

Rosemount 3051 Pressure Transmitter

with HART® Protocol



ROSEMOUNT

Rosemount 3051 Pressure Transmitter

▲ WARNING

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

For technical assistance, contacts are listed below:

Customer Central

Technical support, quoting, and order-related questions.

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

Asia Pacific- 65 777 8211

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

North American Response Center

Equipment service needs.

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

Outside of these areas, contact your local Emerson Process Management representative.

▲ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Process Management Sales Representative.

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Section 1 Introduction

1.1 Using this manual

The sections in this manual provide information on installing, operating, and maintaining the Rosemount 3051. The sections are organized as follows:

[Section 2: Installation](#) contains mechanical and electrical installation instructions, and field upgrade options.

[Section 3: Configuration](#) provides instruction on commissioning and operating Rosemount 3051 transmitters. Information on software functions, configuration parameters, and online variables is also included.

[Section 4: Operation and maintenance](#) contains operation and maintenance techniques.

[Section 5: Troubleshooting](#) provides troubleshooting techniques for the most common operating problems.

[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.

1.2 Service support

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

Within the United States, call the Emerson Process Management Instrument and Valve Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed.

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. The product being returned will require a copy of the required Material Safety Data Sheet (MSDS) for each substance must be included with the returned goods.

Emerson Process Management Instrument and Valve Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

1.3 Models covered

The following Rosemount 3051 Pressure Transmitters are covered by this manual:

Rosemount 3051C coplanar pressure transmitter

Rosemount 3051CD Differential Pressure Transmitter

Measures differential pressure up to 2000 psi (137,9 bar).

Rosemount 3051CG Gage Pressure Transmitter

Measures gage pressure up to 2000 psi (137,9 bar).

Rosemount 3051CA Absolute Pressure Transmitter

Measures absolute pressure up to 4000 psia (275,8 bar).

Rosemount 3051T in-line pressure transmitter

Rosemount 3051T Gage and Absolute Pressure Transmitter

Measures gage pressure up to 10000 psi (689,5 bar).

Rosemount 3051L liquid level transmitter

Provides precise level and specific gravity measurements up to 300 psi (20,7 bar) for a wide variety of tank configurations.

Rosemount 3051H high process temperature pressure transmitter

Provides high process temperature capability to 375 °F (191 °C) for measuring differential or gage pressure without use of remote diaphragm seals or capillaries.

Note

For Rosemount 3051 with FOUNDATION™ fieldbus, see Rosemount Product Manual 00809-0100-4774. For Rosemount 3051 with Profibus PA, see Rosemount Product Manual 00809-0100-4797.

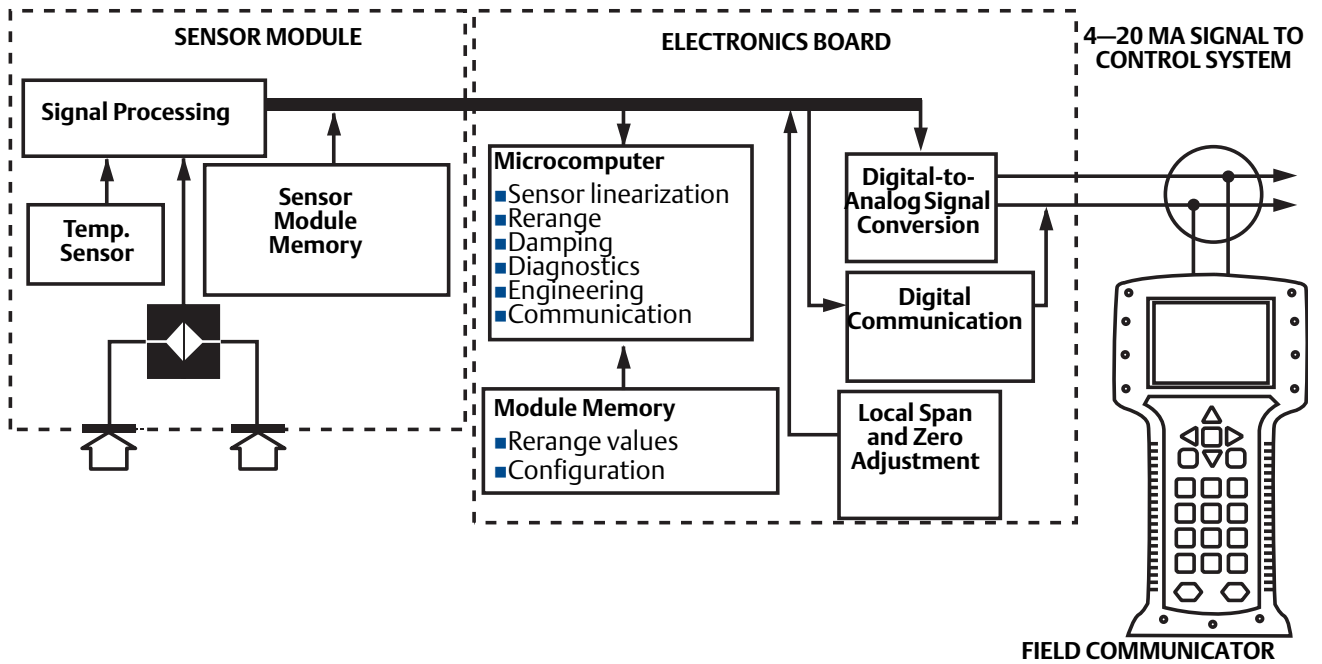
1.4 Transmitter overview

The Rosemount 3051C Coplanar™ design is offered for Differential Pressure (DP), Gage Pressure (GP) and Absolute Pressure (AP) measurements. The Rosemount 3051C utilizes Emerson Process Management capacitance sensor technology for DP and GP measurements. Piezoresistive sensor technology is utilized in the Rosemount 3051T and 3051CA measurements.

The major components of the Rosemount 3051 are the sensor module and the electronics housing. The sensor module contains the oil filled sensor system (isolating diaphragms, oil fill system, and sensor) and the sensor electronics. The sensor electronics are installed within the sensor module and include a temperature sensor (RTD), a memory module, and the capacitance to digital signal converter (C/D converter). The electrical signals from the sensor module are transmitted to the output electronics in the electronics housing. The electronics housing contains the output electronics board, the local zero and span buttons, and the terminal block. The basic block diagram of the Rosemount 3051CD is illustrated in [Figure 1-1](#).

For the Rosemount 3051C design pressure is applied to the isolating diaphragms, the oil deflects the center diaphragm, which then changes the capacitance. This capacitance signal is then changed to a digital signal in the C/D converter. The microprocessor then takes the signals from the RTD and C/D converter calculates the correct output of the transmitter. This signal is then sent to the D/A converter, which converts the signal back to an analog signal and superimposes the HART signal on the 4-20 mA output.

Figure 1-1. Block diagram of operation



1.5 Product recycling/ disposal

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


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Safety messages	page 5
General considerations	page 6
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2.1 Overview

The information in this section covers installation considerations for the Rosemount 3051 with HART protocols. A Quick Installation Guide for HART protocol (document number 00825-0100-4001) is shipped with every transmitter to describe basic pipe-fitting and wiring procedures for initial installation. Dimensional drawings for each 3051 variation and mounting configuration are included on [page 13](#).

2.2 Safety messages

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

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

- Before connecting a Field 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/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.

Electrical shock can result in death or serious injury.

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

⚠ WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals.

Process leaks could result in death or serious injury.

- Install and tighten all four flange bolts before applying pressure.
- Do not attempt to loosen or remove flange bolts while the transmitter is in service.

Replacement equipment or spare parts not approved by Emerson Process Management for use as spare parts could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous.

- Use only bolts supplied or sold by Emerson Process Management as spare parts.
- Refer to [page 164](#) for a complete list of spare parts.

Improper assembly of manifolds to traditional flange can damage sensor module.

- For safe assembly of manifold to traditional flange, bolts must break back plane of flange web (i.e., bolt hole) but must not contact sensor module housing.

2.3 General considerations

Measurement accuracy depends upon proper installation of the transmitter and impulse piping. Mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. Keep in mind the need for easy access, personnel safety, practical field calibration, and a suitable transmitter environment. Install the transmitter to minimize vibration, shock, and temperature fluctuation.

Important

Install the enclosed pipe plug (found in the box) in unused conduit opening with a minimum of five threads engaged to comply with explosion-proof requirements.

For material compatibility considerations, see document number 00816-0100-3045 on www.emersonprocess.com/rosemount.

2.4 Mechanical considerations

Note

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

Note

When the transmitter is mounted on its side, position the Coplanar flange to ensure proper venting or draining. Mount the flange as shown in [Figure 2-8 on page 16](#), keeping drain/vent connections on the bottom for gas service and on the top for liquid service.

2.5 Draft range considerations

Installation

For the Rosemount 3051CD0 draft range pressure transmitter, it is best to mount the transmitter with the isolators parallel to the ground. Installing the transmitter in this way reduces oil head effect and provides for optimal temperature performance.

Be sure the transmitter is securely mounted. Tilting of the transmitter may cause a zero shift in the transmitter output.

Reducing process noise

There are two recommended methods of reducing process noise: output damping and, in gage applications, reference side filtering.

Output damping

The output damping for the Rosemount 3051CD0 is factory set to 3.2 seconds as a default. If the transmitter output is still noisy, increase the damping time. If faster response is needed, decrease the damping time. Damping adjustment information is available on [page 57](#).

Reference side filtering

In gage applications it is important to minimize fluctuations in atmospheric pressure to which the low side isolator is exposed.

One method of reducing fluctuations in atmospheric pressure is to attach a length of tubing to the reference side of the transmitter to act as a pressure buffer.

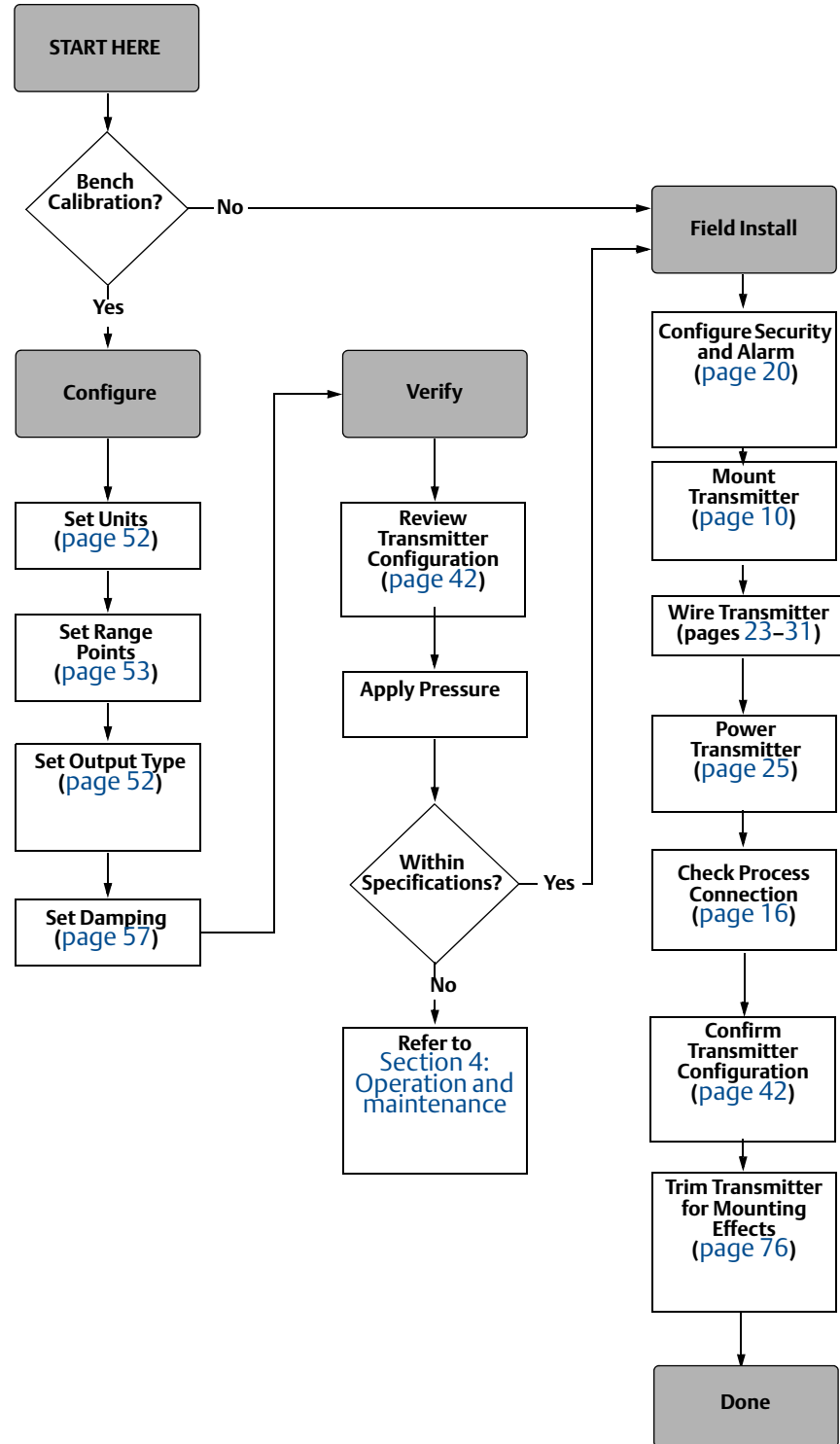
Another method is to plumb the reference side to a chamber that has a small vent to atmosphere. If multiple draft transmitters are being used in an application, the reference side of each device can be plumbed to a chamber to achieve a common gage reference.

2.6 Environmental considerations

Best practice is to mount the transmitter in an environment that has minimal ambient temperature change. The transmitter electronics temperature operating limits are -40 to 185 °F (-40 to 85 °C). Refer to [Appendix A: Specifications and reference data](#) that lists the sensing element operating limits. Mount the transmitter so that it is not susceptible to vibration and mechanical shock and does not have external contact with corrosive materials.

2.7 HART installation flowchart

Figure 2-1. HART installation flowchart



2.8 Installation procedures

2.8.1 Mount the transmitter

For dimensional drawing information refer to [Appendix A: Specifications and reference data](#) on page 120.

Process flange orientation

Mount the process flanges with sufficient clearance for process connections. For safety reasons, place the drain/vent valves so the process fluid is directed away from possible human contact when the vents are used. In addition, consider the need for a testing or calibration input.

Note

Most transmitters are calibrated in the horizontal position. Mounting the transmitter in any other position will shift the zero point to the equivalent amount of liquid head pressure caused by the varied mounting position. To reset zero point, refer to [“Sensor Trim”](#) on page 10.

Housing rotation

See [“Housing rotation”](#) on page 18.

Terminal side of electronics housing

Mount the transmitter so the terminal side is accessible. Clearance of 0.75 in. (19 mm) is required for cover removal. Use a conduit plug in the unused conduit opening.

Circuit side of electronics housing

Provide 0.75 in. (19 mm) of clearance for units with out an LCD display. Three inches of clearance is required for cover removal if a meter is installed.

Cover installation

Always ensure a proper seal by installing the electronics housing cover(s) so that metal contacts metal. Use Rosemount O-rings.

Conduit entry threads

For NEMA 4X, IP66, and IP68 requirements, use thread seal (PTFE) tape or paste on male threads to provide a watertight seal.

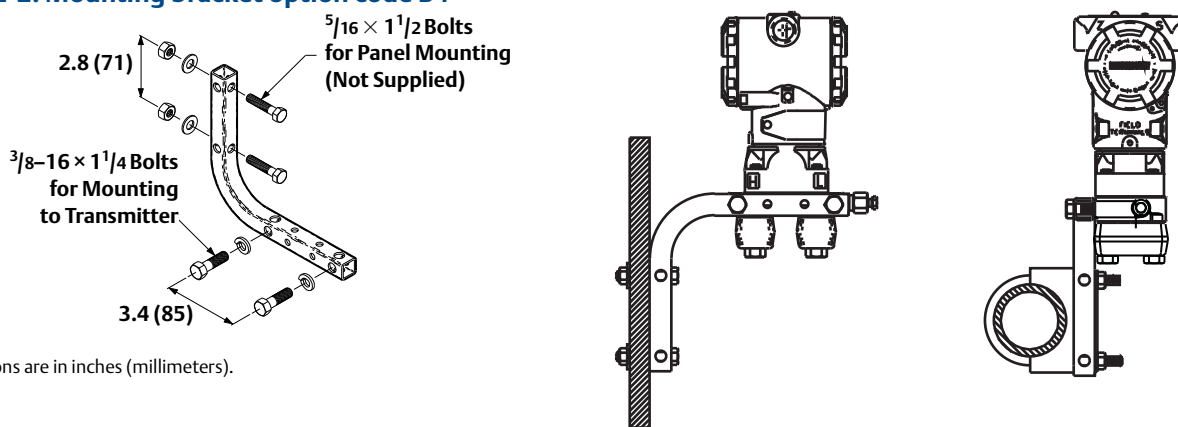
Mounting brackets

Rosemount 3051 Transmitters may be panel-mounted or pipe-mounted through an optional mounting bracket. Refer to [Table 2-1](#) for the complete offering and see [Figure 2-2](#) through [Figure 2-5](#) on pages 11 and 12 for dimensions and mounting configurations.

Table 2-1. Mounting brackets

3051 brackets										
Option code	Process connections			Mounting			Materials			
	Coplanar	In-line	Traditional	Pipe mount	Panel mount	Flat panel mount	CS bracket	SST bracket	CS bolts	SST bolts
B4	X	X		X	X	X		X		X
B1			X	X			X		X	
B2			X		X		X		X	
B3			X			X	X		X	
B7			X	X			X			X
B8			X		X		X			X
B9			X			X	X			X
BA			X	X				X		X
BC			X			X		X		X

Figure 2-2. Mounting bracket option code B4



Note
Dimensions are in inches (millimeters).

