

# Rosemount 1151 Pressure Transmitter with 4-20 mA HART Protocol

*Product Discontinued*



**ROSEMOUNT**

[www.rosemount.com](http://www.rosemount.com)



**EMERSON**  
Process Management

 **WARNING****Explosions could result in death or serious injury:**

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 1151 reference manual for any restrictions associated with a safe installation.

- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-Proof/Flame-Proof installation, do not remove the transmitter covers when power is applied to the unit.

**Process leaks may cause harm or result in death.**

- To avoid process leaks, only use the o-ring designed to seal with the corresponding flange adapter.

**Electrical shock can result in death or serious injury.**

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

 **IMPORTANT NOTICE**

This installation guide provides basic guidelines for Rosemount 1151 transmitters. It does not provide instructions for configuration, diagnostics, maintenance, service, troubleshooting, Explosion-Proof, Flame-Proof, or intrinsically safe (I.S.) installations. Refer to the Rosemount 1151 reference manual (document number 00809-0100-4360) for more instruction. This manual is also available electronically on [www.emersonprocess.com/rosemount](http://www.emersonprocess.com/rosemount).

## Quick Installation Guide

00825-0100-4593, Rev BA  
July 2009

Rosemount 1151

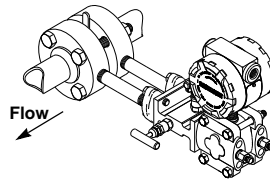
# STEP 1: MOUNT THE TRANSMITTER

## A. Applications

### Liquid Flow Applications

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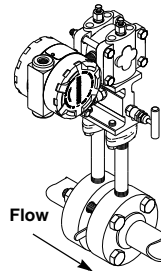
1. Place taps to the side of the line.
2. Mount beside or below the taps.



### Gas Flow Applications

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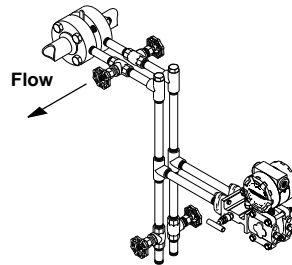
1. Place taps in the top or side of the line.
2. Mount beside or above the taps.



### Steam Flow Applications

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1. Place taps to the side of the line.
2. Mount beside or below the taps.
3. Fill impulse lines with water.



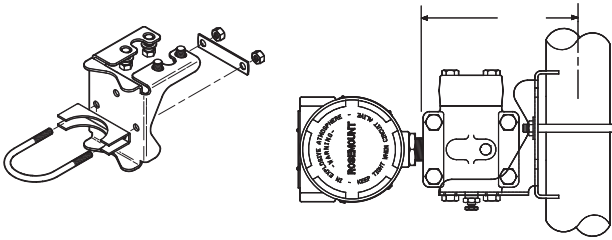
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**STEP 1 CONTINUED...**

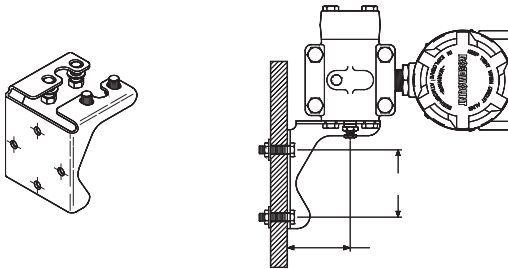
**B. Optional Mounting Brackets**

When installing the transmitter to one of the optional mounting brackets, torque the bracket bolts to 125 in.-lbs. (0,9 N-m).

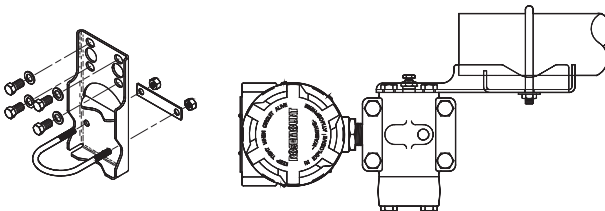
**Pipe Mount**



**Panel Mount<sup>(1)</sup>**



**Flat Mount**



(1) Panel bolts are customer supplied.

