics.

Basic Diagnostics

375	Transducer Block, Diagnostics

The basic diagnostics menu contains all of the standard diagnostics and tests that are available in the 8732E transmitter.

Empty Pipe Limits

375	Transducer Block, Diagnostics, Basic Diagnostics

Empty Pipe allows you to view the current value and configure the diagnostic parameters. For more detail on this parameter see Appendix C: Diagnostics.

EP Value

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits

Read the current Empty Pipe Value. This number is a unitless number and is calculated based on multiple installation and process variables. For more detail on this parameter see Appendix C: Diagnostics.

EP Trigger Level

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits

Limits: 3 to 2000

Configure the threshold limit that the empty pipe value must exceed before the diagnostic alert activates. Default from the factory is set to 100. For more detail on this parameter see Appendix C: Diagnostics.

EP Counts

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits

Limits: 5 to 50

Configure the number of consecutive times that the empty pipe value must exceed the empty pipe trigger level before the diagnostic alert activates. Counts are taken at 1.5 second intervals. Default from the factory is set to 5. For more detail on this parameter see Appendix C: Diagnostics.

Electronics Temp Value

375	Transducer Block, Diagnostics, Basic Diagnostics

Electronics Temperature allows you to view the current value for the electronics temperature.

Advanced Diagnostics

375	Transducer Block, Diagnostics

The advanced diagnostics menu contains information on all of the additional diagnostics and tests that are available in the 8732 transmitter if one of the diagnostics suite packages was ordered.

Rosemount offers two advanced diagnostic suites. Functionality under this menu will depend on which of these suites are ordered.

Advanced diagnostics suite option one (D01 option) contains advanced diagnostics for High Process Noise detection and Grounding and Wiring fault detection.

Advanced diagnostics suite option two (D02 option) contains advanced diagnostics for the 8714i Meter Verification. This diagnostic is used to verify the accuracy and performance of the magnetic flow meter installation.

8714i Meter Verification

375	Transducer Block, Diagnostics, Advanced Diagnostics

This diagnostic allows you to test and verify that the sensor, transmitter, or both are working within specifications. For more details on this diagnostic, see Appendix C: Diagnostics.

Run 8714i

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification

Run the meter verification test to check the transmitter, sensor, or entire installation.

Full Meter Verification
Run the internal meter verification to check the entire installation, sensor and transmitter at the same time.

Transmitter Only
Run the internal meter verification to check the transmitter only.

Sensor Only
Run the internal meter verification to check the sensor only.

8714i Results

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification**

Review the results of the most recently performed 8714i Meter Verification test. Information in this section details the measurements taken and if the meter passed the verification test. For more details on these results and what they mean, see Appendix C: Diagnostics.

Test Condition

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the conditions that the 8714i Meter Verification test was performed under. For more details on this parameter see Appendix C: Diagnostics.

Test Criteria

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the criteria that the 8714i Meter Verification test was performed against. For more details on this parameter see Appendix C: Diagnostics.

8714i Result

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the results of the 8714i Meter Verification test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Simulated Velocity

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the test velocity used to verify transmitter calibration. For more details on this parameter see Appendix C: Diagnostics.

Actual Velocity

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the velocity measured by the transmitter during the transmitter calibration verification test. For more details on this parameter see Appendix C: Diagnostics.

Velocity Deviation

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the deviation of the transmitter calibration verification test. For more details on this parameter see Appendix C: Diagnostics.

Transmitter Calibration Result

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the result of the transmitter calibration verification test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Sensor Calibration Deviation

375	**Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results**

Displays the deviation of the sensor calibration verification test. For more details on this parameter see Appendix C: Diagnostics.

Sensor Calibration Result

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results

Displays the result of the sensor calibration verification test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Coil Circuit Result

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results

Displays the result of the coil circuit test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Electrode Circuit Result

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results

Displays the result of the electrode circuit test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Sensor Signature

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification

The sensor signature describes the sensor characteristics to the transmitter and is an integral part of the sensor meter verification test. From this menu you can view the current stored signature, have the transmitter take and store the sensor signature, and re-call the last saved good values for the sensor signature. For more details on this parameter see Appendix C: Diagnostics.

Signature Values

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature

Review the current values stored for the sensor signature. For more details on this parameter see Appendix C: Diagnostics.

Coil Resistance

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Signature Values

View the reference value for the coil resistance taken during the sensor signature process.

Coil Signature

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Signature Values

View the reference value for the coil signature taken during the sensor signature process.

Electrode Resistance

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Signature Values

View the reference value for the electrode resistance taken during the sensor signature process.

Re-Signature Meter

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature

Have the transmitter measure and store the sensor signature values. These values will then be used as the baseline for the meter verification test. Use this when connecting to older Rosemount or competitors' sensors or installing the magnetic flowmeter system for the first time. For more details on this parameter see Appendix C: Diagnostics.

Recall Last Saved Values

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature

Recalls the last saved "good" values for the sensor signature.

Set Pass/Fail Criteria

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification

Set the maximum allowable deviation percentage test criteria for the 8714i Meter Verification test. There are three tests that this criteria can be set for:

- Full Pipe; No Flow (Best test condition) – Default is 2%
- Full Pipe; Flowing – Default is 3%
- Empty Pipe – Default is 5%

NOTE
If the 8714i Meter Verification test is done with an empty pipe, the electrode circuit will NOT be tested.

No Flow Limit

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Set Pass/Fail Criteria

Limits: 1 to 10 percent

Set the pass/fail test criteria for the 8714i Meter Verification test at Full Pipe, No Flow conditions.

Flowing Limit

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Set Pass/Fail Criteria

Limits: 1 to 10 percent

Set the pass/fail test criteria for the 8714i Meter Verification test at Full Pipe, Flowing conditions.

Empty Pipe Limit

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Set Pass/Fail Criteria

Limits: 1 to 10 percent

Set the pass/fail test criteria for the 8714i Meter Verification test at Empty Pipe conditions.

Measurements

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification

View the measured values taken during the meter verification process. These values are compared to the signature values to determine if the test passes or fails. Values are shown for the Coil Resistance, Coil Signature, and Electrode Resistance.

Coil Resistance

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, measurements

View the measured value for the coil resistance taken during the meter verification test.

Coil Signature

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, measurements

View the measured value for the coil signature taken during the meter verification test.

Electrode Resistance

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, measurements

View the measured value for the electrode resistance taken during the meter verification test.

Licensing

375	Transducer Block, Diagnostics, Advanced Diagnostics

If a diagnostic suite was not ordered initially, advanced diagnostics can be licensed in the field. Access the licensing information from this menu. For more details on licensing, see Appendix C: Diagnostics.

License Status

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing

Determine if a diagnostics suite has been licensed, and if so, which diagnostics are available for activation.

License Key

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing

A license key is required to activate diagnostics in the field if the diagnostic suite was not initially ordered. This menu allows for gathering of necessary data to generate a license key and also the ability to enter the license key once it has been received.

Device ID

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing, License Key

This function displays the Device ID and Software Revision for the transmitter. Both of these pieces of information are required to generate a license key.

License Key

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing, License Key

Allows you to enter a license key to activate a diagnostic suite.

Diagnostic Variables

375	Transducer Block, Diagnostics

From this menu, all of the diagnostic variable values can be reviewed. This information can be used to get more information about the transmitter, sensor, and process, or to get more detail about an alert that may have activated.

Empty Pipe Value

375	Transducer Block, Diagnostics, Diagnostic Variables

Read the current value of the Empty Pipe parameter. This value will read zero if Empty Pipe is turned off.

Electronics Temperature

375	Transducer Block, Diagnostics, Diagnostic Variables

Read the current value of the Electronics Temperature.

Line Noise

375	Transducer Block, Diagnostics, Diagnostic Variables

Read the current value of the amplitude of AC line noise measured on the transmitter's electrode inputs. This value is used in the grounding / wiring diagnostic.

5Hz SNR

375	Transducer Block, Diagnostics, Diagnostic Variables

Read the current value of the signal to noise ratio at 5 Hz. For optimum performance, a value greater than 100 is preferred. Values less than 25 will cause the High Process Noise alert to activate.

37Hz SNR

375	Transducer Block, Diagnostics, Diagnostic Variables

Read the current value of the signal to noise ratio at 37.5 Hz. For optimum performance, a value greater than 100 is preferred. Values less than 25 will cause the High Process Noise alert to activate.

Signal Power

375	Transducer Block, Diagnostics, Diagnostic Variables

Read the current value of the velocity of the fluid through the sensor. Higher velocities result in greater signal power.

8714i Results

375	Transducer Block, Diagnostics, Diagnostic Variables

Review the results of the 8714i Meter Verification tests. For more details on these results and what they mean, see Appendix C: Diagnostics.

Test Condition

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the conditions that the 8714i Meter Verification test was performed under. For more details on this parameter see Appendix C: Diagnostics.

Test Criteria

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the criteria that the 8714i Meter Verification test was performed against. For more details on this parameter see Appendix C: Diagnostics.

8714i Result

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the results of the 8714i Meter Verification test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Simulated Velocity

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the test velocity used to verify transmitter calibration. For more details on this parameter see Appendix C: Diagnostics.

Actual Velocity

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the velocity measured by the transmitter during the transmitter calibration verification test. For more details on this parameter see Appendix C: Diagnostics.

Velocity Deviation

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the deviation of the transmitter calibration verification test. For more details on this parameter see Appendix C: Diagnostics.

Transmitter Calibration Result

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the result of the transmitter calibration verification test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Sensor Calibration Deviation

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the deviation of the sensor calibration verification test. For more details on this parameter see Appendix C: Diagnostics.

Sensor Calibration Result

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the result of the sensor calibration verification test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Coil Circuit Result

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the result of the coil circuit test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Electrode Circuit Result

375	Transducer Block, Diagnostics, Diagnostic Variables, 8714i Results

Displays the result of the electrode circuit test as pass or fail. For more details on this parameter see Appendix C: Diagnostics.

Trims

375	Transducer Block, Diagnostics

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.

Electronics Trim

375	Transducer Block, Diagnostics, Trims

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

NOTE
Attempting an Electronics trim without a Rosemount 8714 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 power down the Rosemount 8732E to clear the message.

To simulate a nominal sensor with the Rosemount 8714, you must change the following five parameters in the Rosemount 8732E:

1. Sensor Calibration Number—1000015010000000
2. Units—ft/s
3. PV URV—AI EU at 100 = 30.00 ft/s
4. PV LRV—AI EU at 0 = 0 ft/s
5. Coil Drive Frequency—5 Hz

The instructions for changing the Sensor Calibration Number, Units, PV URV, and PV LRV are located in “Basic Setup” on page 3-14. Instructions for changing the Coil Drive Frequency can be found on page 4-12 in this section.

Set the loop to manual, if necessary, before you begin. Complete the following steps:

1. Power down the transmitter.
2. Connect the transmitter to a Rosemount 8714 sensor simulator.
3. Power up the transmitter with the Rosemount 8714 connected and read the flow rate. The electronics need about a 5-minute warm-up time to stabilize.
4. Set the 8714 calibrator to the 30 ft/s setting.
5. The flow rate reading after warm-up should be between 29.97 and 30.03 ft/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 Handheld Communicator. The digital trim takes about 90 seconds to complete. No transmitter adjustments are required.

Auto Zero

375	Transducer Block, Diagnostics, Trims

The auto zero function initializes the transmitter for use with the 37 Hz coil drive mode only. Run this function only with the transmitter and sensor installed in the process. The sensor must be filled with process fluid at zero flow. Before running the auto zero function, be sure the coil drive mode is set to 37 Hz (Auto Zero will not run with the coil drive frequency set at 5 Hz).

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

Universal Trim

375	Transducer Block, Diagnostics, Trims

The universal auto trim function enables the Rosemount 8732E 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 your Rosemount sensor has a 16-digit calibration number, in-process calibration is not required. If it does not, or if your sensor is made by another manufacturer, complete the following steps for in-process calibration.

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.

Status

375	Transducer Block, Diagnostics

Review status information regarding the operation of the transducer block. This is where additional information can be reviewed regarding transmitter health and diagnostic messages.

ADVANCED CONFIGURATION

In addition to the basic configuration options and the diagnostic information and controls, the 8732 has many advanced functions that can also be configured as required by the application.

DETAILED SETUP

375	Transducer Block

The detailed setup function provides access to other parameters within the transmitter that can be configured such as coil drive frequency, output parameters, local display configuration, and other general information about the device.

Additional Parameters

375	Transducer Block, Detailed Setup

The additional parameters menu provides a means to configure optional parameters within the 8732E transmitter.

Coil Drive Frequency

375	Transducer Block, Detailed Setup, Additional Params

Coil drive frequency allows pulse-rate selection of the sensor 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 output, increase the coil drive frequency to 37 Hz. If the 37 Hz mode is selected, perform the auto zero function.

Density Value

375	Transducer Block, Detailed Setup, Additional Params

The density value is used to convert from a volumetric flow rate to a mass flow rate using the following equation:

$Q_m = Q_v \times \rho$

Where:

Q_m is the mass flow rate

Q_v is the volumetric flow rate, and

ρ is the fluid density

NOTE
A density value is required to configure the flow units for mass flow rate measurement.

Sensor Range: EU at 100%

375	Transducer Block, Detailed Setup, Additional Params

This parameter is the maximum value that the PV Range value can be set to. This is the upper measuring limit of the transmitter and sensor.

Sensor Range: EU at 0%

375	Transducer Block, Detailed Setup, Additional Params

This parameter is the minimum value that the PV Range value can be set to. This is the lower measuring limit of the transmitter and sensor.

Cal Min Span

375	Transducer Block, Detailed Setup, Additional Params

The PV minimum span is the minimum flow range that must separate the minimum and maximum configured PV Range values.

Reverse Flow

375	Transducer Block, Detailed Setup, Additional Params

Enable or disable the transmitter's ability to read reverse flow.

Reverse Flow allows the transmitter to read negative flow. This may occur when flow in the pipe is going the negative direction, or when either electrode wires or coil wires are reversed. This also enables the totalizer to count in the reverse direction.

Display Language

375	Transducer Block, Detailed Setup

This allows you to configure the language shown on the display. There are five options available:

- English
- Spanish
- Portuguese
- German
- French

Signal Processing

375	Transducer Block, Detailed Setup

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

Operating Mode

375	Transducer Block, Detailed Setup, Signal Processing

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.

Man Config DSP

375	Transducer Block, Detailed Setup, Signal Processing

Manually configure the digital signal processing parameters.

The 8732E transmitter includes digital signal processing capabilities that can be used to condition the output from the transmitter by enabling noise rejection. See Appendix D: Digital Signal Processing for more information on the DSP functionality.

Control

375	Transducer Block, Detailed Setup, Signal Processing, Man Config DSP

When ON is selected, the Rosemount 8732E 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. 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 37 Hz. The three parameters that make up signal processing (number of samples, maximum percent limit, and time limit) are described below.

Samples

375	Transducer Block, Detailed Setup, Signal Processing, Man Config DSP

0 to 125 Samples

The number of samples function sets the amount of time that inputs are collected and used to calculate the average value. Each second is divided into tenths (1/10) with the number of samples equaling the number of 1/10 second increments used to calculate the average.

For example, a value of:

1 averages the inputs over the past 1/10 second

10 averages the inputs over the past 1 second

100 averages the inputs over the past 10 seconds

125 averages the inputs over the past 12.5 seconds

% Limit

375	Transducer Block, Detailed Setup, Signal Processing, Man Config DSP

0 to 100 Percent

The maximum percent limit is a tolerance band set up on either side of the running average. The percentage value refers to deviation from the running average. For example, if the running average is 100 gal/min, and a 2 percent maximum limit is selected, then the acceptable range is from 98 to 102 gal/min.

Values within the limit are accepted while values outside the limit are analyzed to determine if they are a noise spike or an actual flow change.

Time Limit

375	Transducer Block, Detailed Setup, Signal Processing, Man Config DSP

0 to 256 Seconds

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 8732E 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. The selected signal processing configuration may be turned ON or OFF to suit your needs.

Coil Drive Frequency

375	Transducer Block, Detailed Setup, Signal Processing

Coil drive frequency allows pulse-rate selection of the sensor 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 output, increase the coil drive frequency to 37 Hz. If the 37 Hz mode is selected, perform the auto zero function with no flow and a full sensor.

Low Flow Cutoff

375	Transducer Block, Detailed Setup, Signal Processing

Low flow cutoff allows you to specify the flow rate, between 0.01 and 38.37 feet per second, below which the outputs are driven to zero flow. The units format for low flow cutoff cannot be changed. It is always displayed as feet per second regardless of the format selected. The low flow cutoff value applies to both forward and reverse flows.

Primary Variable Damping

375	Transducer Block, Detailed Setup, Signal Processing

0 to 256 Seconds

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.

Device Info

375	Transducer Block, Detailed Setup

Information variables are used for identification of flowmeters in the field and to store information that may be useful in service situations. Information variables have no effect on flowmeter output or process variables.

Device ID

375	Transducer Block, Detailed Setup, Device Info

This function displays the Device ID of the transmitter. This is one piece of information required to generate a license code to enable diagnostics in the field.

PV Sensor S/N

375	Transducer Block, Detailed Setup, Device Info

The PV sensor serial number is the serial number of the sensor connected to the transmitter and can be stored in the transmitter configuration for future reference. The number provides easy identification if the sensor needs servicing or for other purposes.

Sensor Tag

375	Transducer Block, Detailed Setup, Device Info

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

DSP Software Rev

375	Transducer Block, Detailed Setup, Device Info

This function displays the software revision number of the transmitter.

Construction Materials

375	Transducer Block, Detailed Setup, Device Info

Construction materials contain information about the sensor that is connected to the transmitter. This information is configured into the transmitter for later reference. This information can be helpful when calling the factory for support.

Flange Type

375	Transducer Block, Detailed Setup, Device Info, Construction Materials

Flange type enables you to select the flange type for your magnetic transmitter system. This variable only needs to be changed if you have changed your sensor. Options for this value are:

• ANSI 150	• PN 10
• ANSI 300	• PN 16
• ANSI 600	• PN 25
• ANSI 900	• PN 40
• ANSI 1500	• PN 64
• ANSI 2500	• Other
• Wafer	

Flange Material

375	Transducer Block, Detailed Setup, Device Info, Construction Materials

Flange material enables you to select the flange material for your magnetic transmitter system. This variable only needs to be changed if you have changed your sensor. Options for this value are:

- Carbon Steel
- 304L Stainless Steel
- 316L Stainless Steel
- Wafer
- Other

Electrode Type

375	Transducer Block, Detailed Setup, Device Info, Construction Materials

Electrode type enables you to select the electrode type for your magnetic transmitter system. This variable only needs to be changed if you have replaced electrodes or if you have replaced your sensor. Options for this value are:

- Standard
- Std & Ground
- Bullet
- Other

Electrode Material

375	Transducer Block, Detailed Setup, Device Info, Construction Materials

Electrode Material enables you to select the electrode material for your magnetic transmitter system. This variable only needs to be changed if you have replaced electrodes or if you have replaced your sensor. Options for this value are:

- 316L SST
- Nickel Alloy 276 (UNS N10276)
- Tantalum
- Titanium
- 80% Platinum – 20% Iridium
- Alloy 20
- Other

Liner Material

375	Transducer Block, Detailed Setup, Device Info, Construction Materials

Liner material enables you to select the liner material for the attached sensor. This variable only needs to be changed if you have replaced your sensor. Options for this value are:

- PTFE
- ETFE
- PFA
- Polyurethane
- Linatex
- Natural Rubber
- Neoprene
- Other

MODE

375	Transducer Block

Set and review the mode configuration for the transducer function block.

Block Mode: Target

375	Transducer Block, Mode

Operator requested mode for the function block. Only one selection may be made. Options include:

Auto
Use this mode when all configuration changes to the block are complete and the transmitter is ready to be returned to service.

OOS
Out of service mode. Use this mode when making configuration changes to parameters found in the function block. This removes the transmitter from operation until the mode is set back to Auto.

Block Mode: Actual

375	Transducer Block, Mode

This is the current mode of the function block. This mode may differ from the Target mode based on operating conditions.

Block Mode: Permitted

375	Transducer Block, Mode

This parameter defines which modes are available for a given function block.

Block Mode: Normal

375	Transducer Block, Mode

Displays the mode that the function block should be set to for normal operation.

Section 5 Sensor Installation

This section covers the steps required to physically install the magnetic sensor. For electrical connections and cabling see Section 2: "Installation". Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

SAFETY MESSAGES

⚠ This symbol is used throughout this manual to indicate that special attention to warning information is required.

⚠WARNING

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 that the operating environment of the sensor and transmitter is consistent with the appropriate hazardous area approval.

Do not connect a Rosemount 8732 to a non-Rosemount sensor that is located in an explosive atmosphere.

⚠WARNING

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 8732 reference manual for any restrictions associated with a safe installation.

Before connecting a Field 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.

Electrical shock can result in death or serious injury

Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

⚠WARNING

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.

To avoid possible damage to the sensor liner ends, do not use metallic or spiral-wound gaskets. 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 limits. Failure to observe these instructions could result in severe damage to the sensor lining and possible sensor replacement.

Emerson Process Management can supply lining protectors to prevent liner damage during removal, installation, and excessive bolt torquing.

SENSOR HANDLING

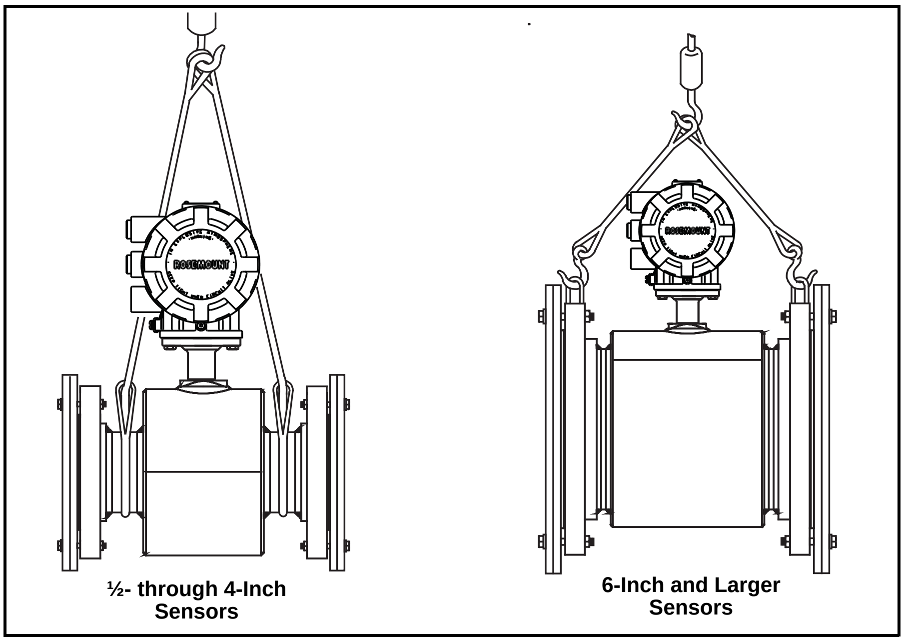
Handle all parts carefully to prevent damage. Whenever possible, transport the system to the installation site in the original shipping containers. PTFE-lined sensors are shipped with end covers that protect it from both mechanical damage and normal unrestrained distortion. Remove the end covers just before installation.

Flanged 6- through 36-inch sensors come with a lifting lug on each flange. The lifting lugs make the sensor easier to handle when it is transported and lowered into place at the installation site.

Flanged ½- to 4-inch sensors do not have lugs. They must be supported with a lifting sling on each side of the housing.

Figure 5-1 shows sensors correctly supported for handling and installation. Notice the plywood end pieces are still in place to protect the sensor liner during transportation.

Figure 5-1. Rosemount 8705 Sensor Support for Handling



See "Safety Messages" on pages 5-1 and 5-2 for complete warning information.

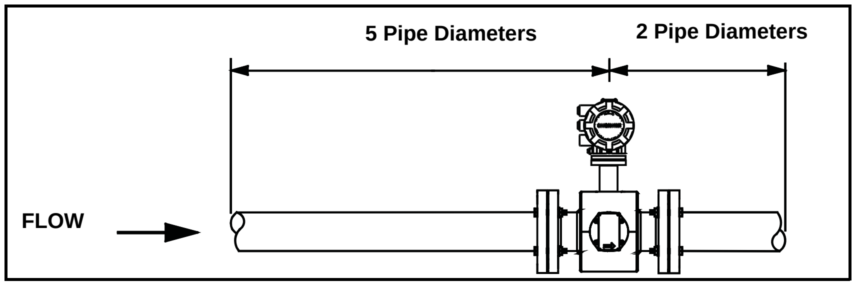
SENSOR MOUNTING

Physical mounting of a sensor is similar to installing a typical section of pipe. Conventional tools, equipment, and accessories (bolts, gaskets, and grounding hardware) are required.

Upstream/Downstream Piping

To ensure specification accuracy over widely varying process conditions, install the sensor a minimum of five straight pipe diameters upstream and two pipe diameters downstream from the electrode plane (see Figure 5-2).

Figure 5-2. Upstream and Downstream Straight Pipe Diameters



Sensor Orientation

The sensor should be installed in a position that ensures the sensor remains full during operation. Figures 5-3, 5-4, and 5-5 show the proper sensor orientation for the most common installations. The following orientations ensure that the electrodes are in the optimum plane to minimize the effects of entrapped gas.

Vertical installation allows upward process fluid flow and is generally preferred. Upward flow keeps the cross-sectional area full, regardless of flow rate. Orientation of the electrode plane is unimportant in vertical installations. As illustrated in Figures 5-3 and 5-4, avoid *downward* flows where back pressure does not ensure that the sensor remains full at all times.

Installations with reduced straight runs from 0 to five pipe diameters are possible. In reduced straight pipe run installations, performance will shift to as much as 0.5% of rate. Reported flow rates will still be highly repeatable.

Figure 5-3. Vertical Sensor Orientation

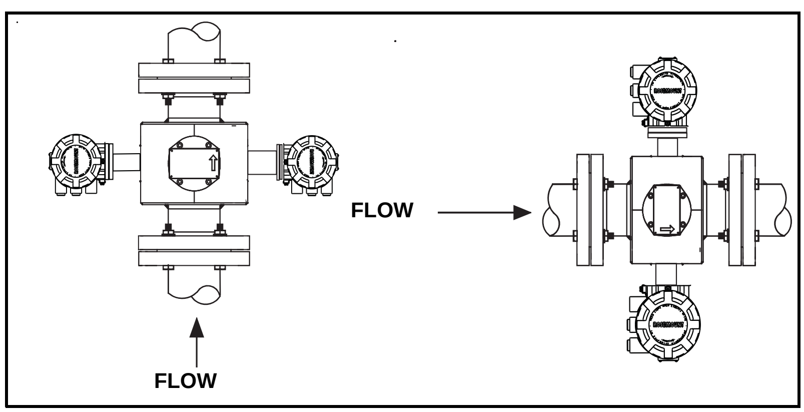
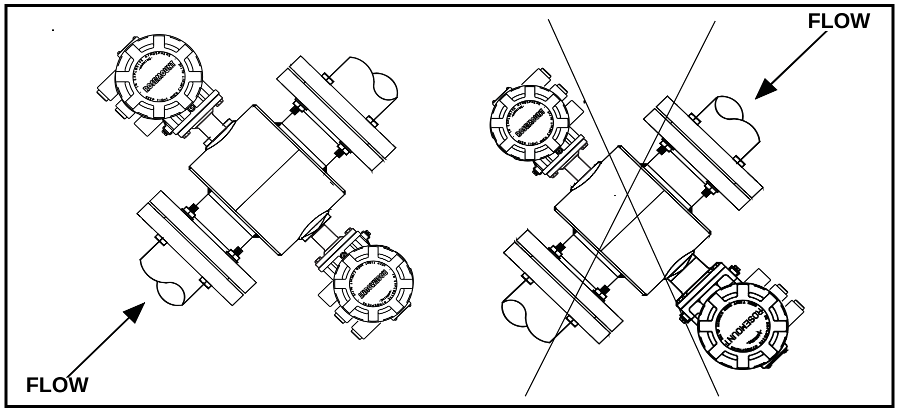
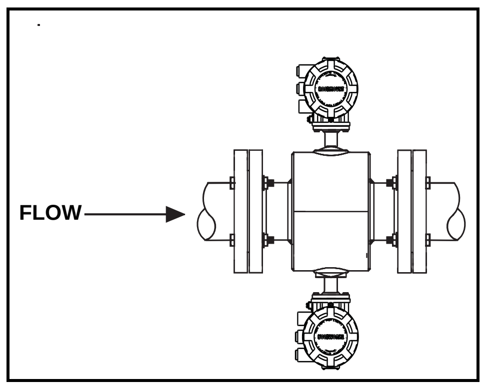


Figure 5-4. Incline or Decline Orientation



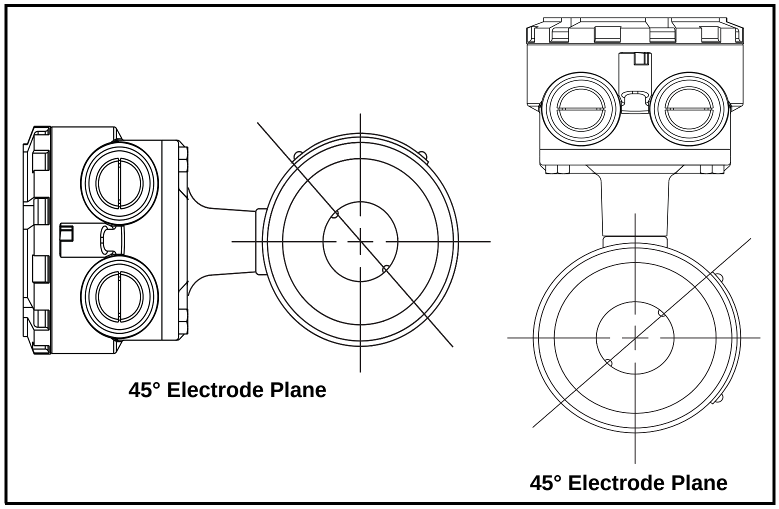
Horizontal installation should be restricted to low piping sections that are normally full. Orient the electrode plane to within 45 degrees of horizontal in horizontal installations. A deviation of more than 45 degrees of horizontal would place an electrode at or near the top of the sensor thereby making it more susceptible to insulation by air or entrapped gas at the top of the sensor.

Figure 5-5. Horizontal Sensor Orientation



The electrodes in the Rosemount 8711 are properly oriented when the top of the sensor is either vertical or horizontal, as shown in Figure 5-6. Avoid any mounting orientation that positions the top of the sensor at 45 degrees from the vertical or horizontal position.

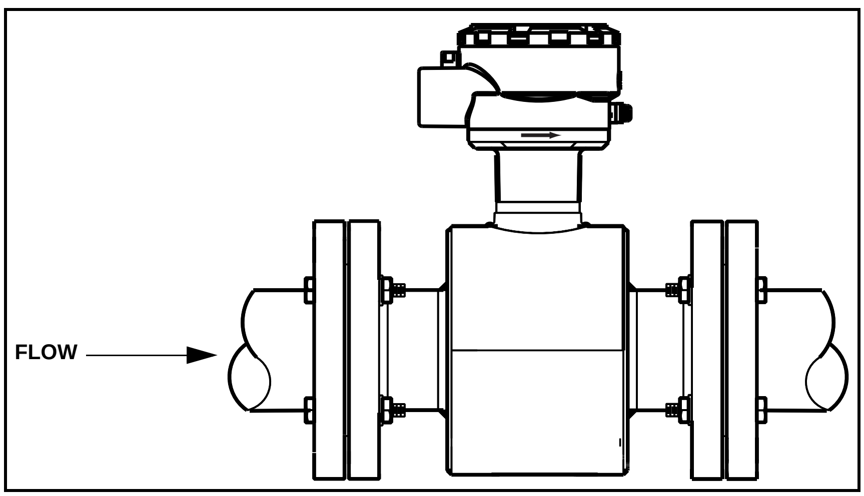
Figure 5-6. Rosemount 8711 Mounting Position



Flow Direction

The sensor should be mounted so that the FORWARD end of the flow arrow, shown on the sensor identification tag, points in the direction of flow through the sensor (see Figure 5-7).

Figure 5-7. Flow Direction



INSTALLATION (FLANGED SENSOR)

The following section should be used as a guide in the installation of the flange-type Rosemount 8705 and Rosemount 8707 High-Signal Sensors. Refer to page 5-10 for installation of the wafer-type Rosemount 8711 Sensor.

Gaskets

⚠ The sensor requires a gasket at each of its connections to adjacent devices or piping. The gasket material selected must be compatible with the process fluid and operating conditions. **Metallic or spiral-wound gaskets can damage the liner.** If the gaskets will be removed frequently, protect the liner ends. All other applications (including sensors with lining protectors or a grounding electrode) require only one gasket on each end connection, as shown in Figure 5-8. If grounding rings are used, gaskets are required on each side of the grounding ring, as shown in Figure 5-9.

Figure 5-8. Gasket Placement

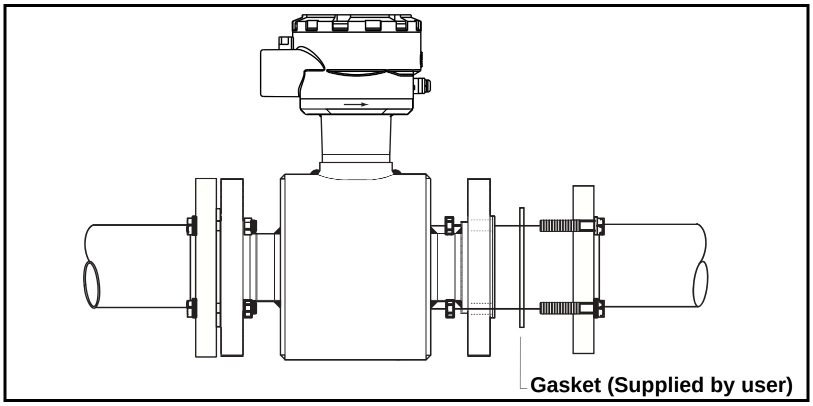
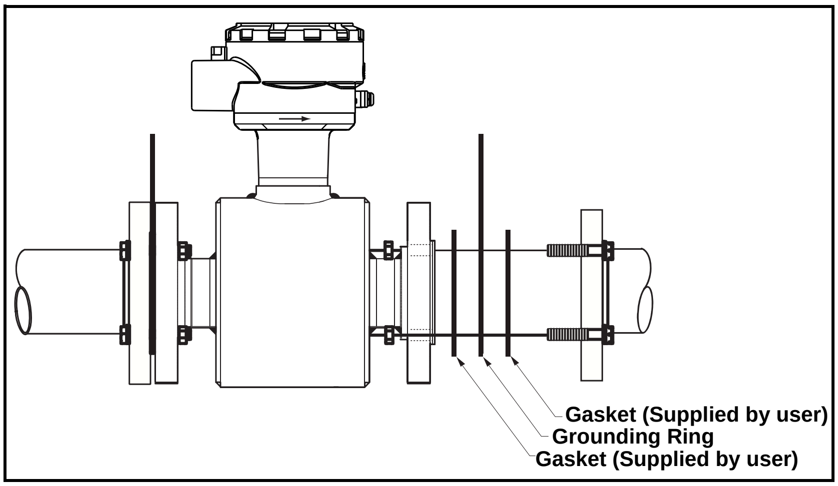


Figure 5-9. Gasket Placement with Non-attached Grounding Rings



Flange Bolts

Suggested torque values by sensor line size and liner type are listed in Table 5-1 on page 5-8 for ASME B16.5 (ANSI) flanges and Table 5-2 and Table 5-3 for DIN flanges. Consult the factory for other flange ratings. Tighten flange bolts in the incremental sequence as shown in Figure 5-10. See Table 5-1 and Table 5-2 for bolt sizes and hole diameters.

⚠ See ”Safety Messages” on pages 5-1 and 5-2 for complete warning information.

NOTE
Do not bolt one side at a time. Tighten each side simultaneously. Example:
1. Snug left
2. Snug right
3. Tighten left
4. Tighten right
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.

⚠ Always check for leaks at the flanges after tightening the flange bolts. Failure to use the correct flange bolt tightening methods can result in severe damage. All sensors require a second torquing 24 hours after initial flange bolt tightening.

