Reference Manual
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Rosemount™ 4600 Oil & Gas Panel Transmitter

EMERSON™
Process Management

Contents

Appendix A: Specification and Reference Data

Appendix B: Product Certifications

Rosemount™ 4600 Oil & Gas Panel Transmitter

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.

Emerson™ Process Management 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 Emerson Process Management 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 Emerson Process Management.

Apply torque only to the hex flat located at the process end of the transmitter. Do not apply torque to the transmitter body or electrical connection - severe damage could result. Do not exceed 100 ft-lbs.

Static electricity can damage sensitive components.

Observe safe handling precautions for static-sensitive components.

⚠WARNING

Explosions can result in death or serious injury.

- Transmitters located in hazardous areas should be installed in accordance with local codes and requirements for that area.
- Use appropriately rated Ex adapters, blanking elements, and glands during installation.
- Keep process insulation at least 1-in. [25 mm] from transmitter connection.

Electrical shock can result in death or serious injury.

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

Process leaks could result in death or serious injury.

- Properly tighten process connections before applying pressure.

Section 1 Introduction

1.1 Using this manual

The sections in this manual provides information on installing, operating, and maintaining the Rosemount™ 4600 Oil & Gas Pressure Transmitter. The sections are organized as follows:

- Section 2: Configuration contains mechanical and electrical installation instructions.
- Section 3: Installation provides instruction on commissioning and configuring the Rosemount 4600 Transmitter. Information on software functions, configuration parameters, and online variables is also included.
- Section 4: Operation and Maintenance contains operation and maintenance instructions.
- Section 5: Troubleshooting provides troubleshooting techniques for the most common operating problems.
- Appendix A: Specification and Reference Data supplies reference and specification data, as well as ordering information.
- Appendix B: Product Certifications contains approval information

1.2 Product recycling/disposal

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

Section 2 Configuration

2.1 Overview

This section contains information on commissioning and tasks that should be performed on the bench prior to installation. This section contains the Rosemount™ 4600 Oil & Gas Pressure Transmitter HART® configuration information.

Field Communicator and AMS™ Device Manager instructions are given to perform configuration functions. For convenience, Field Communicator Fast Key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

2.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

⚠WARNING

Explosions can result in death or serious injury.

- Transmitters located in hazardous areas should be installed in accordance with local codes and requirements for that area.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Electrical shock can result in death or serious injury.

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

2.3 Commissioning on the bench with HART

Commissioning consists of testing the Rosemount 4600 and verifying transmitter configuration data. The transmitter can be commissioned either before or after installation. Commissioning the transmitter on the bench before installation using a Field Communicator or AMS Device Manager ensures that all transmitter components are in working order.

⚠ To commission on the bench, connect the transmitter and the Field Communicator or AMS Device Manager. Connect Field Communicator leads at any termination point in the signal loop.

In order to commission the transmitter, the power supply must provide 11.25 to 42.4 V dc at the transmitter terminals. A current meter is also required to measure current output. To enable communication, a resistance of at least 250 ohms must be present between the Field Communicator loop connection and the power supply. Do not use inductive-based transient protectors with more than 3 mH of inductance with the Rosemount 4600.

When using a Field Communicator, any configuration changes made must be sent to the transmitter by using the **"Send"** key (F2). AMS Device Manger configuration changes are implemented when the **"Apply"** button is selected.

For more information on the Field Communicator, see 475 Field Communicator website for the most up to date literature. AMS Device Manger help can be found in the AMS Device Manager online guides within the AMS system.

2.3.1 Setting the loop to manual

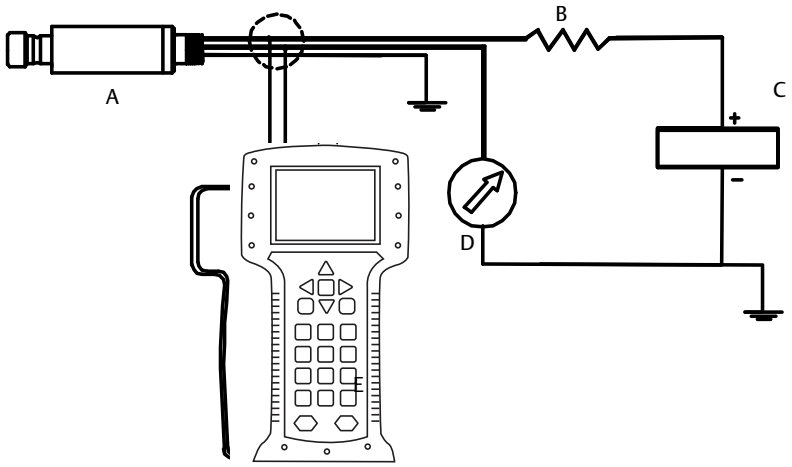
Whenever sending or requesting data that would disrupt the loop or change the output of the transmitter, set the process application loop to manual. The Field Communicator or AMS Device Manager will prompt you to set the loop to manual when necessary. Acknowledging this prompt does not set the loop to manual. The prompt is only a reminder; set the loop to manual as a separate operation.

2.3.2 Wiring diagrams

Bench hook-up

Connect the bench equipment as shown in Figure 2-1 and turn on the Field Communicator by pressing the **ON/OFF** key or log into AMS Device Manager. The Field Communicator or AMS Device Manager will search for a HART-compatible device and indicate when the connection is made. If the Field Communicator or AMS Device Manager fail to connect, it indicates that no device was found. If this occurs, refer to Section 5: Troubleshooting.

Figure 2-1. Bench Wiring (4–20 mA)



A. Rosemount 4600
B. R_L > 250 ohm
C. Power supply
D. Current meter
E. Field Communicator

2.4 Field Communicator

The following menu indicates Fast Key sequences for common functions. For full Field Communicator menu tree see EmersonProcess.com/Rosemount.

Function	HART Fast Key Sequence
Alarm Level Config.	1, 4, 2, 7, 7
Alarm and Saturation Levels	1, 4, 2, 7
Analog Output Alarm Direction	1, 4, 2, 7, 6
Analog Output Trim	1, 2, 3, 2
Burst Mode On/Off	1, 4, 3, 3, 3
Burst Options	1, 4, 3, 3, 4
Damping	1, 3, 6
Date	1, 3, 4, 1
Descriptor	1, 3, 4, 2
Digital To Analog Trim (4-20 mA Output)	1, 2, 3, 2, 1
Field Device Information	1, 4, 4, 1
Loop Test	1, 2, 2
Lower Sensor Trim	1, 2, 3, 3, 1
Message	1, 3, 4, 3
Number of Requested Preambles	1, 4, 3, 3, 2
Pressure Alert Config.	1, 4, 3, 4, 3

Function	HART Fast Key Sequence
Poll Address	1, 4, 3, 3, 1
Poll a Multidropped Transmitter	Left Arrow, 3, 1, 1
Rerange- Keypad Input	1, 2, 3, 1, 1
Saturation Level Config.	1, 4, 2, 7, 8
Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2
Sensor Information	1, 4, 4, 2
Sensor Temperature	1, 1, 4
Sensor Trim	1, 2, 3, 3
Sensor Trim Points	1, 2, 3, 3, 4
Status	1, 2, 1
Tag	1, 3, 1
Temperature Alert Config.	1, 4, 3, 4, 4
Transmitter Security (Write Protect)	1, 3, 4, 4
Units (Process Variable)	1, 3, 2
Upper Sensor Trim	1, 2, 3, 3, 2
Zero Trim	1, 2, 3, 3, 1

2.5 Review configuration data

Fast Keys	1, 5

Note
Information and procedures in this section that make use of Field Communicator Fast Key sequences and AMS Device Manager assume the transmitter and communication equipment are connected, powered, and operating correctly.

Field Communicator

Before placing the transmitter into operation, review the transmitter configuration data below which was set by the factory.

- PV Lower Sensor Limit (LSL)
- PV Upper Sensor Limit (USL)
- PV Lower Range Value (LRV)
- PV Upper Range Value (URV)
- PV minimum span
- Lower sensor trim point
- Upper sensor trim point
- Sensor trim calibration type
- Damping
- Alarm direction
- High Alarm (Value)
- Low Alarm (Value)
- High saturation
- Low saturation
- Alarm/Saturation type
- Sensor S/N
- Isolator material
- Fill fluid
- Process connector
- Process connector material
- Tag
- Date
- Descriptor
- Message
- Write protect
- Local keys
- Universal revision
- Field device revision
- Software revision
- Hardware revision
- Physical signal code
- Final assembly number
- Device ID
- Burst mode
- Burst option
- Poll address
- Number req preams
- Distributor

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu. Select the tabs to review the transmitter configuration data.

2.6 Check output

Before performing other transmitter online operations, review the digital output parameters to ensure the transmitter is operating properly and is configured to the appropriate process variables.

2.6.1 Process variables

Fast Keys	1, 1

The process variables for the Rosemount 4600 provide transmitter output, and are continuously updated. The pressure reading in both engineering units and percent of range will continue to track with pressures outside of the defined range from the lower to the upper range limit.

Field Communicator

The process variable menu displays the following process variables:

- Pressure
- Percent of range
- Analog output
- Sensor temperature

Note
Regardless of the range points, the Rosemount 4600 will measure and report all readings within the digital limits of the sensor. For example, if the 4 and 20 mA points are set to 0 and 1,000 psi, and the transmitter detects a pressure of 2,500 psi, it digitally outputs the 2,500 psi reading and a 250% of span reading. However, there may be up to ±5.0% error associated with output outside of the range points.

AMS Device Manger

Right click on the device and select **Process Variables...** from the menu.The process variable screen displays the following process variables:

- Pressure
- Percent of range
- Analog output
- Sensor temperature

2.6.2 Sensor temperature

Fast Keys	1, 1, 4

The Rosemount 4600 contains a temperature sensor near the pressure sensor in the transmitter. When reading this temperature, keep in mind this is not an accurate indicator of process temperature.

Field Communicator

Enter the Fast Key sequence below *Sensor Temperature* to view the sensor temperature reading.

AMS Device Manger

Right click on the device and select **Process Variables...** from the menu. *Snsr Temp* is the sensor temperature reading.

2.7 Basic setup

2.7.1 Set process variable units

Fast Keys	1, 3, 2

The PV Unit command sets the process variable units to allow you to monitor your process using the appropriate units of measure.

Field Communicator

Enter the Fast Key sequence shown. Select from the following engineering units:

- inH_2O
- inHg
- ftH_2O
- mmH_2O
- mmHg
- psi
- bar
- mbar
- g/cm^2
- kg/cm^2
- Pa
- kPa
- torr
- atm
- MPa
- inH_2O at 4 °C
- mmH_2O at 4 °C

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu. In the *Basic Setup* tab, use *Unit* drop down menu to select units.

2.7.2 Rerange

The Range Values command sets the 4 and 20 mA points and digital lower (LRV) and upper (URV) range values. In practice, you may reset the transmitter range values as often as necessary to reflect changing process conditions. Changing the lower or upper range point results in similar changes to the span.

Note
Transmitters are shipped from Emerson Process Management. fully calibrated per request or by the factory default of full scale (span = upper range limit.)

Use one of the methods below to rerange the transmitter. Each method is unique; examine all options closely before deciding which method works best for your process.

- Rerange with a Field Communicator only.
- Rerange with a pressure input source and a Field Communicator.
- Rerange with a pressure input source and the local zero and span targets (option D1).
- Rerange with AMS Device Manger only.
- Rerange with a pressure input source and AMS Device Manger.

Rerange with a Field Communicator only

Fast Keys	1, 2, 3, 1, 1

The easiest and most popular way to rerange is to use the Field Communicator only. This method changes the values of the analog 4 and 20 mA points independently without a pressure input.

From the *HOME* screen, enter the Fast Key sequence shown.

1. At *Keypad Input* select **1** and use the keypad to enter lower range value.
2. From *Keypad Input* select **2** and use the keypad to enter upper range value.

Rerange with a pressure input source and Field Communicator

Fast Keys	1, 2, 3, 1, 2

Reranging using the Field Communicator and a pressure source or process pressure is a way of reranging the transmitter when specific 4 and 20 mA points are unknown.

Note
The span is maintained when the 4 mA point is set. The span changes when the 20 mA point is set. If the lower range point is set to a value that causes the upper range point to exceed the sensor limit, the upper range point is automatically set to the sensor limit, and the span is adjusted accordingly.

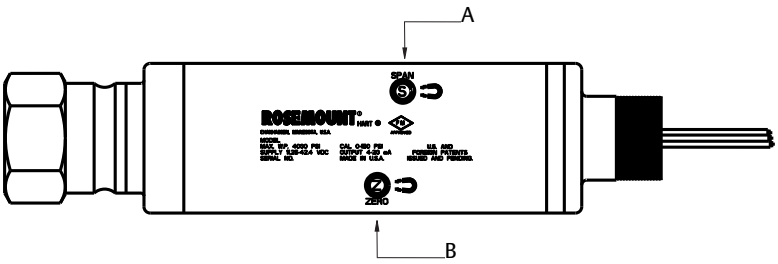
1. From the *HOME* screen, enter the Fast Key sequence shown to configure lower and upper range values and follow the online instructions.

Rerange with a pressure input source and the local zero and span targets (option D1)

1. For Zero based lower range values (gauge only):
   Vent the transmitter.

   For Non-Zero based lower range values:
   Using a pressure source with an accuracy 3 to 10 times the desired calibrated accuracy, apply a pressure equivalent to the lower range value to the transmitter.
2. Using the supplied magnetic adjustment tool, touch and hold the magnetic end to the zero adjustment target for at least two seconds, but no longer than ten seconds.
3. Using a pressure source with an accuracy 3 to 10 times the desired calibrated accuracy, apply a pressure equivalent to the upper range value to the transmitter.
4. Using the supplied magnetic adjustment tool, touch and hold the magnetic end to the span adjustment target for at least two seconds, but no longer than ten seconds.

Figure 2-2. Local Zero and Span Locations



A. Magnetic span target
B. Magnetic zero target

Rerange with AMS Device Manger only

Right click on the device and select **Configuration Properties** from the menu. In the *Basic Setup* tab, locate the *Analog Output* box and perform the following procedure:

1. Enter the lower range value (LRV) and the upper range value (URV) in the fields provided. Select **Apply**.
2. An *Apply Parameter Modification* screen appears, enter desired information and select **OK**.
3. After carefully reading the warning provided, select **OK**.