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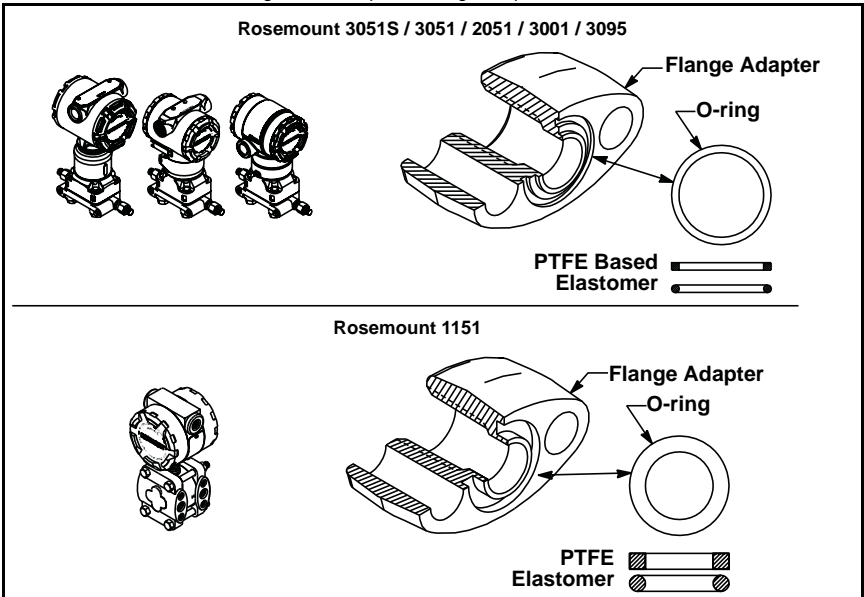
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## STEP 1 CONTINUED...

### C. O-rings with Flange Adapters

#### **⚠ WARNING**

Failure to install proper flange adapter O-rings may cause process leaks, which can result in death or serious injury. The two flange adapters are distinguished by unique O-ring grooves. Only use the O-ring that is designed for its specific flange adapter, as shown below.



**⚠** Whenever the flanges or adapters are removed, visually inspect the o-rings. Replace them if there are any signs of damage, such as nicks or cuts. If you replace the o-rings, re-torque the flange bolts and alignment screws after installation to compensate for seating of the PTFE o-ring.

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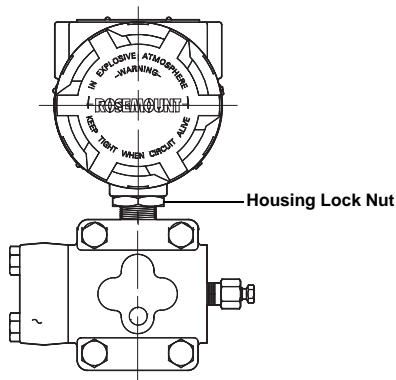
**STEP 2: CONSIDER HOUSING ROTATION**

To improve field access or to better view the optional LCD display:

1. Loosen the housing lock nut.
2. Rotate the housing clockwise to the desired position – up to 90° from its original position. Over rotating will damage the transmitter.
3. If the desired position is attained, tighten the housing lock nut.
4. If the desired position cannot be reached because the housing will not rotate further, rotate the housing counterclockwise until in the desired position (up to 90° from its original position).
5. Tighten the housing lock nut to 420-in/lb. Use a sealing compound (Loctite 222 – Small Screw Threadlocker) on the threads to ensure a watertight seal on the housing.

**NOTE**

If the desired position cannot be attained within the 90° limit, the transmitter will need to be disassembled. See the Rosemount 1151 reference manual (document number 00809-0100-4360) for further instruction.



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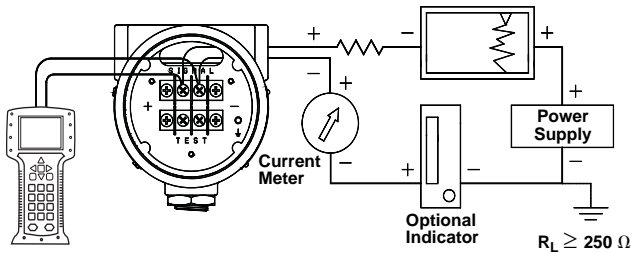
Rosemount 1151

### STEP 3: CONNECT THE WIRING AND POWER UP

Use the following steps to wire the transmitter:

1. Remove the housing cover on the side marked TERMINALS on the nameplate.
2. Connect the positive lead to the "+" terminal and the negative lead to the "-" terminal.