Table 5-1. Flange Bolt Torque Specifications for Rosemount 8705 and 8707 High-Signal Sensors

		PTFE/ETFE liner		Polyurethane liner	
Size Code	Line Size	Class 150 (pound-feet)	Class 300 (pound-feet)	Class 150 (pound-feet)	Class 300 (pound-feet)
005	1/2-inch (15 mm)	8	8	—	—
010	1 inch (25 mm)	8	12	—	—
015	1 1/2 inch (40 mm)	13	25	7	18
020	2 inch (50 mm)	19	17	14	11
030	3 inch (80 mm)	34	35	23	23
040	4 inch (100 mm)	26	50	17	32
060	6 inch (150mm)	45	50	30	37
080	8 inch (200 mm)	60	82	42	55
100	10 inch (250 mm)	55	80	40	70
120	12 inch (300 mm)	65	125	55	105
140	14 inch (350 mm)	85	110	70	95
160	16 inch (400 mm)	85	160	65	140
180	18 inch (450 mm)	120	170	95	150
200	20 inch (500 mm)	110	175	90	150
240	24 inch (600 mm)	165	280	140	250
300	30 inch (750 mm)	195	415	165	375
360	36 inch (900 mm)	280	575	245	525

Table 5-2. Flange Bolt Torque and Bolt Load Specifications for Rosemount 8705

Size Code	Line Size	PTFE/ETFE liner PN10 (Newton-meter)	PN10 (Newton)	PN 16 (Newton-meter)	PN 16 (Newton)	PN 25 (Newton-meter)	PN 25 (Newton)	PN 40 (Newton-meter)	PN 40 (Newton)
005	1/2-inch (15 mm)	7	3209	7	3809	7	3809	7	4173
010	1 inch (25 mm)	13	6983	13	6983	13	6983	13	8816
015	1 1/2 inch (40 mm)	24	9983	24	9983	24	9983	24	13010
020	2 inch (50 mm)	25	10420	25	10420	25	10420	25	14457
030	3 inch (80 mm)	14	5935	14	5935	18	7612	18	12264
040	4 inch (100 mm)	17	7038	17	7038	30	9944	30	16021
060	6 inch (150mm)	23	7522	32	10587	60	16571	60	26698
080	8 inch (200 mm)	35	11516	35	11694	66	18304	66	36263
100	10 inch (250 mm)	31	10406	59	16506	105	25835	105	48041
120	12 inch (300 mm)	43	14439	82	22903	109	26886	109	51614
140	14 inch (350 mm)	42	13927	80	22091	156	34578	156	73825
160	16 inch (400 mm)	65	18189	117	28851	224	45158	224	99501
180	18 inch (450 mm)	56	15431	99	24477	—	—	—	67953
200	20 inch (500 mm)	66	18342	131	29094	225	45538	225	73367
240	24 inch (600 mm)	104	25754	202	40850	345	63940	345	103014

Figure 5-10. Flange Bolt Torquing Sequence

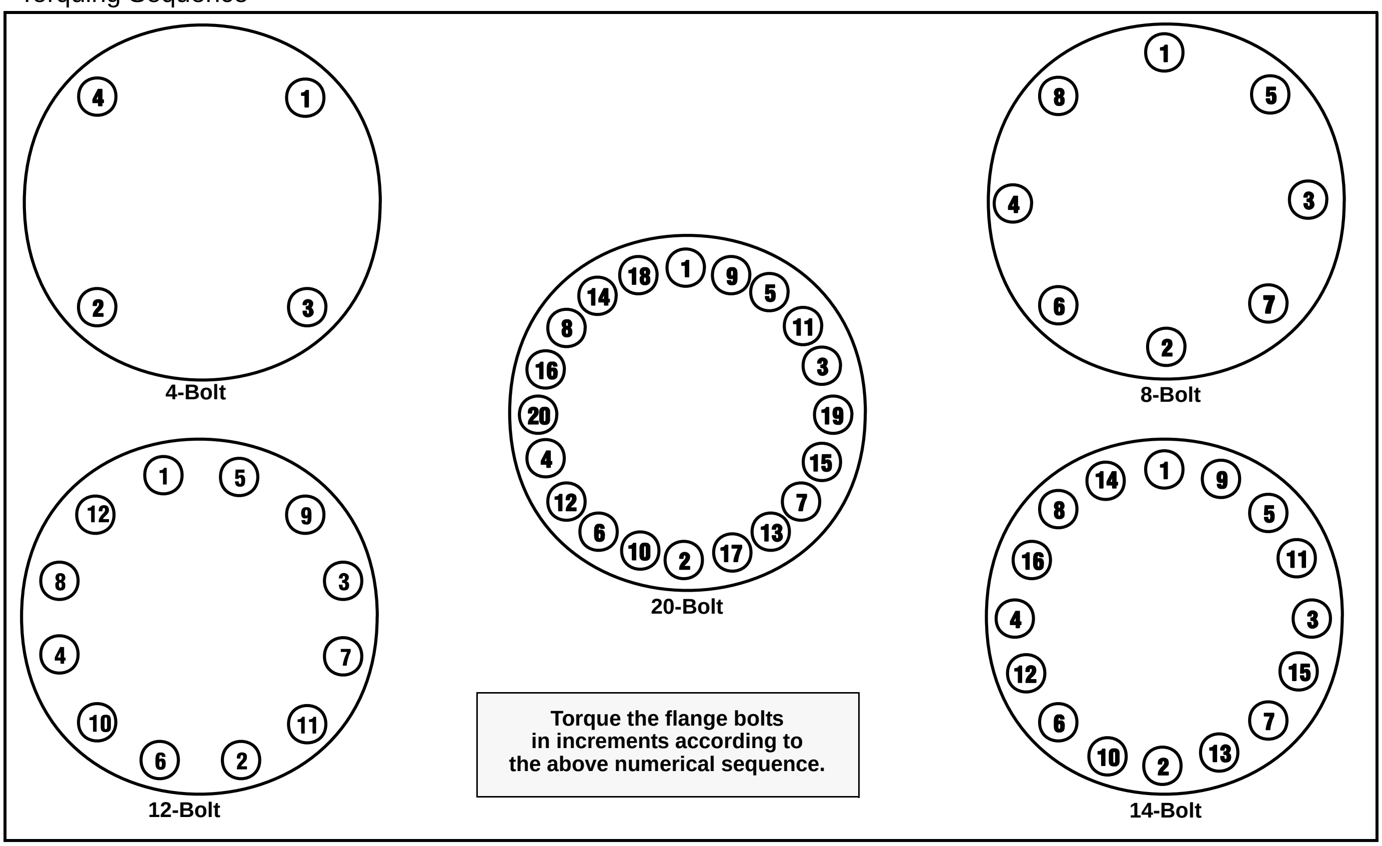


Table 5-3. Flange Bolt Torque and Bolt Load Specifications for Rosemount 8705

Size Code	Line Size	Polyurethane Liner							
		PN 10		PN 16		PN 25		PN 40	
		(Newton-meter)	(Newton)	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)	(Newton-meter)	(Newton)
005	1/2-inch (15 mm)	1	521	1	826	2	1293	6	3333
010	1 inch (25 mm)	2	1191	3	1890	5	2958	10	5555
015	1 1/2 inch (40 mm)	5	1960	7	3109	12	4867	20	8332
020	2 inch (50 mm)	6	2535	10	4021	15	6294	26	10831
030	3 inch (80 mm)	5	2246	9	3563	13	5577	24	19998
040	4 inch (100 mm)	7	3033	12	4812	23	7531	35	11665
060	6 inch (150mm)	16	5311	25	8425	47	13186	75	20829
080	8 inch (200 mm)	27	8971	28	9487	53	14849	100	24687
100	10 inch (250 mm)	26	8637	49	13700	87	21443	155	34547
120	12 inch (300 mm)	36	12117	69	19220	91	22563	165	36660
140	14 inch (350 mm)	35	11693	67	18547	131	29030	235	47466
160	16 inch (400 mm)	55	15393	99	24417	189	38218	335	62026
200	20 inch (500 mm)	58	15989	114	25361	197	39696	375	64091
240	24 inch (600 mm)	92	22699	178	36006	304	56357	615	91094

INSTALLATION (WAFER SENSOR)

The following section should be used as a guide in the installation of the Rosemount 8711 Sensor. Refer to page 5-7 for installation of the flange-type Rosemount 8705 and 8707 High-Signal sensor.

Gaskets

⚠ The sensor requires a gasket at each of its connections to adjacent devices or piping. The gasket material selected must be compatible with the process fluid and operating conditions. **Metallic or spiral-wound gaskets can damage the liner.** If the gaskets will be removed frequently, protect the liner ends. If grounding rings are used, a gasket is required on each side of the grounding ring.

Alignment and Bolting

1. On 1 1/2 - through 8-inch (40 through 200 mm) line sizes, place centering rings over each end of the sensor. The smaller line sizes, 0.15- through 1-inch (4 through 25 mm), do not require centering rings.
2. Insert studs for the bottom side of the sensor between the pipe flanges. Stud specifications are listed in Table 5-4. **Using carbon steel bolts on smaller line sizes, 0.15- through 1-inch (4 through 25 mm), rather than the required stainless steel bolts, will degrade performance.**

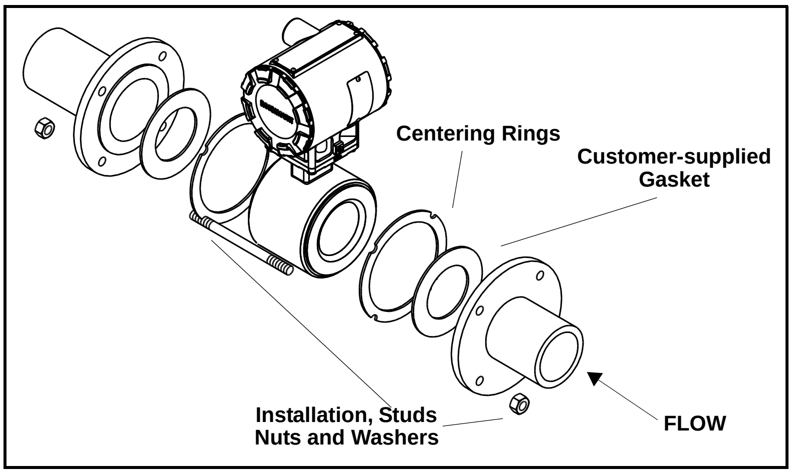
Table 5-4. Stud Specifications

Nominal Sensor Size	Stud Specifications
0.15 – 1 inch (4 – 25 mm)	316 SST ASTM A193, Grade B8M Class 1 threaded mounted studs
$1^1/_2$ – 8 inch (40 – 200 mm)	CS, ASTM A193, Grade B7, threaded mounting studs

3. Place the sensor between the flanges. Make sure that the centering rings are properly placed in the studs. The studs should be aligned with the markings on the rings that correspond to the flange you are using.
4. Insert the remaining studs, washers, and nuts.
5. Tighten to the torque specifications shown in Table 5-5. Do not overtighten the bolts or the liner may be damaged.

NOTE
On the 4- and 6- inch PN 10-16, insert the sensor with rings first and then insert the studs. The slots on this ring scenario are located on the inside of the ring.

Figure 5-11. Gasket Placement with Centering Rings



Flange Bolts

Sensor sizes and torque values for both Class 150 and Class 300 flanges are listed in Table 5-5. Tighten flange bolts in the incremental sequence, shown in Figure 5-10.

NOTE
Do not bolt one side at a time. Tighten each side simultaneously. Example:
1. Snug left
2. Snug right
3. Tighten left
4. Tighten right
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.

⚠ Always check for leaks at the flanges after tightening the flange bolts. All sensors require a second torquing 24 hours after initial flange bolt tightening.

Table 5-5. Flange bolt Torque Specifications of Rosemount 8711 Sensors

Size Code	Line Size	Pound-feet	Newton-meter
15F	0.15 inch (4 mm)	5	6.8
30F	0.30 inch (8 mm)	5	6.8
005	$^1/_2$-inch (15 mm)	5	6.8
010	1 inch (25 mm)	10	13.6
015	$1^1/_2$ inch (40 mm)	15	20.5
020	2 inch (50 mm)	25	34.1
030	3 inch (80 mm)	40	54.6
040	4 inch (100 mm)	30	40.1
060	6 inch (150 mm)	50	68.2
080	8 inch (200 mm)	70	81.9

INSTALLATION (SANITARY SENSOR)

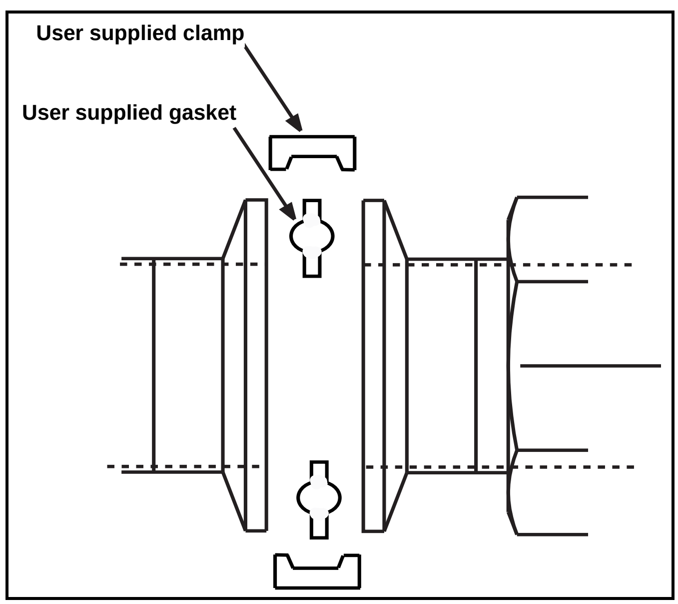
Gaskets

The sensor requires a gasket at each of its connections to adjacent devices or piping. The gasket material selected must be compatible with the process fluid and operating conditions. Gaskets are supplied with all Rosemount 8721 Sanitary sensors except when the process connection is an IDF sanitary screw type.

Alignment and Bolting

Standard plant practices should be followed when installing a magmeter with sanitary fittings. Unique torque values and bolting techniques are not required.

Figure 5-12. Rosemount 8721 Sanitary Installation



Process grounding the sensor is one of the most important details of sensor installation. Proper process grounding ensures that the transmitter amplifier is referenced to the process. This creates the lowest noise environment for the transmitter to make a stable reading. Use Table 5-6 to determine which grounding option to follow for proper installation.

NOTE
Consult factory for installations requiring cathodic protection or situations where there are high currents or high potential in the process.

The sensor case should always be earth grounded in accordance with national and local electrical codes. Failure to do so may impair the protection provided by the equipment. The most effective grounding method is direct connection from the sensor to earth ground with minimal impedance.

The Internal Ground Connection (Protective Ground Connection) located in side the junction box is the Internal Ground Connection screw. This screw is identified by the ground symbol: ⏚

Table 5-6. Grounding Installation

	Grounding Options			
Type of Pipe	No Grounding Options	Grounding Rings	Grounding Electrodes	Lining Protectors
Conductive Unlined Pipe	See Figure 5-13	Not Required	Not Required	See Figure 5-14
Conductive Lined Pipe	Insufficient Grounding	See Figure 5-14	See Figure 5-13	See Figure 5-14
Non-Conductive Pipe	Insufficient Grounding	See Figure 5-15	See Figure 5-16	See Figure 5-15

Figure 5-13. No Grounding Options or Grounding Electrode in Lined Pipe

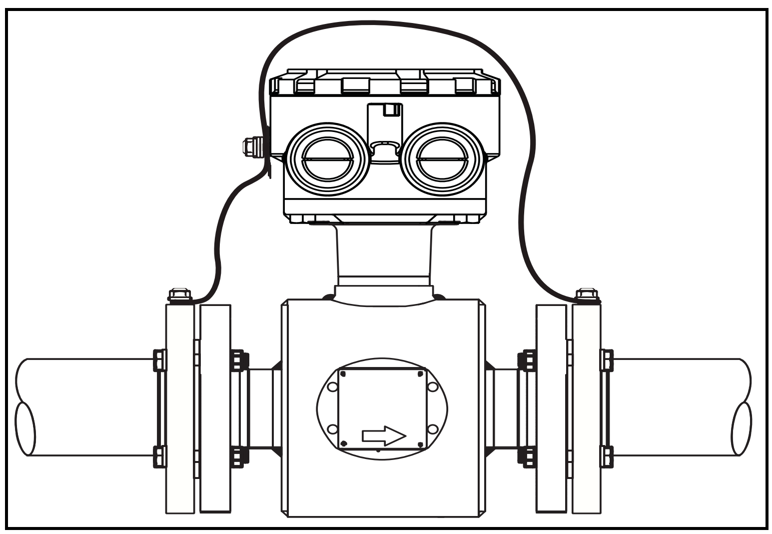


Figure 5-14. Grounding with Grounding Rings or Lining Protectors

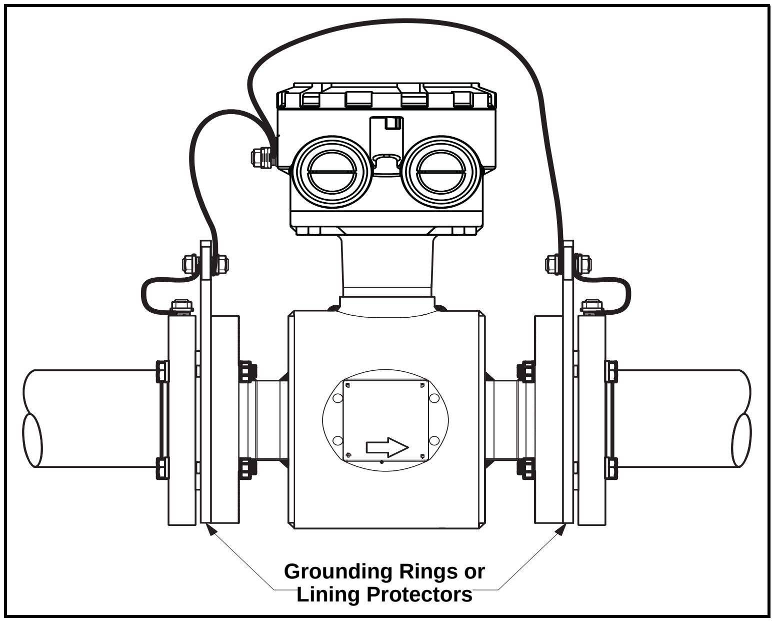


Figure 5-15. Grounding with Grounding Rings or Lining Protectors

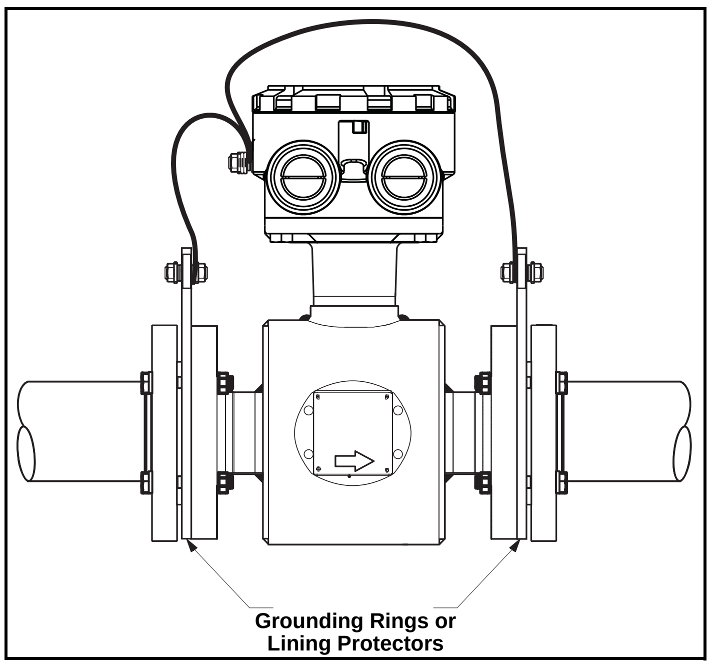
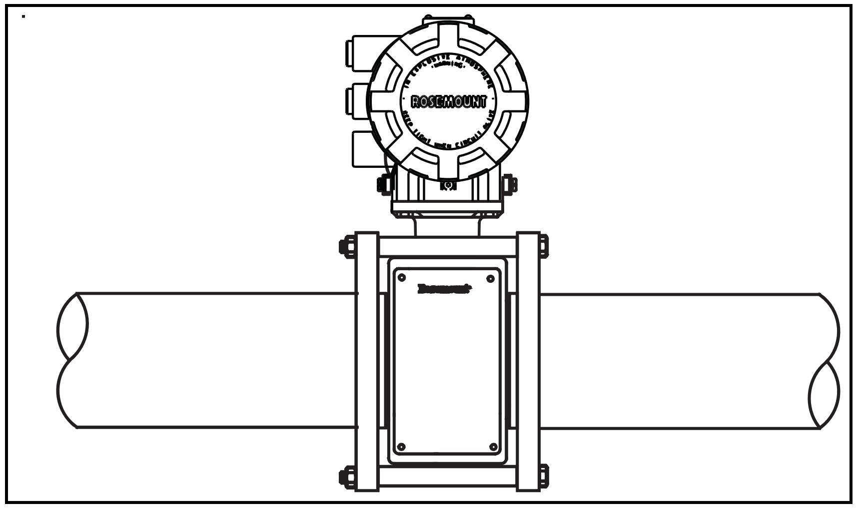


Figure 5-16. Grounding with Grounding Electrodes



PROCESS LEAK PROTECTION (OPTIONAL)

The Rosemount 8705 and 8707 High-Signal Sensor housing is fabricated from carbon steel to perform two separate functions. First, it provides shielding for the sensor magnetics so that external disturbances cannot interfere with the magnetic field and thus affect the flow measurement. Second, it provides the physical protection to the coils and other internal components from contamination and physical damage that might occur in an industrial environment. The housing is completely welded and gasket-free.

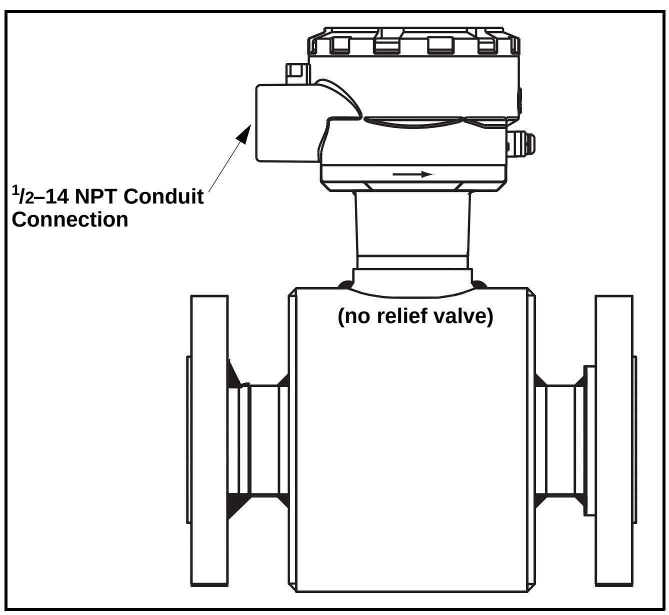
The three housing configurations are identified by the W0, W1, or W3 in the model number option code when ordering. Below are brief descriptions of each housing configuration, which are followed by a more detailed overview.

- **Code W0** — sealed, welded coil housing (standard configuration)
- **Code W1** — sealed, welded coil housing with a relief valve capable of venting fugitive emissions to a safe location (additional plumbing from the sensor to a safe area, installed by the user, is required to vent properly)
- **Code W3** — sealed, welded coil housing with separate electrode compartments capable of venting fugitive emissions (additional plumbing from the sensor to a safe area, installed by the user, is required to vent properly)

Standard Housing Configuration

The standard housing configuration is identified by a code W0 in the model number. This configuration does not provide separate electrode compartments with external electrode access. In the event of a process leak, these models will not protect the coils or other sensitive areas around the sensor from exposure to the pressure fluid (Figure 5-17).

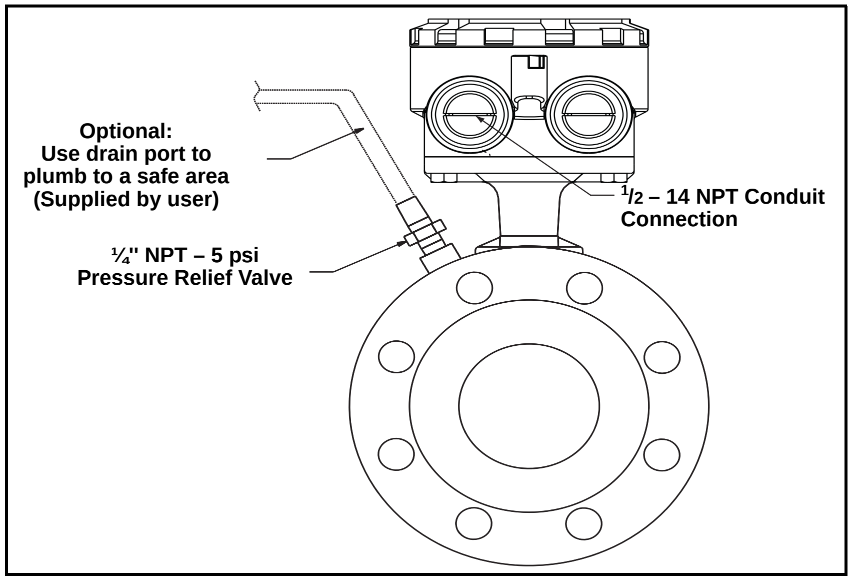
Figure 5-17. Standard Housing Configuration — Sealed Welded Housing (Option Code W0)



Relief Valves

The first optional configuration, identified by the W1 in the model number option code, uses a completely welded coil housing. This configuration does not provide separate electrode compartments with external electrode access. This optional housing configuration provides a relief valve in the housing to prevent possible overpressuring caused by damage to the lining or other situations that might allow process pressure to enter the housing. The relief valve will vent when the pressure inside the sensor housing exceeds 5 psi. Additional piping (provided by the user) may be connected to this relief valve to drain any process leakage to safe containment (see Figure 5-18).

Figure 5-18. Coil-Housing Configuration — Standard Welded Housing With Relief Valve (Option Code W1)



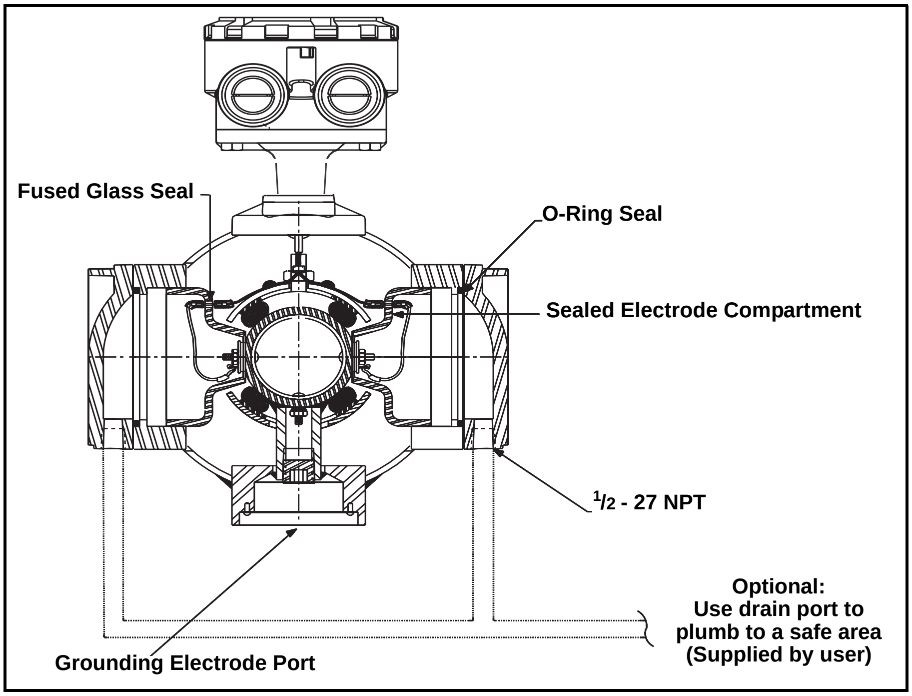
Process Leak Containment

The second optional configuration, identified as option code W3 in the model number, divides the coil housing into three compartments: one for each electrode and one for the coils. Should a damaged liner or electrode fault allow process fluid to migrate behind the electrode seals, the fluid is contained in the electrode compartment. The sealed electrode compartment prevents the process fluid from entering the coil compartment where it would damage the coils and other internal components.

The electrode compartments are designed to contain the process fluid at full line pressure. An o-ring sealed cover provides access to each of the electrode compartments from outside the sensor; drainports are provided in each cover for the removal of fluid.

NOTE
The electrode compartment could contain full line pressure and it must be depressurized before the cover is removed.

Figure 5-19. Housing Configuration — Sealed Electrode Compartment (Option Code W3)



If necessary, capture any process fluid leakage, connect the appropriate piping to the drainports, and provide for proper disposal (see Figure 5-19).

Section 6 Maintenance and Troubleshooting

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 your system. If the problem persists, consult your 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. Please read the following safety messages before performing any operation described in this section. Refer to these warnings when appropriate throughout this section.

SAFETY INFORMATION

⚠WARNING

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 that the operating environment of the sensor and transmitter is consistent with the appropriate FM or CSA approval.

Do not connect a Rosemount 8732 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 8732 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 pin point the problem and make the appropriate adjustments.

If there are problems with a new magmeter installation, see “Installation Check and Guide” on page 6-2 for a quick guide to solve the most common installation problems. For existing magmeter installations, Table 6-4 lists the most common magmeter problems and corrective actions.

INSTALLATION CHECK AND GUIDE

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

Before You Begin

Transmitter

Apply power to your system before making the following transmitter checks.

1. Verify that the correct sensor calibration number is entered in the transmitter. The calibration number is listed on the sensor nameplate.
2. Verify that the correct sensor line size is entered in the transmitter. The line size value is listed on the sensor nameplate.
3. Verify that the function blocks are not in Out of Service mode.
4. Verify that the transmitter is functioning correctly by using the 8714i Meter Verification diagnostic or the 8714D Calibration Reference Standard.

Sensor

Be sure that power to your system is removed before beginning sensor checks.

1. **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.
2. Ensure that 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.

Wiring for Remote Configurations

1. The signal wire and coil drive wire must be twisted shielded cable. Emerson Process Management, Rosemount division. recommends 20 AWG twisted shielded cable for the electrodes and 14 AWG twisted shielded cable for the coils.
2. The cable shield must be connected at both ends of the electrode and coil drive cables. Connection of the signal wire shield at both ends is necessary for proper operation. It is recommended that the coil drive wire shield also be connected at both ends for maximum flowmeter performance
3. The signal and coil drive wires must be separate cables, unless Emerson Process Management specified combo cable is used. See Table 2-2 on page 2-11.
4. The single conduit that houses both the signal and coil drive cables should not contain any other wires.

Process Fluid

1. The process fluid conductivity should be 5 microsiemens (5 micro mhos) per centimeter minimum.
2. The process fluid must be free of air and gasses.
3. The sensor should be full of process fluid.

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 your system.

Table 6-1. Rosemount 8732 Basic Diagnostic Messages

Message	Potential Cause	Corrective Action
"Fieldbus Not Communicating"	Fieldbus segment is disconnected	Connect the fieldbus segment
	Fieldbus segment power missing	Verify the segment fieldbus voltage
	Electronics failure	Replace electronics
"Sensor Processor Not Communicating"	Transmitter input power (AC/DC) is not connected	Connect the input power. If the LCD displays a message, the input power is applied
	Electronics failure	Replace electronics
"Empty Pipe"	Empty Pipe	None - message will clear when pipe is full
	Wiring Error	Check that wiring matches appropriate wiring diagrams - see Appendix E: Universal Sensor Wiring Diagrams
	Electrode Error	Perform sensor tests C and D (see Table 6-5 on page 6-8)
	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
"Coil Open Circuit"	Improper wiring	Check coil drive wiring and sensor coils Perform sensor test A - Sensor Coil
	Other manufacturer's sensor	Change coil current to 75 mA Perform a Universal Auto Trim to select the proper coil current
	Circuit Board Failure	Replace Rosemount 8732 Electronics
	Coil Circuit OPEN Fuse	Return to factory for fuse replacement
"Auto Zero Failure" (Cycle power to clear messages, no changes were made)	Flow is not set to zero	Force flow to zero, perform autozero
	Unshielded cable in use	Change wire to shielded cable
	Moisture problems	See moisture problems in "Accuracy Section"
	Empty pipe is present	Fill sensor with process fluid
"Universal Trim Failure"	No flow in pipe while performing Universal Auto Trim	Establish a known flow in sensor, and perform Universal Auto-Trim calibration
	Wiring error	Check that wiring matches appropriate wiring diagrams - see "Universal Sensor Wiring Diagrams" on page E-1
	Flow rate is changing in pipe while performing Universal Auto-Trim routine	Establish a constant flow in sensor, 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 1000005010000001
	Wrong sensor size selected	Correct sensor size setting - See "Line Size" on page 3-9
	Sensor failure	Perform sensor tests C and D (see Table 6-5 on page 6-8)
"Electronics Failure"	Electronics self check failure	Replace Electronics
"Electronics Temp Fail"	Ambient temperature exceeded the electronics temperature limits	Move transmitter to a location with an ambient temperature range of -40 to 165 °F (-40 to 74 °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	Re-install sensor correctly, or switch either the electrode wires (18 and 19) or the coil wires (1 and 2)
"Flow Rate > Sensor Limit"	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 test A - Sensor Coil (see Table 6-5 on page 6-8)
"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 1000005010000001
	Calibrator is not set to 30 FPS	Change calibrator setting to 30 FPS
	Bad calibrator	Replace calibrator

Table 6-2. Rosemount 8732 Advanced Diagnostic Messages (Suite 1 - Option Code D01)

Message	Potential Cause	Corrective Action
Grounding/Wiring Fault	Improper installation of wiring	See “Sensor Connections” on page 2-11
	Coil/Electrode shield not connected	See “Sensor Connections” on page 2-11
	Improper process grounding	See “Grounding” on page 5-12
	Faulty ground connection	Check wiring for corrosion, moisture in the terminal block, and refer to “Grounding” on page 5-12
	Sensor not full	Verify sensor is full and empty pipe diagnostic is on
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 “Step 2: Process Noise” on page 6-7
	Chemical additives upstream of the sensor	Move injection point downstream of the sensor, or move the sensor Complete the possible solutions listed under “Step 2: Process Noise” on page 6-7
	Electrode not compatible with the process fluid	Refer to the Rosemount Magnetic Flowmeter Material Selection Guide (00816-0100-3033)
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions
	Electrode coating	Use bulletnose electrodes Downsize sensor to increases flowrate above 3 ft/s (1 m/s) Periodically clean sensor
	Styrofoam or other insulating particles	Complete the possible solutions listed under “Step 2: Process Noise” on page 6-7 Consult factory
	Low conductivity fluids (below 10 microsiemens/cm)	Trim electrode and coil wires - refer to “Installation” on page 2-1

Table 6-3. Rosemount 8732 Advanced Diagnostic Messages (Suite 2 - Option Code D02)

Message	Potential Cause	Corrective Action
8714i Failed	Transmitter Calibration Verification test failed	Verify pass/fail criteria Rerun 8714i Meter Verification under no flow conditions Verify calibration using 8714D Calibration Standard Perform digital trim Replace electronics board
	Sensor Calibration test failed	Verify pass/fail criteria Perform sensor test - see Table 6-5 on page 6-8
	Sensor Coil Circuit test failed	Verify pass/fail criteria Perform sensor test - see Table 6-5 on page 6-8
	Sensor Electrode Circuit test failed	Verify pass/fail criteria Perform sensor test - see Table 6-5 on page 6-8

TRANSMITTER TROUBLESHOOTING

Table 6-4. Advanced Troubleshooting–Rosemount 8732

Symptom	Potential Cause	Corrective Action
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
	Electrode Coating	Use bulletnose electrodes; Downsize sensor to increase flow rate above 3 ft/s; Periodically clean sensor
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions.
	Moisture problem	Perform the sensor Tests A, B, C, and D (see Table 6-5 on page 6-8)
	Improper wiring	If electrode shield and signal wires are switched, flow indication will be about half of what is expected. Check wiring diagrams for your application.
	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 C and D (see Table 6-5 on page 6-8)
	Sensor failure–Shorted or open coil	Perform the sensor Tests A and B (see Table 6-5 on page 6-8)
	Transmitter failure	Verify transmitter operation with an 8714 Calibration Standard or replace the electronic board
Noisy Process	Chemical additives upstream of magnetic flowmeter	Complete the Noisy Process Basic procedure. 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	Complete the Noisy Process Basic procedure; Consult factory
	Electrode coating	Use replaceable electrodes in Rosemount 8705. Use a smaller sensor to increase flow rate above 3 ft/s. Periodically clean sensor.
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions.
	Low conductivity fluids (below 10 microsiemens/cm)	• Trim electrode and coil wires – see “Conduit Cables” on page 2-6 • Keep flow rate below 3 FPS • Integral mount transmitter • Use 8712-0752-1,3 cable • Use N0 approval sensor

Advanced Troubleshooting continued on next page

Table 6-4. Advanced Troubleshooting–Rosemount 8732

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: • Integral mount • Move cable to lower vibration run • Tie down cable mechanically • Trim electrode and coil wires • See “Conduit Cables” on page 2-6 • Route cable line away from other equipment powered by 60 Hz • Use 8712-0752-1,3 cable
	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 “Mount the Transmitter” on page 2-3 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 A, B, C, and D (See Table 6-5 on page 6-8)
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
	Electrode coating	Use bulletnose electrodes in the Rosemount 8705 Sensor. Downsize the sensor to increase the flow rate above 3 ft/s. Periodically clean the sensor
	Air in line	Move the sensor to another location in the process line to ensure that it is full under all conditions
	Flow rate is below 1 ft/s (specification issue)	See the accuracy specification for specific transmitter and sensor
	Insufficient upstream/downstream pipe diameter	Move sensor to location where 5 pipe diameters upstream and 2 pipe diameters downstream is possible
	Cables for multiple magmeters run through same conduit	Run only one conduit cable between each sensor and transmitter
	Auto zero was not performed when the coil drive frequency was changed from 5 Hz to 37.5 Hz	Perform the auto zero function with full pipe and no flow
	Sensor failure—shorted electrode	See Table 6-5 on page 6-8
	Sensor failure—shorted or open coil	See Table 6-5 on page 6-8
	Transmitter failure	Replace the electronics board
	Transmitter wired to correct sensor	Check wiring

QUICK TROUBLESHOOTING

Step 1: Wiring Errors

The most common magmeter problem is wiring between the sensor and the transmitter in remote mount installations. The signal wire and coil drive wire must be twisted shielded cable: 20 AWG twisted shielded cable for the electrodes and 14 AWG twisted shielded cable for the coils. Ensure that the cable shield is connected at both ends of the electrode and coil drive cables. Signal and coil drive wires must have their own cables. The single conduit that houses both the signal and coil drive cables should not contain any other wires. For more information on proper wiring practices, refer to "Transmitter to Sensor Wiring" on page 2-11.

Step 2: Process Noise

In some circumstances, process conditions rather than the magmeter can cause the meter output to be unstable. Possible solutions for addressing a noisy process situation are given below. When the output attains the desired stability, no further steps are required.