Flange bolts

The 3051 can be shipped with a Coplanar flange or a Traditional flange installed with four 1.75-inch flange bolts. Mounting bolts and bolting configurations for the Coplanar and Traditional flanges can be found on [page 14](#). Stainless steel bolts supplied by Emerson Process Management are coated with a lubricant to ease installation. Carbon steel bolts do not require lubrication. No additional lubricant should be applied when installing either type of bolt. Bolts supplied by Emerson Process Management are identified by their head markings:

Figure 2-3. Mounting bracket option codes B1, B7, and BA

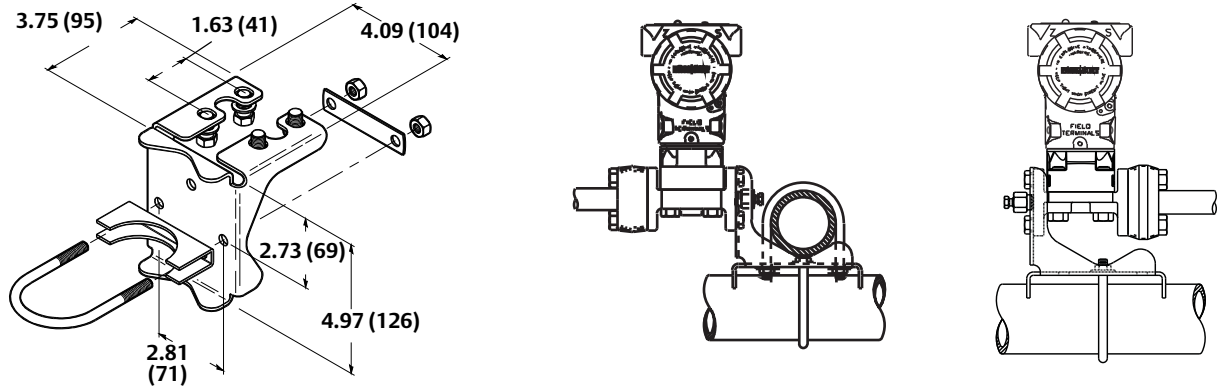


Figure 2-4. Panel mounting bracket option codes B2 and B8

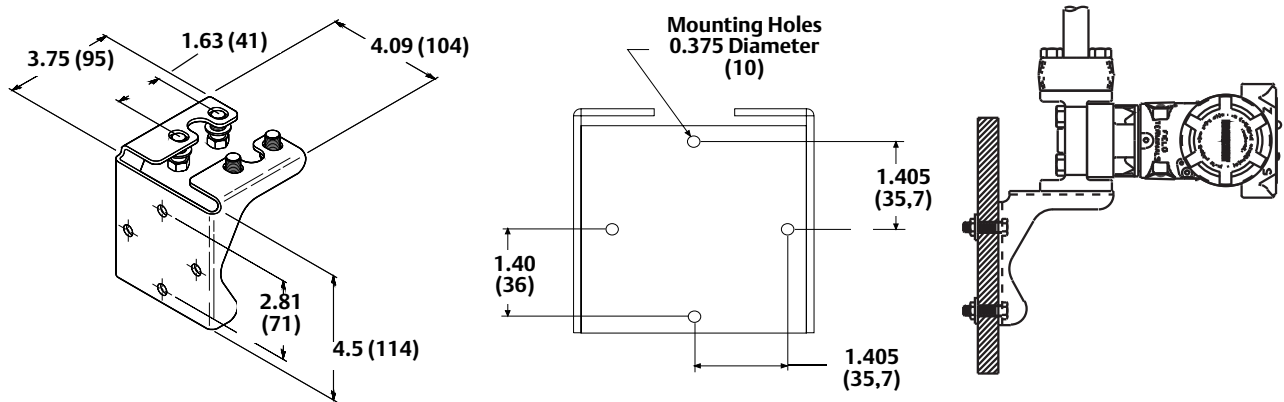
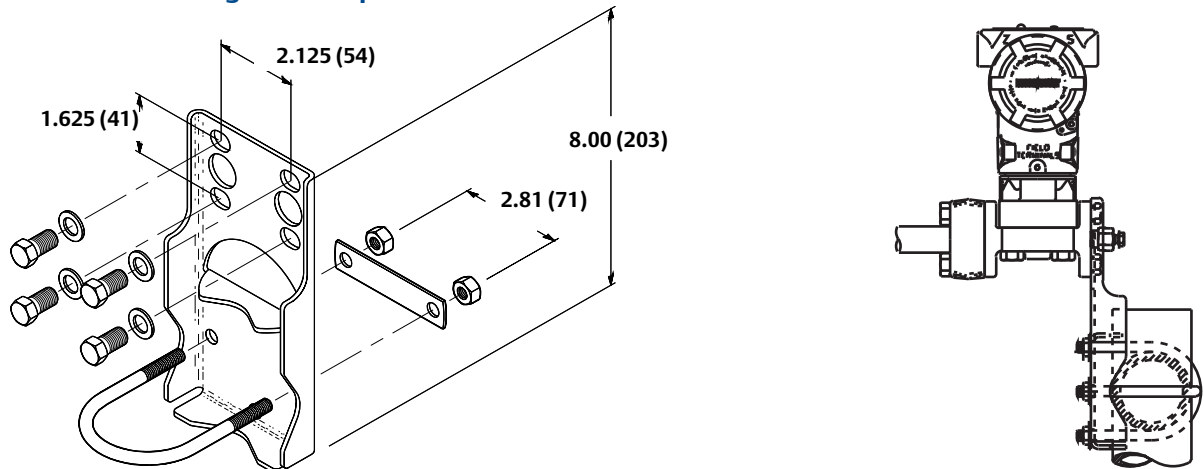
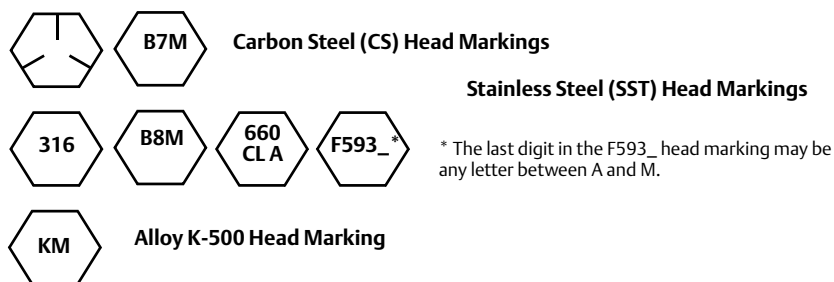



Figure 2-5. Flat mounting bracket option codes B3 and BC



Note
Dimensions are in inches (millimeters).



Bolt installation

 Only use bolts supplied with the Rosemount 3051 or sold by Emerson Process Management as spare parts for the Rosemount 3051 transmitter. Use the following bolt installation procedure:

1. Finger-tighten the bolts.
2. Torque the bolts to the initial torque value using a crossing pattern (see [Table 2-2](#) for torque values).
3. Torque the bolts to the final torque value using the same crossing pattern.

Table 2-2. Bolt installation torque values

Bolt material	Initial torque value	Final torque value
CS-ASTM-A445 Standard	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
316 SST—Option L4	150 in.-lb (17 N-m)	300 in.-lb (34 N-m)
ASTM-A-19 B7M—Option L5	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
Alloy 400—Option L6	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)

Figure 2-4. Traditional flange bolt configurations

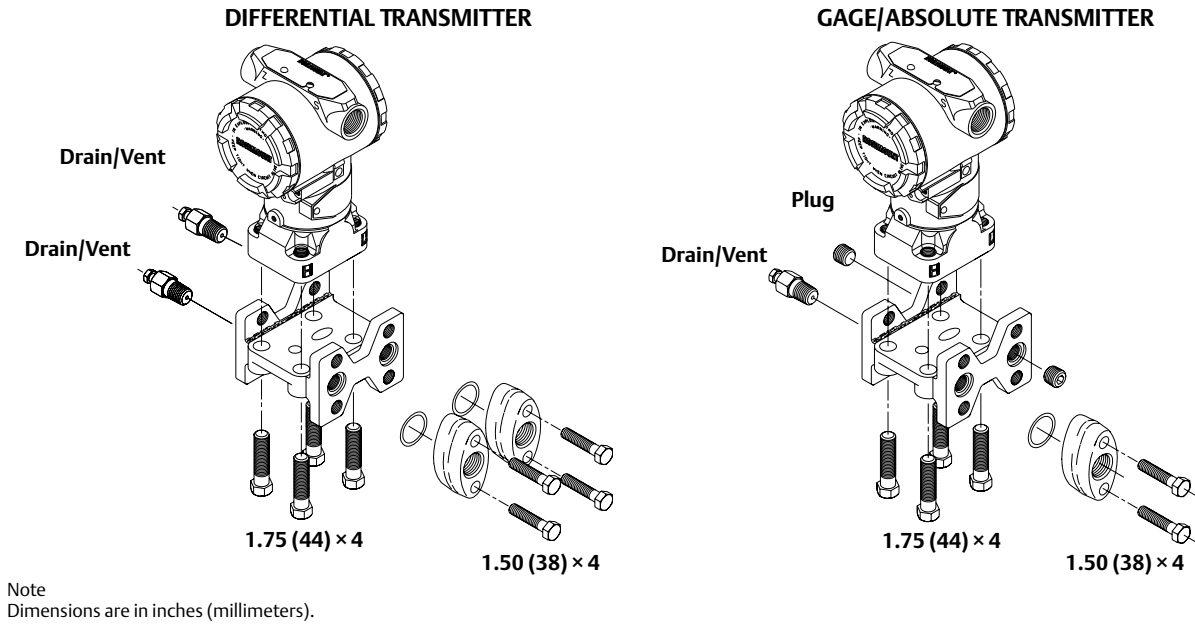
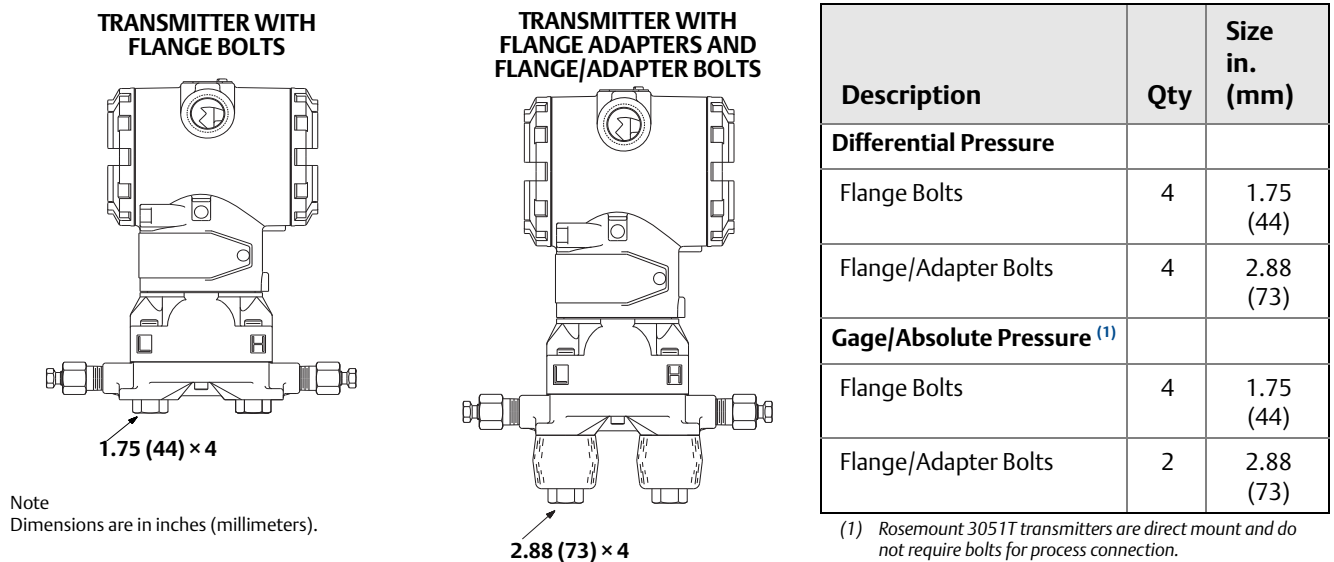


Figure 2-7. Mounting bolts and bolt configurations for coplanar flange



Description	Qty	Size in. (mm)
Differential Pressure		
Flange Bolts	4	1.75 (44)
Flange/Adapter Bolts	4	2.88 (73)
Gage/Absolute Pressure ⁽¹⁾		
Flange Bolts	4	1.75 (44)
Flange/Adapter Bolts	2	2.88 (73)

(1) Rosemount 3051T transmitters are direct mount and do not require bolts for process connection.

Note
Dimensions are in inches (millimeters).

2.8.2 Impulse piping

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are five possible sources of error: pressure transfer, leaks,

friction loss (particularly if purging is used), trapped gas in a liquid line, liquid in a gas line, and density variations between the legs.

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

- Keep impulse piping as short as possible.
- For liquid service, slope the impulse piping at least 1 in./foot (8 cm/m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1 in./foot (8 cm/m) downward from the transmitter toward the process connection.
- Avoid high points in liquid lines and low points in gas lines.
- Make sure both impulse legs are the same temperature.
- Use impulse piping large enough to avoid friction effects and blockage.
- Vent all gas from liquid piping legs.
- When using a sealing fluid, fill both piping legs to the same level.
- When purging, make the purge connection close to the process taps and purge through equal lengths of the same size pipe. Avoid purging through the transmitter.
- Keep corrosive or hot (above 250 °F [121 °C]) process material out of direct contact with the sensor module and flanges.
- Prevent sediment deposits in the impulse piping.
- Maintain equal leg of head pressure on both legs of the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process flange.

Mounting requirements

Impulse piping configurations depend on specific measurement conditions. Refer to [Figure 2-8](#) for examples of the following mounting configurations:

Liquid flow measurement

- Place taps to the side of the line to prevent sediment deposits on the transmitter's process isolators.
- Mount the transmitter beside or below the taps so gases can vent into the process line.
- Mount drain/vent valve upward to allow gases to vent.

Gas flow measurement

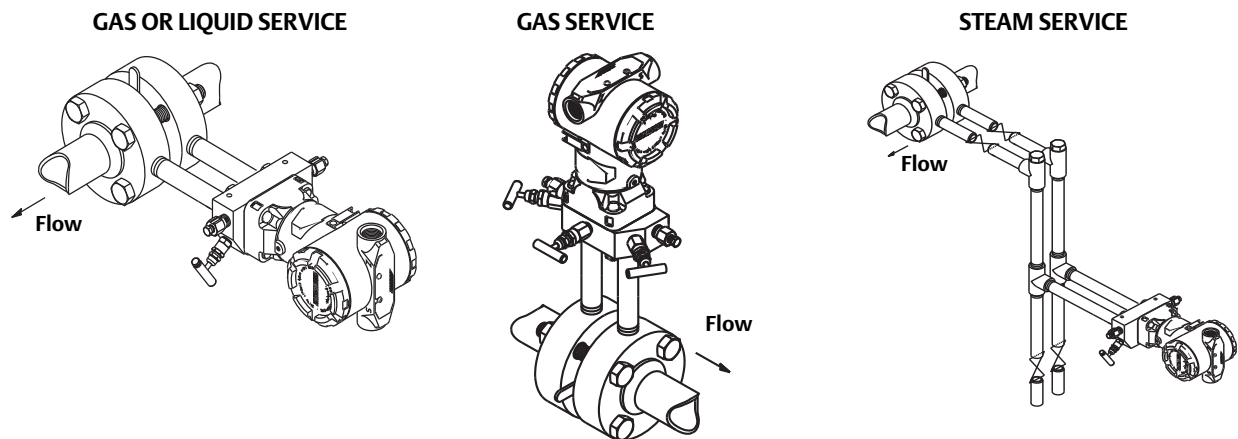
- Place taps in the top or side of the line.
- Mount the transmitter beside or above the taps so liquid will drain into the process line.

Steam flow measurement

- Place taps to the side of the line.
- Mount the transmitter below the taps to ensure that the impulse piping will stay filled with condensate.
- In steam service above 250 °F (121 °C), fill impulse lines with water to prevent steam from contacting the transmitter directly and to ensure accurate measurement start-up.

Note

For steam or other elevated temperature services, it is important that temperatures at the process connection do not exceed the transmitter's process temperature limits.

Figure 2-8. Installation examples

2.8.3 Process connections

Coplanar or traditional process connection

- ⚠ Install and tighten all four flange bolts before applying pressure, or process leakage will result. When properly installed, the flange bolts will protrude through the top of the sensor module housing. Do not attempt to loosen or remove the flange bolts while the transmitter is in service.

Flange adaptors:

- ⚠ Rosemount 3051DP and GP process connections on the transmitter flanges are $\frac{1}{4}$ -18 NPT. Flange adapters are available with standard $\frac{1}{2}$ -14 NPT Class 2 connections. The flange adapters allow users to disconnect from the process by removing the flange adapter bolts. Use plant-approved lubricant or sealant when making the process connections. Refer to Dimensional Drawings on [page 120](#) for the distance between pressure connections. This distance may be varied $\pm \frac{1}{8}$ in. (3.2 mm) by rotating one or both of the flange adapters.

To install adaptors to a Coplanar flange, perform the following procedure:

1. Remove the flange bolts.
2. Leaving the flange in place, move the adapters into position with the o-ring installed.
3. Clamp the adapters and the Coplanar flange to the transmitter sensor module using the larger of the bolts supplied.
4. Tighten the bolts. Refer to “[Flange bolts](#)” on [page 11](#) for torque specifications.