Rerange with a pressure input source and AMS Device Manger

Right click on the device, choose **Calibrate**, then **Apply values** from the menu.

1. Select **Next** after the control loop is set to manual.
2. From the *Apply Values* menu, follow the online instructions to configure lower and upper range values.
3. Select **Exit** to leave the *Apply Values* screen.
4. Select **Next** to acknowledge the loop can be returned to automatic control.
5. Select **Finish** to acknowledge the method is complete.

2.7.3 Damping

Fast Keys	1, 3, 6

The Damp command introduces a delay in processing which increases the response time of the transmitter; smoothing variations in output readings caused by rapid input changes. Determine the appropriate damp setting based on the necessary response time, signal stability, and other requirements of the of loop dynamics of your system. The default damping value is 0.4 seconds and is user-selectable from 0.3 to 60 seconds.

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu.

1. In the *Basic Setup* tab, enter the damping value in the *Damp* field, select **Apply**.
2. An *Apply Parameter Modification* screen appears, enter desired information and select **OK**.
3. After carefully reading the warning provided, select **OK**.

2.8 Detailed setup

2.8.1 Failure mode alarm and saturation

The Rosemount 4600 Transmitter automatically and continuously perform self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives the output to configured alarm values. The transmitter will also drive the output to configured saturation values if the applied pressure goes outside the 4-20 mA range values.

Note
The failure mode alarm direction can also be configured using the Field Communicator or AMS Device Manager.

Note
Under some failure conditions, the transmitter will ignore user configured alarm conditions and drive the transmitter to low alarm.

The Rosemount 4600 Transmitter have three configurable options for failure mode alarm and saturation levels:

- Rosemount (Standard), see Table 2-1
- Custom, see Table 2-2

Table 2-1. Rosemount (Standard) Alarm and Saturation Values

Level	4–20 mA saturation	4–20 mA alarm
Low	3.9 mA	≤ 3.75 mA
High	20.8 mA	≥ 21.75 mA

Table 2-2. Custom Alarm and Saturation Values

Level	4–20 mA saturation	4–20 mA alarm
Low	3.7 mA — 3.9 mA	3.6 mA — 3.8 mA
High	20.1 mA — 21.5 mA	20.2 mA — 23.0 mA

Failure mode alarm and saturation levels can be configured using a Field Communicator or AMS Device Manager, see "Alarm and saturation level configuration" on page 13. Per Table 2-2, custom alarm and saturation levels can be configured between 3.6 mA and 3.9 mA for low values and between 20.1 mA and 23 mA for high values. The following limitations exist for custom levels:

- Low alarm level must be less than the low saturation level
- High alarm level must be higher than the high saturation level
- High saturation level must not exceed 21.5 mA
- Alarm and saturation levels must be separated by at least 0.1 mA

The Field Communicator or AMS Device Manager will provide an error message if a configuration rule is violated.

2.8.2 Alarm and saturation level configuration

Fast Keys	1, 4, 2, 7

To configure alarm and saturation levels with a Field Communicator or AMS Device Manager perform the following procedure:

Field Communicator

1. From the *HOME* screen, follow the Fast Key sequence under Alarm and Saturation Levels.
2. Select **7, Config. Alarm Level** to configure alarm levels.
3. Select **OK** after setting the control loop to manual.
4. Select **OK** to acknowledge current settings.
5. Select desired setting, if *OTHER* is selected, enter HI and LO custom values.
6. Select **OK** to acknowledge the loop can be returned to automatic control.
7. Select **8, Config. Sat. Levels** to configure saturation levels.
8. Repeat steps 3-6 to configure saturation levels.

AMS Device Manger

1. Right click on the device, select **Device Configuration**,
2. Select **Alarm/Saturation Levels**,
3. Select **Alarm Levels** from the menu.
4. Select **Next** after setting the control loop to manual.
5. Select **Next** after acknowledging the current alarm levels.
6. Select the desired alarm settings: *NAMUR*, *Rosemount*, *Other*
7. If *Other* is selected, enter desired *HI Value* and *LO Value* custom values.
8. Select **Next** to acknowledge new alarm levels.
9. Select **Next** to acknowledge the loop can be returned to automatic control.
10. Select **Finish** to acknowledge the method is complete.
11. Right click on the device, select **Device Configuration**, then select **Alarm/Saturation Levels**, then **Alarm Levels** from the menu.
12. Select **Saturation Levels**.
13. Repeat Step 5 - 11 to configure saturation levels.

2.8.3 Alarm and saturation levels for burst mode

Transmitters set to burst mode handle saturation and alarm conditions differently.

Alarm conditions

- Analog output switches to alarm value
- Primary variable is burst with a status bit set
- Percent of range follows primary variable
- Temperature is burst with a status bit set

Saturation

- Analog output switches to saturation value
- Primary variable is burst normally
- Temperature is burst normally

2.8.4 Alarm and saturation values for multidrop mode

Transmitters set to multidrop mode handle saturation and alarm conditions differently.

Alarm conditions

- Primary variable is sent with a status bit set
- Percent of range follows primary variable
- Temperature is sent with a status bit set

Saturation

- Primary variable is sent normally
- Temperature is sent normally

2.8.5 Alarm level verification

To verify the transmitter alarm values, perform a loop test and set the transmitter output to the alarm value (see Tables 2-1 and 2-2 on page 12, and "Advanced functions for HART protocol" on page 18). This feature is also useful in testing the reaction of the control system to a transmitter in an alarm state.

2.8.6 Process alerts

Fast Keys	1, 4, 3, 4

Process alerts allow the user to configure the transmitter to output a HART message when the configured data point is exceeded. Process alerts can be set for pressure, temperature, or both. A process alert will be transmitted continuously if the pressure or temperature set points are exceeded and the alert mode is ON. An alert will be displayed on a Field Communicator, or AMS Device Manger status screen. The alert will reset once the value returns within range.

Note
HI alert value must be higher than the LO alert value. Both alert values must be within the pressure or temperature sensor limits.

Field Communicator

To configure the process alerts with a Field Communicator, perform the following procedure:

1. From the *HOME* screen, follow the Fast Key sequence listed.
2. Select **3, Config Press Alert** to configure the pressure alert.
   Select **4, Config Temp Alert** to configure the temperature alerts.
3. Use the right arrow key to configure the HI and LO alert values.
4. Use the left arrow to move back to the process alert menu.
   Select **1, Press Alert Mode** to turn on the pressure alert mode.
   Select **2, Temp Alert Mode** to turn on the temperature alert mode.

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu.

1. In the *Analog Output* tab, locate the *Configuration Pressure Alerts* box, enter *Press Hi Alert Val* and *Press Lo Alert Val* to configure the pressure alerts.
2. Configure *Press Alert Mode* to **ON** or **OFF** the drop down menu.
3. In the *Configuration Temperature Alerts* box, enter *Temp Hi Alert Val* and *Temp Lo Alert Val* to configure the temperature alerts.
4. Configure *Temp Alert Mode* to **ON** or **OFF** using the drop down menu and select **Apply**.
5. An *Apply Parameter Modification* screen appears, enter desired information and select **OK**.
6. After carefully reading the warning provided, select **OK**.

2.8.7 Sensor temperature unit

Fast Keys	1, 4, 1, 2, 2

The Sensor Temperature Unit command selects between Celsius and Fahrenheit units for the sensor temperature. The sensor temperature output is accessible via HART only.

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu.

1. In the Process Input tab, use the drop down menu *Snsr temp unit* to select **F** (Farenheit) or **C** (Celsius). Select **Apply**.
2. Select **Next** to acknowledge send warning.
3. Select **Finish** to acknowledge the method is complete.
4. An *Apply Parameter Modification* screen appears, enter desired information and select **OK**.
5. After carefully reading the warning, select **OK**.

2.9 Diagnostics and service

Diagnostics and service functions listed below are primarily for use after field installation. The Transmitter Test feature is designed to verify that the transmitter is operating properly, and can be performed either on the bench or in the field. The Loop Test feature is designed to verify proper loop wiring and transmitter output, and should only be performed after you install the transmitter.

2.9.1 Loop Test

Fast Keys	1, 2, 2

The Loop Test command verifies the output of the transmitter, the integrity of the loop, and the operations of any recorders or similar devices installed in the loop.

Field Communicator

To initiate a loop test, perform the following procedure:

1. Connect a reference meter to the transmitter by shunting transmitter power through the meter at some point in the loop.
2. From the *Home* screen, enter the Fast Key sequence below Loop Test to verify the output of the transmitter.
3. Select **OK** after the control loop is set to manual (see "Setting the loop to manual" on page 4).
4. Select a discrete milliamp level for the transmitter to output. At the *Choose Analog Output* prompt select **1: 4mA, select 2: 20mA, or select 3: Other** to manually input a value.
   a. If you are performing a loop test to verify the output of a transmitter, enter a value between 4 and 20 mA.
   b. If you are performing a loop test to verify alarm levels, enter the milliamp value representing an alarm state (see Tables 2-1and 2-2 on page 12).
5. Check the reference meter installed in the test loop to verify that it displays the commanded output value.
   a. If the values match, the transmitter and the loop are configured and functioning properly.
   b. If the values do not match, the current meter may be attached to the wrong loop, there may be a fault in the wiring, the transmitter may require an output trim, or the reference meter may be malfunctioning.

After completing the test procedure, the display returns to the loop test screen to select another output value or to end loop testing.

AMS Device Manger

1. Right click on the device and select **Diagnostics and Test** then **Loop test** from the menu.
2. Select **Next** after setting the control loop to manual.
3. Select desired analog output level. Select **Next**.
4. Select **Next** to acknowledge output being set to desired level.
5. Check the reference meter installed in the test loop to verify that it displays the commanded output value.
   a. If the values match, the transmitter and the loop are configured and functioning properly.
   b. If the values do not match, the current meter may be attached to the wrong loop, there may be a fault in the wiring, the transmitter may require an output trim, or the reference meter may be malfunctioning.

After completing the test procedure, the display returns to the loop test screen to select another output value or to end loop testing.

6. Select **End** and select **Next** to end loop testing.
7. Select **Next** to acknowledge the loop can be returned to automatic control.
8. Select **Finish** to acknowledge the method is complete.

2.10 Advanced functions for HART protocol

2.10.1 Saving, recalling, and cloning configuration data

Fast Keys	left arrow, 1, 2

Use the cloning feature of the Field Communicator or the AMS Device Manger “User Configuration” feature to configure several Rosemount 4600 Transmitter similarly. Cloning involves configuring a transmitter, saving the configuration data, then sending a copy of the data to a separate transmitter. Several possible procedures exist when saving, recalling, and cloning configuration data. For complete instructions refer to the Field Communicator Reference Manual or AMS online guides. One common method is as follows:

Note
Do not clone an absolute pressure transmitter with sealed gauge pressure configuration data. Do not clone a sealed gauge pressure transmitter with absolute pressure data.

Field Communicator

1. Confirm and apply configuration changes to the first transmitter.

Note
If transmitter configuration has not been modified, "SAVE" option in Step 2 will be disabled.

2. Save the configuration data:
   a. Select **SAVE** from the bottom of the Field Communicator screen.
   b. Select to save your configuration in either the **"Internal Flash"** (default) or the **"Configuration EM"** (Configuration Expansion Module).
   c. Enter the name for this configuration file. The default name is the transmitter tag number.
   d. Select **SAVE**.
3. Power the receiving transmitter and connect with Field Communicator.
4. Access the HART Application menu by pressing the **LEFT ARROW** from the *HOME/ONLINE* screen.
5. Locate the saved transmitter configuration file.
   a. Select **Offline**
   b. Select **Saved Configuration**
   c. Select either **Internal Flash Contents** or **Configuration EM Content** depending on where the configuration was stored per Step 2b.
6. Use the **DOWN ARROW** to scroll through the list of configurations in the memory module, and use the **RIGHT ARROW** to select and retrieve the desired configuration.
7. Select **Send** to transfer the configuration to the receiving transmitter.
8. Select **OK** after the control loop is set to manual.
9. After the configuration has been sent, select **OK** to acknowledge that the loop can be returned to automatic control. When finished, the Field Communicator informs you of the status. Repeat Step 3 through Step 9 to configure another transmitter.

Note
The transmitter receiving cloned data must have the same software version (or later) as the original transmitter.

AMS Device Manger creating a reusable copy

To create a reusable copy of a configuration perform the following procedure:

1. Select **View** then **User Configuration View** from the menu bar (or click the toolbar button).
2. In the *User Configuration* window, right click and select **New** from the context menu.
3. In the *New* window, select a device from the list of templates shown, and select **OK**.
4. The template is copied into the *User Configurations* window, with the tag name highlighted; rename it as appropriate and select **Enter**.

Note
A device icon can also be copied by dragging and dropping a device template or any other device icon from AMS Explorer or Device Connection View into the User Configurations window.

The *Compare Configurations* window appears, showing the Current values of the copied device on one side and mostly blank fields on the other (User Configuration) side.

5. Transfer values from the current configuration to the user configuration as appropriate or enter values by typing them into the available fields.
6. Select **Apply** to apply the values, or select **OK** to apply the values and close the window.

AMS Device Manger applying a user configuration

Any amount of user configurations can be created for the application. They can also be saved, and applied to connected devices or to devices in the device list or plant database.

Note
When using AMS Revision 6.0 or later, the device to which the user configuration is applied, bust be the same model type as the one created in the user configuration. When using AMS Revision 5.0 or earlier, the same model type and revision number are required.

To apply a user configuration, perform the following procedure:

1. Select the desired user configuration in the *User Configurations* window.
2. Drag the icon onto a like device in AMS Explorer or Device Connection View. The *Compare Configurations* window opens, showing the parameters of the target device on one side and the parameters of the user configuration on the other.
3. Transfer parameters from the user configuration to the target device as desired. Select **OK** to apply the configuration and close the window.

2.10.2 Burst mode

Fast Keys	1, 4, 3, 3, 3

When configured for burst mode, the Rosemount 4600 provides faster digital communication from the transmitter to the control system by eliminating the time required for the control system to request information from the transmitter. Burst mode is compatible with the analog signal. Because the HART protocol features simultaneous digital and analog data transmission, the analog value can drive other equipment in the loop while the control system is receiving the digital information. Burst mode applies only to the transmission of dynamic data (pressure and temperature in engineering units, pressure in percent of range, and/or analog output), and does not affect the way other transmitter data is accessed.