Use the Auto Zero function to initialize the transmitter for use with the 37.5 Hz coil drive mode only. Run this function only with the transmitter and sensor installed in the process. The sensor must be filled with process fluid with zero flow rate. Before running the auto zero function, be sure the coil drive mode is set to 37.5 Hz.

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

1. Change the coil drive to 37.5 Hz. Complete the Auto Zero function, if possible (see "Coil Drive Frequency" on page 4-13).
2. Turn on Digital Signal Processing (see "Signal Processing" on page 4-25)
3. Increase the damping (see "Damping" on page 3-17).

If the preceding steps fail to resolve the process noise symptoms, consult your Rosemount sales representative about using a high-signal magnetic flowmeter system.

Step 3: Installed Sensor Tests

If a problem with an installed sensor is identified, Table 6-5 can assist in troubleshooting the sensor. Before performing any of the sensor tests, disconnect or turn off power to the transmitter. To interpret the results, the hazardous location certification for the sensor must be known. Applicable codes for the Rosemount 8705 are N0, N5, and KD. Applicable codes for the Rosemount 8707 are N0 and N5. Applicable codes for the Rosemount 8711 are N0, N5, E5, and KD. Always check the operation of test equipment before each test.

If possible, take all readings from inside the sensor junction box. If the sensor junction box is inaccessible, take measurements as close as possible. Readings taken at the terminals of remote-mount transmitters that are more than 100 feet away from the sensor may provide incorrect or inconclusive information and should be avoided. A sensor circuit diagram is provided in Figure 6-1 on page 6-9.

Table 6-5. Sensor Test

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	$2\Omega \le R \le 18\Omega$	• Open or Shorted Coil	• Remove and replace sensor
B. Shields to Case	Installed or Uninstalled	Multimeter	17 and ⏚ ⏚ and case ground 17 and case ground	$< 0.2\Omega$	• Moisture in terminal block • Leaky electrode • Process behind liner	• Clean terminal block • Remove sensor
C. Coil Shield to Coil	Installed or Uninstalled	Multimeter	1 and ⏚ 2 and ⏚	$\infty\Omega$ (< 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 Shield to Electrode	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 NO: $\lvert R_1 - R_2 \rvert \le 300\Omega$ N5, E5, CD, ED: $\lvert R_1 \ R_2 \rvert \le 1500\Omega$	• Unstable R_1 or R_2 values confirm coated electrode • Shorted electrode • Electrode not in contact with process • Empty Pipe • Low conductivity • Leaky electrode	• Remove coating from sensor wall • Use bulletnose electrodes • Repeat measurement • Pull sensor, complete test in Table 6-6 and Table 6-7 on page 6-10 out of line.

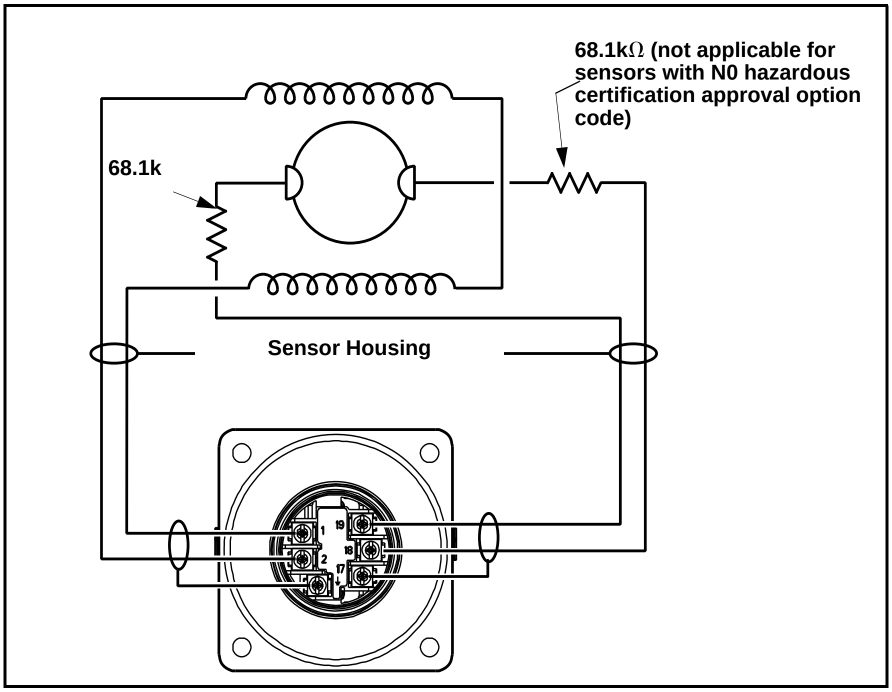
To test the sensor, a multimeter capable of measuring conductance in nanosiemens is preferred. Nanosiemens is the reciprocal of resistance.

$$1\text{nanosiemens} = \frac{1}{1\text{gigaohm}}$$

or

$$1\text{nanosiemens} = \frac{1}{1 \times 10^{9}\text{ohm}}$$

Figure 6-1. Sensor Circuit Diagram

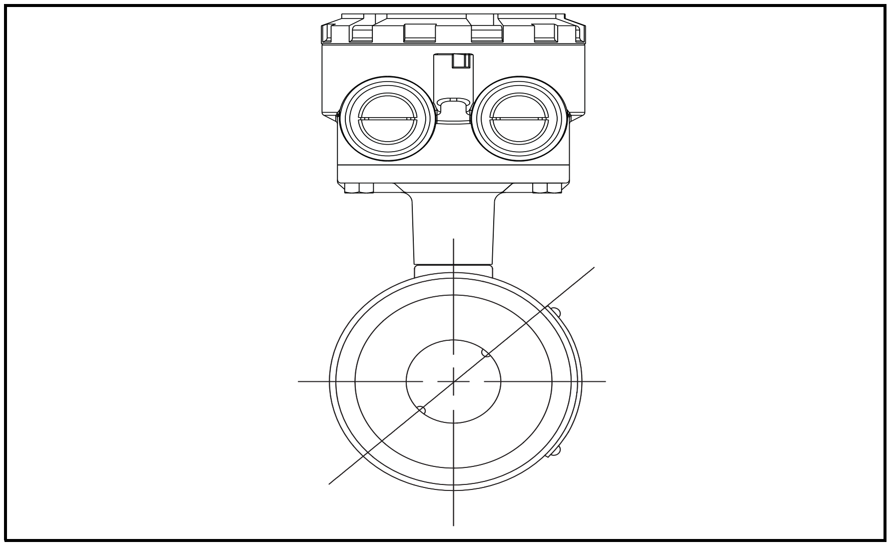


Step 4: Uninstalled Sensor Tests

An uninstalled sensor can also be used for sensor troubleshooting. To interpret the results, the hazardous location certification for the sensor must be known. Applicable codes for the Rosemount 8705 are N0, N5, and KD. Applicable codes for the Rosemount 8707 are N0 and N5. Applicable codes for the Rosemount 8711 are N0, N5, E5, and KD.

A sensor circuit diagram is provided in Figure 6-1. Take measurements from the terminal block and on the electrode head inside the sensor. The measurement electrodes, 18 and 19, are on opposite sides in the inside diameter. If applicable, the third grounding electrode is in between the other two electrodes. On Rosemount 8711 sensors, electrode 18 is near the sensor junction box and electrode 19 is near the bottom of the sensor (Figure 6-2). The different sensor models will have slightly different resistance readings. Flanged sensor resistance readings are in Table 6-6 while wafer sensor resistance readings are in Table 6-7.

Figure 6-2. 45° Electrode Plane



To insure accuracy of resistance readings, zero out multimeter by shorting and touching the leads together.

Table 6-6. Uninstalled Rosemount 8705 / 8707 Flanged Sensor Tests

	Hazardous Location Certifications	
Measuring at Connections	N0	N5, KD
18 and Electrode(1)	≤ 275Ω	61kΩ ≤ R ≤ 75kΩ
19 and Electrode(1)	≤ 275Ω	61kΩ ≤ R ≤ 75kΩ
17 and Grounding Electrode	≤ 0.3Ω	≤ 0.3Ω
17 and Ground Symbol	≤ 0.3Ω	≤ 0.3Ω
17 and 18	Open	Open
17 and 19	Open	Open
17 and 1	Open	Open

(1) It is difficult to tell from visual inspection alone which electrode is wired to which number terminal in the terminal block. Measure both electrodes. One electrode should result in an open reading, while the other electrode should be less than 275Ω.

Table 6-7. Uninstalled Rosemount 8711 Wafer Sensor Tests

	Hazardous Location Certification	
Measuring at Connections	N0	N5, E5, CD
18 and Electrode(1)	≤ 0.3Ω	61kΩ ≤ R ≤ 75kΩ
19 and Electrode(2)	≤ 275Ω	61kΩ ≤ R ≤ 75kΩ
17 and Grounding Electrode	≤ 0.3Ω	≤ 0.3Ω
17 and Grounding Symbol	≤ 0.3Ω	≤ 0.3Ω
17 and 18	Open	Open
17 and 19	Open	Open
17 and 1	Open	Open

(1) Measure the electrode closest to the junction box
(2) Measure the electrode farthest away from the junction box.

Appendix A Reference Data

FUNCTIONAL SPECIFICATIONS

Sensor Compatibility

Compatible with Rosemount 8705, 8711, 8721, and 570TM sensors.
Compatible with Rosemount 8707 sensor with D2 Dual calibration option.
Compatible with AC and DC powered sensors of other manufacturers.

Sensor Coil Resistance

350 Ω maximum

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 for 8732E. Excludes the effect of interconnecting cable length in remote mount transmitter installations.

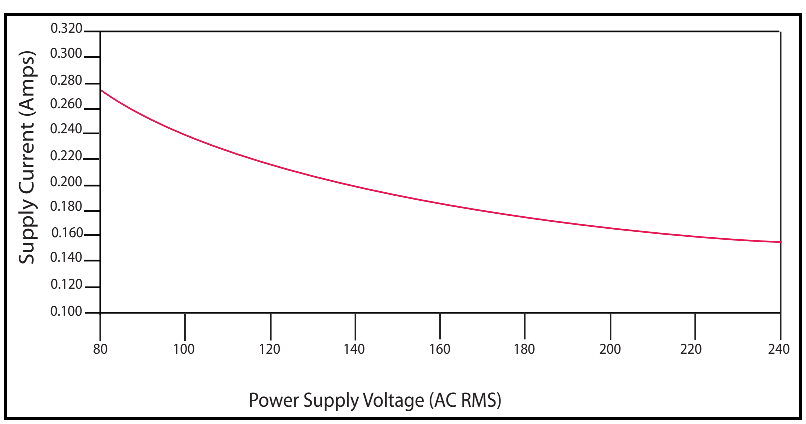
Power Supply

90 -250 V AC ±10%, 50–60 Hz or 12-42 V DC

AC Power Supply Requirements

Units powered by 90-250 V AC have the following power requirements.

Figure A-1. AC Current Requirements



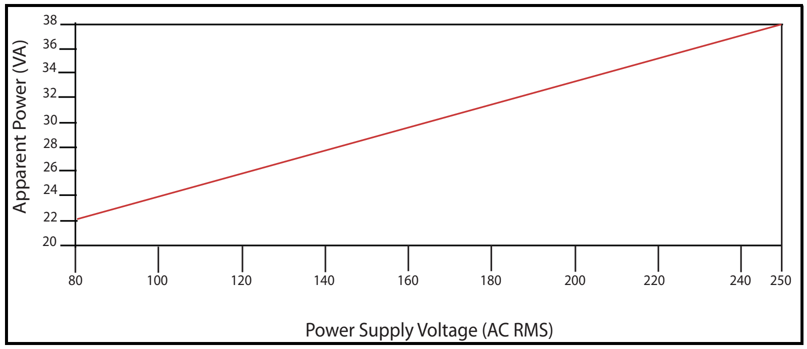


Figure A-2. Apparent Power

DC Supply Current Requirements

Units powered by 12-42 V DC power supply may draw up to 1 amp of current steady state.

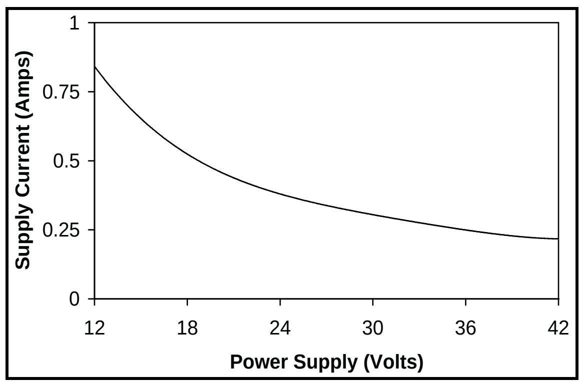


Figure A-3. DC Current Requirements

Installation Coordination

Installation (overvoltage) Category II

Power Consumption

10 watts maximum

Switch-on current
AC: Maximum 26 A (< 5 ms) at 250 V AC

DC: Maximum 30 A (< 5 ms) at 42 V DC

Ambient Temperature Limits

Operating
–58 to 165 °F (–50 to 74 °C) without local operator interface

13 to 149 °F (–25 to 65 °C) with local operator interface

Storage
–40 to 185 °F (–40 to 85 °C)

–22 to 176 °F (–30 to 80 °C) with local operator interface

Humidity Limits

0–100% RH to 150 °F (65 °C)

Enclosure Rating

NEMA 4X CSA Type 4X, IEC 60529, IP66 (transmitter), Pollution Degree 2

Output Signal

Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02

FOUNDATION™ FIELDBUS SPECIFICATIONS

Schedule Entries

Seven (7)

Links

Twenty (20)

Virtual Communications Relationships (VCRs)

One (1) predefined (F6, F7) Nineteen (19) configurable (see Table 1)

Table A-1. Block Information

Block	Execution Time (Milliseconds)
Resource (RB)	—
Transducer (TB)	—
Analog Input (AI)	10
Proportional/Integral/ Derivative (PID)	10
Integrator (INT)	10
Arithmetic (AR)	10

Reverse Flow

Detects and reports reverse flow

Software Lockout

A write-lock switch and software lockout are provided in the resource function block.

Turn-on Time

5 minutes to rated accuracy from power up; 10 seconds from power interruption.

Start-up Time

50 ms from zero flow.

Low Flow Cutoff

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 local display and field communicator.

Damping

Adjustable between 0 and 256 seconds.

Sensor Compensation

Rosemount sensors are flow-calibrated and assigned a calibration factor at the factory. The calibration factor is entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.

8732E transmitters and other manufacturer's 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 "Universal Trim" on page 4-11.

Diagnostics

Basic
Self test
Transmitter faults
Tunable empty pipe
Reverse flow
Coil circuit fault
Electronics temperature

Advanced (D01 Suite)
Ground/wiring fault
High process noise

Advanced (D02 Suite)
8714i Meter Verification

PERFORMANCE SPECIFICATIONS

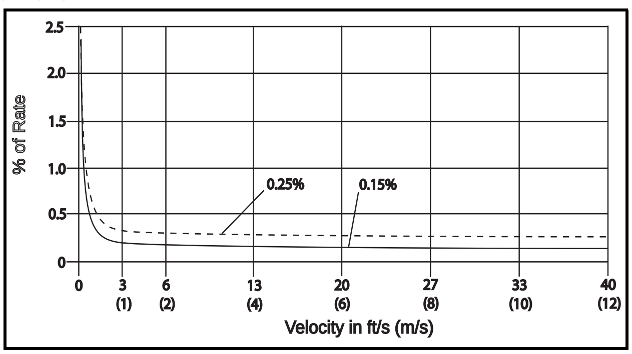
(System specifications are given using the frequency output and with the unit at reference conditions.)

Accuracy

Includes the combined effects of linearity, hysteresis, repeatability, and calibration uncertainty.

Rosemount 8732E with 8705/8707 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.

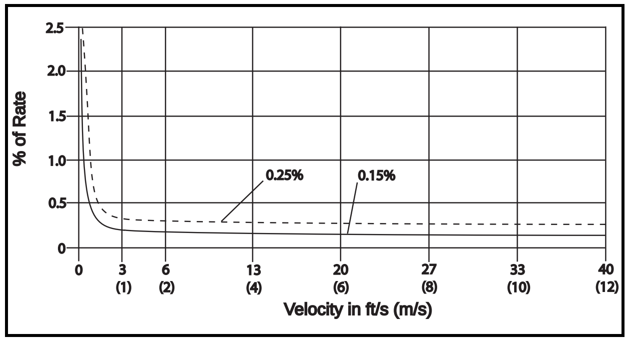
Optional high accuracy is ±0.15% of rate ±1.0 mm/sec from 0.04 to 13 ft/s (0.01 to 4 m/s); above 13 ft/s (4 m/s), the system has an accuracy of ±0.18% of rate.(1)



Rosemount 8732E with 8711 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).

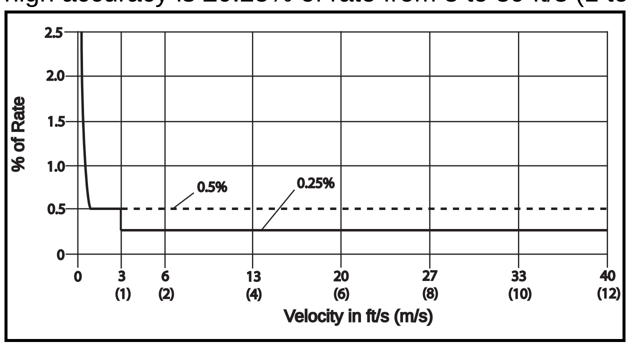
(1) For Sensor sizes greater than 12 in. (300 mm) the high accuracy is ±0.25% of rate from 3 to 39 ft/sec (1 to 12 m/sec).

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 8732E with 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).



Rosemount 8732E with Legacy 8705 Sensors:
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).

Rosemount 8732E with Legacy 8711 Sensors:
Standard system accuracy is ±0.5% of rate from 3 to 39 ft/s (1 to 12 m/s); between 0.04 and 3.0 ft/s (0.01 and 1 m/s), the system has an accuracy of ±0.015 ft/s (0.005 m/s).

Rosemount 8732E with 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.

Vibration Effect

IEC 60770-1

Repeatability

±0.1% of reading

Stability

±0.1% of rate over six months

Ambient Temperature Effect

±0.25% change over operating temperature range

EMC Compliance

EN61326-1 1997 + A1/A2/A3 (Industrial) electromagnetic compatibility (EMC) for process and laboratory apparatus.

PHYSICAL SPECIFICATIONS

Materials of Construction

Housing
Low copper aluminum, NEMA 4X and IEC 60529 IP66

Pollution Degree 2

Paint
Polyurethane

Cover Gasket
Rubber

Electrical Connections

Two $^1/_2$–14 NPT connections provided on the transmitter housing (optional third connection available). PG13.5 and CM20 adapters are available. Screw terminals provided for all connections. Power wiring connected to transmitter only. Integrally mounted transmitters are factory wired to the sensor.

Transmitter Weight

Approximately 7 pounds (3.2 kg). Add 1 pound (0.5 kg) for Option Code M5.

Appendix B Approval Information

PRODUCT CERTIFICATIONS

Approved Manufacturing Locations

Rosemount Inc. — Eden Prairie, Minnesota, USA

Fisher-Rosemount Technologias de Flujo, S.A. de C.V. — Chihuahua Mexico

Emerson Process Management Flow — Ede, The Netherlands

Emerson Process Management Flow Technologies Co., Ltd. — Nanjing, China

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on our website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

ATEX Directive

Rosemount Inc. complies with the ATEX Directive.

Type n protection type in accordance with EN50 021

- Closing of entries in the device must be carried out using the appropriate EExe or EExn metal cable gland and metal blanking plug or any appropriate ATEX approved cable gland and blanking plug with IP66 rating certified by an EU approved certification body.

For Rosemount 8732E transmitters:

Complies with Essential Health and Safety Requirements:
EN 60079-0: 2006
IEC 60079-1: 2007
EN 60079-7: 2007
EN 60079-11: 2007
EN 60079-26: 2004
EN 50281-1-1: 1998 + A1

European Pressure Equipment Directive (PED) (97/23/EC)

Rosemount 8705 and 8707 Magnetic Flowmeter sensors in line size and flange combinations:

Line Size: 1$^1/_2$ in. - 24 in. with all DIN flanges and ANSI 150 and ANSI 300 flanges. Also available with ANSI 600 flanges in limited line sizes.

Line Size: 30 in. - 36 in. with AWWA 125 flanges
QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

Rosemount 8711 Magnetic Flowmeter Sensors
Line Sizes: 1.5, 2, 3, 4, 6, and 8 in.
QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

Rosemount 8721 Sanitary Magmeter Sensors in line sizes of 1$^1/_2$ in. and larger:

Module A Conformity Assessment

All other Rosemount 8705/8707/8711/8721 Sensors — in line sizes of 1 in. and less: Sound Engineering Practice

Sensors that are SEP are outside the scope of PED and cannot be marked for compliance with PED.

Mandatory CE-marking for sensors in accordance with Article 15 of the PED can be found on the sensor body (CE 0575).

Sensor category I is assessed for conformity per module A procedures.

Sensor categories II – IV, use module H for conformity assessment procedures.

Electro Magnetic Compatibility (EMC) (2004/108/EC)

Models 8712D - EN 50081-1: 1992, EN 50082-2: 1995,
Model 8732E - EN 61326: 1997: A1 + A2 + A3

Installed signal wiring should not be run together and should not be in the same cable tray as AC power wiring.

Device must be properly grounded or earthed according to local electric codes.

To improve protection against signal interference, shielded cable is recommended.

Low Voltage Directive (93/68/EEC)

Model 8712D - EN 61010 -1: 1995

Low Voltage Directive (2006/95/EC)

Model 8732E - EN 61010 -1: 2001

Other important guidelines

Only use new, original parts.

To prevent the process medium escaping, do not unscrew or remove process flange bolts, adapter bolts or bleed screws during operation.

Maintenance shall only be done by qualified personnel.

CE *CE Marking*

Compliance with all applicable European Union Directives. (Note: CE Marking is not available on Rosemount 8712H).

IECEx Scheme

For Rosemount 8732E transmitters:

Rosemount complies with all of the stated standards below:
IEC 60079-0 : 2004
IEC 60079-1 : 2007-04
IEC 60079-11 : 2006
IEC 60079-26 : 2006
IEC 60079-7 : 2006-07
IEC 61010-1 : 2001
IEC 61241-0 : 2004
IEC 61241-1 : 2004

C-Tic Marking

Complies with IEC 61326-1 : 1997 + A1, A2, A3.

HAZARDOUS LOCATIONS PRODUCT APPROVALS OFFERING

The Rosemount 8700 Series magnetic flowmeters offer many different hazardous locations certifications. The table below provides an overview of the available hazardous area approval options. Equivalent hazardous locations certifications for sensor and transmitter must match in integrally mounted magnetic flowmeter systems. Remote mounted magnetic flowmeter systems do not require matched hazardous location certifications. For complete information about the hazardous area approval codes listed, see Hazardous Location Certifications starting on page B-5.

Table B-1. Factory Mutual (FM) Approvals Offering

Transmitter	8732E			8712D(1)			8712H(1)
Sensor	8705	8707	8711	8705	8707	8711	8707
FM Category	Hazardous Area Approval Code						
Non-Classified Locations							
Transmitter	NA	NA	NA	NA	NA	NA	N0
Sensor	NA	N0	NA	NA	N0	NA	N0
Suitable for Class I, Division 1							
Explosion-Proof							
Trans: Groups C, D T6	E5(2)	-	E5	-	-	-	-
Sensor: Groups C, D T6	E5(2)	-	E5	-	-	-	-
Explosion-Proof with Intrinsically Safe Output							
Trans: Groups C, D T6	E5(2)(3)	-	E5(3)	-	-	-	-
Sensor: Groups C, D T6	E5(2)	-	E5	-	-	-	-
Suitable for Class I, Division 2							
Non-Flammable Fluids							
Trans: Groups A,B,C,D T4	N0	N0	N0	N0	N0	N0	N0
Sensor: Groups A,B,C,D T5	N0	N0(4)	N0	N0	N0(4)	N0	N0(4)
Flammable Fluids							
Trans: Groups A,B,C,D T4	N5	N5	N5	N5	N5	N5	N5
Sensor: Groups A,B,C,D T5	N5	N5(4)	N5	N5	N5(4)	N5	N5(4)
Non-Flammable Fluids with Intrinsically Safe Output							
Trans: Groups A,B,C,D T4	N0(3)	N0(3)	N0(3)	-	-	-	-
Sensor: Groups A,B,C,D T5	N0	N0(4)	N0	-	-	-	-
Other Certifications	**Product Certification Code(5)**						
European Pressure Equipment Directive (PED)	PD	-	PD	PD	-	PD	-
NSF 61 Drinking Water(6)	DW	-	DW	DW	-	DW	-

(1) Remote Transmitter Only
(2) Available in line sizes 0.5 in. to 8 in. (15 mm to 200 mm) only
(3) For I.S. Output, Output Code B must be ordered
(4) 8707 Sensor has Temp Code - T3C
(5) Product Certification Codes are added to the Sensor model number only
(6) Only available with PTFE (all line sizes) or Polyurethane (4 in. or larger) Lining Materials and 316L SST Electrodes

Table B-2. Canadian Standards Association (CSA) Approvals Offering

Transmitter	8732E			8712D(1)			8712H(1)
Sensor	8705	8707	8711	8705	8707	8711	8707
CSA Category	Hazardous Area Approval Code						
Non-Classified Locations							
Transmitter	NA	-	NA	NA	-	NA	-
Sensor	NA	-	NA	NA	-	NA	-
Suitable for Class I, Division 2							
Non-Flammable Fluids							
Trans: Groups A,B,C,D T4	N0	N0	N0	N0	N0	N0	N0
Sensor: Groups A,B,C,D T5	N0	N0(2)	N0	N0	N0(2)	N0	N0(2)
Other Certifications	**Product Certification Code(3)**						
European Pressure Equipment Directive (PED)	PD	-	PD	PD	-	PD	-
NSF 61 Drinking Water(4)	DW	-	DW	DW	-	DW	-

(1) Remote Transmitter Only
(2) 8707 Sensor has Temp Code - T3C
(3) Product Certification Codes are added to the Sensor model number only
(4) Only available with PTFE (all line sizes) or Polyurethane (4 in. or larger) Lining Materials and 316L SST Electrodes

Table B-3. ATEX Approvals Offering

Transmitter	8732E			8712D(1)			8712H(1)
Sensor	8705	8707	8711	8705	8707	8711	8707
ATEX Category	Hazardous Area Approval Code						
Non-Hazardous							
Trans: LVD and EMC	NA	-	NA	NA	-	NA	-
Sensor: LVD and EMC	NA	-	NA	NA	-	NA	-
Equipment Category 2							
Gas Group IIB							
Trans: Ex d IIB T6	ED	-	ED	-	-	-	-
Sensor: Ex e ia IIC T3...T6	KD(2)	-	KD(2)	-	-	-	-
Gas Group IIC							
Trans: Ex d IIC T6	E1	-	E1	-	-	-	-
Sensor: Ex e ia IIC T3...T6	E1	-	E1	-	-	-	-
Gas Group IIB with Intrinsically Safe Output							
Trans: Ex de [ia] IIB T6	ED(3)	-	ED(3)	-	-	-	-
Sensor: Ex e ia IIC T3...T6	KD(2)	-	KD(2)	-	-	-	-
Gas Group IIC with Intrinsically Safe Output							
Trans: Ex de [ia] IIC T6	E1(3)	-	E1(3)	-	-	-	-
Sensor: Ex e ia IIC T3...T6	E1	-	E1	-	-	-	-
Equipment Category 3							
Gas Group IIC							
Trans: Ex nA nL IIC T4	N1	-	N1	N1	-	N1	-
Sensor: Ex nA [L] IIC T3...T6	N1	-	N1	N1	-	N1	-
Equipment Category 1 - Dust Environment							
Dust Environment Only							
Trans: Dust Ignition Proof	ND	-	ND	-	-	-	-
Sensor: Dust Ignition Proof	ND	-	ND	-	-	-	-
Other Certifications	**Product Certification Code(4)**						
European Pressure Equipment Directive (PED)	PD	-	PD	PD	-	PD	-
NSF 61 Drinking Water(5)	DW	-	DW	DW	-	DW	-

(1) Remote Transmitter Only
(2) With integral mount transmitter, approval is valid for Gas Group IIB
(3) For I.S. Output, Output Code B must be ordered
(4) Product Certification Codes are added to the Sensor model number only
(5) Only available with PTFE (all line sizes) or Polyurethane (4 in. or larger) Lining Materials and 316L SST Electrodes

Table B-4. IECEx Approvals Offering

Transmitter	8732E(1)		
Sensor	8705	8707	8711
IECEx Category	Hazardous Area Approval Code		
Non-Hazardous			
Trans: LVD and EMC	NA	-	NA
Sensor: LVD and EMC	NA	-	NA
Equipment Category 2			
Gas Group IIB			
Trans: Ex d IIB T6	EF	-	EF
Gas Group IIC			
Trans: Ex d IIC T6	E7	-	E7
Gas Group IIB with Intrinsically Safe Output			
Trans: Ex de [ia] IIB T6	EF(2)	-	EF(3)
Gas Group IIC with Intrinsically Safe Output			
Trans: Ex de [ia] IIC T6	E1(3)	-	E1(3)
Equipment Category 3			
Gas Group IIC			
Trans: Ex nA nL IIC T4	N7	-	N7

Equipment Category 1 - Dust Environment			
Dust Environment Only			
Trans: Dust Ignition Proof	NF	-	NF
Other Certifications	**Product Certification Code**(3)		
European Pressure Equipment Directive (PED)	PD	-	PD
NSF 61 Drinking Water(4)	DW	-	DW

(1) Available in remote mount configuration only. Requires equivalent ATEX approval on the sensor
(2) For I.S. Output, Output Code B must be ordered
(3) Product Certification Codes are added to the Sensor model number only
(4) Only available with PTFE (all line sizes) or Polyurethane (4 in. or larger) Lining Materials and 316L SST Electrodes

HAZARDOUS LOCATION CERTIFICATIONS

Equivalent Hazardous Location Certifications for sensor and transmitter must match in integrally-mounted magnetic flowmeter systems. Remote-mounted systems do not require matched hazardous location certification option codes.

Transmitter Approval Information

Table B-5. Transmitter Option Codes

	Rosemount 8732E		Rosemount 8712D	Rosemount 8712H
Approval Codes	HART	FOUNDATION fieldbus		
NA	•	•	•	
N0	•	•	•	•
N1	•	•	•	
N5	•	•	•	•
N7	•	•		
ND	•	•		
NF	•	•		
E1	•	•		
E5	•	•		
E7	•	•		
ED	•	•		

North American Certifications

Factory Mutual (FM)

NOTE
For intrinsically safe (IS) outputs on the 8732E output option code B must be selected.
IS outputs for Class I, Division 1, Groups A, B, C, D.
Temp Code – T4 at 60°C

NOTE
For the 8732E transmitters with a local operator interface (LOI) or display, the lower ambient temperature limit is -20 °C.

N0 Division 2 Approval (All transmitters)

Reference Rosemount Control Drawing 08732-1052 (8732E).

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (8712 at 40°C)
T4 (8732 at 60°C: -50 °C ≤ Ta ≤ 60 °C)

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Codes – T4 (8712 at 40°C), T5 (8732 at 60°C)

Enclosure Type 4X

N5 Division 2 Approval (All Transmitters)
For sensors with IS electrodes only

Reference Rosemount Control Drawing 08732-1052 (8732E).

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (8712 at 40°C),
T4 (8732 at 60°C: -50 °C ≤ Ta ≤ 60 °C)

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Codes – T4 (8712 at 40°C), T5 (8732 at 60°C)

Enclosure Type 4X

E5 Explosion-Proof Approval (8732E)

Reference Rosemount Control Drawing 08732-1052

Explosion-Proof for Class I, Division 1, Groups C, D
Temp Code – T6 at 60°C

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T5 at 60°C

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (8732 at 60°C)

Enclosure Type 4X

Canadian Standards Association (CSA)

N0 Division 2 Approval

Reference Rosemount Control Drawing 08732-1051 (8732E)

Class I, Division 2, Groups A, B, C, D
Temp Codes – T4 (8732 at 60°C: -50 °C ≤ Ta ≤ 60 °C)

Dust-ignition proof Class II/III, Division 1, Groups E, F, G
Temp Codes – T4 (8712 at 40°C), T5 (8732 at 60°C)

Enclosure Type 4X

European Certifications

E1 ATEX Flameproof

Hydrogen gas group
8732 - Certificate No.: KEMA 07ATEX0073 X ⟨Ex⟩ II 2G
Ex de [ia] IIC T6 (-50 °C ≤ Ta ≤ +60 °C)
with LOI T6 (-20 °C ≤ Ta ≤ +60 °C)
V_{max} = 250 V AC or 42 V DC
CE 0575

ED ATEX Flameproof

8732 - Certificate No.: KEMA 07ATEX0073 X ⟨Ex⟩ II 2G
Ex de [ia] IIB T6 (-50 °C ≤ Ta ≤ +60 °C)
with LOI T6 (-20 °C ≤ Ta ≤ +60 °C)
V_{max} = 250 V AC or 42 V DC
CE 0575

ND ATEX Dust

8732 - Certificate No.: KEMA 06ATEX0006 ⟨Ex⟩ II 1D
max ΔT = 40 °K(1)
Amb. Temp. Limits: (-20 °C ≤ Ta ≤ + 65 °C)
V_{max} = 250 V AC or 42 V DC
IP 66
CE 0575

SPECIAL CONDITIONS FOR SAFE USE (KEMA 07ATEX0073 X):
If the Rosemount 8732 Flow Transmitter is used integrally with the Rosemount 8705 or 8711 Sensors, it shall be assured that the mechanical contact areas of the Sensor and Flow Transmitter comply with the requirements for flat joints according to standard EN/IEC 60079-1 clause 5.2.

The relation between ambient temperature, process temperature, and temperature class is to be taken from *Table B-8 on page B-13*

The electrical data is to be taken from *Table B-7 on page B-12*

If the Rosemount 8732 Flow Transmitter is used integrally with the Junction Box, it shall be assured that the mechanical contact areas of the Junction Box and Flow Transmitter comply with the requirements for flanged joints according to standard EN/IEC 60079-1 clause 5.2.

Per EN60079-1: 2004 the gap of the joint between transmitter and remote junction box/sensor is less than required per table 1 clause 5.2.2, and is only approved for use with an approved Rosemount transmitter and approved junction box/sensor.

INSTALLATION INSTRUCTIONS:
The cable and conduit entry devices and blanking elements shall be of a certified flameproof type, suitable for the conditions of use and correctly installed. With the use of conduit, a certified stopping box shall be provided immediately to the entrance of the enclosure.

SPECIAL CONDITIONS FOR SAFE USE (X) (03ATEX2159X):
The relation between ambient temperature, process temperature and temperature class is to be taken from *Table B-8 on page B-13.*

(1) Max surface temperature is 40 °C above the ambient temperature conditions. Tmax = 100 °C

INSTALLATION INSTRUCTIONS:
The cable and conduit entry devices and the closing elements shall be of a certified increased safety type, suitable for the conditions of use and correctly installed.

At ambient temperatures above 50 °C, the flow meter shall be used with heat resistant cables with a temperature rating of at least 90 °C.

A Junction Box in type of explosion protection increased safety “e” may be attached to the base of the Rosemount 8732E Flow Transmitter, permitting remote mounting of the Rosemount 8705 and 8711 Sensors.

Ambient temperature range of the Junction Box: -50 °C to +60 °C.

The Junction Box is classified as:
II 2 G Ex e IIB T6 and certified under KEMA 07ATEX0073 X.

N1 ATEX Type n

8712D - ATEX Certificate No: BASEEFA 05ATEX0170X
EEx nA nL IIC T4 (Ta = -50 °C to + 60 °C)
V_{max} = 42 V DC
CE 0575

8732 - ATEX Certificate No: BASEEFA 07ATEX0203X
Ex nA nL IIC T4 (Ta = -50 °C to + 60 °C)
V_{max} = 42 V DC
CE 0575

Remote Junction Box

8732 - Certificate No.: KEMA 07ATEX0073 X Ex II 2G
ATEX Ex e (1) T6 (Ta = -50 °C to +60 °C)
When installed per drawing 08732-1060
After de-energizing, wait 10 minutes before opening cover
CE 0575

(1) *IIC for E1*
IIB for ED

International Certifications

E7 IECEx Flameproof

8732 - Certificate No.: KEM 07.0038X
Ex de [ia] IIC T6 (-50 °C ≤ Ta ≤ +60 °C)
V_{max} = 250 V AC or 42 V DC

EF IECEx Flameproof

8732 - Certificate No.: KEM 07.0038X
Ex de [ia] IIB T6 (-50 °C ≤ Ta ≤ +60 °C)
V_{max} = 250 V AC or 42 V DC

NF IECEx Dust

8732 - Certificate No.: KEM 07.0038X
Ex tD A20 IP66 T 100 °C
T6 (-20 °C ≤ Ta ≤ +60 °C)
V_{max} = 250 V AC or 42 V DC

SPECIAL CONDITIONS FOR SAFE USE (KEM 07.0038X):
If the Rosemount 8732 Flow Transmitter is used integrally with the Rosemount 8705 or 8711 Sensors, it shall be assured that the mechanical contact areas of the Sensor and Flow Transmitter comply with the requirements for flat joints according to standard EN/IEC 60079-1 clause 5.2.

The relation between ambient temperature, process temperature, and temperature class is to be taken from *Table B-8 on page B-13*

The electrical data is to be taken from *Table B-7 on page B-12*

If the Rosemount 8732 Flow Transmitter is used integrally with the Junction Box, it shall be assured that the mechanical contact areas of the Junction Box and Flow Transmitter comply with the requirements for flanged joints according to standard EN/IEC 60079-1 clause 5.2.

