

## Quick Installation Guide

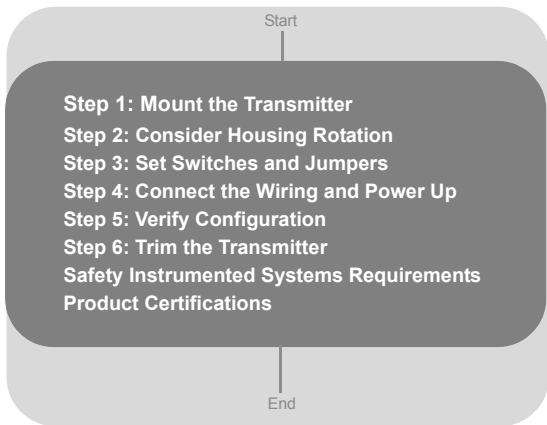
00825-0100-4801, Rev EA

January 2004

Rosemount 3051S Series

# Rosemount 3051S Series Pressure Transmitter with HART<sup>®</sup> Protocol

# Rosemount 3051SF Series Flowmeter Electronics with HART Protocol



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HART<sup>®</sup> CE



**ROSEMOUNT<sup>®</sup>**

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



**EMERSON<sup>™</sup>**  
Process Management

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## Rosemount 3051S Series

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## IMPORTANT NOTICE

This installation guide provides basic guidelines for Rosemount 3051S transmitters (reference manual document number 00809-0100-4801). It also provides the basic electronics guidelines for the 3095SFA (reference manual document number 00809-0100-4809) and 3095SFC (reference manual document number 00809-0100-4810). It does not provide instructions for diagnostics, maintenance, service, or troubleshooting. This document is also available electronically on [www.rosemount.com](http://www.rosemount.com).

## 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 3051S reference manual for any restrictions associated with a safe installation.

- Before connecting a HART communicator in an explosive atmosphere, ensure 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.**

- Install and tighten process connectors before applying pressure.

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

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

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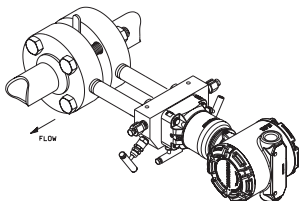
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# STEP 1: MOUNT THE TRANSMITTER

## Liquid Flow Applications

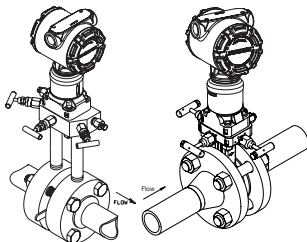
1. Place taps to the side of the line.
2. Mount beside or below the taps.
3. Mount the transmitter so that the drain/vent valves are oriented upward.



3151\_c03b

## Gas Flow Applications

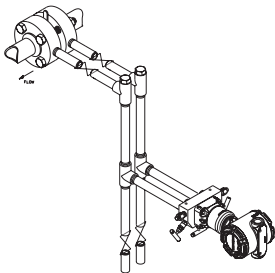
1. Place taps in the top or side of the line.
2. Mount beside or above the taps.



3151\_a405c, 3151\_a03a

## Steam Flow Applications

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



3151\_d03b

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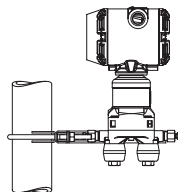
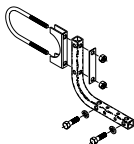
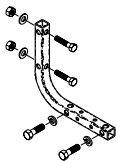
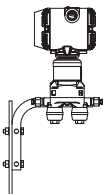
# Rosemount 3051S Series

## STEP 1 CONTINUED...

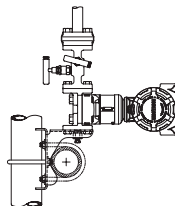
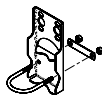
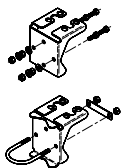
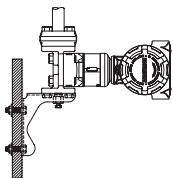
Panel Mount

Pipe Mount

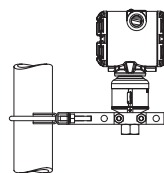
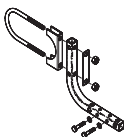
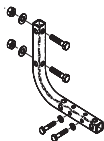
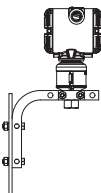
Coplanar™ Flange