Whenever you remove flanges or adapters, visually inspect the PTFE o-rings. Replace with o-ring designed for Rosemount transmitter if there are any signs of damage, such as nicks or cuts. Undamaged o-rings may be reused. If you replace the o-rings, retorque the flange bolts after installation to compensate for cold flow. Refer to the process sensor body reassembly procedure in [Section 5: Troubleshooting](#).

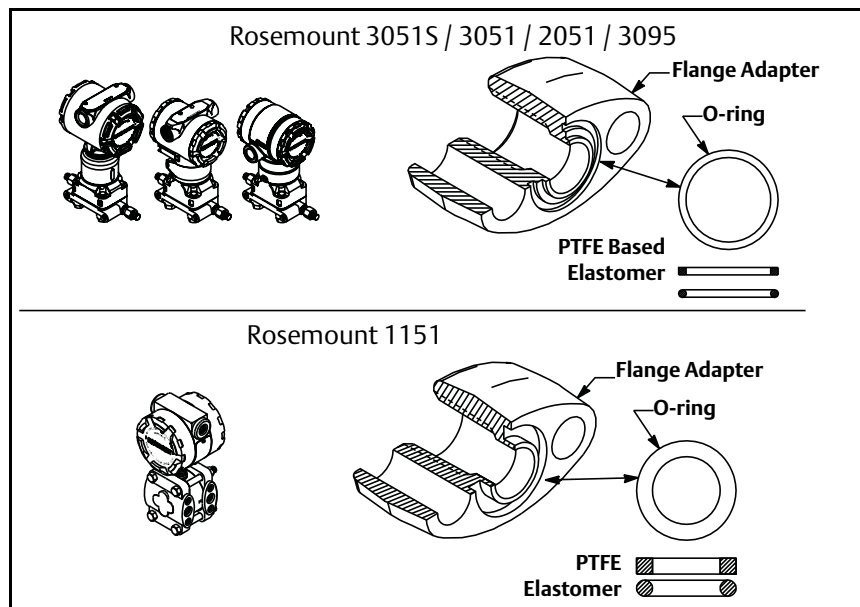
O-rings:

The two styles of Rosemount flange adapters (Rosemount 1151 and Rosemount 3051S/3051/2051/3095) each require a unique O-ring (see [Figure 2-9](#)). Use only the O-ring designed for the corresponding flange adaptor.

Figure 2-9. O-Rings.

⚠ 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.



⚠ When compressed, PTFE O-rings tend to “cold flow,” which aids in their sealing capabilities.

Note

PTFE O-rings should be replaced if the flange adapter is removed.

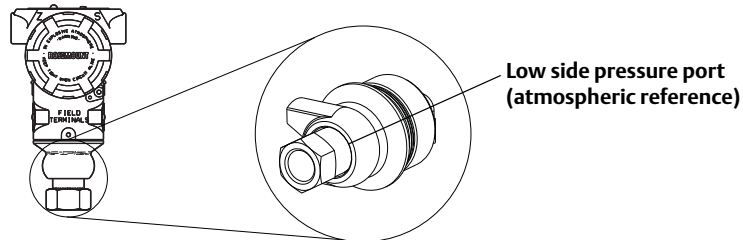
2.8.4 Inline process connection

Inline gage transmitter orientation

The low side pressure port on the inline gage transmitter is located in the neck of the transmitter, behind the housing. The vent path is 360 degrees around the transmitter between the housing and sensor (See Figure 2-10).

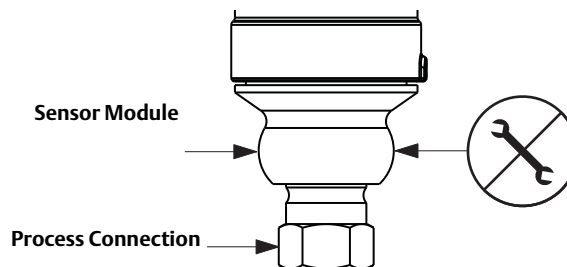
Keep the vent path free of any obstruction, such as paint, dust, and lubrication by mounting the transmitter so that the process can drain away.

Figure 2-10. Inline gage low side pressure port



⚠ WARNING

Do not apply torque directly to the sensor module. Rotation between the sensor module and the process connection can damage the electronics. To avoid damage, apply torque only to the hex-shaped process connection.

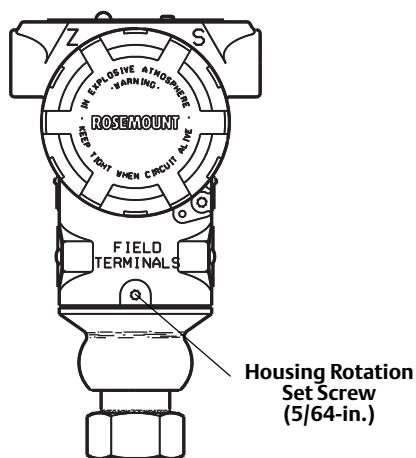


2.8.5 Housing rotation

The electronics housing can be rotated up to 180 degrees in either direction to improve field access, or to better view the optional LCD display. To rotate the housing, perform the following procedure:

1. Loosen the housing rotation set screw using a $\frac{5}{64}$ -in. hex wrench.
2. Turn the housing left or right up to 180° from its original position. Over rotating will damage the transmitter.
3. Retighten the housing rotation set screw.

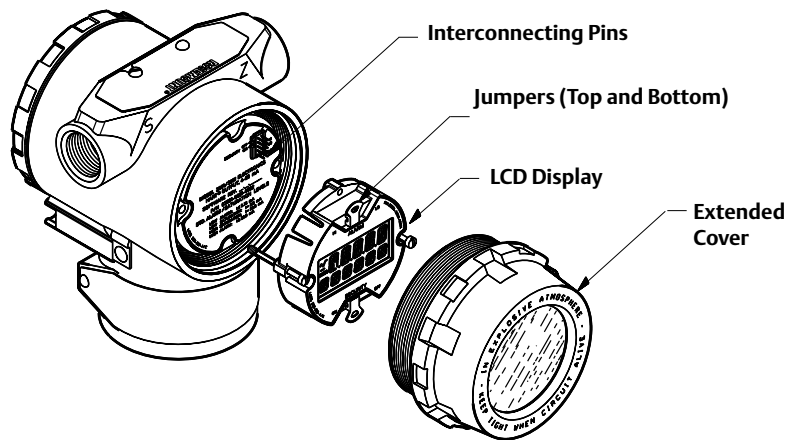
Figure 2-11. Housing rotation



2.8.6 LCD display

Transmitters ordered with the LCD option are shipped with the display installed. Installing the display on an existing 3051 transmitter requires a small instrument screwdriver.

Figure 2-12. LCD display



2.8.7 Configure security and alarm

Security (write protect)

There are three security methods with the Rosemount 3051 transmitter:

1. Security Jumper: prevents all writes to transmitter configuration.
2. Local Keys (Local Zero and Span) Software Lock Out: prevents changes to transmitter range points via local zero and span adjustment keys. With local keys security enabled, changes to configuration are possible via HART.
3. Physical Removal of Local Keys (Local Zero and Span) Magnetic Buttons: removes ability to use local keys to make transmitter range point adjustments. With local keys security enabled, changes to configuration are possible via HART.

You can prevent changes to the transmitter configuration data with the write protection jumper. Security is controlled by the security (write protect) jumper located on the electronics board or LCD display. Position the jumper on the transmitter circuit board in the “ON” position to prevent accidental or deliberate change of configuration data.

If the transmitter write protection jumper is in the “ON” position, the transmitter will not accept any “writes” to its memory. Configuration changes, such as digital trim and reranging, cannot take place when the transmitter security is on.

Note

If the security jumper is not installed, the transmitter will continue to operate in the security OFF configuration.

Configuring transmitter security and alarm jumper procedure

To reposition the jumpers, follow the procedure described below.

1. Do not remove the transmitter covers in explosive atmospheres when the circuit is live. If the transmitter is live, set the loop to manual and remove power.
2. Remove the housing cover opposite the field terminal side. Do not remove the transmitter covers in explosive atmospheres when the circuit is live.
3. Reposition the jumpers as desired.
 - [Figure 2-13](#) shows the jumper positions for the 4-20 mA HART Transmitter.
 - [Figure 2-14](#) shows the jumper positions for the 1-5 HART Vdc Low Power Transmitter.
4. Reattach the transmitter cover. Always ensure a proper seal by installing the electronics housing covers so that metal contacts metal to meet explosion-proof requirements.

Figure 2-13. Electronics board

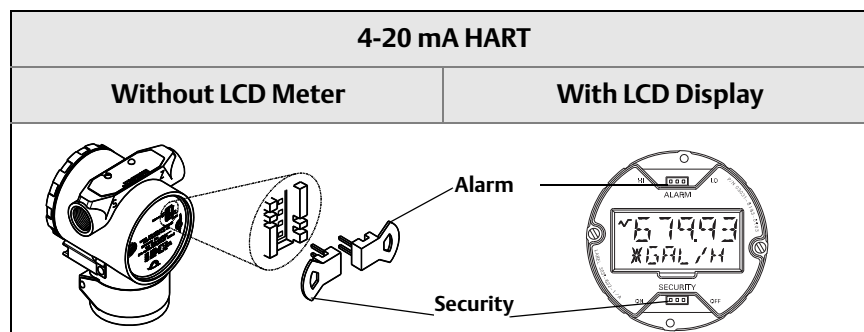
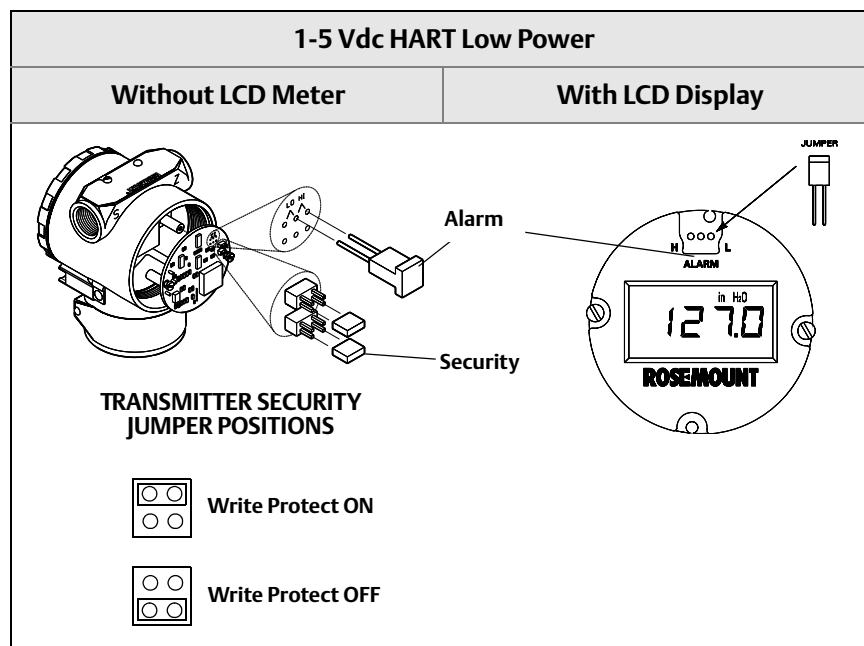


Figure 2-14. Low power transmitter electronics boards



Note

Security jumper not installed = Not Write Protected
Alarm jumper not installed = High Alarm

2.9 Electrical considerations

Note

Make sure all electrical installation is in accordance with national and local code requirements.

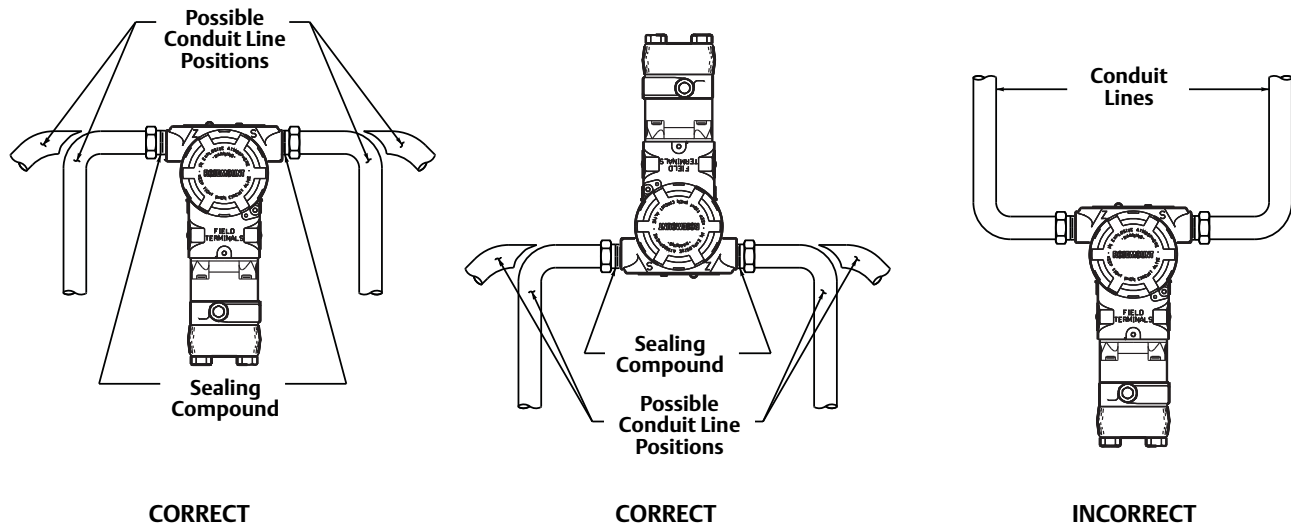
2.9.1 Conduit installation

⚠ CAUTION

If all connections are not sealed, excess moisture accumulation can damage the transmitter. Make sure to mount the transmitter with the electrical housing positioned downward for drainage. To avoid moisture accumulation in the housing, install wiring with a drip loop, and ensure the bottom of the drip loop is mounted lower than the conduit connections or the transmitter housing.

Recommended conduit connections are shown in Figure 2-15.

Figure 2-15. Conduit installation diagrams.



2.9.2 Wiring

▲ CAUTION

Do not connect the power signal wiring to the test terminals. Voltage may burn out the reverse-polarity protection diode in the test connection.

Note

Use shielded twisted pairs to yield best results. To ensure proper communication, use 24 AWG or larger wire, and do not exceed 5000 feet (1500 meters).

Figure 2-16. 4-20 mA HART wiring

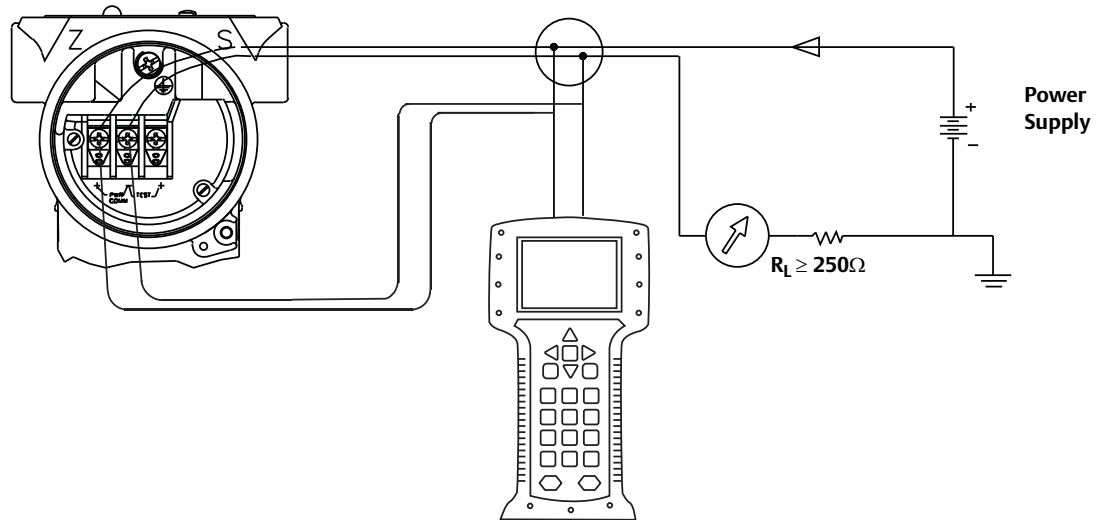
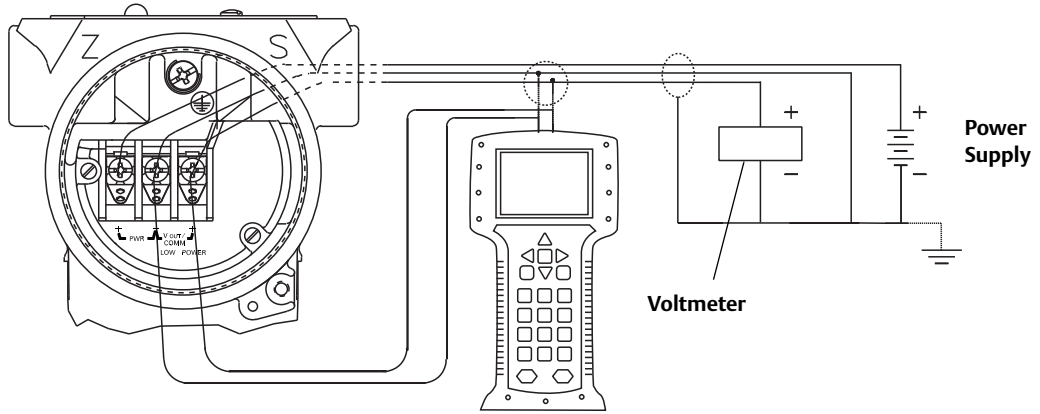




Figure 2-17. 1-5 Vdc low power wiring



Perform the following procedure to make wiring connections:

1.  Remove the housing cover on terminal compartment side. Do not remove the cover in explosive atmospheres when the circuit is live. Signal wiring supplies all power to the transmitter.
2. 
 - a. For 4-20 mA HART output, connect the positive lead to the terminal marked (+) and the negative lead to the terminal marked (pwr/comm -). Do not connect powered signal wiring to the test terminals. Power could damage the test diode.
 - b. For 1-5 Vdc HART Low Power output, connect the positive lead to the terminal marked (+ pwr) and the negative lead to the terminal marked (pwr -). Connect signal lead to V_{out} / comm +.
3. Plug and seal unused conduit connection on the transmitter housing to avoid moisture accumulation in the terminal side. Install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.