INSTALLATION INSTRUCTIONS:
The cable and conduit entry devices and blanking elements shall be of a certified flameproof type, suitable for the conditions of use and correctly installed. With the use of conduit, a certified stopping box shall be provided immediately to the entrance of the enclosure.

N7 IECEx Type n

8712D - Certificate No: IECEx BAS 07.0036X

EEx nA nL IIC T4 (Ta = -50 °C to + 60 °C)
V_{max} = 42 V DC

8732 - Certificate No: IECEx BAS 07.0062X

Ex nA nL IIC T4 (Ta = -50 °C to + 60 °C)
V_{max} = 42 V DC

Remote Junction Box

8732 - Certificate No.: KEM 07.0038X
IECEx Ex e [(1)] T6 (Ta = -50 °C to + 60 °C)
When installed per drawing 08732-1060
After de-energizing, wait 10 minutes before opening cover

(1) *IIC for E7*
IIB for EF

Table B-6. Sensor Approval Information

Approval Codes	Rosemount 8705 Sensor		Rosemount 8707 Sensor		Rosemount 8711 Sensor		Rosemount 8721 Sensors
	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids	For Flammable Fluids	For Non-flammable Fluids
NA	•						•
N0	•		•		•		
ND	•	•	•	•	•	•	•
N1	•	•			•	•	
N5	•	•	•	•	•	•	
N7	•	•			•	•	
ND	•	•			•	•	
NF	•	•			•	•	
E1	•	•			•	•	
E5(1)	•	•			•	•	
KD(2)	•	•					

(1) Available in line sizes up to 8 in. (200 mm) only.
(2) Refer to Table B-8 on page B-13 for relation between ambient temperature, process temperature, and temperature class.

North American Certifications

Factory Mutual (FM)

N0 **Division 2 Approval for Non-Flammable Fluids (All Sensors)**

Class I, Division 2, Groups A, B, C, D
Temp Code – T5 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T6 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Enclosure Type 4X

N0 **for 8721 Hygienic Sensor**

Factory Mutual (FM) Ordinary Location;
CE Marking; 3-A Symbol Authorization #1222;
EHEDG Type EL

N5 **Division 2 Approval for Flammable Fluids (All Sensors)**

Class I, Division 2, Groups A, B, C, D
Temp Code – T5 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T6 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Enclosure Type 4X

E5 **Explosion-Proof (8705 and 8711 Only)**

Explosion-Proof for Class I, Division 1, Groups C, D
Temp Code – T6 at 60°C

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G
Temp Code – T6 at 60°C

Class I, Division 2, Groups A, B, C, D
Temp Code – T5 at 60°C

Enclosure Type 4X

Canadian Standards Association (CSA)

N0 Suitable for Class I, Division 2, Groups A, B, C, D
Temp Code – T5 (8705/8711 at 60°C)
Temp Code – T3C (8707 at 60°C)

Dust-Ignition proof Class II/III, Division 1, Groups E, F, G

Enclosure Type 4X

N0 **for 8721 Hygienic Sensor**

Canadian Standards Association (CSA) Ordinary Location;
CE Marking; 3-A Symbol Authorization #1222;
EHEDG Type EL

European Certifications

ND **ATEX Dust**

8732 - Certificate No.: KEMA 06ATEX0006 Ex II 1D max
T = 40 °K(1) Amb. Temp. Limits: (-20 °C = Ta = +65 °C)
Vmax = 40 V DC (pulsed)
IP 66
CE 0575

N1 **ATEX Non-Sparking/Non-incendive (8705/8711 Only)**

Certificate No: KEMA02ATEX1302X Ex II 3G

EEx nA [L] IIC T3... T6
Ambient Temperature Limits -20 to 65°C

SPECIAL CONDITIONS FOR SAFE USE (X):
The relation between ambient temperature, process temperature and temperature class is to be taken from the table under (15-description) above. - (See Table 13) The electrical data is to be taken from the summary under (15-electrical data above). (See Table 12)

E1 ATEX Increased Safety (Zone 1)
KD with IS Electrodes (8711 only)

Certificate No: KEMA03ATEX2052X Ex II 1/2G
EEx e ia IIC T3... T6 (Ta = -20 to +60°) (See *Table B-8 on page B-13*)
CE 0575
V_{max} = 40 V DC (pulsed)

SPECIAL CONDITIONS FOR SAFE USE (X):
If the Rosemount 8732 Flow Transmitter is used integrally with the Rosemount 8705 or Rosemount 8711 Sensors, it shall be assured that the mechanical contact areas of the Sensor and Flow Transmitter comply with the requirements for flat joints according to standard EN 50018, clause 5.2. The relation between ambient temperature, process temperature and temperature class is to be taken from the table under (15-description) above. - (See Table 11) The electrical data is to be taken from the summary under (15-electrical data above). (See Table 12)

INSTALLATION INSTRUCTIONS:
At ambient temperature above 50 °C, the flowmeter shall be used with heat resistant cables with a temperature rating of at least 90 °C.

A fuse with a rating of maximum 0,7 A according to IEC 60127-1 shall be included in the coil excitation circuit if the sensors are used with other flow transmitters (e.g. Rosemount 8712).

E1 ATEX Increased Safety (Zone 1)
KD with IS Electrodes (8705 only)

Certificate No. KEMA 03ATEX2052X Ex II 1/2G
EEx e ia IIC T3... T6 (Ta = -20 to 60 °C) (See *Table B-8 on page B-13*)
CE 0575
V_{max} = 40 V DC (pulsed)

SPECIAL CONDITIONS FOR SAFE USE (X):
If the Rosemount 8732 Flow Transmitter is used integrally with the Rosemount 8705 or Rosemount 8711 Sensors, it shall be assured that the mechanical contact areas of the Sensor and Flow Transmitter comply with the requirements for flat joints according to standard EN 50018, clause 5.2. The relation between ambient temperature, process temperature and temperature class is to be taken from the table under (15-description) above. - (See Table 11) The electrical data is to be taken from the summary under (15-electrical data above). (See Table 12)

INSTALLATION INSTRUCTIONS:
At ambient temperature above 50 °C, the flowmeter shall be used with heat resistant cables with a temperature rating of at least 90 °C.

A fuse with a rating of maximum 0.7 A according to IEC 60127-1 shall be included in the coil excitation circuit.

Table B-7. Electrical Data

Rosemount 8732 Flow Transmitter	
Power supply:	250 V AC, 1 A or 42 Vdc, 2,5 A, 20 W maximum
Foundation fieldbus output:	30 V DC, 30 mA, 1 W maximum
Rosemount 8705 and 8711 Sensors	
Coil excitation circuit:	40 V DC (pulsed), 0,5 A, 20 W maximum
Electrode circuit:	Intrinsically Safe Electrode Circuit: U_i = 5 V, I_i = 0.2 mA, P_i = 1 mW, U_m = 250 V
Rosemount 8732E Flow Transmitter:	
Power supply:	250 V AC, 1 A or 42 Vdc, 2, 5 A, 20 W maximum
FOUNDATION™ fieldbus output:	Intrinsically Safe Output:
	U_i = 30 V
	I_i = 380 mA
	P_i = 5,32 W
	C_i = 924 pF
	L_i = 0 mH

Table B-8. Relation between ambient temperature, process temperature, and temperature class(1)

Meter Size (Inches)	Maximum Ambient Temperature	Maximum Process Temperature	Temperature Class
1/2	115°F (65°C)	239°F (115°C)	T3
1	149°F (65°C)	248°F (120°C)	T3
1	95°F (35°C)	95°F (35°C)	T4
1 1/2	149°F (65°C)	257°F (125°C)	T3
1 1/2	122°F (50°C)	148°F (60°C)	T4
2	149°F (65°C)	257°F (125°C)	T3
2	149°F (65°C)	167°F (75°C)	T4
2	104°F (40°C)	104°F (40°C)	T5
3 - 36	149°F (65°C)	266°F (130°C)	T3
3 - 36	149°F (65°C)	194°F (90°C)	T4
3 - 36	131°F (55°C)	131°F (55°C)	T5
3 - 36	104°F (40°C)	104°F (40°C)	T6
6	115°F (65°C)	275°F(135°C)	T3
6	115°F (65°C)	230°F (110°C)	T4
6	115°F (65°C)	167°F (75°C)	T5
6	140°F (60°C)	140°F (60°C)	T6
8-60	115°F (65°C)	284°F (140°C)	T3
8-60	115°F (65°C)	239°F (115°C)	T4
8-60	115°F (65°C)	176°F (80°C)	T5
8-60	115°F (65°C)	156°F (69°C)	T6

Table B-9. Relation between the maximum ambient temperature, the maximum process temperature, and the temperature class(2)

Maximum Ambient Temperature	Maximum process temperature °F (°C) per temperature class			
	T3	T4	T5	T6
0.5 in. sensor size				
149°F (65°C)	297°F (147°C)	138°F (59°C)	54°F (12°C)	18°F (-8°C)
140°F (60°C)	309°F (154°C)	151°F (66°C)	66°F (19°C)	28°F (-2°C)
131°F (55°C)	322°F (161°C)	163°F (73°C)	79°F (26°C)	41°F (5°C)
122°F (50°C)	334°F (168°C)	176°F (80°C)	90°F (32°C)	54°F (12°C)
113°F (45°C)	347°F (175°C)	189°F (87°C)	102°F (39°C)	66°F (19°C)
104°F (40°C)	351°F (177°C)	199°F (93°C)	115°F (46°C)	79°F (26°C)
95°F (35°C)	351°F (177°C)	212°F (100°C)	127°F (53°C)	90°F (32°C)
86°F (30°C)	351°F (177°C)	225°F (107°C)	138°F (59°C)	102°F (39°C)
77°F (25°C)	351°F (177°C)	237°F (114°C)	151°F (66°C)	115°F (46°C)
68°F (20°C)	351°F (177°C)	248°F (120°C)	163°F (73°C)	127°F (53°C)
1.0 in. sensor size				
149°F (65°C)	318°F (159°C)	158°F (70°C)	72°F (22°C)	34°F (1°C)
140°F (60°C)	331°F (166°C)	171°F (77°C)	84°F (29°C)	46°F (8°C)
131°F (55°C)	343°F (173°C)	183°F (84°C)	97°F (36°C)	59°F (15°C)
122°F (50°C)	351°F (177°C)	196°F (91°C)	109°F (43°C)	72°F (22°C)
113°F (45°C)	351°F (177°C)	207°F (97°C)	122°F (50°C)	84°F (29°C)
104°F (40°C)	351°F (177°C)	219°F (104°C)	135°F (57°C)	97°F (36°C)
95°F (35°C)	351°F (177°C)	232°F (111°C)	145°F (63°C)	109°F (43°C)
86°F (30°C)	351°F (177°C)	244°F (118°C)	158°F (70°C)	122°F (50°C)
77°F (25°C)	351°F (177°C)	257°F (125°C)	171°F (77°C)	135°F (57°C)
68°F (20°C)	351°F (177°C)	270°F (132°C)	183°F (84°C)	145°F (63°C)

(1) This table is applicable for CD and KD option codes only.
(2) This table is applicable for N1 option codes only.

Maximum Ambient Temperature	Maximum process temperature °F (°C) per temperature class T3	T4	T5	T6
1.5 in. sensor size				
149°F (65°C)	297°F (147°C)	160°F (71°C)	88°F (31°C)	55°F (13°C)
140°F (60°C)	307°F (153°C)	171°F (77°C)	97°F (36°C)	66°F (19°C)
131°F (55°C)	318°F (159°C)	181°F (83°C)	108°F (42°C)	77°F (25°C)
122°F (50°C)	329°F (165°C)	192°F (89°C)	118°F (48°C)	88°F (31°C)
113°F (45°C)	340°F (171°C)	203°F (95°C)	129°F (54°C)	97°F (36°C)
104°F (40°C)	351°F (177°C)	214°F (101°C)	140°F (60°C)	108°F (42°C)
95°F (35°C)	351°F (177°C)	223°F (106°C)	151°F (66°C)	118°F (48°C)
86°F (30°C)	351°F (177°C)	234°F (112°C)	160°F (71°C)	129°F (54°C)
77°F (25°C)	351°F (177°C)	244°F (118°C)	171°F (77°C)	140°F (60°C)
68°F (20°C)	351°F (177°C)	255°F (124°C)	181°F (83°C)	151°F (66°C)
2.0 in. sensor size				
149°F (65°C)	289°F (143°C)	163°F (73°C)	95°F (35°C)	66°F (19°C)
140°F (60°C)	300°F (149°C)	172°F 78(°C)	104°F (40°C)	75°F (24°C)
131°F (55°C)	309°F (154°C)	183°F (84°C)	115°F (46°C)	84°F (29°C)
122°F (50°C)	318°F (159°C)	192°F (89°C)	124°F (51°C)	95°F (35°C)
113°F (45°C)	329°F (165°C)	201°F (94°C)	135°F (57°C)	104°F (40°C)
104°F (40°C)	338°F (170°C)	212°F (100°C)	144°F (62°C)	115°F (46°C)
95°F (35°C)	349°F (176°C)	221°F (105°C)	153°F (67°C)	124°F (51°C)
86°F (30°C)	351°F (177°C)	232°F (111°C)	163°F (73°C)	135°F (57°C)
77°F (25°C)	351°F (177°C)	241°F (116°C)	172°F (78°C)	144°F (62°C)
68°F (20°C)	351°F (177°C)	252°F (122°C)	183°F (84°C)	153°F (67°C)
3 to 60 in. sensor size				
149°F (65°C)	351°F (177°C)	210°F (99°C)	117°F (47°C)	75°F (24°C)
140°F (60°C)	351°F (177°C)	223°F (106°C)	129°F (54°C)	90°F (32°C)
131°F (55°C)	351°F (177°C)	237°F (114°C)	144°F (62°C)	102°F (39°C)
122°F (50°C)	351°F (177°C)	250°F (121°C)	156°F (69°C)	117°F (47°C)
113°F (45°C)	351°F (177°C)	264°F (129°C)	171°F (77°C)	129°F (54°C)
104°F (40°C)	351°F (177°C)	266°F (130°C)	183°F (84°C)	144°F (62°C)
95°F (35°C)	351°F (177°C)	266°F (130°C)	198°F (92°C)	156°F (69°C)
86°F (30°C)	351°F (177°C)	266°F (130°C)	203°F (95°C)	171°F (77°C)
77°F (25°C)	351°F (177°C)	266°F (130°C)	203°F (95°C)	176°F (80°C)
68°F (20°C)	351°F (177°C)	266°F (130°C)	203°F (95°C)	176°F (80°C)

Figure B-1. ATEX Installation
(1 of 6)

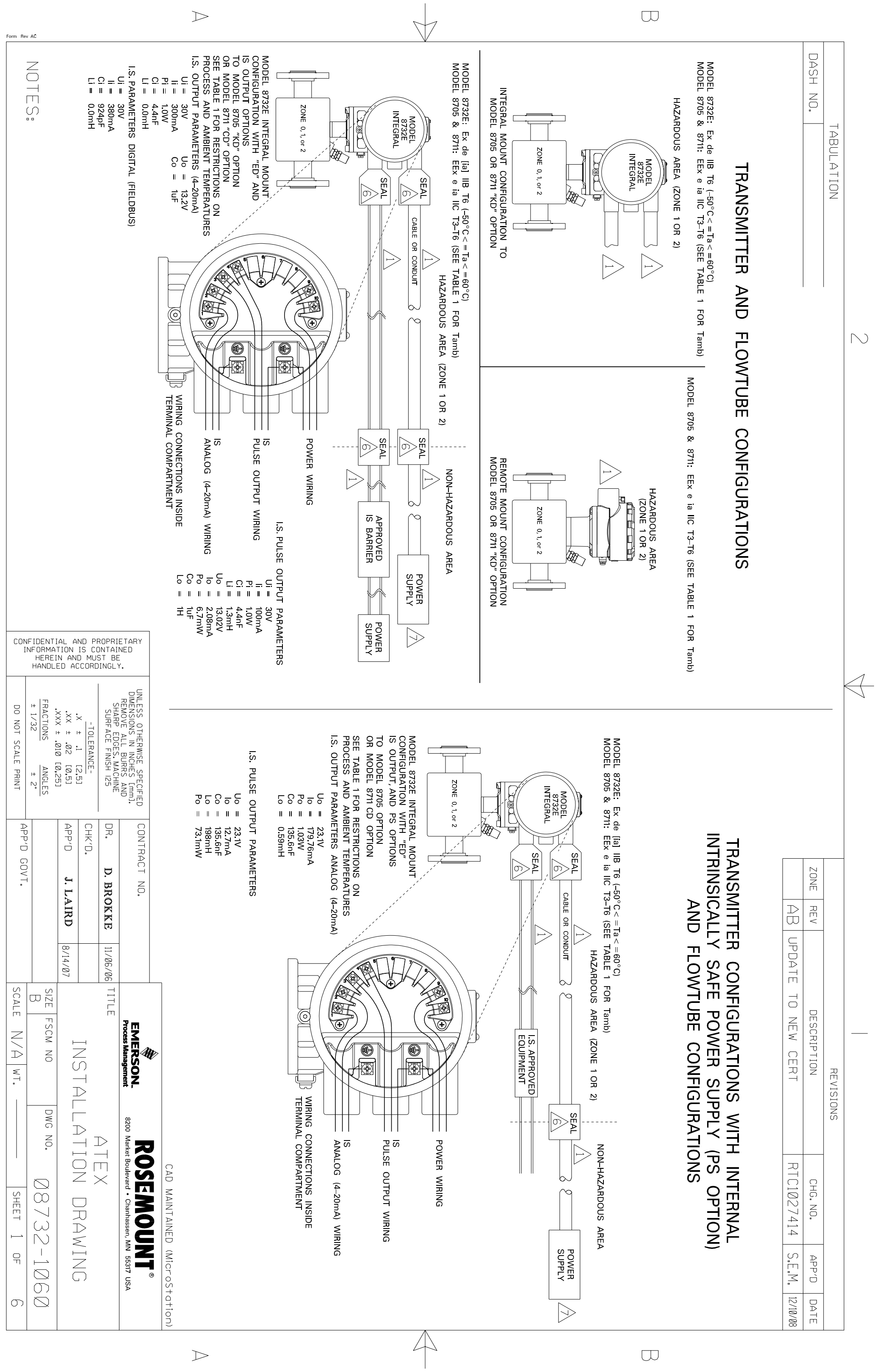


Figure B-2. ATEX Installation
(2 of 6)

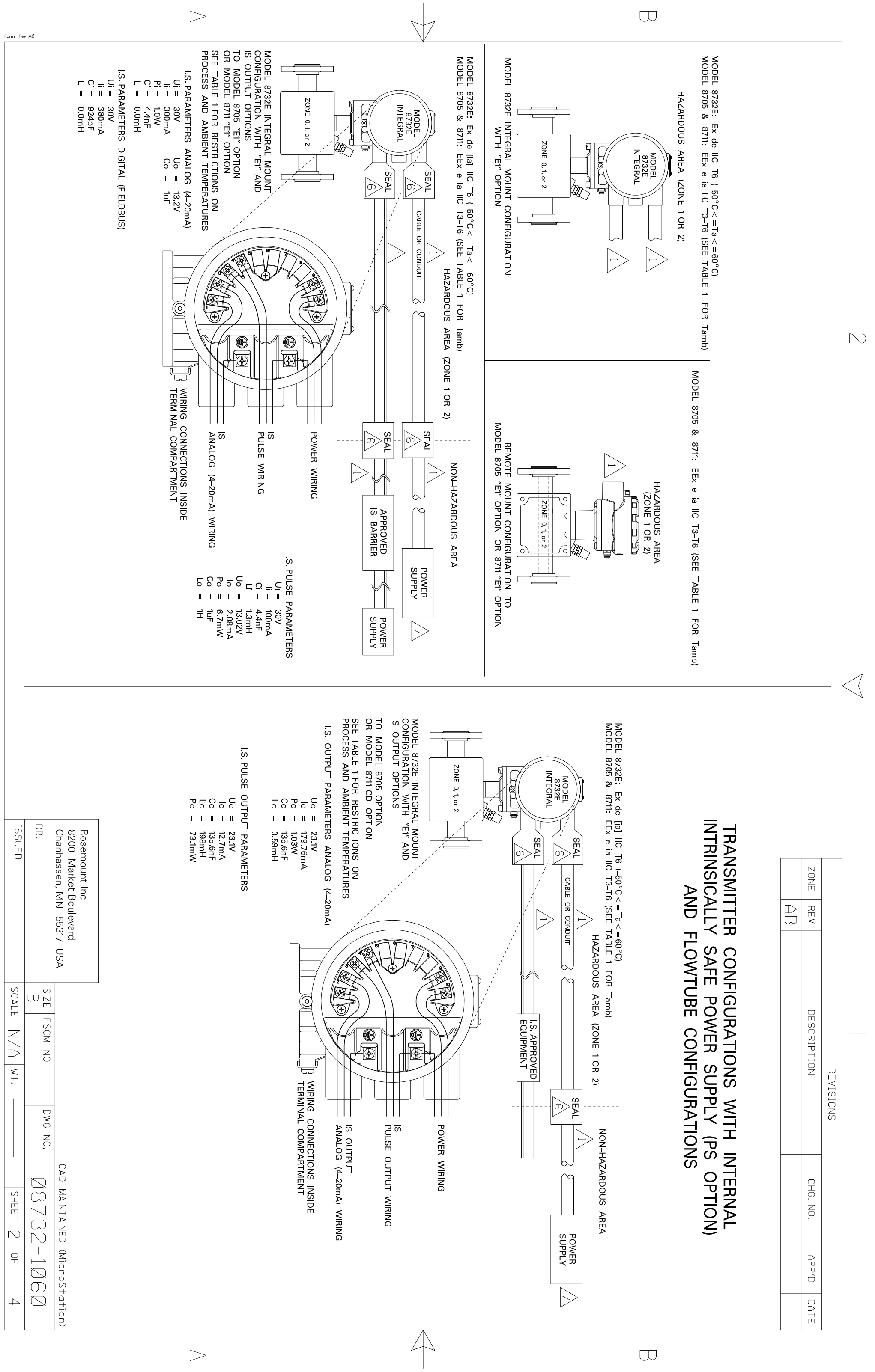


Figure B-3. ATEX Installation
(3 of 6)

REVISIONS					
ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AB				

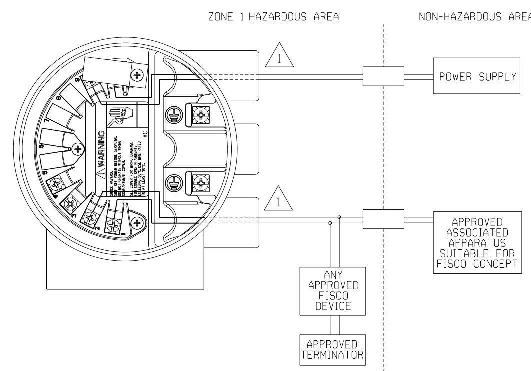
FISCO CONCEPT

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (Vmax), THE CURRENT (Imax), AND THE POWER (Pmax) WHICH AN INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE CONSIDERING FAULTS, MUST BE EQUAL OR GREATER THAN VOLTAGE (Voc), AND CURRENT (Isc) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (C_i) AND THE INDUCTANCE (L_i) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 uH RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE (Voc) OF THE ASSOCIATED APPARATUS IS LIMITED TO A RANGE OF 14 TO 17.5 VDC. ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.
THE CABLE USED TO INTERCONNECT DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

Loop Resistance Rc:	15.....150 Ohm/km
Inductance per unit length Lc:	0.4.....1 mH/km
Capacitance per unit length Cc:	45.....200 nF
Length of trunk cable:	less than or equal to 1000m
Length of spur cable:	less than or equal to 60m

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE LINE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE:
R = 90.....102 Ohm C = 0.....2.2uF
ONE OF THE ALLOWED TERMINATIONS MIGHT ALREADY BE INTEGRATED IN THE ASSOCIATED APPARATUS. THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED DUE TO I.S. REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF TRUNK AND ALL SPUR CABLES) OF CABLE IS PERMITTED. THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.



FISCO PARAMETERS

U_i (Vmax) = 30V
I_i (Imax) = 380mA
P_i (Pmax) = 5.32W
C_i = 924pF
L_i = 0.0uH
LEAKAGE CURRENT: LESS THAN OR EQUAL TO 50uA
TEMPERATURE CLASSIFICATION: T4
MAX AMBIENT TEMP: (-50°C LESS THAN OR EQUAL TO Ta LESS THAN OR EQUAL TO 60°C)

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR.	SIZE B	FSCM NO	DWG NO. 08732-1060
ISSUED	SCALE N/A	WT. ———	SHEET 3 OF 6

Figure B-4. ATEX Installation
(4 of 6)

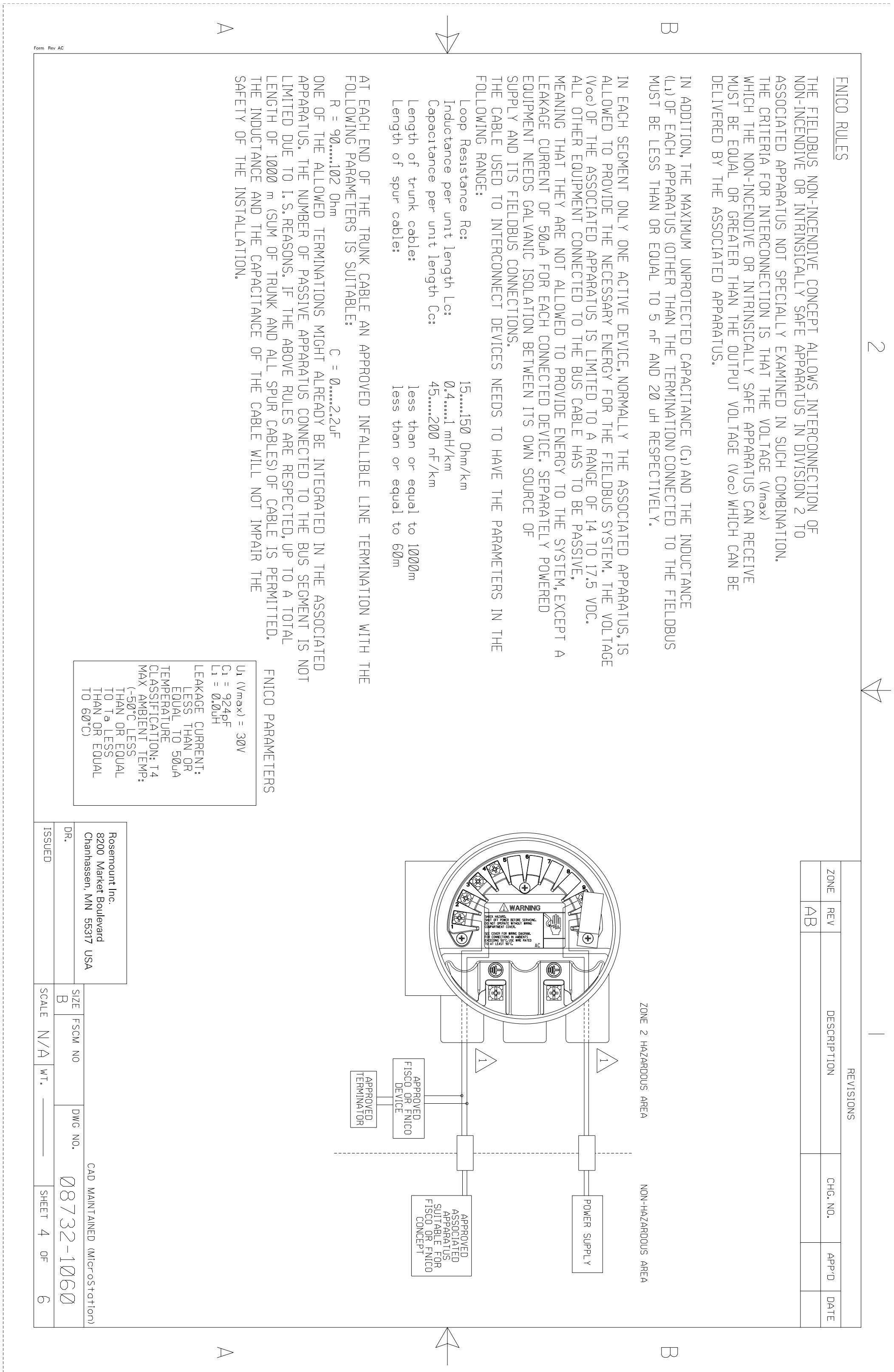


Figure B-5. ATEX Installation
(5 of 6)

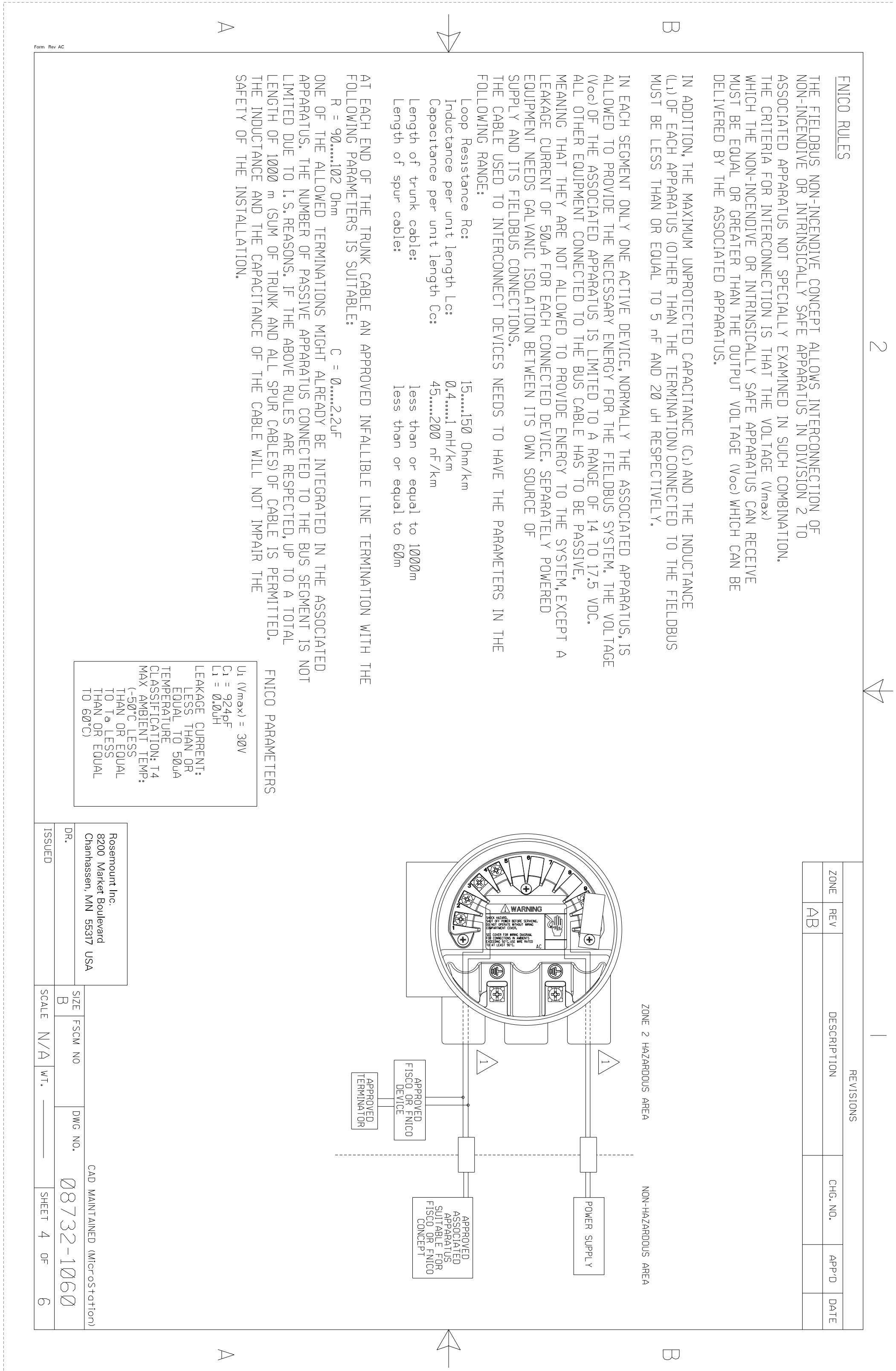


Figure B-6. ATEX Installation
(6 of 6)

REVISIONS					
ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AB				

TABLE 2 - TYPE 'n' FLOWTUBE TEMPERATURE LIMITS ✳				
0.5 INCH	TEMPERATURE CODE RATINGS (°C)			
	T3	T4	T5	T6
AMBIENT	PROCESS	PROCESS	PROCESS	PROCESS
65	147	59	12	-8
60	154	66	19	-2
55	161	73	26	5
50	168	80	32	12
45	175	87	39	19
40	177	93	46	26
35	-	100	53	32
30	-	107	59	39
25	-	114	66	46
20	-	120	73	53

'-' = VALUE IS SAME AS THAT SHOWN IN ROW ABOVE

TABLE 5 - TYPE 'n' FLOWTUBE TEMPERATURE LIMITS ✳				
2.0 INCH	TEMPERATURE CODE RATINGS (°C)			
	T3	T4	T5	T6
AMBIENT	PROCESS	PROCESS	PROCESS	PROCESS
65	143	73	35	19
60	149	78	40	24
55	154	84	46	29
50	159	89	51	35
45	165	94	57	40
40	170	100	62	46
35	176	105	67	51
30	177	111	73	57
25	-	116	78	62
20	-	122	84	67

'-' = VALUE IS SAME AS THAT SHOWN IN ROW ABOVE

TABLE 3 - TYPE 'n' FLOWTUBE TEMPERATURE LIMITS ✳				
1.0 INCH	TEMPERATURE CODE RATINGS (°C)			
	T3	T4	T5	T6
AMBIENT	PROCESS	PROCESS	PROCESS	PROCESS
65	159	70	22	1
60	166	77	29	8
55	173	84	36	15
50	177	91	43	22
45	-	97	50	29
40	-	104	57	36
35	-	111	63	43
30	-	118	70	50
25	-	125	77	57
20	-	132	84	63

'-' = VALUE IS SAME AS THAT SHOWN IN ROW ABOVE

TABLE 6 - TYPE 'n' FLOWTUBE TEMPERATURE LIMITS ✳				
3-60 INCH	TEMPERATURE CODE RATINGS (°C)			
	T3	T4	T5	T6
AMBIENT	PROCESS	PROCESS	PROCESS	PROCESS
65	177	99	47	24
60	-	106	54	32
55	-	114	62	39
50	-	121	69	47
45	-	129	77	54
40	-	130	84	62
35	-	-	92	69
30	-	-	95	77
25	-	-	-	80
20	-	-	-	-

'-' = VALUE IS SAME AS THAT SHOWN IN ROW ABOVE

TABLE 4 - TYPE 'n' FLOWTUBE TEMPERATURE LIMITS ✳				
1.5 INCH	TEMPERATURE CODE RATINGS (°C)			
	T3	T4	T5	T6
AMBIENT	PROCESS	PROCESS	PROCESS	PROCESS
65	147	71	31	13
60	153	77	36	19
55	159	83	42	25
50	165	89	48	31
45	171	95	54	36
40	177	101	60	42
35	-	106	66	48
30	-	112	71	54
25	-	118	77	60
20	-	124	83	66

'-' = VALUE IS SAME AS THAT SHOWN IN ROW ABOVE

✳ UPPER TEMPERATURE LIMITS FOR AMBIENT AND PROCESS TEMPERATURES

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR.	SIZE B	FSCM NO	DWG NO. 08732-1060
ISSUED	SCALE N/A	WT. ———	SHEET 6 OF 6

Figure B-7. FM Certified I.S. Output (1 of 4)

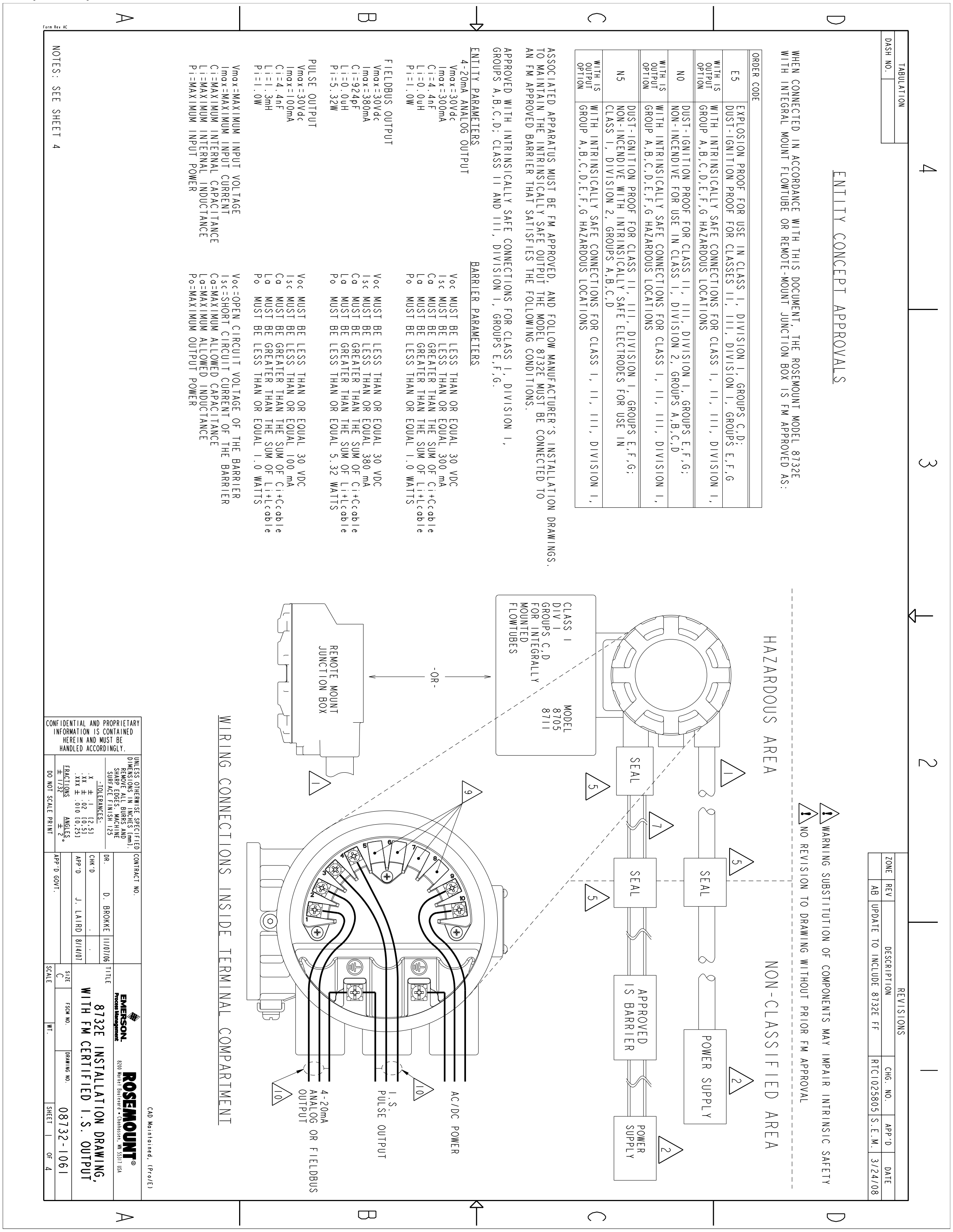


Figure B-8. FM Certified I.S. Output (2 of 4)

