Rosemount 644 Temperature Transmitter with Profibus PA
Rosemount 644 Temperature Transmitter with Profibus PA

Rosemount 644 Hardware Revision 9

**NOTICE**

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

The United States has two toll-free assistance numbers and one international number.

**Customer Central**
1-800-999-9307 (7:00 a.m. to 7:00 p.m. CST)

**National Response Center**
1-800-654-7768 (24 hours a day)
Equipment service needs

**International**
1-(952) 906-8888

**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 an Emerson Process Management Sales Representative.
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January 2011

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SAFETY MESSAGES

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

Warnings

⚠️ WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before connecting Profibus devices in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-intrinsic field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.
USING THIS MANUAL

The sections in this manual provide information on installing, operating, and maintaining the Rosemount 644 with Profibus PA protocol. The sections are organized as follows:

Section 2: Configuration provides instruction on commissioning and operating the Rosemount 644 PA transmitter. Information on software functions, configuration parameters, and online variables is also included.

Section 3: Hardware Installation contains mechanical mounting and installation instructions, and field upgrade options.

Section 4: Electrical Installation contains electrical installation instructions, with wiring and power considerations.

Section 5: Calibration contains techniques for calibration and troubleshooting

Appendix A: Specifications and Reference Data supplies reference and specification data, as well as ordering information.

Appendix B: Product Certifications contains intrinsic safety approval information, European ATEX directive information, and approval drawings.

Appendix C: Profibus Block Information contains Profibus block and parameter information.

TRANSMITTER OVERVIEW

Features of the Rosemount 644 with Profibus PA include:

- Accepts inputs from a wide variety of sensors (T/C, RTD, Ohm, mV)
- Configuration using Siemens SIMATIC PDM
- Electronics that are completely encapsulated in epoxy making the transmitter extremely durable and ensuring long-term reliability
- A compact size and a variety of housing options allowing mounting flexibility for the control room or the field

Refer to the following literature for a full range of compatible connection heads, sensors, and thermowells provided by Emerson Process Management.

- Temperature Sensors and Assemblies Product Data Sheet, Volume 1 (document number 00813-0100-2654)
- Temperature Sensors and Assemblies Product Data Sheet, Volume 2 (document number 00813-0200-2654)
- Rosemount 1067 compact sensor and 1097 Thermowell Product Data Sheet (00813-0100-4951)
- Rosemount 65Q and 65B Resistance Temperature Sensors for Hygienic and Sanitary Applications Product Data Sheet (00813-0100-4827)

NOTE

For Rosemount 644 with HART® or FOUNDATION™ fieldbus, see Rosemount Product Manual 00809-0100-4728.
DEVICE REVISION

Table 1-1. Device Revisions (NE53)

<table>
<thead>
<tr>
<th>Date</th>
<th>Software Revision</th>
<th>Profibus Profile</th>
<th>Changes to Software</th>
<th>Compatible Files</th>
<th>Manual Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/10</td>
<td>1.01.016</td>
<td>3.02</td>
<td>New Product</td>
<td>644 GSD: EPM1039.gsd Profile:3.02 GSD: pa139700.gsd DD: see Rosemount.com DTM: see Rosemount.com</td>
<td>AA</td>
</tr>
</tbody>
</table>

CONSIDERATIONS

General

Electrical temperature sensors such as RTDs and thermocouples produce low-level signals proportional to their sensed temperature. The 644 converts the low-level sensor signal to digital Profibus PA signal that is relatively insensitive to lead length and electrical noise. This signal is then transmitted to the control room via two wires.

Commissioning

The transmitter can be commissioned before or after installation. It may be useful to commission it on the bench, before installation, to ensure proper operation and to become familiar with its functionality. Make sure the instruments in the loop are installed in accordance with intrinsically safe, FISCO, or non-incendive field wiring practices.

Mechanical

Location

When choosing an installation location and position, take into account the need for access to the transmitter.

Special Mounting

Special mounting hardware is available for mounting a 644 head mount transmitter to a DIN rail, or assembling a new 644 head mount to an existing threaded sensor connection head (former option code L1).

Electrical

Proper electrical installation is necessary to prevent errors due to sensor lead resistance and electrical noise. For best results, shielded cable should be used in electrically noisy environments.

Make wiring connections through the cable entry in the side of the connection head. Be sure to provide adequate clearance for cover removal.

Environmental

The transmitter electronics module is permanently sealed within the housing, resisting moisture and corrosive damage. Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Temperature Effects

The transmitter will operate within specifications for ambient temperatures between –40 and 185 °F (–40 and 85 °C). Heat from the process is transferred from the thermowell to the transmitter housing. If the expected process temperature is near or beyond specification limits, consider the use of additional thermowell lagging, and extension nipple, or a remote mounting configuration to isolate the transmitter from the process.
Figure 1-1 provides an example of the relationship between transmitter housing temperature rise and extension length.

**Example**

The transmitter specification limit is 85 °C. If the ambient temperature is 55 °C and the process temperature to be measured is 800 °C, the maximum permissible connection head temperature rise is the transmitter specification limit minus the ambient temperature (moves 85 to 55 °C), or 30 °C.

In this case, an extension of 100 mm meets this requirement, but 125 mm provides a margin of 8 °C, thereby reducing any temperature effects in the transmitter.

**RETURN OF MATERIALS**

To expedite the return process in North America, call the Emerson Process Management National Response Center toll-free at 800-654-7768. This center, available 24 hours a day, will assist you with any needed information or materials.

⚠️ The center will ask for the following information:
- Product model
- Serial numbers
- The last process material to which the product was exposed

The center will provide
- A Return Material Authorization (RMA) number
- Instructions and procedures that are necessary to return goods that were exposed to hazardous substances

For other locations, please contact an Emerson Process Management sales representative.

**NOTE**

If a hazardous substance is identified, a Material Safety Data Sheet (MSDS), required by law to be available to people exposed to specific hazardous substances, must be included with the returned materials.
Section 2  Configuration

SAFETY MESSAGES

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

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- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.
Figure 2-1. Configuration Flowchart

START HERE

Bench Calibration?

YES

BASIC SETUP

Set Sensor Type

Set Number of Wires

Set Units

Set Range Values

Set Damping

VERIFY

Simulate Sensor Input

Within Specifications?

YES

NO

FIELD INSTALL

Mount Transmitter

Wire Transmitter

Power Transmitter

FINISHED

Refer to Section 2: Configuration
CONFIGURATION
GUIDELINES

To configure on the bench, required equipment includes a power supply, a class 2 master with DP/PA coupler, proper cable, and terminators. Verify that the Security hardware jumper is set to the OFF position in order to proceed with configuration. See Figure 4-2 for jumper location.

Setup for the Rosemount 644 can be done via Siemens SIMATIC® PDM software or any other DD or DTM based Class 2 master.

Profile 3.02 Identification Number Adaptation Mode

Rosemount 644 Profibus Profile 3.02 devices are set to Identification Number Adaptation Mode when shipped from the factory. This mode allows the transmitter to communicate with any Profibus class 1 master with either the generic Profile GSD (9700) or Rosemount 644 specific GSD (1039).

Block Modes

When configuring a device with a class 2 master, it is best practice to set blocks to OOS when downloading parameters that affect the transmitter output. However, the 644 will allow configuration changes made in AUTO to be downloaded to the device. This prevents the class one master from seeing a jump in output without a status change. Setting the blocks OOS and back into Auto is done automatically when using the class two master configuration wizards within the Rosemount 644 DD or DTM. This is done so no additional action is required when configuring the device.

Configuration Tools

The Rosemount 644 can be configured through the factory at order entry or using a class 2 master. The C1 option code must be ordered to obtain addressing and configuration of the device at the factory.

Class 2 masters require either DD or DTM files for configuration. These files can be found at www.rosemount.com or by contacting your local Emerson Process representative.

The remainder of this section will cover the configuration tasks using the Class 2 master configuration tool.

NOTE

Instructions in this section use the terminology found in the class 2 master. See Appendix C: Profibus Block Information to cross reference parameters between the class2 master, and the Profibus specification.

BASIC SETUP TASKS

Device Description

Before configuring the device, ensure the host has the appropriate Device Description file revision for this device. The device descriptor can be found on www.rosemount.com. The initial release of the Rosemount 644 with Profibus PA protocol is device revision 1.

Assign Address

The Rosemount 644 is shipped with a temporary address of 126. This must be changed to a unique value between 1 and 125 in order to establish communication with the class 1 master. Usually, addresses 1-2 are reserved for masters, therefore transmitter addresses between 3 and 125 are recommended for the device.

Address can be set using either:

- Factory Configuration (C1 option code)
- Class 2 master – see respective class 2 master manual for setting instrument addresses
Rosemount 644

**Default Configuration**

Unless otherwise specified, the Rosemount 644 will be shipped with the following settings:

**Table 2-1. Temperature configuration defaults**

<table>
<thead>
<tr>
<th>Device Address: 126</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Type: RTD, Pt 100 ( (\alpha = 0.00385, 4 \text{ wire}) )</td>
</tr>
<tr>
<td>Damping: 5 sec.</td>
</tr>
<tr>
<td>Units of Measurement: °C</td>
</tr>
<tr>
<td>Alarm Limits:</td>
</tr>
<tr>
<td>- HI-HI: Infinity</td>
</tr>
<tr>
<td>- HI: Infinity</td>
</tr>
<tr>
<td>- LO: - Infinity</td>
</tr>
<tr>
<td>- LO-LO: Infinity</td>
</tr>
<tr>
<td>Local Display (when installed): Engineering Units of Temperature</td>
</tr>
<tr>
<td>Measurement Range: 0 °C to 100 °C</td>
</tr>
</tbody>
</table>

**TRANSMITTER SETUP USING CLASS 2 MASTER**

**Basic Transmitter Setup**

**Table 2-2. Basic Transmitter Configuration using Class 2 master**

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu &gt;&gt; Parameter &gt;&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Sensor Type</td>
<td>Primary Value&gt;&gt;Sensor&gt;&gt;Sensor Type</td>
</tr>
<tr>
<td>Set Connection Type (Number of Wires)</td>
<td>Primary Value&gt;&gt;Sensor&gt;&gt;Sensor Connection</td>
</tr>
<tr>
<td>Set Units</td>
<td>Primary Value&gt;&gt;Sensor&gt;&gt;Primary Value Unit</td>
</tr>
<tr>
<td>Set Upper Range Value</td>
<td>Primary Value&gt;&gt;Process Value Scale&gt;&gt;Upper Value</td>
</tr>
<tr>
<td>Set Lower Range Value</td>
<td>Primary Value&gt;&gt;Process Value Scale&gt;&gt;Lower Value</td>
</tr>
<tr>
<td>Set Damping Value</td>
<td>Primary Value&gt;&gt;Sensor&gt;&gt;Damping Value</td>
</tr>
</tbody>
</table>

* Please see “Basic Transmitter Configuration using DD or DTM” on page 2-6 for considerations when changing units.

**Process Alarms**

Process alarms activate an output alarm status when the configured alarm point is exceeded. A process alarm will be transmitted continuously if the output set points are exceeded. The alarms will reset once the value returns within range.

Process Alarm parameters are defined as follows:

- HI-HI Alarm: Changes Output Status to Good – Critical Alarm – Hi Limit
- HI Warning: Changes Output Status to Good – Advisory Alarm – Hi Limit
- LO Warning: Changes Output Status to Good – Advisory Alarm – Lo Limit
- LO-LO Alarm: Changes Output Status to Good – Critical Alarm – Lo Limit
- Alarm Hysteresis: Amount the output value must pass back into range before alarm is cleared.

Example: Upper Alarm = 100 °C. Alarm Hysteresis = 0.5 °C. After activation at 100 °C, the alarm will clear once the output goes below 99.5 °C = 100 - 0.5 °C.

Process Alerts can be set using:

- Class 2 master – see Table 2-3 for configuration
Table 2-3. Process Alarm Configuration using Class 2 master

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter Process Alarm Levels</td>
<td>Output&gt;&gt;Output Limits&gt;&gt;LO-LO Alarm</td>
</tr>
<tr>
<td></td>
<td>Output&gt;&gt;Output Limits&gt;&gt;LO Warning</td>
</tr>
<tr>
<td></td>
<td>Output&gt;&gt;Output Limits&gt;&gt;HI Warning</td>
</tr>
<tr>
<td></td>
<td>Output&gt;&gt;Output Limits&gt;&gt;HI- HI Alarm</td>
</tr>
</tbody>
</table>

Simulation

Simulation is in the AI block and used to verify the output from the transducer block. The Rosemount 644 has a simulation jumper located on the transmitter puck top cover that must be set to the ON position in order to simulate.

**NOTE**

This jumper position is ignored when the transmitter is initially powered. The jumper position must be changed while the transmitter is powered to activate simulation. If power is removed and restored, the simulation mode will be OFF regardless of jumper position.

With simulation enabled, the actual measurement value has no impact on the OUT value or the status. The OUT value will equal the simulated value from the transducer block plus any scaling or linearization effects performed in the AI block.

Once the simulation jumper is set to on, simulation mode can be activated using a Class 2 master see Table 2-4.

Table 2-4. Simulation configuration using Class 2 master

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu &gt;&gt; Parameter &gt;&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Simulate</td>
<td>Main Setup&gt;&gt;Human Interface&gt;&gt; Simulation Status&gt;&gt;State&gt;&gt; Select Enabled</td>
</tr>
<tr>
<td></td>
<td>Enter Simulation Value</td>
</tr>
<tr>
<td></td>
<td>Select Simulation Status&gt;&gt;Press “Download to device” icon</td>
</tr>
<tr>
<td>Disable Simulate</td>
<td>Main Setup&gt;&gt;Human Interface&gt;&gt; Simulation Status&gt;&gt;State&gt;&gt; Select Disabled</td>
</tr>
<tr>
<td></td>
<td>Press “Download to device” icon</td>
</tr>
</tbody>
</table>
TRANSMITTER ONLINE SETUP WITH DD OR DTM

Basic Transmitter Setup

Table 2-5. Basic Transmitter Configuration using DD or DTM

Using Guided Setup

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu &gt;&gt; Category &gt;&gt; Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Sensor Type</td>
<td>Configure&gt;&gt;Guided Setup&gt;&gt;Configure Sensor Method</td>
</tr>
<tr>
<td>Set Connection Type</td>
<td>Configure&gt;&gt;Guided Setup&gt;&gt;Configure Sensor Method</td>
</tr>
<tr>
<td>Set Units</td>
<td>Configure&gt;&gt;Guided Setup&gt;&gt;Configure Sensor Method</td>
</tr>
<tr>
<td>Set Damping</td>
<td>Configure&gt;&gt;Guided Setup&gt;&gt;Configure Sensor Method</td>
</tr>
</tbody>
</table>

Using Manual Setup

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu &gt;&gt; Category &gt;&gt; Tab &gt;&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Sensor Type</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Sensor&gt;&gt;Sensor Type</td>
</tr>
<tr>
<td>Set Connection Type (Number of Wires)</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Sensor&gt;&gt;Sensor Connection</td>
</tr>
<tr>
<td>Set Units</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Classic View&gt;&gt;Transducer Block&gt;&gt;Primary Value Unit</td>
</tr>
<tr>
<td>Set Damping</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Sensor&gt;&gt;Damping Value</td>
</tr>
<tr>
<td>Set Upper Range Value</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Classic View&gt;&gt;Analog Input Block&gt;&gt;Analog Input Block_1&gt;&gt;Lower Range</td>
</tr>
<tr>
<td>Set Lower Range Value</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Classic View&gt;&gt;Analog Input Block&gt;&gt;Analog Input Block_1&gt;&gt;Upper Range</td>
</tr>
</tbody>
</table>

NOTE

Changes made to the PRIMARY_VALUE_UNIT parameter through Manual Setup>>Classic View are only reflected in the Transducer Block parameters. To change the AI OUT units the PV Scale and OUT Scale need to be updated to mirror the upper and lower sensor limits in the desired units.

Example: (All values are arbitrary)

The default configuration of the device is:

<table>
<thead>
<tr>
<th>4-wire PT100_A_385</th>
<th>AI.OUT = 23 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY_VALUE_UNIT = °C</td>
<td>PV_SCALE = 100.0</td>
</tr>
<tr>
<td>PV.VALUE = 23 °C</td>
<td>OUT_SCALE = 100.0, °C</td>
</tr>
<tr>
<td>SV.VALUE = 23 °C</td>
<td></td>
</tr>
<tr>
<td>USL = 850 °C</td>
<td></td>
</tr>
<tr>
<td>LSL = -200 °C</td>
<td></td>
</tr>
</tbody>
</table>

If the user desires to change the units to °F, only the parameters in Bold will change with the PRIMARY.VALUE_UNIT. The AI.OUT will stay in °C until the PV_SCALE and OUT_SCALE are configured to match each other. (This can be with the measurement range or the sensor limits.