Access to information other than dynamic transmitter data is obtained through the normal poll/response method of HART communication. A Field Communicator, AMS Device Manger or the control system may request any of the information that is normally available while the transmitter is in burst mode. Between each message sent by the transmitter, a short pause allows the Field communicator, AMS Device Manger or a control system to initiate a request. The transmitter will receive the request, process the response message, and then continue "bursting" the data approximately three times per second.

Field Communicator

To configure the transmitter for burst mode, perform the following step:

1. From the *HOME* screen, enter the Fast Key sequence below *Burst Mode*.

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu.

1. In the *HART* tab, use the drop down menu to select **Burst Mode ON** or **OFF**. For *Burst option* select the desired properties from the drop down menu. Burst options are as follows:

- PV
- % range/current
- Process vars/crnt
- Process variables

2. After selecting options, select **Apply**.
3. An *Apply Parameter Modification* screen appears, enter desired information and select **OK**.
4. After carefully reading the warning provided, select **OK**.

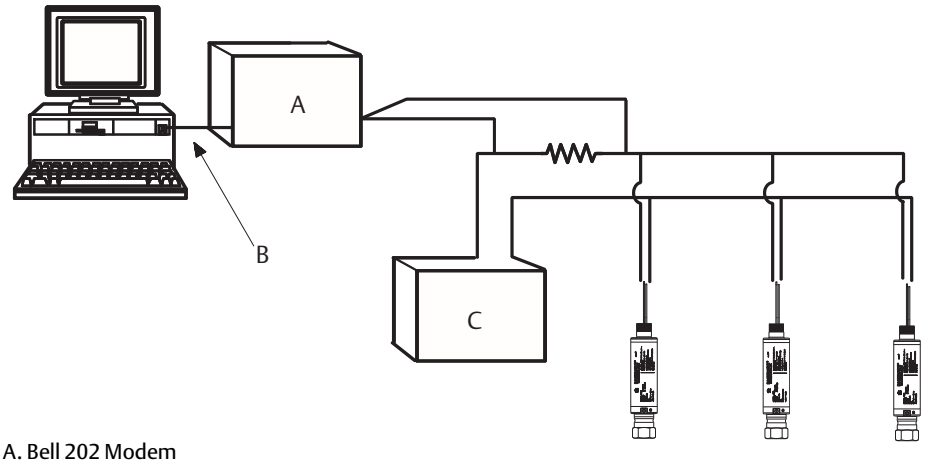
2.11 Multidrop communication

Multidropping transmitters refers to the connection of several transmitters to a single communications transmission line. Communication between the host and the transmitters takes place digitally with the analog output of the transmitters deactivated. Up to 15 transmitters can be connected on a single twisted pair of wires.

Multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Communication with transmitters can be accomplished with Bell 202 modems and a host implementing HART protocol. Each transmitter is identified by a unique address (1–15) and responds to the commands defined in the HART protocol. Field Communicators and AMS Device Manger can test, configure, and format a multidropped transmitter the same way as a transmitter in a standard point-to-point installation.

Figure 2-3 shows a typical multidrop network. This figure is not intended as an installation diagram.

Figure 2-3. Typical Multidrop Network



A. Bell 202 Modem
B. RS-232-C
C. Power supply

The Rosemount 4600 is set to address zero (0) at the factory, which allows operation in the standard point-to-point manner with a 4–20 mA output signal. To activate multidrop communication, the transmitter address must be changed to a number from 1 to 15. This change deactivates the 4–20 mA analog output, sending it to 4 mA. It also disables the failure mode alarm signal, which is controlled by the upscale/downscale alarm direction configuration parameter. Failure signals in multidropped transmitters are communicated through HART messages.

Note
A minimum loop resistance of 250 ohms is required to communicate with a Field Communicator. If a single power supply is used to power more than one Rosemount 4600, the power supply and circuitry common to the transmitter, should not have more than 20 ohms of impedance at 1200 Hz.

2.11.1 Changing a transmitter address

Fast Keys	1, 4, 3, 3, 1

To activate multidrop communication, the transmitter poll address must be assigned a number from one to 15, and each transmitter in a multidropped loop must have a unique poll address.

Field Communicator

1. From the *HOME* screen, enter the Fast Key sequence shown.

AMS Device Manger

Right click on the device and select **Configuration Properties** from the menu.

1. In the *HART* tab, in the *ID* box, enter the poll address located in the *Poll addr* box. Select **Apply**.
2. An *Apply Parameter Modification* screen appears. Enter the desired information and select **OK**.
3. After carefully reading the warning provided, select **OK**.

2.11.2 Communicating with a multidropped transmitter

Fast Keys	Left arrow, 3, 1, 1

Field Communicator

To communicate with a multidropped transmitter, configure the Field Communicator to poll for a non-zero address.

1. From the *HOME* screen, enter the Fast Key sequence shown.
2. On the polling menu, scroll down and select Polling Addresses and select the appropriate polling range. In this mode, the Field Communicator automatically polls for devices at addresses within the specified range upon start up.

AMS Device Manger

1. Select on the HART modem icon and select **Scan All Devices**.

2.11.3 Polling a multidropped transmitter

Fast Keys	Left arrow, 3, 1

Polling a multidropped loop determines the model, address, and number of transmitters on the given loop.

Field Communicator

1. From the *HOME* screen, enter the Fast Key sequence shown.

AMS Device Manger

1. Select on the HART modem icon and select **Scan All Devices**.

Section 3 Installation

3.1 Overview

The information in this section covers installation considerations. A Quick Start Guide (document number 00825-0100-4022) is shipped with every transmitter to describe basic mounting and wiring procedures for initial installation.

Field Communicator and AMS™ Device Manager instructions are provided to allow users to perform configuration functions. For convenience, Field Communicator Fast Key sequences are provided and labeled “Fast Keys” for each software function below the appropriate headings.

3.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation. Information that raises potential safety issues is indicated with a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions can result in death or serious injury.

- Transmitters located in hazardous areas should be installed in accordance with local codes and requirements for that area.
- Use appropriately rated Ex adapters, blanking elements, and glands during installation.
- Keep process insulation at least 1-in. (25 mm) from transmitter connection.

Electrical shock can result in death or serious injury.

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

Process leaks could result in death or serious injury.

- Properly tighten process connections before applying pressure.

⚠ CAUTION

Apply torque only to the hex flat located at the process end of the transmitter. Do not apply torque to the transmitter body or electrical connection - severe damage could result. Do not exceed 100 ft-lbs.

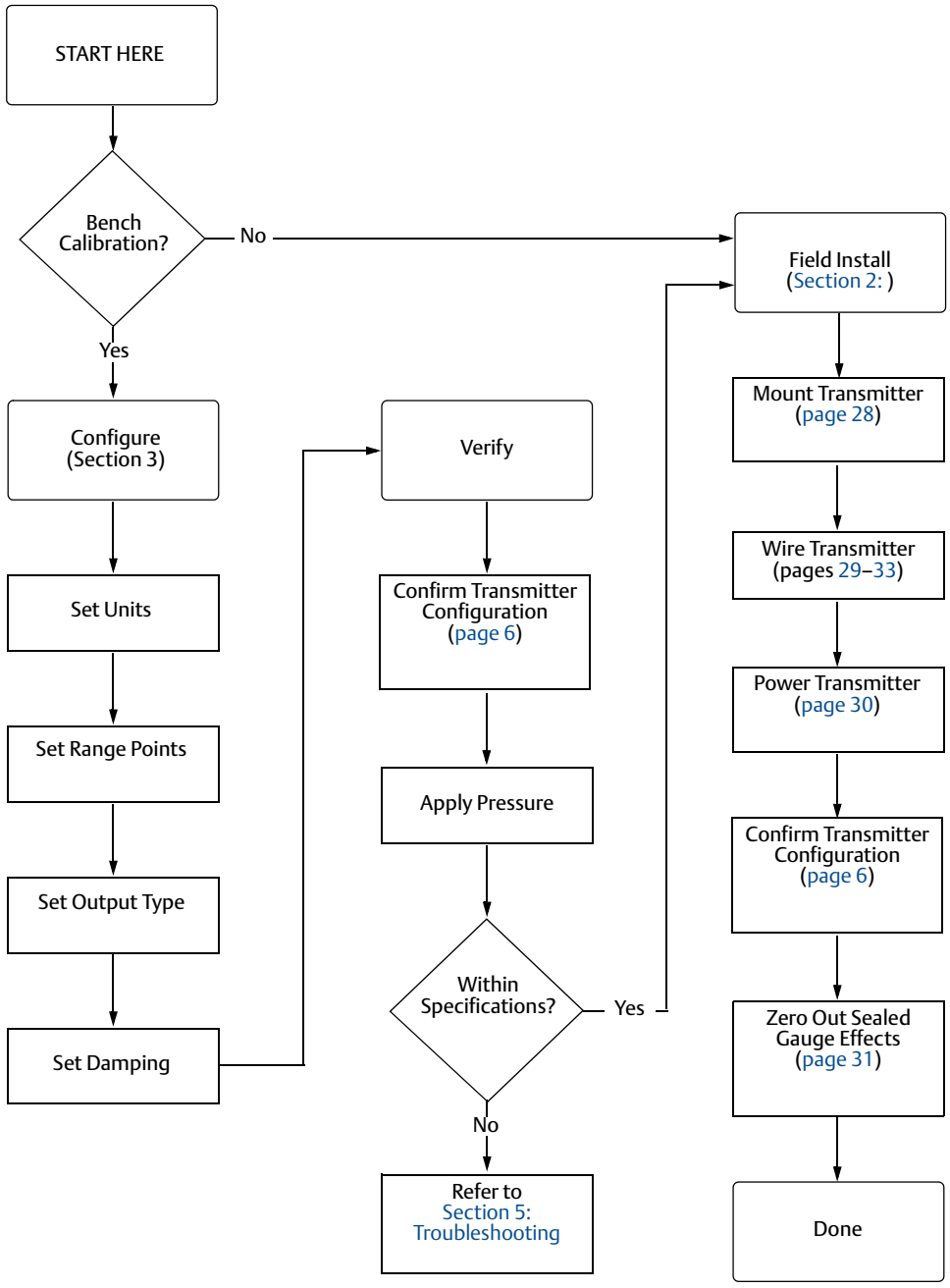
3.3 General considerations

Measurement accuracy depends upon proper installation of the transmitter and impulse piping. Mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. Also, consider the need for easy access, personnel safety, practical field calibration, and a suitable transmitter environment. Install the transmitter to minimize vibration, shock, and temperature fluctuation. Appendix A: Specification and Reference Data lists temperature operating limits.

3.4 Mechanical considerations

Note
For applications with process temperatures greater than the limits of the transmitter, do not blow down impulse piping through the transmitter. Flush lines with the blocking valves closed and refill lines with water before resuming measurement.

Figure 3-1. HART Installation Flowchart



3.5 Installation procedures

For dimensional drawing information refer to Appendix A: Specification and Reference Data on page 51.

3.5.1 Zero and span target orientation

Mount the transmitter with sufficient clearance so the zero and span targets are accessible.

3.5.2 Mount the transmitter

Panel mount

Electrical connection

1. Pull the leads through the threaded mounting hole in the panel wall.
2. Hand tighten the electrical connection into the mounting hole.
3. ⚠ Using a wrench on the hex flat at the process connection, apply sufficient torque to prevent transmitter vibration. Do not exceed 100 ft-lbs.

Process connection

1. Hand tighten the appropriate sized impulse piping into the process connection.
2. ⚠ Using a wrench on the hex flat at the impulse piping connection, apply enough torque to prevent the process fluid from leaking. Do not exceed 100 ft-lbs.

⚠ **Note**
Apply torque only to the hex flat located at the process end of the transmitter. Do not apply torque to the transmitter body or electrical connection - severe damage could result. Do not exceed 100 ft-lbs.

Note
Integral conduit seal meets the requirements of NEC® 2002 section 501:5 (A) and 501.5 (B). No additional conduit seal is required.

Note
The Rosemount™ 4600 Oil & Gas Pressure Transmitter features a reliable dual process seal design which meets the requirements of NEC 2002 section 501:5 (F)(3) and API 14F 6.8.2.2. No additional process sealing is required.

Impulse piping

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are five possible sources of error: pressure transfer, leaks, friction loss (particularly if purging is used), trapped gas in a liquid line and liquid in a gas line.

⚠ See "Safety messages" on page 25 for complete warning information.

The best location for the transmitter in relation to the process pipe depends on the process itself. Use the following guidelines to determine transmitter location and placement of impulse piping:

- Keep impulse piping as short as possible.
- For liquid service, slope the impulse piping at least 1-in. per foot (8 cm per m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1-in per foot (8 cm per m) downward from the transmitter toward the process connection.
- Avoid high points in liquid lines and low points in gas lines.
- Use impulse piping large enough to avoid friction effects and blockage.
- Vent all gas from liquid piping legs.
- When purging, make the purge connection close to the process taps and purge through equal lengths of the same size pipe. Avoid purging through the transmitter.
- Keep corrosive or hot (above 200 °F [93.3 °C]) process material out of direct contact with the transmitter.
- Prevent sediment deposits in the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process connector.

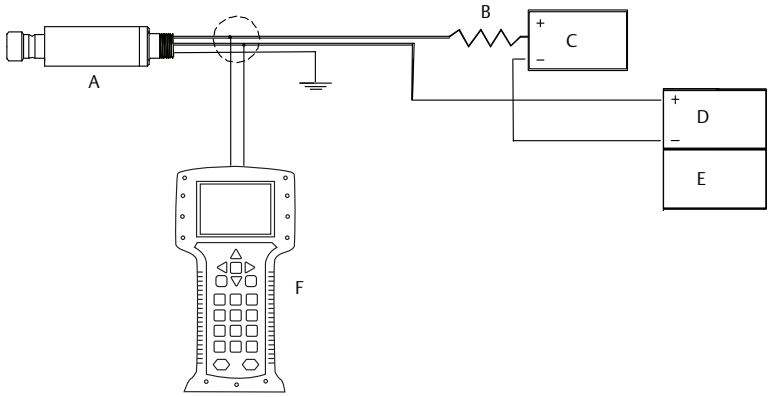
3.5.3 Connect wiring and power up

Wiring

To make connections, connect the red lead to the positive terminal of the power supply and the black lead to the positive terminal of the I/O card on the PLC. Connect the green wire to panel ground. Keep green ground wire as short as possible to minimize the effects of Radio Frequency Interference (RFI).