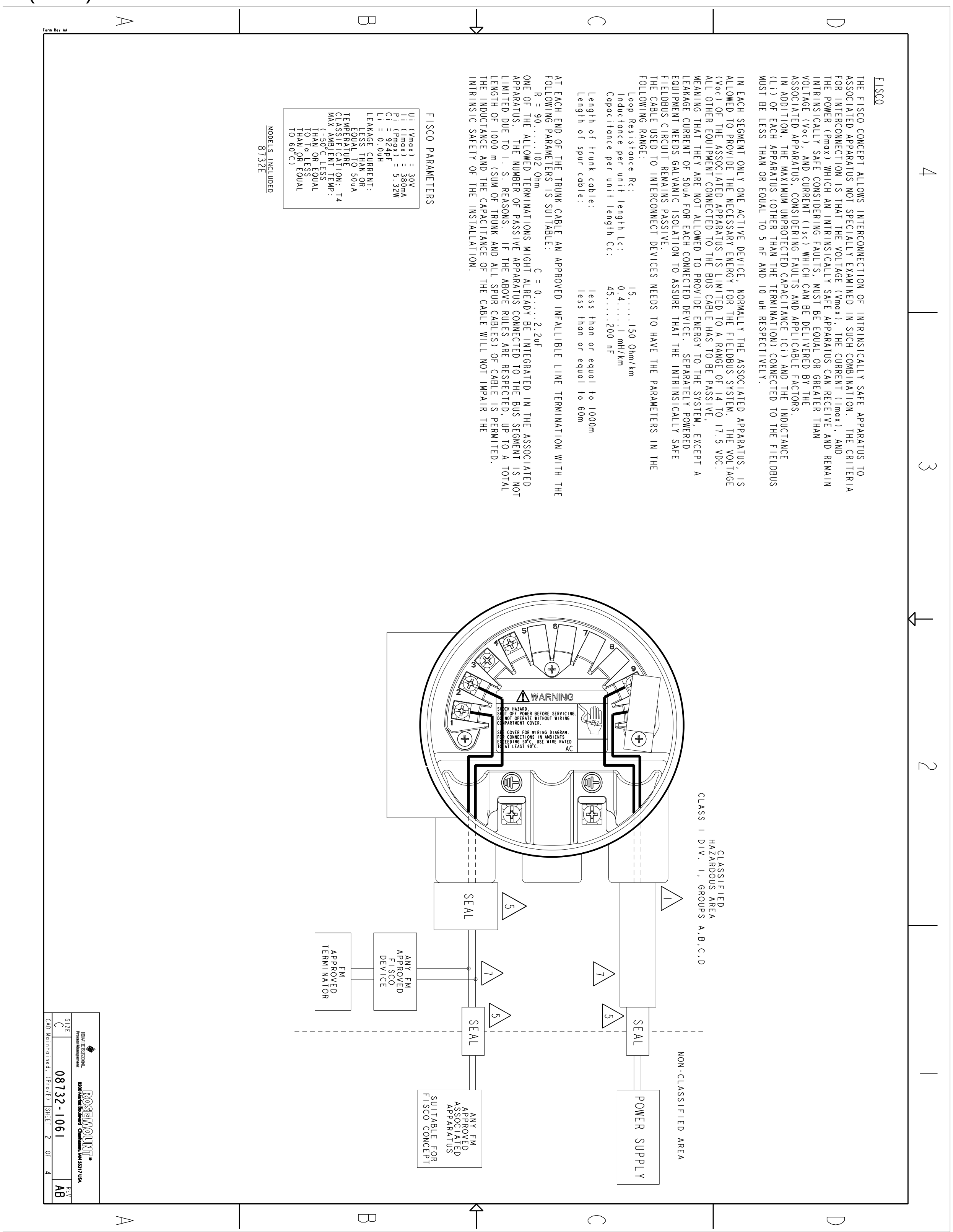


Figure B-9. FM Certified I.S. Output (3 of 4)

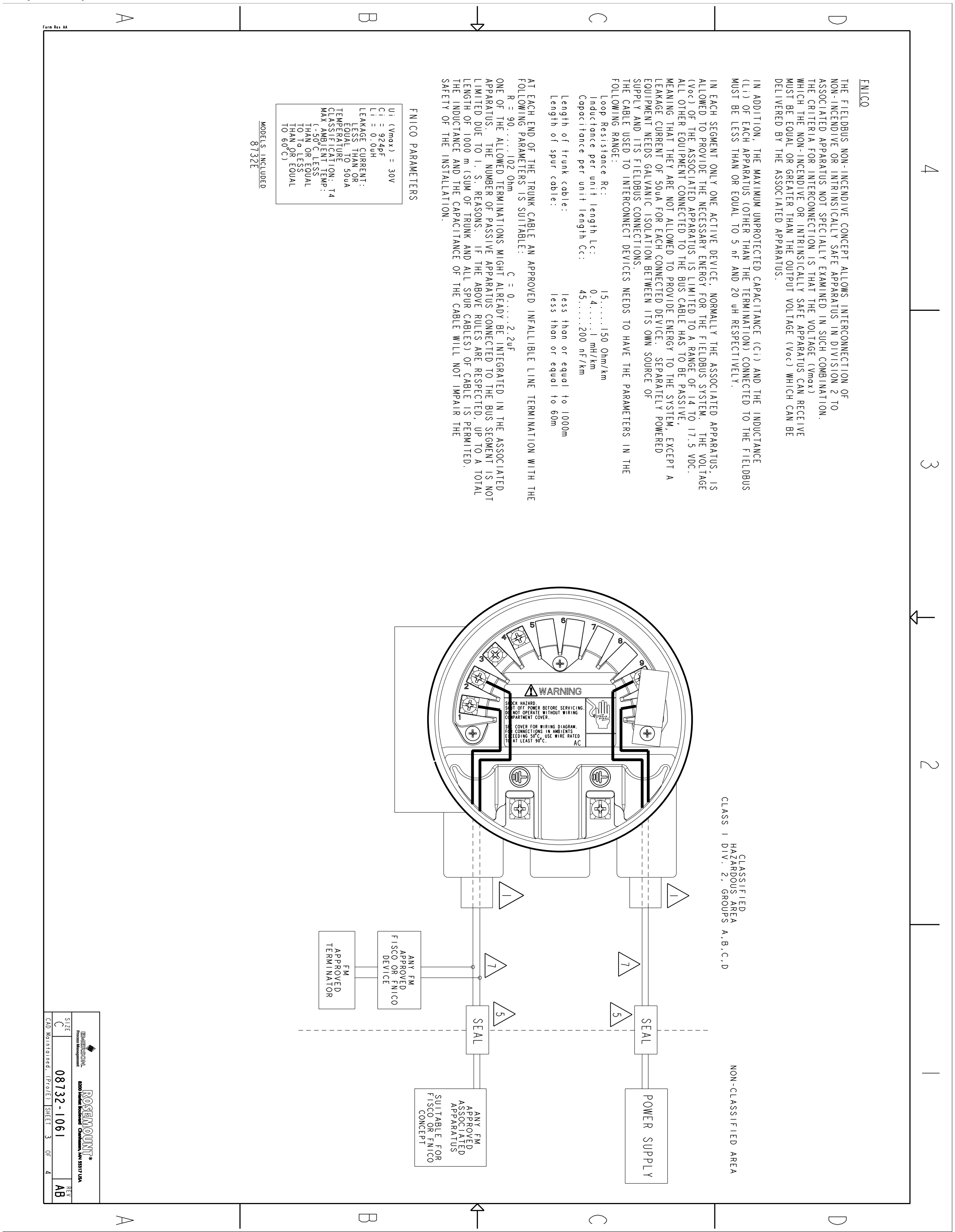


Figure B-10. FM Certified I.S.
Output (4 of 4)

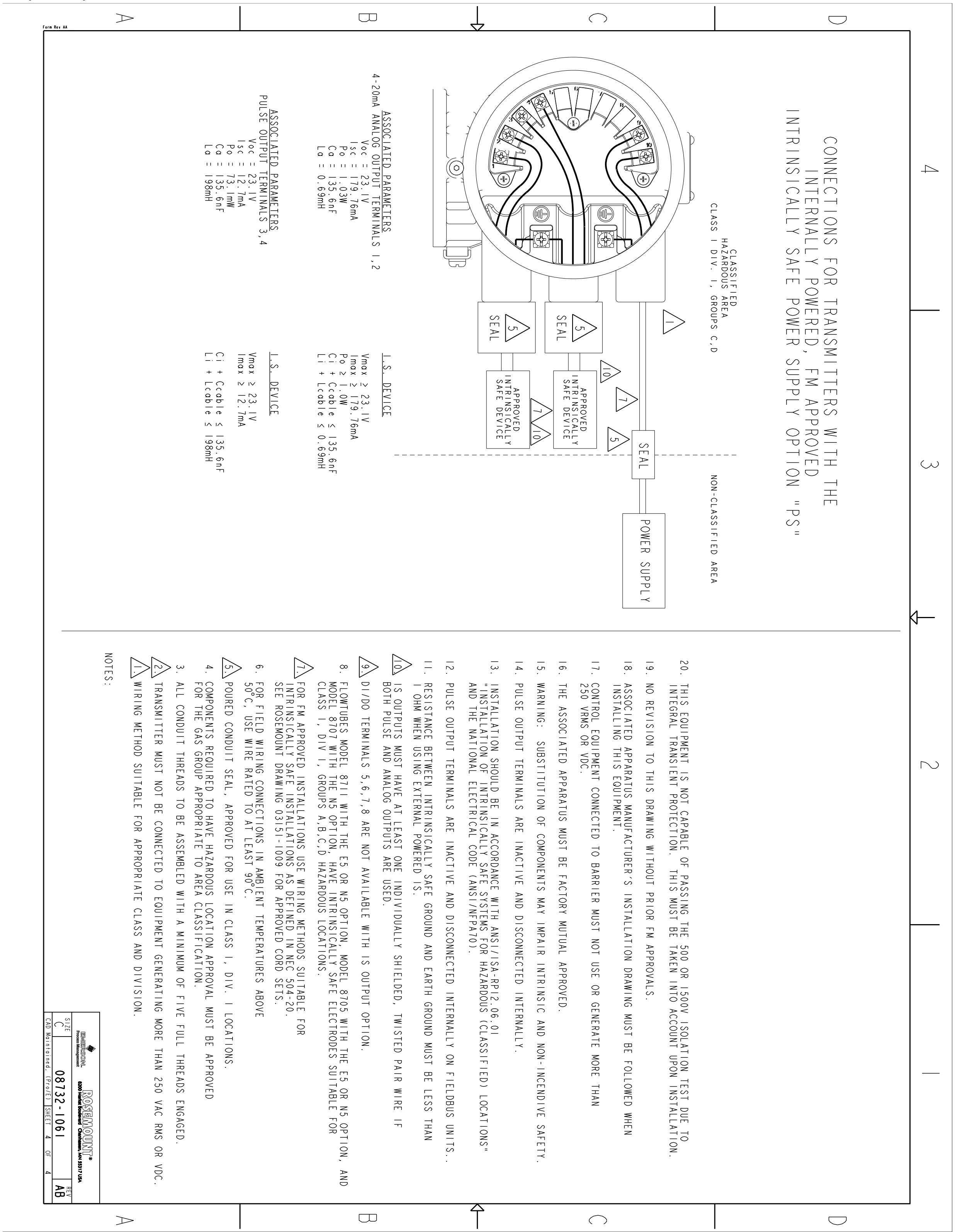


Figure B-11. CSA Certified I.S. Output (1 of 2)

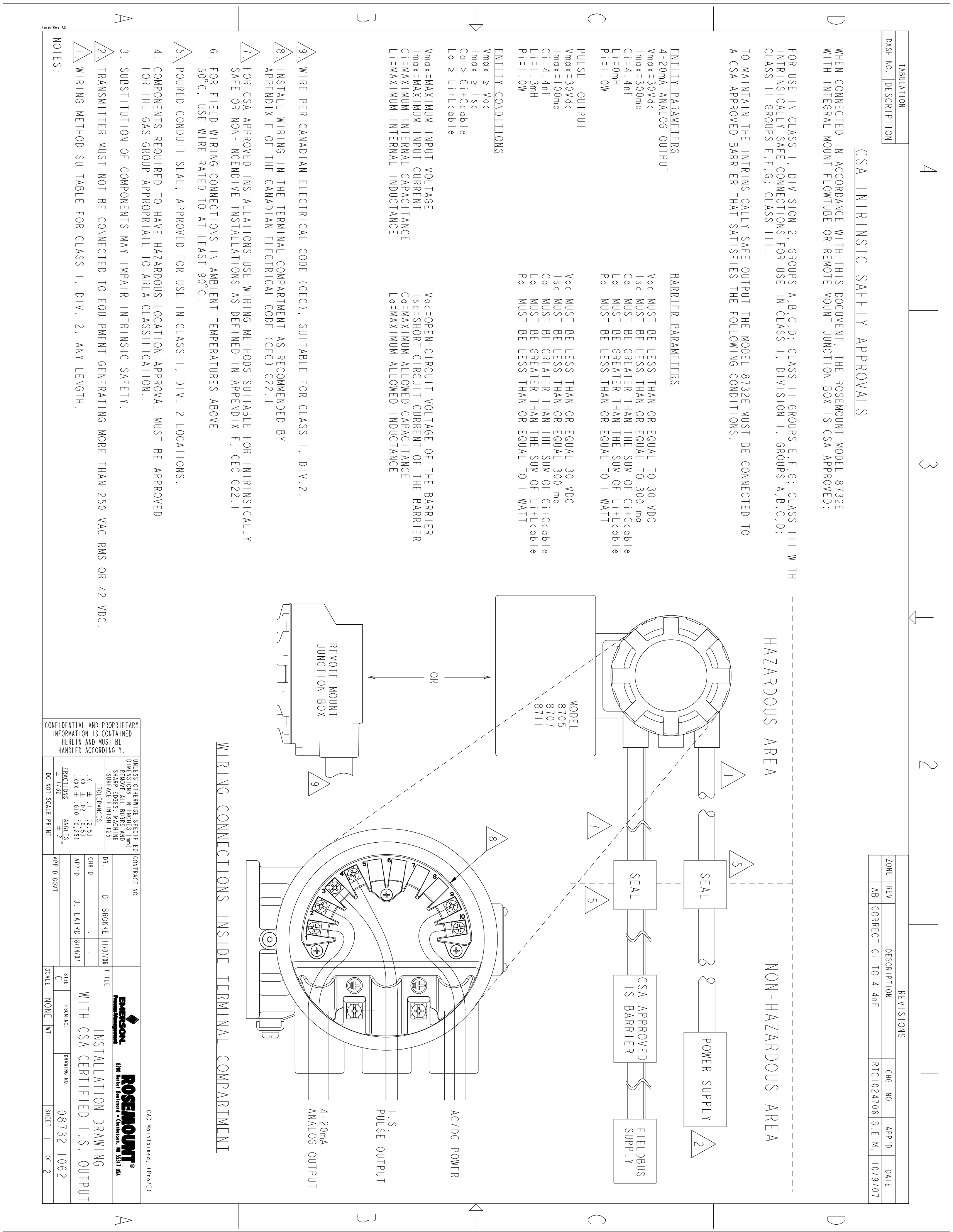


Figure B-12. CSA Certified I.S. Output (2 of 2)

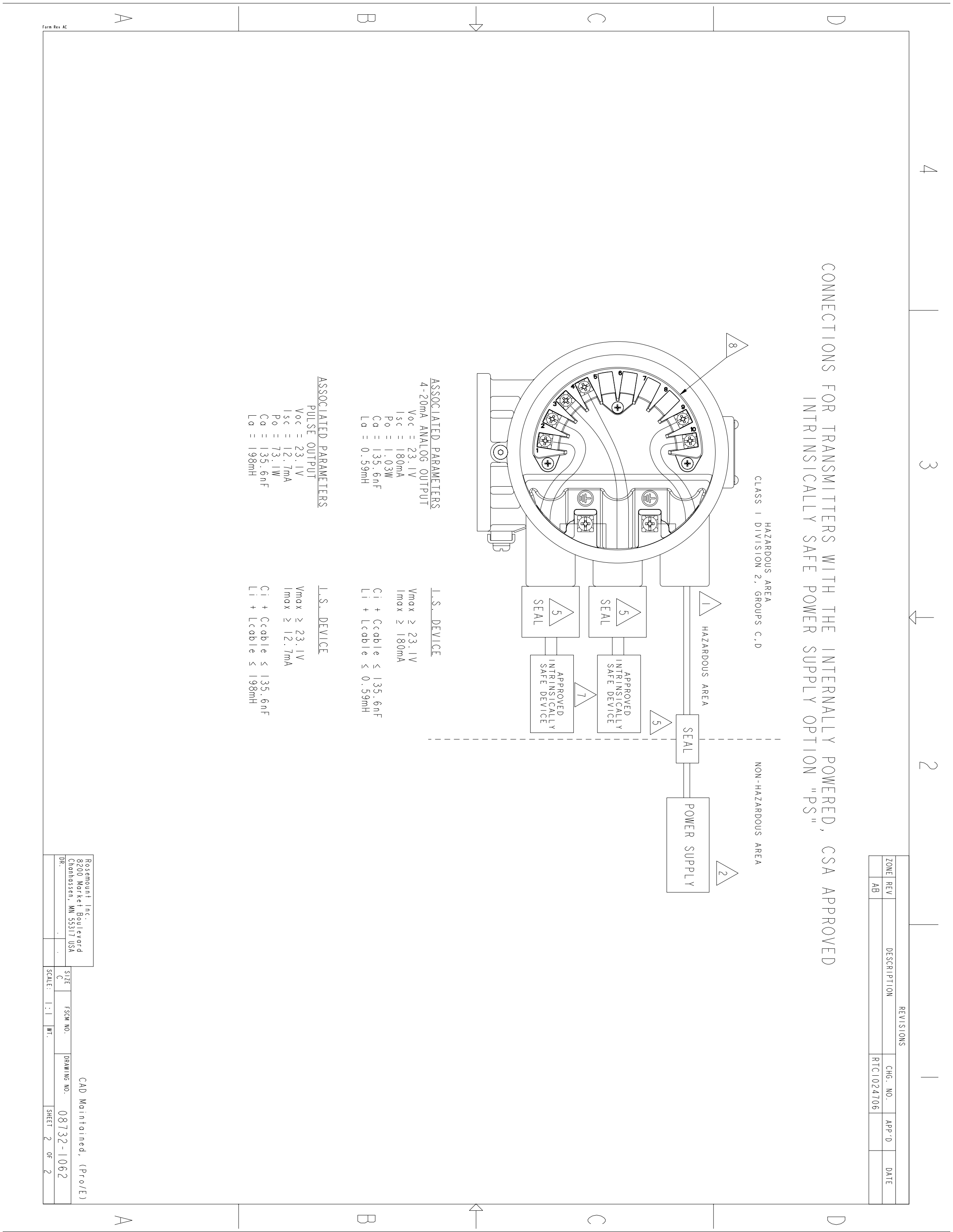


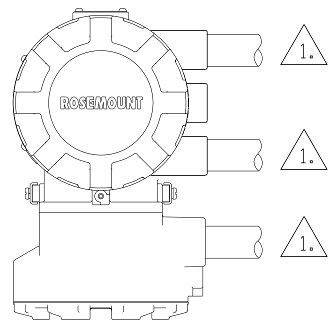
Figure B-13. CSA Installation

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY

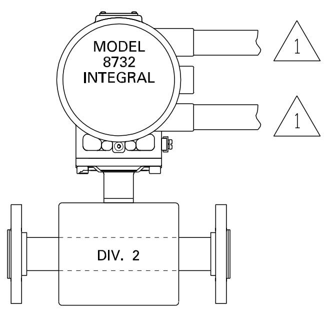
REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AE	UPDATE TRANSMITTER, JUNCTION BOX VIEWS	RTC1029252	S.E.M.	10/12/09

HAZARDOUS (CLASSIFIED) LOCATION

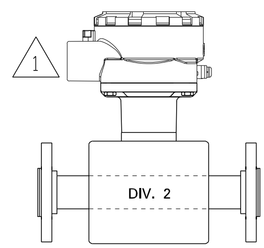
DUST-IGNITION PROOF FOR
CLASS II/III, DIV. 1, GROUPS E, F, & G;
SUITABLE FOR
CLASS I, DIV. 2, GROUPS A, B, C, & D.
CSA ENCLOSURE TYPE 4X
AMBIENT TEMP. LIMITS: -50°C TO +60°C.



REMOTE MOUNT CONFIGURATION



MODEL 8705, 8707, 8711, OR 8750W INTEGRAL,
"STANDARD PRODUCT OFFERING"



MODEL 8705, 8707, 8750W REMOTE
OR
MODEL 8711 REMOTE
"STANDARD PRODUCT OFFERING"

1. INSTALL PER CANADIAN ELECTRICAL CODE (CEC).

2. MODEL 8705, 8707, 8711, & 8750W FLOWTUBES HAVE NON-INCENDIVE ELECTRODES FOR CLASS I, DIVISION 2, GROUPS A, B, C, AND D.

WARNING EXPLOSIVE HAZARD-
SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIV 2

WARNING EXPLOSIVE HAZARD-
DO NOT SET UP SWITCHES UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.

DR.	C.SCRIBNER	4/18/95
CHK'D		
APP'D.	J.TEMPLIN	8/25/95
APP'D. GOVT.		

EMERSON. Process Management
ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INSTALLATION DRAWING:
MODEL 8732, 8705, 8707, 8711, 8750W
CSA

SIZE	FSCM NO	DWG NO.
A		08732-1051

SCALE N/A | WT. ———— | SHEET 1 OF 1

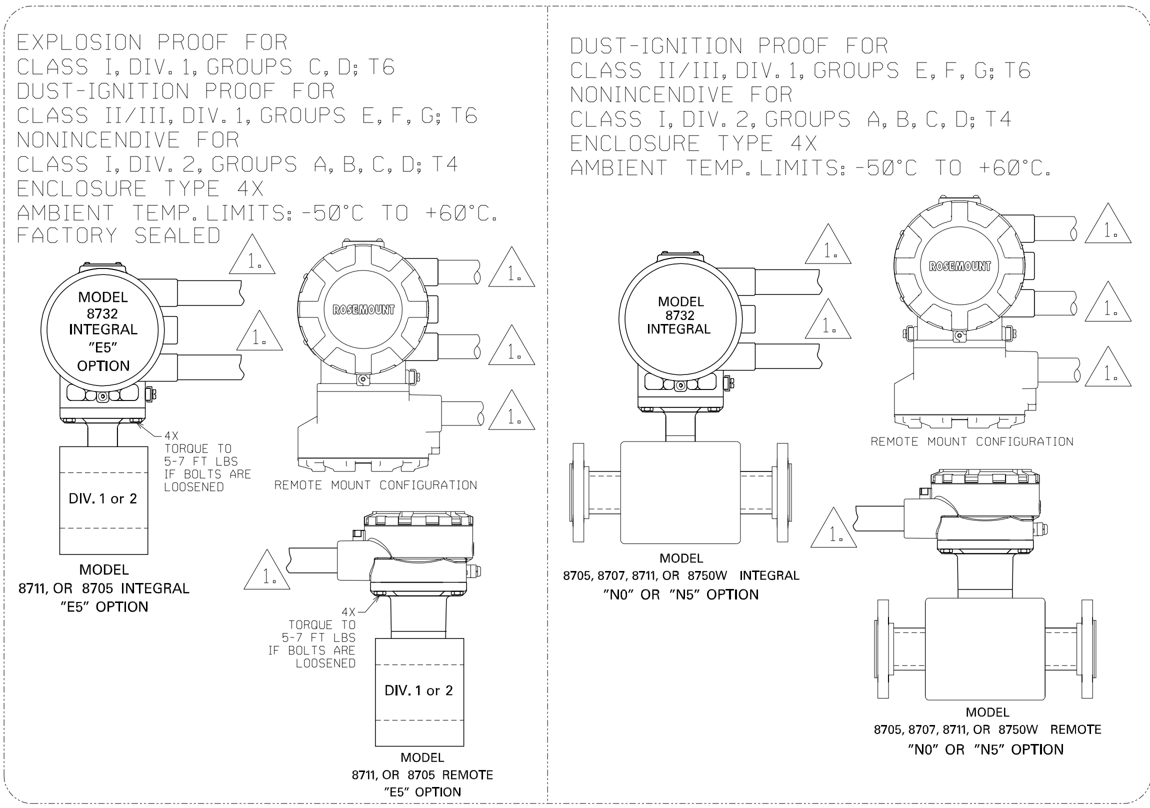
Form Rev AC

Figure B-14. Factory Mutual Hazardous Locations

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AF	UPDATE JUNCTION BOX	RTC1028826	S.E.M.	7/23/09

HAZARDOUS (CLASSIFIED) LOCATION



3. MODEL 8711 AND 8705 WITH E5 AND N5 OPTION, AND 8750W AND 8707 WITH N5 OPTION FLOWTUBES HAVE INTRINSICALLY SAFE ELECTRODES SUITABLE FOR FLAMMABLE PROCESS.

2. ALL CONDUIT THREADS MUST BE ASSEMBLED WITH A MINIMUM OF FIVE FULL THREADS ENGAGEMENT.

1. (triangle) INSTALL PER NATIONAL ELECTRICAL CODE (NEC) FOR DIVISION 1 OR 2 INSTALLATIONS.

NOTES:

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.		
DR.	C. SCRIBNER	4/18/95
CHK'D		
APP'D.	J.TEMPLIN	8/25/95
APP'D. GOVT.		

EMERSON. Process Management — ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE: INSTALLATION DRAWING: MODEL 8705, 8707, 8711, 8732, 8750W FACTORY MUTUAL HAZARDOUS LOCATIONS

SIZE	FSCM NO	DWG NO.
A		08732-1052

SCALE N/A | WT. ——— | SHEET 1 OF 1

Form Rev AC

Appendix C Diagnostics

DIAGNOSTIC AVAILABILITY

Rosemount Magmeters provide device diagnostics that powers PlantWeb and informs the user of abnormal situations throughout the life of the meter - from installation to maintenance and meter verification. With Rosemount Magmeter diagnostics enabled, users can change their practices to improve plant availability and output, and reduce costs through simplified installation, maintenance and troubleshooting.

Table C-1. Rosemount Magmeter Diagnostics

Diagnostics	Mag User Practice	8732 FF
Basic		
Empty Pipe	Process Management	•
Electronics Temperature	Maintenance	•
Coil Fault	Maintenance	•
Transmitter Faults	Maintenance	•
Reverse Flow	Process Management	•
Advanced (Suite 1)		D01 Option
High Process Noise	Process Management	•
Grounding/Wiring Fault	Installation	•
Advanced (Suite 2)		D02 Option
8714i Meter Verification	Meter Verification	•

Options for Accessing Diagnostics

Rosemount Magmeter Diagnostics can be accessed through the 375 Field Communicator, AMS Device Manager, or any other FOUNDATION fieldbus configuration tool.

Access Diagnostics through AMS Intelligent Device Manager for the Ultimate Value

The value of the Diagnostics increases significantly when AMS is used. AMS provides a simplified screen flow and procedures for how to respond to the Diagnostic messages.

LICENSING AND ENABLING

All non-basic diagnostics must be licensed by ordering option code D01, D02, 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. To obtain a license key, contact your local Rosemount Representative. Each transmitter has a unique license key specific to the diagnostic option code. See the detailed procedures below for entering the license key and enabling the advanced diagnostics.

Licensing the 8732 Diagnostics

For licensing the advanced diagnostics, follow the steps below.

1. Power-up the 8732 transmitter
2. Verify that you have 1.01.001 software or later

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing
AMS Tab	License

3. Determine the Device ID

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing, License Key, Device ID
AMS Tab	License

4. Obtain a License Key from your local Rosemount Representative.
5. Enter License Key

375	Transducer Block, Diagnostics, Advanced Diagnostics, Licensing, License Key, License Key
AMS Tab	License

6. Enable Advanced Diagnostics

375	Transducer Block, Diagnostics, Diagnostic Controls
AMS Tab	Diagnostics

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 a PlantWeb alert.

Turning Empty Pipe On/Off

375	Transducer Block, Diagnostics, Diagnostic Controls
AMS Tab	Diagnostics

The Empty Pipe diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (D01 Option) was ordered, then the Empty Pipe diagnostic will be turned on. If D01 was not ordered, the default setting is off.

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 Value

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits, EP Value
AMS Tab	Diagnostics

Reads the current Empty Pipe Value. This is a read-only value. This number is a unitless 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 Trigger Level

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits, EP Trigger Level
AMS Tab	Diagnostics

Limits: 3 to 2000

This value configures 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 Counts

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits, EP Counts
AMS Tab	Diagnostics

Limits: 5 to 50

This value configures the number of consecutive updates that the Empty Pipe Value must exceed the Empty Pipe Trigger Level before the Empty Pipe diagnostic alert activates. The default setting from the factory is 5.

Optimizing Tunable Empty Pipe

The Tunable Empty Pipe diagnostic is set at the factory to properly diagnose most applications. If this diagnostic unexpectedly activates, the following procedure can be followed to optimize the Empty Pipe diagnostic for the application.

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

Troubleshooting Empty Pipe

The following actions can be taken if Empty Pipe detection is unexpected.

1. Verify the sensor is full.
2. Verify that 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 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 activate the Empty Pipe alert. The count range is 5-50, with 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. Confirm the resistance reading between coil ground (ground symbol) and coil (1 and 2) is infinity, or open. Confirm the resistance reading between electrode ground (17) and an electrode (18 or 19) is greater than 2 kohms and rises. For more detailed information, consult Table 6-5 on page 6-8.

GROUND/WIRING FAULT DETECTION

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 a PlantWeb alert. This diagnostic can also detect if the grounding is lost over-time due to corrosion or another root cause.

Turning Ground/Wiring Fault On/Off

375	Transducer Block, Diagnostics, Basic Diagnostics, Empty Pipe Limits, EP Counts
AMS Tab	Diagnostics

The Ground/Wiring Fault diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (D01 Option) was ordered, then the Ground/Wiring Fault diagnostic will be turned on. If D01 was not ordered or licensed, this diagnostic is not available.

Ground/Wiring Fault Parameters

The Ground/Wiring Fault diagnostic has one read-only parameter. It does not have any configurable parameters.

Line Noise

375	Transducer Block, Diagnostics, Diagnostic Variables, Line Noise
AMS Tab	Diagnostics

Reads the current 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.

Troubleshooting Ground/Wiring Fault

The transmitter detected high levels of 50/60 Hz noise caused by improper wiring or poor process grounding.

1. Verify that the transmitter is earth grounded.
2. Connect ground rings, grounding electrode, lining protector, or grounding straps. Grounding diagrams can be found in “Grounding” on page 5-12.
3. Verify sensor is full.
4. Verify wiring between sensor and transmitter is prepared properly. Shielding should be stripped back less than 1 in. (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.

Ground/Wiring Fault Functionality

The transmitter continuously monitors signal amplitudes over a wide range of frequencies. For the Ground/Wiring Fault 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.

HIGH PROCESS NOISE DETECTION

The High Process Noise diagnostic detects if there is a process condition causing unstable or noisy readings, but the noise is not real flow variation. One 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 variation is seen, this diagnostic will activate and deliver a PlantWeb alert. If this situation exists and is left without remedy, it will add additional uncertainty and noise to the flow reading.

Turning High Process Noise On/Off

375	Transducer Block, Diagnostics, Diagnostic Controls
AMS Tab	Diagnostics

The High Process Noise diagnostic can be turned on or off as required by the application. If the advanced diagnostics suite 1 (D01 Option) was ordered, then the High Process Noise diagnostic will be turned on. If D01 was not ordered or licensed, this diagnostic is not available.

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 > 1 ft/s.

5 Hz Signal to Noise Ratio

375	Transducer Block, Diagnostics, Diagnostic Variables, 5Hz SNR
AMS Tab	Diagnostics

Reads the current 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 approximately one minute, then the High Process Noise diagnostic alert will activate.

37 Hz Signal to Noise Ratio

375	Transducer Block, Diagnostics, Diagnostic Variables, 37Hz SNR
AMS Tab	Diagnostics

Reads 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 approximately one minute, then the High Process Noise diagnostic alert will activate.

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 4-13) and, if possible, perform Auto Zero function (refer to “Auto Zero” on page 4-12).
2. Verify sensor is electrically connected to the process with grounding 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 (refer to Appendix D: 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 3-11). This will add dead-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.

High Process Noise Functionality

The High Process Noise diagnostic is useful for detecting situations where the process fluid may be causing electrical noise resulting in a poor measurement from the magnetic flowmeter. There are three basic types of process noise that can affect the performance of the magnetic flowmeter system.

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 the general background noise of the plant.

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 high consistency pulp stock stream (>10%) in a paper mill.

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 alert will activate 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.

8714I METER VERIFICATION

The 8714i Meter Verification diagnostic provides a means of verifying the flowmeter is within calibration without removing the sensor from the process. This is a manually initiated diagnostic test that provides a review of the transmitter and sensors critical parameters as a means to document verification of calibration. The results of running this diagnostic provide the deviation amount from expected values and a pass/fail summary against user-defined criteria for the application and conditions.

Initiating 8714i Meter Verification

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification
AMS Tab	Diagnostics

The 8714i Meter Verification diagnostic can be initiated as required by the application. If the advanced diagnostic suite (D02) was ordered, then the 8714i Meter Verification diagnostic will be available. If D02 was not ordered or licensed, this diagnostic will not be available.

Sensor Signature Parameters

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.

Establishing the baseline sensor signature

The first step in running the 8714i 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.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Re-Signature
AMS Tab	Context Menu, Diagnostics and Tests,

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 signature measurements. 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.

8714i Meter Verification Test Parameters

The 8714i has a multitude of parameters that set the test criteria, test conditions, and scope of the calibration verification test.

Test Conditions for the 8714i Meter Verification

There are three possible test conditions that the 8714i Meter Verification test can be initiated under. This parameter is set at the time that the Sensor Signature or 8714i Meter Verification test is initiated.

No Flow

Run the 8714i Meter Verification test with a full pipe and no flow in the line. Running the 8714i Meter Verification test under this condition provides the most accurate results and the best indication of magnetic flowmeter health.

Flowing, Full

Run the 8714i Meter Verification test with a full pipe and flow in the line. Running the 8714i Meter Verification test under this condition provides the ability to verify the magnetic flowmeter health without shutting down the process flow in applications where a shutdown is not possible. Running the calibration verification under flowing conditions can cause false fails if the flow rate is not at a steady flow, or if there is process noise present.

Empty Pipe

Run the 8714i Meter Verification test with an empty pipe. Running the 8714i Meter Verification test under this condition provides the ability to verify the magnetic flowmeter health with an empty pipe. Running the calibration verification under empty pipe conditions will not check the electrode circuit health.

8714i Meter Verification Test Criteria

The 8714i Meter Verification diagnostic provides the ability for the user to define the test criteria that the verification must test to. The test criteria can be set for each of the flow conditions discussed above.

375	Transducer Block, Diagnostics, Diagnostic Variables, Line Noise
AMS Tab	8714i

No Flow

Set the test criteria for the No Flow condition. The factory default for this value is set to two percent with limits configurable between one and ten percent.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Set Pass/Fail Criteria, No Flow Limit
AMS Tab	8714i

Flowing, Full

Set the test criteria for the Flowing, Full condition. The factory default for this value is set to three percent with limits configurable between one and ten percent.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Set Pass/Fail Criteria, Flowing Limit
AMS Tab	8714i

Empty Pipe

Set the test criteria for the Empty Pipe condition. The factory default for this value is set to three percent with limits configurable between one and ten percent.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Set Pass/Fail Criteria, Empty Pipe Limit
AMS Tab	8714i

8714i Meter Verification Test Scope

The 8714i Meter Verification 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 8714i Meter Verification test is initiated.