Traditional Flange



In-line



Housings

PlantWeb™

Junction Box

Remote Mount Meter



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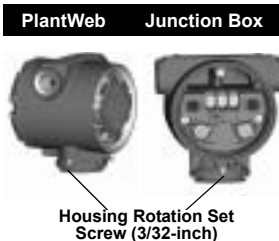
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### STEP 2: CONSIDER HOUSING ROTATION

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

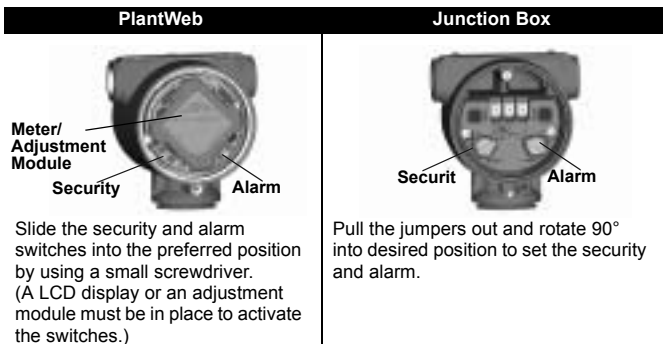
1. Loosen the housing rotation set screw.
2. First rotate the housing clockwise to the desired location. If the desired location cannot be achieved due to thread limit, rotate the housing counter clockwise to the desired location (up to 360° from thread limit).
3. Retighten the housing rotation set screw.



### STEP 3: SET JUMPERS AND SWITCHES

If alarm and security adjustment option is not installed, the transmitter will operate normally with the default alarm condition *high* and the security *off*.

Figure 1. Transmitter Switch and Jumper Configuration



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### STEP 4: CONNECT WIRING AND POWER UP

Use the following steps to wire the transmitter:

1. Remove the housing cover labeled “Field Terminals.”
2. Connect the positive lead to the “+” terminal, and the negative lead to the “-” terminal.

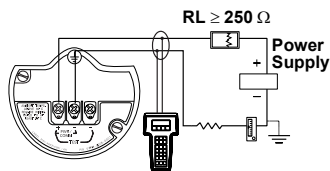
#### NOTE

Do not connect the power across the test terminals. Power could damage the test diode in the test connection. Twisted pairs yield best results; shielded signal wiring is not necessary. Use 24 AWG or larger wire and do not exceed 5,000 feet (1 500 meters).

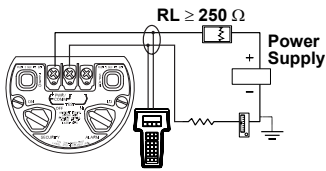
3. Plug and seal unused conduit connections.
4. If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
5. Replace the housing cover.

The figures below show the wiring connections necessary to power a 3051S and enable communications with a hand-held HART communicator.

PlantWeb Housing Wiring



Junction Box Housing Wiring



*Installation of the transient protection terminal block does not provide transient protection unless the 3051S case is properly grounded.*

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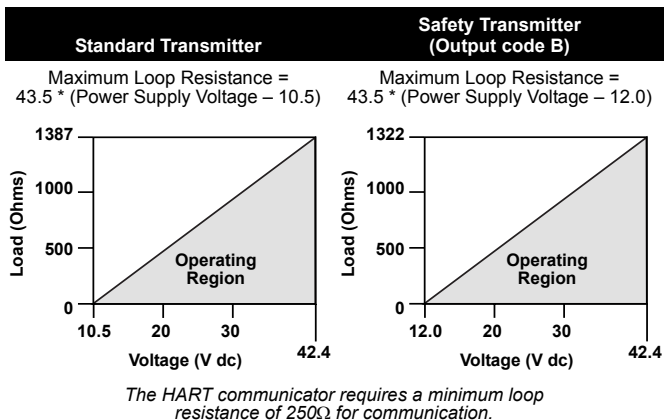
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### STEP 4 CONTINUED...