<table>
<thead>
<tr>
<th>4-wire PT100_A_385</th>
<th>AI.OUT = 23 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY_VALUE_UNIT = °C</td>
<td>PV_SCALE = 212.32</td>
</tr>
<tr>
<td>PV.VALUE = 73 °C</td>
<td>OUT_SCALE = 100.0, °C</td>
</tr>
<tr>
<td>SV.VALUE = 73 °C</td>
<td></td>
</tr>
<tr>
<td>USL = 1562 °C</td>
<td></td>
</tr>
<tr>
<td>LSL = -328 °C</td>
<td></td>
</tr>
</tbody>
</table>

So the following change is needed:

PV_SCALE = 1562,-328 (make the same as USL and LSL)

OUT_SCALE = 1562,-328, °F (make the same as PV_SCALE)
Process Alarms

Process Alarms can be set using a DD or DTM – see Table 2-6 for configuration.

Table 2-6. Process Alarm Configuration using DD or DTM

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter Process Alert Levels</td>
<td>Configure&gt;&gt;Alarm Setup&gt;&gt;LO-LO&gt;&gt;[Value]</td>
</tr>
<tr>
<td></td>
<td>Configure&gt;&gt;Alarm Setup&gt;&gt;LO&gt;&gt;[Value]</td>
</tr>
<tr>
<td></td>
<td>Configure&gt;&gt;Alarm Setup&gt;&gt;HI &gt;&gt;[Value]</td>
</tr>
<tr>
<td></td>
<td>Configure&gt;&gt;Alarm Setup&gt;&gt;HI-HI &gt;&gt;[Value]</td>
</tr>
</tbody>
</table>

LCD Display

The LCD display connects directly to the top of the transmitter puck and uses a 10-pin connector to directly connect to the electronics board. A display cover is provided to accommodate the display.

The display always indicates the transmitter output temperature as well as abbreviated diagnostic status when applicable. When turned on, the display will alternate between the selected variables.

For LCD display configuration using a DD or DTM see Table 2-7.

Table 2-7. LCD Display Configuration using DD or DTM

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu &gt;&gt; Parameter &gt;&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Display Parameters</td>
<td>Configure&gt;&gt;Manual Setup&gt;&gt;Display Tab&gt;&gt;Select Parameters to display</td>
</tr>
</tbody>
</table>

Simulation

Once the simulation jumper is set to on, simulation mode can be activated using DD or DTM see Table 2-8.

Table 2-8. Simulation Configuration using DD or DTM

<table>
<thead>
<tr>
<th>Desired Action</th>
<th>Menu &gt;&gt; Parameter &gt;&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Simulate</td>
<td>Service Tools&gt;&gt;Simulate&gt;&gt;Select Enabled State Enter Simulation Value</td>
</tr>
<tr>
<td></td>
<td>Service Tools&gt;&gt;Simulate&gt;&gt;Select Simulation Status&gt;&gt;Press Transfer button</td>
</tr>
<tr>
<td>Disable Simulate</td>
<td>Service Tools&gt;&gt;Simulate&gt;&gt;Select Disabled State</td>
</tr>
<tr>
<td></td>
<td>&gt;&gt;Press Transfer button</td>
</tr>
</tbody>
</table>
Section 3  Hardware Installation

OVERVIEW
The information in this section covers installation considerations for the Rosemount 644. A Quick Installation Guide is shipped with every transmitter to describe pipe-fitting, wiring procedures, and basic configuration for initial installation.

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.

Warnings

⚠️ WARNING

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

- In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.
- Install and tighten process connectors before applying pressure.

Electric shock could cause death or serious injury.
- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

Individual transmitters are clearly marked with a tag indicating the approvals they carry. Transmitters must be installed in accordance with all applicable codes and standards to maintain these certified ratings. Refer to “Hazardous Locations Certificates” on page B-2 for information on these approvals.
MOUNTING

Mount the transmitter at a high point in the conduit run to prevent moisture from draining into the transmitter housing.

The 644 head mount installs
• In a connection head or universal head mounted directly on a sensor assembly
• Apart from a sensor assembly using a universal head
• To a DIN rail using an optional mounting clip.

The 644 rail mount attaches directly to a wall or to a DIN rail.

Mounting a 644H to a DIN Rail

To attach a head mount transmitter to a DIN rail, assemble the appropriate rail mounting kit (part number 00644-5301-0010) to the transmitter as shown in Figure 3-1.

Retrofitting a 644H for Use in an Existing Threaded Sensor Connection Head

To mount a 644 in an existing threaded sensor connection head (former option code L1), order the 644H retrofit kit (part number 00644-5321-0010). The retrofit kit includes a new mounting bracket and all associated hardware necessary to facilitate the installation of the 644H in the existing head. See Figure 3-2.
Figure 3-2. Assembling 644H for Use in an Existing L1 Connection Head

INSTALLATION

Typical European Installation

HEAD MOUNT TRANSMITTER WITH DIN PLATE STYLE SENSOR

1. Attach the thermowell to the pipe or process container wall. Install and tighten the thermowell before applying process pressure.

2. Assemble the transmitter to the sensor. Push the transmitter mounting screws through the sensor mounting plate and insert the snap rings (optional) into the transmitter mounting screw groove.

3. Wire the sensor to the transmitter (see Figure 4-3 on page 4-3).

4. Insert the transmitter-sensor assembly into the connection head. Thread the transmitter mounting screw into the connection head mounting holes. Assemble the extension to the connection head. Insert the assembly into the thermowell.

5. Attach conduit or a cable gland to the open connection head entry.

6. Insert the shielded cable leads into the connection head through the conduit or cable entry. Seal the entry properly.

7. Connect the shielded power cable leads to the transmitter power terminals. Avoid contact with sensor leads and sensor connections.

8. Install and tighten the connection head cover. Enclosure covers must be fully engaged to meet explosion-proof requirements.

A = 644H Transmitter  
B = Connection Head  
C = Thermowell  
D = Transmitter Mounting Screws  
E = Integral Mount Sensor with Flying Leads  
F = Extension
1. Attach the thermowell to the pipe or process container wall. Install and tighten thermowells before applying process pressure.

2. Attach necessary extension nipples and adapters to the thermowell. Seal the nipple and adapter threads with silicone tape.

3. Screw the sensor into the thermowell. Install drain seals if required for severe environments or to satisfy code requirements.

4. Pull the sensor wiring leads through the universal head and transmitter. Mount the transmitter in the universal head by threading the transmitter mounting screws into the universal head mounting holes.

5. Mount the transmitter-sensor assembly into the thermowell. Seal adapter threads with silicone tape.

6. Install a cable gland or conduit for field wiring to the conduit entry of the universal head. Seal threads with silicone tape.

7. Pull the field wiring leads through the conduit into the universal head. Attach the sensor and power leads to the transmitter. Avoid contact with other terminals.

8. Install and tighten the universal head cover. Enclosure covers must be fully engaged to meet explosion-proof requirements.

A = Threaded Thermowell  
B = Threaded Style Sensor  
C = Standard Extension  
D = Universal Head  
E = Conduit Entry
LCD Display Installation

The LCD display provides local indication of the transmitter output and abbreviated diagnostic messages governing transmitter operation. Transmitters ordered with the LCD display are shipped with the meter installed. After-market installation requires the meter kit (part number 00644-4430-0001), which includes:

- LCD display assembly (includes LCD display, meter spacer, and 2 screws)
- Meter cover with O-ring in place

Figure 3-3. Installing the LCD Display

Use the following procedure to install the meter.

1. If the transmitter is installed in a loop, secure the loop and disconnect the power. If the transmitter is installed in an enclosure, remove the cover from the enclosure.

2. Decide meter orientation (the meter can be rotated in 90° increments). To change meter orientation, remove the screws located above and below the display screen. Lift the meter off the meter spacer. Remove the 10-pin plug and re-insert it in the location that will result in the desired viewing orientation.

3. Reattach the meter to the meter spacer using the screws. If the meter was rotated 90° from its original position it will be necessary to remove the screws from their original holes and re-insert them in the adjacent screws holes.

4. Line up the 10-pin connector with the 10-pin socket and push the meter into the transmitter until it snaps into place.

5. Attach and tighten the universal head cover. Enclosure covers must be fully engaged to meet explosion-proof requirements.

6. Use a Profibus Class 2 master to configure the meter to the desired display parameters.

NOTE
Observe the following LCD display temperature limits:
Operating: –4 to 185 °F (–20 to 85 °C)
Storage: –50 to 185 °F (–45 to 85 °C)
Section 4  Electrical Installation

OVERVIEW
The information in this section covers installation considerations for the Rosemount 644. A Quick Installation Guide is shipped with every transmitter to describe pipe-fitting, wiring procedures, and basic configuration for initial installation.

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

Warnings

⚠️ WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before powering Profibus devices segment in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.
All power to the transmitter is supplied over the signal wiring. Use ordinary copper wire of sufficient size to ensure that the voltage across the transmitter power terminals does not drop below 9 Vdc for Profibus PA. If the sensor is installed in a high-voltage environment and a fault condition or installation error occurs, the sensor leads and transmitter terminals could carry lethal voltages. Use extreme caution when making contact with the leads and terminals.

**NOTE**
Do not apply high voltage (e.g., ac line voltage) to the transmitter terminals. Abnormally high voltage can damage the unit. (Sensor and transmitter power terminals are rated to 42.4 Vdc. A constant 42.4 volts across the sensor terminals may damage the unit.)

The transmitters will accept inputs from a variety of RTD and thermocouple types. Refer to Figure 4-1 when making sensor connections. Refer to Figure 4-2 for Profibus installations.

Use the following steps to wire the power and sensor to the transmitter:

1. Connect the positive power lead to the .+ terminal. Connect the negative power lead to the -. terminal.
2. Tighten the terminal screws. When tightening the sensor and power wires, the max torque is 6-in.-lbs (0.7 N-m).
3. Apply power.

![Figure 4-1. Transmitter Power, Communication and Sensor Terminal](image-url)
Figure 4-2. Typical connection of a Profibus configuration host to a transmitter loop

NOTE

1. Each Segment in a Profibus trunk must be terminated at both ends.
2. Some DP/PA couplers contain the power supply, one terminator, and the power conditioner within the coupling device.
3. The configuration tool is typically located in the control room.

Sensor Connections

⚠️ The 644 is compatible with a number of RTD and thermocouple sensor types. Figure 4-3 shows the correct input connections to the sensor terminals on the transmitter. To ensure a proper sensor connection, anchor the sensor lead wires into the appropriate compression terminals and tighten the screws.

Figure 4-3. Sensor Wiring Diagrams

<table>
<thead>
<tr>
<th>644 Sensor Connections Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-wire RTD and Ω</td>
</tr>
<tr>
<td>234</td>
</tr>
</tbody>
</table>

* Emerson Process Management provides 4-wire sensors for all single element RTDs. Use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.

Thermocouple or Millivolt Inputs

The thermocouple can be connected directly to the transmitter. Use appropriate thermocouple extension wire if mounting the transmitter remotely from the sensor. Make millivolt input connections with copper wire. Use shielding for long runs of wire.
RTD or Ohm Inputs

The transmitters will accept a variety of RTD configurations, including 2-wire, 3-wire, and 4-wire. If the transmitter is mounted remotely from a 3-wire or 4-wire RTD, it will operate within specifications, without recalibration, for lead wire resistances of up to 60 ohms per lead (equivalent to 6,000 feet of 20 AWG wire). In this case, the leads between the RTD and transmitter should be shielded. If using only two leads, both RTD leads are in series with the sensor element, so significant errors can occur if the lead lengths exceed three feet of 20 AWG wire (approximately 0.05 °C/ft). For longer runs, attach a third or fourth lead as described above.

Sensor Lead Wire Resistance Effect– RTD Input

When using a 4-wire RTD, the effect of lead resistance is eliminated and has no impact on accuracy. However, a 3-wire sensor will not fully cancel lead resistance error because it cannot compensate for imbalances in resistance between the lead wires. Using the same type of wire on all three lead wires will make a 3-wire RTD installation as accurate as possible. A 2-wire sensor will produce the largest error because it directly adds the lead wire resistance to the sensor resistance. For 2- and 3-wire RTDs, an additional lead wire resistance error is induced with ambient temperature variations. The table and the examples shown below help quantify these errors.

<table>
<thead>
<tr>
<th>Sensor Input</th>
<th>Approximate Basic Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-wire RTD</td>
<td>None (independent of lead wire resistance)</td>
</tr>
<tr>
<td>3-wire RTD</td>
<td>± 1.0 Ω in reading per ohm of unbalanced lead wire resistance (Unbalanced lead wire resistance = maximum imbalance between any two leads.)</td>
</tr>
<tr>
<td>2-wire RTD</td>
<td>1.0 Ω in reading per ohm of lead wire resistance</td>
</tr>
</tbody>
</table>

Examples of Approximate Lead Wire Resistance Effect Calculations

Given:
- Total cable length: 150 m
- Imbalance of the lead wires at 20 °C: 1.5 Ω
- Resistance/length (18 AWG Cu): 0.025 Ω/m °C
- Temperature coefficient of Cu ($\alpha_{Cu}$): 0.039 Ω/Ω °C
- Temperature coefficient of Pt ($\alpha_{Pt}$): 0.00385 Ω/Ω °C
- Change in Ambient Temperature ($\Delta T_{amb}$): 25 °C
- RTD Resistance at 0 °C ($R_o$): 100 Ω (for Pt 100 RTD)

- Pt100 4-wire RTD: No lead wire resistance effect.
- Pt100 3-wire RTD:
  
  Basic Error = \frac{\text{Imbalance of Lead Wires}}{(\alpha_{Pt} \times R_o)}

  Error due to amb. temp. variation = \frac{(\alpha_{Cu}) \times \Delta T_{amb} \times \text{Imbalance of Lead Wires}}{(\alpha_{Pt} \times R_o)}
Rosemount 644

Lead wire imbalance seen by the transmitter = 0.5 Ω

$$\text{Basic error} = \frac{0.5 \, \Omega}{(0.00385 \, \Omega / \, ^\circ C) \times (100 \, \Omega)} = 1.3 \, ^\circ C$$

Error due to amb. temp. var. of ± 25 °C

$$= \frac{(0.0039 \, \Omega / \, ^\circ C) \times (25 \, ^\circ C) \times (0.5 \, \Omega)}{(0.00385 \, \Omega / \, ^\circ C) \times (100\Omega)} = \pm 0.1266 \, ^\circ C$$

- Pt100 2-wire RTD:

  Basic Error = \frac{\text{Lead Wire Resistance}}{(\alpha_{Pt} \times R_o)}

  Error due to amb. temp. variation = \frac{(\alpha_{Cu}) \times (\Delta T_{amb}) \times (\text{Lead Wire Resistance})}{(\alpha_{Pt}) \times (R_o)}

  Lead wire resistance seen by the transmitter = 150 m × 2 wires × 0.025 Ω/m = 7.5 Ω

  $$\text{Basic error} = \frac{7.5 \, \Omega}{(0.00385 \, \Omega / \, ^\circ C) \times (100 \, \Omega)} = 19.5 \, ^\circ C$$

  Error due to amb. temp. var. of ± 25 °C

  $$= \frac{(0.0039 \, \Omega / \, ^\circ C) \times (25 \, ^\circ C) \times (7.5 \, \Omega)}{(0.00385 \, \Omega / \, ^\circ C) \times (100\Omega)} = \pm 1.9 \, ^\circ C$$

Profibus PA Installation

Powered over Profibus PA with standard Profibus power supplies; the transmitter operates between 9.0 and 32.0 Vdc, 11 mA maximum. Transmitter power terminals are rated to 42.4 Vdc. The power terminals on the 644 with Profibus are polarity insensitive.

Ground the Transmitter

The transmitter will operate with the current signal loop either floating or grounded. However, the extra noise in floating systems affects many types of readout devices. If the signal appears noisy or erratic, grounding the current signal loop at a single point may solve the problem. The best place to ground the loop is at the negative terminal of the power supply. Do not ground the current signal loop at more than one point.

The transmitter is electrically isolated to 500 Vdc/ac rms (707 Vdc), so the input circuit may also be grounded at any single point. When using a grounded thermocouple, the grounded junction serves as this point.

Neither side of the loop should be grounded on Profibus PA devices. Only the shield wire should be grounded.

NOTE

Do not ground the signal wire at both ends.

Ungrounded Thermocouple, mV, and RTD/Ohm Inputs

Each process installation has different requirements for grounding. Use the grounding options recommended by the facility for the specific sensor type, or begin with grounding Option 1 (the most common).
Option 1:
1. Connect signal wiring shield to the sensor wiring shield.
2. Ensure the two shields are tied together and electrically isolated from the transmitter housing.
3. Ground shield at the power supply end only.
4. Ensure that the sensor shield is electrically isolated from the surrounding grounded fixtures.

Option 2:
1. Connect sensor wiring shield to the transmitter housing (only if the housing is grounded).
2. Ensure the sensor shield is electrically isolated from surrounding fixtures that may be grounded.
3. Ground signal wiring shield at the power supply end.