All

Run the 8714i Meter Verification test and verify the entire flowmeter installation. This parameter results in the verification test 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.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Run 8714i
AMS Tab	Context Menu, Diagnostics and Tests, 8714i Meter Verification

Transmitter

Run the 8714i 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 8714i Meter Verification test was initiated.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Run 8714i
AMS Tab	Context Menu, Diagnostics and Tests, 8714i Meter Verification

Sensor

Run the 8714i 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 8714i Meter Verification test was initiated, verifying the coil circuit health, and the electrode circuit health.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Run 8714i
AMS Tab	Context Menu, Diagnostics and Tests, 8714i Meter Verification

8714i Meter Verification Test Results Parameters

Once the 8714i Meter Verification test is initiated, the transmitter will make several measurements to verify the transmitter calibration, sensor calibration, coil circuit health, and electrode circuit health. The results of these tests can be reviewed and recorded on the calibration verification report found on page C-16. This report can be used to validate that the meter is within the required calibration limits to comply with governmental regulatory agencies such as the Environmental Protection Agency or Food and Drug Administration.

Viewing the 8714i Meter Verification Results

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 375 Field Communicator, each individual component can be viewed as a menu item. In AMS, the calibration report is populated with the necessary data eliminating the need to manually complete the report found on page C-16.

NOTE
When using AMS there are two possible methods that can be used to print the report. Method one involves taking a screen capture of the 8714i Report tab. Using Ctrl + Alt + PrntScrn will capture the active window and allow for pasting of the report directly into a word processing program.

Method two involves using the print feature within AMS while on the status screen. This will result in a printout of all of the information stored on the status tabs. Page two of the report will contain all of the necessary calibration verification result data.

The results are displayed in the following order:

Test Condition

Review the test condition that the 8714i Meter Verification test was performed under.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Test Condition
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Test Criteria

Review the test criteria used to determine the results of the 8714i Meter Verification tests.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Test Criteria
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

8714i Result

Displays the overall result of the 8714i Meter Verification test as either a Pass or Fail.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, 8714i Result
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Simulated Velocity

Displays the simulated velocity used to verify the transmitter calibration.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Simulated Vel
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Actual Velocity

Displays the velocity measured by the transmitter during the transmitter calibration verification process.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Actual Velocity
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Velocity Deviation

Displays the deviation in the actual velocity compared to the simulated velocity in terms of a percentage. This percentage is then compared to the test criteria to determine if the transmitter is within calibration limits.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Velocity Dev
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Transmitter Calibration Verification

Displays the results of the transmitter calibration verification test as either a Pass or Fail.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Xmtr Cal Result
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Sensor Calibration Deviation

Displays the deviation in the sensor calibration. This value tells how much the sensor calibration has shifted from the original baseline signature. This percentage is compared to the test criteria to determine if the sensor is within calibration limits.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Sensor Cal Dev
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Sensor Calibration Verification

Displays the results of the sensor calibration verification test as either a Pass or Fail.=

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Sensor Cal Rslt
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Coil Circuit Verification

Displays the results of the coil circuit health check as either a Pass or Fail.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Coil Ckt Result
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Electrode Circuit Verification

Displays the results of the electrode circuit health check as either a Pass or Fail.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, 8714i Results, Electrode Ckt Res
AMS Tab	Context Menu, Device Diagnostics, 8714i Report

Optimizing the 8714i Meter Verification

The 8714i 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 every year to comply with Environmental Protection Agency and Pollution Control Agency standards. These governmental agencies require that the meter be certified to five percent accuracy.

Since this is an effluent meter, shutting down the process may not be viable. In this instance the 8714i 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 semi-annual verification of meter calibration on a critical feed line for one of their products. This is an internal standard, but plant requirements require a calibration record be kept on-hand. Meter calibration on this process must meet one 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 8714i Meter Verification test can be run under no flow conditions, set the test criteria for No Flow to one percent to comply with the necessary plant standards.

Example

A food and beverage company requires an annual verification 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 8714i 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.

Troubleshooting the 8714i Meter Verification Test

In the event that the 8714i Meter Verification test fails, the following steps can be used to determine the appropriate course of action. Begin by reviewing the 8714i results to determine the specific test that failed.

Figure C-1. Troubleshooting the 8714i Meter Verification Test Table

Test	Potential Causes of Failure	Steps to Correct
Transmitter Verification Test Failed	• Unstable flow rate during the verification test • Noise in the process • Transmitter drift • Faulty electronics	• Perform the test with no flow in the pipe • Check calibration with an external standard like the 8714D • Perform a digital trim • Replace the electronics
Sensor Verification Failed	• Moisture in the terminal block of the sensor • Calibration shift caused by heat cycling or vibration	• Remove the sensor and send back for recalibration.
Coil Circuit Health Failed	• Moisture in the terminal block of the sensor • Shorted Coil	• Perform the sensor checks detailed on page 6-8.
Electrode Circuit Health Failed	• Moisture in the terminal block of the sensor • Coated Electrodes • Shorted Electrodes	• Perform the sensor checks detailed on page 6-8.

8714i Meter Verification Functionality

The 8714i Meter Verification diagnostic functions by taking a baseline sensor signature and then comparing measurements taken during the verification test to these baseline results.

Sensor Signature Values

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

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 when the 8714i Meter Verification diagnostic is initiated.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Signature Values, Coil Resistance
AMS Tab	Config/Setup, 8714i

Coil Signature

The Coil Signature is a measurement of the magnetic field strength. This value is used as a baseline to determine if a sensor calibration shift has occurred when the 8714i Meter Verification diagnostic is initiated.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Signature Values, Coil Signature
AMS Tab	Config/Setup, 8714i

Electrode Circuit Resistance

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 when the 8714i Meter Verification diagnostic is initiated.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Sensor Signature, Signature Values, Electrode Resistance
AMS Tab	Config/Setup, 8714i

8714i Meter Verification Measurements

The 8714i 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

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.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Measurements, Coil Resistance
AMS Tab	Config/Setup, 8714i

Coil Signature

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.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Measurements, Coil Signature
AMS Tab	Config/Setup, 8714i

Electrode Circuit Resistance

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.

375	Transducer Block, Diagnostics, Advanced Diagnostics, 8714i Meter Verification, Measurements, Electrode Resistance
AMS Tab	Config/Setup, 8714i

ROSEMOUNT MAGNETIC FLOWMETER CALIBRATION VERIFICATION REPORT

Calibration Verification 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: 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: ____________________

Appendix D Digital Signal Processing

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.

Warnings

⚠WARNING

Explosions could result in death or serious injury:

- Verify that 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 alive.
- Before connecting a Field 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.

⚠WARNING

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

- Make sure only qualified personnel perform the installation.
- Do not perform any service other than those contained in this manual unless qualified.

Process leaks could result in death or serious injury:

- The electrode compartment may contain line pressure; it must be depressurized before the cover is removed.

⚠WARNING

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

- Avoid contact with leads and terminals.

PROCEDURES

If the output of your Rosemount 8732 is unstable, first check the wiring and grounding 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 grounding electrodes are being used in lined or nonconductive piping?
- Both of the shields are attached at both ends?

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 electrochemical 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 8732 coil drive mode is selectable between the standard 5 Hz and the noise-reducing 37 Hz. See “Coil Drive Frequency” on page 4-26 for instructions on how to change the coil drive mode to 37 Hz.

Auto Zero

To ensure optimum accuracy when using 37 Hz coil drive mode, there is an auto zero function that must be initiated during start-up. The auto zero operation is also discussed in the start-up and configuration sections. 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.

Signal Processing

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 8732 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 8732 microprocessor can actually scrutinize each input based on three user-defined parameters to reject the noise specific to the application.

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:

1. Number of samples: The number of samples function sets the amount of time that inputs are collected and used to calculate the average value. Each second is divided into tenths ($^1/_{10}$) with the number of samples equaling the number of $^1/_{10}$ second increments used to calculate the average. Factory Preset Value = 90 samples.

   For example, a value of:

   1 averages the inputs over the past $^1/_{10}$ second

   10 averages the inputs over the past 1 second

   100 averages the inputs over the past 10 seconds

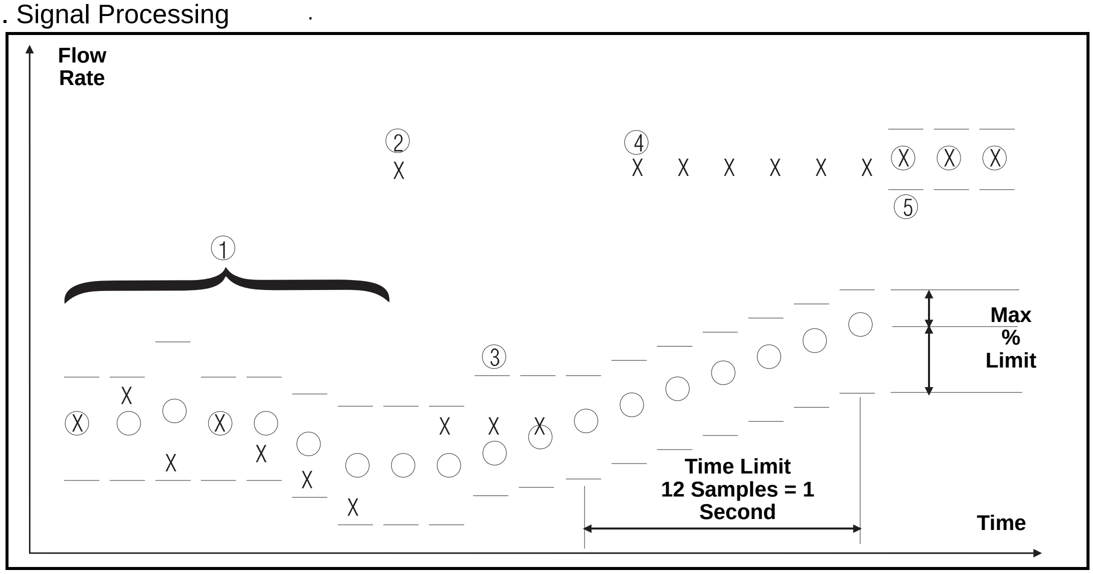
   125 averages the inputs over the past 12.5 seconds

2. Maximum Percent Limit: The tolerance band set up 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. Factory Preset Value = 2 percent.
3. Time Limit: Forces the output and running average values to the new value of an actual flow rate change that is outside the percent limit boundaries, thereby limiting response time to real flow changes to the time limit value rather than the length of the running average. Factory Preset Value = 2 seconds.

How Does It Really Work?

The best way to explain this is with the help of an example, plotting flow rate versus time

Figure D-1. Signal Processing



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, a shortcut 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.

When Should Signal Processing Be Used?

The Rosemount 8732 offers three separate functions that can be used in series for improving a noisy output. The first step is to toggle the coil drive to the 37 Hz mode and initialize with an auto zero. If the output is still noisy at this stage, signal processing should be actuated and, if necessary, tuned to match the specific application. Finally, if the signal is still too unstable, the traditional damping function can be used.

NOTE
Failure to complete an Auto Zero will result in a small (<1%) error in the output. While the output level will be offset by the error, the repeatability will not be affected.

Appendix E Universal Sensor Wiring Diagrams

The wiring diagrams in this section illustrate the proper connections between the Rosemount 8732 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 manufacturers' sensors is provided. If the manufacturer for your sensor is not included, see the drawing for generic connections.

Table E-1. Sensor Cross References

Rosemount Transmitter	Sensor Manufacturer	Page Number
Rosemount		
Rosemount 8732	Rosemount 8705, 8707, 8711	page E-3
Rosemount 8732	Rosemount 8701	page E-4
Brooks		
Rosemount 8732	Model 5000	page E-6
Rosemount 8732	Model 7400	page E-7
Endress and Hauser		page E-5
Rosemount 8732	Generic Wiring for Sensor	page E-8
Fischer and Porter		page E-9
Rosemount 8732	Model 10D1418	page E-9
Rosemount 8732	Model 10D1419	page E-10
Rosemount 8732	Model 10D1430 (Remote)	page E-11
Rosemount 8732	Model 10D1430	page E-12
Rosemount 8732	Model 10D1465, 10D1475 (Integral)	page E-13
Rosemount 8732	Generic Wiring for Sensors	page E-14
Foxboro		
Rosemount 8732	Series 1800	page E-15
Rosemount 8732	Series 1800 (Version 2)	page E-16
Rosemount 8732	Series 2800	page E-17
Rosemount 8732	Generic Wiring for Sensors	page E-18
Kent		
Rosemount 8732	Veriflux VTC	page E-19
Rosemount 8732	Generic Wiring for Sensors	page E-20
Krohne		
Rosemount 8732	Generic Wiring for Sensors	page E-21
Taylor		
Rosemount 8732	Series 1100	page E-23
Rosemount 8732	Generic Wiring for Sensors	page E-23
Yamatake Honeywell		
Rosemount 8732	Generic Wiring for Sensors	page E-24
Yokogawa		
Rosemount 8732	Generic Wiring for Sensors	page E-25
Generic Manufacturer Wiring		page E-26
Rosemount 8732	Generic Wiring for Sensors	page E-26

ROSEMOUNT SENSORS

Rosemount 8705/8707/8711/8721 Sensors to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure .

Figure E-1. Wiring Diagram to a Rosemount 8732 Transmitter

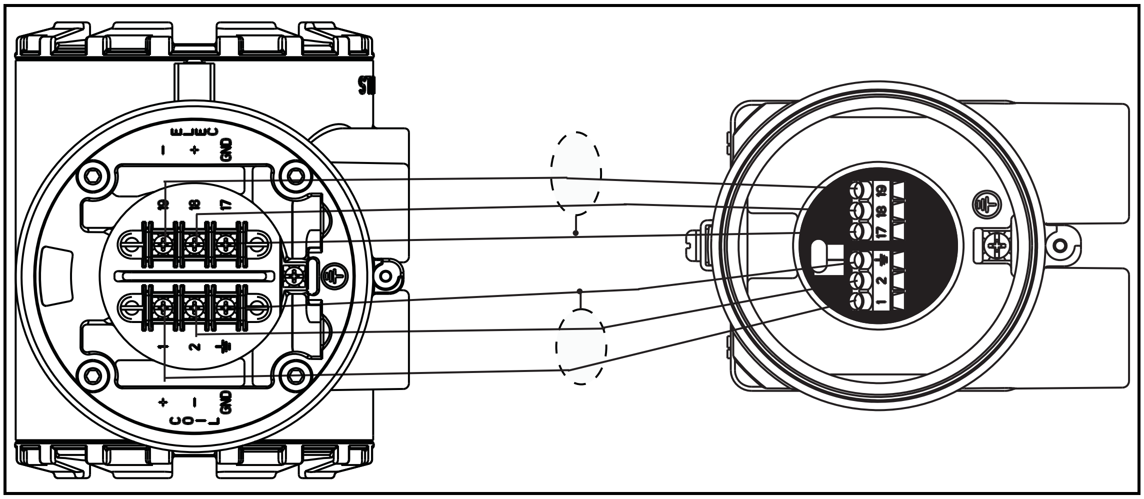
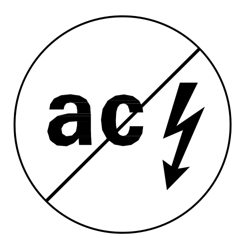


Table E-2. Rosemount 8705/8707/8711/8721 Sensor Wiring Connections

Rosemount 8732 Transmitters	Rosemount 8705/8707/8711/8721 Sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Rosemount 8701 Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-2 on page E-4.

Figure E-2. Wiring Diagram for Rosemount 8701 Sensor and Rosemount 8732 Transmitter

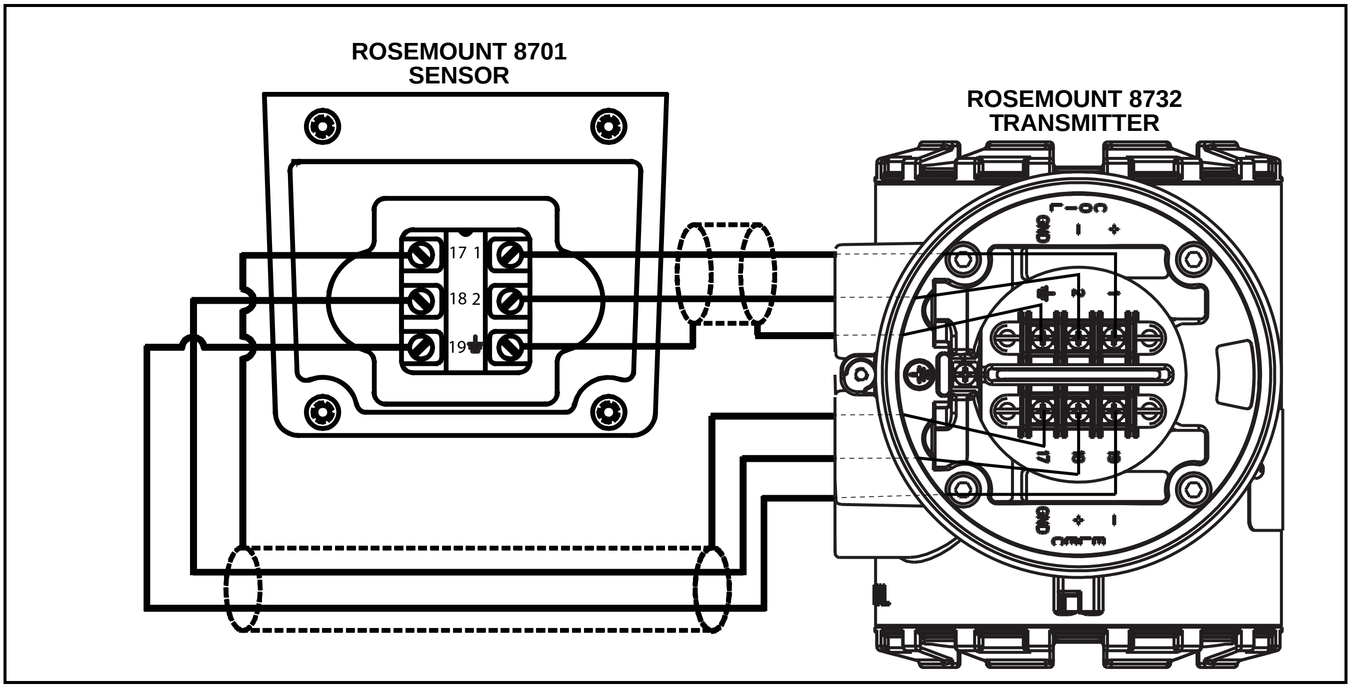
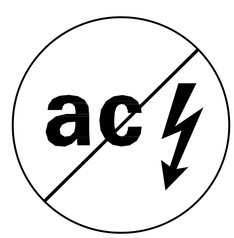


Table E-3. Rosemount 8701 Sensor Wiring Connections

Rosemount 8732	Rosemount 8701 Sensors
1	1
2	2
⏚	⏚
17	17
18	18
19	19

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



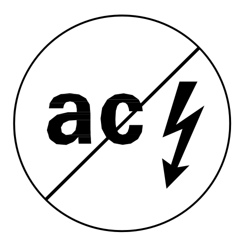
Connecting Sensors of Other Manufacturers

Before connecting another manufacturer's sensor to the Rosemount 8732 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 that 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 "Mount the Transmitter" on page 2-3.
6. Verify that 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 220V operation are typically wired in parallel and must be rewired in series.)
7. Verify that 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.
8. Connect the sensor to the transmitter in accordance with reference wiring diagrams. See Appendix E: Universal Sensor Wiring Diagrams for specific drawings.
9. Connect and verify all connections between the sensor and the transmitter, then apply power to the transmitter.
10. Perform the Universal Auto Trim function.

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



BROOKS SENSORS

Model 5000 Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-3.

Figure E-3. Wiring Diagram for Brooks Sensor Model 5000 and Rosemount 8732

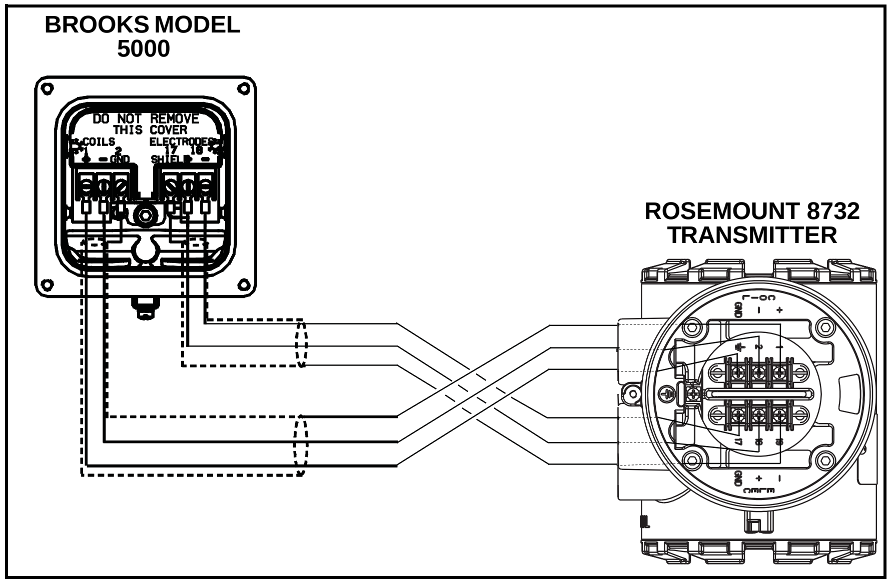
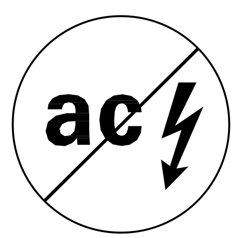


Table E-4. Brooks Model 5000 Sensor Wiring Connections

Rosemount 8732	Brooks Sensors Model 5000
1	1
2	2
⏚	⏚
17	17
18	18
19	19

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 7400 Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-4.

Figure E-4. Wiring Diagram for Brooks Sensor Model 7400 and Rosemount 8732

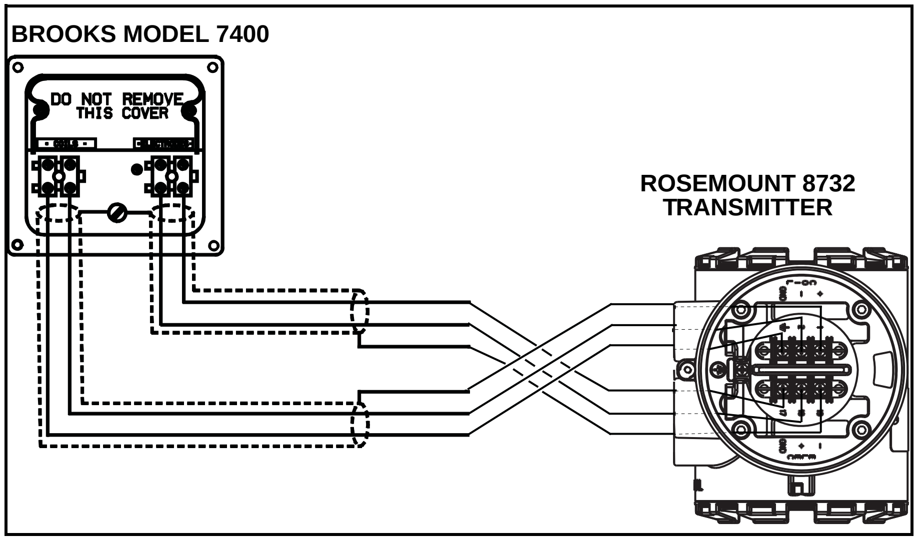
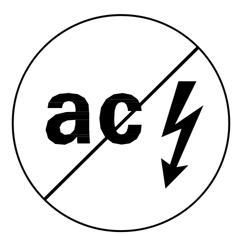


Table E-5. Brooks Model 7400 Sensor Wiring Connections

Rosemount 8732	Brooks Sensors Model 7400
1	Coils +
2	Coils –
⏚	⏚
17	Shield
18	Electrode +
19	Electrode –

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



ENDRESS AND HAUSER SENSORS

Connect coil drive and electrode cables as shown in Figure E-5.

Endress and Hauser Sensor to Rosemount 8732 Transmitter

Figure E-5. Wiring Diagram for Endress and Hauser Sensors and Rosemount 8732

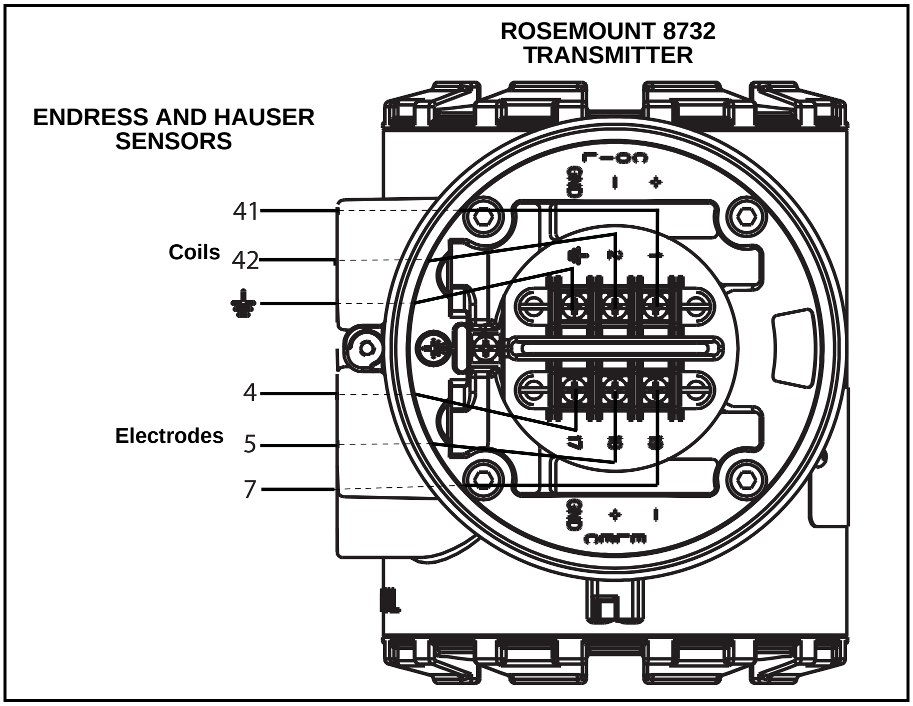
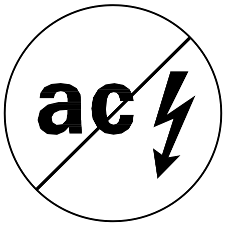


Table E-6. Endress and Hauser Sensor Wiring Connections

Rosemount 8732	Endress and Hauser Sensors
1	41
2	42
⏚	14
17	4
18	5
19	7

⚠CAUTION	
This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.	

FISCHER AND PORTER SENSORS

Connect coil drive and electrode cables as shown in Figure E-6.

Model 10D1418 Sensor to Rosemount 8732 Transmitter

Figure E-6. Wiring Diagram for Fischer and Porter Sensor Model 10D1418 and Rosemount 8732

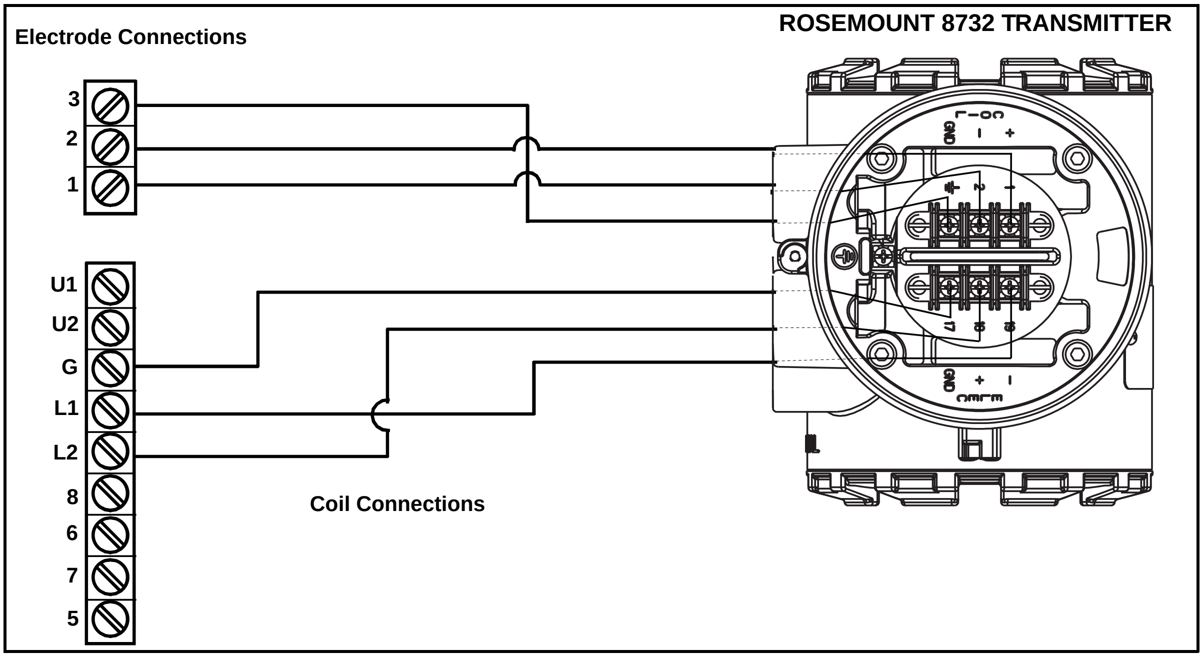
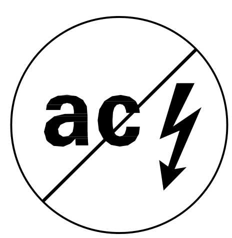


Table E-7. Fischer and Porter Model 10D1418 Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1418 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1419 Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-7.

Figure E-7. Wiring Diagram for Fischer and Porter Sensor Model 10D1419 and Rosemount 8732

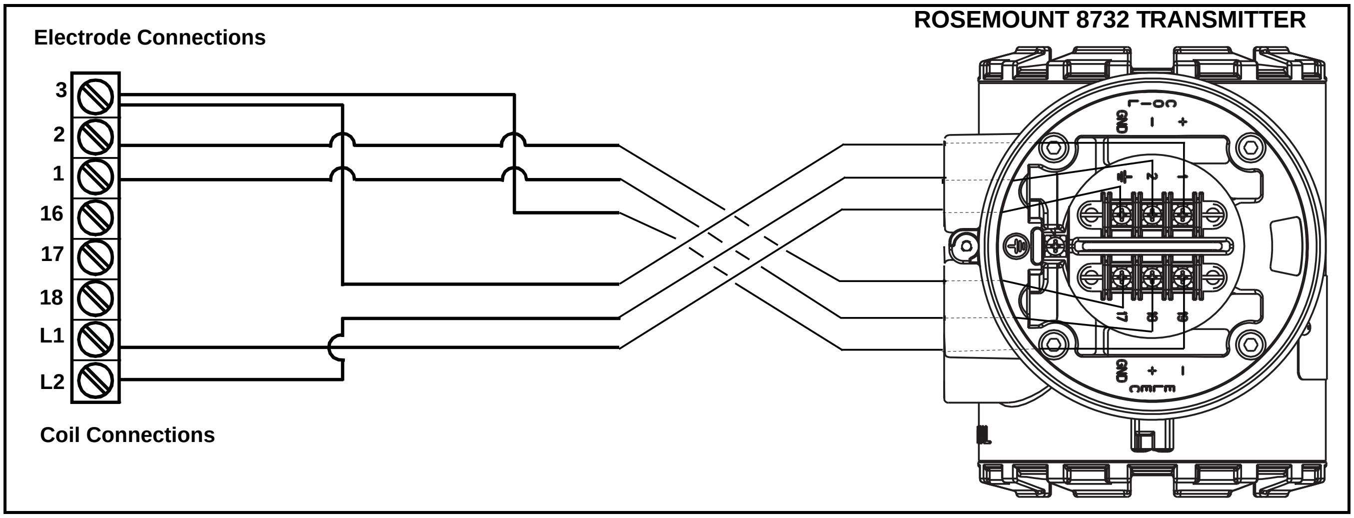
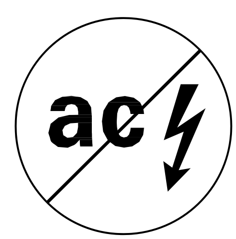


Table E-8. Fischer and Porter Model 10D1419 Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1419 Sensors
1	L1
2	L2
⏚	3
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1430 Sensor (Remote) to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-8.

Figure E-8. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Remote) and Rosemount 8732

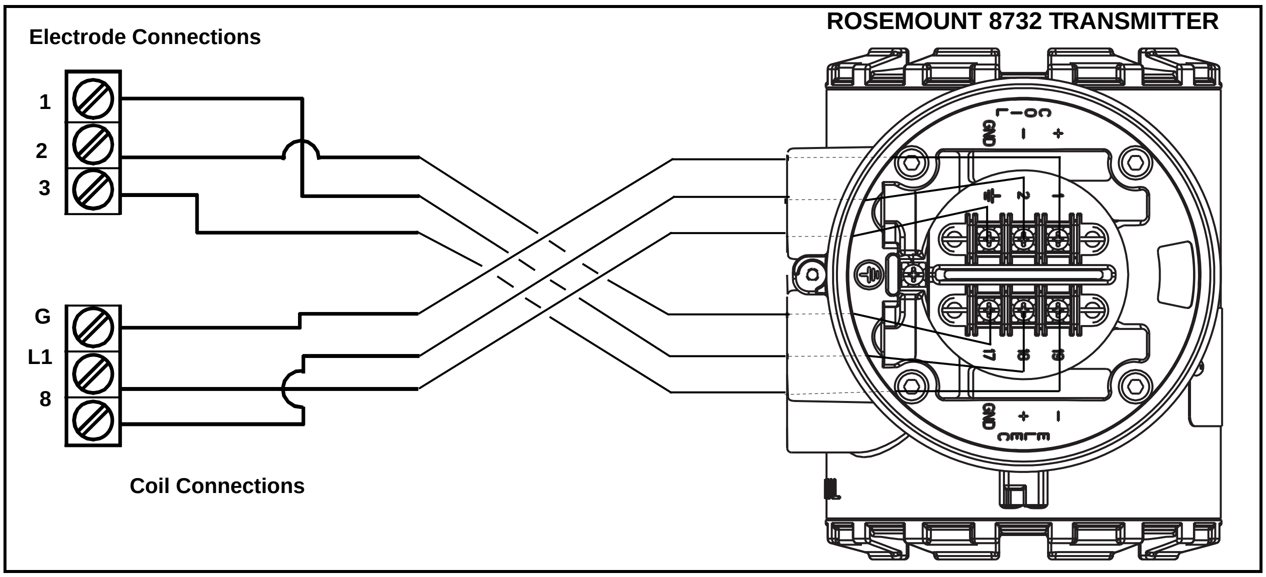
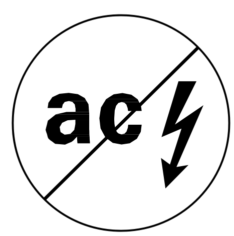


Table E-9. Fischer and Porter Model 10D1430 (Remote) Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1430 (Remote) Sensors
1	L1
2	8
⏚	G
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1430 Sensor (Integral) to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-9.

Figure E-9. Wiring Diagram for Fischer and Porter Sensor Model 10D1430 (Integral) and Rosemount 8732

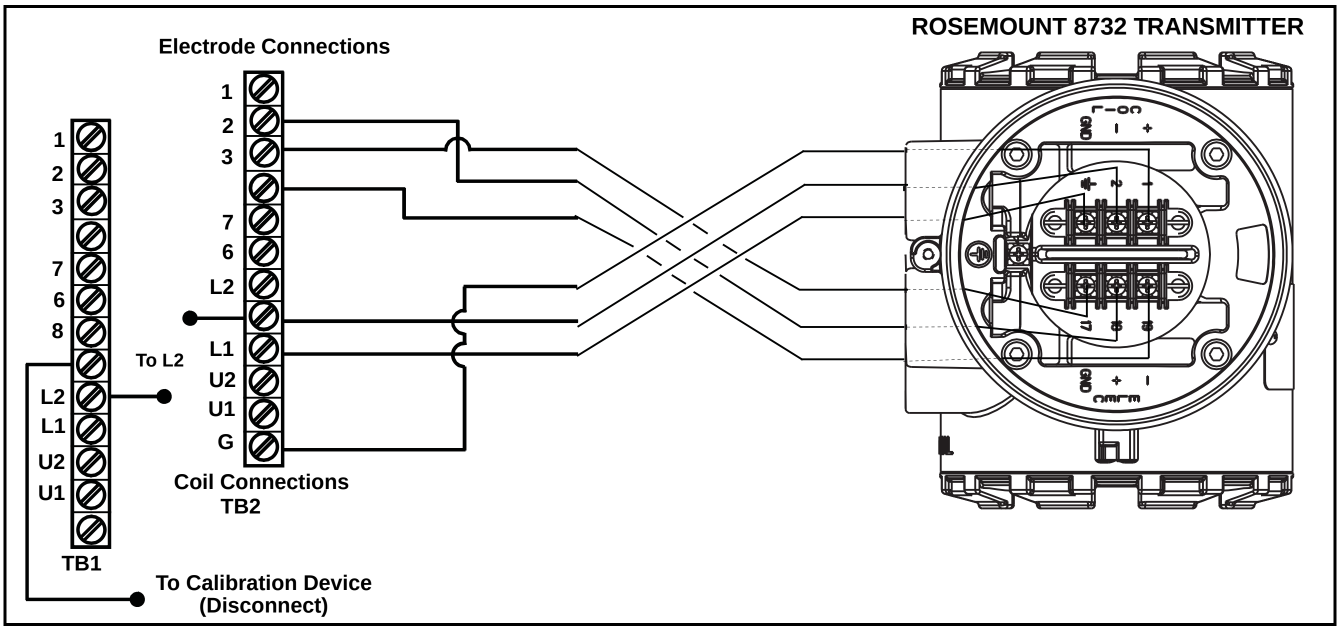
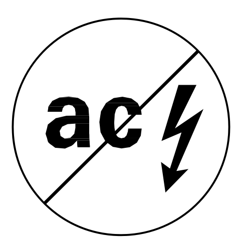


Table E-10. Fischer and Porter Model 10D1430 (Integral) Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1430 (Integral) Sensors
1	L1
2	L2
⏚	G
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Model 10D1465 and Model 10D1475 Sensors (Integral) to 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-10.