Power supply for 4-20 mA HART

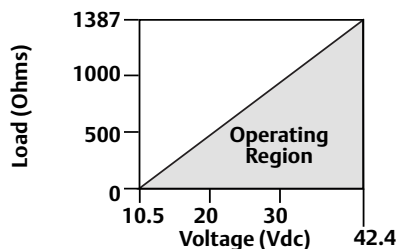
Transmitter operates on 10.5 - 42.4 Vdc. The dc power supply should provide power with less than two percent ripple.

Note

A minimum loop resistance of 250 ohms is required to communicate with a Field Communicator. If a single power supply is used to power more than one 3051 transmitter, the power supply used, and circuitry common to the transmitters, should not have more than 20 ohms of impedance at 1200 Hz.

Figure 2-18. Load limitation

$$\text{Maximum Loop Resistance} = 43.5 * (\text{Power Supply Voltage} - 10.5)$$



The Field Communicator requires a minimum loop resistance of 250Ω for communication.

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.

Power supply for 1-5 Vdc HART low power

Low power transmitters operate on 6-14 Vdc. The dc power supply should provide power with less than two percent ripple. The V_{out} load should be 100 k Ω or greater.

2.9.3 Transient protection terminal block

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

The transient protection terminal block can be ordered as an installed option (Option Code T1 in the transmitter model number) or as a spare part to retrofit existing 3051 transmitters in the field. See “Spare parts” on page 164 for spare part numbers. The lightning bolt symbol shown in Figure 2-19 and Figure 2-20 identifies the transient protection terminal block.

Figure 2-19. 4-20 mA HART wiring with transient protection

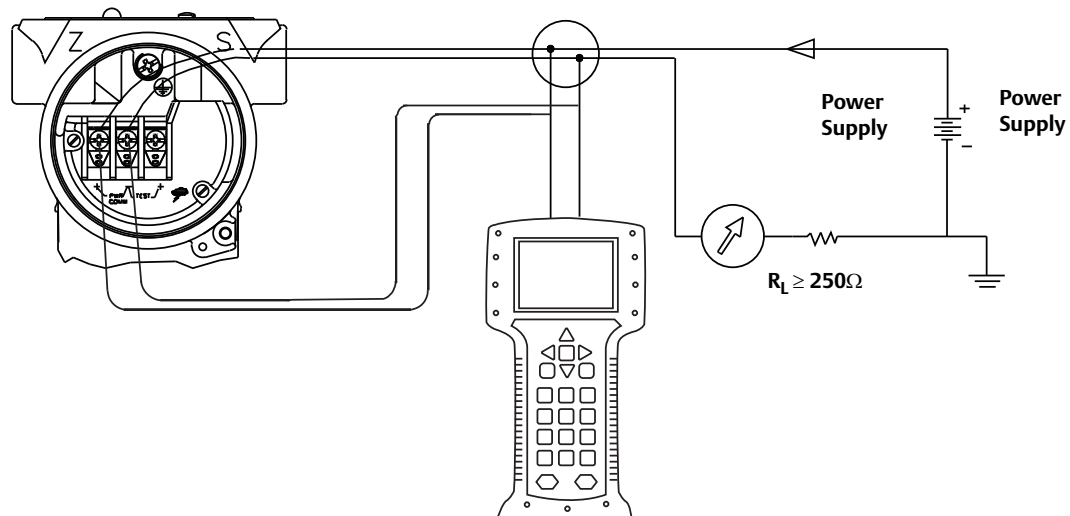


Figure 2-20. 1-5 Vdc low power wiring with transient protection

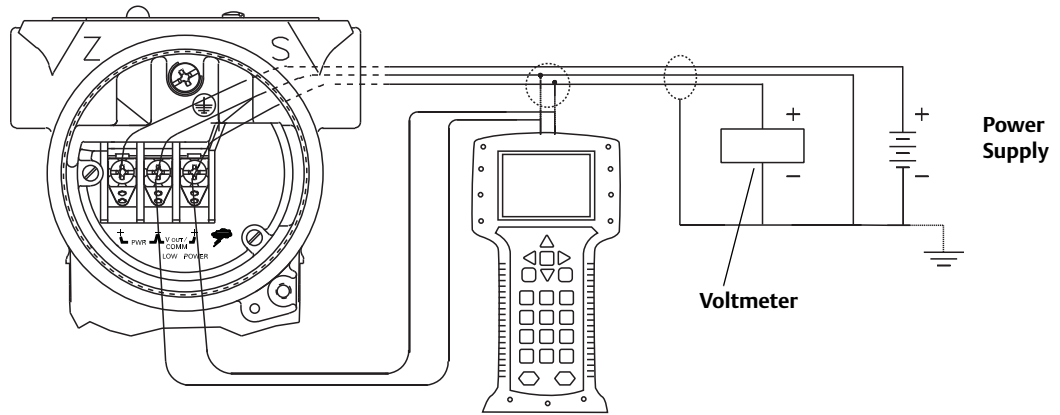
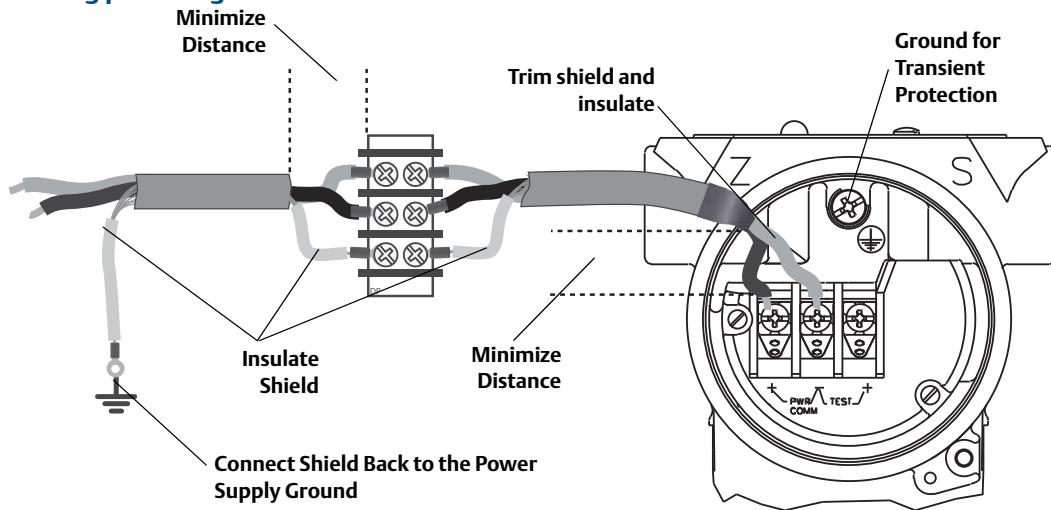


Figure 2-21. Wiring pair and ground



Note

The transient protection terminal block does not provide transient protection unless the transmitter case is properly grounded. Use the guidelines to ground the transmitter case. Refer to [page 27](#).

Do not run the transient protection ground wire with signal wiring as the ground wire may carry excessive current if a lightning strike occurs.

2.9.4 Grounding

⚠ Use the following techniques to properly ground the transmitter signal wiring and case:

Signal wiring

Do not run signal wiring in conduit or open trays with power wiring or near heavy electrical equipment. It is important that the instrument cable shield be:

- Trimmed close and insulated from touching the transmitter housing
- Connected to the next shield if cable is routed through a junction box
- Connected to a good earth ground at the power supply end

For 4-20 mA HART output, the signal wiring may be grounded at any one point on the signal loop or may be left ungrounded. The negative terminal of the power supply is a recommended grounding point.

For 1-5 Vdc HART Low Power output, the power wires may be grounded at only one point or left ungrounded. The negative terminal of the power supply is a recommended grounding point.

Transmitter case

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

- **Internal Ground Connection:** The Internal Ground Connection screw is inside the FIELD TERMINALS side of the electronics housing. This screw is identified by a ground symbol (\oplus). The ground connection screw is standard on all Rosemount 3051 transmitters. Refer to [Figure 2-22](#).

Figure 2-22. Internal ground screw

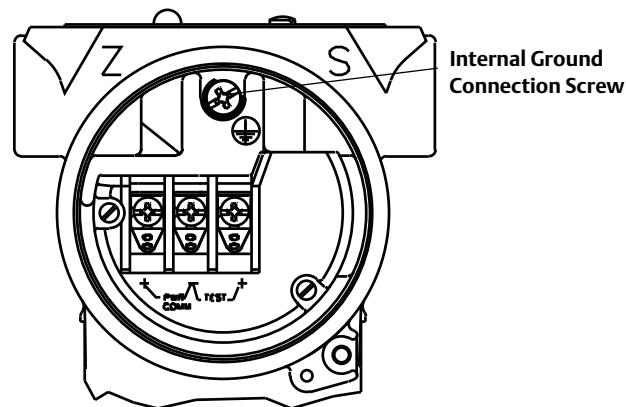
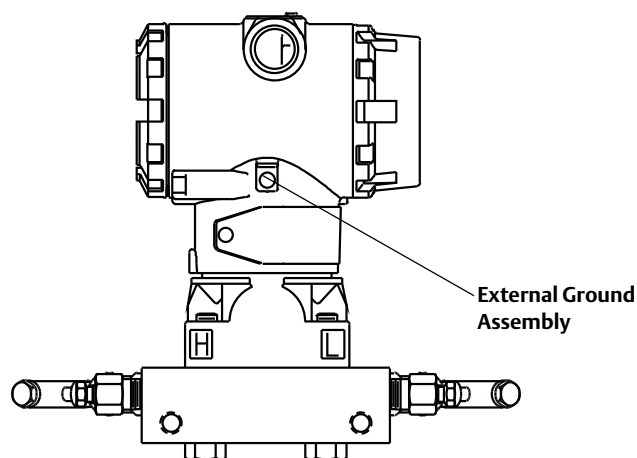


Figure 2-23. External ground assembly



Note

Grounding the transmitter case via threaded conduit connection may not provide sufficient ground continuity.

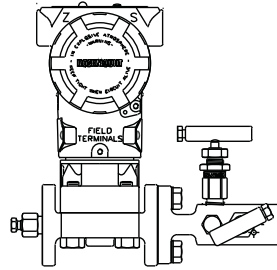
2.10 Hazardous locations certifications

- ⚠ 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 certifications](#)” on page 177 for information on these approvals.

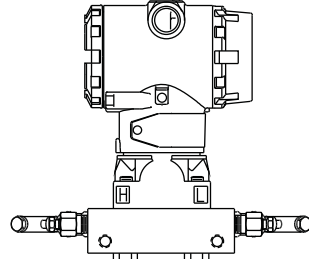
2.11 Rosemount 305, 306, and 304 manifolds

The 305 Integral Manifold is available in two designs: Traditional and Coplanar. The traditional 305 Integral Manifold can be mounted to most primary elements with mounting adapters in the market today. The 306 Integral Manifold is used with the 3051T in-line transmitters to provide block-and-bleed valve capabilities of up to 10000 psi (690 bar).

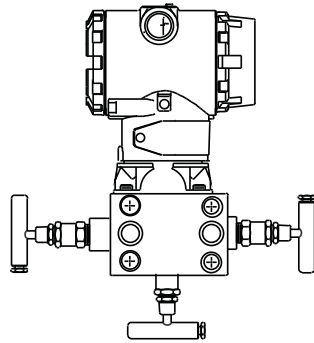
Figure 2-24. Manifolds



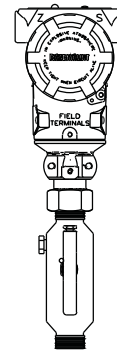
3051C AND 304
CONVENTIONAL



3051C AND 305 INTEGRAL
COPLANAR




3051C AND 305
INTEGRAL TRADITIONAL



3051T AND 306
IN-LINE

2.11.1 Rosemount 305 integral manifold installation procedure

To install a 305 Integral Manifold to a 3051 transmitter:

1.  Inspect the PTFE sensor module o-rings. Undamaged o-rings may be reused. If the o-rings are damaged (if they have nicks or cuts, for example), replace with o-rings designed for Rosemount transmitter.

Important

If replacing the o-rings, take care not to scratch or deface the o-ring grooves or the surface of the isolating diaphragm while you remove the damaged o-rings.


2. Install the Integral Manifold on the sensor module. Use the four 2.25-in. manifold bolts for alignment. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value. See “[Flange bolts](#)” on page 11 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the sensor module housing.
3. If the PTFE sensor module o-rings have been replaced, the flange bolts should be re-tightened after installation to compensate for cold flow of the o-rings.

Note

Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate mounting effects.

2.11.2 Rosemount 306 integral manifold installation procedure

The 306 Manifold is for use only with a 3051T In-line transmitter.


1.  Assemble the 306 Manifold to the 3051T In-line transmitter with a thread sealant.

2.11.3 Rosemount 304 conventional manifold installation procedure

To install a 304 Conventional Manifold to a 3051 transmitter:

1. Align the Conventional Manifold with the transmitter flange. Use the four manifold bolts for alignment.
2. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value. See “[Flange bolts](#)” on page 11 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the sensor module housing.
3. Leak-check assembly to maximum pressure range of transmitter.

2.11.4 Manifold operation

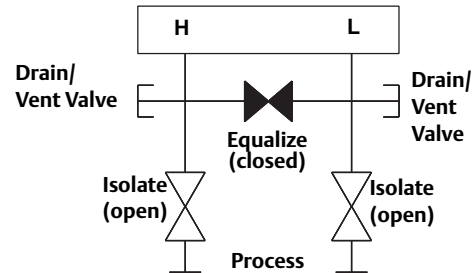
1.  Improper installation or operation of manifolds may result in process leaks, which may cause death or serious injury.

 See “[Safety messages](#)” on page 5 for complete warning information.

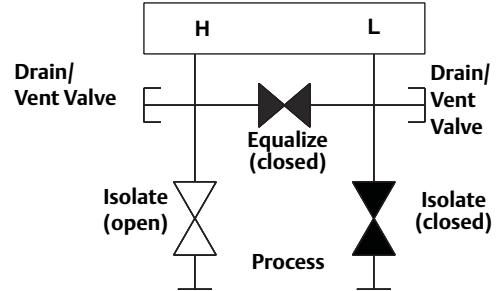
Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate any shift due to mounting effects. See “[Sensor Trim Overview](#)” on page 10.

Three and five-valve configurations shown:

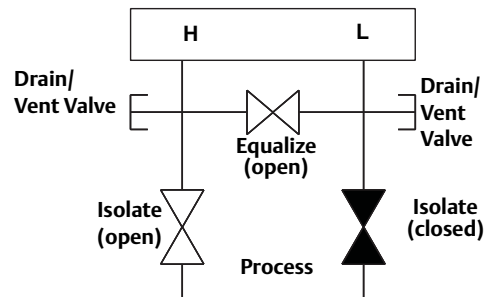
In normal operation the two block valves between the process and instrument ports will be open and the equalizing valve will be closed.



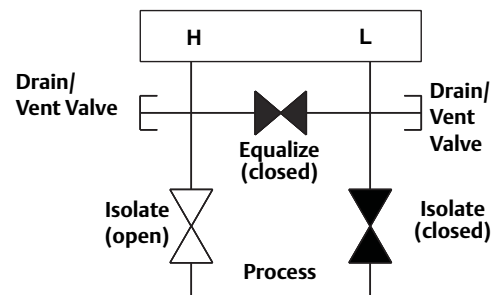
1. To zero the 3051, close the block valve to the low pressure (downstream) side of the transmitter first.



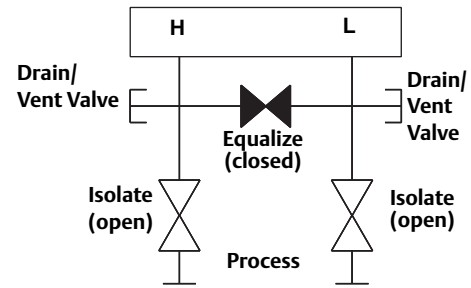
2. Open the center (equalize) valve to equalize the pressure on both sides of the transmitter. The manifold valves are now in the proper configuration for zeroing the transmitter.



3. After zeroing the transmitter, close the equalizing valve.

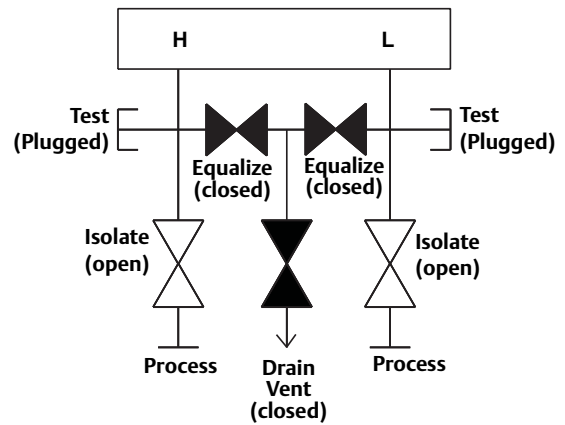


- Open the block valve on the low pressure side of the transmitter to return the transmitter to service.