Option 3:
1. Ground sensor wiring shield at the sensor, if possible.
2. Ensure that the sensor wiring and signal wiring shields are electrically isolated from the transmitter housing.
3. Do not connect the signal wiring shield to the sensor wiring shield.
4. Ground signal wiring shield at the power supply end.
Grounded Thermocouple Inputs

1. Ground sensor wiring shield at the sensor.
2. Ensure that the sensor wiring and signal wiring shields are electrically isolated from the transmitter housing.
3. Do not connect the signal wiring shield to the sensor wiring shield.
4. Ground signal wiring shield at the power supply end.
Section 5  Calibration

Overview ...........................................page 5-1
Safety Messages .....................................page 5-1

OVERVIEW
This section contains information on calibrating the Rosemount 644 Profibus Temperature Transmitter using either the Local Operator Interface (LOI) or a class two master.

SAFETY MESSAGES
Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠️). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠️ WARNING
Failure to follow these installation guidelines could result in death or serious injury.
- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.
- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before connecting Profibus devices in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-intrinsic field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.
- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.
- Use extreme caution when making contact with the leads and terminals.
Sensor Transducer Block

Sensor Calibration, Lower and Upper Trim Methods

In order to calibrate the transmitter, run the Lower and Upper Trim Methods. If your system does not support methods, manually configure the Transducer Block parameters listed below.

1. Set TARGET_MODE to OOS
2. Set SENSOR_CAL_METHOD to User Trim
3. Set CAL_UNIT to supported engineering units in the Transducer Block
4. Apply temperature that corresponds to the lower calibration point and allow the temperature to stabilize. The temperature must be between the range limits defined in PRIMRY_VALUE_RANGE.
5. Set values of CAL_POINT_LO to correspond to the temperature applied by the sensor.
6. Set SENSOR_CAL_METHOD to User Trim
7. Apply temperature, temperature corresponding to the upper calibration
8. Allow temperature to stabilize.
9. Set CAL_POINT_HI

NOTE
CAL_POINT_HI must be less than UPPER_SENSOR_LIMIT and greater than CAL_POINT_LO + CAL_MIN_SPAN

10. Set SENSOR_CAL_DATE to the current date.
11. Set SENSOR_CAL_WHO to the person responsible for the calibration.
12. Set SENSOR_CAL_LOC to the calibration location.
13. Set TARGET_MODE to AUTO

NOTE
If trim fails the transmitter will automatically revert to factory trim. Excessive correction or sensor failure could cause device status to read “calibration error”. To clear this, trim the transmitter.

Recall Factory Trim

To recall a factory trim on the transmitter, run the Recall Factory Trim. If your system does not support methods, manually configure the Transducer Block parameters listed below.

1. Set TARGET_MODE to OOS
2. Set SENSOR_CAL_METHOD to Factory Trim.
3. Set SENSOR_CAL_DATE to the current date.
4. Set SENSOR_CAL_WHO to the person responsible for the calibration.
5. Set SENSOR_CAL_LOC to the calibration location.
6. Set TARGET_MODE to AUTO.
NOTE
When sensor type is changed, the transmitter reverts to the factory trim. Changing sensor type causes you to loose any trim performed on the transmitter.
Section 6 Troubleshooting

OVERVIEW
This section contains information on how to troubleshoot the Rosemount 644 Profibus Pressure Transmitter.

SAFETY MESSAGES
Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠️). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠️ WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before connecting Profibus devices in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-intrinsic field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.
The Rosemount 644 Profibus device diagnostics can be used to warn a user about a potential transmitter error. There is a transmitter error if the Output Status reads anything but Good or Good - Function Check, or the LCD reads ERROR SENSOR or ERROR DEVICE. Use Table 6-1 to identify what Diagnostic Condition exists based on the combination of errors under the Physical Block Diagnostic Extension and PV Status columns. Once the condition is identified, use the Recommended Actions column to remedy the error.

<table>
<thead>
<tr>
<th>Diagnostics</th>
<th>Physical Block Diagnostic Extension</th>
<th>PV Status</th>
<th>Recommended Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert Simulation Active (Simulate Active)</td>
<td>PV Simulate Active</td>
<td>N/A</td>
<td>1. To disable Simulation Mode, set the Simulate switch on the device to OFF.</td>
</tr>
<tr>
<td>Configuration Error</td>
<td>Invalid configuration</td>
<td>BAD, Maintenance Alarm, More Diagnosis Available, Not Limited</td>
<td>1. Verify that the sensor type and number of wires matches the Sensor Configuration of the device. 2. If the error persists, contact Rosemount Customer Central.</td>
</tr>
<tr>
<td>Sensor Measurement Degraded (Primary Value Degraded)</td>
<td>Sensor Degraded</td>
<td>UNCERTAIN, Process Related, No Maintenance, Not Limited</td>
<td>1. Verify the process temperature is within the sensor type's specified operating range. 2. Check the terminal connection and terminal blocks for corrosion, wire thinning, and faulty connections. 3. If error persists, check installation for stray voltages. 4. If error persists, verify that the transmitter is properly grounded. 5. If error persists, verify the integrity of the sensor and lead wires. 6. If error persists, replace the sensor.</td>
</tr>
<tr>
<td>Terminal Temperature Out of Operating Range</td>
<td>Secondary Value Degraded (PV Status unchanged)</td>
<td>NA</td>
<td>1. Independently measure the ambient temperature of the transmitter's environment. 2. If the ambient temperature is above the transmitter's operating range, modify the installation to correct the ambient temperature. 3. If the ambient temperature is within the transmitter's operating range, replace the transmitter.</td>
</tr>
<tr>
<td>Calibration Error</td>
<td>Calibration Error</td>
<td>BAD, Maintenance Alarm, More Diagnosis Available, Not Limited</td>
<td>1. Revert to Factory Calibration. 2. Re-calibrate the device. Make sure the user entered calibration points are close to the applied calibration temperature.</td>
</tr>
<tr>
<td>Electronics Failure</td>
<td>ASIC RCV Error ASIC TXError ASIC Interrupt Error Reference Error ASIC Configuration Error</td>
<td>BAD, Maintenance Alarm, More Diagnosis Available, Not Limited</td>
<td>1. Restart the processor. 2. If the condition persists, replace the electronics or the transmitter.</td>
</tr>
<tr>
<td>Hardware/Software Incompatible</td>
<td>Hardware/Software Incompatible</td>
<td>BAD, Maintenance Alarm, More Diagnosis Available, Not Limited</td>
<td>1. If possible, revert to the previous software revision. 2. Contact a Service Center and verify the transmitter information using the Show Transmitter Information button.</td>
</tr>
<tr>
<td>Memory Error</td>
<td>Manufacturing Block Integrity Error NV memory integrity Error ROM integrity error</td>
<td>BAD, Maintenance Alarm, More Diagnosis Available, Not Limited</td>
<td>1. Restart the processor. 2. If the error persists, download the transmitter configuration. 3. If the error persists, replace the electronics or the transmitter.</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Physical Block Diagnostic Extension</td>
<td>PV Status</td>
<td>Recommended Actions</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
2. If the error persists, verify the sensor connection and wiring. Refer to the device and sensor wiring diagrams to ensure proper wiring.  
3. If the error persists, verify the integrity of the sensor and sensor lead wires. If the sensor is faulty, repair or replace the sensor. |
| Sensor Beyond Operating Limits      | Sensor Beyond Operating Limits      | BAD, Maintenance Alarm, More Diagnosis Available, Lo / Hi Limited          | 1. Verify the process temperature is within the specified sensor type's range.  
2. If the error persists, verify the sensor connection and wiring. Refer to the device and sensor wiring diagrams to ensure proper wiring.  
3. If the error persists, verify the integrity of the sensor and sensor lead wires. If the sensor is faulty, repair or replace the sensor. |
| Terminal Temperature Failure        | Terminal Temperature Failure        | BAD, Maintenance Alarm, More Diagnosis Available, Not Limited              | 1. Verify the temperature of the transmitter's ambient environment is within the transmitter's specified operating limits. Refer to the product manual for the transmitter's operating limits.  
2. If the ambient temperature is within the specified operating limits, replace the transmitter. |
| Terminal Temperature Beyond Operating Limits | Terminal Temperature Beyond Operating Limits | UNCERTAIN, Process Related, No Maintenance, Not Limited | 1. Verify the temperature of the transmitter's ambient environment is within the transmitter's specified operating limits. Refer to the product manual for the transmitter's operating limits.  
2. If the ambient temperature is within the specified operating limits, replace the transmitter. |
Extended Diagnostics
Identification with class
one master

If using a class one master to identify Physical Block Diagnostic Extensions, see Figure 6-1 and Figure 6-2 for diagnostic bit information. Table 6-1 and Table 6-2 list the diagnostic description for each bit.

NOTE
A class two master will automatically decode bits and provide diagnostic names.

Figure 6-1. Extended Diagnostics Identification

<table>
<thead>
<tr>
<th>Header Byte</th>
<th>Status, Slot Number, Status Specifier</th>
<th>Diagnosis</th>
<th>Extended Diagnosis (Vendor Specific)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 x x x x x</td>
<td>3 Bytes</td>
<td>4 Bytes</td>
<td>3 Bytes</td>
</tr>
</tbody>
</table>

Figure 6-2. Diagnoses and Extended Diagnoses Bit Identification

Diagnosis

<table>
<thead>
<tr>
<th>Bit</th>
<th>Byte 1</th>
<th>Byte 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit_Diag_Bit</td>
<td>7 6 5 4 3 2 1 0</td>
<td>7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td></td>
<td>31 30 29 28 27 26 25 24</td>
<td>39 38 37 36 35 34 33 32</td>
</tr>
</tbody>
</table>

Extended Diagnosis

<table>
<thead>
<tr>
<th>Bit</th>
<th>Byte 1</th>
<th>Byte 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit_Diag_Bit</td>
<td>7 6 5 4 3 2 1 0</td>
<td>7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td></td>
<td>63 62 61 60 59 58 57 56</td>
<td>69 68 67 66 65 64</td>
</tr>
</tbody>
</table>

Byte 3

<table>
<thead>
<tr>
<th>Bit</th>
<th>Byte 1</th>
<th>Byte 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit_Diag_Bit</td>
<td>7 6 5 4 3 2 1 0</td>
<td>7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td></td>
<td>79 78 77 76 75 74 73 72</td>
<td></td>
</tr>
</tbody>
</table>
Table 6-1. Device Related Diagnosis Descriptions

<table>
<thead>
<tr>
<th>Byte-Bit</th>
<th>Unit_Diag_Bit (1)</th>
<th>Diagnostic Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>35</td>
<td>Restart</td>
</tr>
<tr>
<td>2-4</td>
<td>36</td>
<td>Cold Start</td>
</tr>
<tr>
<td>2-5</td>
<td>37</td>
<td>Maintenance Required</td>
</tr>
<tr>
<td>2-7</td>
<td>39</td>
<td>Ident_Number violation</td>
</tr>
<tr>
<td>3-0</td>
<td>40</td>
<td>Failure of the device</td>
</tr>
<tr>
<td>3-1</td>
<td>41</td>
<td>Maintenance demanded</td>
</tr>
<tr>
<td>3-2</td>
<td>42</td>
<td>Function Check</td>
</tr>
<tr>
<td>3-3</td>
<td>43</td>
<td>Process not returning valid values</td>
</tr>
<tr>
<td>4-7</td>
<td>55</td>
<td>Extension Available</td>
</tr>
</tbody>
</table>

(1) Unit_Diag_Bit located in GSD file

Table 6-2. Extended Diagnosis Descriptions (1)

<table>
<thead>
<tr>
<th>Byte-Bit</th>
<th>Unit_Diag_Bit (1)</th>
<th>Diagnostic Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-0</td>
<td>96</td>
<td>Invalid Configuration</td>
</tr>
<tr>
<td>6-1</td>
<td>97</td>
<td>ASIC RCV Error</td>
</tr>
<tr>
<td>6-2</td>
<td>98</td>
<td>ASIC TX Error</td>
</tr>
<tr>
<td>6-3</td>
<td>99</td>
<td>ASIC Interrupt Error</td>
</tr>
<tr>
<td>6-4</td>
<td>100</td>
<td>Reference Error</td>
</tr>
<tr>
<td>6-5</td>
<td>101</td>
<td>ASIC Configuration Error</td>
</tr>
<tr>
<td>6-6</td>
<td>102</td>
<td>Sensor Open</td>
</tr>
<tr>
<td>6-7</td>
<td>103</td>
<td>Sensor Shorted</td>
</tr>
<tr>
<td>5-0</td>
<td>88</td>
<td>Terminal Temperature Failure</td>
</tr>
<tr>
<td>5-1</td>
<td>89</td>
<td>Sensor out of Operating Range</td>
</tr>
<tr>
<td>5-2</td>
<td>90</td>
<td>Sensor Beyond Operating Limits</td>
</tr>
<tr>
<td>5-3</td>
<td>91</td>
<td>Terminal Temperature Out of Operating Range</td>
</tr>
<tr>
<td>5-4</td>
<td>92</td>
<td>Terminal Temperature Out of Operating Limits</td>
</tr>
<tr>
<td>5-5</td>
<td>93</td>
<td>Sensor Degraded</td>
</tr>
<tr>
<td>5-6</td>
<td>94</td>
<td>Calibration Error</td>
</tr>
<tr>
<td>5-7</td>
<td>95</td>
<td>Manufacturing Block Integrity Error</td>
</tr>
<tr>
<td>4-0</td>
<td>80</td>
<td>Hardware/Software Incompatible</td>
</tr>
<tr>
<td>4-1</td>
<td>81</td>
<td>Non-Volatile Memory Integrity Error</td>
</tr>
<tr>
<td>4-2</td>
<td>82</td>
<td>ROM Integrity Error</td>
</tr>
</tbody>
</table>

(1) Unit_Diag_Bit located in GSD file
PLANTWEB AND NE107 DIAGNOSTICS

Table 6-3 describes the recommended status of each diagnostic condition based on PlantWeb and Namur NE107 recommendations.

Table 6-3. Output Status

<table>
<thead>
<tr>
<th>Name</th>
<th>PlantWeb Alert Category</th>
<th>NE107 Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV Simulation Enabled</td>
<td>Advisory</td>
<td>Check</td>
</tr>
<tr>
<td>AI in Manual Mode</td>
<td>Advisory</td>
<td>Check</td>
</tr>
<tr>
<td>Sensor Out of Operating Range</td>
<td>Maintenance</td>
<td>Out of spec</td>
</tr>
<tr>
<td>Sensor Degraded</td>
<td>Maintenance</td>
<td>Out of spec</td>
</tr>
<tr>
<td>Terminal Temperature Out of Operating Range</td>
<td>Maintenance</td>
<td>Out of spec</td>
</tr>
<tr>
<td>Terminal Temperature Out of Operating Limits</td>
<td>Maintenance</td>
<td>Out of spec</td>
</tr>
<tr>
<td>Electronics Failure</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Sensor Open</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Sensor Shorted</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Sensor Beyond Operating Limits</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Terminal Temperature Failure</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Memory Failure</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Hardware/Software Incompatible</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Configuration Error</td>
<td>Failure</td>
<td>Failure</td>
</tr>
<tr>
<td>Calibration Error</td>
<td>Failure</td>
<td>Failure</td>
</tr>
</tbody>
</table>

ALERT MESSAGES AND FAIL SAFE TYPE SELECTION

Table 6-4 defines the output status and LCD messages that will be driven by a diagnostic condition. This table can be used to determine what type of fail safe value setting is preferred. Fail safe type can be set with a class two master under fail safe >> fail safe mode.