Inductive-based transient protectors with more than 3 mH of inductance can adversely affect the output of the Rosemount 4600. If your application requires transient protection, it is recommended that you order a transmitter with the transient protection option specified.

Figure 3-2. Field Wiring



A. Rosemount 4600
B. R_L > 250 ohm
C. Power supply
D. I/O card
E. PLC
F. Field Communicator

Signal wiring grounding

Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment.

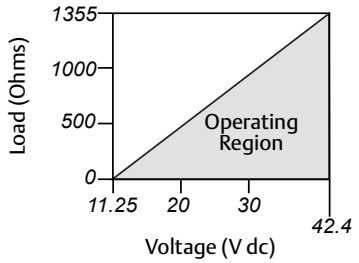
Power supply 4–20 mA transmitters

The dc power supply should provide power with less than two percent ripple. Total resistance load is the sum of resistance from signal leads and the load resistance of the controller, indicator, and related pieces. Note that the resistance of intrinsic safety barriers, if used, must be included.

Note
A minimum loop resistance of 250 ohms is required to communicate with a Field Communicator. If a single power supply is used to power more than one Rosemount 4600, the power supply and circuitry common to the transmitter, should not have more than 20 ohms of impedance at 1200 Hz.

Figure 3-3. Power Supply Load Limitations, 4–20 mA Transmitters

Maximum field loop Resistance = 43.5 * (Power Supply Voltage - 11.25)



*Communication requires a minimum loop resistance of 250 ohms.

Surges/transients

The transmitter will withstand electrical transients of the energy level usually encountered in static discharges or induced switching transients. However, high-energy transients, such as those induced in wiring from nearby lightning strikes, can damage the transmitter.

Optional transient protection

Transient protection can be ordered as a factory installed option (Option Code T1 in the transmitter model number). Transient protection can not be added to units ordered without the T1 option.

3.5.4 Zero the transmitter

Performing a zero adjustment is a recommended step for sealed gauge transmitters.

Note
Do not re-zero absolute transmitters.

Re-zeroing the transmitter allows for a single point adjustment to compensate for any mounting position and sealed gauge effects. This can be done with a zero trim (See "Sensor trim" on page 40), 4-20 mA rerange or with the zero and span adjustments.

3.5.5 Re-zeroing

Fast Keys	1, 3, 3, 2

Field Communicator

4mA rerange

1. Vent the transmitter.
2. Follow the HART Fast Key sequence shown.
3. Select **OK** after the control is set to manual (see "Setting the loop to manual" on page 4).
4. Select **1** to set the 4 mA point.
5. Select **OK** to set the new 4 mA point.
6. Select **1** to set the vented pressure as the new 4 mA point.
7. Select **3** to exit the screen.
8. Select **OK** to acknowledge that the loop can be returned to automatic control.

Using the transmitter zero adjustment target

1. Vent the transmitter.
2. Set the 4 mA point by touching the magnetic end of the provided adjustment tool to the zero target (Z) on the transmitter. You must maintain contact for at least two seconds, but no longer than ten seconds for the zero function to activate.
3. Verify that the output is 4 mA.

3.6 Hazardous locations

The Rosemount 4600 Transmitter has an explosion-proof housing. Individual transmitters are clearly marked with a tag indicating the certifications they carry. See Appendix B: Product Certifications for additional information.

Note
Once a device labeled with multiple approvals is installed, it should not be reinstalled using any other approval type(s). Permanently mark the certification label to distinguish the installed approval type from unused approval types.

3.7 Grounding the transmitter case

Always ground the transmitter case in accordance with national and local electrical codes. The most effective transmitter case grounding method is a direct connection to earth ground with minimal impedance. Methods for grounding the transmitter case include:

- **Internal Ground Connection**: The green lead provides the internal ground connection, and is standard on all Rosemount 4600 Transmitters.
- **External Ground Assembly**: This assembly is included with the optional transient protection (Option Code T1). The External Ground Assembly can also be ordered with the transmitter (Option Code D4), or as a spare part (4600-0113-0001).

Note
Grounding the transmitter case using the threaded electrical or process connections may not provide a sufficient ground. The transient protection (Option Code T1) will not provide transient protection unless the transmitter case is properly grounded. Use the above guidelines to ground the transmitter case. Do not run transient protection ground wire with signal wiring; the ground wire may carry excessive current if a lightning strike occurs.

Section 4 Operation and Maintenance

4.1 Overview

This section contains information on operation and maintenance of the Rosemount™ 4600 Oil & Gas Pressure Transmitter.

Field Communicator and AMS™ Device Manger instructions are given to perform maintenance functions. For convenience, Field Communicator Fast Key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

4.2 Calibration for HART® protocol

Calibrating a transmitter may include the following procedures:

- Rerange: Sets the 4 and 20 mA points at required pressures.
- Sensor Trim: Adjusts the position of the factory characterization curve to optimize performance over a specified pressure range, or to adjust for mounting effects.
- Analog Output Trim: Adjusts the analog output to match the plant standard or the control loop.

The Rosemount 4600 uses a microprocessor that contains information about the sensor’s specific characteristics in response to pressure and temperature inputs. A smart transmitter compensates for these sensor variations. The process of generating the sensor performance profile is called factory characterization. Factory characterization also provides the ability to readjust the 4 and 20 mA points without applying pressure to the transmitter.

Trim and rerange functions differ significantly. Reranging sets analog output to the selected upper and lower range points and can be done with or without an applied pressure. Reranging does not change the factory characterization curve stored in the microprocessor. Sensor trimming requires an accurate pressure input and adds additional compensation that adjusts the position of the factory characterization curve to optimize performance over a specific pressure range.

Note
Sensor trimming adjusts the position of the factory characterization curve. It is possible to degrade performance of the transmitter if the trim is done improperly or with inaccurate equipment.

Table 4-1. Recommended Calibration Tasks

Transmitter	Bench calibration tasks	Field calibration tasks
Rosemount 4600G Rosemount 4600A	1.Set output configuration parameters: a. Set the range points. b. Set the output units. c. Set the output type. d. Set the damping value. 2.*Optional*: Perform a full sensor trim if equipment available (accurate absolute pressure source required), otherwise perform the low trim value section of the full sensor trim procedure. 3.*Optional*: Perform an analog output trim (Accurate multimeter required).	1.Reconfigure parameters if necessary. 2.Perform low trim value section of the full sensor trim procedure to correct for mounting position effects.

4.2.1 Calibration overview

Complete calibration of the Rosemount 4600 involves the following tasks:

Configure the output parameters

- Set Process Variable Units (page 9)
- Rerange (page 9)
- Set Damping (page 11)

Calibrate the sensor

- Full Trim (page 42)
- Zero Trim (page 41)

Calibrate the 4–20 mA output

- 4–20 mA Output Trim (page 44); or
- 4–20 mA Output Trim Using Other Scale (page 45)

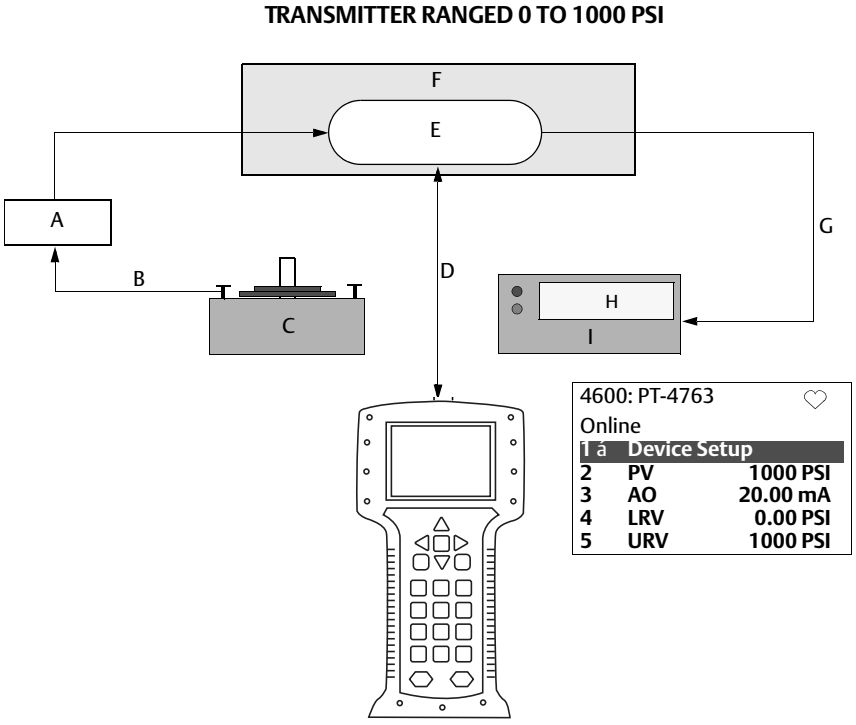
Figure 4-1 on page 37 illustrates Rosemount 4600 data flow. Data flow can be summarized in four major steps:

1. A change in pressure is measured by a change in the sensor output (Sensor Signal).
2. The sensor signal is converted to a digital format that is understood by the microprocessor (Analog-to-Digital Signal Conversion).
3. Corrections are performed in the microprocessor to obtain a digital representation of the process input (Digital PV).
4. The Digital PV is converted to an analog value (Digital-to-Analog Signal Conversion).

Figure 4-1 also identifies the approximate transmitter location for each calibration task. Data flows from left to right, and a parameter change affects all values to the right of the changed parameter.

Not all calibration procedures should be performed for each Rosemount 4600. Some procedures are appropriate for bench calibration, but should not be performed during field calibration. Table 4-1 identifies the recommended calibration procedures for each type of Rosemount 4600 transmitter for bench or field calibration.

Figure 4-1. Transmitter Data Flow with Calibration Options

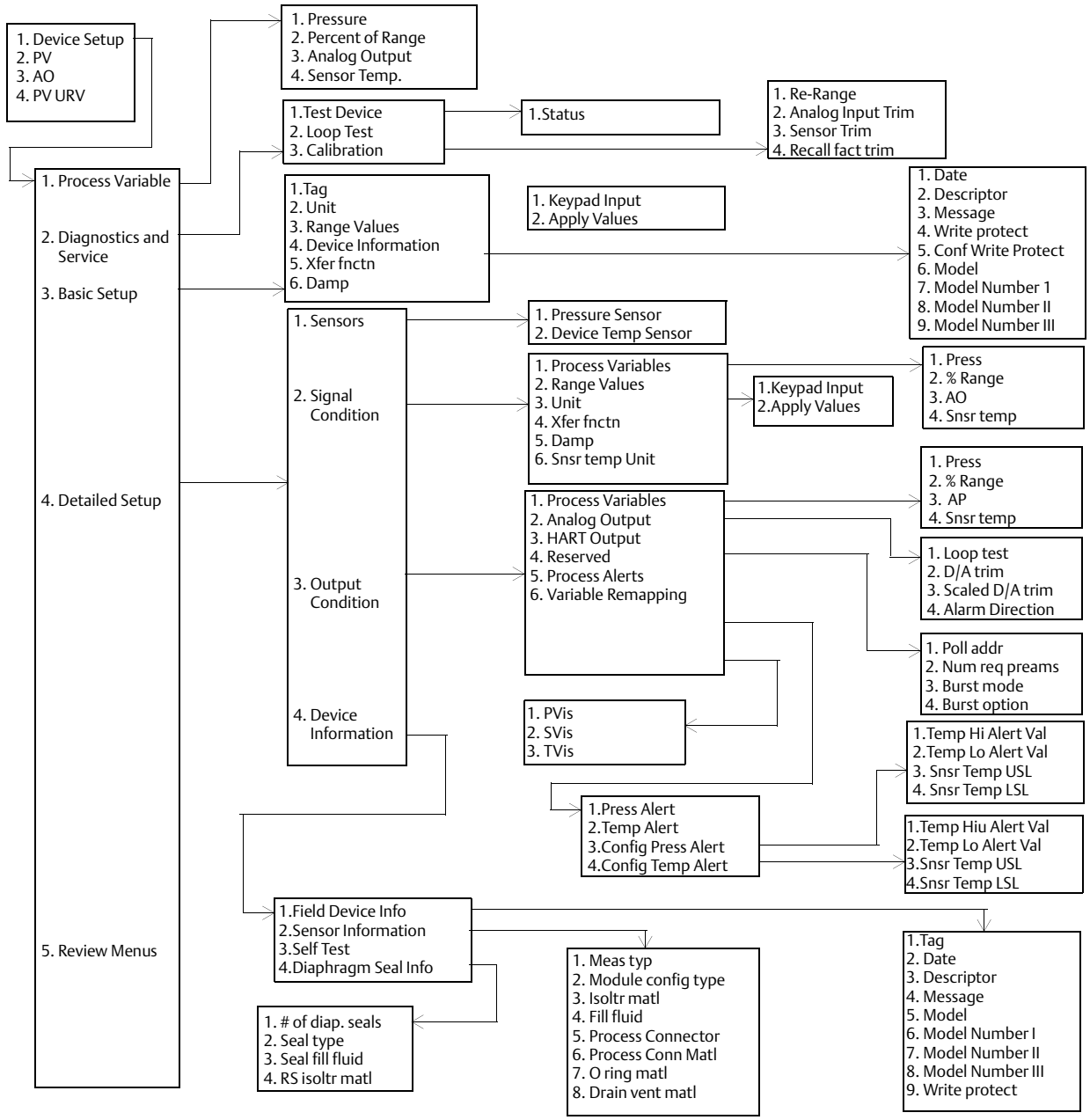


A. Sensor
B. Input pressure
C. Input device
D. Field Communicator
E. Microprocessor digital PV
F. Transmitter electronics module
G. Analog output
H.20 mA
I. Output device

Note

Value on PV line should equal the input pressure. Value on AO line should equal the output device reading.

Figure 4-2. HART Menu Tree



4.2.2 Determining calibration frequency

Calibration frequency can vary greatly depending on the application, performance requirements, and process conditions. Use the following procedure to determine calibration frequency that meets the needs of your application.