Figure 1. Field Wiring Diagram



*Installation of the transient protection terminal block does not provide transient protection unless the 1151 case is properly grounded.*

3. Ensure proper grounding. It is important that the instrument cable shield:
  - be trimmed close and insulated from touching the transmitter housing
  - be connected to the next shield if cable is routed through a junction box
  - be connected to a good earth ground at the power supply end

#### NOTE

Do not connect the powered signal wiring to the test terminals. Power could damage the test diode in the test connection. Twisted pair cable should be used for best results. In high EMI/RFI environments, use either transient terminal block or shielded signal wiring. Use 12 to 24 AWG wire and do not exceed 5,000 feet (1500 meters).

4. Plug and seal unused conduit connections.
5. If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
6. Replace the housing cover.

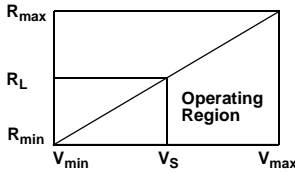
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**STEP 3 CONTINUED...**

**Power Supply**

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

Figure 2. Load Limitation



Code	$V_{min}$	$V_{max}$	$R_{min}$	$R_{max}$	$R_L$ at Supply Voltage ( $V_S$ )
S <sup>(1)</sup>	12	45	0	1650	$R_L = 43.5 (V_S - 12)$

(1) A minimum of 250  $\Omega$  is required for communication.



## STEP 4: CONFIGURE THE TRANSMITTER

### Failure Mode Alarm Switch

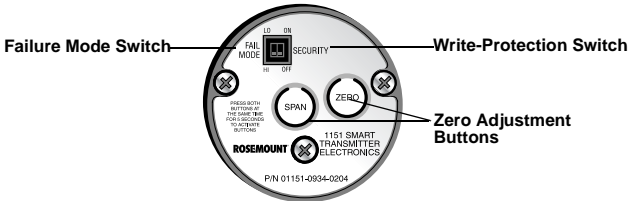
1. Remove the housing cover.
2. Locate the failure mode switch (see Figure 3).
3. Move the switch to the desired alarm setting. To set the failure mode to high alarm, position the switch toward "HI." To set the failure mode to low alarm, position the switch to "LO."
4. Replace the housing cover.

### Write-Protect Switch

In the "ON" position, the write-protect switch prevents changes to the configuration data.

1. Remove the housing cover.
2. Move the write-protect switch to the "OFF."
3. Verify transmitter configuration (see "Verify Transmitter Configuration").
4. Move the write-protect switch to the "ON."
5. Replace the housing cover.

Figure 3. Switch Locations



**STEP 5: CALIBRATE THE TRANSMITTER****Verify Transmitter Configuration****NOTE:**

A check (✓) indicates the basic configuration parameters. At minimum, these parameters should be verified as part of the configuration and startup procedure.

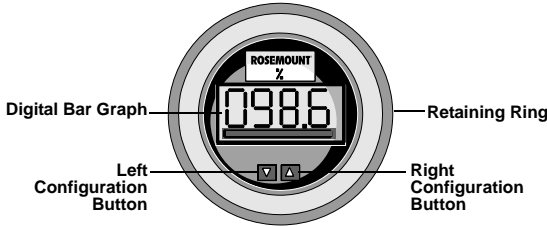
Table 1. HART Communicator Fast Key Sequence