#### 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



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### STEP 5: VERIFY CONFIGURATION

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 Fast Key Sequence

Function	3051S	Safety Transmitter
Alarm Level Configuration	1, 4, 2, 7, 7	1, 4, 2, 7, 6
Alarm and Saturation Levels Configuration	1, 4, 2, 7	1, 4, 2, 7, 6
Analog Output Alarm Direction Configuration	1, 4, 2, 7, 6	1, 4, 2, 7, 6
Analog Output Trim	1, 2, 3, 2	1, 2, 3, 2
Burst Mode On/Off	1, 4, 3, 3, 3	1, 4, 3, 3, 3
Burst Options	1, 4, 3, 3, 4	1, 4, 3, 3, 4
✓ Damping	1, 3, 6	1, 3, 6
Date	1, 3, 4, 1	1, 3, 4, 1
Descriptor	1, 3, 4, 2	1, 3, 4, 2
Digital To Analog Trim (4-20 mA Output)	1, 2, 3, 2, 1	1, 2, 3, 2, 1
Field Device Information	1, 4, 4, 1	1, 4, 4, 1
LCD Meter Configuration	1, 3, 7	1, 3, 7
Loop Test	1, 2, 2	1, 2, 2
Lower Sensor Trim	1, 2, 3, 3, 2	1, 2, 3, 3, 2
Master Reset	Not applicable	1, 2, 1, 2
Message	1, 3, 4, 3	1, 3, 4, 3
Number of Requested Preambles	1, 4, 3, 3, 2	1, 4, 3, 3, 2
Pressure Alert Configuration	1, 4, 3, 5, 3	1, 4, 3, 4, 3
Poll Address	1, 4, 3, 3, 1	1, 4, 3, 3, 1
Poll a Multidropped Transmitter	Left Arrow, 4, 1, 1	Left Arrow, 4, 1, 1
Remapping	1, 4, 3, 6, 4	1, 4, 3, 6, 4
Rerange- Keypad Input	1, 2, 3, 1, 1	1, 2, 3, 1, 1

*Continued on Next Page*



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### STEP 5 CONTINUED...

Function	3051S	Safety Transmitter
Saturation Level Configuration	1, 4, 2, 7, 8	1, 4, 2, 7, 6
Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2	1, 2, 3, 2, 2
Scaled Variable Configuration	1, 4, 3, 4, 7	Not applicable
Self Test (Transmitter)	1, 2, 1, 1	1, 2, 1, 1
Sensor Information	1, 4, 4, 2	1, 4, 4, 2
Sensor Temperature	1, 1, 4	1, 1, 4
Sensor Trim	1, 2, 3, 3	1, 2, 3, 3
Sensor Trim Points	1, 2, 3, 3, 5	1, 2, 3, 3, 5
Status	1, 2, 1, 2	1, 2, 1, 3
✓ Tag	1, 3, 1	1, 3, 1
Temperature Alert Configuration	1, 4, 3, 5, 4	1, 4, 3, 4, 4
✓ Transfer Function (Setting Output Type)	1, 3, 5	1, 3, 5
Transmitter Security (Write Protect)	1, 3, 4, 5	1, 3, 4, 5
✓ Units (Process Variable)	1, 3, 2	1, 3, 2
Upper Sensor Trim	1, 2, 3, 3, 3	1, 2, 3, 3, 3
Zero Trim	1, 2, 3, 3, 1	1, 2, 3, 3, 1

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### STEP 6: TRIM THE TRANSMITTER

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

#### Zero Trim

A zero trim is a single-point adjustment used for compensating mounting position and line pressure 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 to perform a zero trim. If zero offset is greater than 3% of true zero, follow the “Using the Transmitter Zero Adjustment Button” instructions below to rerange. If hardware adjustments are not available, see the 3051S Reference Manual (document number 00809-0100-4801) to perform a rerange using the HART Communicator.

#### Using the HART Communicator

HART Fast Keys	Steps
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>

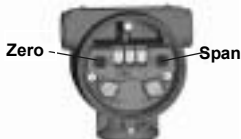
#### Using the Transmitter Zero Adjustment Button

Push and hold the zero adjustment button for at least two seconds but no longer than ten seconds.

PlantWeb



Junction Box



### SAFETY INSTRUMENTED SYSTEMS

Additional Safety Instrumented Systems information is available in the Rosemount 3051S reference manual (document number 00809-0100-4801). The manual is available electronically on [www.rosemount.com](http://www.rosemount.com) or by contacting a sales representative.

#### 3051S SIS Identification

All safety certified 3051S transmitters require the installation of safety supervisory electronics. All safety supervisory electronics can be identified by the yellow plastic casing surrounding the electronics.

To verify a safety certified transmitter:

1. Remove the electronics housing cover.
2. Verify that the electronics casing is yellow.

#### Installation

No special installation is required in addition to the standard installation practices outlined in this document. Always ensure a proper seal by installing the electronics housing cover(s) so that metal contacts metal.