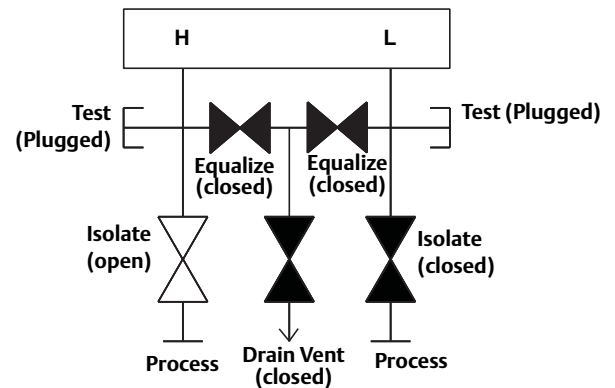


Five-valve Natural Gas configurations shown:

In normal operation, the two block valves between the process and instrument ports will be open, and the equalizing valves will be closed.



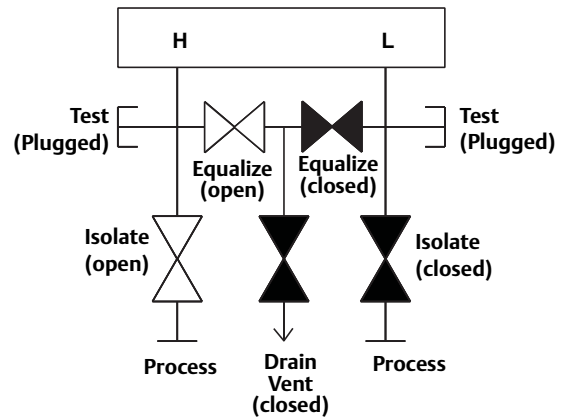
- To zero the 3051, first close the block valve on the low pressure (downstream) side of the transmitter.



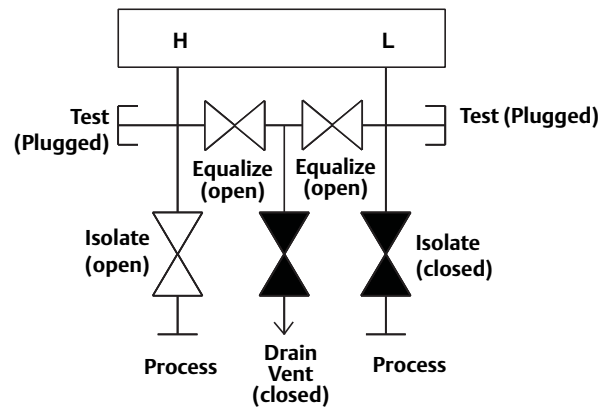
Note

Do not open the low side equalize valve before the high side equalize valve. Doing so will overpressure the transmitter.

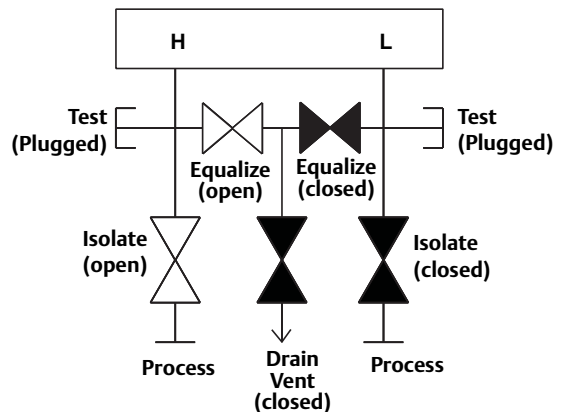
- Open the equalize valve on the high pressure (upstream) side of the transmitter.



- Open the equalize valve on the low pressure (downstream) side of the transmitter. The manifold is now in the proper configuration for zeroing the transmitter.



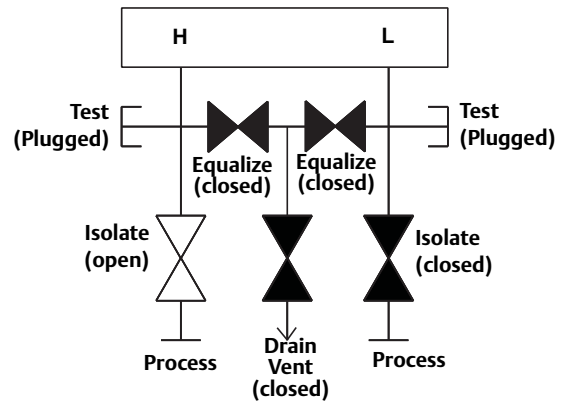
- After zeroing the transmitter, close the equalize valve on the low pressure (downstream) side of the transmitter.



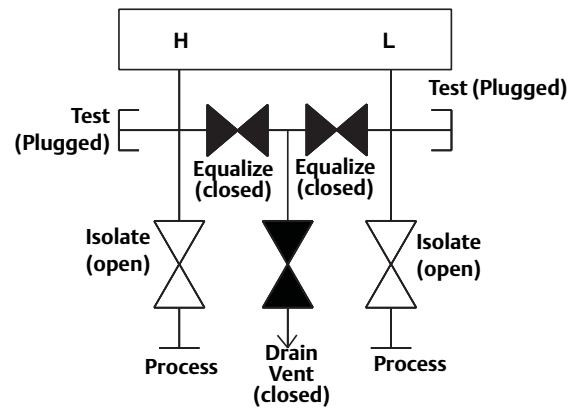
2.12 Liquid level measurement

Differential pressure transmitters used for liquid level applications measure hydrostatic pressure head. Liquid level and specific gravity of a liquid are factors in determining pressure head. This pressure is equal to the liquid height above the tap multiplied by the specific gravity of the liquid. Pressure head is independent of volume or vessel shape.

5. Close the equalize valve on the high pressure (upstream) side.



6. Finally, to return the transmitter to service, open the low side isolation valve.



2.12.1 Open vessels

A pressure transmitter mounted near a tank bottom measures the pressure of the liquid above.

Make a connection to the high pressure side of the transmitter, and vent the low pressure side to the atmosphere. Pressure head equals the liquid's specific gravity multiplied by the liquid height above the tap.

Zero range suppression is required if the transmitter lies below the zero point of the desired level range. [Figure 2-25](#) shows a liquid level measurement example.

2.12.2 Closed vessels

Pressure above a liquid affects the pressure measured at the bottom of a closed vessel. The liquid specific gravity multiplied by the liquid height plus the vessel pressure equals the pressure at the bottom of the vessel.

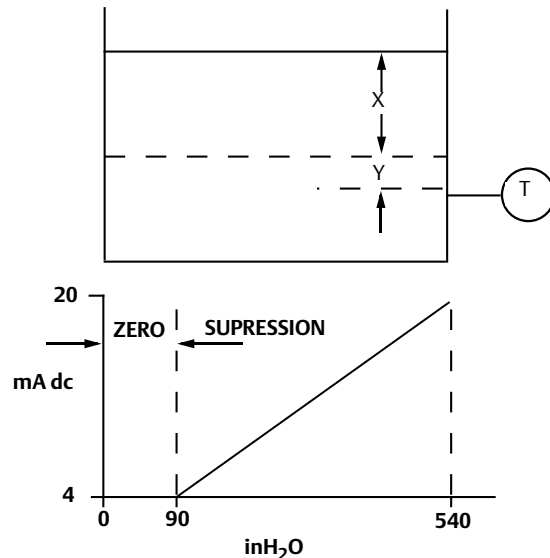
To measure true level, the vessel pressure must be subtracted from the vessel bottom pressure. To do this, make a pressure tap at the top of the vessel and connect this to the low side of the transmitter. Vessel pressure is then equally applied to both the high and low sides of the transmitter. The resulting differential pressure is proportional to liquid height multiplied by the liquid specific gravity.

Dry leg condition

Low-side transmitter piping will remain empty if gas above the liquid does not condense. This is a dry leg condition. Range determination calculations are the same as those described for bottom-mounted transmitters in open vessels, as shown in [Figure 2-25](#).

Figure 2-25. Liquid level measurement example.

Let X equal the vertical distance between the minimum and maximum measurable levels (500 in.).
 Let Y equal the vertical distance between the transmitter datum line and the minimum measurable level (100 in.).
 Let SG equal the specific gravity of the fluid (0.9).
 Let h equal the maximum head pressure to be measured in inches of water.
 Let e equal head pressure produced by Y expressed in inches of water.
 Let Range equal e to e + h.
 Then $h = (X)(SG)$
 $= 500 \times 0.9$
 $= 450 \text{ inH}_2\text{O}$
 $e = (Y)(SG)$
 $= 100 \times 0.9$
 $= 90 \text{ inH}_2\text{O}$
 Range = 90 to 540 inH₂O



Wet leg condition

Condensation of the gas above the liquid slowly causes the low side of the transmitter piping to fill with liquid. The pipe is purposely filled with a convenient reference fluid to eliminate this potential error. This is a wet leg condition.

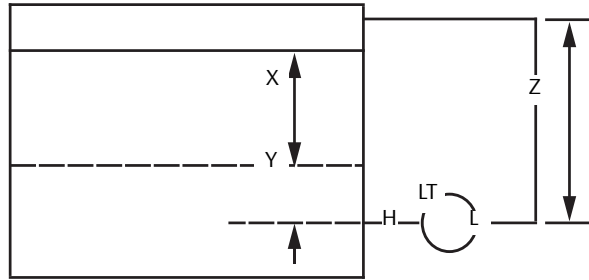
The reference fluid will exert a head pressure on the low side of the transmitter. Zero elevation of the range must then be made. See [Figure 2-26](#).

Bubbler system in open vessel

A bubbler system that has a top-mounted pressure transmitter can be used in open vessels. This system consists of an air supply, pressure regulator, constant flow meter, pressure transmitter, and a tube that extends down into the vessel.

Bubble air through the tube at a constant flow rate. The pressure required to maintain flow equals the liquid's specific gravity multiplied by the vertical height of the liquid above the tube opening. [Figure 2-27](#) shows a bubbler liquid level measurement example.

Figure 2-26. Wet leg example.



Let X equal the vertical distance between the minimum and maximum measurable levels (500 in.).
 Let Y equal the vertical distance between the transmitter datum line and the minimum measurable level (50 in.).
 Let z equal the vertical distance between the top of the liquid in the wet leg and the transmitter datum line (600 in.).
 Let SG_1 equal the specific gravity of the fluid (1.0).
 Let SG_2 equal the specific gravity of the fluid in the wet leg (1.1).
 Let h equal the maximum head pressure to be measured in inches of water.
 Let e equal the head pressure produced by Y expressed in inches of water.
 Let s equal head pressure produced by z expressed in inches of water.
 Let Range equal e - s to h + e - s.
 Then $h = (X)(SG_1)$
 $= 500 \times 1.0$
 $= 500 \text{ in H}_2\text{O}$
 $e = (Y)(SG_1)$
 $= 50 \times 1.0$
 $= 50 \text{ inH}_2\text{O}$
 $s = (z)(SG_2)$
 $= 600 \times 1.1$
 $= 660 \text{ inH}_2\text{O}$
 Range = e - s to h + e - s.
 $= 50 - 660 \text{ to } 500 + 50 - 660$
 $= -610 \text{ to } -110 \text{ inH}_2\text{O}$

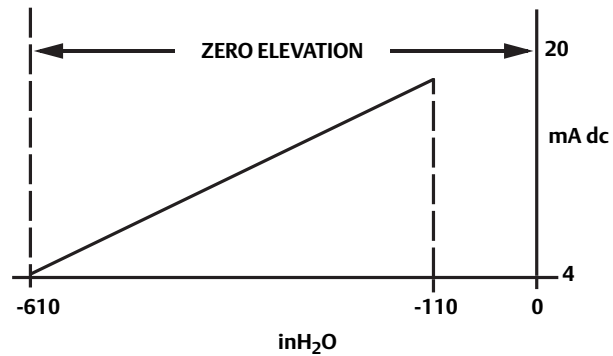
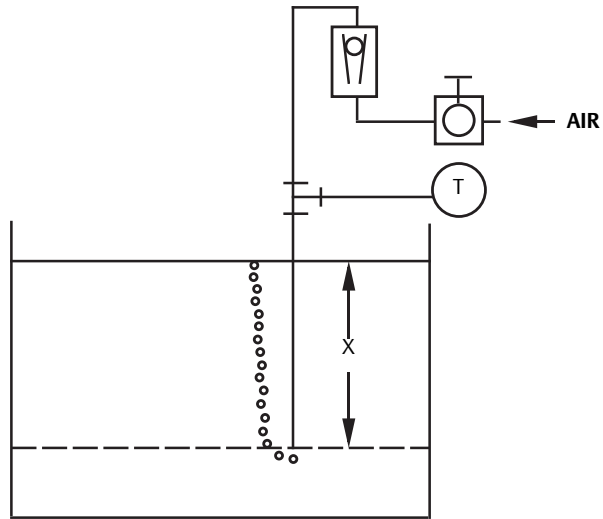
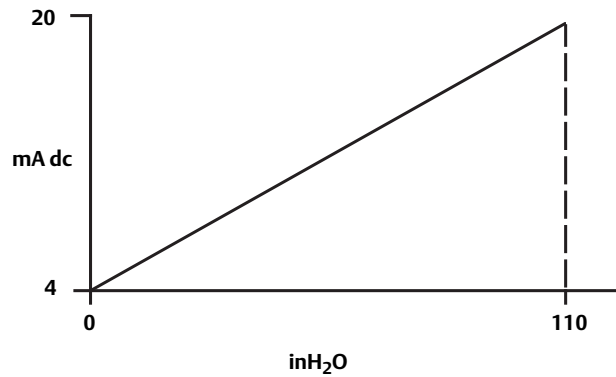


Figure 2-27. Bubbler liquid level measurement example.



Let X equal the vertical distance between the minimum and maximum measurable levels (100 in.).
Let SG equal the specific gravity of the fluid (1.1).
Let h equal the maximum head pressure to be measured in inches of water.
Let Range equal zero to h.
Then $h = (X)(SG)$
 $= 100 \times 1.1$
 $= 110 \text{ inH}_2\text{O}$
Range = 0 to 110 inH₂O



Section 3 Configuration

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3.1 Overview

This section contains information on commissioning and tasks that should be performed on the bench prior to installation.

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

3.2 Safety messages

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

⚠ WARNING

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

- Before connecting a Field 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/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.

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.

3.3 Commissioning

Commissioning consists of testing the transmitter and verifying transmitter configuration data. The 3051 transmitters can be commissioned either before or after installation. Commissioning the transmitter on the bench before installation using a Field Communicator or AMS Device Manager ensures that all transmitter components are in working order.

- ⚠ To commission on the bench, required equipment includes a power supply, a milliamp meter, and a Field Communicator or AMS Device Manager. Wire equipment as shown in [Figure 3-1](#) and [Figure 3-2](#). To ensure successful communication, a resistance of at least 250 ohms must be present between the Field Communicator loop connection and the power supply. Connect the Field Communicator leads to the terminals labeled “COMM” on the terminal block.

Set all transmitter hardware adjustments during commissioning to avoid exposing the transmitter electronics to the plant environment after installation.

When using a Field Communicator, any configuration changes made must be sent to the transmitter by using the Send key. AMS Device Manager configuration changes are implemented when the Apply button is clicked.

3.3.1 Setting the loop to manual

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

3.3.2 Wiring diagrams

Connect the equipment as shown in [Figure 3-1](#) for 4-20 mA HART or [Figure 3-2](#) for 1-5 Vdc HART Low Power. To ensure successful communication, a resistance of at least 250 ohms must be present between the Field Communicator loop connection and the power supply. The Field Communicator or AMS Device Manager may be connected at “COMM” on the transmitter terminal block or across the load resistor. Connecting across the “TEST” terminals will prevent successful communication for 4-20 mA HART output.

Turn on the Field Communicator by pressing the ON/OFF key or log into AMS Device Manager. The Field Communicator or AMS Device Manager will search for a HART-compatible device and indicate when the connection is made. If the Field Communicator or AMS Device Manager fail to connect, it indicates that no device was found. If this occurs, refer to [Section 5: Troubleshooting](#).

Figure 3-1. Wiring (4–20 mA)

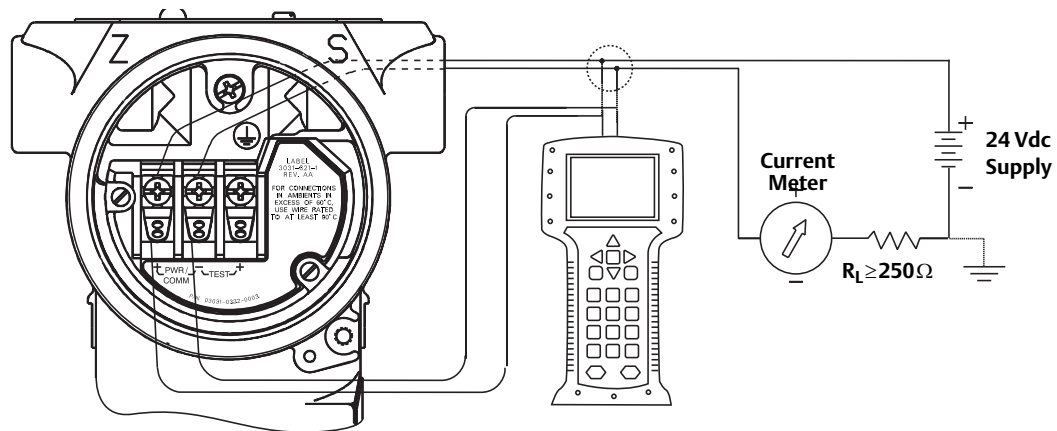
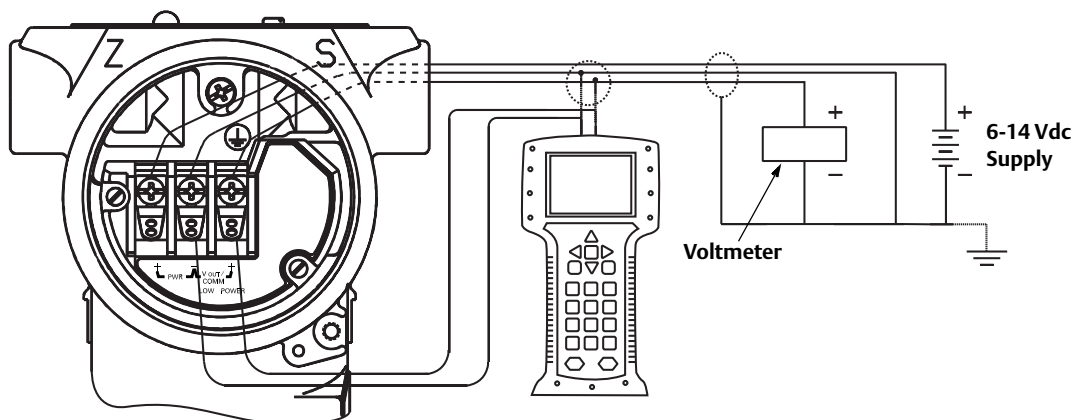


Figure 3-2. Wiring (Low-Power)



3.4 Configuration data review

Note

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

The following is a list of factory default configurations. These can be reviewed by using the Field Communicator or AMS Device Manager.