Table 6-4. Alert Messages

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>FSAFE_TYPE 0 (Failsafe Value)</th>
<th>FSAFE_TYPE 1 (Last usable Value)</th>
<th>FSAFE_TYPE 2 (Wrong calculated Value)</th>
<th>LCD Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Error</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>36 - BAD, Maintenance Alarm, Not Limited</td>
<td>“ERROR SENSOR”</td>
</tr>
<tr>
<td>Electronics Failure</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>36 - BAD, Maintenance Alarm, Not Limited</td>
<td>“ERROR DEVICE”</td>
</tr>
<tr>
<td>Primary Value Failure - Sensor is Open</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>36 - BAD, Maintenance Alarm, Not Limited</td>
<td>“ERROR SENSOR”</td>
</tr>
<tr>
<td>Primary Value Failure - Sensor is Shorted</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>36 - BAD, Maintenance Alarm, Not Limited</td>
<td>“ERROR SENSOR”</td>
</tr>
<tr>
<td>Primary Value Degraded - Sensor Out of Operating Range</td>
<td>120 - UNCERTAIN, Process Related, No Maintenance, Not Limited</td>
<td>120 - UNCERTAIN, Process Related, No Maintenance, Not Limited</td>
<td>120 - UNCERTAIN, Process Related, No Maintenance, Not Limited</td>
<td>N/A</td>
</tr>
<tr>
<td>Primary Value Failure - Sensor Beyond Operating Limits</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>37 or 38 - BAD, Maintenance Alarm, Lo / Hi Limited</td>
<td>“ERROR SENSOR”</td>
</tr>
<tr>
<td>Terminal Temperature Failure</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>75 - Uncertain, Substitute set, Constant</td>
<td>36 - BAD, Maintenance Alarm, Not Limited</td>
<td>“ERROR DEVICE”</td>
</tr>
<tr>
<td>Terminal Temperature Out of Operating Range</td>
<td>NA (Status unchanged)</td>
<td>NA (Status unchanged)</td>
<td>NA (Status unchanged)</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Table 6-5. Output Status Bit Definition

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Condensed Status</th>
<th>AI Block OUT Status Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal Temperature Beyond Operating</td>
<td>Bad - passivated</td>
<td>0x23</td>
</tr>
<tr>
<td>Limits</td>
<td>Good, ok</td>
<td>0xB0</td>
</tr>
<tr>
<td>Calibration Error</td>
<td>Good, update event</td>
<td>0xB4</td>
</tr>
<tr>
<td></td>
<td>Good, advisory alarm, low limit</td>
<td>0xB9</td>
</tr>
<tr>
<td></td>
<td>Good, advisory alarm, high limit</td>
<td>0xBA</td>
</tr>
<tr>
<td></td>
<td>Good, critical alarm, low limit</td>
<td>0xBD</td>
</tr>
<tr>
<td></td>
<td>Good, critical alarm, high limit</td>
<td>0xBE</td>
</tr>
<tr>
<td></td>
<td>Good, function check</td>
<td>0xBC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Description</th>
<th>HEX</th>
<th>DECIMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal Temperature Beyond Operating</td>
<td>Bad - passivated</td>
<td>0x23</td>
<td>35</td>
</tr>
<tr>
<td>Limits</td>
<td>Good, ok</td>
<td>0xB0</td>
<td>128</td>
</tr>
<tr>
<td>Calibration Error</td>
<td>Good, update event</td>
<td>0xB4</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td>Good, advisory alarm, low limit</td>
<td>0xB9</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>Good, advisory alarm, high limit</td>
<td>0xBA</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Good, critical alarm, low limit</td>
<td>0xBD</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>Good, critical alarm, high limit</td>
<td>0xBE</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>Good, function check</td>
<td>0xBC</td>
<td>188</td>
</tr>
<tr>
<td>Memory Failure</td>
<td>Bad, maintenance alarm, more diagnostics available</td>
<td>0x24</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Uncertain, substitute set, constant</td>
<td>0x28</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Uncertain, process related, no maintenance</td>
<td>0x78</td>
<td>120</td>
</tr>
</tbody>
</table>
Appendix A Specifications and Reference Data

PROFIBUS PA SPECIFICATIONS

Functional

Inputs
User-selectable; sensor terminals rated to 42.4 Vdc. See “Accuracy” on page A-5 for sensor options.

Output
Single 2-wired device with digital output with Profibus PA (compliant with profile 3.02).

Isolation
Input/output isolation tested to 620 Vac (880 Vdc) at 50/60 Hz for 2 seconds minimum.

Local Display
The optional five-digit integral LCD Display includes a floating or fixed decimal point. It can also display engineering units (°F, °C, °R, K, Ω, and millivolts), milliampere, and percent of span. The display can be configured to alternate between selected display options. Display settings are preconfigured at the factory according to the standard transmitter configuration. They can be reconfigured in the field using a Profibus Class 2 master.

Humidity Limits
0–99% relative humidity

Update Time
≤ 0.5 seconds
### Physical

#### Electrical Connections

<table>
<thead>
<tr>
<th>Model</th>
<th>Power and Sensor Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>644H</td>
<td>Compression screws permanently fixed to terminal block</td>
</tr>
</tbody>
</table>

#### Materials of Construction

**Electronics Housing and Terminal Block**

- 644H: *Noryl*® glass reinforced

**Enclosure (Option code J5 or J6)**

<table>
<thead>
<tr>
<th>Housing</th>
<th>Paint</th>
<th>Cover O-ring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-copper aluminum</td>
<td>Polyurethane</td>
<td>Buna-N</td>
</tr>
</tbody>
</table>

**Materials of Construction (Stainless Steel Housing for Biotechnology, Pharmaceutical Industries, and Sanitary Applications)**

- Housing and Standard Meter Cover
  - 316 SST
- Cover O-Ring
  - Buna-N

#### Mounting

The 644H installs in a connection head or universal head mounted directly on a sensor assembly, apart from a sensor assembly using a universal head, or to a DIN rail using an optional mounting clip.

#### Weight

<table>
<thead>
<tr>
<th>Code</th>
<th>Options</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>644H</td>
<td>Profibus Head Mount Transmitter</td>
<td>92 g (3.25 oz)</td>
</tr>
<tr>
<td>M5</td>
<td>LCD Display</td>
<td>38 g (1.34 oz)</td>
</tr>
<tr>
<td>J5, J6</td>
<td>Universal Head, Standard Cover</td>
<td>577 g (20.35 oz)</td>
</tr>
<tr>
<td>J5, J6</td>
<td>Universal Head, Meter Cover</td>
<td>667 g (23.53 oz)</td>
</tr>
</tbody>
</table>

#### Weight (Stainless Steel Housing for Biotechnology, Pharmaceutical Industries, and Sanitary Applications)

<table>
<thead>
<tr>
<th>Option Code</th>
<th>Standard Cover</th>
<th>Meter Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>840 g (27 oz)</td>
<td>995 g (32 oz)</td>
</tr>
<tr>
<td>S2</td>
<td>840 g (27 oz)</td>
<td>995 g (32 oz)</td>
</tr>
<tr>
<td>S3</td>
<td>840 g (27 oz)</td>
<td>995 g (32 oz)</td>
</tr>
<tr>
<td>S4</td>
<td>840 g (27 oz)</td>
<td>995 g (32 oz)</td>
</tr>
</tbody>
</table>

#### Enclosure Ratings (644H)

All option codes (S1, S2, S3, S4, J5, J6, J7, and J8) are NEMA 4X, IP66, and IP68. Option code J6 is CSA Enclosure Type 4X.

#### Sanitary Housing Surface

Surface finish is polished to 32 RMA. Laser etched product marking on housing and standard covers.
Performance

CE Mark
The 644 meets all requirements listed under IEC 61326: Amendment 1, 1998.

Power Supply Effect
Less than ±0.005% of span per volt

Stability
RTDs and thermocouples have a stability of ±0.15% of output reading or 0.15 °C (whichever is greater) for 24 months

Vibration Effect
The 644 is tested to the following specifications with no effect on performance:

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Vibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 60 Hz</td>
<td>0.21 mm displacement</td>
</tr>
<tr>
<td>60 to 500 Hz</td>
<td>3 g peak acceleration</td>
</tr>
</tbody>
</table>

Sensor Connections

<table>
<thead>
<tr>
<th>644 Sensor Connections Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-wire RTD and Ω</td>
</tr>
<tr>
<td>3-wire RTD and Ω</td>
</tr>
<tr>
<td>4-wire RTD and Ω</td>
</tr>
<tr>
<td>T/C and mV</td>
</tr>
</tbody>
</table>

* Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.

Function Blocks

Physical Block
- The Physical Block contains physical transmitter information including manufacturer identification, device type, software tag, and unique identification.

Transducer Block
- The Transducer Block contains the actual temperature measurement data, including sensor 1 and terminal temperature. It includes information about sensor type and configuration, engineering units, linearization, re-ranging, damping, temperature correction, and diagnostics.

Analog Input Block (AI)
- The Analog Input Block processes the measurement and makes it available on the Profibus segment. Allows filtering, alarming, and engineering unit changes.

Turn on time
Performance within specifications in less than 20 seconds after power is applied, when damping value is set to 0 seconds.
Power Supply
Powered over Profibus with standard fieldbus power supplies. The transmitter operates between 9.0 and 32.0 Vdc, 12 mA maximum. The power terminals are rated to 42.4 Vdc (max.)

Alarms
The AI function block allows the user to configure the alarms to HI-HI, HI, LO, or LO-LO with hysteresis settings.
## Accuracy

Table A-1. Rosemount 644 Input Options and Accuracy.

<table>
<thead>
<tr>
<th>Sensor Options</th>
<th>Sensor Reference</th>
<th>Input Ranges</th>
<th>Recommended Min. Span(1)</th>
<th>Digital Accuracy(2)</th>
<th>D/A Accuracy(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-, 3-, 4-wire RTDs</td>
<td>IEC 751</td>
<td>°C</td>
<td>°F</td>
<td>°C</td>
<td>°F</td>
</tr>
<tr>
<td>Pt 100 (α = 0.00385)</td>
<td>IEC 751</td>
<td>–200 to 850</td>
<td>–328 to 1562</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 200 (α = 0.00385)</td>
<td>IEC 751</td>
<td>–200 to 850</td>
<td>–328 to 1562</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 500 (α = 0.00385)</td>
<td>IEC 751</td>
<td>–200 to 850</td>
<td>–328 to 1562</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 1000 (α = 0.00385)</td>
<td>IEC 751</td>
<td>–200 to 300</td>
<td>–328 to 572</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 100 (α = 0.003916)</td>
<td>JIS 1604</td>
<td>–200 to 645</td>
<td>–328 to 1193</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 200 (α = 0.003916)</td>
<td>JIS 1604</td>
<td>–200 to 645</td>
<td>–328 to 1193</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Ni 120</td>
<td>Edison Curve No. 7</td>
<td>–70 to 300</td>
<td>–94 to 572</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Cu 10</td>
<td>Edison Copper Winding No. 15</td>
<td>–50 to 250</td>
<td>–58 to 482</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 50 (α = 0.00391)</td>
<td>GOST 6651-94</td>
<td>–200 to 550</td>
<td>–328 to 1022</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Pt 100 (α = 0.00391)</td>
<td>GOST 6651-94</td>
<td>–200 to 550</td>
<td>–328 to 1022</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Cu 50 (α = 0.00426)</td>
<td>GOST 6651-94</td>
<td>–50 to 200</td>
<td>–58 to 392</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Cu 10 (α = 0.00428)</td>
<td>GOST 6651-94</td>
<td>–185 to 200</td>
<td>–301 to 392</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Cu 10 (α = 0.00426)</td>
<td>GOST 6651-94</td>
<td>–50 to 200</td>
<td>–58 to 392</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Cu 10 (α = 0.00428)</td>
<td>GOST 6651-94</td>
<td>–185 to 200</td>
<td>–301 to 392</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Thermocouples(4)</td>
<td>NIST Monograph 175, IEC 584</td>
<td>100 to 1820</td>
<td>212 to 3308</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Type B(5)</td>
<td>NIST Monograph 175, IEC 584</td>
<td>–50 to 1000</td>
<td>–58 to 1832</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Type E</td>
<td>NIST Monograph 175, IEC 584</td>
<td>–180 to 760</td>
<td>–292 to 1400</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Type K(6)</td>
<td>NIST Monograph 175, IEC 584</td>
<td>–180 to 1372</td>
<td>–292 to 2501</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Type N</td>
<td>NIST Monograph 175, IEC 584</td>
<td>–200 to 1300</td>
<td>–328 to 2372</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Type R</td>
<td>NIST Monograph 175, IEC 584</td>
<td>0 to 1768</td>
<td>32 to 3214</td>
<td>25</td>
<td>45</td>
</tr>
</tbody>
</table>

(1) No minimum or maximum span restrictions within the input ranges. Recommended minimum span will hold noise within accuracy specification with damping at zero seconds.

(2) The published digital accuracy applies over the entire sensor input range. Digital output can be accessed by Profibus Communications or Rosemount control system.

(3) Total Analog accuracy is the sum of digital and D/A accuracies. This is not applicable for FOUNDATION fieldbus.

(4) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.5 °C (cold junction accuracy).

(5) Digital accuracy for NIST Type B T/C is ±3.0 °C (±5.4 °F) from 100 to 300 °C (212 to 572 °F).

(6) Digital accuracy for NIST Type K T/C is ±0.70 °C (±1.26 °F) from –180 to –30 °C (–292 to –26 °F).
Ambient Temperature Effect

<table>
<thead>
<tr>
<th>Sensor Options</th>
<th>Sensor Reference</th>
<th>Input Range (°C)</th>
<th>Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature(1)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-, 3-, 4-wire RTDs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt 100 (α = 0.00385)</td>
<td>IEC 751</td>
<td>-200 to 850</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 200 (α = 0.00385)</td>
<td>IEC 751</td>
<td>-200 to 850</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 500 (α = 0.00385)</td>
<td>IEC 751</td>
<td>-200 to 850</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 1000 (α = 0.00385)</td>
<td>IEC 751</td>
<td>-200 to 300</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 100 (α = 0.003916)</td>
<td>JIS 1604</td>
<td>-200 to 645</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 200 (α = 0.003916)</td>
<td>JIS 1604</td>
<td>-200 to 645</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Ni 120</td>
<td>Edison Curve No. 7</td>
<td>-70 to 300</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 10</td>
<td>Edison Copper Winding No. 15</td>
<td>-50 to 250</td>
<td>0.03 °C (0.054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 50 (α = 0.00391)</td>
<td>GOST 6651-94</td>
<td>-200 to 550</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 100 (α = 0.00391)</td>
<td>GOST 6651-94</td>
<td>-200 to 550</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 50 (α = 0.00426)</td>
<td>GOST 6651-94</td>
<td>-50 to 200</td>
<td>0.008 °C (0.0144 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 100 (α = 0.00426)</td>
<td>GOST 6651-94</td>
<td>-185 to 200</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 100 (α = 0.00428)</td>
<td>GOST 6651-94</td>
<td>-185 to 200</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 50 (α = 0.00428)</td>
<td>GOST 6651-94</td>
<td>-185 to 200</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 50 (α = 0.00391)</td>
<td>GOST 6651-94</td>
<td>-200 to 550</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Pt 100 (α = 0.00391)</td>
<td>GOST 6651-94</td>
<td>-200 to 550</td>
<td>0.003 °C (0.0054 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 100 (α = 0.00426)</td>
<td>GOST 6651-94</td>
<td>-200 to 550</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>Cu 100 (α = 0.00428)</td>
<td>GOST 6651-94</td>
<td>-200 to 550</td>
<td>0.004 °C (0.0072 °F)</td>
<td>Entire Sensor Input Range</td>
</tr>
</tbody>
</table>

**Thermocouples**

<table>
<thead>
<tr>
<th>Sensor Options</th>
<th>Sensor Reference</th>
<th>Input Range (°C)</th>
<th>Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature(1)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B</td>
<td>NIST Monograph 175, IEC 584</td>
<td>100 to 1820</td>
<td>0.014 °C</td>
<td>T ≥ 1000 °C</td>
</tr>
<tr>
<td>Type E</td>
<td>NIST Monograph 175, IEC 584</td>
<td>-50 to 1000</td>
<td>0.054 °C – (0.0011% of (T – 100))</td>
<td>100 °C ≤ T &lt; 300 °C</td>
</tr>
<tr>
<td>Type J</td>
<td>NIST Monograph 175, IEC 584</td>
<td>-180 to 760</td>
<td>0.0054 °C + (0.0025% of absolute value T)</td>
<td>T &lt; 0 °C</td>
</tr>
<tr>
<td>Type K</td>
<td>NIST Monograph 175, IEC 584</td>
<td>-180 to 1372</td>
<td>0.0061 °C + (0.0054% of T)</td>
<td>T &lt; 0 °C</td>
</tr>
<tr>
<td>Type N</td>
<td>NIST Monograph 175, IEC 584</td>
<td>-200 to 1300</td>
<td>0.0068 °C + (0.0036% of T)</td>
<td>All</td>
</tr>
<tr>
<td>Type R</td>
<td>NIST Monograph 175, IEC 584</td>
<td>0 to 1768</td>
<td>0.016 °C</td>
<td>T ≥ 200 °C</td>
</tr>
<tr>
<td>Type S</td>
<td>NIST Monograph 175, IEC 584</td>
<td>0 to 1768</td>
<td>0.016 °C</td>
<td>T ≥ 200 °C</td>
</tr>
<tr>
<td>Type T</td>
<td>NIST Monograph 175, IEC 584</td>
<td>-200 to 400</td>
<td>0.0064 °C</td>
<td>T &lt; 0 °C</td>
</tr>
<tr>
<td>DIN Type L</td>
<td>DIN 43710</td>
<td>-200 to 900</td>
<td>0.0054 °C + (0.0025% of absolute value T)</td>
<td>T &lt; 0 °C</td>
</tr>
<tr>
<td>DIN Type U</td>
<td>DIN 43710</td>
<td>-200 to 900</td>
<td>0.0064 °C</td>
<td>T &lt; 0 °C</td>
</tr>
<tr>
<td>Type W5Re/W26Re</td>
<td>ASTM E 988-96</td>
<td>0 to 2000</td>
<td>0.016 °C</td>
<td>T ≥ 200 °C</td>
</tr>
<tr>
<td>GOST Type L</td>
<td>GOST R 8.585-2001</td>
<td>-200 to 800</td>
<td>0.007 °C</td>
<td>T ≥ 0 °C</td>
</tr>
</tbody>
</table>

Other Input Types

<table>
<thead>
<tr>
<th>Sensor Options</th>
<th>Input Range</th>
<th>Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature(1)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millivolt Input</td>
<td>-10 to 100 mV</td>
<td>0.0005 mV</td>
<td>Entire Sensor Input Range</td>
</tr>
<tr>
<td>2-, 3-, 4-wire Ohm</td>
<td>0 to 2000 Ω</td>
<td>0.0084 Ω</td>
<td>Entire Sensor Input Range</td>
</tr>
</tbody>
</table>

(1) Change in ambient is with reference to the calibration temperature of the transmitter 68 °F (20 °C) from factory.