The loop should be designed so the terminal voltage does not drop below 12 Vdc when the transmitter output is 22.5 mA.

If desired, position the security switch to the "ON" position to prevent accidental or deliberate change of configuration data during normal operation.

#### Configuration

Use any HART-compliant master to communicate with and verify configuration of the 3051S SIS (see Table 1 on page 8 to verify configuration). DD revision 3051S SIS Dev. 1 Rev 1 is required.

User-selected damping will affect the transmitters ability to respond to changes in the applied process. The *damping value + response time* should not exceed the loop requirements.

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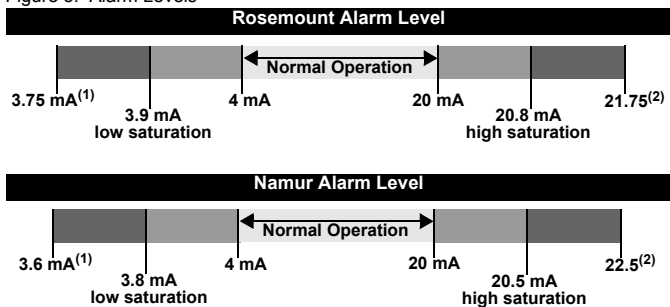
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### NOTES

1. Transmitter output is not safety-rated during the following: configuration changes, multidrop, loop test. Alternative means should be used to ensure process safety during transmitter configuration and maintenance activities.

2. DCS or safety logic solver should be configured to match transmitter configuration. Figure 3 identifies the two alarm level available and their operation values. Position the alarm switch to the required HI or LO alarm position. With a HART communicator, select the alarm and saturation levels using the following HART fast keys 1 *Device Setup*, 4 *Detailed Setup*, 2 *Signal Condition*, 7 *ALM/SAT Levels*, 6 *Config Alarm and Sat Levels*.

Figure 3. Alarm Levels



(1) Transmitter Failure, hardware alarm in LO position.

(2) Transmitter Failure, hardware alarm in HI position.

### NOTE

Some detected faults are indicated on the analog output at a level above high alarm regardless of the alarm switch selection.

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## Operation and Maintenance

### Proof Test and Inspection

The following proof tests are recommended. Proof test results and corrective actions taken must be documented at [www.rosemount.com/safety](http://www.rosemount.com/safety) in the event that an error is found in the safety functionality.

Use "Table 1: HART Fast Key Sequence" to perform a Loop Test, Analog Output Trim, or Sensor Trim. See the 3051S reference manual for additional information.

#### *Five-Year<sup>(1)</sup> Proof-Test*

Conducting an analog output Loop Test satisfies the proof test requirements and will detect more than 65% of DU failures not detected by the 3051S SIS automatic diagnostics.

1. Execute the Master Reset command to initiate start-up diagnostics.
2. Enter the milliampere value representing a high alarm state
3. Check the reference meter to verify the mA output corresponds to the entered value.
4. Enter the milliampere value representing a low alarm state
5. Check the reference meter to verify the mA output corresponds to the entered value.

#### *Ten-Year Proof-Test*

This proof test, when combined with the Five-year Proof-Test, will detect over 98% of DU failures not detected by the 3051S SIS automatic diagnostics.

1. Execute the Master Reset command to initiate start-up diagnostics.
2. Perform a minimum two point sensor calibration check using the 4-20mA range points as the calibration points.
3. Check the reference mA meter to verify the mA output corresponds to the pressure input value.
4. If necessary, use one of the "Trim" procedures available in the 3051S reference manual to calibrate.

(1) May be a longer proof test interval as justified by PFDavg calculation.

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### NOTE

The user determines the proof-test requirements for impulse piping.

### Visual Inspection

Not required.

### Special Tools

Not required

### Product Repair

All failures detected by the transmitter diagnostics or by the proof-test must be reported. Feedback can be submitted electronically at [www.rosemount.com/safety](http://www.rosemount.com/safety).

The 3051S is repairable by major component replacement. Follow the instructions in the 3051S reference manual (document number 00809-0100-4801) for additional information.

## Reference

### Certification

3051S SIS designed, developed, and audited to be compliant to TÜVIT, IEC 61508 Safety certified SIL 2 Claim Limit.