Field communicator

Traditional 4-20 mA Fast Keys	1, 5
Traditional 1-5 Vdc Fast Keys	1, 5
Device Dashboard Fast Keys	1, 7

Enter the fast key sequence to view the configuration data.

Transmitter Model	Type
Tag	Range
Date	Descriptor
Message	Minimum and Maximum Sensor Limits
Minimum Span	Units
4 and 20 mA points	Output (linear or sq. root)
Damping	Alarm Setting (high, low)
Security Setting (on, off)	Local Zero/Span Keys (enabled, disabled)
Integral Display	Sensor Fill
Isolator Material	Flange (type, material)
O-Ring Material	Drain/Vent
Remote Seal (type, fill fluid, isolator material, number)	Transmitter S/N
Address	Sensor S/N

AMS device manager

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

3.5 Field communicator

(Version 1.8)

3.5.1 Field communicator user interface

Figure 3-3. Traditional interface

The corresponding Menu Trees can be viewed on [page 44](#) and [page 45](#).

The fast key sequence can be viewed on [page 48](#).

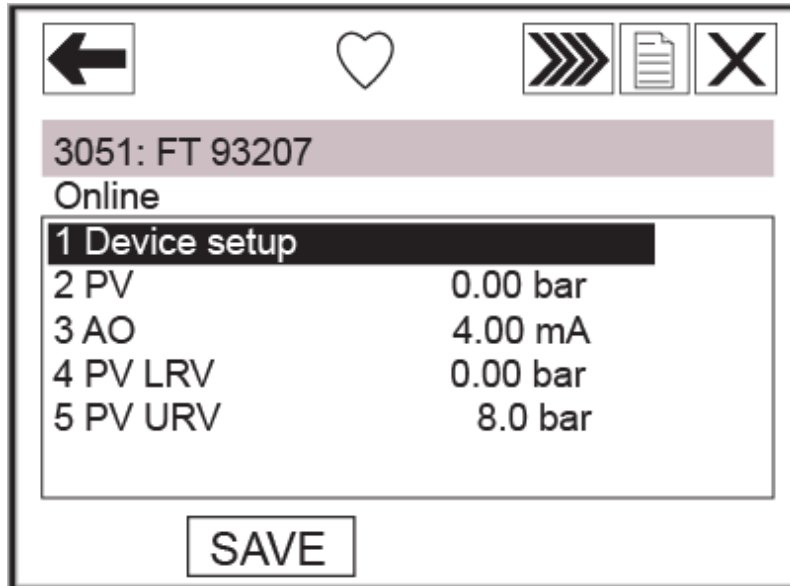
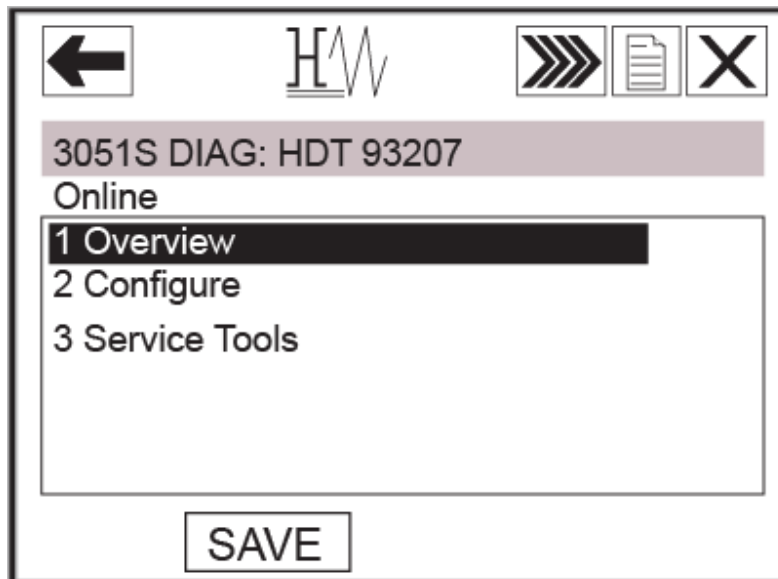


Figure 3-4. Device dashboard

The corresponding Menu Trees can be viewed on [page 46](#) through [page 48](#).

The fast key sequence can be viewed on [page 50](#).