Function	Fast Key Sequences
Analog Output	3
Analog Output Alarm	1, 4, 3, 3
Burst Mode Control	1, 4, 3, 4, 3
Burst Operation	1, 4, 3, 4, 4
Calibration	1, 2, 3
Characterize	1, 4, 1, 1, 2, 2
✓ Damping	1, 3, 6
Date	1, 3, 4, 1
Descriptor	1, 3, 4, 2
Digital-to-Analog Trim (4–20 mA Output)	1, 2, 3, 2, 1
Field Device Information	1, 4, 4, 1
Full Trim	1, 2, 3, 3
Keypad Input	1, 2, 3, 1, 1
Loop Test	1, 2, 2
Lower Range Value	4, 1
Lower Sensor Trim	1, 2, 3, 3, 2
Message	1, 3, 4, 3
Meter Type	1, 3, 4, 5
Number of Requested Preambles	1, 4, 3, 4, 2
Percent Range	1, 1, 2
Poll Address	1, 4, 3, 4, 1
Pressure	2
✓ Range Values	1, 3, 3
Rerange	1, 2, 3, 1
Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2
Self-Test (Transmitter)	1, 2, 1, 1
Sensor Information	1, 4, 4, 2
Sensor Trim Points	1, 2, 3, 3, 4
Status	1, 2, 1, 2
✓ Tag	1, 3, 1
✓ Transfer Function (Setting Output Type)	1, 3, 5
Transmitter Security (Write Protect)	1, 3, 4, 4
Trim Analog Output	1, 2, 3, 2
✓ Units (Process Variable)	1, 3, 2
Upper Range Value	5, 2
Upper Sensor Trim	1, 2, 3, 3, 3
Zero Trim	1, 2, 3, 3, 1

**STEP 5 CONTINUED...**

**Configure LCD Display**

Figure 4. Sample 1151 LCD Display



**NOTE**

The LCD display time-out is approximately 16 seconds. If keys are not pressed within this period, the indicator reverts to reading the signal.

**Position the Decimal Point and Select the Meter Function**

1. Unscrew the retaining ring shown in Figure 4 and remove the LCD display cover.
2. Press the left and right configuration buttons simultaneously and release immediately.
3. To move the decimal point to the desired location, press the left configuration button. Note that the decimal point wraps around.
4. To scroll through the mode options, press the right configuration button until the desired mode is displayed (see Table 2).
5. Press both configuration buttons simultaneously for two seconds.
6. Replace the LCD Display cover.

Table 2. LCD Display Modes

Options	Relationship between Input Signal and Digital Display
L in	Linear
L in F	Linear with five-second filter
Srt	Square root
SrtF	Square root with five-second filter

**Square root function:** relates to the digital display. The bar graph output remains linear with the current signal.

**Square root response:** digital display will be proportional to the square root of the input current where 4 mA=0 and 20 mA=1.0, scaled per the calibration procedure. The transition point from linear to square root is at 25% of full scale flow.

**Filter response:** operates upon "present input" and "input received in the previous five second interval" in the following manner:

$$\text{Display} = (0.75 \times \text{previous input}) + (0.25 \times \text{present input})$$

This relationship is maintained provided that the previous reading minus the present reading is less than 25% of full scale.

**NOTE**

The meter displays "----" for approximately 7.5 seconds while the information is being stored.

**STEP 5 CONTINUED...****Set the Display Equivalent to a 4 mA Signal**

1. Unscrew the retaining ring shown in Figure 4 and remove the LCD display cover.
2. Press the left button for two seconds.
3. To decrement the display numbers, press the left configuration button and to increment the numbers, press the right configuration button. Set the numbers between -999 and 1000.
4. To store the information, press both configuration buttons simultaneously for two seconds.
5. Replace the LCD display cover.

**Set the Display Equivalent to a 20 mA Signal**

1. Unscrew the retaining ring shown in Figure 4 and remove the LCD display cover.
2. Press the right button for two seconds.
3. To decrement the display numbers, press the left configuration button on the display and to increment the numbers, press the right configuration button. Set the numbers between -999 and 9999. The sum of the 4 mA point and the span must not exceed 9999.
4. To store the information, press both configuration buttons simultaneously for two seconds. The LCD display is now configured.
5. Replace the LCD Display cover.

## **STEP 6: TRIM THE TRANSMITTER**

### **NOTE**

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

### **Full Trim**

A full trim is a two-point sensor calibration where two end-point pressures are applied, and the transmitter process variable output is adjusted to agree with the pressure input.