Transmitters can be installed in locations where the ambient temperature is between –40 and 85 °C (–40 and 185 °F). In order to maintain excellent accuracy performance, each transmitter is individually characterized over this ambient temperature range at the factory.
DIMENSIONAL DRAWINGS

644H (DIN A Head Mount)
Shown with Standard Compression Screw Terminals

<table>
<thead>
<tr>
<th>Threaded-Sensor Universal Head (Option code J5, J6, J7 or J8)</th>
<th>Integral DIN Style Sensor Connection Head (see Sensor PDS for ordering options)</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Diagram of 644H Head Mount]</td>
<td>![Diagram of Integral DIN Style Sensor Connection Head]</td>
</tr>
</tbody>
</table>

Note: A “U” Bolt is shipped with each universal head unless assembly option XA is ordered. Since the head is integrally mounted to the sensor, it may not need to be used.

Note: If ordering the transmitter with a DIN style sensor, it is required that the enclosure be ordered within the Sensor Model (Product Data Sheet doc # 00813-0200-2654) rather than within the transmitter model, this is in order to drive necessary parts.

Dimensions are in millimeters (inches)
### 644H with LCD Display

- Captive Mounting Screws and Springs
- Meter Spacer
- 10 pin Connector
- LCD Display

### Mounting Kits for 644H

<table>
<thead>
<tr>
<th>644R Rail &amp; Walls Clips</th>
<th>644H Rail Clips</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-Rail (asymmetric)</td>
<td>Top Hat Rail (symmetric)</td>
</tr>
<tr>
<td>G-Rail Grooves</td>
<td>Mounting Hardware</td>
</tr>
<tr>
<td>Top Hat Rail Grooves</td>
<td>Transmitter</td>
</tr>
<tr>
<td>Screw Holes for Mounting to a Wall</td>
<td>Rail Clip</td>
</tr>
<tr>
<td></td>
<td>Transmitter</td>
</tr>
<tr>
<td></td>
<td>Rail Clip</td>
</tr>
</tbody>
</table>

**Note:** Kit (part number 00644-5301-0010) includes mounting hardware and both types of rail kits.

### 644H Retrofit Kit

- Existing Threaded Sensor Connection Head (former option code L1)
- Kit includes replacement bracket and screws.

**Note:** Kit (part number 00644-5321-0010) includes a new mounting bracket and the hardware necessary to facilitate the installation.
ORDERING INFORMATION

Table A-2. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.

The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>644</td>
<td>Smart Temperature Transmitter</td>
</tr>
</tbody>
</table>

### Transmitter Type

<table>
<thead>
<tr>
<th>Standard</th>
<th>Head Mount (suitable for mounting in the field with enclosure options below)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>★</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Head</td>
<td>Rail</td>
</tr>
<tr>
<td>A</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>F</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>W</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Product Certifications

<table>
<thead>
<tr>
<th>Hazardous Locations Certificates (consult factory for availability)</th>
<th>A</th>
<th>F</th>
<th>W</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E5(1) FM Explosion–Proof</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>I5(2) FM Intrinsic Safety (includes standard I.S. and FISCO for fieldbus units)</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>K5(2) FM Intrinsic Safety and Explosion–Proof combination (includes standard I.S. and FISCO for fieldbus units)</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>KC FM/CSA Intrinsic Safety and Non-incendive Approval</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>I6(2) CSA Intrinsic Safety (includes standard I.S. and FISCO for fieldbus units)</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>K6(1)(3) CSA Intrinsic Safety and Explosion–Proof combination (includes standard I.S. and FISCO for fieldbus units)</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>I3 NEPSI Intrinsic Safety</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>E3 NEPSI Flameproof</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>E1(1) ATEX Flameproof</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>N1(1) ATEX Type n Component</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>ND(1) ATEX Dust Ignition–Proof</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>I1(2) ATEX Intrinsic Safety (includes standard I.S. and FISCO for fieldbus units)</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>E7(1) IECEx Flameproof and Dust</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>I7(3)(2) IECEx Intrinsic Safety (includes standard I.S. and FISCO for fieldbus units)</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>N7(1)(3) IECEx Type n</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>NG IECEx Type n Component</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>E4(1)(3) TIIS Explosion–Proof</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>E2 INMETRO Flameproof</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>NA No approval</td>
<td>●</td>
<td>●</td>
<td>–</td>
<td>●</td>
</tr>
</tbody>
</table>

### OPTIONS

<table>
<thead>
<tr>
<th>Plant Web Software Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
</tr>
<tr>
<td>A01 Regulatory Control Suite – 1 PID Block</td>
</tr>
</tbody>
</table>

### Assembly

<table>
<thead>
<tr>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>XA</td>
</tr>
</tbody>
</table>
### Table A-2. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.

The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) SST pipe bracket (M20 entries)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>J5(4)(5) Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) SST pipe bracket (1/2–14 NPT entries)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>J6(3) Universal Head (junction box), cast SST with 50.8 mm (2-in.) SST pipe bracket (M20 entries)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>J7(3)(5) Universal Head (junction box), cast SST with 50.8 mm (2-in.) SST pipe bracket (1/2–14 NPT entries)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Expanded</td>
<td>Connection Head, Polished Stainless Steel (1/2–14 NPT entries)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S1</td>
<td>Connection Head, Polished Stainless Steel (1/2–14 NPSM entries)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S2</td>
<td>Connection Head, Polished Stainless Steel (M20 x 1.5 conduit and entries)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S4</td>
<td>Connection Head, Polished Stainless Steel (M20 x 1.5 conduit entries, M24 x 1.5 head entry)</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local Display (644H only)</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>LCD Display</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Expanded</td>
<td>LCD Display with Polycarbonate Meter Face</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Factory configuration date, descriptor, and message fields (CDS, document number 00806-0100-4728 required).</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog Output</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: high alarm configuration</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>A1</td>
<td>Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: low alarm configuration</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>CN</td>
<td>Low Alarm (standard Rosemount alarm and saturation values)</td>
<td>●</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Filter</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>60 Hz line voltage filter</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trim</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Transmitter-sensor matching, trim to specific Rosemount RTD calibration schedule (CVD constants)</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calibration Option</th>
<th>Standard</th>
<th>Head</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>5-point calibration. Use option code Q4 to generate a calibration certificate</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>C4</td>
<td>Calibration certificate. 3-Point calibration with certificate</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Table A-2. Rosemount 644 Smart Temperature Transmitter Ordering Information

The Standard offering represents the most common models and options. These options should be selected for best delivery.

The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

<table>
<thead>
<tr>
<th>Accessory Options</th>
<th>Standard</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G1</strong> External ground lug assembly(6) (see “External Ground Screw Assembly” on page A-12)</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
<tr>
<td><strong>G2</strong> Cable gland(7), EEx d, Brass, 7.5 mm - 11.99 mm</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
<tr>
<td><strong>G7</strong> Cable gland, M20x1.5, EEx e, Blue, Polyamide, Diam 5-9mm</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
<tr>
<td><strong>G3</strong> Cover chain. Only available with enclosure option codes J5 or J6. Not available with LCD Display option code M5.</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
<tr>
<td><strong>G5</strong> WAGO spring clamp terminals</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessory Options</th>
<th>Standard</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GE(8)</strong> Eurofast® Interlinkbt Connector</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
<tr>
<td><strong>GM(8)</strong> Minifast® Interlinkbt Connector</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Label</th>
<th>Standard</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EL</strong> External label for ATEX Intrinsic Safety</td>
<td>● ● ● –</td>
<td>★</td>
</tr>
</tbody>
</table>

Typical Rail Mount Model Number: 644 R A I5
Typical Head Mount Model Number: 644 H F I5 M5 J5 C1

1. Requires enclosure option J5, J6, J7, or J8.
2. When IS approval is ordered on a Profibus PA, both standard IS and FISCO IS approvals apply. The device label is marked appropriately.
3. Consult factory for availability.
4. Suitable for remote mount configuration.
5. When ordered with XA, 1/2" NPT enclosure will come equipped with an M20 adapter with the sensor installed as process ready.
6. Only available with enclosure option code J5 or J6. For ATEX approved units the Ground Lug Assembly is included. It is not necessary to include code G1 for units with ATEX approvals.
7. Only available with Enclosure option code J5.
8. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe or non-incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1009 to maintain NEMA 4X rating.

**NOTE**

For additional options (e.g. “K” codes), please contact your local Emerson Process Management representative.
Tagging

Hardware
- 13 characters total
- Tags are adhesive labels
- Permanently attached to transmitter
- Character height is 1/16-in (1.6 mm)

Software
- Order with C1 option
- The transmitter can store up to 13 characters for Profinet PA. If no characters are specified, the first 8 characters of the hardware tag are the default.

Considerations

Special Mounting Considerations
See “Mounting Kits for 644H” on page A-8 for the special hardware that is available to:
- Mount a 644H to a DIN rail. (see Table A-3 on page A-12)
- Retrofit a new 644H to replace an existing 644H transmitter in an existing threaded sensor connection head. (see Table A-3 on page A-12)

External Ground Screw Assembly
The external ground screw assembly can be ordered by specifying code G1 when an enclosure is specified. However, some approvals include the ground screw assembly in the transmitter shipment, hence it is not necessary to order code G1. The table below identifies which approval options include the external ground screw assembly and which do not.

<table>
<thead>
<tr>
<th>Approval Type</th>
<th>External Ground Screw Assembly Included?</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5, I1, I2, I5, I6, I7, K5, K6, NA, I4</td>
<td>No—Order option code G1</td>
</tr>
<tr>
<td>E1, E2, E3, E4, E7, K7, N1, N7, ND</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table A-3. Transmitter Accessories

<table>
<thead>
<tr>
<th>Part Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum alloy Universal Head, standard cover—M20 entries</td>
<td>00644-4420-0002</td>
</tr>
<tr>
<td>Aluminum alloy Universal Head, meter cover—M20 entries</td>
<td>00644-4420-0102</td>
</tr>
<tr>
<td>Aluminum alloy Universal Head, standard cover—1/2-14 NPT entries</td>
<td>00644-4420-0001</td>
</tr>
<tr>
<td>Aluminum alloy Universal Head, meter cover—1/2-14 NPT entries</td>
<td>00644-4420-0101</td>
</tr>
<tr>
<td>LCD Display (includes meter and meter spacer assembly)</td>
<td>00644-4430-0002</td>
</tr>
<tr>
<td>LCD Display kit (includes meter and meter spacer assembly, and meter cover)</td>
<td>00644-4430-0001</td>
</tr>
<tr>
<td>Ground screw assembly kit</td>
<td>00644-4431-0001</td>
</tr>
<tr>
<td>Kit, Hardware for mounting a 644H to a DIN rail (includes clips for symmetrical and asymmetrical rails)</td>
<td>00644-5301-0010</td>
</tr>
<tr>
<td>Kit, Hardware for retrofitting a 644H in an existing threaded sensor connection head (former option code L1)</td>
<td>00644-5321-0010</td>
</tr>
<tr>
<td>Kit, 316 U-Bolt for Universal Housing</td>
<td>00644-4423-0001</td>
</tr>
<tr>
<td>Universal clip for rail or wall mount</td>
<td>03044-4103-0001</td>
</tr>
<tr>
<td>24 Inches of symmetric (top hat) rail</td>
<td>03044-4200-0001</td>
</tr>
<tr>
<td>24 Inches of asymmetric (G) rail</td>
<td>03044-4201-0001</td>
</tr>
<tr>
<td>Ground clamp for symmetric or asymmetric rail</td>
<td>03044-4202-0001</td>
</tr>
<tr>
<td>End clamp for symmetric or asymmetric rail</td>
<td>03044-4203-0001</td>
</tr>
<tr>
<td>Snap rings kit (used for assembly to a DIN sensor – quantity 12)</td>
<td>00644-4432-0001</td>
</tr>
<tr>
<td>SST Universal Head, standard cover—M20 entries</td>
<td>00644-4433-0002</td>
</tr>
</tbody>
</table>
Table A-3. Transmitter Accessories

<table>
<thead>
<tr>
<th>Part Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SST Universal Head, meter cover—M20 entries</td>
<td>00644-4433-0102</td>
</tr>
<tr>
<td>SST Universal Head, standard cover—1/2-14 NPT entries</td>
<td>00644-4433-0001</td>
</tr>
<tr>
<td>SST Universal Head, meter cover—1/2-14 NPT entries</td>
<td>00644-4433-0101</td>
</tr>
<tr>
<td>Polished SST Connection Head, standard cover—1/2-14 NPT entries</td>
<td>00079-0312-0011</td>
</tr>
<tr>
<td>Polished SST Connection Head, meter cover—1/2-14 NPT entries</td>
<td>00079-0312-0111</td>
</tr>
<tr>
<td>Polished SST Connection Head, standard cover—1/2-14 NPSM entries</td>
<td>00079-0312-0022</td>
</tr>
<tr>
<td>Polished SST Connection Head, meter cover—1/2-14 NPSM entries</td>
<td>00079-0312-0122</td>
</tr>
<tr>
<td>Polished SST Connection Head, standard cover—M20 x 1.5 entries</td>
<td>00079-0312-0033</td>
</tr>
<tr>
<td>Polished SST Connection Head, meter cover—M20 x 1.5 entries</td>
<td>00079-0312-0133</td>
</tr>
<tr>
<td>Polished SST Connection Head, standard cover—M20 x 1.5 / M24 x 1.5 entries</td>
<td>00079-0312-0034</td>
</tr>
<tr>
<td>Polished SST Connection Head, meter cover—M20 x 1.5 / M24 x 1.5 entries</td>
<td>00079-0312-0134</td>
</tr>
</tbody>
</table>
### Dimensional Drawings

#### Sanitary Housing Covers

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Dimension (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>79.8</td>
<td>3.14</td>
</tr>
<tr>
<td>70.0</td>
<td>2.76</td>
</tr>
<tr>
<td>33</td>
<td>1.3</td>
</tr>
<tr>
<td>76.2</td>
<td>3.0</td>
</tr>
<tr>
<td>24.4</td>
<td>0.96</td>
</tr>
<tr>
<td>27.9</td>
<td>1.1</td>
</tr>
<tr>
<td>25.4</td>
<td>1.0</td>
</tr>
<tr>
<td>44.5</td>
<td>1.75</td>
</tr>
<tr>
<td>70.0</td>
<td>2.76</td>
</tr>
</tbody>
</table>

#### LCD Display Cover

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Dimension (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>2.4</td>
</tr>
<tr>
<td>74.4</td>
<td>2.93</td>
</tr>
<tr>
<td>47</td>
<td>1.85</td>
</tr>
<tr>
<td>33</td>
<td>1.3</td>
</tr>
<tr>
<td>76.2</td>
<td>3.0</td>
</tr>
<tr>
<td>27.9</td>
<td>1.1</td>
</tr>
<tr>
<td>25.4</td>
<td>1.0</td>
</tr>
<tr>
<td>44.5</td>
<td>1.75</td>
</tr>
<tr>
<td>70.0</td>
<td>2.76</td>
</tr>
</tbody>
</table>

Dimensions are in millimeters (inches)
Configuration

Transmitter Configuration
The transmitter is available with standard configuration setting for Profibus PA (see "Standard Profibus PA Configuration"). The configuration settings and block configuration may be changed in the field with Emerson’s DeltaV®, AMS™ Suite, Handheld Field Communicator or other host or configuration tool.