3.6 Field communicator menu trees

Figure 3-5. Rosemount 3051 traditional HART menu tree for 4-20 mA HART output

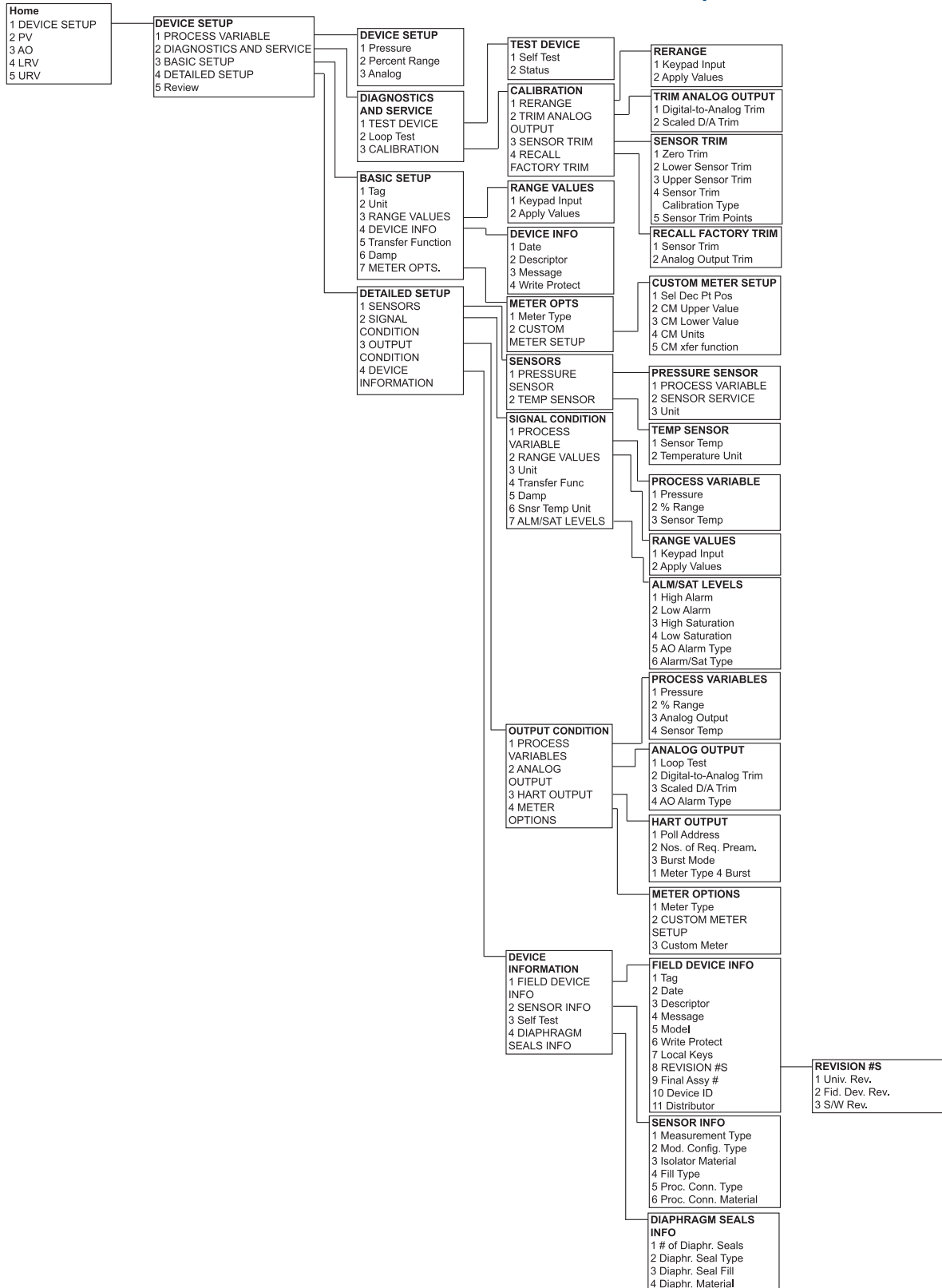


Figure 3-6. Rosemount 3051 traditional HART menu tree for 1-5 Vdc low power

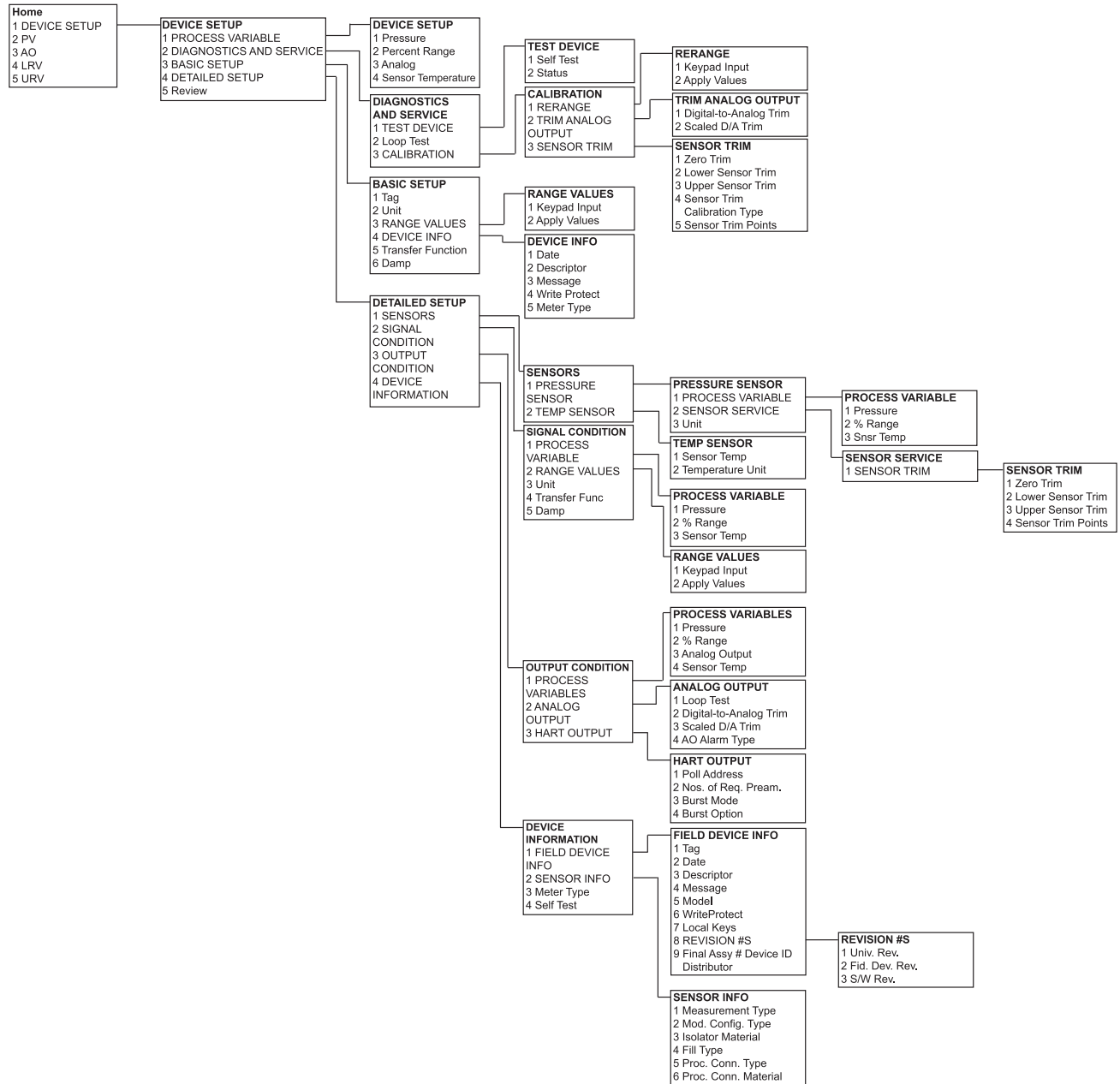


Figure 3-7. Rosemount 3051 device dashboard menu tree - overview

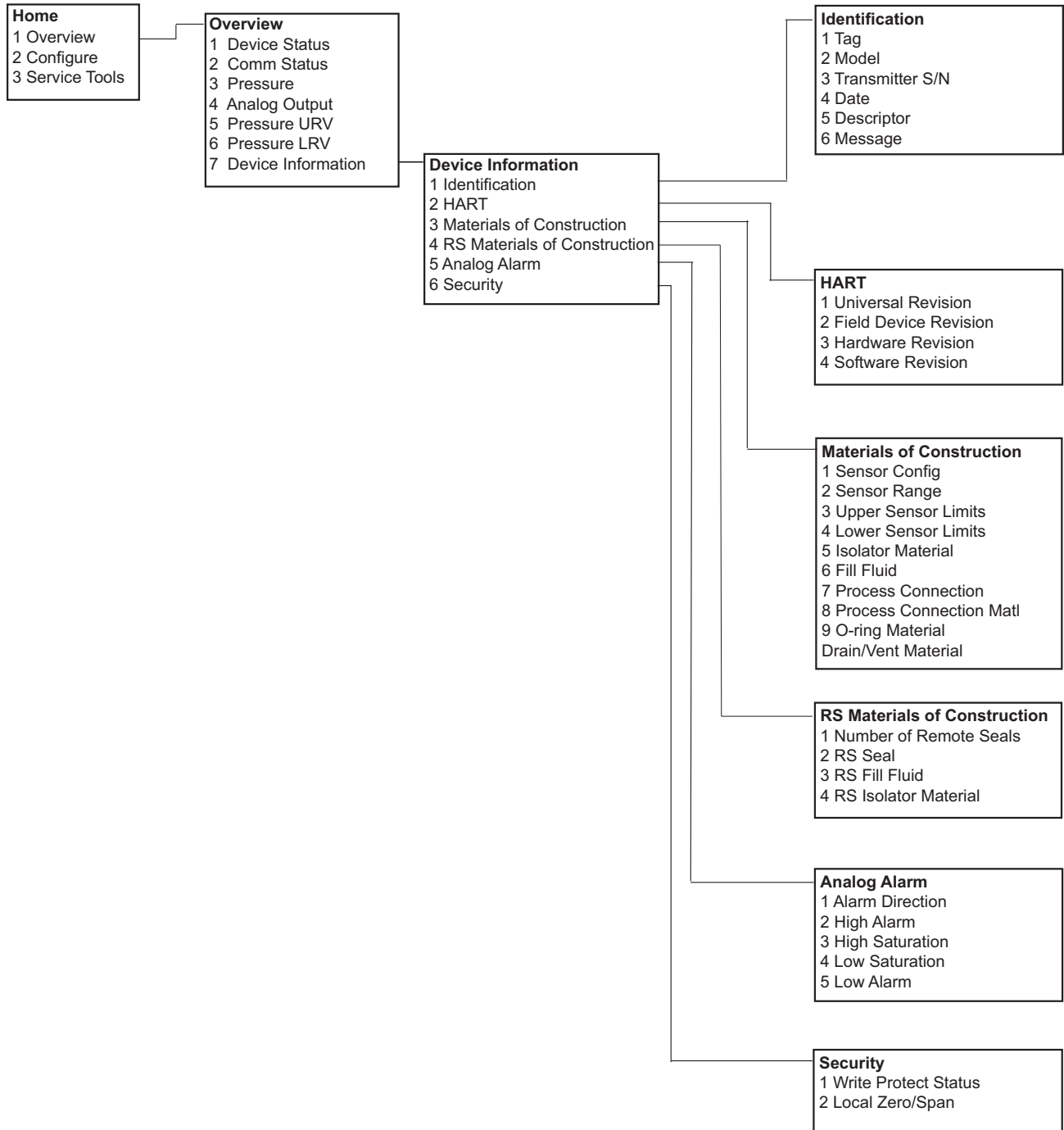


Figure 3-8. Rosemount 3051 device dashboard menu tree - configure

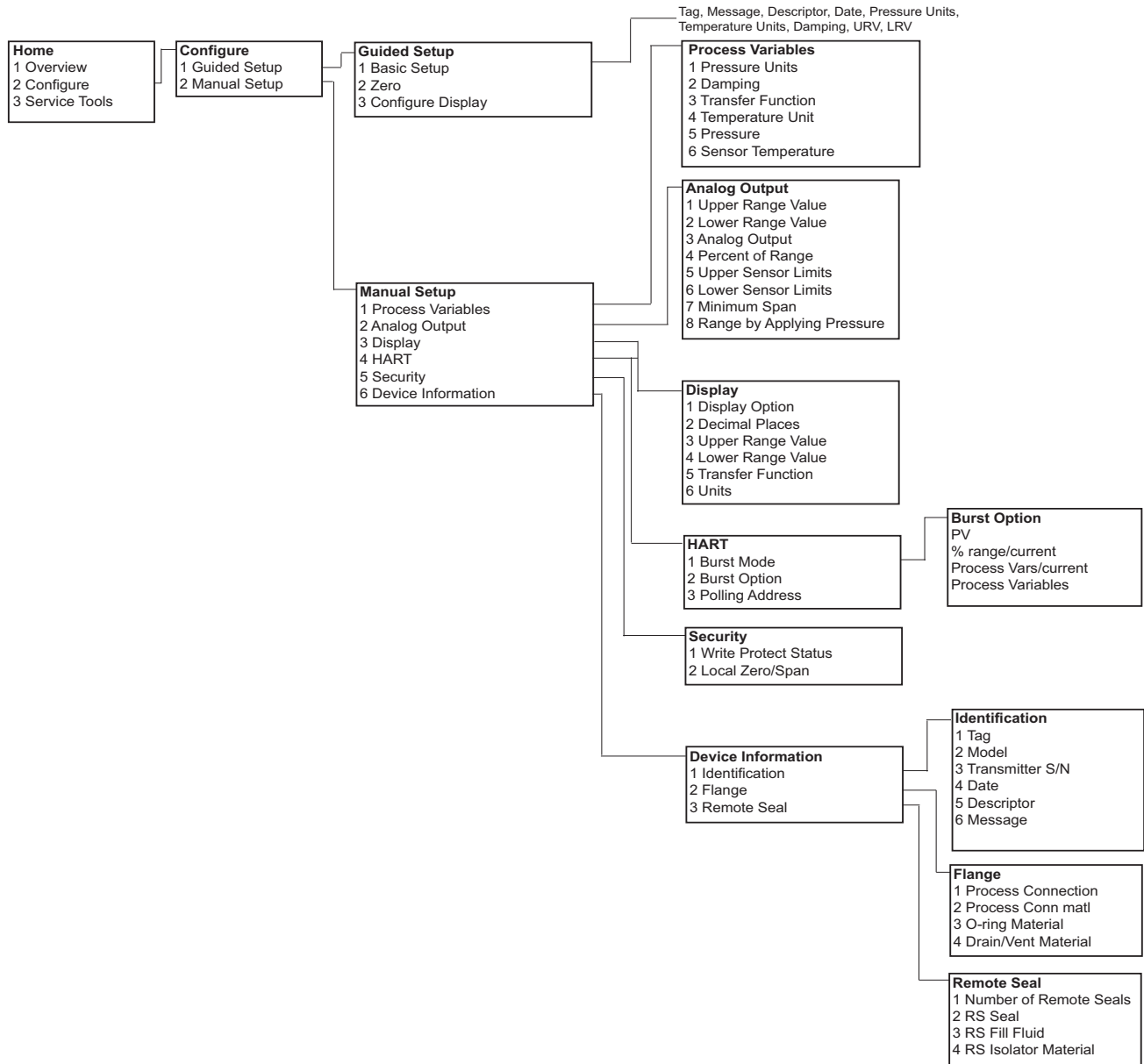
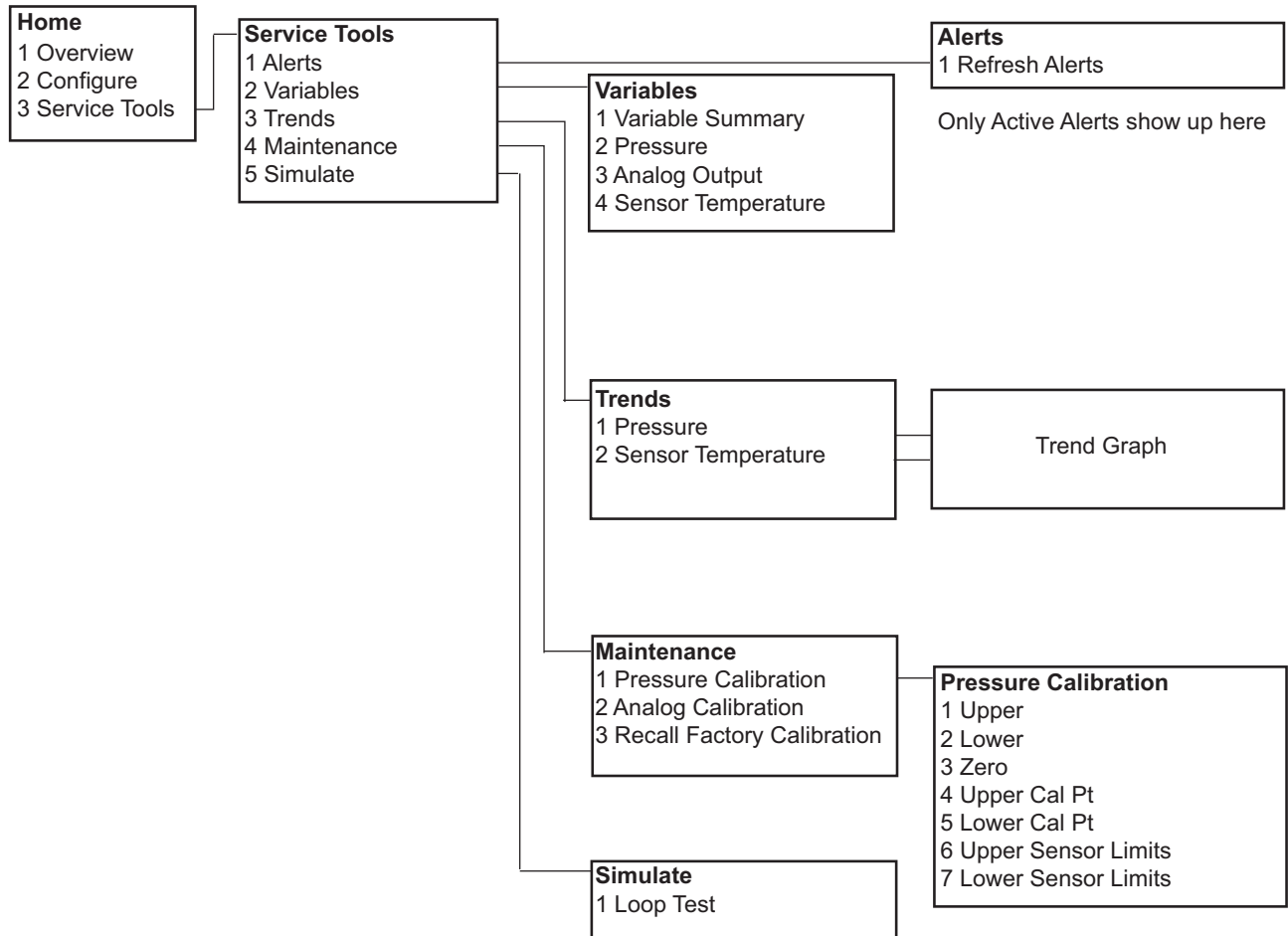


Figure 3-9. Rosemount 3051 device dashboard menu tree - service tools



3.7 Traditional fast key sequence

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

Table 3-1. 3051 Traditional fast key sequence

	Function	4-20 mA HART	1-5 Vdc HART low power
✓	Alarm and Saturation Levels	1, 4, 2, 7	N/A
	Analog Output Alarm Type	1, 4, 3, 2, 4	1, 4, 3, 2, 4
	Burst Mode Control	1, 4, 3, 3, 3	1, 4, 3, 3, 3
	Burst Operation	1, 4, 3, 3, 4	1, 4, 3, 3, 4
	Custom Meter Configuration	1, 3, 7, 2	N/A

	Function	4-20 mA HART	1-5 Vdc HART low power
	Custom Meter Value	1, 4, 3, 4, 3	N/A
✓	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
	Disable Local Span/Zero Adjustment	1, 4, 4, 1, 7	1, 4, 4, 1, 7
	Field Device Information	1, 4, 4, 1	1, 4, 4, 1
	Full Trim	1, 2, 3, 3	1, 2, 3, 3
	Keypad Input – Rerange	1, 2, 3, 1, 1	1, 2, 3, 1, 1
	Local Zero and Span Control	1, 4, 4, 1, 7	1, 4, 4, 1, 7
	Loop Test	1, 2, 2	1, 2, 2
	Lower Sensor Trim	1, 2, 3, 3, 2	1, 2, 3, 3, 2
	Message	1, 3, 4, 3	1, 3, 4, 3
	Meter Options	1, 4, 3, 4	N/A
	Number of Requested Preambles	1, 4, 3, 3, 2	1, 4, 3, 3, 2
	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
✓	Range Values	1, 3, 3	1, 3, 3
	Rerange	1, 2, 3, 1	1, 2, 3, 1
	Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2	1, 2, 3, 2, 2
	Self Test (Transmitter)	1, 2, 1, 1	1, 2, 1, 1
	Sensor Info	1, 4, 4, 2	1, 4, 4, 2
	Sensor Temperature	1, 1, 4	1, 1, 4
	Sensor Trim Points	1, 2, 3, 3, 4	1, 2, 3, 3, 4
	Status	1, 2, 1, 2	1, 2, 1, 2
✓	Tag	1, 3, 1	1, 3, 1
✓	Transfer Function (Setting Output Type)	1, 3, 5	1, 3, 5
	Transmitter Security (Write Protect)	1, 3, 4, 4	1, 3, 4, 4
	Trim Analog Output	1, 2, 3, 2	1, 2, 3, 2
✓	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

Table 3-2. 3051 device dashboard fast key sequence

Function	4-20 mA HART
Alarm and Saturation Levels	1, 7, 5
Analog Output Alarm Type	1, 7, 5
Burst Mode Control	2, 2, 4, 1
Burst Option	2, 2, 4, 2
Custom Display Configuration	2, 2, 3
Damping	2, 2, 1, 2
Date	2, 2, 6, 1, 4
Descriptor	2, 2, 6, 1, 5
Digital to Analog Trim (4 - 20 mA Output)	3, 4, 2
Disable Zero & Span Adjustment	2, 2, 5, 2
Field Device Information	2, 2, 6
Loop Test	3, 5, 1
Lower Sensor Trim	3, 4, 1, 2
Message	2, 2, 6, 1, 6
Poll Address	2, 2, 4, 3
Range Values	1, 5
Rerange with Keypad	1, 5
Scaled D/A Trim (4 - 20 mA Output)	3, 4, 2
Sensor Temperature/Trend	3, 3, 2
Tag	2, 2, 6, 1, 1
Transfer Function	2, 2, 1, 3
Transmitter Security (Write Protect)	2, 2, 5, 1
Units	2, 2, 1, 1
Upper Sensor Trim	3, 4, 1, 1
Zero Trim	3, 4, 1, 3

3.8 Check output

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

3.8.1 Process variables

The process variables for the 3051 provide transmitter output, and are continuously updated. The pressure reading in both engineering units and percent of range will continue to track with pressures outside of the defined range from the lower to the upper range limit of the sensor module.

Field communicator

Traditional 4-20 mA Fast Keys	1, 1
Traditional 1-5 Vdc Fast Keys	1, 1
Device Dashboard Fast Keys	3, 2

The process variable menu displays the following process variables:

- Pressure
- Percent of range
- Analog output

AMS device manager

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

- Pressure
- Percent of range
- Analog output

3.8.2 Sensor temperature

The 3051 contains a temperature sensor near the pressure sensor in the sensor module. When reading this temperature, keep in mind the sensor is not a process temperature reading.

Field communicator

Traditional 4-20 mA Fast Keys	1, 1, 4
Traditional 1-5 Vdc Fast Keys	1, 1, 4
Device Dashboard Fast Keys	3, 2, 4

Enter the fast key sequence “Sensor Temperature” to view the sensor temperature reading.

AMS device manager

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

3.9 Basic setup

3.9.1 Set process variable units

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

Field communicator

Traditional 4-20 mA Fast Keys	1, 3, 2
Traditional 1-5 Vdc Fast Keys	1, 3, 2
Device Dashboard Fast Keys	2, 2, 1, 1

Enter the fast key sequence “Set Process Variable Units.” Select from the following engineering units:

- inH₂O
- inHg
- ftH₂O
- mmH₂O
- mmHg
- psi
- bar
- mbar
- g/cm²
- kg/cm²
- Pa
- kPa
- torr
- atm
- inH₂O at 4 °C
- mmH₂O at 4 °C

AMS device manager

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

3.9.2 Set output (Transfer function)

The 3051 has two output settings: Linear and Square Root. Activate the square root output option to make analog output proportional to flow. As input approaches zero, the 3051 automatically switches to linear output in order to ensure a more smooth, stable output near zero (see [Figure 3-10](#)).

For 4-20 mA HART output, the slope of the curve is unity ($y = x$) from 0 to 0.6 percent of the ranged pressure input. This allows accurate calibration near zero. Greater slopes would cause large changes in output (for small changes at input). From 0.6 percent to 0.8 percent, curve slope equals 42 ($y = 42x$) to achieve continuous transition from linear to square root at the transition point.

Field communicator

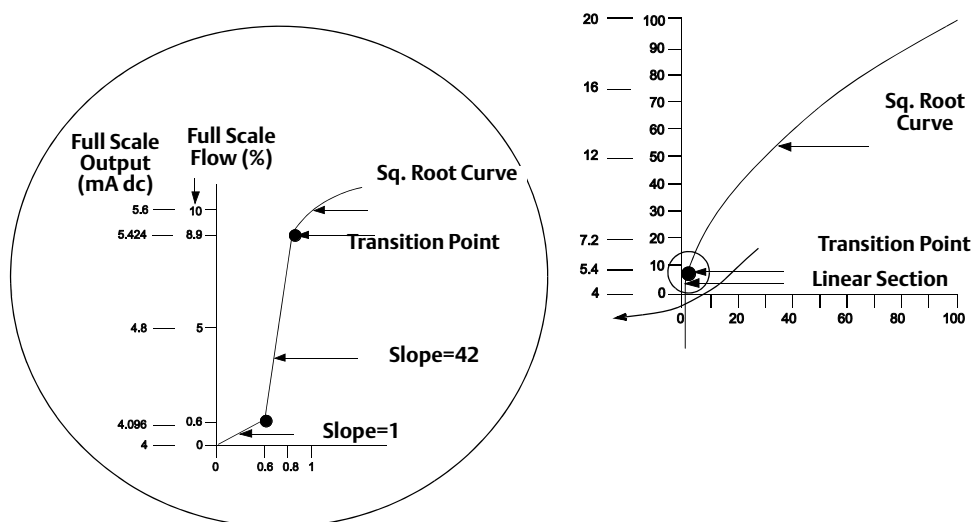
Traditional 4-20 mA Fast Keys	1, 3, 5
Traditional 1-5 Vdc Fast Keys	1, 3, 5
Device Dashboard Fast Keys	2, 2, 1, 3

AMS device manager

Right click on the device and select Configure from the menu.

1. In the *Basic Setup* tab, use Xfer frctn drop down menu to select output, click Apply.
2. After carefully reading the warning provided, select yes.

Figure 3-10. 4-20 mA HART square root output transition point



Note

For a flow turndown of greater than 10:1 it is not recommended to perform a square root extraction in the transmitter. Instead, perform the square root extraction in the system.

3.9.3

Rerange

The Range Values command sets each of the lower and upper range analog values (4 and 20 mA points and 1 and 5 Vdc points) to a pressure. The lower range point represents 0% of range and the upper range point represents 100% of range. In practice, the transmitter range values may be changed as often as necessary to reflect changing process requirements. For a complete listing of Range & Sensor limits, refer to “[Range and sensor limits](#)” on page 108.

Note

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

Note

Regardless of the range points, the 3051 will measure and report all readings within the digital limits of the sensor. For example, if the 4 and 20 mA points are set to 0 and 10 inH₂O, and the transmitter detects a pressure of 25 inH₂O, it digitally outputs the 25 inH₂O reading and a 250% of range reading.

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

- Rerange with a Field Communicator or AMS Device Manager only.
 - Rerange with a pressure input source and a Field Communicator or AMS Device Manager.
 - Rerange with a pressure input source and the local zero and span buttons (option D4).
-

Note

If the transmitter security switch is **ON**, adjustments to the zero and span will not be able to be made. Refer to “[Configure security and alarm](#)” on page 20 for security information.

Rerange with a Field Communicator or AMS Device Manager Only.

The easiest and most popular way to rerange is to use the Field Communicator only. This method changes the range values of the analog 4 and 20 mA points (1 and 5 Vdc points) independently without a pressure input. This means that when you change either the 4 or 20 mA setting, you also change the span.

An example for the 4-20 mA HART output:

If the transmitter is ranged so that

4 mA = 0 inH₂O, and
20 mA = 100 inH₂O,

and you change the 4 mA setting to 50 inH₂O using the communicator only, the new settings are:

4 mA = 50 inH₂O, and
20 mA = 100 inH₂O.

Note that the span was also changed from 100 inH₂O to 50 inH₂O, while the 20 mA setpoint remained at 100 inH₂O.

To obtain reverse output, simply set the 4 mA point at a greater numerical value than the 20 mA point. Using the above example, setting the 4 mA point at 100 inH₂O and the 20 mA point at 0 inH₂O will result in reverse output.

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 1
Traditional 1-5 Vdc Fast Keys	1, 2, 3, 1
Device Dashboard Fast Keys	2, 2, 2, 1

From the *HOME* screen, enter the fast key sequence “Rerange with a Communicator Only.”

AMS device manager

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

1. Enter the lower range value (LRV) and the upper range value (URV) in the fields provided. Click Apply.
2. After carefully reading the warning provided, select yes.