1. Determine the performance required for your application.
2. Determine the operating conditions.
3. Calculate the Total Probable Error (TPE).
4. Calculate the stability per month.
5. Calculate the calibration frequency.

Sample calculation

1. Determine the performance required for your application.

Required Performance:	1.1% of span

2. Determine the operating conditions.

Transmitter:	Rosemount 4600G, Range 4
Calibrated Span:	4000 psig
Ambient Temperature Change:	50 °F

3. Calculate total probable error (TPE).

$$TPE = \sqrt{(ReferenceAccuracy)^2 + (TemperatureEffect)^2} = 0.572\% \text{ of span}$$

Where:

Reference Accuracy = ± 0.25% of span

Ambient Temperature Effect =

$$\pm\left(\frac{0.03 \times URL}{Span} + 1.0\right)\frac{per\,100°F}{2} = \pm 0.515\% \text{ of span}$$

Note
Temperature Effect is specified per 100 °F, divide by 2 for 50 °F temperature change.

4. Calculate the stability per month.

Stability = ±0.5% of span for 3 years = ±0.0139% of span per month

5. Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - TPE)}{\text{Stability per Month}} = \frac{(1.1\% - 0.57\%)}{0.0139\%} = 36 \text{ months}$$

4.2.3 Selecting a trim procedure

To decide which trim procedure to use, you must first determine whether the analog-to-digital section or the digital-to-analog section of the transmitter electronics need calibration. Refer to Figure 4-1 and perform the following procedure:

1. Connect a pressure source, a Field Communicator or AMS Device Manger, and a digital readout device to the transmitter.
2. Establish communication between the transmitter and the Field Communicator.
3. Apply pressure equal to the upper range point pressure.
4. Compare the applied pressure to the Process Variable (PV) line on the Field Communicator Online Menu or the Primary Variables screen in AMS Device Manger.
   a. If the PV reading does not match the applied pressure (with high-accuracy test equipment), perform a sensor trim.
5. Compare the Analog Output (AO) line, on the Field Communicator or AMS Device Manger, to the digital readout device.
   a. If the AO reading does not match the digital readout device (with high-accuracy test equipment), perform an output trim.

4.3 Sensor trim

Trim the sensor using either full or zero trim functions. Trim functions vary in complexity and are application-dependent. Both trim functions alter the transmitter's interpretation of the input signal.

Zero trim is a single-point adjustment. It is useful for compensating for mounting position and sealed gauge effects. Since this correction maintains the slope of the characterization curve, it should not be used in place of a full trim over the full sensor range.

When performing a zero trim, ensure that the transmitter is vented to atmosphere.

Note
Do not perform a zero trim on Rosemount 4600 Absolute Pressure Transmitters. Zero trim is zero based, and absolute pressure transmitters reference absolute zero. To correct mounting position effects on a Rosemount 4600 Oil & Gas Transmitter, perform a low trim within the full sensor trim function. The low trim function provides a "zero" correction similar to the zero trim function, but it does not require zero-based input.

Full trim is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. Always adjust the low trim value first to establish the correct offset. Adjustment of the high trim value provides a slope correction to the characterization curve based on the low trim value. The factory-established characterization curve is not changed by this procedure. The trim values allow you to optimize performance over your specified measuring range at the calibration temperature.

4.3.1 Zero Trim

Fast Keys	1, 2, 3, 3, 1

Note
The transmitter must be within three percent of the span away from zero (for zero-based spans) in order to calibrate with zero trim function. If the zero reading is not within three percent of the true zero, the transmitter will require iterative trims to move the zero within trimmable range.

Field Communicator

Calibrate the sensor with a Field Communicator using the zero trim function as follows:

1. Vent the transmitter and attach a Field Communicator to the measurement loop.
2. From the *Home* screen, follow the Fast Key sequence shown.
3. Follow the commands provided by the Field Communicator to complete the zero trim adjustment.

AMS Device Manger

1. Right click on the device and select **Calibrate**, Select **Zero trim** from the menu.
2. Select **Next** after setting the control loop to manual.
3. Select **Next** to acknowledge warning.
4. Select **Next** after applying appropriate pressure to sensor.
5. Select **Next** to acknowledge the loop can be returned to automatic control.
6. Select **Finish** to acknowledge the method is complete.

4.3.2 Full trim

Fast Keys	1, 2, 3, 3

Note
Use a pressure input source that is at least three times more accurate than the transmitter, and allow the input pressure to stabilize for ten seconds before entering any values.

Field Communicator

To calibrate the sensor with a Field Communicator using the full trim function, perform the following procedure:

1. Assemble and power the entire calibration system including a transmitter, Field Communicator, power supply, pressure input source, and readout device.
2. From the *Home* screen, enter the Fast Key sequence shown.
3. Select **2: Lower sensor trim**.

Note
Select pressure input values so that low and high values are equal to or outside the 4 and 20 mA points. Do not attempt to obtain reverse output by reversing the high and low points. The transmitter allows approximately five percent URL deviation from the characterized curve established at the factory.

4. Follow the commands provided by the Field Communicator to complete the adjustment of the lower value.
5. Repeat the procedure for the upper value, replacing 2: Lower sensor trim with 3: Upper sensor trim in Step 3.

AMS Device Manger

1. Right click on the device and select Calibrate, then Sensor trim from the menu.
2. Select Lower sensor trim.
3. Select **Next** after setting the control loop to manual.
4. Select **Next** after applying appropriate pressure to sensor.
5. Select **Next** to acknowledge the loop can be returned to automatic control.
6. Select **Finish** to acknowledge the method is complete.
7. Right click on the device and select **Calibrate**. Select Sensor trim from the menu.
8. Select **Upper sensor trim** and repeat Step 2-5.

4.4 Recall factory trim

The recall factory trim commands allow the restoration of the as-shipped factory settings of the sensor trim and analog output trim.

4.4.1 Recall factory trim—sensor trim

Fast Keys	1, 2, 3, 4, 1

This command resets the transmitter sensor trim to the “as shipped” factory settings. The recall factory trim—sensor trim command can be useful for recovering from an inadvertent zero trim of an absolute pressure unit or inaccurate pressure source.

AMS Device Manger

1. Right click on the device and select **Calibrate**, then **Recall Factory Trim** from the menu.
2. Select **Next** after setting the control loop to manual.
3. Select **Sensor trim** under *Trim to recall* and select **Next**.
4. Select **Next** to acknowledge restoration of trim values is complete.
5. Select **Next** to acknowledge the loop can be returned to automatic control.
6. Select **Finish** to acknowledge the method is complete.

4.4.2 Recall factory trim—analog output

Fast Keys	1, 2, 3, 4, 2

This command resets the transmitter analog output trim to the “as shipped” factory settings. The recall factory trim—analog output command can be useful for recovering from an inadvertent trim, incorrect Plant Standard or faulty meter.

AMS Device Manger

1. Right click on the device and select **Calibrate**, then **Recall Factory Trim** from the menu.
2. Select **Next** after setting the control loop to manual.
3. Select **Analog output trim** under *Trim to recall* and select **Next**.
4. Select **Next** to acknowledge restoration of trim values is complete.
5. Select **Next** to acknowledge the loop can be returned to automatic control.
6. Select **Finish** to acknowledge the method is complete.

4.5 Analog output trim

The Analog Output Trim commands allow you to adjust the transmitter's current output at the 4 and 20 mA points to match the plant standards. This command adjusts the digital to analog signal conversion (see Figure 4-1 on page 37).

4.5.1 Digital-to-analog trim

Fast Keys	1, 2, 3, 2, 1

Field Communicator

To perform a digital-to-analog trim with a Field Communicator, perform the following procedure.

1. From the *Home* screen, enter the Fast Key sequence shown. Select **OK** after setting the control loop to manual, see "Setting the loop to manual" on page 4.
2. Connect an accurate reference ammeter to the transmitter at the *Connect Reference Meter* prompt. Connect in series with the signal loop, or shunt power through the reference meter at some point.
3. Select **OK** after connecting the reference meter.
4. Select **OK** at the *Setting Fld Dev Output To 4 MA* prompt. The transmitter outputs 4.0 mA.
5. Record the actual value from the reference meter, and enter it at the *Enter Meter Value* prompt. The Field Communicator prompts you to verify whether or not the output value equals the value on the reference meter.
6. Select **1: Yes**, if the reference meter value equals the transmitter output value, or **2: No** if it does not.
   a. If 1 is selected: **Yes**, proceed to Step 7.
   b. If 2 is selected: **No**, repeat Step 5.
7. Select **OK** at the *Setting Fld Dev Output To 20 MA* prompt, and repeat Step 5 and 6 until the reference meter value equals the transmitter output value.
8. Select **OK** after the control loop is returned to automatic control.

AMS Device Manger

1. Right click on the device and select **Calibrate**, then **D/A Trim** from the menu.
2. Select **Next** after setting the control loop to manual.
3. Select **Next** after connecting the reference meter.
4. Select **Next** at the *Setting fld dev output to 4mA* screen.
5. Record the actual value from the reference meter, and enter it at the *Enter meter value* screen and select **Next**.
6. Select **Yes**, if the reference meter value equals the transmitter output value, or **No** if it does not. Select **Next**.
   a. If Yes is selected, proceed to Step 7.
   b. If No is selected, repeat Step 5.
7. Select **Next** at the *Setting fld dev output to 20 mA* screen.
8. Repeat Step 5 - 6 until the reference meter equals the transmitter output value.
9. Select **Next** to acknowledge the loop can be returned to automatic control.
10. Select **Finish** to acknowledge the method is complete.

4.5.2 Digital-to-analog trim using alternate scale

Fast Keys	1, 2, 3, 2, 2

The Scaled D/A Trim command matches the 4 and 20 mA points to a user selectable reference scale other than 4 and 20 mA (e.g. 1 to 5 volts if measuring across a 250 ohm load, or 0 to 100 percent if measuring from a Distributed Control System [DCS]). To perform a scaled D/A trim, connect an accurate reference meter to the transmitter and trim the output signal to scale, as outlined in the Output Trim procedure.

Note
Use a precision resistor for optimum accuracy. If you add a resistor to the loop, ensure the power supply is sufficient to power the transmitter to a 20 mA output with additional loop resistance.

AMS Device Manger

Right click on the device and choose **Calibrate** then **Scaled D/A trim** from the menu.

1. Select **Next** after setting the control loop to manual.
2. Select **Change** to change scale, select **Next**.
3. Enter Set scale-Lo output value, select **Next**.
4. Enter Set scale-Hi output value, select **Next**.
5. Select **Next** to proceed with Trim.
6. Select **Next** after connecting the reference meter.
7. Select **Next** at the *Setting fld dev output to 4 mA* screen.
8. Record the actual value from the reference meter, and enter it at the *Enter meter value* screen and select **Next**.
9. Select **Yes**, if the reference meter value equals the transmitter output value, or **No** if it does not. Select **Next**.
   a. If **Yes** is selected, proceed to Step 10.
   b. If **No** is selected, repeat Step 8.
10. Select **Next** at the *Setting fld dev output to 20 mA* screen.
11. Repeat steps 8 - 9 until the reference meter equals the transmitter output value.
12. Select **Next** to acknowledge the loop can be returned to automatic control.
13. Select **Finish** to acknowledge the method is complete.

Section 5 Troubleshooting

5.1 Overview

Table 5-1 provides summarized maintenance and troubleshooting suggestions for the most common operating problems.

If you suspect malfunction despite the absence of any diagnostic messages on the Field Communicator display, follow the procedures described here to verify that transmitter hardware and process connections are in good working order. Always deal with the most likely checkpoints first.

5.2 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

- Transmitters located in hazardous areas should be installed in accordance with local codes and requirements for that area.
- Use appropriately rated Ex adapters, blanking elements, and glands during installation.
- Keep process insulation at least 1-in. [25 mm] from transmitter connection.

⚠ CAUTION

Static electricity can damage sensitive components.

- Observe safe handling precautions for static-sensitive components.

Table 5-1. Troubleshooting

Symptom	Corrective actions
Transmitter milliamp reading is zero	Verify power is applied to signal terminals.
	Check power wires for reversed polarity.
	Verify terminal voltage is 11.25 to 42.4 V dc.
Transmitter Not Communicating with Field Communicator	Verify the output is between 4 and 20 mA or saturation levels.
	Verify clean dc Power to transmitter (Max ac noise 0.2 volts peak to peak).
	Check loop resistance, 250 Ω minimum (PS voltage -transmitter voltage/loop current).
	Check if unit is addressed properly.
Transmitter milliamp reading is low or high	Verify applied pressure.
	Verify 4 and 20 mA range points.
	Verify output is not in alarm condition.
	Verify if 4 – 20 mA output trim is required.
Transmitter will not respond to changes in applied pressure	Check test equipment.
	Check impulse piping or manifold for blockage.
	Verify applied pressure is between the 4 and 20 mA set points.
	Verify output is not in alarm condition.
	Verify transmitter is not in Loop Test mode.
Digital Pressure Variable reading is low or high	Check test equipment (verify accuracy).
	Check impulse piping for blockage or low fill in wet leg.
	Verify transmitter is calibrated properly.
	Verify pressure calculations for application.
Digital Pressure Variable reading is erratic	Check application for faulty equipment in pressure line.
	Verify transmitter is not reacting directly to equipment turning on/off.
	Verify damping is set properly for application.
Milliamp reading is erratic	Verify power source to transmitter has adequate voltage and current.
	Check for external electrical interference.
	Verify transmitter is properly grounded.
	Verify shield for twisted pair is only grounded at one end.
HART message reading: “Brown-out condition detected.”	Verify power source to transmitter has adequate voltage and current.
	Check loop resistance, 250 Ω minimum (PS voltage -transmitter voltage/loop current).
HART message reading: “Configuration not update due to brown-out.”	Cycle power and repeat configuration change.

5.2.1 Service support

To expedite the return process outside of the United States, contact the nearest Emerson™ Process Management representative.

Within the United States, call the Rosemount National Response Center using the 1-800-654-RSMT (7768) toll-free number. This 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 process material to which the product was last exposed.

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. 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.