Standard Profibus PA Configuration
Unless specified, the transmitter will be shipped as follows:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device Address</td>
<td>126</td>
</tr>
<tr>
<td>Sensor Type</td>
<td>RTD, Pt 100 (α=0.00385, 4-wire)</td>
</tr>
<tr>
<td>Damping</td>
<td>5 sec.</td>
</tr>
<tr>
<td>Units of Measurement</td>
<td>°C</td>
</tr>
<tr>
<td>Line Voltage Filter</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Software Tag</td>
<td></td>
</tr>
<tr>
<td>Alarm Limits</td>
<td></td>
</tr>
<tr>
<td>• HI-HI</td>
<td>Infinity</td>
</tr>
<tr>
<td>• HI</td>
<td>Infinity</td>
</tr>
<tr>
<td>• LO</td>
<td>- Infinity</td>
</tr>
<tr>
<td>• LO-LO</td>
<td>Infinity</td>
</tr>
<tr>
<td>Local Display (when installed)</td>
<td>Engineering Units of Temperature</td>
</tr>
</tbody>
</table>
Appendix B  Product Certifications

Approved Manufacturing Locations . . . . . . . . . . . . . . . . . . page B-1
European Union Directive Information . . . . . . . . . . . . . . . page B-1
Hazardous Locations Certificates . . . . . . . . . . . . . . . . . . . . . . page B-2
Installation Drawings . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . page B-7

APPROVED MANUFACTURING LOCATIONS

Emerson Process Management Rosemount Division. – Chanhassen, Minnesota, USA
Rosemount Temperature GmbH – Germany
Emerson Process Management Asia Pacific – Singapore

EUROPEAN UNION DIRECTIVE INFORMATION

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

ATEX Directive (94/9/EC)
Rosemount Inc. complies with the ATEX Directive.

CE Electromagnetic Compatibility Compliance Testing
The 644 meets the criteria under IEC 61326:2006
HAZARDOUS LOCATIONS CERTIFICATES

Rosemount 644 with Profibus PA

North American Certifications

Factory Mutual (FM) Approvals

I5  FM Intrinsically Safe
Intrinsically Safe (Entity) / FISCO for use in Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G; when installed per control drawing 00644-2075.
   Temperature Code: T4A (T_{amb} = −50 \, ^\circ\text{C} to 60 \, ^\circ\text{C}).
   Nonincendive for use in Class I, Division 2, Groups A, B, C, and D.
   Temperature Code: T6 (T_{amb} = −50 \, ^\circ\text{C} to 70 \, ^\circ\text{C});
                  T5 (T_{amb} = −50 \, ^\circ\text{C} to 85 \, ^\circ\text{C})

E5  FM Explosion Proof
Explosion Proof for Class I, Division 1, Groups B, C, and D.
   Nonincendive for use in Class 1, Division 2, Groups A, B, C, and D.
   Temperature Code: T5 (T_{amb} = −50 \, ^\circ\text{C} to 85 \, ^\circ\text{C})
   When installed per Rosemount control drawing 00644-1049
   Dust Ignition Proof for Class II/III, Division 1, Groups E, F, G.
   Temperature Code: T5 (T_a = −50 \, ^\circ\text{C} to 85 \, ^\circ\text{C})
   When installed per Rosemount drawing 00644-1049.
   (J5, J6, and J8 options only.)

Canadian Standards Association (CSA) Approvals

I6  CSA Intrinsically Safe
Intrinsically Safe and FISCO for Class I, Division 1, groups A, B, C, and D when connected per Rosemount drawing 00644-2076.
   Temperature code: T4 (T_{amb} = −50 \, ^\circ\text{C} to 60 \, ^\circ\text{C});
   Suitable for Class I, Division 2, groups A, B, C, and D (must be installed in a suitable enclosure)

K6  CSA Intrinsically Safe, Explosion–proof
Includes Intrinsically Safe “I6” and Explosion-Proof for Class I, Division 1, groups B, C, and D.
   Dust-Ignition Proof for Class II, Division 1, Groups E, F, and G.
   Dust-Ignition Proof for Class III, Division 1
   Seal not required.
   CSA Enclosure Type 4X
   Temperature Code: T4 (T_{amb} = −50 \, ^\circ\text{C} to 60 \, ^\circ\text{C});
                  T5 (T_{amb} = −50 \, ^\circ\text{C} to 85 \, ^\circ\text{C})

NOTE
K6 is only available with 644H option codes J5 and J6.
European Certifications

**ATEX Approvals**

**E1** ATEX Flame Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking:  Ex d IIC T6 (–40 °C ≤ Tamb ≤ 65 °C)
U, = 32 Vdc

**SPECIAL CONDITIONS FOR SAFE USE (X):**

For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

**I1** ATEX Intrinsic Safety
Certificate Number: Baseefa03ATEX0499X
ATEX Marking:  Ex ia IIC T4 (-50 °C ≤ Tamb ≤ 60 °C)

Table B-1. Entity Parameters

<table>
<thead>
<tr>
<th>I.S. Loop/Power Terminals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U, = 30 V</td>
<td></td>
</tr>
<tr>
<td>I, = 300 mA</td>
<td></td>
</tr>
<tr>
<td>P, = 1.3 W</td>
<td></td>
</tr>
<tr>
<td>C, = 2.1 nF</td>
<td></td>
</tr>
<tr>
<td>L, = 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FISCO Loop/Power Terminals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U, = 17.5 V</td>
<td></td>
</tr>
<tr>
<td>I, = 380 mA</td>
<td></td>
</tr>
<tr>
<td>P, = 5.32 W</td>
<td></td>
</tr>
<tr>
<td>C, = 2.1 nF</td>
<td></td>
</tr>
<tr>
<td>L, = 0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensor Terminals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U, = 13.9 V</td>
<td></td>
</tr>
<tr>
<td>I, = 23 mA</td>
<td></td>
</tr>
<tr>
<td>P, = 79 mW</td>
<td></td>
</tr>
<tr>
<td>C, = 7.7 nF</td>
<td></td>
</tr>
<tr>
<td>L, = 0</td>
<td></td>
</tr>
</tbody>
</table>

**SPECIAL CONDITIONS FOR SAFE USE (X):**

The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20. Non-metallic enclosures must have a surface resistance of less than 1GΩ, light alloy or zirconium enclosures must be protected from impact and friction when installed.
N1 ATEX Type n
Certificate Number: BAS00ATEX3145
ATEX Marking:  @ II 3 G
Ex nL IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)
U_{i} = 32 V

NC ATEX Type n Component
Certificate Number: BAS99ATEX3084U
ATEX Marking:  @ II 3 G
Ex nL IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)
U_{i} = 32 V

NOTE
The equipment must be installed in an enclosure meeting the requirements of IP54 and the requirements of the impact tests described in EN50021.

ND ATEX Dust Ignition-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking:  @ II 1 D
tD A20 T95°C (-40 °C ≤ T_{amb} ≤ 85 °C)
€ 1180
IP66

SPECIAL CONDITIONS FOR SAFE USE (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

IECEx Certifications
E7 IECEx Flameproof and Dust
Certificate Number: IECEx KEM 09.0015X
Ex d IIC T6 (Flameproof)
Ex tD A20 IP 66 T 95 °C (Dust)
V_{max} = 32 V

SPECIAL CONDITIONS FOR SAFE USE (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

Table B-2. Electrical Data

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{max} = 32 Vdc</td>
<td>U_{max} = 5 Vdc</td>
</tr>
<tr>
<td>I_{max} = 12.0 mA</td>
<td>I_{max} = 2.0 mA</td>
</tr>
</tbody>
</table>

I7 IECEx Intrinsic Safety
Certificate Number: IECEx BAS 07.0053X
Ex ia IIC T4/T5/T6

Table B-3. Temperature Classification

<table>
<thead>
<tr>
<th>P_{r} (W)</th>
<th>Temperature Class</th>
<th>T_{amb}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3</td>
<td>T4</td>
<td>-50 °C to 60 °C</td>
</tr>
<tr>
<td>5.32 (FISCO Group IIC)</td>
<td>T4</td>
<td>-60 °C to 80 °C</td>
</tr>
</tbody>
</table>
SPECIAL CONDITIONS FOR SAFE USE (X):

1. The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20.
2. Non-metallic enclosures must have a surface resistance of less than 1 GΩ; light alloy or zirconium enclosures must be protected from impact and friction when installed.

Table B-4. Entity Parameters

<table>
<thead>
<tr>
<th>Transmitter (I.S.)</th>
<th>Transmitter (FISCO)</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ = 30 Vdc</td>
<td>Uᵢ = 17.5 Vdc</td>
<td>Uₒ = 13.9 Vdc</td>
</tr>
<tr>
<td>Iᵢ = 300 mA</td>
<td>Iᵢ = 380 mA</td>
<td>Iₒ = 23 mA</td>
</tr>
<tr>
<td>Pᵢ = 1.3 W</td>
<td>Pᵢ = 5.32 W</td>
<td>Pₒ = 79 mW</td>
</tr>
<tr>
<td>Cᵢ = 2.1 nF</td>
<td>Cᵢ = 2.1 nF</td>
<td>Cᵢ = 7.7 nF</td>
</tr>
<tr>
<td>Lᵢ = 0 mH</td>
<td>Lᵢ = 0 mH</td>
<td>Lᵢ = 0 mH</td>
</tr>
</tbody>
</table>

**N7** IECEx Type n
Certificate Number: IECEx BAS 07.0055
Ex nA nL IIC T5 (-40 °C ≤ Tᵦmb ≤ 70 °C)

Table B-5. Electrical Data

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uᵢ = 32 V</td>
<td>RTD</td>
</tr>
<tr>
<td>Uᵢ = 5 V</td>
<td>Thermocouple</td>
</tr>
<tr>
<td>Uᵢ = 0</td>
<td></td>
</tr>
</tbody>
</table>

**NG** IECEx Type n Component
Certificate Number: IECEx BAS 07.0054U
Ex nA nL IIC T5 (-40 °C ≤ Tᵦmb ≤ 75 °C)
Input Parameter: Ui = 32 Vdc

**SCHEDULE OF LIMITATIONS:**
The component must be housed in a suitably certified enclosure that provides a degree of protection of at least IP54.

**Japanese Certifications**

*Japanese Industrial Standard (JIS) Approvals*

I4 JIS Intrinsic Safety
E4 JIS Explosion Proof

Table B-6. Certificate and Description

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Description</th>
<th>Approval Group</th>
<th>Temp Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>C15744</td>
<td>644H with meter and no sensor</td>
<td>Ex d II C</td>
<td>T6</td>
</tr>
<tr>
<td>C15745</td>
<td>644H without meter and no sensor</td>
<td>Ex d II C</td>
<td>T6</td>
</tr>
<tr>
<td>C15749</td>
<td>644H without meter and with RTD</td>
<td>Ex d II B</td>
<td>T4</td>
</tr>
<tr>
<td>C15750</td>
<td>644H without meter and with thermocouple</td>
<td>Ex d II B</td>
<td>T4</td>
</tr>
</tbody>
</table>
Table B-6. Certificate and Description

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Description</th>
<th>Approval Group</th>
<th>Temp Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>C15751</td>
<td>644H with meter and thermocouple</td>
<td>Ex d II B</td>
<td>T4</td>
</tr>
<tr>
<td>C15752</td>
<td>644H with meter and RTD</td>
<td>Ex d II B</td>
<td>T4</td>
</tr>
<tr>
<td>C15910</td>
<td>644H without meter and with thermocouple</td>
<td>Ex d II B + H2</td>
<td>T4</td>
</tr>
<tr>
<td>C15911</td>
<td>644H with meter and thermocouple</td>
<td>Ex d II B + H2</td>
<td>T4</td>
</tr>
<tr>
<td>C15912</td>
<td>644H without meter and with RTD</td>
<td>Ex d II B + H2</td>
<td>T4</td>
</tr>
<tr>
<td>C15913</td>
<td>644H with meter and RTD</td>
<td>Ex d II B + H2</td>
<td>T4</td>
</tr>
</tbody>
</table>

Combination Approvals
K5  Combination of I5 and E5.

Russian GOST Certifications
PPC BA-13006:
0 Ex ia IIC T4/T5/T6

Kazakhstan GOST
Pattern approval Certificate for Measuring Instruments
See Certificate

Ukraine GOST
Pattern Approval for Measuring Instruments
See Certificate
The installation guidelines presented by the drawings must be followed in order to maintain certified ratings for installed transmitters.

Rosemount Drawing 00644-1064, 1 Sheet, Canadian Standards Association Intrinsic Safety Installation Drawing

Rosemount Drawing 00644-1059, 1 Sheet; Canadian Standards Association Explosion-Proof Installation Drawing

Rosemount Drawing 00644-2076, 3 Sheets; Canadian Standards Association 644 Fieldbus Intrinsic Safety/FISCO Installation Drawing

Rosemount Drawing 00644-0009, 2 Sheet Factory Mutual Intrinsic Safety Installation Drawing

Rosemount Drawing 00644-1049, 1 Sheet; Factory Mutual Explosion-proof Installation Drawing

Rosemount Drawing 00644-2075, 3 Sheets; Factory Mutual 644 Fieldbus Intrinsic Safety/FISCO Installation Drawing

IMPORTANT
Once a device labeled with multiple approval types is installed, it should not be reinstalled using any of the other labeled approval types. To ensure this, the approval label should be permanently marked to distinguish the used from the unused approval type(s).
CSA INTRINSIC SAFETY APPROVAL CONFIGURATION

644 & 244E CIRCUIT CONNECTION WITH CSA APPROVED BARRIER

Exd

Intrinsically Safe/Securite Intrinsique

Figure B.1: CSA Intrinsic Safety Installation Drawing 00644-1064, Rev. AB

INTRINSICALLY SAFE OUTPUT PARAMETERS
CLASS I, DIVISION 1

GROUPS A, C, AND D

If $T_{a} - 50^\circ C 
\leq 60^\circ C$

- 30V or less, 200 ohms or more (196)
- 25V or less, 200 ohms or more (188)
- 22V or less, 150 ohms or more (174)

If $T_{a} - 50^\circ C 
< 60^\circ C$

- 30V or less, 250 ohms or more (186)
- 28V or less, 200 ohms or more (168)
- 25V or less, 200 ohms or more (188)
- 22V or less, 150 ohms or more (174)

GROUPS B, C, AND D

If $T_{a} - 50^\circ C 
\leq 60^\circ C$

- 30V or less, 250 ohms or more (186)
- 28V or less, 200 ohms or more (168)
- 25V or less, 150 ohms or more (174)

NOTES:

- Watts: (Watts x 0.8) = U.S. [Pounds] x F.S.U. (Current)
- Power limited to 60 Watts to limit thermal rise
- Power limited to 90 Watts to ensure 210 rating of protection components
- The 644 & 244E must be installed in a suitable enclosure. Refer to installation codes stipulated in the Canadian Electrical Code (NEC).
Figure B-3. CSA 644 Fieldbus Intrinsic Safety, FISCO Installation Drawing 00644-2076, Rev. AB Sheet 1 of 3
FISCO FOR CLASS I, DIVISION 1, GROUPS A, B, C, D

NOTES:

2.1 FISCO IS A SUBSET OF STANDARD INTRINSICALLY SAFE INSTALLATION (SEE PAGE 11) EXCEPT AS SPECIFICALLY NOTED HERE.

2.2 AMBIENT TEMPERATURE LIMITS: T4 (-50°C ≤ T ≤ 60°C).

WHAT IS FISCO?

FIELD-AND-INTRINSICALLY SAFE CONCEPT IS A PARTICULAR, YET SUFFICIENTLY FLEXIBLE, APPROACH UPON INSTALLATION CONFIGURATION THAT ALLOWS FOR A CONTROLLED DISTRIBUTION OF THE ELECTRICAL CHARACTERISTICS AROUND THE SEGMENT.

WHAT ARE THE LIMITATIONS WITHIN THE BOUNDS OF THIS CONCEPT?

A. MORE DEVICES ARE ALLOWED ON THE FIELD AND MORE POWER CAN BE APPLIED.
B. THE R, L, AND C CHARACTERISTICS OF THE FIELD-CABLE NEED NOT BE CALCULATED.

FIELD-CABLE CONFIGURATIONS:

LENGTH:
- TURNT SP: 1000 m
- TURNT B: 20 m
- TURNT C: 2 m

CABLE PROPERTIES:
- LOOP RESISTANCE: R ≤ 150 Ω/mm
- INDUCTANCE: L ≤ 0.4 H/m
- CAPACITANCE: C: 80 to 200 nF/m
- C: 0 V TO-LINE TO-LINE
  - C LINE TO-LINE + C LINE TO SHIELD + FOR BOTH LINES FLOATING WITH RESPECT TO SHIELD
  - C LINE TO-LINE + C LINE TO SHIELD (FOR THE LINE TIED TO SHIELD)

APPARATUS CRITERIA:

2.6 (L) + (L) AND (L) ≤ 10 Ω FOR EACH APPARATUS, OTHER THAN THE TERMINATOR, CONNECTED TO THE FIELD-CABLE.

2.4 Routing TERMINATOR AND (L) ≤ 10 Ω FOR THE LINE TERMINATION. THIS TERMINATION MAY BE INTEGRATED INTO AN APPARATUS.

2.5 EACH APPARATUS, OTHER THAN THE ASSOCIATED APPARATUS, MUST BE PASSIVE, NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM.