### **Using the HART Communicator**

<b>HART Fast Keys</b>	<b>Steps</b>
1, 2, 3, 3	<ol style="list-style-type: none"><li>1. Equalize or vent the transmitter and connect HART communicator.</li><li>2. At the menu, input the HART Fast Key sequence.</li><li>3. Follow the commands to perform a full trim.</li></ol>

### **Zero Trim**

A zero trim is a single-point adjustment used for compensating mounting position effects. When performing a zero trim, ensure that the equalizing valve is open and all wet legs are filled to the correct level. If zero offset is less than 3% of true zero, follow the "Using the HART Communicator" instructions below. If zero offset is greater than 3% of true zero, follow the "Using the Transmitter Zero Adjustment Buttons" instructions.

### **Using the HART Communicator**

<b>HART Fast Keys</b>	<b>Steps</b>
1, 2, 3, 3, 1	<ol style="list-style-type: none"><li>1. Equalize or vent the transmitter and connect HART communicator.</li><li>2. At the menu, input the HART Fast Key sequence.</li><li>3. Follow the commands to perform a zero trim.</li></ol>

**STEP 6 CONTINUED...****Using the Transmitter Zero Adjustment Buttons**

Perform the following steps to perform a rerange using the zero adjustment buttons (see Figure 3).

1. Apply a pressure equivalent to the lower calibrated value on the high side of the transmitter.
2. Remove the circuit side cover to expose the span and zero buttons. Hold both the span and zero buttons down simultaneously for at least five seconds to activate the controls.
3. Press the zero button for five seconds to set the 4 mA point. Verify that the output is 4 mA.
4. Apply a pressure equivalent to the higher calibrated value to the high side of the transmitter.
5. Press the span button for five seconds to set the 20 mA point. Verify that the output is 20 mA.

**4-20 mA Output Trim**

A 4-20 mA output trim adjusts the transmitter milliampere output to match plant standards. This procedure is used to trim the transmitter using a current meter.

**Using the HART Communicator**

HART Fast Keys	Steps
1, 2, 3, 2, 2	<ol style="list-style-type: none"><li>1. Equalize or vent the transmitter and connect HART communicator.</li><li>2. At the menu, input the HART Fast Key sequence.</li><li>3. Follow the commands to perform a full trim.</li></ol>

## **PRODUCT CERTIFICATIONS**

### **Approved Manufacturing Locations**

Rosemount Inc. — Chanhassen, Minnesota, USA

Fisher-Rosemount GmbH & Co. — Wessling, Germany

Emerson Process Management Asia Pacific

Private Limited — Singapore

Beijing Rosemount Far East Instrument Co., Limited – Beijing, China

### **European Directive Information**

The EC declaration of conformity can be found on page 19. The most recent revision can be found on [www.emersonprocess.com/rosemount](http://www.emersonprocess.com/rosemount).

#### **ATEX Directive (94/9/EC)**

Emerson Process Management complies with the ATEX Directive.

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

1151GP9, 0; 1151HP4, 5, 6, 7, 8 Pressure Transmitters

— QS Certificate of Assessment - EC No. PED-H-20  
Module H Conformity Assessment

All other 1151 Pressure Transmitters

— Sound Engineering Practice

Transmitter Attachments:

Diaphragm Seal - Process Flange - Manifold

— Sound Engineering Practice

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

All models

EN 61326-1: 2006, EN61326-2-3: 2006

## **Hazardous Locations Certifications**

### **North American Certifications**

#### *Factory Mutual (FM) Approvals*

FM Explosion Proof tag is standard. Appropriate tag will be substituted if optional certification is selected.

Explosion Proof: Class I, Division 1, Groups B, C, and D, T5 ( $T_a = 85\text{ }^\circ\text{C}$ ). Dust-Ignition

Proof: Class II, Division 1, Groups E, F, and G; Class III, Division 1, T5 ( $T_a = 85\text{ }^\circ\text{C}$ ).

Indoor and outdoor use. Enclosure Type 4X. Factory Sealed.