Rosemount National Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

Appendix A Specification and Reference Data

A.1 Ordering Information

Table A-1. Rosemount 4600 Oil and Gas Pressure Transmitter Ordering Information

★ **The Standard offering represents the most common options.**

Model	Transmitter type	
4600	Oil and gas panel pressure transmitter	
Measurement type		
G	Sealed gauge	★
A	Absolute	★
Pressure range		
2	0-20 to 0-150 psi	★
4	0-125 to 0-5000 psi	★
5	0-330 to 0-10,000 psi	★
6	0-660 to 0-20,000 psi (available only with H11)	★
Isolating diaphragm/process connection materials(1)		
2	316L SST	★
3	Alloy C-276	★
Process connection style		
E09(2)	1/4–18 NPT female	★
E11(3)	1/2–14 NPT female	★
H11(4)	Coned and threaded, compatible with autoclave type F-250-C	★
Output		
A	4-20 mA with digital signal based on HART® protocol	★
Electrical connection		
5A	1/2–14 NPT male with 72-in. flying lead	★

Table A-1. Rosemount 4600 Oil and Gas Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options.

Options (Include with selected model number)

Software configuration		
C1	Custom software configuration (CDS required with order)	★
Alarm limits		
C6	Custom alarm and saturation signal levels, high alarm	★
C7	Custom alarm and saturation signal levels, low alarm	★
Hardware adjustments		
D1	Zero and span adjustments	★
External ground screw assembly		
D4	External ground screw assembly	★
Product certifications		
E1	ATEX Flameproof	★
E2	INMETRO Flameproof	★
I1	ATEX Intrinsic Safety	★
K1	ATEX Flameproof, Intrinsic Safety, Type n (combination of E1, I1, and N1)	★
N1	ATEX Type n	★
ND	ATEX Dust Ignition-Proof	★
E5	FM Approval Explosionproof	★
I5	FM Approval Intrinsic Safety, Non-incendive	★
K5	FM Approval Explosionproof, Intrinsic Safety, Non-incendive (combination of E5 and I5)	★
E6	CSA Explosionproof, Division 2	★
I6	CSA Intrinsic Safety	★
K6	CSA Explosionproof, Intrinsic Safety, Division 2 (combination of E6 and I6)	★
EM	Technical Regulations Customs Union (EAC) Flameproof	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety	★
KM	Technical Regulation Customs Union (EAC) Flameproof and Intrinsic Safety	★
KA	ATEX/ CSA Flameproof and Intrinsic Safety (combination of E1, I1, E6, and I6)	★
KB	FM Approval and CSA Explosionproof and Intrinsic Safety (combination of E5, E6, I5, and I6)	★
KC	FM Approval and ATEX Explosionproof and Intrinsic Safety (combination of E5, E1, I5, and I1)	★
Calibration certifications		
Q4	Calibration Data Certificate consistent with ISO 104742.1 or EN 10204 2.1	★
Material traceability certification		
Q8	Material Traceability Certification per EN 10204 3.1B	★
Transient protection		
T1	Transient protection	★

Table A-1. Rosemount 4600 Oil and Gas Pressure Transmitter Ordering Information

★ The Standard offering represents the most common options.

Quality certification for safety		
QS	Prior-use certificate of FMEDA data	★
Typical model number: 4600 G 4 2 E11 A 5A WR5 D1 K5		

1. Materials of Construction comply with recommendations per NACE® MR0175/ISO 15156 for sour oilfield production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
2. Not available with Pressure Range 6.
3. Not available with Pressure Range 5 or 6.
4. Only available with Pressure Range 5 or 6.

A.2 Specifications

A.2.1 Performance specifications

For zero-based spans, reference conditions, silicone oil fill, SST materials, 1/2-in. 14 NPT process connections, digital trim values set to equal range points. Does not include any error due to the effects of sealed gauge.

Conformance to specification (±3 Sigma)

Technology leadership, advanced manufacturing techniques and statistical process control ensure specification conformance to at least ±3 sigma.

Reference accuracy

Includes the effects of terminal based linearity, hysteresis, and repeatability.
Range 2: ±0.25% of calibrated span from 1:1 to 7.5:1 rangedown
Range 4: ±0.25% of calibrated span from 1:1 to 40:1 rangedown
Range 5: ±0.25% of calibrated span from 1:1 to 30:1 rangedown
Range 6: ±0.25% of calibrated span from 1:1 to 30:1 rangedown

Long term stability

0.5% of span for three years under normal operating conditions

Vibration effect

Less than ±0.1% of URL when tested per the requirements of IEC 60770.84 pipeline (general and extreme vibration level) (10-60 Hz 0.21mm peak to peak displacement/60-2000 Hz 3g).

Electromagnetic Compatibility (EMC)

Meet all relevant requirements of EN 61326.

Transient Protection (Option T1)

Meets IEEE C62.41, Category B
6 kV crest (0.5 µs – 100 kHz)
3 kA crest (8 × 20 microseconds)
6 kV crest (1.2 × 50 microseconds)

General Specifications:
Response Time: < 1 nanosecond
Peak Surge Current: 5000 amps to housing
Peak Transient Voltage: 100 V dc
Loop Impedance: < 25 ohms
Applicable Standards: IEC61000-4-4, IEC61000-4-5

Note
Calibrations at 68 °F (20 °C) per ASME Z210.1 (ANSI).

A.2.2 Functional specifications

Table A-2. Range and sensor limits

Units	Range 2		Range 4 Span		Range 5		Range 6	
	min.	max.	min.	max.	min.	max.	min.	max.
psi	20	150	125	5,000	330	10,000	660	20,000
MPa	0.14	1.03	125	34.47	2.28	68.95	4.55	137.90
bar	1.38	10.34	125	344.74	22.75	689.48	45.51	1378,95
kg/cm^2	1.41	10.55	125	351.535	23.20	703.07	46.40	1406,14

Dynamic performance

500 Milliseconds (response time + dead time)

Ambient temperature effect per 100 °F (56 °C)

±0.03% URL + 1.0% span from 1:1 to maximum turndown

Service

Liquid, gas, and vapor applications

4–20 mA (output code A)

Zero and span adjustment
Zero and span values can be set anywhere within the range.

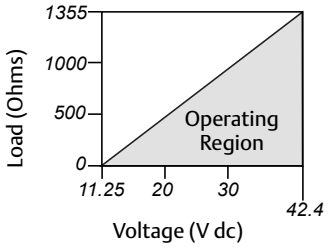
Span must be greater than or equal to the minimum span.

Output
Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

Power supply
External power supply required. Standard transmitter (4–20 mA) operates on 11.25 to 42.4 V dc with no load.

Load limitations
Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

Max. Loop Resistance = 43.5 (Power Supply Voltage – 11.25)



Communication requires a minimum loop resistance of 250 ohms.

Overpressure limits

Transmitters withstand the following pressure without damage:
Range 2: 1,500 psi (103,4 bar)
Range 4: 7,500 psi (517,1 bar)
Range 5: 15,000 psi (1034 bar)
Range 6: 24,000 psi (1655 bar)

Burst pressure limits

Range 2: 11,000 psi (758,4 bar)
Range 4: 11,000 psi (758,4 bar)
Range 5: 26,000 psi (1793 bar)
Range 6: 31,000 psi (2137 bar)

Temperature limits

Ambient
–40 to 185 °F (–40 to 85 °C)

Storage
–50 to 230 °F (–46 to 110 °C)

Process temperature limits
–40 to 200 °F (–40 to 93 °C)

Turn-on time

Performance within specifications less than 2.5 seconds after power is applied to the transmitter

Damping

Analog output response to a step input change is user-selectable from 0.3 to 60 seconds for one time constant. This software damping is in addition to sensor module response time.

Failure mode alarm

HART 4-20mA (output code A)
If self-diagnostics detect a gross transmitter failure, the analog signal will be driven offscale to alert the user. Rosemount standard and custom alarm levels are available.

High or low alarm signal is software-selectable.

Alarm configuration
Rosemount

High Alarm: ≥ 21.75 mA

Low Alarm: ≤ 3.75 mA

Custom Level [1]

High Alarm: 20.2 - 23.0 mA

Low Alarm: 3.6 - 3.8 mA

A.2.3 Physical specifications

Electrical connections

1/2–14 NPT Male, 72-in. flying leads (polyvinyl chloride insulated #18 AWG copper wire)

Conduit seal

Integral conduit seal meets the requirements of NEC© 2002 section 501.5 (A), 501.5 (B) and 505.16 (B)(1). No additional conduit seal required.

Process connections

- 1/2-14 NPT female (available on Ranges 2 and 4 only)
- 1/4–18 NPT female (not available on Range 6)
- Autoclave type F-250-C (Pressure relieved 9/16-18 gland thread: 1/4 OD high pressure tube 60° cone: available Range 5 and 6 transmitters only.

1. *Low alarm must be 0.1 mA less than low saturation and high alarm must be 0.1 mA greater than high saturation.*

Process sealing

Reliable dual process seal design meets the requirements NEC© 2002 section 501.5 (F)(3), 505.16 (E)(3) and API 14F/14FZ 6.8.2.2. No additional process sealing is required.

Meets the requirements of ISA 12.27.01.
No additional process sealing required.

Process-wetted parts

Process isolating diaphragms[1]
316L SST
Alloy C-276

Non-wetted parts

Electronics housing
316L SST
NEMA 4X
IP 68, IP 66

Sensor module fill fluid

Silicone

Ordinary locations certifications

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Shipping weights

Range 2 and 4: 1.34 lb. (0.61 kg)

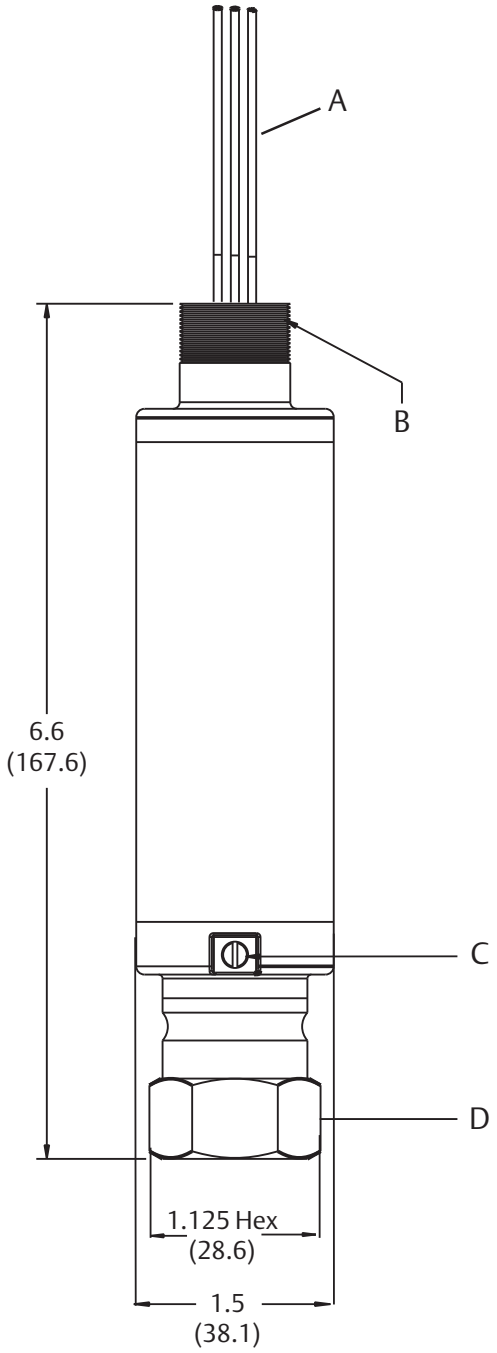
Range 5 and 6: 2.03 lb. (0.92 kg)

1. *Materials of Construction meet NACE material recommendations per MR 01-75. Caution is strongly advised when considering the use of 316L SST isolating diaphragms in sour environments. Although these diaphragms meet the intent of the standard, it can be jeopardized by chlorine contaminates that are frequently found in sour process streams.*

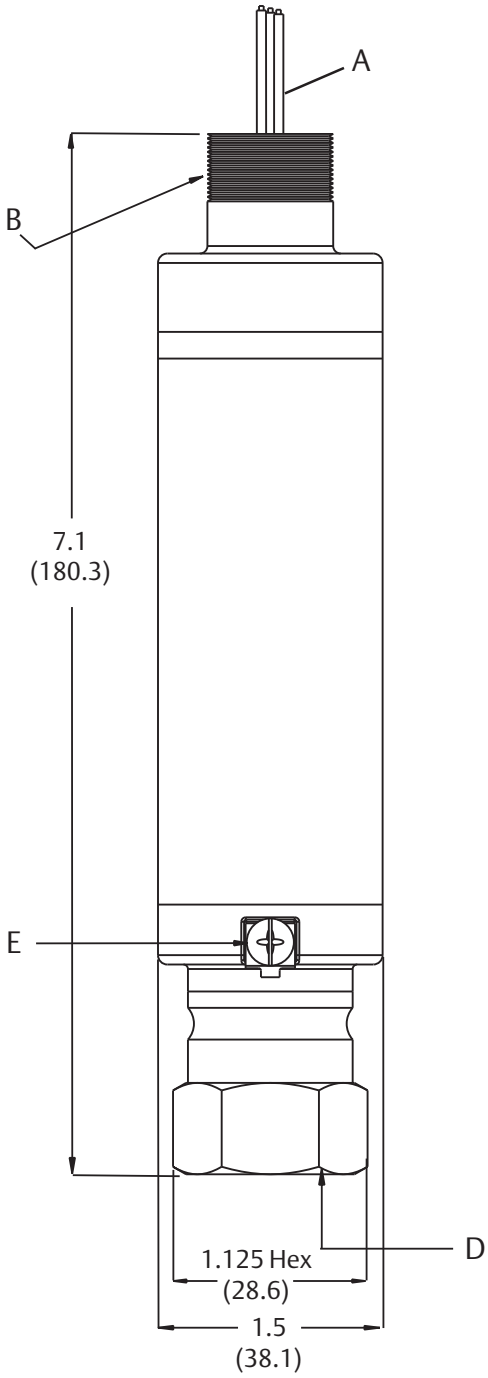
A.3 Dimensional drawings

Figure A-1. Range 2 and 4

Without T1 ordering option



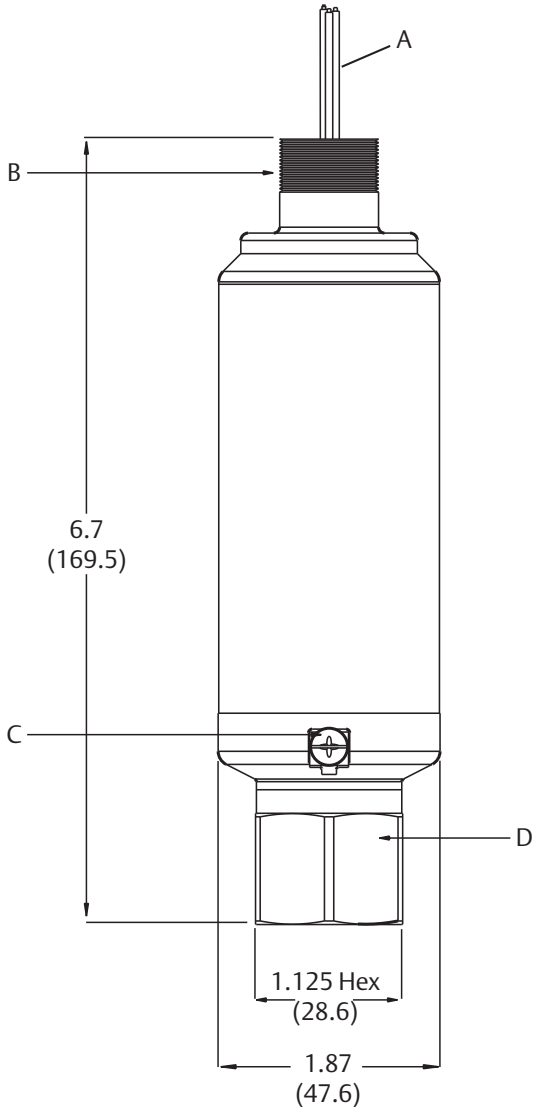
With T1 ordering option



A.Ground
B. Electrical connection ½–14 NPT
C. Optional ground screw (Ordering option D4)
D. Process connection
E. Optional ground screw (standard with T1 option)
Dimensions are in inches (millimeters)