2.6 INTERCONNECTION IS ALLOWED WHEN THE FOLLOWING IS TRUE:

<table>
<thead>
<tr>
<th>1.5 APPARATUS</th>
<th>ASSOCIATED APPARATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TURNT SP: 20 m</td>
<td>TURNT SP: 20 m</td>
</tr>
<tr>
<td>TURNT B: 2 m</td>
<td>TURNT B: 2 m</td>
</tr>
<tr>
<td>TURNT C: 2 m</td>
<td>TURNT C: 2 m</td>
</tr>
</tbody>
</table>

COSA 06/34-2016
CSA INTRINSIC SAFETY APPROVAL CONFIGURATION
644H FIELDBUS CIRCUIT CONNECTION
WITH CSA APPROVED BARRIER
Ex ia
PARAMETRIC INSTALLATION

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT: La Substitution de composants peut compromettre la sécurité intrinsèque.

GROUPS A, B, AND C

GROUPS C AND D

UNIVERSAL HEAD ENCLOSURE OPTIONS:

J5
J6

TRANSmitter MODEL NUMBERS:

640GF

NOTES:

1. TRANSFORMER X 1.5, CURRENTS 1.5 F.D.S. CURRENTS REFERENCED TO FIGURE 2 OF C22.2 NO. 157-87.

POWER LIMITED TO 1.8 WATTS TO ENSURE 25% RATING OF PROTECTION COMPONENTS.

THE 644H FIELDBUS MUST BE INSTALLED IN A SUITABLE ENCLOSURE TO MEET INSTALLATION CODES STIPULATED IN THE CANADIAN ELECTRICAL CODE (CEC).

4. SENSOR MUST BE SIMPLE APPARATUS DEVICE.
ROSEMOUNT 644 & 244E TRANSMITTERS ARE FM/IC APPROVED AS INTRINSICALLY SAFE AND CAN BE USED IN
CIRCUIT WITH AN APPROVED ASSOCIATED APPARATUS WHICH MEETS THE ENTITY PARAMETERS LISTED
IN CLASSES I, II, III, DIVISION 1 AND 2, AND GROUPS A, B, C, D, E, F, AND G.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER
AND ASSOCIATED APPARATUS MUST BE USED IN ACCORDANCE
WITH THE ASSOCIATED APPARATUS MANUFACTURER'S
FIELD WIRING INSTRUCTIONS AND THE
CIRCUIT DIAGRAM SHOWN BELOW.

NOTES:

1.1 ONLY EQUIPMENT CLASSIFIED AS SIMPLE APPARATUS,
SUCH AS THERMOCOUPLES AND RTD'S MAY BE
CONNECTED TO SENSOR TERMINALS.

1.2 NO REVISION TO DRAWING WITHOUT PRIOR FACTORY
MUTUAL APPROVAL.

1.3 ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION
DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS
EQUIPMENT.

1.4 THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF
INTRINSICALLY SAFE APPARATUS WITH ASSOCIATED
APPARATUS WHEN THE FOLLOWING IS TRUE:

1.5 DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN
INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

1.11 UNIVERSAL HEA 35, 36

1.12 RAIL MOUNT MODELS NUMBERS 644R, 244ER

REFERENCES

HIGHER DEFINED VALUES FOR DENOTED OUTPUT PARAMETER LIMITS PAGES 6 & 7
THE EX AND Zone ARE FIDE APPROVED AS NON-INCIENT FOR CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS (CLASSIFIED) LOCATIONS.

TO ASSURE A NON-INCIENT SYSTEM, THE TRANSMITTER AND ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH THE ASSOCIATED APPARATUS MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.

**Hazardous Area**

**Sensor Terminal Output Specifications:**
- \( V_{in} = 13.6 \, \text{Vdc} \)
- \( I_{in} = 10 \, \text{mA} \)
- \( R_{in} = 10 \, \text{kΩ} \)
- \( C_{in} = 0.074 \, \mu\text{F} \)
- \( L_{in} = 600 \, \mu\text{H} \)

**Current Temperature Limits:**
- \( T < 50 \, \text{°C} < 95 \, \text{°C} \)

**Non-hazardous Area**

**Associated Apparatus Specifications:**
- \( U_{in} \leq 30 \, \text{Vdc} \)
- \( P_{in} \leq 1.0 \, \text{W} \)
- OR
- \( P_{in} \leq 0.67 \, \text{A} \)
- \( C_{in} > 0.056 \, \mu\text{F} \)
- \( L_{in} > 0.0 \, \mu\text{H} \)

**Notes:**

1. TRANSMITTER MUST BE INSTALLED IN A SUITABLE RATED ENCLOSURE.
2. ONLY EQUIPMENT CLASSIFIED AS SIMPLE APPARATUS, SUCH AS THERMOCOUPLES AND RTD'S, MAY BE CONNECTED TO SENSOR TERMINALS.

**Rosemount 644**

Reference Manual
00809-0300-4728, Rev AA
January 2011

Sheet 2 of 2
HAZARDOUS (CLASSIFIED) LOCATION

EXPLOSION PROOF FOR CLASS I, DIV. 1, GROUPS B, C, D
DUST-IGNITION PROOF FOR CLASS I, II, III, DIV. 1, GROUPS E, F, G
NONINCENDIVE FOR CLASS I, DIV 2, GROUPS A, B, C, D
AMBIENT TEMPERATURE LIMITS: -60°C TO +60°C

8. WHEN SUPPLIED WITH ROSEMOUNT MODEL 68, 78 OR 183 TEMPERATURE SENSOR, THE AMBIENT TEMPERATURE RATING IS DEGRADED TO -40°C TO 85°C.

1. SPRING LOADED TEMPERATURE SENSORS MUST BE PLACED IN A LISTED OR APPROVED THERMOCOUPLE RATED FOR APPROPRIATE AREA CLASSIFICATION TO PROVIDE A SEAL FROM THE PROCESS.

6. TEMPERATURE SENSOR ASSEMBLY MUST BE FM APPROVED FOR APPROPRIATE AREA CLASSIFICATION.

5. CONDUIT AND SENSOR MUST BE ASSEMBLED TO UNIVERSAL HEAD USING THREAD SEALANT OR TAPE.

⚠️ FM EXPLOSIONPROOF ENCLOSURE OPTIONS: JS OR JS.

3. FOR FIELD WIRING CONNECTIONS IN AMBIENT TEMPERATURES ABOVE 60°C USE WIRING RATED TO AT LEAST 90°C.

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

⚠️ INSTALL PER NATIONAL ELECTRICAL CODE (NEC). CONDUIT SEAL NOT REQUIRED FOR COMPLIANCE WITH NEC 501-6A-11.

NOTES:

B-15
ROSEMOUNT 644 FIELDBUS TRANSMITTERS ARE FM APPROVED AS INTRINSICALLY SAFE WHEN USED IN CIRCUIT WITH AN APPROVED ASSOCIATED APPARATUS WHICH MEETS THE ENTITY PARAMETERS LISTED IN CLASS I, II, III, DIVISION 1 AND 2, AND GROUPS A, B, C, D, E, F AND G.

TO ACHIEVE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH THE ASSOCIATED APPARATUS MANUFACTURER'S FIELD INSTALLATION INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.

NOTES:

1.1 ONLY EQUIPMENT CLASSIFIED AS SIMPLE APPARATUS, SUCH AS THERMOCOUPLES AND RTD'S MAY BE CONNECTED TO SENSOR TERMINALS.

1.2 NO REVISION TO DRAWING WITHOUT PRIOR FM APPROVAL.

1.3 ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.

1.4 THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:

Vmax or U ≤ 60 Vdc, f ≤ 60 Hz

IMP or P ≤ 1 W

CIL ≤ 0.011 µF

LIL ≤ 0.011 H

1.5 DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.

1.11 UNIVERSAL HEAD J5, J8
ROSEMOUNT 644 FIELD TRANSMITTERS ARE FM APPROVED AS FISCO WHEN USED IN
CIRCUIT WITH AN APPROVED ASSOCIATED APPARATUS WHICH MEETS THE ENTITY PARAMETERS LISTED
IN CLASS 1, II, III, DIVISION 1 AND 2, AND GROUPS A, B, C, D, E, F AND G.

TO ASSURE A FISCO SYSTEM, THE TRANSMITTERS AND
ASSOCIATED APPARATUS MUST BE NITED IN ACCORDANCE
WITH THE ASSOCIATED APPARATUS MANUFACTURER’S
FIELD INSTALLATION INSTRUCTIONS AND THE CIRCUIT
DIAGRAM SHOWN BELOW.

Hazardous Area

ROSEMOUNT 644

Class II, Div I, Group A, B, C, D


Notes:
2.1 FISCO IS A SURFACE OF STANDARD INHERENTLY SAFE INSTALLATION (SEE PAGE 1)
2.2 THE FM-FISCO INSTALLATION IS ONLY VALID WITH NOXEL OPTION CODES 11, 12 OR 13
FM TEST CONCEPT IS A PARTICULAR, NOT SUFFICIENTLY FLEXIBLE, DISTRIUTION OF THE ELECTRICAL CHARACTERISTICS AROUND THE SEGMENT.
WHAT ARE THE BENEFITS TO INSTALLING WITHIN THE BRANDS OF THIS CONCEPT:
A. THE B, 2, L AND C CHARACTERISTICS OF THE FIELDBUS CABLE NEED NOT BE CALCULATED.

MISWIRING CONCEPT:
LENGTH:
TRUNK CABLE ≤ 1000 m
SPRING CABLE 200 m
SPLICE ≤ 1 m
CABLE PROPERTIES:
LOOPS 2 TO 150 OHM
INDUCTANCE 0.64 ± 10%
CAPACITANCE 0.6 ± 300 kF/m
2: 2 LINE-TO-LINE • 4/2 LINE-TO-SHIELD (FOR BOTH LINES FLOATING WITH
RESPOND TO GROUND)
2: 2 LINE-TO-LINE • 2 LINE-TO-SHIELD (FOR ONE LINE TIED TO SHIELD)

APPARATUS CRITERIA:
2.6 CI ≤ 0.5 MFD AND LI ≤ 0.5 H IN EACH APPARATUS, OTHER THAN THE TERMINATOR,
CONNECTED TO THE FIELDBUS.

0.6 ST TO 130 OHM AND CI ≥ 2.2 MFD FOR THE LINE TERMINATION.
THIS TERMINATION MAY BE INTEGRATED INTO AN APPARATUS.

2.5 EACH APPARATUS, OTHER THAN THE ASSOCIATED APPARATUS, MUST BE PASSIVE.
NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM.

2.6 INTERCONNECTION IS ALLOWED WHEN THE FOLLOWING IS TRUE:

<table>
<thead>
<tr>
<th>S.</th>
<th>APPARATUS (FIELD DEVICE)</th>
<th>ASSOCIATED APPARATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>Vv, V1, OR V0</td>
<td>Vv, V1, OR V0</td>
</tr>
<tr>
<td>1.5</td>
<td>Pi, PI, OR PI</td>
<td>Pi, PI, OR PI</td>
</tr>
<tr>
<td>1.5</td>
<td>P, P0</td>
<td>P, P0</td>
</tr>
</tbody>
</table>

ASSOCIATED APPARATUS MANUFACTURER’S INSTALLATION DRAWINGS MUST BE FOLLOWED
WHEN INSTALLING THIS EQUIPMENT.

2.7 INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/UL508, NFPA 70.

2.8 INSTALLATION SHOULD BE IN ACCORDANCE WITH NFPA 70.
THE 644M FIELDBUS TRANSMITTER IS FM APPROVED AS NON-INCENDIVE FOR CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS (CLASSIFIED) LOCATIONS.

TO ASSURE A NON-INCENDIVE SYSTEM, THE TRANSMITTER AND ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH THE ASSOCIATED APPARATUS MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM BELOW.

NOTE:

5.1 ONLY EQUIPMENT CLASSIFIED AS SIMPLE APPARATUS, SUCH AS THERMOCOUPLES AND RTDs, MAY BE CONNECTED TO SENSOR TERMINALS.
Appendix C  Profibus Block Information

Overview ...................................................... page C-1
Safety Messages ................................................. page C-1
Resource Block .................................................. page C-2
Condensed Status ............................................... page C-7

OVERVIEW

This Appendix contains Profibus block and parameter information.

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (WARNING). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

WARNING

Explosions could result in death or serious injury.
Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approval sections of the 644 Profibus reference manual for any restrictions associated with a safe installation.

• In an Explosion-Proof/Flameproof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks could result in death or serious injury.

• Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

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

Table C-1 through Table C-3 can be used to cross reference parameters from the Profibus specification, class 2 master, DD, or DTM.

Table C-1. Physical Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16</td>
<td>BLOCK_OBJECT</td>
<td>This object contains the characteristics of the blocks.</td>
<td>The BLOCK_OBJECT parameter is the first parameter of every block. It contains the characteristics of the block e.g. block type and profile number.</td>
</tr>
<tr>
<td>0</td>
<td>17</td>
<td>ST_REV</td>
<td>Static Revision</td>
<td>Parameter that changes by 1 when the corresponding block has been modified.</td>
</tr>
<tr>
<td>0</td>
<td>18</td>
<td>TAG_DESC</td>
<td>Tag</td>
<td>A user-supplied description of the block.</td>
</tr>
<tr>
<td>0</td>
<td>19</td>
<td>STRATEGY</td>
<td>Strategy</td>
<td>The STRATEGY parameter has a user-specified value. This assigned value can be used in configuration or diagnostics as a key in sorting block information.</td>
</tr>
<tr>
<td>0</td>
<td>20</td>
<td>ALERT_KEY</td>
<td>Alert Key</td>
<td>The ALERT_KEY parameter has a user assigned value which may be used in sorting alarms or events generated by a block.</td>
</tr>
<tr>
<td>0</td>
<td>21</td>
<td>TARGET_MODE</td>
<td>Target Mode</td>
<td>The TARGET_MODE parameter indicates which mode is desired for the block. It is normally set by a control application or by an operator through a human interface application.</td>
</tr>
<tr>
<td>0</td>
<td>22</td>
<td>MODE_BLK</td>
<td>N/A</td>
<td>The MODE_BLK parameter is a structured parameter composed of the actual mode, the normal mode, and the permitted mode.</td>
</tr>
<tr>
<td>0</td>
<td>23</td>
<td>ALARM_SUM</td>
<td>N/A</td>
<td>The parameter ALARM_SUM summarizes the status of up to 16 block alarms.</td>
</tr>
<tr>
<td>0</td>
<td>24</td>
<td>SOFTWARE_REVISION</td>
<td>Software Revision</td>
<td>Revision-number of the software of the field device.</td>
</tr>
<tr>
<td>0</td>
<td>25</td>
<td>HARDWARE_REV</td>
<td>Hardware Revision</td>
<td>Revision-number of the hardware of the field device.</td>
</tr>
<tr>
<td>0</td>
<td>26</td>
<td>DEVICE_MAN_ID</td>
<td>Manufacturer ID</td>
<td>Identification code of the manufacturer of the field device.</td>
</tr>
<tr>
<td>0</td>
<td>27</td>
<td>DEVICE_ID</td>
<td>Model</td>
<td>Manufacturer specific identification of the device.</td>
</tr>
<tr>
<td>0</td>
<td>28</td>
<td>DEVICE_SER_NUM</td>
<td>Permanent Tag</td>
<td>Serial number of the field device.</td>
</tr>
<tr>
<td>0</td>
<td>29</td>
<td>DIAGNOSIS</td>
<td>Diagnosis</td>
<td>Detailed information of the device, bitwise coded.</td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>DIAGNOSIS_EXTENSION</td>
<td>Diagnosis Extension</td>
<td>Additional manufacturer-specific information of the device, bitwise coded. More than one message possible at once.</td>
</tr>
<tr>
<td>0</td>
<td>31</td>
<td>DIAGNOSIS_MASK</td>
<td>Diagnosis Mask</td>
<td>Definition of supported DIAGNOSIS information-bits. 0: not supported 1: supported</td>
</tr>
<tr>
<td>0</td>
<td>32</td>
<td>DIAGNOSIS_MASK_EXTENSION</td>
<td>Diagnosis Mask Extension</td>
<td>Definition of supported DIAGNOSIS_EXTENSION information-bits. 0: not supported 1: supported</td>
</tr>
<tr>
<td>0</td>
<td>34</td>
<td>WRITE_LOCKING</td>
<td>Write Lock</td>
<td>Software write protection.</td>
</tr>
<tr>
<td>0</td>
<td>35</td>
<td>FACTORY_RESET</td>
<td>Factory Reset</td>
<td>The command for resetting a device to default values. The setting of the bus address is not affected.</td>
</tr>
<tr>
<td>0</td>
<td>36</td>
<td>DESCRIPTOR</td>
<td>Descriptor</td>
<td>User-definable text (a string) to describe the device within the application.</td>
</tr>
</tbody>
</table>
Table C-1. Physical Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>37</td>
<td>DEVICE_MESSAGE</td>
<td>Message</td>
<td>User-definable MESSAGE to describe the device within the application or in the plant. Date of installation of the device.</td>
</tr>
<tr>
<td>0</td>
<td>38</td>
<td>DEVICE_INSTALL_DATE</td>
<td>Installation Date</td>
<td>Date of installation of the device.</td>
</tr>
<tr>
<td>0</td>
<td>40</td>
<td>IDENT_NUMBER_SELECTOR</td>
<td>GSD Type</td>
<td>The Profibus Ident Number.</td>
</tr>
<tr>
<td>0</td>
<td>42</td>
<td>FEATURE</td>
<td>Features</td>
<td>Indicates optional features implemented in the device and the status of these features which indicates if the feature is supported or not supported.</td>
</tr>
<tr>
<td>0</td>
<td>43</td>
<td>COND_STATUS_DIAG</td>
<td>Current Status and Diagnostic</td>
<td>Indicates the mode of a device that can be configured for status and diagnostic behavior.</td>
</tr>
<tr>
<td>0</td>
<td>49</td>
<td>DEVICE_ADDRESS</td>
<td>Address</td>
<td>The address of the device.</td>
</tr>
<tr>
<td>0</td>
<td>50</td>
<td>STACK_LIB_VERSION</td>
<td>Stack Revision</td>
<td>The version of the registered stack in the device.</td>
</tr>
<tr>
<td>0</td>
<td>51</td>
<td>OUTPUT_BOARD_SN</td>
<td>Output Board Serial Number</td>
<td>The serial number given to the electronics output board.</td>
</tr>
<tr>
<td>0</td>
<td>52</td>
<td>FINAL_ASSY_NUM</td>
<td>Final Assembly Number</td>
<td>An identifying number given to the device at Final Assembly</td>
</tr>
<tr>
<td>0</td>
<td>53</td>
<td>CONFIGURE_LCD</td>
<td>Configure LCD</td>
<td>Selection of what parameters to be displayed on the LCD.</td>
</tr>
<tr>
<td>0</td>
<td>54</td>
<td>IDENT_VALUE</td>
<td>PROFIBUS Ident Number</td>
<td>Each PROFIBUS device shall have an Ident Number provided by PI. The Ident Number specifies the cyclic behavior of a device which is described in the corresponding GSD file. A PROFIBUS PA device shall support at least one profile specific Ident Number.</td>
</tr>
</tbody>
</table>