Figure E-10. Wiring Diagram for Fischer and Porter Sensor Model 10D1465 and Model 10D1475 (Integral) and Rosemount 8732

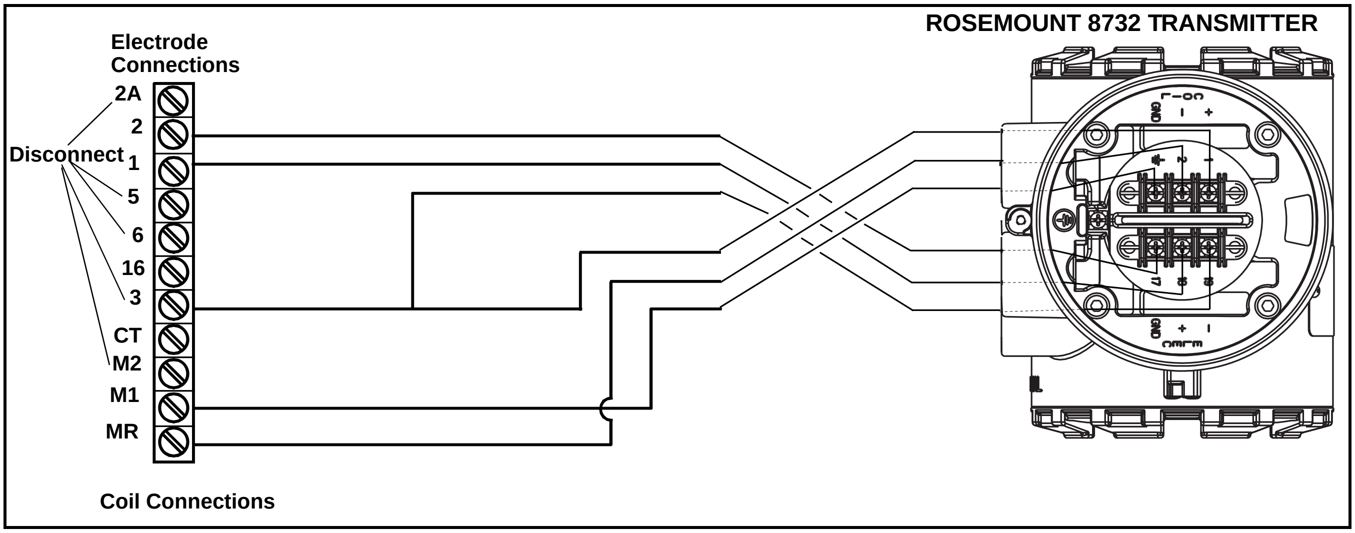
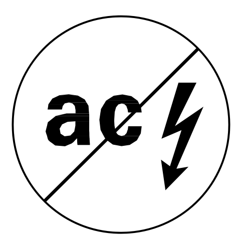


Table E-11. Fischer and Porter Model 10D1465 and 10D1475 Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Model 10D1465 and 10D1475 Sensors
1	MR
2	M1
⏚	3
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Fischer and Porter Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-11.

Figure E-11. Generic Wiring Diagram for Fischer and Porter Sensors and Rosemount 8732

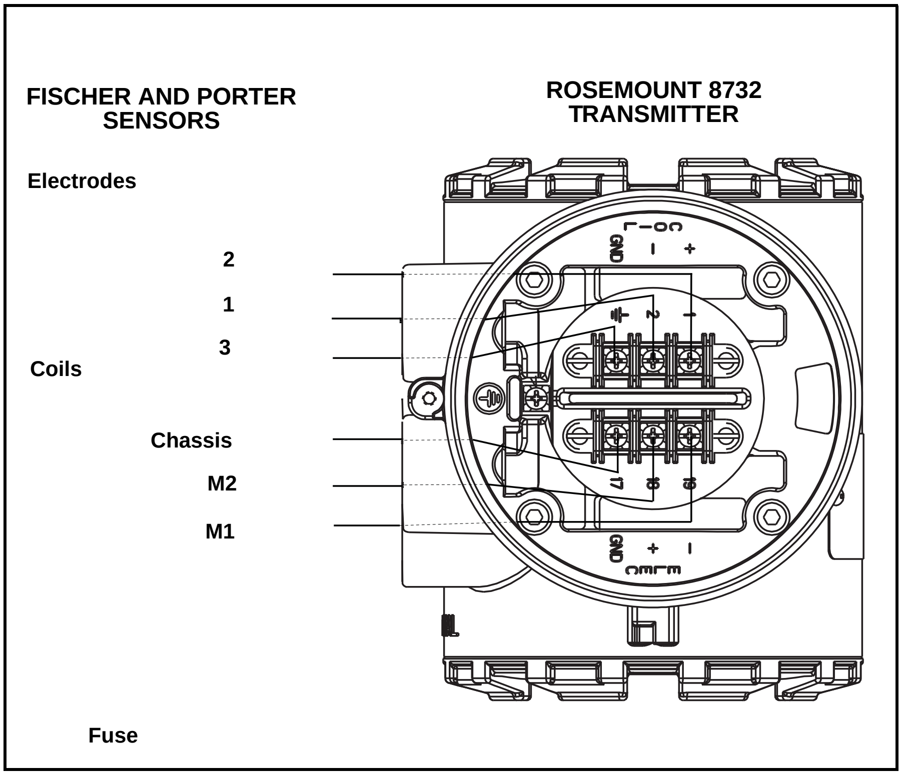
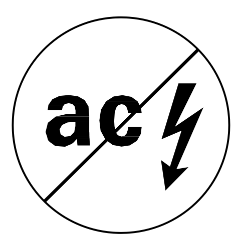


Table E-12. Fischer and Porter Generic Sensor Wiring Connections

Rosemount 8732	Fischer and Porter Sensors
1	M1
2	M2
⏚	Chassis Ground
17	3
18	1
19	2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



FOXBORO SENSORS

Connect coil drive and electrode cables as shown in Figure E-12.

Series 1800 Sensor to Rosemount 8732 Transmitter

Figure E-12. Wiring Diagram for Foxboro Series 1800 and Rosemount 8732

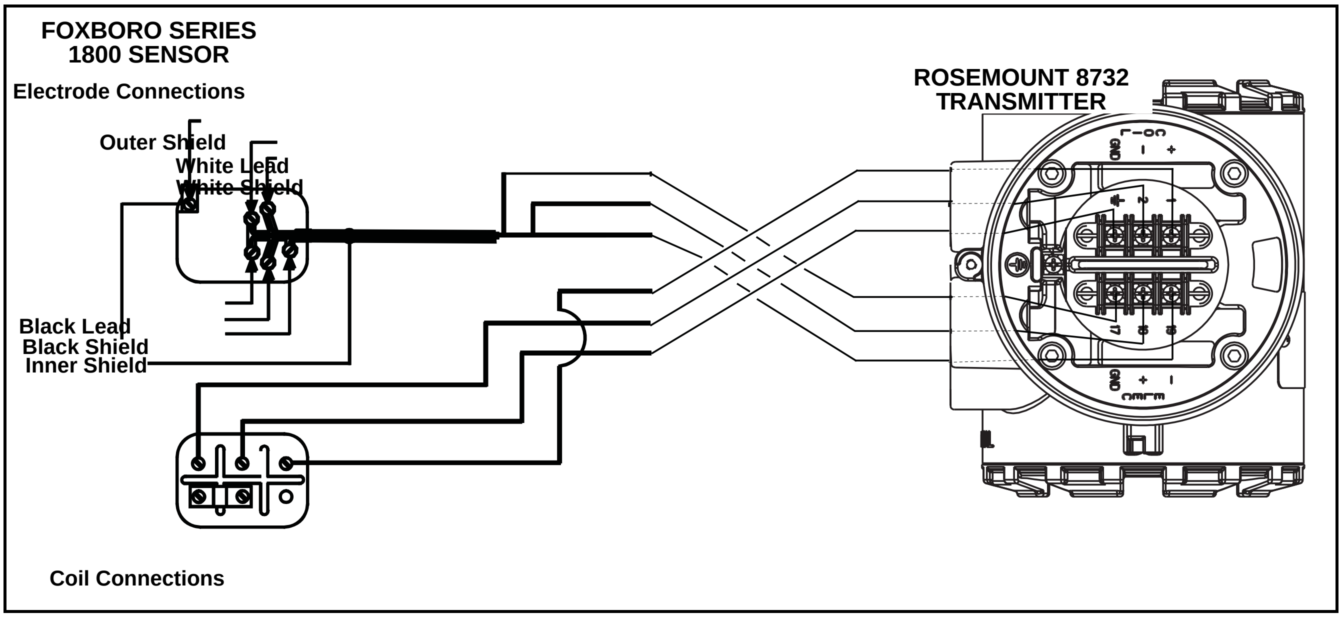
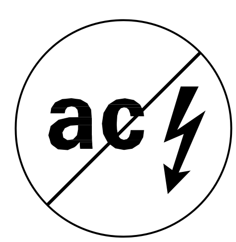


Table E-13. Foxboro Generic Sensor Wiring Connections

Rosemount 8732	Foxboro Series 1800 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Series 1800 (Version 2) Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-13.

Figure E-13. Wiring Diagram for Foxboro Series 1800 (Version 2) and Rosemount 8732

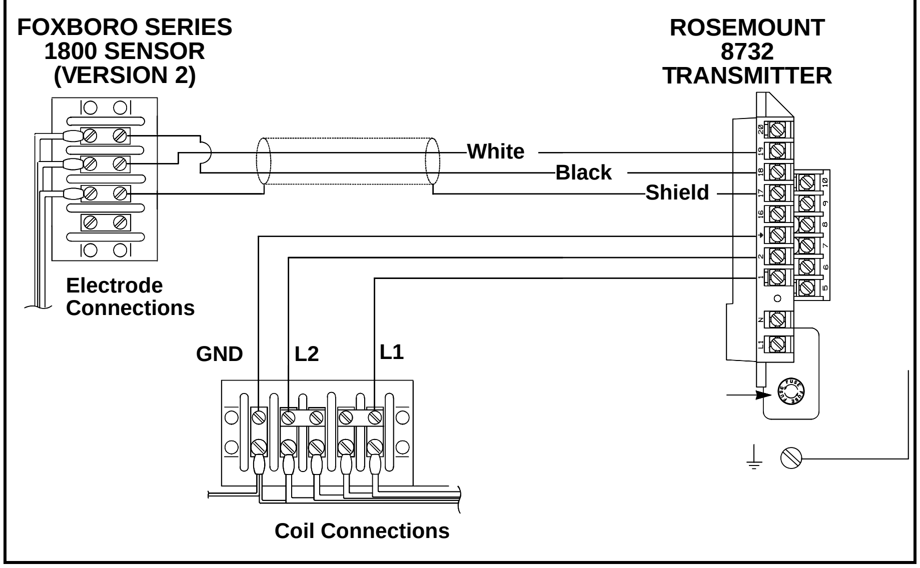
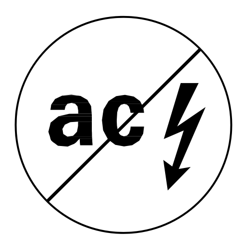


Table E-14. Foxboro Generic Sensor Wiring Connections

Rosemount 8732	Foxboro Series 1800 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION	
This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.	

Series 2800 Sensor to 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-14.

Figure E-14. Wiring Diagram for Foxboro Series 2800 and Rosemount 8732

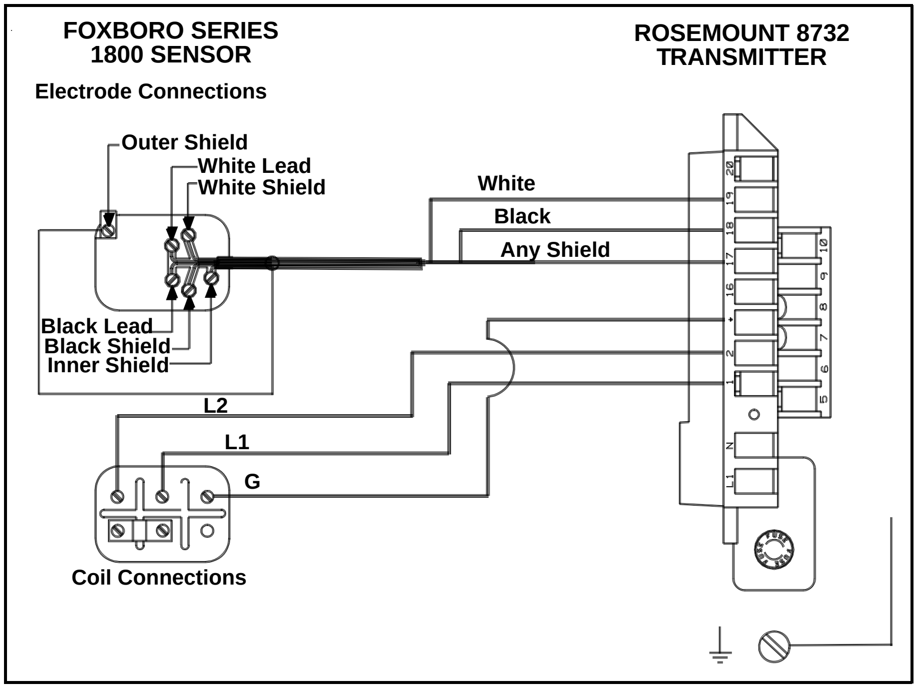
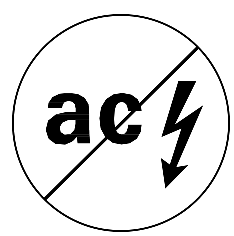


Table E-15. Foxboro Series 2800 Sensor Wiring Connections

Rosemount 8732	Foxboro Series 2800 Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION	
This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.	

Foxboro Sensor to 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-15.

Figure E-15. Generic Wiring Diagram for Foxboro Sensors and Rosemount 8732

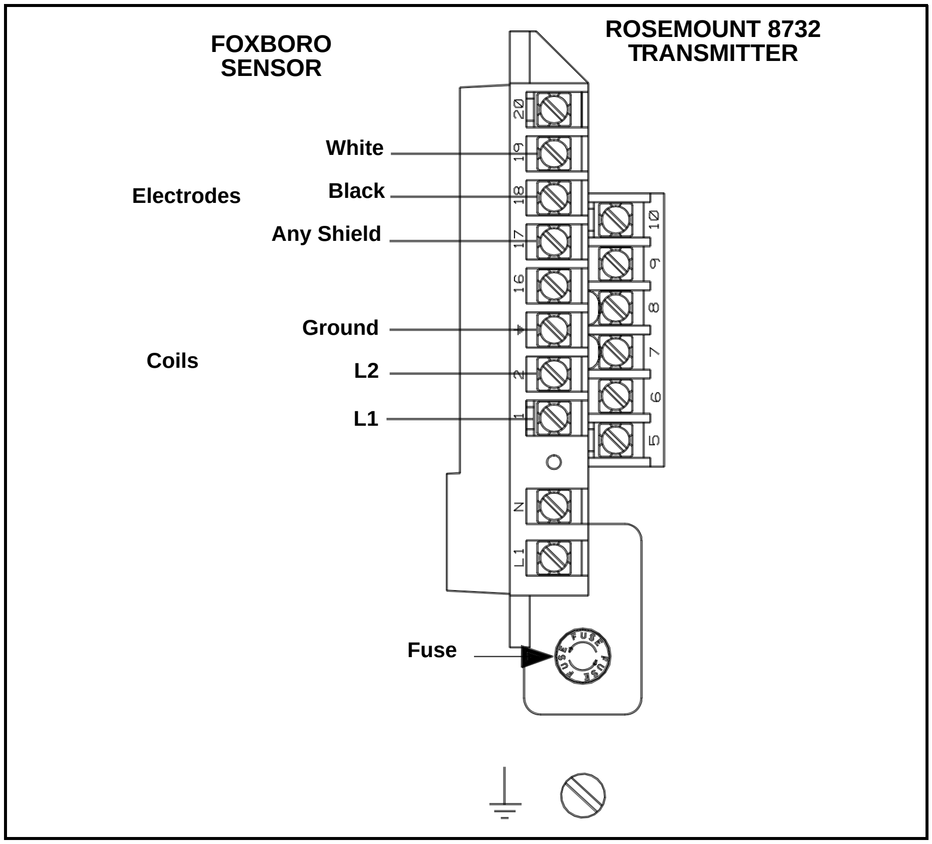
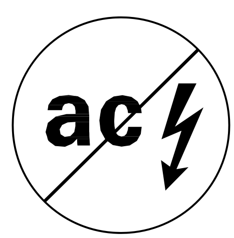


Table E-16. Foxboro Sensor Wiring Connections

Rosemount 8732	Foxboro Sensors
1	L1
2	L2
⏚	Chassis Ground
17	Any Shield
18	Black
19	White

⚠CAUTION	
This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.	

KENT VERIFLUX VTC SENSOR

Connect coil drive and electrode cables as shown in Figure E-16.

Veriflux VTC Sensor to 8732 Transmitter

Figure E-16. Wiring Diagram for Kent Veriflux VTC Sensor and Rosemount 8732

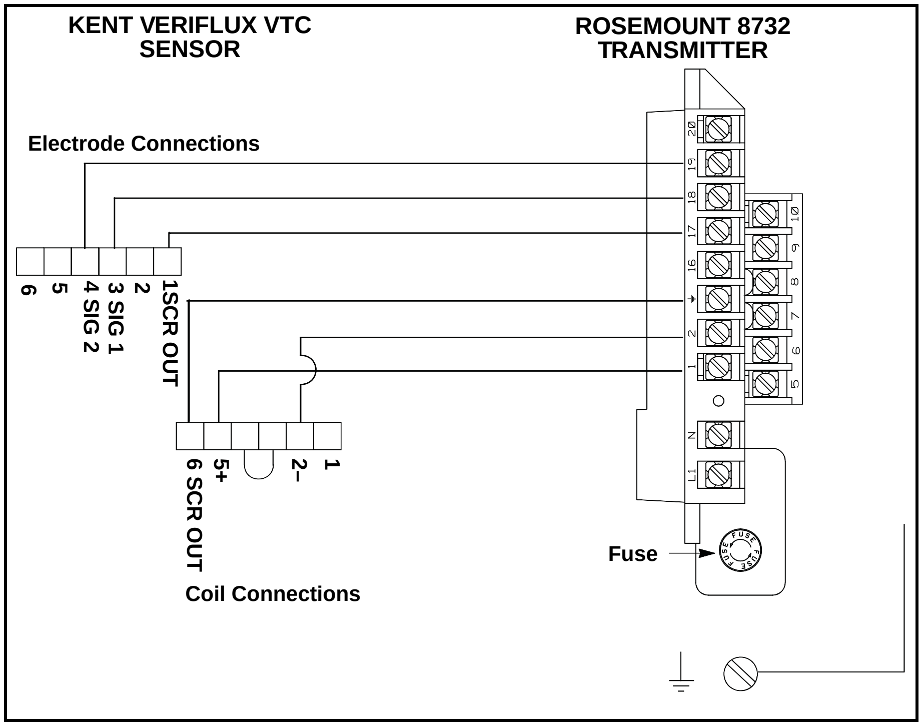
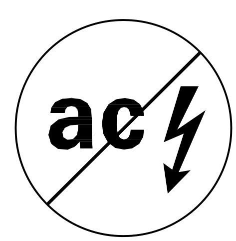


Table E-17. Kent Veriflux VTC Sensor Wiring Connections

Rosemount 8732	Kent Veriflux VTC Sensors
1	2
2	1
⏚	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



KENT SENSORS

Connect coil drive and electrode cables as shown in Figure E-17.

Kent Sensor to Rosemount 8732 Transmitter

Figure E-17. Generic Wiring Diagram for Kent Sensors and Rosemount 8732

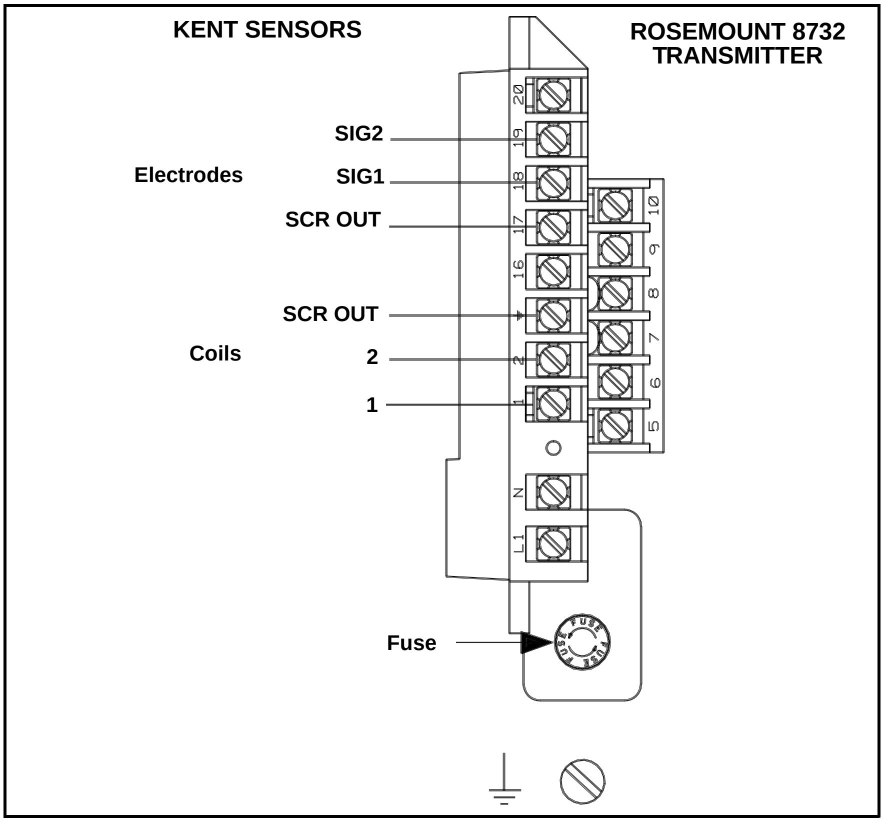
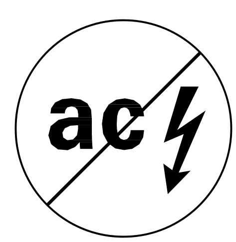


Table E-18. Kent Sensor Wiring Connections

Rosemount 8732	Kent Sensors
1	1
2	2
⏚	SCR OUT
17	SCR OUT
18	SIG1
19	SIG2

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



KROHNE SENSORS

Connect coil drive and electrode cables as shown in Figure E-18.

Krohne Sensor to Rosemount 8732 Transmitter

Figure E-18. Generic Wiring Diagram for Krohne Sensors and Rosemount 8732

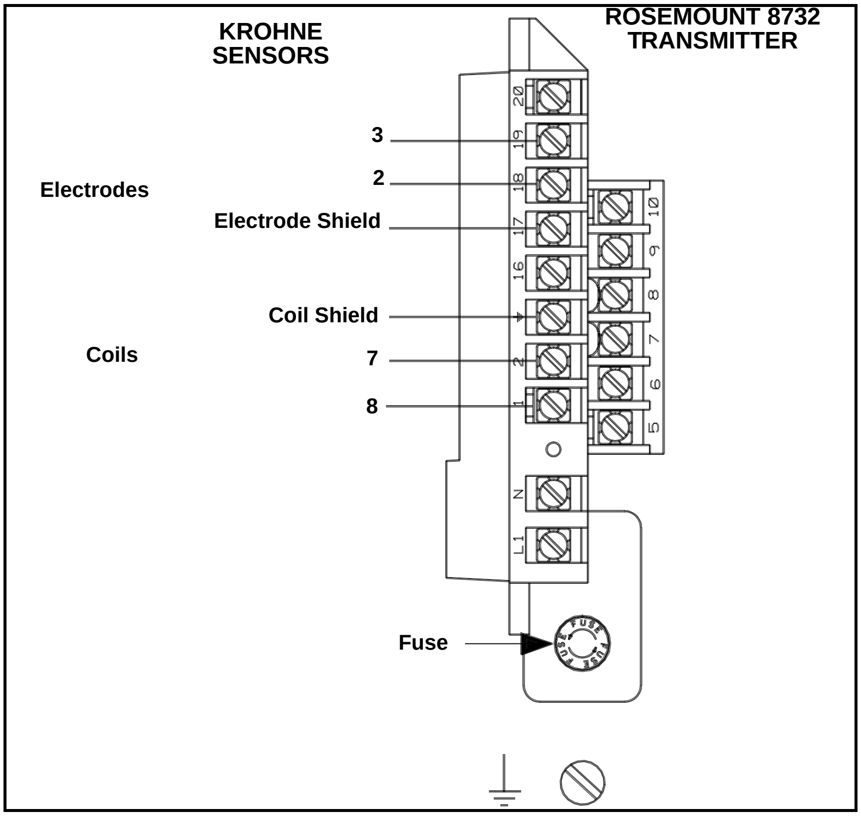
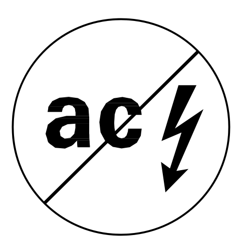


Table E-19. Krohne Sensor Wiring Connections

Rosemount 8732	Krohne Sensors
1	8
2	7
⏚	Coil Shield
17	Electrode Shield
18	2
19	3

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



TAYLOR SENSORS

Series 1100 Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-19.

Figure E-19. Wiring Diagram for Taylor Series 1100 Sensors and Rosemount 8732

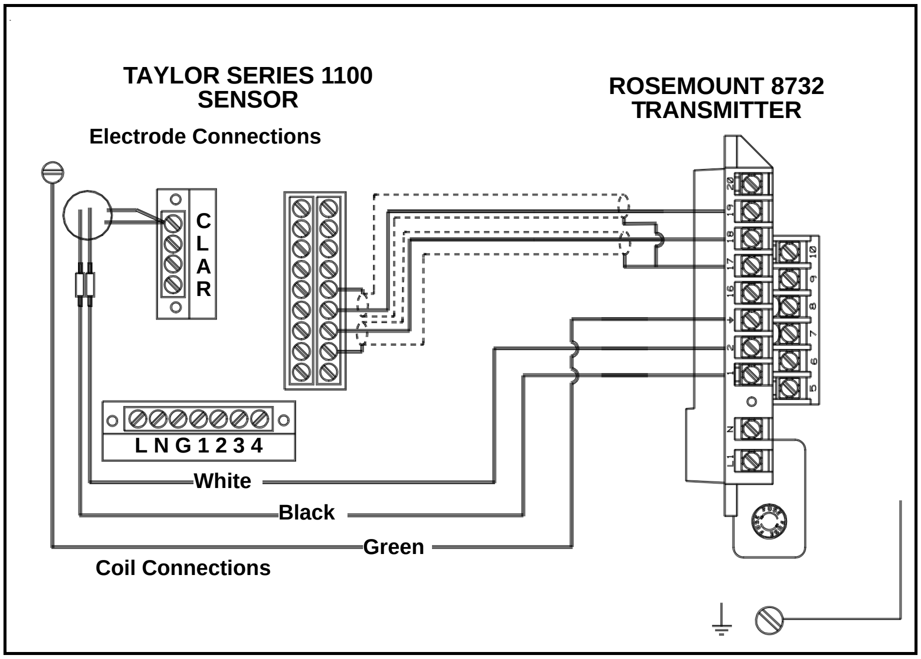
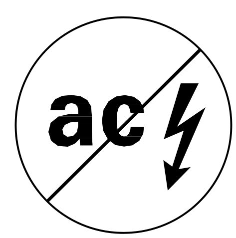


Table E-20. Taylor Series 1100 Sensor Wiring Connections

Rosemount 8732	Taylor Series 1100 Sensors
1	Black
2	White
⏚	Green
17	S1 and S2
18	E1
19	E2

⚠CAUTION	
This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.	

Taylor Sensor to Rosemount 8732 Transmitter

Connect coil drive and electrode cables as shown in Figure E-20.

Figure E-20. Generic Wiring Diagram for Taylor Sensors and Rosemount 8732

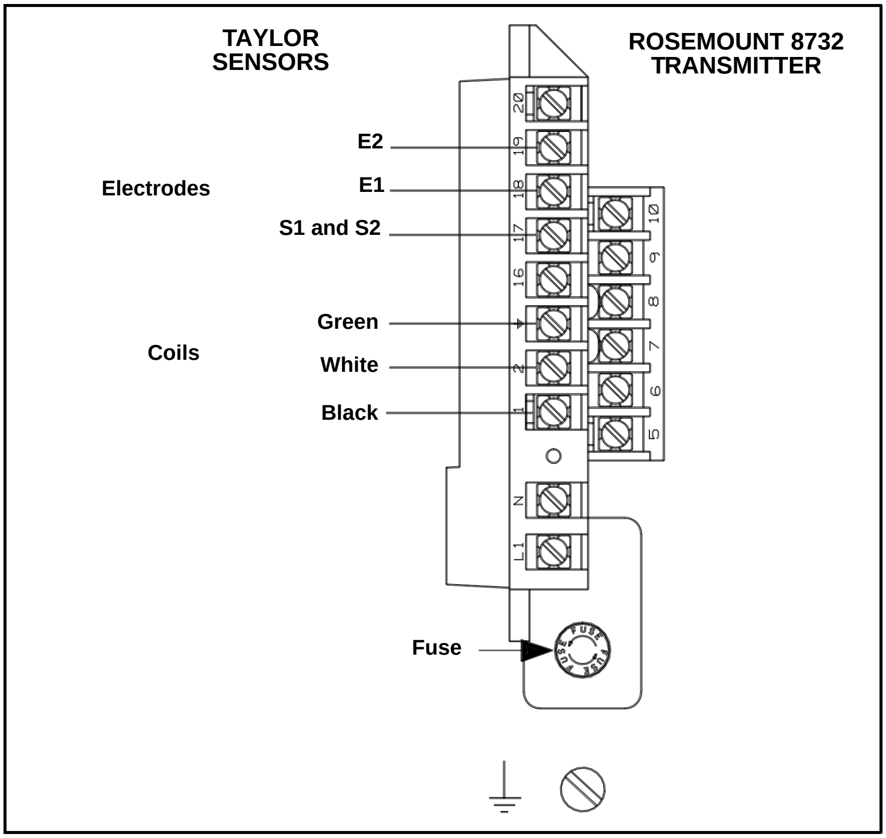
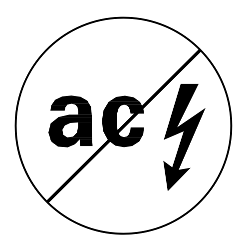


Table E-21. Taylor Sensor Wiring Connections

Rosemount 8732	Taylor Sensors
1	Black
2	White
⏚	Green
17	S1 and S2
18	E1
19	E2

⚠CAUTION

This is a pulsed DCDC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



YAMATAKE HONEYWELL SENSORS

Connect coil drive and electrode cables as shown in Figure E-21.

Yamatake Honeywell Sensor to Rosemount 8732 Transmitter

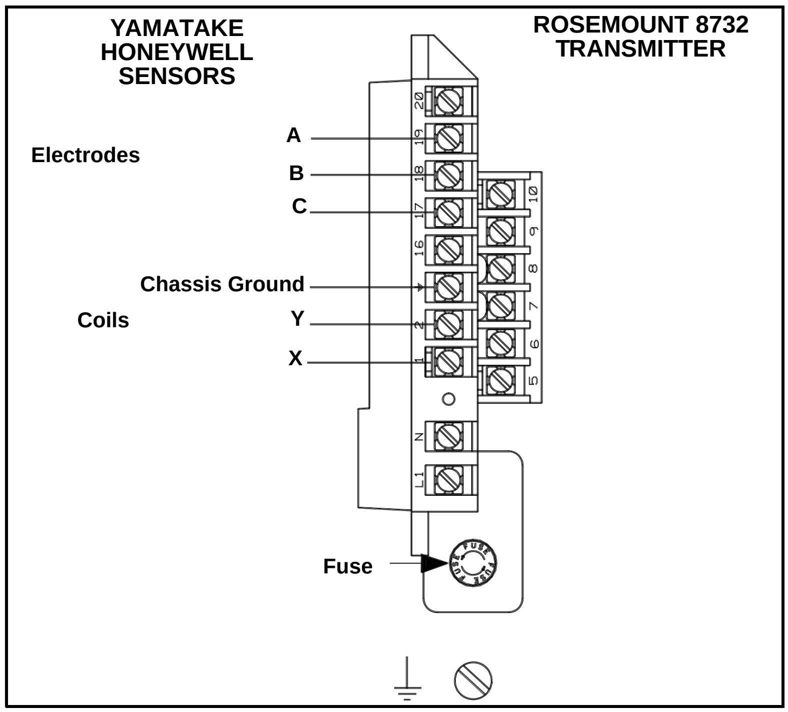


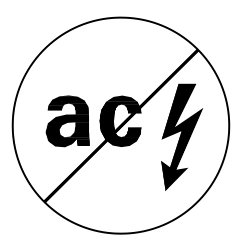
Figure E-21. Generic Wiring Diagram for Yamatake Honeywell Sensors and Rosemount 8732

Table E-22. Yamatake Honeywell Sensor Wiring Connections

Rosemount 8732	Yamatake Honeywell Sensors
1	X
2	Y
⏚	Chassis Ground
17	C
18	B
19	A

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



YOKOGAWA SENSORS

Connect coil drive and electrode cables as shown in Figure E-22.

Yokogawa Sensor to Rosemount 8732 Transmitter

Figure E-22. Generic Wiring Diagram for Yokogawa Sensors and Rosemount 8732

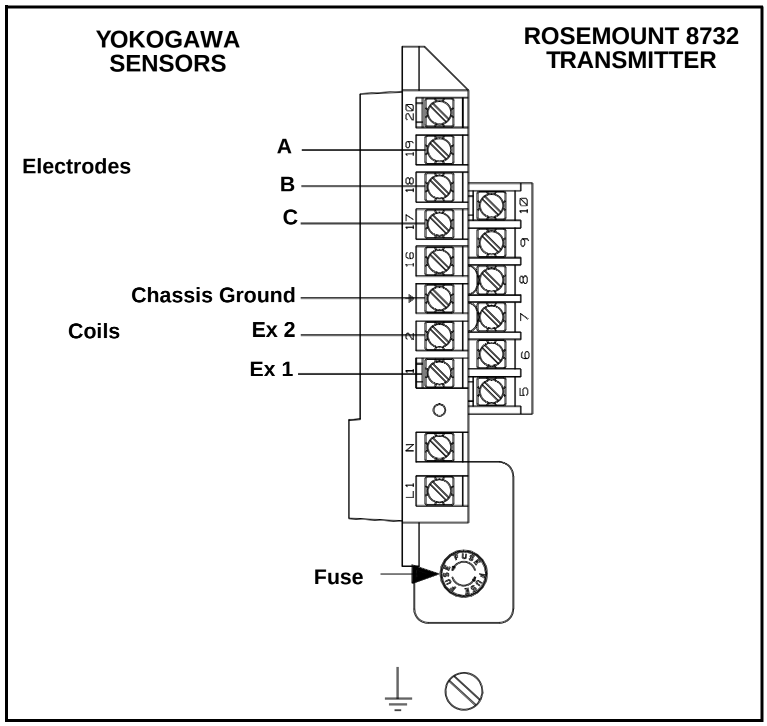
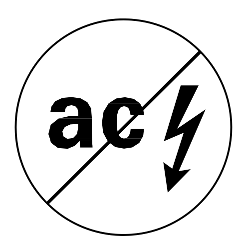


Table E-23. Yokogawa Sensor Wiring Connections

Rosemount 8732	Yokogawa Sensors
1	EX1
2	EX2
⏚	Chassis Ground
17	C
18	B
19	A

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



GENERIC MANUFACTURER SENSORS

Generic Manufacturer Sensor to Rosemount 8732 Transmitter

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.

Wiring Connections

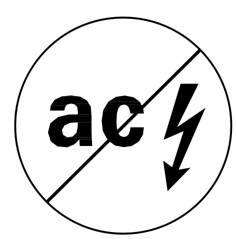
Connect the electrode terminals to Rosemount 8732 terminals 18 and 19. The electrode shield should be connected to terminal 17.

Connect the coil terminals to Rosemount 8732 terminals 1, 2, and ⏚.

If the Rosemount 8732 Transmitter indicates a reverse flow condition, switch the coil wires connected to terminals 1 and 2.

⚠CAUTION

This is a pulsed DC magnetic flowmeter. **Do not connect AC power to the sensor or to terminals 1 and 2 of the transmitter**, or replacement of the electronics board will be necessary.



Appendix F Resource Block

This section contains information on the resource block for the Rosemount 8732 Magnetic Flowmeter Transmitter. Descriptions of all resource block parameters, errors, and diagnostics are included. Also, the modes, alarm detection, status handling, virtual communication relationships (VCRs), and troubleshooting are discussed.

Definition

The resource block defines the physical resources of the device, such as measurement and memory. The resource block also handles functionality, such as shed times, that is common across multiple blocks. The block has no linkable inputs or outputs, and it performs memory-level diagnostics.

PARAMETERS AND DESCRIPTIONS

Table F-1 lists all of the configurable parameters of the resource block, including the descriptions and index numbers for each parameter. Newer software revisions have added functionality and some index numbers have changed. To determine the software revision of a transmitter, check the parameter SOFTWARE_REVISION_MAJOR. The most recent transmitters have a label on the electronic board stack.