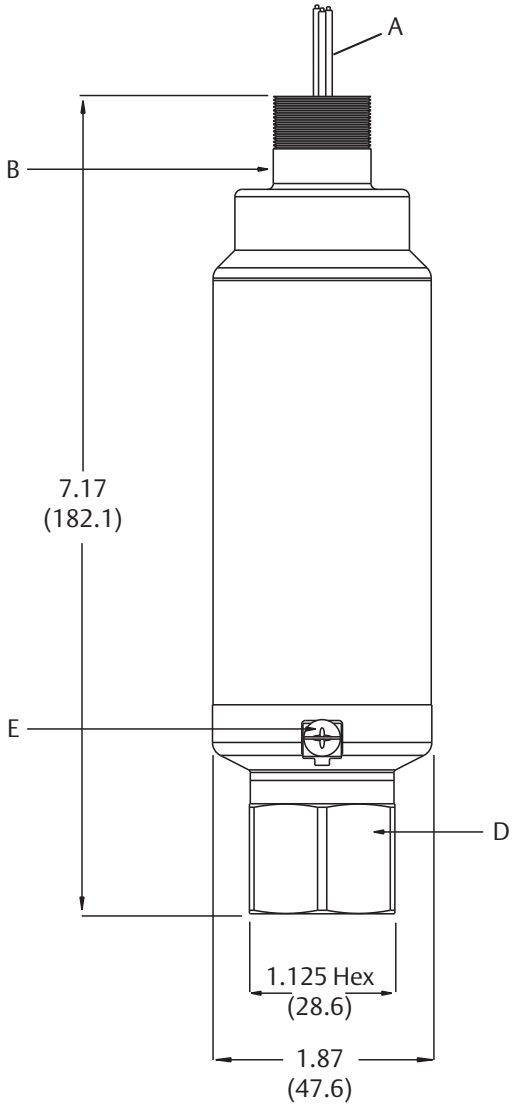
Figure A-2. Range 5 and 6

Without T1 ordering option



A.Ground
B. Electrical connection ½–14 NPT
C Optional ground screw (Ordering Option D4)

With T1 ordering option



D. Optional ground screw (Standard with T1 Option)
E. Process connection
Dimensions are in inches (millimeters)

Appendix B Product Certifications

Rev 1.3

B.1 European Directive Information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at EmersonProcess.com/Rosemount.

B.2 Ordinary Location Certification

As standard, the transmitter has been examined and tested to determine that the design meets the basic electrical, mechanical, and fire protection requirements by a nationally recognized test laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.2.1 North America

E5 US Explosionproof (XP) and Dust-Ignitionproof (DIP)
Certificate: 3012302
Standards: FM Class 3600 - 2011; FM Class 3615 - 2006; FM Class 3810 - 2005; NEMA 250 - 1991; ANSI/ISA-S12.0.01 - 1998; ANSI/ISA-S12.22.01 - 1998; ANSI/ISA-60079-0 - 2009;
Markings: Explosionproof for Class I, Division 1, Groups B, C, and D; Flameproof for Class 1, Zone 1 AEx d IIC T5 (–40 °C to 85 °C); Dust-ignition proof for Class II and Class III, Division 1, Groups E, F, and G; Temperature Code T5 (T_{amb} = –40 °C to 85 °C); Enclosure Type 4X; Conduit seal not required.

I5 US Intrinsic Safety (IS), Nonincendive (NI)
Certificate: 3012302
Standards: FM Class 3600 - 2011; Class 3610 - 2010; Class 3611 - 2004; NEMA 250 - 1991; ANSI/ISA-S12.0.01 - 1998; ANSI/ISA-S12.22.01 - 1998; ANSI/ISA-60079-0 - 2009; ANSI/ISA-60079-11 - 2009
Markings: Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Temperature Code T4 (–50 °C to 70 °C); Intrinsically Safe for use in Class I, Zone 0 AEx ia IIC T4 (–50 °C to 70 °C) in accordance with control drawing 04620-5007; Nonincendive for Class I, Division 2, Groups A, B, C, and D when connected in accordance with Rosemount drawing 04620-5007; Enclosure Type 4X

E6 Canada Explosionproof and Division 2
Certificate: 1384913
Standards: CSA Std C22.2 No. 25-1966; CSA Std C22.2 No. 30-M1986; CAN/CSA-C22.2 No. 94-M91; CSA Std C22.2 No. 142-M1987; CAN/CSA-C22.2 No. 157-92; CSA Std C22.2 No. 213-M1987; CAN/CSA-E79- 0-95; CAN/CSA- E79-1-95; CAN/CSA- E79-11-95; ANSI/ISA No. 12.27.01-2011
Markings: Explosionproof for Class I, Division 1, Groups B, C, and D; Dust-Ignitionproof for Class II and Class III, Division 1, Groups E, F, and G; Temperature Code T5 (–50 °C to 40 °C); Explosion-proof for Class 1, Zone 1 Ex d IIC T5 (–20 °C to 40 °C); Suitable for Class I, Division 2, Groups A, B, C, and D when installed per Rosemount drawing 04620-5005; Enclosure Type 4X; Conduit seal not required

I6 Canada Intrinsic Safety
Certificate: 1384913
Standards: CSA Std C22.2 No. 25-1966; CSA Std C22.2 No. 30-M1986; CAN/CSA-C22.2 No. 94-M91; CSA Std C22.2 No. 142-M1987; CAN/CSA-C22.2 No. 157-92; CSA Std C22.2 No. 213-M1987; CAN/CSA-E79- 0-95; CAN/CSA- E79-1-95; CAN/CSA- E79-11-95; ANSI/ISA No. 12.27.01-2011

Markings: Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Temperature Code T3C (–50 °C to 70 °C); Intrinsically Safe for use in Class I, Zone 0 Ex ia IIC T4 (–50 °C to 70 °C) when connected in accordance with Rosemount drawing 04620-5005; Enclosure Type 4X; For entity parameters see control drawing 04620-5005

B.2.2 Europe

E1 ATEX Flameproof
Certificate: KEMA02ATEX2231X
Standards: EN60079-0:2006; EN60079-1:2007; EN60079-26:2007
Markings: Ⓔx II 1/2 G Ex d IIC T6 (–40 °C ≤ T_a ≤ +70 °C)

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. The Rosemount 4600 Pressure Transmitter is provided with a permanently connected unterminated cable. The free end of the cable shall be connected using a suitable junction box, e.g. in type of protection flameproof enclosure “d” or increased safety “e”.

I1 ATEX Intrinsic Safety
Certificate: Baseefa03ATEX0114X
Standards: EN60079-0:2012+A11:2013, EN60079-11:2012
Markings: Ⓔx II 1 G Ex ia IIC T4 Ga (–40 °C ≤ T_a ≤ +70 °C)

Input parameters	HART
Voltage U_i	30 V
Current I_i	200 mA
Power P_i	1.0 W
Capacitance C_i	35 nF
Inductance L_i	390 µH

Special Condition for Safe Use (X):

1. The equipment with the Transient Protection (T1) option is not capable of withstanding the 500 V insulation test required by Clause 6.3.13 of EN60079-11:2012. This must be taken into account when installing the equipment.

N1 ATEX Type n
Certificate: Baseefa03ATEX0115X
Standards: EN60079-0:2012+A11:2013, EN60079-15:2010
Markings: Ⓔx II 3G Ex nA IIC T5 Gc (–40 °C ≤ T_a ≤ +70 °C)
U_i = 42.4V

Special Condition for Safe Use (X):

1. The equipment with the Transient Protection (T1) option is not capable of withstanding the 500 V insulation test required by Clause 6.5.1 of EN60079-15:2010. This must be taken into account when installing the equipment.

ND ATEX Dust
Certificate: KEMA02ATEX2231X
Standards: EN60079-0:2006, EN60079-26:2007, EN61241-0:2006, EN61241-1:2004 + C1:2006
Markings: Ⓔx II 1 D Ex tD A20 T85 °C (–40 °C ≤ T_a ≤ +70 °C)

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. The Rosemount 4600 is provided with a permanently connected unterminated cable. The free end of the cable shall be connected using a suitable junction box, e.g. in type of protection flameproof enclosure “d” or increased safety “e”.

B.2.3 Brazil

E2 INMETRO Flameproof
Certificate: UL-BR 15.0509X
Standards: ABNT NBR IEC 60079-0, ABNT NBR IEC 60079-1, ABNT NBR IEC 60079-26
Markings: Ex d IIC Ga/Gb, T6(–60 °C ≤ T_a ≤ +70 °C), T5/T4(–60 °C ≤ T_a ≤ +80 °C)

Special Condition for Safe Use (X):

1. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail in order to assure safety during its expected lifetime.

B.2.4 Technical Regulations Customs Union (EAC)

EM EAC Flameproof
Certificate: RU C-US.GB05.B.00401
Markings: Ga/Gb Ex d IIC T6...T4 X,
T6(–60 °C ≤ T_a ≤ +70 °C),
T4/T5(–60 °C ≤ T_a ≤ +80 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

IM EAC Intrinsically Safe
Certificate: RU C-US.GB05.B.00401
Markings: 0Ex ia IIC T4 Ga X (–40 °C ≤ T_a ≤ +70 °C)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

B.2.5 Combinations

K1 Combination of E1, I1, and N1

K5 Combination of E5 and I5

K6 Combination of E6 and I6

KA Combination of E1, I1, E6, and I6

KB Combination of E5, I5, I6, and E6

KC Combination of E5, E1, I5, and I1

KM Combination of EM and IM

B.3 Installation drawings

Figure B-1. CSA 04620-5005

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

REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	NEW RELEASE	RTC1014494	C.M.M.	1/13/03
AB	ADD HIGH PRESSURE	RTC1015334	K.N.	5/12/03

TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1 & CLASS I, ZONE 0.

AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 1 & CLASS I, ZONE 0.

CONTENTS:

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. Myles Lee Miller 12/12/02

CHK'D

APP'D. Chad McGuire 1/13/03

APP'D. GOVT.

EMERSON. Process Management

ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INDEX OF I.S. CSA FOR 4600

SIZE A | FSCM NO | DWG NO. Ø4620-5005

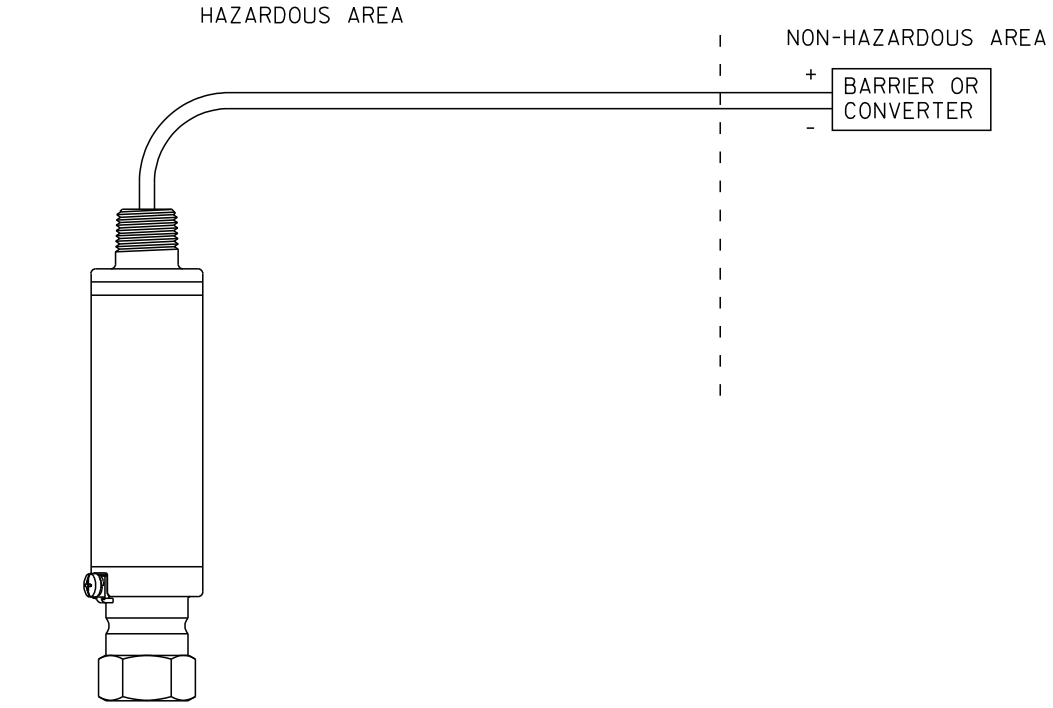
SCALE N/A | WT. ——— | SHEET 1 OF 4

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

CSA INTRINSIC SAFETY APPROVALS

CIRCUIT CONNECTION WITH BARRIER OR CONVERTER
TYPICAL FOR ALL PRESSURE RANGES.