Table C-2. Transducer Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16</td>
<td>BLOCK_OBJECT</td>
<td>This object contains the characteristics of the blocks.</td>
<td>The BLOCK_OBJECT parameter is the first parameter of every block. It contains the characteristics of the block e.g. block type and profile number.</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>ST_REV</td>
<td>Static Revision</td>
<td>Parameter that changes by 1 when the corresponding block has been modified.</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>TAG_DESC</td>
<td>Tag</td>
<td>A user-supplied description of the block.</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>STRATEGY</td>
<td>Strategy</td>
<td>The STRATEGY parameter has a user-specified value. This assigned value can be used in configuration or diagnostics as a key in sorting block information.</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>ALERT_KEY</td>
<td>Alert Key</td>
<td>The ALERT_KEY parameter has a user assigned value which may be used in sorting alarms or events generated by a block.</td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>TARGET_MODE</td>
<td>Target Mode</td>
<td>The TARGET_MODE parameter indicates which mode is desired for the block. It is normally set by a control application or by an operator through a human interface application.</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>MODE_BLK</td>
<td>Mode</td>
<td>The MODE_BLK parameter is a structured parameter composed of the actual mode, the normal mode and the permitted mode.</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
<td>ALARM_SUM</td>
<td>Alarm Summary</td>
<td>The parameter ALARM_SUM summarizes the status of up to 16 block alarms.</td>
</tr>
</tbody>
</table>
Table C-2. Transducer Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>24</td>
<td>PRIMARY_VALUE</td>
<td>Primary Value</td>
<td>Process value</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>PRIMARY_VALUE_UNIT</td>
<td>Primary Value Unit</td>
<td>Selects the unit code of the PRIMARY_VALUE and other values.</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>SECONDARY_VALUE_1</td>
<td>Secondary Value</td>
<td>Process value connected to channel 1 and corrected by BIAS_1.</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
<td>SENSOR_MEAS_TYPE</td>
<td>Sensor Measurement Type</td>
<td>Mathematical function to calculate PRIMARY_VALUE (PV).</td>
</tr>
<tr>
<td>2</td>
<td>29</td>
<td>INPUT_RANGE</td>
<td>Electrical Input Range and Mode</td>
<td>Electrical input range and mode.</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>LIN_TYPE</td>
<td>Sensor Type</td>
<td>Selects the type of sensor (Code) for Thermocouples, Rtd, Pyrometers or linear.</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>BIAS_1</td>
<td>Bias</td>
<td>Bias that can be algebraically added to the process value of channel 1.</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>UPPER_SENSOR_LIMIT</td>
<td>Upper Sensor Limit</td>
<td>Physical upper limit function of the sensor (e.g. Pt 100 = 850 °C) and input range.</td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>LOWER_SENSOR_LIMIT</td>
<td>Lower Sensor Limit</td>
<td>Physical lower limit function of the sensor (e.g. Pt 100 = -200 °C) and input range.</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>INPUT_FAULT_GEN</td>
<td>Input Malfunction</td>
<td>Input malfunction: Diagnosis object for errors that concerns all values.</td>
</tr>
<tr>
<td>2</td>
<td>41</td>
<td>INPUT_FAULT_1</td>
<td>SV Input Malfunction</td>
<td>Input malfunction: Diagnosis object for errors that concern SV_1.</td>
</tr>
<tr>
<td>2</td>
<td>43</td>
<td>SENSOR_WIRE_CHECK_1</td>
<td>Check Open/Short Sensor</td>
<td>Enables lead breakage and short circuit detection for Sensor 1.</td>
</tr>
<tr>
<td>2</td>
<td>49</td>
<td>RJ_TEMP</td>
<td>Terminal Temperature</td>
<td>Reference junction temperature.</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>RJ_TYPE</td>
<td>Reference Junction</td>
<td>Selects reference junction from internal to fixed value.</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>SENSOR_CONNECTION</td>
<td>Sensor Connection</td>
<td>Connection to the sensor, selected for 2, 3, and 4 wires connection.</td>
</tr>
<tr>
<td>2</td>
<td>53</td>
<td>COMP_WIRE1</td>
<td>2-Wire Offset</td>
<td>Value in Ω to compensate line resistance when the thermo resistance is connected with 2 wires.</td>
</tr>
<tr>
<td>2</td>
<td>79</td>
<td>CAL_POINT_HI</td>
<td>Upper Cal Point</td>
<td>This parameter contains the highest calibrated value. For calibration of the high limit point give the high measurement value (pressure) to the sensor and transfer this point as HIGH to the transmitter.</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>CAL_POINT_LO</td>
<td>Lower Cal Point</td>
<td>This parameter contains the lowest calibrated value. For calibration of the low limit point give the low measurement value (pressure) to the sensor and transfer this point as LOW to the transmitter.</td>
</tr>
<tr>
<td>2</td>
<td>81</td>
<td>CAL_MIN_SPAN</td>
<td>Calibration Minimum Span</td>
<td>This parameter contains the minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together.</td>
</tr>
<tr>
<td>2</td>
<td>82</td>
<td>CAL_UNIT</td>
<td>Calibration Unit</td>
<td>The units used for Calibration.</td>
</tr>
<tr>
<td>2</td>
<td>83</td>
<td>SENSOR_CAL_METHOD</td>
<td>Method</td>
<td>Method used to calibrate the temperature sensor.</td>
</tr>
<tr>
<td>2</td>
<td>84</td>
<td>SENSOR_CAL_LOC</td>
<td>Location</td>
<td>The location the calibration was performed.</td>
</tr>
<tr>
<td>2</td>
<td>85</td>
<td>SENSOR_CAL_DATE</td>
<td>Date</td>
<td>The date the calibration was performed.</td>
</tr>
<tr>
<td>2</td>
<td>86</td>
<td>SENSOR_CAL_WHO</td>
<td>Performed By</td>
<td>The name of the person performing the calibration.</td>
</tr>
<tr>
<td>2</td>
<td>87</td>
<td>SENSOR_SN</td>
<td>Sensor Serial Number</td>
<td>The serial number associated with the sensor reading the temperature.</td>
</tr>
</tbody>
</table>
Table C-2. Transducer Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>89</td>
<td>TERMINAL_TEMP_RANGE</td>
<td>Terminal Temperature Range</td>
<td>The temperature range associated with the terminal temperature of the device.</td>
</tr>
<tr>
<td>2</td>
<td>90</td>
<td>ASIC_REJECTION</td>
<td>AC Power Filter</td>
<td>Should be configured to the frequency of AC Power (50Hz/60Hz) currently running in the facility.</td>
</tr>
<tr>
<td>2</td>
<td>91</td>
<td>CALIBRATOR_MODE</td>
<td>Active Calibrator Mode</td>
<td>Select 'Active Calibrator On' if using a calibration device. This is critical if the calibrator requires constant current for calibration. If using a sensor or a calibration device that can accept pulsed current, select 'Active Calibrator Off'.</td>
</tr>
<tr>
<td>2</td>
<td>92</td>
<td>OPEN_SNSR_HOLDOFF</td>
<td>Open Sensor Holdoff</td>
<td>A software feature that has the transmitter perform additional verification of the open sensor status prior to activating the transmitter alarm. If the additional verification shows that the open sensor condition is not valid, the transmitter will not go into alarm.</td>
</tr>
<tr>
<td>2</td>
<td>93</td>
<td>INTER_DETECT_THRESH</td>
<td>Transient Filter</td>
<td>The Intermittent Sensor Detect feature is designed to guard against process temperature readings caused by intermittent open sensor conditions (and open sensor condition lasting less than one update). Default is set to 0.2% of the sensor limits. The feature can be switched on or off and can be adjusted from 0 to 100% of the sensor limits.</td>
</tr>
<tr>
<td>2</td>
<td>94</td>
<td>CAL_VAN_DUSEN_COEFF</td>
<td>Callendar-Van Dusen</td>
<td>The calculated coefficients used in the Callendar Van dusen equation to characterize the sensor curve with Transmitter-Sensor matching.</td>
</tr>
</tbody>
</table>

Table C-3. Analog Input Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td>BLOCK_OBJECT</td>
<td></td>
<td>This object contains the characteristics of the blocks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The BLOCK_OBJECT parameter is the first parameter of every block. It contains the characteristics of the block e.g. block type and profile number.</td>
</tr>
<tr>
<td>1</td>
<td>17</td>
<td>ST_REV</td>
<td></td>
<td>Static Revision</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Parameter that changes by 1 when the corresponding block has been modified.</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>TAG_DESC</td>
<td></td>
<td>Tag Description</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A user-supplied description of the block.</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>STRATEGY</td>
<td>Strategy</td>
<td>The STRATEGY parameter has a user-specified value. This assigned value can be used in configuration or diagnostics as a key in sorting block information.</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>ALERT_KEY</td>
<td>Alert Key</td>
<td>The ALERT_KEY parameter has a user assigned value which may be used in sorting alarms or events generated by a block.</td>
</tr>
<tr>
<td>1</td>
<td>21</td>
<td>TARGET_MODE</td>
<td>Target Mode</td>
<td>The TARGET_MODE parameter indicates which mode is desired for the block. It is normally set by a control application or by an operator through a human interface application.</td>
</tr>
<tr>
<td>1</td>
<td>22</td>
<td>MODE_BLK</td>
<td>N/A</td>
<td>The MODE_BLK parameter is a structured parameter composed of the actual mode, the normal mode and the permitted mode.</td>
</tr>
<tr>
<td>1</td>
<td>23</td>
<td>ALARM_SUM</td>
<td>N/A</td>
<td>The parameter ALARM_SUM summarizes the status of up to 16 block alarms.</td>
</tr>
</tbody>
</table>
### Table C-3. Analog Input Block Parameters

<table>
<thead>
<tr>
<th>Slot</th>
<th>Index</th>
<th>Parameter Name</th>
<th>DD Label</th>
<th>Help Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>BATCH</td>
<td>Batch</td>
<td>The Batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts.</td>
</tr>
<tr>
<td>1</td>
<td>26</td>
<td>OUT</td>
<td>Out</td>
<td>The Function Block parameter OUT contains the current measurement value in a vendor specific or configuration adjusted engineering unit and the belonging status in AUTO MODE.</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>PV_SCALE</td>
<td>PV Scale - Upper Value PV Scale - Lower Value</td>
<td>Conversion of the Process Variable into percent using the high and low scale values.</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>OUT_SCALE</td>
<td>Out Scale</td>
<td>The Function Block parameter OUT_SCALE contains the values of the lower limit and upper limit effective range.</td>
</tr>
<tr>
<td>1</td>
<td>29</td>
<td>LIN_TYPE</td>
<td>Linearization Type</td>
<td>Type of linearization.</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
<td>CHANNEL</td>
<td>Channel</td>
<td>Reference to the active Transducer Block which provides the measurement value to the Function Block.</td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>PV_FTIME</td>
<td>Damping Value</td>
<td>Filter time of the Process Variable.</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>FSAFE_TYPE</td>
<td>Fail Safe Type</td>
<td>Defines the reaction of the device, if a fault is detected.</td>
</tr>
<tr>
<td>1</td>
<td>34</td>
<td>FSAFE_VALUE</td>
<td>Fail Safe Value</td>
<td>Default value for the OUT parameter, if a sensor or sensor electronic fault is detected.</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
<td>ALARM_HYS</td>
<td>Alarm Hysteresis</td>
<td>Hysteresis. The hysteresis is expressed as value below high limit and above low limit in the engineering unit of expressed as value below high limit and above low limit in the engineering unit of xx_LIM.</td>
</tr>
<tr>
<td>1</td>
<td>37</td>
<td>HI_HI_LIM</td>
<td>Hi Hi</td>
<td>Value for upper limit of alarms.</td>
</tr>
<tr>
<td>1</td>
<td>39</td>
<td>HI_LIM</td>
<td>Hi</td>
<td>Value for upper limit of warnings.</td>
</tr>
<tr>
<td>1</td>
<td>41</td>
<td>LO_LIM</td>
<td>Lo</td>
<td>Value for lower limit of warnings.</td>
</tr>
<tr>
<td>1</td>
<td>43</td>
<td>LO_LO_LIM</td>
<td>Lo Lo</td>
<td>Value for the lower limit of alarms.</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>SIMULATE</td>
<td>Simulate</td>
<td>For commissioning and test purposes the input value from the Transducer Block in the Analog Input Function Block AI-FB can be modified.</td>
</tr>
</tbody>
</table>
CONDENSED STATUS

The Rosemount 644 device utilizes condensed status as recommended by the Profile 3.02 specification and NE 107. Condensed status has some additional bits and changed bit assignments from classic status. Confirm bit assignment using Table C-4 and Table C-5.

Table C-4. Diagnostic Descriptions

<table>
<thead>
<tr>
<th>Byte-Bit</th>
<th>Unit_Diag_Bit (1)</th>
<th>Diagnostic Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>35</td>
<td>Restart</td>
</tr>
<tr>
<td>2-4</td>
<td>36</td>
<td>Cold Start</td>
</tr>
<tr>
<td>2-5</td>
<td>37</td>
<td>Maintenance Required</td>
</tr>
<tr>
<td>2-7</td>
<td>39</td>
<td>Ident_Number violation</td>
</tr>
<tr>
<td>3-0</td>
<td>40</td>
<td>Failure of the device</td>
</tr>
<tr>
<td>3-1</td>
<td>41</td>
<td>Maintenance demanded</td>
</tr>
<tr>
<td>3-2</td>
<td>42</td>
<td>Function Check</td>
</tr>
<tr>
<td>3-3</td>
<td>43</td>
<td>Process not returning valid values</td>
</tr>
<tr>
<td>4-7</td>
<td>55</td>
<td>Extension Available</td>
</tr>
</tbody>
</table>

(1) Unit_Diag_Bit located in GSD file

Table C-5. Output Status Bit Definition

<table>
<thead>
<tr>
<th>Condensed Status</th>
<th>AI Block OUT Status Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>HEX</td>
</tr>
<tr>
<td>Bad - passivated</td>
<td>0x23</td>
</tr>
<tr>
<td>Bad, maintenance alarm, more diagnostics available</td>
<td>0x24</td>
</tr>
<tr>
<td>Bad, process related - no maintenance</td>
<td>0x28</td>
</tr>
<tr>
<td>Uncertain, substitute set</td>
<td>0x4B</td>
</tr>
<tr>
<td>Uncertain, process related, no maintenance</td>
<td>0x78</td>
</tr>
<tr>
<td>Good, ok</td>
<td>0x80</td>
</tr>
<tr>
<td>Good, update event</td>
<td>0x84</td>
</tr>
<tr>
<td>Good, advisory alarm, low limit</td>
<td>0x89</td>
</tr>
<tr>
<td>Good, advisory alarm, high limit</td>
<td>0x8A</td>
</tr>
<tr>
<td>Good, critical alarm, low limit</td>
<td>0x8D</td>
</tr>
<tr>
<td>Good, critical alarm, high limit</td>
<td>0x8E</td>
</tr>
<tr>
<td>Good, function check</td>
<td>0xBC</td>
</tr>
</tbody>
</table>