Table F-1. Resource Block Parameters

Parameter	Index Number Rev 5	Description
ACK_OPTION	38	ACK_OPTION is a selection of whether alarms associated with the function block will be automatically acknowledged.
ADVISE_ACTIVE	82	Active advisory alarms.
ADVISE_ALM	83	Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.
ADVISE_ENABLE	80	Enables or disables the advisory conditions within a device.
ADVISE_MASK	81	Mask of advisory Alarm. Corresponds bit for bit to the Advisory Active. A bit on means that the failure is masked out from alarming.
ADVISE_PRI	79	Designates the alarming priority of the advisory alarm.
ALARM_SUM	37	This parameter shows the current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block. In the Rosemount 8732 Magnetic Flowmeter Transmitter, the two resource block alarms are *write alarm* and *block alarm*.
ALERT_KEY	04	ALERT_KEY shows the identification number of the plant unit. This information may be used in the host for sorting alarms, etc.

Parameter	Index Number Rev 5	Description
BLOCK_ALM	36	The block alarm is used for all configuration, hardware, connection failure, or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the status parameter. As soon as the unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the active status, if the subcode has changed.
BLOCK_ERR	06	This parameter reflects the error status of the hardware or software components associated with a block. It is a bit string, so multiple errors may be shown.
CLR_FSAFE	30	Writing a Clear to this parameter will clear the device FAULT_ STATE if the field condition has cleared.
CONFIRM_TIME	33	This parameter represents the minimum time between retries of alert reports.
CYCLE_SEL	20	This parameter is used to select the block execution method for this resource. The Rosemount 8732 supports the following executions: Scheduled: Blocks are only executed based on the schedule in FB_START_LIST. Block Execution: A block may be executed by linking to another block’s completion.
CYCLE_TYPE	19	This parameter identifies the block execution methods available for this resource.
DD_RESOURCE	09	This string identifies the tag of the resource that contains the device description for this resource.
DD_REV	13	DD_REV is a revision of the DD associated with the resource—used by an interface device to locate the DD file for the resource.
DEFINE_WRITE_LOCK	60	This parameter is an enumerated value describing the implementation of the WRITE_LOCK.
DETAILED_STATUS	55	DETAILED_STATUS is an additional status bit string.
DEV_REV	12	This parameter represents the manufacturer revision number associated with the resource—used by an interface device to locate the DD file for the resource.
DEV_STRING	43	Used to load new licensing into the device. The value can be written but will always read back with a value of 0.
DEV_TYPE	11	This parameter represents the manufacturer’s model number associated with the resource—used by interface devices to locate the DD file for the resource (Rosemount 8732).
DIAG_OPTION	46	Indicates which diagnostics licensing options are enabled.
DISTRIBUTOR	42	References the company that is responsible for the distribution of this device.
DOWNLOAD_MODE	67	DOWNLOAD_MODE gives access to the boot block code for over-the-wire downloads.
FAILED_ACTIVE	72	Active fail alarms.
FAILED_ALM	73	Alarm indicating a failure within a device which makes the device non-operational.
FAILED_ENABLE	70	Enables or disables the failure conditions within a device.
FAILED_MASK	71	Mask of Failure Alarm. Corresponds bit of bit to the Fail Active. A bit on means that the failure is masked out from alarming.
FAILED_PRI	69	Designates the alarming priority of the fail alarm.
FAULT_STATE	28	Condition set by loss of communication to an output block, fault promoted to an output block or physical contact. When FAULT_ STATE condition is set, then output function blocks will perform their FAULT_ STATE actions.
FB_OPTION	45	Indicates which function block licensing options are enabled.
FEATURES	17	This parameter is used to show supported resource block options.
FEATURE_SEL	18	Used to show selected resource block options. The Rosemount 8732 Magnetic Flowmeter Transmitter supports the following options: Unicode: Tells the host to use unicode for string values Reports: Enables alarms; must be set for alarming to work Software Lock: Software write locking enabled but not active; WRITE_LOCK must be set to activate Hardware Lock: Hardware write locking enabled but not active; WRITE_LOCK follows the status of the security switch
FINAL_ASSY_NUM	54	FINAL_ASSEMBLY_NUMBER is used for identification purposes and is associated with the overall field device.

Parameter	Index Number Rev 5	Description
FREE_SPACE	24	This parameter represents the percent of memory available for further configuration (zero in a preconfigured device).
FREE_TIME	25	This parameter represents the percent of the block processing time that is free to process additional blocks.
GRANT_DENY	14	Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block (not used by the device).
HARD_TYPES	15	HARD_TYPES shows the types of hardware available as channel numbers. For the Rosemount 8732, this parameter is limited to scalar (i.e., analog) inputs.
HARDWARE_REV	52	This parameter represents the hardware revision of the hardware that has the resource block in it.
HEALTH_INDEX	84	Parameter representing the overall health of the device, 100 being perfect and 1 being non-functioning. The value is based on the active PWA alarms.
ITK_VER	41	FOUNDATION fieldbus Interoperability Test Kit Version
LIM_NOTIFY	32	Maximum number of unconfirmed alert notify messages allowed.
MAINT_ACTIVE	77	Active maintenance alarms.
MAINT_ALM	78	Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.
MAINT_PRI	74	Designates the alarming priority of the maintenance alarm.
MAINT_ENABLE	75	Enables or disables the maintenance conditions within a device.
MAINT_MASK	76	Mask of Maintenance Alarm. Corresponds bit for bit to the Maintenance Active. A bit on means that the failure is masked out from alarming.
MANUFAC_ID	10	Manufacturer identification number—used by an interface device to locate the DD file for the resource (001151 for Rosemount).
MAX_NOTIFY	31	Maximum number of unconfirmed alert notify messages possible.
MEMORY_SIZE	22	Available configuration memory in the empty resource. To be checked before attempting a download.
MESSAGE_DATE	57	MESSAGE_DATE is the date associated with the MESSAGE_TEXT parameter.
MESSAGE_TEXT	58	MESSAGE_TEXT is used to indicate changes made by the user to the device's installation, configuration, or calibration.
MIN_CYCLE_T	21	Time duration of the shortest cycle interval of which the resource is capable.
MISC_OPTION	47	Indicates which miscellaneous licensing options are enabled.
MODE_BLK	05	The actual, target, permitted, and normal modes of the block: Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that the target mode may take on Normal: Most common mode for the actual mode
NV_CYCLE_T	23	NV_CYCLE_T is the interval between which copies of nonvolatile (NV) parameters are written to NV memory. Zero denotes that NV parameters are never written to NV memory.
OUTPUT_BOARD_SN	53	This parameter represents the output board serial number.
PWA_SIMULATE	85	Parameter allows simulation of PWA alarms.
RB_SFTWR_REV_ALL	51	Software revision string containing the following fields: major revision, minor revision, build, time of build, day of week of build, month of build, day of month of build, year of build, initials of builder.
RB_SFTWR_REV_BUILD	50	This parameter shows the build of software that the resource block was created with.
RB_SFTWR_REV_MAJOR	48	This parameter shows the major revision of the software that the resource block was created with.
RB_SFTWR_REV_MINOR	49	This parameter shows the minor revision of the software that the resource block was created with.
RECOMMENDED_ACTION	68	Enumerated list of recommended actions displayed with an alert.

Parameter	Index Number Rev 5	Description
RESTART	16	Allows a manual restart to be initiated. Several degrees of restart are possible: 1 Run: Nominal state when not restarting 2 Restart resource: Not used 3 Restart with defaults: Set parameters to default values (see START_WITH_DEFAULTS below for which parameters are set). 4 Restart processor: Does a warm start of the central processing unit (CPU).
RS_STATE	07	RS_STATE denotes the state of the function block application state machine.
SAVE_CONFIG_NOW	61	This parameter controls saving of configuration in EEPROM.
SAVE_CONFIG_BLOCKS	62	Number of EEPROM blocks that have been modified since the last burn. This value will count down to zero when the configuration is saved.
SECURITY_IO	65	SECURITY_JUMPER denotes the status of security jumper/switch.
SELF_TEST	59	SELF_TEST instructs the resource block to perform a self-test.
SET_FSAFE	29	Allows the FAULT_ STATE condition to be manually initiated by selecting Set.
SHED_RCAS	26	This parameter represents the time duration at which to give up on computer writes to function block RCas locations.
SHED_ROUT	27	This parameter represents the time duration at which to give up on computer writes to function block ROut locations.
SIMULATE_IO	64	SIMULATE_JUMPER shows the status of the simulate jumper/switch.
SIMULATE_STATE	66	SIMULATE_STATE represents the state of the simulate function.
ST_REV	01	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
START_WITH_DEFAULTS	63	START_WITH_DEFAULTS controls what defaults are used at power-up.
STRATEGY	03	The strategy field can be used to identify grouping of blocks. These data are not checked or processed by the block.
SUMMARY_STATUS	56	This parameter represents an enumerated value of repair analysis.
TAG_DESC	02	The user description of the intended application of the block.
TEST_RW	08	A parameter for a host to use to test reading and writing. Not used by the device at all.
UPDATE_EVT	35	This alert is generated by any change to the static data.
WRITE_ALM	40	This alert is generated if the write lock parameter is cleared.
WRITE_LOCK	34	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.
WRITE_PRI	39	WRITE_PRI represents the priority of the alarm generated by clearing the write lock.
XD_OPTION	44	Indicates which transducer block licensing block options are enabled.

RESOURCE BLOCK ERRORS

Table F-2 lists conditions reported in the BLOCK_ERR parameter. Conditions in *italics* are inactive for the resource block and are given here only for your reference.

Table F-2. Resource BLOCK_ERR Conditions

Condition Number	Condition Name and Description
1	**Block Configuration Error**: A feature in FEATURES_SEL is set that is not supported by FEATURES or an execution cycle in CYCLE_SEL is set that is not supported by CYCLE_TYPE.
2	**Link Configuration Error**: A link used in one of the function blocks is improperly configured.
3	**Simulate Active**: The simulation jumper is in place. Simulate active is not an indication that the I/O blocks are using simulated data.
4	*Local Override*
5	*Device Fault State Set*
6	*Device Needs Maintenance Soon*
7	*Input failure/process variable has bad status*
8	*Output Failure: The output is bad based primarily upon a bad input.*
9	**Memory Failure**: A memory failure has occurred in FLASH, RAM, or EEPROM memory.
10	**Lost Static Data**: Static data that are stored in nonvolatile memory have been lost.
11	**Lost NV Data**: Nonvolatile data that are stored in nonvolatile memory have been lost.
12	*Readback Check Failed*
13	Device Needs Maintenance Now
14	**Power Up**: The device was just powered-up.
15	**Out of Service**: The actual mode is out of service.

MODES

The resource block supports two modes of operation as defined by the MODE_BLK parameter:

- **Automatic (Auto)**—The block is processing its normal background memory checks.
- **Out of Service (O/S)**—The block is not processing its tasks. When the resource block is in O/S, all blocks within the resource (device) are forced into O/S. The BLOCK_ERR parameter shows **OUT OF SERVICE**. In this mode, you can make changes to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

Alarm Detection

A block alarm will be generated whenever the BLOCK_ERR has an error bit set. The types of block error for the resource block are defined in Table F-2.

A write alarm is generated whenever the WRITE_LOCK parameter is cleared. The priority of the write alarm is set in the following parameter:

- WRITE_PRI

Alarms are grouped into five levels of priority, as shown in Table F-3.

Table F-3. Alarm Priorities

Priority Number	Priority Description
0	The priority of an alarm condition changes to 0 after the condition that caused the alarm is corrected.
1	An alarm condition with a priority of 1 is recognized by the system, but is not reported to the operator.
2	An alarm condition with a priority of 2 is reported to the operator, but does not require operator attention (such as diagnostics and system alerts).
3–7	Alarm conditions of priority 3–7 are advisory alarms of increasing priority.
8–15	Alarm conditions of priority 8–15 are critical alarms of increasing priority.

Status Handling

There are no status parameters associated with the resource block.

VCR

The number of configurable virtual communication relationships or VCRs is 18. The parameter is not contained or viewable within the resource block, but it does apply to all blocks.

TROUBLESHOOTING

Refer to Table F-4 to troubleshoot resource block problems.

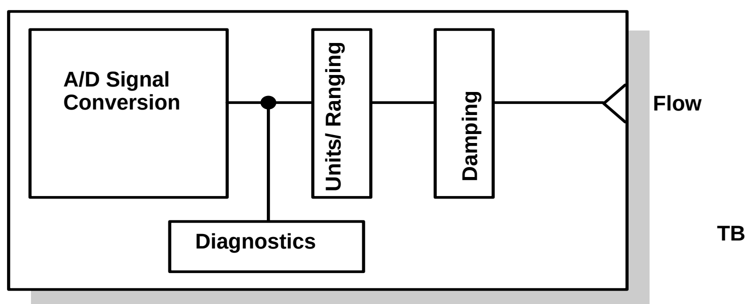
Table F-4. Troubleshooting

Symptom	Possible Causes	Corrective Action
Mode will not leave OOS.	Target mode not set	Set target mode to something other than OOS.
	Memory failure	BLOCK_ERR will show the lost NV Data or Lost Static Data bit set. Restart the device by setting RESTART to Processor. If the block error does not clear, call the factory.
Block alarms will not work.	Features	FEATURES_SEL does not have Alerts enabled. Enable the Alerts bit.
	Notification	LIM_NOTIFY is not high enough. Set equal to MAX_NOTIFY.
	Status options	STATUS_OPTS has Propagate Fault Forward bit set. This should be cleared to cause an alarm to occur.

Appendix G Transducer Block

This appendix contains information on the transducer block for the Rosemount 8732 Magnetic Flowmeter Transmitter (see Figure G-1). Descriptions of all transducer block parameters, errors, and diagnostics are listed. Also, the modes, alarm detection, status handling, application information, and troubleshooting are discussed.

Figure G-1. Transducer Block Diagram



Definition

The transducer block contains the actual flow measurement data. This data includes information about sensor type, engineering units, digital filter settings, damping, and diagnostics. Only a single channel is defined in the Rosemount 8732. Channel 1 provides flow measurements to the analog input (AI) block.

PARAMETERS AND DESCRIPTIONS

Table G-1 lists all of the configurable parameters of the transducer block, indicating the descriptions and index numbers for each parameters.

Table G-1. Transducer Block Parameters

Parameter	Index Number	Definition
ALERT_KEY	4	ID number of the transmitter–may be used on the host for sorting alarms
BLOCK_ALM	8	Block alarm
COIL_DRIVE_FREQ	35	Frequency at which the coils are being driven (5 or 37.5 Hz)
DAMPING	30	Damping filter value (in seconds)
DENSITY_UNIT	31	Unit code associated with DENSITY_VALUE. Valid values are lb/cubic feet, or kg/cubic meter
DENSITY_VALUE	75	User entered density value to be used by the transducer block when calculating flow rate in mass flow units
DIAGNOSTIC_HANDLING	60	On/Off handling for diagnostics
ELECTRODE_MATERIAL	51	Enumerated string indicating flange material of installed flowtube
ELECTRODE_TYPE	52	Enumerated string indicating electrode type of installed flowtube
EP_TRIG_COUNTS	40	Number of EP measurements that must be above the trigger level to set empty pipe
EP_TRIG_LEVELS	41	Empty Pipe Trigger Levels
FLANGE_MATERIAL	54	Enumerated string indicating liner material of installed flowtube
FLANGE_TYPE	53	Enumerated string indicating liner material of installed flowtube
FLOW_TUBE_SERIAL_NUMBER	49	Flow tube serial number from physical tag on flowtube
FLOW_TUBE_TAG	48	Text String Identifier of flowtube
LICENSE_KEY	78	Key/password to enable diagnostic features. Any changes to the licensing will be shown in the LICENSE_STATUS parameter
LINER_MATERIAL	50	Enumerated string indicating liner material of installed flowtube
LOI_LANG	39	Selects the language to be used in the local display for status and diagnostics messages
LOW_FLOW_CUTOFF	37	When flow rate is less than this entered value, flow rate output will be set to 0 ft/s
MODE_BLK	5	Mode of the record of the block–contains the actual, target, permitted, and normal modes
SENSOR_CAL_DATE	25	Date of the last sensor calibration–intended to reflect the calibration of the sensor
SENSOR_CAL_LOC	24	Location of the last sensor calibration–describes the physical location at which the calibration was performed
SENSOR_CAL_METHOD	23	Method of the last sensor calibration–ISO defines several standard methods of calibration (This parameter is intended to record that method or if some other method was used.)
SENSOR_CAL_WHO	26	Name of the person responsible for the last sensor calibration
STATUS_MESSAGE_MFG	61	Used by manufacturing to test groups to simulate status codes
STRATEGY	3	Can be used to help group the blocks (Not checked or processed by the block)
TAG_DESC	2	Static tag–ASCII character string
TUBE_CAL_NO	33	Sensor gain and zero offset number used in flow calculation (Number entered is locate on physical tag of the sensor.)
TUBE_SIZE	34	Tube Size. See Tube Size for actual line sizes
UPDATE_EVT	7	Update event

FLOW-SPECIFIC BLOCK CONFIGURATION VALUES

Once the transmitter is installed and communication is established, configuration must be completed. Three parameters must be entered for proper configuration:

- Sensor calibration number
- Engineering units (configured via AI block)
- Sensor size

The sensor calibration number can be found on the sensor nameplate. A list of all possible sensor sizes and engineering units are listed in Table G-2 and Table G-3. Mass units (lb, kg, ton, and ston) require configuration of the DENSITY_VALUE.

Table G-2. Supported Line Sizes

User-Defined Sensor Line Size	
0.1 in. (3 mm)	16 in. (400 mm)
0.15 in. (4 mm)	18 in. (450 mm)
0.25 in. (6 mm)	20 in. (500 mm)
0.3 in (8 mm)	24 in. (600 mm)
0.5 in. (15 mm)	28 in. (700 mm)
0.75 in. (20 mm)	30 in. (750 mm)
1 in. (25 mm)	32 in (800 mm)
1.5 in. (40 mm)	36 in. (900 mm)
2 in. (50 mm)	40 in. (1000 mm)
2.5 in. (65 mm)	42 in. (1050 mm)
3 in. (80 mm)(1)	48 in. (1200 mm)
4 in. (100 mm)	54 in. (1350 mm)
6 in. (150 mm)	56 in. (1400 mm)
8 in. (200 mm)	60 in. (1500 mm)
10 in. (250 mm)	64 in. (1600 mm)
12 in. (300 mm)	72 in. (1800 mm)
14 in. (350 mm)	80 in. (2000 mm)

(1) Default Factory Configuration

Table G-3. Supported Engineering Units

User Defined Engineering Units			
• ft/s(1)	• CFS	• bbl/s	• kg/s
• ft/m	• CFM	• bbl/min	• kg/min
• ft/h	• CFH	• bbl/h	• kg/h
• m/s	• ft^3/d	• bbl/d	• kg/d
• m/h	• m^3/s	• cm^3/s	• STon/s
• gal/s	• m^3/min	• cm^3/min	• STon/min
• GPM	• m^3/h	• cm^3/h	• STon/h
• gal/h	• m^3/d	• cm^3/d	• STon/d
• gal/d	• IGAL/s	• lb/s	• t/s
• L/s	• IGAL/min	• lb/min	• t/min
• L/min	• IGAL/h	• lb/h	• t/h
• L/h	• IGAL/d	• lb/d	• t/d
• L/d			

(1) Default factory configuration

TRANSDUCER BLOCK ERRORS

The following conditions are reported in the BLOCK_ERR and XD_ERROR parameters. Conditions in *italics* are inactive for the transducer block and are given here only for your reference.

Table G-4. Transducer BLOCK_ERR and XD_ERR Conditions

Condition Number	Condition Name and Description
1	*Block Configuration Error*
2	*Link Configuration Error*
3	*Simulate Active*
4	*Local Override*
5	*Device Fault State Set*
6	Device Needs Maintenance Soon
7	Input Failure/Process Variable Has Bad Status
8	*Output Failure*
9	*Memory Failure*
10	*Lost Static Data*
11	*Lost NV Data*
12	*Readback Check Failed*
13	Device Needs Maintenance Now
14	**Power Up**: The device was just powered-up.
15	**Out of Service**: The actual mode is out of service.
16	**Unspecified Error**: An unidentified error occurred.
17	**General Error**: A general error that cannot be specified below occurred.
18	**Calibration Error**: An error occurred during calibration of the device, or a calibration error was detected during normal operations.
19	**Configuration Error**: An error occurred during configuration of the device, or a configuration error was detected during normal operations.
20	**Electronics Failure**: An electrical component failed.
21	**Mechanical Failure**: A mechanical component failed.
22	**I/O Failure**: An input/output (I/O) failure occurred.
23	**Data Integrity Error**: Data stored in the device are no longer valid due to a nonvolatile memory checksum failure, a data verify after write failure, etc.
24	**Software Error**: The software has detected an error due to an improper interrupt service routine, an arithmetic overflow, a watchdog time-out, etc.
25	**Algorithm Error**: The algorithm used in the transducer block produced an error due to overflow, data reasonableness failure, etc.

TRANSDUCER BLOCK DIAGNOSTICS

In addition to the BLOCK_ERR and XD_ERROR parameters, more detailed information on the measurement status can be obtained via DETAILED_STATUS. Table G-5 lists the potential errors and the possible corrective actions for the given values. Reset the transmitter by cycling power and then, if the error persists, perform the corrective action as described in Table G-5. More detailed and descriptive corrective actions are listed in Section 4: Operation and Section 6: Maintenance and Troubleshooting.

Table G-5. TB_DETAILED_STATUS Descriptions and Corrective Actions

Value	Name and Description	Corrective Action
0x00000001	DSP hardware not compatible with software	Send to service center[1]
0x00000002	Electronics failure	Replace the electronics board stack
0x00000004	Coil drive open circuit	Perform sensor electrical resistance checks
0x00000008	Empty Pipe Detected	Verify sensor is full
0x00000010	Calibration failure	Cycle transmitter power to clear message
0x00000020	Auto Zero failure	Repeat Auto Zero process
0x00000040	Sensor high limit exceeded	Lower the process flowrate
0x00000080	Sensor processor not communicating	Replace electronics
0x00000100	Universal Trim failure	Re-run Universal Trim with steady state flow
0x00000200	Reverse flow detected	Verify sensor is not installed backwards
0x00000400	Electronics Temp outside limits	Status message – no corrective action
0x00002000	High Process Noise	Increase the coil drive frequency to 37.5 Hz
0x00008000	Grounding/Wiring Fault	Connect process grounding

(1) *See Section 6: Maintenance and Troubleshooting for detailed instructions on how to return products to an authorized service center or factory.*

MODES

The transducer block supports two modes of operation as defined by the MODE_BLK parameter:

- **Automatic (Auto)**—The channel outputs reflect the analog input measurement.
- **Out of Service (O/S)**—The block is not processed. Channel outputs are not updated and the status is set to **BAD: OUT OF SERVICE** for each channel. The BLOCK_ERR parameter shows **OUT OF SERVICE**. In this mode, you can make changes to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

Alarm Detection

Alarms are not generated by the transducer block. By correctly handling the status of the channel values, the down stream block (AI) will generate the necessary alarms for the measurement. The error that generated this alarm can be determined by looking at BLOCK_ERR and XD_ERROR.

Status Handling

Normally, the status of the output channels reflects the status of the measurement value, the operating condition of the measurement electronics card, and any active alarm condition.

In Auto mode, OUT reflects the value and status quality of the output channels.

TROUBLESHOOTING

Refer to Table G-6 to troubleshoot transducer block problems.

Table G-6. Troubleshooting

Symptom	Possible Causes	Corrective Action
Mode will not leave out of service (OOS).	Target mode not set	Set target mode to something other than OOS.
	Resource block	The actual mode of the resource block is OOS. See Appendix F: Resource Block: and Section 3: Configuration.
PVor SV is BAD	Measurement	See Diagnostics, Table G-4.
		Flow is above SENSOR_RANGE.EU100.
PV or SV is UNCERTAIN	Measurement	Flow is above PRIMARY_VALUE_RANGE.EU100.

Appendix H 375 Field Communicator Operation

HANDHELD COMMUNICATOR

NOTE
Please refer to the Handheld Communicator manual for detailed instructions on the use, features, and full capabilities of the Handheld Communicator.

⚠WARNING

Explosions can result in death or serious injury.

Do not make connections to the serial port or NiCad recharger jack in an explosive atmosphere.

Before connecting the Handheld 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.

CONNECTIONS AND HARDWARE

The 375 Field Communicator exchanges information with the transmitter from the control room, the instrument site, or any wiring termination point in the loop. Be sure to install the instruments in the loop in accordance with intrinsically safe or non-incendive field wiring practices. Explosions can result if connections to the serial port or NiCad recharger jack are made in an explosive situation. The Handheld Communicator should be connected in parallel with the transmitter. Use the loop connection ports on the rear panel of the Handheld Communicator (see Figure H-1). The connections are non-polarized.

Figure H-1. Rear Connection Panel

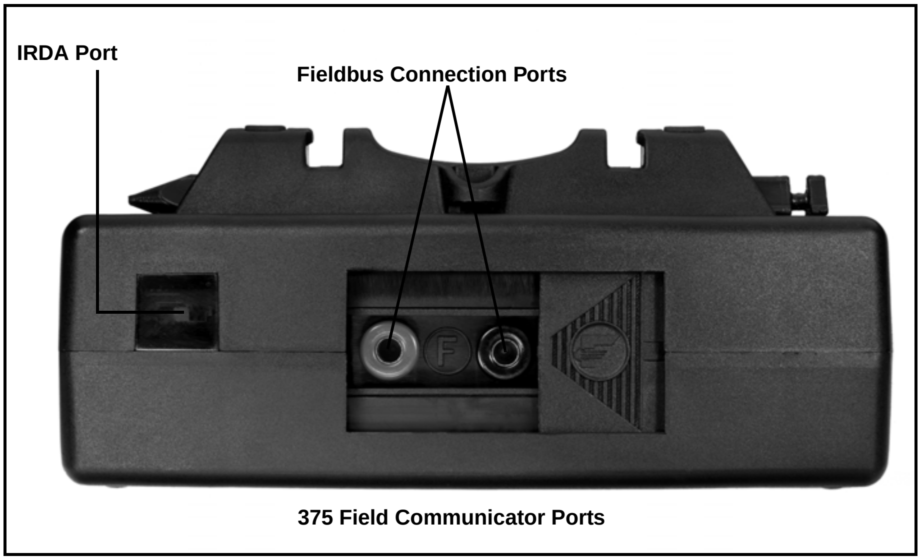
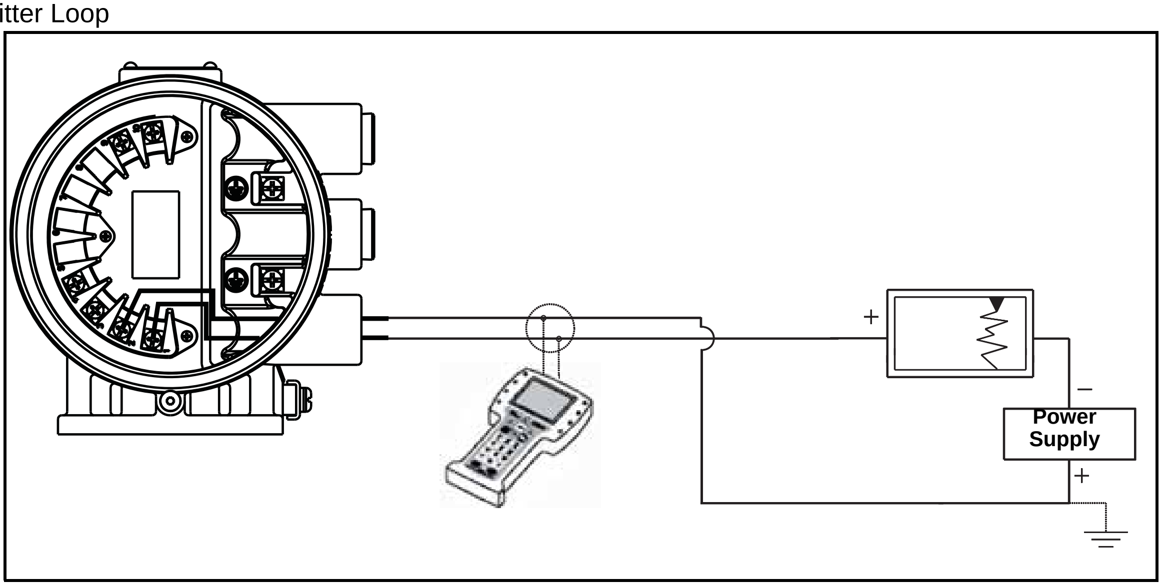


Figure H-2. Connecting the Handheld Communicator to a Transmitter Loop



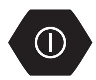
BASIC FEATURES

The basic features of the Handheld Communicator include Action Keys, Function Keys, and Alphanumeric and Shift Keys.

Figure H-3. The Handheld Communicator

Action Keys

The Action Keys
As shown in Figure H-3, the action keys are the six blue, white, and black keys located above the alphanumeric keys. The function of each key is described as follows:

ON/OFF Key 
Use this key to power the Handheld Communicator. When the communicator is turned on, it searches for a transmitter on the FOUNDATION filedbus loop.

If a FOUNDATION fieldbus compatible device is found, the communicator displays the Online Menu with device ID (8732) and tag (TRANSMITTER).

Directional Keys 

Use these keys to move the cursor up, down, left, or right. The right arrow key also selects menu options, and the left arrow key returns to the previous menu.

Tab Key 
Use this key to quickly access important, user-defined options when connected to a device. Pressing the Hot Key turns the Handheld Communicator on and displays the Hot Key Menu. See Customizing the Hot Key Menu in the Handheld Communicator manual for more information.

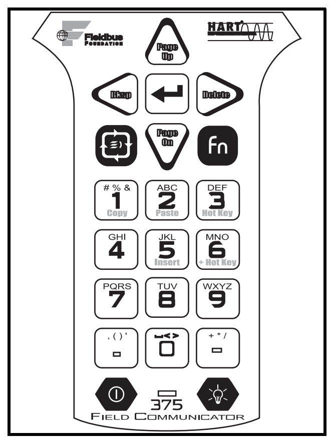
Function Key 

Use the four software-defined function keys, located below the LCD, to perform software functions. On any given menu, the label appearing above a function key indicates the function of that key for the current menu. As you move among menus, different function key labels appear over the four keys. For example, in menus providing access to on-line help, the HELP label may appear above the F1 key. In menus providing access to the Home Menu, the HOME label may appear above the F3 key. Simply press the key to activate the function. See your Handheld Communicator manual for details on specific Function Key definitions.

Alphanumeric and Shift Keys

The Alphanumeric keys perform two functions: the fast selection of menu options and data entry.

Figure H-4. Handheld Communicator Alphanumeric and Shift Keys



Data Entry

Some menus require data entry. Use the Alphanumeric and Shift keys to enter all alphanumeric information into the Handheld Communicator. If you press an Alphanumeric key alone from within an edit menu, the bold character in the center of the key appears. These large characters include the numbers zero through nine, the decimal point (.), and the dash symbol (—).

To enter an alphabetic character, first press the Shift key that corresponds to the position of the letter you want on the alphanumeric key. Then press the alphanumeric key. For example, to enter the letter R, first press the right Shift key, then the “6” key (see Figure H-4 on page H-4). Do not press these keys simultaneously, but one after the other.

MENUS AND FUNCTIONS

The Handheld Communicator is a menu driven system. Each screen provides a menu of options that can be selected as outlined above, or provides direction for input of data, warnings, messages, or other instructions.

Main Menu

The Main Menu provides the following options:

- *Offline* - The Offline option provides access to offline configuration data and simulation functions.
- *Online* - The Online option checks for a device and if it finds one, brings up the Online Menu.
- *Transfer* - The Transfer option provides access to options for transferring data either from the Handheld Communicator (Memory) to the transmitter (Device) or vice versa. Transfer is used to move off-line data from the Handheld Communicator to the flowmeter, or to retrieve data from a flowmeter for off-line revision.

NOTE
Online communication with the flowmeter automatically loads the current flowmeter data to the Handheld Communicator. Changes in on-line data are made active by pressing SEND (F2). The transfer function is used only for off-line data retrieval and sending.

- *Frequency Device* - The Frequency Device option displays the frequency output and corresponding flow output of flow transmitters.
- *Utility* - The Utility option provides access to the contrast control for the Handheld Communicator LCD screen and to the autopoll setting used in multidrop applications.

Once selecting a Main Menu option, the Handheld Communicator provides the information you need to complete the operation. If further details are required, consult the Handheld Communicator manual.

Online Menu

The Online Menu can be selected from the Main Menu as outlined above, or it may appear automatically if the Handheld Communicator is connected to an active loop and can detect an operating flowmeter.

NOTE
The Main Menu can be accessed from the Online Menu. Press the left arrow action key to deactivate the on-line communication with the flowmeter and to activate the Main Menu options.

When configuration variables are reset in the on-line mode, the new settings are not activated until the data are sent to the flowmeter.
Press SEND (F2) to update the process variables of the flowmeter.

On-line mode is used for direct evaluation of a particular meter, re-configuration, changing parameters, maintenance, and other functions.

Diagnostic Messages

The following is a list of messages used by the Handheld Communicator (HC) and their corresponding descriptions.

Variable parameters within the text of a message are indicated with <*variable parameter*>.

Reference to the name of another message is identified by *[another message]*.

Table H-1. Handheld Communicator Diagnostic Messages

Message	Description
Add item for ALL device types or only for this ONE device type	Asks the user whether the hot key item being added should be added for all device types or only for the type of device that is connected.
Command Not Implemented	The connected device does not support this function.
Communication Error	Either a device sends back a response indicating that the message it received was unintelligible or the HC cannot understand the response from the device.
Configuration memory not compatible with connected device	The configuration stored in memory is incompatible with the device to which a transfer has been requested.
Device Busy	The connected device is busy performing another task.
Device Disconnected	Device fails to respond to a command
Device write protected	Device is in write-protect mode Data can not be written
Device write protected – do you still want to shut off?	Device is in write-protect mode – press YES to turn the HC off and lose the unsent data.
Display value of variable on hot key menu?	Asks whether the value of the variable should be displayed adjacent to its label on the hot key menu if the item being added to the hot key menu is a variable.
Download data from configuration memory to device	Prompts user to press SEND softkey to initiate a memory to device transfer.
Exceed field width	Indicates that the field width for the current arithmetic variable exceeds the device- specified description edit format
Exceed precision	Indicates that the precision for the current arithmetic variable exceeds the device- specified description edit form
Ignore next 50 occurrences of status?	Asked after displaying device status – softkey answer determines whether next 50 occurrences of device status will be ignored or displayed
Illegal character	An invalid character for the variable type was entered.
Illegal date	The day portion of the date is invalid.
Illegal month	The month portion of the date is invalid.
Illegal year	The year portion of the date is invalid.
Incomplete exponent	The exponent of a scientific notation floating point variable is incomplete.
Incomplete field	The value entered is not complete for the variable type.
Looking for a device	Polling for multidropped devices at addresses 1–15
Mark as read only variable on hot key menu?	Asks whether the user should be allowed to edit the variable from the hot key menu if the item being added to the hot key menu is a variable
No device configuration in configuration memory	There is no configuration saved in memory available to re-configure off-line or transfer to a device.
No Device Found	Poll of address zero fails to find a device, or poll of all addresses fails to find a device if auto-poll is enabled
No hot key menu available for this device	There is no menu named “hot key” defined in the device description for this device.
No off-line devices available	There are no device descriptions available to be used to configure a device off-line.
No simulation devices available	There are no device descriptions available to simulate a device.
No UPLOAD_VARIABLES in ddl for this device	There is no menu named “upload_variables” defined in the device description for this device – this menu is required for off-line configuration.
No Valid Items	The selected menu or edit display contains no valid items.

Table H-1. Handheld Communicator Diagnostic Messages

Message	Description
OFF KEY DISABLED	Appears when the user attempts to turn the HC off before sending modified data or before completing a method
On-line device disconnected with unsent data – RETRY or OK to lose data	There is unsent data for a previously connected device. Press RETRY to send data, or press OK to disconnect and lose unsent data.
Out of memory for hot key configuration – delete unnecessary items	There is no more memory available to store additional hot key items. Unnecessary items should be deleted to make space available.
Overwrite existing configuration memory	Requests permission to overwrite existing configuration either by a device-to-memory transfer or by an off-line configuration; user answers using the softkeys
Press OK...	Press the OK softkey – this message usually appears after an error message from the application or as a result of hart communications.
Restore device value?	The edited value that was sent to a device was not properly implemented. Restoring the device value returns the variable to its original value.
Save data from device to configuration memory	Prompts user to press SAVE softkey to initiate a device-to-memory transfer
Saving data to configuration memory	Data is being transferred from a device to configuration memory.
Sending data to device	Data is being transferred from configuration memory to a device.
There are write only variables which have not been edited. Please edit them.	There are write-only variables which have not been set by the user. These variables should be set or invalid values may be sent to the device.
There is unsent data. Send it before shutting off?	Press YES to send unsent data and turn the HC off. Press NO to turn the HC off and lose the unsent data.
Too few data bytes received	Command returns fewer data bytes than expected as determined by the device description
Transmitter Fault	Device returns a command response indicating a fault with the connected device
Units for <variable label> has changed – unit must be sent before editing, or invalid data will be sent	The engineering units for this variable have been edited. Send engineering units to the device before editing this variable.
Unsent data to on-line device – SEND or LOSE data	There is unsent data for a previously connected device which must be sent or thrown away before connecting to another device.
Use up/down arrows to change contrast. Press DONE when done.	Gives direction to change the contrast of the HC display
Value out of range	The user-entered value is either not within the range for the given type and size of variable or not within the min/max specified by the device.
<message> occurred reading/writing <variable label>	Either a read/write command indicates too few data bytes received, transmitter fault, invalid response code, invalid response command, invalid reply data field, or failed pre- or post-read method; or a response code of any class other than SUCCESS is returned reading a particular variable.
<variable label> has an unknown value – unit must be sent before editing, or invalid data will be sent	A variable related to this variable has been edited. Send related variable to the device before editing this variable.

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