- 15 Intrinsically safe for Class I, II, and III Division 1, Groups A, B, C, D, E, F, and G, T4 hazardous locations in accordance with entity requirements and Control drawing 01151-0214. Non- incendive for Class I, Division 2, Groups A, B, C and D, T4 hazardous locations. Enclosure Type 4X.

For entity parameters see control drawing 01151-0214.

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**Canadian Certifications***Canadian Standards Association (CSA) Approvals*

- E6 Explosion Proof for Class I, Division 1, Groups C and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 Hazardous Locations. Suitable for Class I, Division 2, Groups A, B, C, and D; CSA enclosure type 4X. Factory Sealed.
- I6 Intrinsically safe for Class I, Division 1, Groups A, B, C, and D hazardous locations when connected per Drawing 01151-2575. For entity parameters see control drawing 01151-2575. Temperature Code T2D.

*Measurement Canada Approvals*

- C5 Accuracy Approval to the Electricity and Gas Inspection Act for the purchase and sale of natural gas.

**European Certifications**

- E8 ATEX Flameproof  
 Certification Number CESI03ATEX037  
 ATEX Marking  II 1/2 G  
 EEx d IIC T6 ( $-40\text{ °C} \leq T_{\text{amb}} \leq 40\text{ °C}$ )  
 EEx d IIC T4 ( $-40\text{ °C} \leq T_{\text{amb}} \leq 80\text{ °C}$ )  
 1180  
 V = 60 Vdc maximum
- I1 ATEX Intrinsic Safety and Combustible Dust Certification  
 Certification Number BAS99ATEX1294X  
 ATEX Marking  II 1 GD  
 Ex ia IIC T5 ( $-60\text{ °C} \leq T_{\text{amb}} \leq 40\text{ °C}$ )  
 Ex ia IIC T4 ( $-60\text{ °C} \leq T_{\text{amb}} \leq 80\text{ °C}$ )  
 Dust Rating: T90 °C ( $T_{\text{amb}} = -20\text{ °C}$  to  $40\text{ °C}$ )  
 IP66  
 1180
- Entity Parameters  
 $U_i = 30\text{V}$   
 $I_i = 125\text{ mA}$   
 $P_i = 1.0\text{ W (T4) or } 0.67\text{ W (T5)}$   
 $C_i = 0.034\text{ }\mu\text{F}$   
 $L_i = 20\text{ }\mu\text{H}$

**Special Conditions for safe use (x):**


The apparatus is not capable of withstanding the 500V insulation test required by EN60079-1. This must be taken into account when installing the apparatus.



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- N1 ATEX Type N and Dust Certification  
Certificate Number: BAS99ATEX3293X  
ATEX Marking:  II 3 GD  
Ex nL IIC T5 (-40 °C ≤ T<sub>amb</sub> ≤ 40 °C)  
EX nL IIC T4 (-40 °C ≤ T<sub>amb</sub> ≤ 80 °C)  
Dust Rating: T90 °C (T<sub>amb</sub> = -20 °C to 40 °C)  
U<sub>i</sub> = 45 Vdc maximum  
IP66

### Special Conditions for safe use (x):

The apparatus is not capable of withstanding the 500V insulation test required by EN60079-1. This must be taken into account when installing the apparatus.

## Australian Certifications

*Standards Association of Australia (SAA) Certification*

- E7 Flameproof  
Certificate Number Aus Ex 494X  
Ex d IIB + H<sub>2</sub> T6  
DIP T6  
IP65

### Special Conditions for safe use (x):

For transmitters having NPT, PG or G cable entry threads, an appropriate flameproof thread adaptor shall be used to facilitate application of certified flameproof cable glands or conduit system.

- I7 Intrinsic Safety  
Certificate Number: Aus Ex 122X  
Ex ia I/IIB T4 (T<sub>a</sub> = 60 °C) / T5 IP66

### Special Conditions for Safe Use (x):

1. It is a condition of safe use that the following parameters shall be taken into account during installation.
2. It is a condition of safe use that the transmitter must be supplied from a resistive current limiting barrier.
3. It is a condition of safe use that when the optional transient protection is used its metallic housing shall be bonded to the system earth.
4. It is a condition of safe use that only the stainless steel case version can be labeled as suitable for Group I.