### Specifications

The 3051S SIS must be operated in accordance to the functional and performance specifications provided in the 3051S reference manual. The 3051S SIS specifications are the same as the 3051S with the following exceptions.

#### *Power Supply*

- Terminal Supply Voltage 12-42.4 Vdc

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### *Accuracy*

- Classic
  - Ranges 2 - 4:  $\pm 0.065\%$  accuracy up to 10:1 turndown
  - Range 5:  $\pm 0.065\%$  accuracy up to 10:1 turndown
  - Range 1:  $\pm 0.10\%$  accuracy up to 10:1 turndown
  - Range 0:  $\pm 0.10\%$  accuracy up to 2:1 turndown

### *PV Response time*

- Ranges 2-5: 185 milliseconds
- Range 1: 340 milliseconds
- Range 0: 785 milliseconds
- 3051S\_T: 185 milliseconds
- 3051S\_L: See Instrument Toolkit™

### **Failure Rate Data**

The FMEDA report includes failure rates and common cause Beta factor estimates. This report is available at [www.rosemount.com](http://www.rosemount.com).

### **3051S SIS Safety Failure Values**

Safety accuracy: 2.0%<sup>(1)</sup>

Safety response time- 1.5 second

### **Product Life**

50 years – based on worst case component wear-out mechanisms – not based on wear-out process wetted materials

*(1) A 2% variation of the transmitter mA output is allowed before a safety trip. Trip values in the DCS or safety logic solver should be derated by 2%.*

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## 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., LTD — Beijing, China

### European 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](http://www.rosemount.com). A hard copy may be obtained by contacting a local sales office.

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

Emerson Process Management complies with the ATEX Directive.

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

Models 3051S\_CA4; 3051S\_CD2, 3, 4, 5; *(also with P9 option)*

Pressure Transmitters — QS Certificate of Assessment -

EC No. PED-H-20, Module H Conformity Assessment

All other Model 3051S Pressure Transmitters

— Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold

— Sound Engineering Practice

Primary Elements, Flowmeter

— See appropriate Primary Element QIG

#### *Electro Magnetic Compatibility (EMC) (89/336/EEC)*

All Models: EN 50081-1:1992; EN 50082-2:1995;

EN 61326-1:1997 – Industrial

### Ordinary Location Certification for Factory Mutual

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



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### Hazardous Locations Certifications

#### North American Certifications

##### *FM Approvals*

- E5** Explosion proof for Class I, Division 1, Groups B, C, and D; dust-ignition proof for Class II and Class III, Division 1, Groups E, F, and G; hazardous locations; enclosure Type 4X, conduit seal not required when installed according to Rosemount drawing 03151-1003.
- I5** Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; Class I, Zone 0 AEx ia IIC when connected in accordance with Rosemount drawing 03151-1006; Non-incendive for Class I, Division 2, Groups A, B, C, and D), Enclosure Type 4X  
For entity parameters see control drawing 03151-1006.

##### *Canadian Standards Association (CSA)*

- E6** Explosion-Proof for Class I, Division 1, Groups B, C, and D; Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G; suitable for Class I, Division 2, Groups A, B, C, and D, when installed per Rosemount drawing 03151-1013, CSA Enclosure Type 4X; conduit seal not required.
- I6** Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03151-1016;  
For entity parameters see control drawing 03151-1016.

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### European Certifications


- I1** ATEX Intrinsic Safety  
Certificate No.: BAS01ATEX1303X  II 1G  
EEx ia IIC T5 ( $-60^{\circ}\text{C} \leq T_a \leq 40^{\circ}\text{C}$ )  
T4 ( $-60^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$ )  
CE 1180

Table 2. Input Parameters

Loop / Power	Groups
$U_i = 30\text{V}$	All
$I_i = 300\text{ mA}$	All
$P_i = 1.0\text{W}$	All
$C_i = 38\text{nF}$	SuperModule™
$C_i = 11.4\text{nF}$	With a Housing option
$C_i = 0$	Remote Display
$L_i = 0$	All Except Remote Display
$L_i = 60\ \mu\text{H}$	Remote Display

### Special Conditions for Safe Use (X)

1. The apparatus, excluding the Types 3051 S-T and 3051 S-C (In-line and Coplanar SuperModules respectively), is not capable of withstanding the 500V test as defined in Clause 6.4.12 of EN 50020. This must be considered during installation.
2. The terminal pins of the Types 3051 S-T and 3051 S-C must be protected to IP20 minimum.