Ex ia
INTRINSICALLY SAFE/SECURITE INTRINSEQUE
4-20 mA, ("A" OUTPUT CODE)



ROSEMOUNT
MODEL 4600
[WITH OR WITHOUT TI
(TRANSIENT PROTECTION) OPTION]
[TYPICAL FOR ALL RANGES]

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD MAINTAINED (MicroStation)
DR. Myles Lee Miller 12/12/02	SIZE A	FSCM NO	DWG NO. 04620-5005
ISSUED	SCALE N/A	WT.	SHEET 2 OF 4

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

ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (Voc) AND MAX. SHORT CIRCUIT CURRENT (Isc) AND MAX. POWER (Voc X Isc/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax), MAXIMUM SAFE INPUT CURRENT (Imax), AND MAXIMUM SAFE INPUT POWER (Pmax) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (Ca) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (La) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

FOR OUTPUT CODE A MODEL 4600
CLASS I, DIV. 1, GROUPS A, B, C AND D T3C
CLASS I, ZONE 0 Ex ia IIC T4

U_i / V_{MAX} = 30V	U_o/V_{OC} IS LESS THAN OR EQUAL TO 30V
I_i / I_{MAX} = 200mA	I_o/I_{SC} IS LESS THAN OR EQUAL TO 200mA
P_i or P_{MAX} = 1.0 WATT	$(\frac{V_o \times I_o}{4})$ or $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
C_i = 35nF	C_o/C_A IS GREATER THAN 35nF + Ccable
L_i = 390μH	L_o/L_A IS GREATER THAN 390μH + Lcable

NOTE: ENTITY PARAMETERS LISTED APPLY ONLY TO ASSOCIATED APPARATUS WITH LINEAR OUTPUT.

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DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 04620-5005
ISSUED	SCALE N/A	WT. ———	SHEET 3 OF 4

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

SYSTEM APPROVALS
4-20 mA, ("A" OUTPUT CODE)

DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I, T3C
CSA APPROVED SAFETY BARRIER	30 V OR LESS 330 OHMS OR MORE 28 V OR LESS 300 OHMS OR MORE 25 V OR LESS 200 OHMS OR MORE 22 V OR LESS 180 OHMS OR MORE	GROUPS A, B, C, D
CSA APPROVED SAFETY BARRIER	30 V OR LESS 150 OHMS OR MORE	GROUPS C, D

NOTES:

1. CSA APPROVED ASSOCIATED APPARATUS MUST MEET THE FOLLOWING PARAMETERS: U_o/V_{oc} LESS THAN OR EQUAL TO U_i/V_{max} AND I_o/I_{sc} LESS THAN OR EQUAL TO I_i/I_{max} (REFER TO PAGE 3).
2. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250V.
3. THE INSTALLATION MUST BE IN ACCORDANCE WITH CANADIAN ELECTRICAL CODE.
4. CAUTION: USE ONLY SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING TEMPERATURE.
5. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.

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DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 04620-5005
ISSUED	SCALE N/A	WT. ———	SHEET 4 OF 4

Figure B-2. Factory Mutual 04620-5007

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

REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	NEW RELEASE	RTC1014546	C.M.M.	1/28/03
AB	ADD NOTES AND MINOR UPDATES	RTC1014911	C.M.M.	2/4/03

ENTITY APPROVALS FOR MODEL 4600

CONTENTS:

THE ROSEMOUNT TRANSMITTERS LISTED ABOVE ARE F.M. APPROVED AS INTRINSICALLY SAFE WHEN USED IN CIRCUIT WITH F.M. APPROVED BARRIERS WHICH MEET THE ENTITY PARAMETERS LISTED IN THE CLASS I, II, AND III, DIVISION 1 GROUPS INDICATED.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.

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. Myles Lee Miller 1/27/03

CHK'D

APP'D. Chad McGuire 1/28/03

APP'D. GOVT.

EMERSON. Process Management

ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE: INDEX OF I.S. & NONINCENDIVE F.M. FOR 4600

SIZE A | FSCM NO | DWG NO. 04620-5007

SCALE N/A | WT. ——— | SHEET 1 OF 5

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

ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (Voc, Uo OR Vt) AND MAX. SHORT CIRCUIT CURRENT (Isc, Io, OR It) AND MAX.POWER Po(Voc X Isc/4) OR (Vt X It/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax, OR U_i), MAXIMUM SAFE INPUT CURRENT (Imax OR I_i), AND MAXIMUM SAFE INPUT POWER (Pmax OR P_i) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (Ca) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (La) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

NOTE: ENTITY PARAMETERS LISTED APPLY ONLY TO ASSOCIATED APPARATUS WITH LINEAR OUTPUT.

FOR OUTPUT CODE A MODEL 4600
CLASS I, DIV. 1, GROUPS A, B, C AND D T4
CLASS I, ZONE 0 AEx ia IIC T4

U_i or V_{MAX} = 30V	Uo, V_T or V_{OC} IS LESS THAN OR EQUAL TO 30V
I_i or I_{MAX} = 200mA	Io, I_T or I_{SC} IS LESS THAN OR EQUAL TO 200mA
P_i or P_{MAX} = 1.0 WATT	$(\frac{V_T \times I_T}{4})$ or $(\frac{Voc \times Isc}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
C_i = 35nF	C_A IS GREATER THAN 35nF + Ccable
L_i = 390µH	L_A IS GREATER THAN 390µH + Lcable
T4 (-50°C ≤ ta ≤ 70°C)	

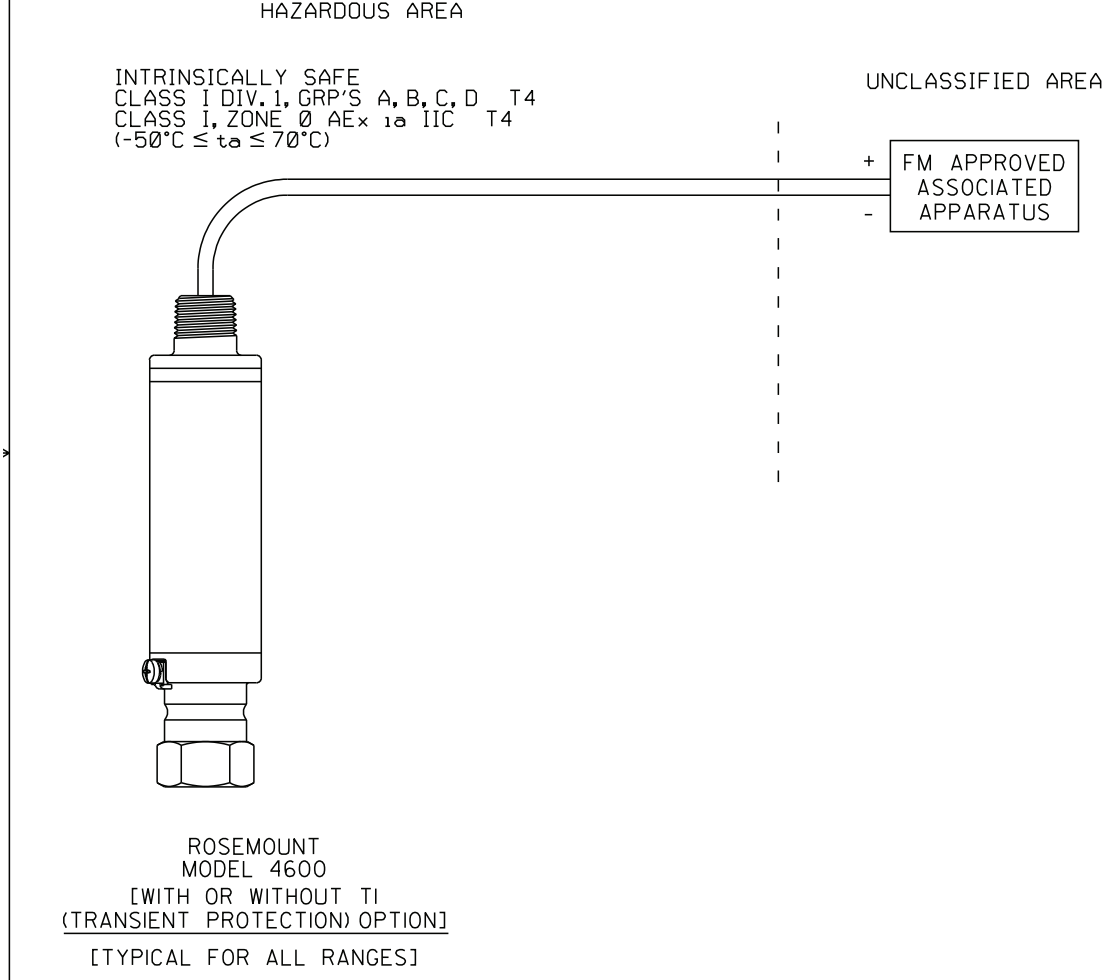
Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 04620-5007
ISSUED	SCALE N/A	WT. ———	SHEET 2 OF 5

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

CIRCUIT DIAGRAM 1
ONE BARRIER OR CONVERTER:
SINGLE or DUAL CHANNEL
(TYPICAL FOR ALL PRESSURE RANGES)



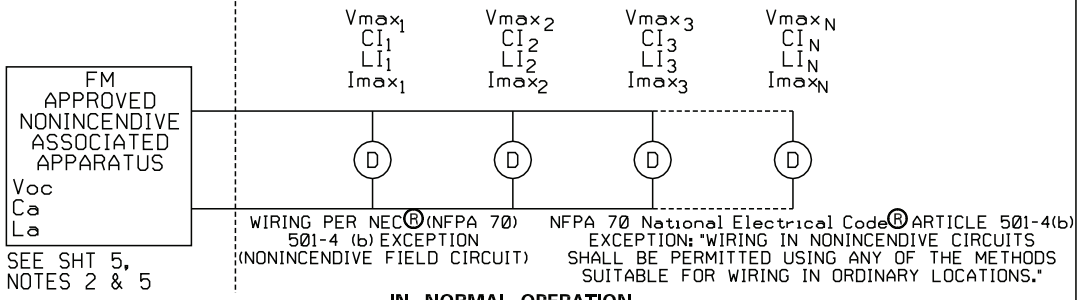
Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD MAINTAINED (MicroStation)
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 04620-5007
ISSUED	SCALE N/A	WT. ———	SHEET 3 OF 5

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

NONINCENDIVE FIELD WIRING CIRCUIT
CLASS I, DIV. 2 LOCATIONS

NON-CLASSIFIED LOCATION

HAZARDOUS (CLASSIFIED) LOCATION
CLASS I, DIV. 2, GRP'S A, B, C, D



SEE SHT 5, NOTES 2 & 5

WIRING PER NEC® (NFPA 70) 501-4 (b) EXCEPTION (NONINCENDIVE FIELD CIRCUIT)

NFPA 70 National Electrical Code® ARTICLE 501-4(b) EXCEPTION: "WIRING IN NONINCENDIVE CIRCUITS SHALL BE PERMITTED USING ANY OF THE METHODS SUITABLE FOR WIRING IN ORDINARY LOCATIONS."

IN NORMAL OPERATION

DEVICES CONTROL THROUGH-CURRENT

PARAMETERS (NON-INCENDIVE FIELD WIRING)	DEVICE 4600 4-20mA / HART	ROSEMOUNT 4600
Vmax	42.4v	
Maximum normal operating current	24mA	
Ci	35nF	
Li	390µH	

$Imax_N >= Iq_N + Isignal_N$

ROSEMOUNT 4600 TRANSMITTERS ARE CURRENT CONTROLLERS ON INDIVIDUAL PARALLEL BRANCHES WITH RESPECT TO THE POWER SUPPLY. IN NONINCENDIVE INSTALLATIONS THE Imax FOR EACH TRANSMITTER IS NOT RELATED TO THE MAXIMUM CURRENT OF THE POWER SUPPLY (Isc) IN THE SAME MANNER AS FOR TRANSMITTER INSTALLED PER I.S. REQUIREMENTS, BECAUSE NONINCENDIVE REQUIREMENTS INCLUDE ONLY NORMAL OPERATING CONDITIONS.

REFERENCE: APPENDIX A7 (FM3611 1999)

Imax for an individual device = Iq + Isignal

Iq =Quiescent current through device (Maximum quiescent current for the device)

Isignal =Signaling current through device (Protocol may limit signaling to one device at a time)

Operating Imax = $Iq_1 + Iq_2 + ... + Iq_N + I_{signal\ max}$

$I_{signal\ max}$ = Max. of ($Isignal_1$, $Isignal_2$ ..... $Isignal_N$)

TEMP CODE: T5 (Ta = -50°C TO +70°C

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REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
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NOTES:

1. NO REVISION TO THIS DRAWING WITHOUT PRIOR FM APPROVAL.
2. CONTROL EQUIPMENT CONNECTED TO BARRIER MUST NOT USE OR GENERATE MORE THAN 250 Vrms or Vdc.
3. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA-RP12.6.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).
4. WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC AND NON-INCENDIVE SAFETY.
5. ASSOCIATED APPARATUS MUST MEET THE FOLLOWING PARAMETERS:
   Uo or Voc or Vt LESS THAN or EQUAL TO U_i (Vmax)
   Io or Isc or It LESS THAN or EQUAL TO I_i (Imax)
   Po or Pmax LESS THAN or EQUAL TO P_i (Pmax)
   Ca IS GREATER THAN or EQUAL THE SUM OF ALL C_i's PLUS Ccable
   La IS GREATER THAN or EQUAL THE SUM OF ALL L_i's PLUS Lcable
6. THE ASSOCIATED APPARATUS MUST BE FM APPROVED.
7. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
8. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 Ohm.
9. WARNING - TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.
10. THE MAGNESIUM CONTENT OF THE ENCLOSURE IS LESS THAN 7.5%.

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DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 04620-5007
ISSUED	SCALE N/A	WT. ———	SHEET 5 OF 5

Index

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00809-0100-4022, Rev GA
September 2016

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