Table 3. Entity Parameters

U<sub>i</sub> = 30V

I<sub>i</sub> = 125 mA

P<sub>i</sub> = 1.0 W (T4) or 0.67W (T5)

C<sub>i</sub> = 14.8 nF

L<sub>i</sub> = 20 μH

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### N7 Type N

Certificate Number: Aus Ex 122X

Ex n IIC T5 ( $T_a = 80\text{ }^\circ\text{C}$ ) / T6 IP66

#### **Special Conditions for safe use (x):**

1. It is a condition of safe use that a nominal voltage of 30 V for Ex n application shall not be exceeded.
2. It is a condition of safe use that when the optional transient protection is used its metallic housing shall be bonded to the system earth.

### **Combination Certifications**

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

C6 Combination of I6 and E6, CSA Explosion Proof and Intrinsic Safety Approval. Factory Sealed.

K5 Combination of FM Explosion Proof, Intrinsic Safety, and Non-incendive Approvals.

K6 Combination of E6, I6, I1, and E8.

**ROSEMOUNT**



**EC Declaration of Conformity**

**No: RMD 1020 Rev. E**

We,

**Rosemount Inc.**  
8200 Market Boulevard  
Chanhassen, MN 55317-9685  
USA

declare under our sole responsibility that the product,

**Model 1151 Smart Pressure Transmitter**

manufactured by,

**Rosemount Inc.**  
8200 Market Boulevard  
Chanhassen, MN 55317-9685  
USA

to which this declaration relates, is in conformity with the provisions of the European Community Directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Community notified body certification, as shown in the attached schedule.



(signature)

March 6, 2007  
(date of issue)

Robert J. Karschnia  
(name - printed)

Vice President Technology  
(function name - printed)



**ROSEMOUNT**



**Schedule  
No: RMD 1020 Rev. E1**

**EMC Directive (2004/108/EC)**

**Model 1151 Smart Pressure Transmitter**  
EN 61326:1997 with amendments A1, A2 and A3

**PED Directive (97/23/EC)**

**Model 1151GP9, 0; 1151HP4, 5, 6, 7, 8 Pressure Transmitters**  
QS Certificate of Assessment - EC No. PED-H-100  
Module H Conformity Assessment

**All other model 1151 Smart Pressure Transmitters**  
Sound Engineering Practice

**Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold**  
Sound Engineering Practice

**ATEX Directive (94/9/EC)**

**Model 1151 Smart Pressure Transmitter**  
BAS99ATEX1294X – Intrinsically Safe & Dust Certificate  
Equipment Group II, Category 1 GD (Ex ia IIC T4/T5)  
EN50014:1997 + A1, A2; EN50020:1994, EN50284:1999, EN 50281-1-1:1998

BAS99ATEX3293X – Type n & Dust Certificate  
Equipment Group II, Category 3 GD (Ex nL IIC T4/T5)  
EN50021:1998, EN 50281-1-1: 1998

CESI03ATEX037 – Flameproof Certificate  
Equipment Group II, Category 1/2 G (E d IIC T4/T6)  
EN50014:1997 + A1, A2; EN50018:2000 + A1; EN50284:1999



**ROSEMOUNT**



**Schedule**  
**No: RMD 1020 Rev. E1**

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**PED Notified Body**

**Det Norske Veritas (DNV)** [Notified Body Number: 00575]  
Veritasveien 1, N-1322  
Hovik, Norway

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**ATEX Notified Bodies for EC Type Examination Certificate**

**Baseefa** [Notified Body Number: 1180]  
Rockhead Business Park, Staden Lane  
Buxton, Derbyshire SK17 9RZ  
United Kingdom

**CESI** [Notified Body Number: 0722]  
Via Rubattino  
1 - 20134  
Italy

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**ATEX Notified Body for Quality Assurance**

**Baseefa** [Notified Body Number: 1180]  
Rockhead Business Park, Staden Lane  
Buxton, Derbyshire SK17 9RZ  
United Kingdom