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### N1 ATEX Type n

Certificate No.: BAS01ATEX3304X  II 3 G

EEx nL IIC T5 ( $T_a = -40\text{ °C TO } 70\text{ °C}$ )

$U_i = 45\text{ Vdc max}$


IP66



### Special Conditions for Safe Use (x)

The apparatus is not capable of withstanding the 500V insulation test required by Clause 9.1 of EN 50021: 1999. This must be taken into account when installing the apparatus.

### ND ATEX Dust

Certificate No.: BAS01ATEX1374X  II 1 D

$T_{105\text{ °C}} (-20\text{ °C} \leq T_{\text{amb}} \leq 85\text{ °C})$

$V_{\text{max}} = 42.4\text{ volts max}$

$A = 24\text{ mA}$

IP66

 1180

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

1. The user must ensure that the maximum rated voltage and current (42.4 volts, 22 milliampere, DC) are not exceeded. All connections to other apparatus or associated apparatus shall have control over this voltage and current equivalent to a category "ib" circuit according to EN 50020.
2. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
3. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
4. Cable entries and blanking plugs must be suitable for the ambient range of the apparatus and capable of withstanding a 7J impact test.
5. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure.

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### E1 ATEX Flame-Proof

Certificate No.: KEMA00ATEX2143X  II 1/2 G

EEx d IIC T6 ( $-50\text{ °C} \leq T_{\text{amb}} \leq 65\text{ °C}$ )

EEx d IIC T5 ( $-50\text{ °C} \leq T_{\text{amb}} \leq 80\text{ °C}$ )

$V_{\text{max}} = 42.4\text{V}$

 1180

### Special conditions for safe use (x)

This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime. The Model 3051S pressure transmitter must include a Series 300S housing integrally mounted to a Series Model 3051S Sensor module as per Rosemount drawing 03151-1023.

### Japanese Certifications (does not apply to 3051SF models)

### E4 JIS Flame-Proof

Ex d IIC T6

Certificate	Description
C15682	Coplanar w/Junction Box Housing
C15683	Coplanar w/PlantWeb Housing
C15684	Coplanar w/PlantWeb Housing & LCD Display
C15685	In-Line SST w/Junction Box Housing
C15686	In-Line Hastelloy w/Junction Box Housing
C15687	In-Line SST w/PlantWeb Housing
C15688	In-Line Hastelloy w/Plantweb Housing
C15689	In-Line SST w/Plantweb Housing and LCD Display
C15690	In-Line Hastelloy w/PlantWeb Housing & LCD Display

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### Australian Certifications (does not apply to 3051SF models)

#### E7 SAA Explosion-Proof (Flame-Proof)

Certification No.: AUS Ex 3798X

Ex d IIC T6 ( $T_a = 60^\circ\text{C}$ ) IP66

DIP A21 TA T6 ( $T_a = 60^\circ\text{C}$ ) IP66

#### Conditions for safe use (X)

1. It is a condition of safe use that each housing shall be connected to external circuits via suitable conduit of Standards Australia certified cable glands. Where only one entry is used for connection to external circuits, the unused entry shall be closed by means of the blanking plug supplied by the equipment manufacturer or by a suitable Standards Australia certified blanking plug.
2. It is a condition of safe use that dielectric strength test shall be applied whenever the terminal block is changed or replaced in either the dual compartment or single compartment housings. The breakdown current shall be less than 5 mA, when 500 V, 47 to 62 Hz, is applied for one minute. Note: if tested with an optional T1 transient protector terminal block fitted, the protection will operate and hence there will be no current indicated.
3. It is a condition of safe use that each transmitter module shall be used with a Model 300S housing, in order to comply with Flame-Proof requirements.
4. It is a condition of safe use that each Model 300S housing fitted with a transmitter module shall be marked with the same certification marking code information. Should the housing be replaced after initial supply to another Model 300S housing, the replacement housing shall have the same certification marking code information as the housing it replaces.

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### Combinations of 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.

**K1** Combination of **E1**, **I1**, **N1**, and **ND**

**K5** Combination of **E5** and **I5**

**K6** Combination of **E6** and **I6**

**KA** Combination of **E1**, **I1**, **E6**, and **I6**

**KB** Combination of **E5**, **I5**, **I6** and **E6**

**KC** Combination of **E5**, **E1**, **I5** and **I1**

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### **Notes**

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