Rerange with a pressure input source and a field communicator or AMS device manager

Reranging using the Field Communicator and applied pressure is a way of reranging the transmitter when specific 4 and 20 mA points (1 and 5 Vdc points) are not calculated.

Note

The span is maintained when the 4 mA point (1 Vdc point) is set. The span changes when the 20 mA point (5 Vdc point) is set. If the lower range point is set to a value that causes the upper range point to exceed the sensor limit, the upper range point is automatically set to the sensor limit, and the span is adjusted accordingly.

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 1, 2
Traditional 1-5 Vdc Fast Keys	1, 2, 3, 1, 2
Device Dashboard Fast Keys	2, 2, 2, 8

From the *HOME* screen, enter the fast key sequence [Rerange with a pressure input source and a field communicator or AMS device manager](#) .

AMS device manager

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

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

Rerange with a pressure input source and the local zero and span buttons (option D4)

Reranging using the local zero and span adjustments (see [Figure 3-11 on page 57](#)) and a pressure source is a way of reranging the transmitter when specific 4 and 20 mA (1 and 5 Vdc) points are not known and a communicator is not available.

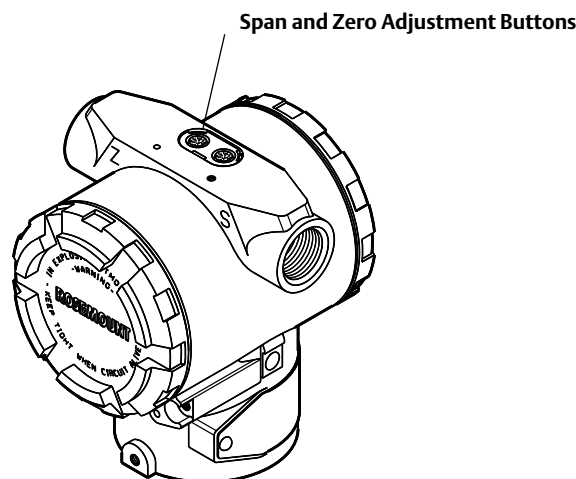
Note

When you set the 4 mA (1 Vdc) point the span is maintained; when you set the 20 mA (5 Vdc) point the span changes. If you set the lower range point to a value that causes the upper range point to exceed the sensor limit, the upper range point is automatically set to the sensor limit, and the span is adjusted accordingly.

To rerange the transmitter using the span and zero buttons, perform the following procedure:

1. Loosen the screw holding the certifications label on the top of the transmitter housing. Slide the label to expose the zero and span buttons. See [Figure 3-11](#).
2. Apply the desired 4 mA (1 Vdc) pressure value to the transmitter. Push and hold the zero adjustment button for at least two seconds but no longer than ten seconds.
3. Apply the desired 20 mA (5 Vdc) pressure value to the transmitter. Push and hold the span adjustment button for at least two seconds but no longer than ten seconds.

Figure 3-11. Zero and span buttons



Note

The span is maintained when the 4 mA point (1 Vdc point) is set. The span changes when the 20 mA point (5 Vdc point) is set. If the lower range point is set to a value that causes the upper range point to exceed the sensor limit, the upper range point is automatically set to the sensor limit, and the span is adjusted accordingly.

3.9.4 Damping

The “Damp” command introduces a delay in the micro-processing which increases the response time of the transmitter; smoothing variations in output readings caused by rapid input changes. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the loop dynamics within your system. The default damping value is 0.4 seconds and it can be set to any of ten pre-configured damping values between 0 and 25.6 seconds. See list below.

■ 0.00 seconds	■ 0.05 seconds	■ 0.10 seconds
■ 0.20 seconds	■ 0.40 seconds	■ 0.80 seconds
■ 1.60 seconds	■ 3.20 seconds	■ 6.40 seconds
■ 12.8 seconds	■ 25.6 seconds	

The current damping value can be determined by executing the Field Communicator fast keys or going to “Configure” in AMS Device Manager.

Field communicator

Traditional 4-20 mA Fast Keys	1, 3, 6
Traditional 1-5 Vdc Fast Keys	1, 3, 6
Device Dashboard Fast Keys	2, 2, 1, 2

AMS device manager

Right click on the device and select Configure from the menu.

1. In the *Basic Setup* tab, enter the damping value in the *Damp* field, click Apply.
2. After carefully reading the warning provided, select yes.

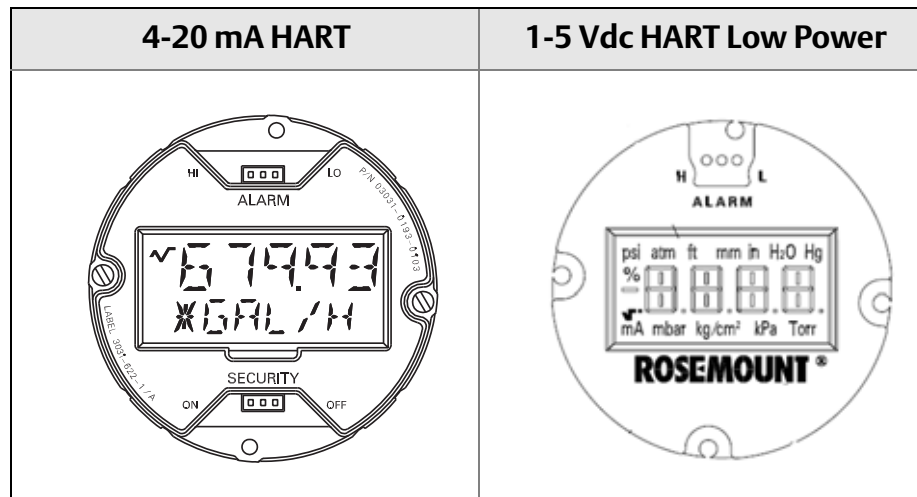
3.10 LCD display

The LCD display connects directly to the interface board which maintains direct access to the signal terminals. The display indicates output and abbreviated diagnostic messages. A display cover is provided to accommodate the display.

For 4-20 mA HART output, the LCD display features a two-line display. The first line of five characters displays the actual measured value, the second line of six characters displays the engineering units. The LCD can also display diagnostic messages. Refer to [Figure 3-12](#).

For 1-5 Vdc HART Low Power output, the LCD display features a single-line display with four characters that display the actual value. The LCD can also display diagnostic messages. Refer to [Figure 3-12](#).

Figure 3-12.



3.10.1 LCD display configuration for 4-20 mA HART only

The factory default alternates are between Engineering Units and % of Range. The LCD Display Configuration command allows customization of the LCD display to suit application requirements. The LCD display will alternate between the selected items:

■ Eng. Units only	■ Alternate Eng. Units & % of Range
■ % of Range only	■ Alternate Eng. Units & Custom Display
■ Custom Display only	■ Alternate % of Range & Custom Display

Field communicator

Traditional 4-20 mA Fast Keys	1, 3, 7
Device Dashboard Fast Keys	2, 2, 3

To change the standard default to one of the above options, follow these steps:

1. From the communicators main menu select (1) Device Setup, (3) Basic Setup, (7) Meter Options.
2. Select (1) Meter Type. Using the up or down arrows scroll up or down until the desired display has been highlighted. Press ENTER, SEND, and HOME.

AMS

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

1. In the *Local Display* tab, locate the *Meter Type* area. Select the desired options to suit your application needs, click Apply.
2. An *Apply Parameter Modification* screen appears, enter desired information and click OK.
3. After carefully reading the warning provided, select OK.

3.10.2 Custom display configuration 4-20 mA HART only

The user-configurable scale is a feature that enables the LCD display to display flow, level, or custom pressure units. With this feature you can define the decimal point position, the upper range value, the lower range value, the engineering units, and the transfer function. The display can be configured using a Field Communicator or AMS.

The user-configurable scale feature can define:

- decimal point position
- upper range values
- lower range values
- engineering units
- transfer function

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

1. Change the Meter Type to “Custom Meter” by using the Fast Key sequence under “LCD display configuration for 4-20 mA HART only” on page 59.
2. Next from the *ONLINE* screen, Select 1 Device Setup, 3 Basic Setup, 7 Meter Options, 2 Meter Options, 2 Custom Meter Setup.
3. To specify decimal point position:
 - a. Select 1 Sel dec pt pos. Choose the decimal point representation that will provide the most accurate output for your application. For example, when outputting between 0 and 75 GPM, choose XX.XXX or use the decimal point examples below:

XXXXX
XXXX.X
XXX.XX
XX.XXX
X.XXXX

Note

Make sure the selection has been sent and the decimal point has changed before proceeding to the next step.

- b. SEND
4. To specify a custom upper range value:
 - a. Select 2 *CM Upper Value*. Type the value that you want the transmitter to read at the 20 mA point.
 - b. SEND
5. To specify a custom lower range value:
 - a. Select 3 *CM Lower Value*. Type the value that you want the transmitter to read at the 4 mA point.
 - b. SEND
6. To define custom units:
 - a. Select 4 *CM Units*. Enter the custom units (five characters maximum) that you want the display to display.
 - b. SEND
7. To choose the transmitter transfer function for the display:
 - a. Select 5 *CM xfer fnct*. Enter the transmitter transfer function for the display. Select *sq root* to display flow units. The custom meter transfer function is independent of the analog output transfer function.
8. Select SEND to upload the configuration to the transmitter.

 See “Safety messages” on page 39 for complete warning information.

3.11 Detailed setup

3.11.1 Failure mode alarm and saturation

The 3051 transmitters automatically and continuously perform self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives its output outside of the normal saturation values. The transmitter will drive its output low or high based on the position of the failure mode alarm jumper. See [Table 3-3](#), [Table 3-4](#), and [Table 3-5](#) for failure mode and saturation output levels. To select alarm position, see “Configure security and alarm” on [page 20](#).

Table 3-3. 4-20 mA HART alarm and saturation values

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

Table 3-4. NAMUR-Compliant alarm and saturation values

Level	4–20 mA saturation	4–20 mA alarm
Low	3.8 mA	≤ 3.6 mA
High	20.5 mA	≥ 22.5 mA

Table 3-5. 1-5 Vdc HART low-power alarm and saturation values

Level	1–5 V saturation	1–5 V alarm
Low	0.97 V	≤ 0.95 V
High	5.20 V	≥ 5.4 V

Caution

Alarm level values will be affected by analog trim. Refer to “Analog output trim” on [page 77](#).

Note

When a transmitter is in an alarm condition, the Field Communicator indicates the analog output the transmitter would drive if the alarm condition did not exist. The transmitter will alarm high in the event of failure if the alarm jumper is removed.

3.11.2 Alarm and saturation levels for burst mode

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

Alarm conditions:

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

Saturation:

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

3.11.3 Alarm and saturation values for multidrop mode

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

Alarm conditions:

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

Saturation:

- Primary variable is sent normally
- Temperature is sent normally

3.11.4 Alarm level verification

If the transmitter electronics board, sensor module, or LCD display is repaired or replaced, verify the transmitter alarm level before returning the transmitter to service. This feature is also useful in testing the reaction of the control system to a transmitter in an alarm state. To verify the transmitter alarm values, perform a loop test and set the transmitter output to the alarm value (see Tables 3-3, 3-4, and 3-5 on page 61, and “Loop test” on page 62).

3.12 Diagnostics and service

Diagnostics and service functions listed below are primarily for use after field installation. The Loop Test feature is designed to verify proper loop wiring and transmitter output.

3.12.1 Loop test

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

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 2
Traditional 1-5 Vdc Fast Keys	1, 2, 2
Device Dashboard Fast Keys	3, 5, 1

To initiate a loop test, perform the following procedure:

1.
 - a. For 4-20 mA HART output, connect a reference meter to the transmitter by either connecting the meter to the test terminals on the terminal block, or shunting transmitter power through the meter at some point in the loop.
 - b. For 1-5 Vdc Low Power HART output, connect a reference meter to the V_{out} terminal.
2. From the *HOME* screen, enter the fast key sequence “Loop Test” to verify the output of the transmitter.
3. Select OK after the control loop is set to manual (see [“Setting the loop to manual” on page 40](#)).
4. Select a discrete milliamp level for the transmitter to output. At the CHOOSE ANALOG OUTPUT prompt select 1: 4mA (1 Vdc), select 2: 20mA (5 Vdc), or select 3: “Other” to manually input a value.
 - a. If you are performing a loop test to verify the output of a transmitter, enter a value between 4 and 20 mA (1 and 5 Vdc).
 - b. If you are performing a loop test to verify alarm levels, enter the value representing an alarm state (see [Tables 3-3, 3-4, and 3-5 on page 61](#)).
5. Check that the reference meter displays the commanded output value.
 - a. If the values match, the transmitter and the loop are configured and functioning properly.
 - b. If the values do not match, the meter may be attached to the wrong loop, there may be a fault in the wiring or power supply, the transmitter may require an output trim, or the reference meter may be malfunctioning.

After completing the test procedure, the display returns to the *Loop Test* screen to choose another output value or to end loop testing.

AMS device manager

Right click on the device and select Diagnostics and Test, then Loop Test from the menu.

1.
 - a. For 4-20 mA HART output, connect a reference meter to the transmitter by either connecting the meter to the test terminals on the terminal block, or shunting transmitter power through the meter at some point in the loop.
 - b. For 1-5 Vdc Low Power HART output, connect a reference meter to the V_{out} terminal.
2. Click Next after setting the control loop to manual.
3. Select desired analog output level. Click Next.
4. Click Next to acknowledge output being set to desired level.
5. Check that the reference meter displays the commanded output value.
 - a. If the values match, the transmitter and the loop are configured and functioning properly.
 - b. If the values do not match, the meter may be attached to the wrong loop, there may be a fault in the wiring or power supply, the transmitter may require an output trim, or the reference meter may be malfunctioning.

After completing the test procedure, the display returns to the *Loop Test* screen to choose another output value or to end loop testing.

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

3.13 Advanced functions

3.13.1 Saving, recalling, and cloning configuration data

Use the cloning feature of the Field Communicator or the AMS Device Manager “User Configuration” feature to configure several 3051 transmitters similarly. Cloning involves configuring a transmitter, saving the configuration data, then sending a copy of the data to a separate transmitter. Several possible procedures exist when saving, recalling, and cloning configuration data. For complete instructions refer to the Field Communicator manual (publication no. 00809-0100-4276) or AMS Device Manager on-line guides. One common method is as follows:

Field communicator

Traditional 4-20 mA Fast Keys	left arrow, 1, 2
Traditional 1-5 Vdc Fast Keys	left arrow, 1, 2
Device Dashboard Fast Keys	3, 4, 3

1. Completely configure the first transmitter.
2. Save the configuration data:
 - a. Select SAVE from the Field Communicator *HOME/ONLINE* screen.
 - b. Ensure that the location to which the data will be saved is set to MODULE. If it is not, select 1: Location to set the save location to MODULE.
 - c. Select 2: Name, to name the configuration data. The default is the transmitter tag number.
 - d. Ensure that the data type is set to STANDARD. If the data type is NOT STANDARD, select 3: Data Type to set the data type to STANDARD.
 - e. Select SAVE.
3. Connect and power the receiving transmitter and Field Communicator.
4. Select the back arrow from the *HOME/ONLINE* screen. The Field Communicator menu appears.
5. Select 1: Offline, 2: Saved Configuration, 1: Module Contents to reach the *MODULE CONTENTS* menu.
6. Use the DOWN ARROW to scroll through the list of configurations in the memory module, and use the RIGHT ARROW to select and retrieve the required configuration.
7. Select 1: Edit.
8. Select 1: Mark All.
9. Select SAVE.
10. Use the DOWN ARROW to scroll through the list of configurations in the memory module, and use the RIGHT ARROW to select the configuration again.
11. Select 3: Send to download the configuration to the transmitter.
12. Select OK after the control loop is set to manual.
13. After the configuration has been sent, select OK to acknowledge that the loop can be returned to automatic control.

When finished, the Field Communicator informs you of the status. Repeat Steps 3 through 13 to configure another transmitter.

Note

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

AMS device manager creating a reusable copy

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

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

Note

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

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

6. Transfer values from the current configuration to the user configuration as appropriate or enter values by typing the values into the available fields.
7. Click Apply to apply the values, or click OK to apply the values and close the window.

AMS device manager applying a user configuration

Any amount of user configurations can be created for the application. They can also be saved, and applied to connected devices or to devices in the Device List or Plant Database.

Note

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

To apply a user configuration perform the following procedure:

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

3.13.2 Burst mode

When configured for burst mode, the 3051 provides faster digital communication from the transmitter to the control system by eliminating the time required for the control system to request information from the transmitter. Burst mode is compatible with the analog signal. Because the HART protocol features simultaneous digital and analog data transmission, the analog value can drive other equipment in the loop while the control system is receiving the digital information. Burst mode applies only to the transmission of dynamic data (pressure and temperature in engineering units, pressure in percent of range, and/or analog output), and does not affect the way other transmitter data is accessed.

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

Field communicator

Traditional 4-20 mA Fast Keys	1, 4, 3, 3, 3
Traditional 1-5 Vdc Fast Keys	1, 4, 3, 3, 3
Device Dashboard Fast Keys	2, 2, 4, 1

AMS device manager

Right click on the device and select Configure from the menu.

1. In the *HART* tab, use the drop down menu to select “Burst Mode ON or OFF.” For “Burst option” select the desired properties from the drop down menu. Burst options are as follows:
 - PV
 - % range/current
 - Process vars/crnt
 - Process variables
2. After selecting options click Apply.
3. After carefully reading the warning provided, select yes.

3.14 Multidrop communication

Multidropping transmitters refers to the connection of several transmitters to a single communications transmission line. Communication between the host and the transmitters takes place digitally with the analog output of the transmitters deactivated. With smart communications protocol, up to fifteen transmitters can be connected on a single twisted pair of wires, or over leased phone lines.

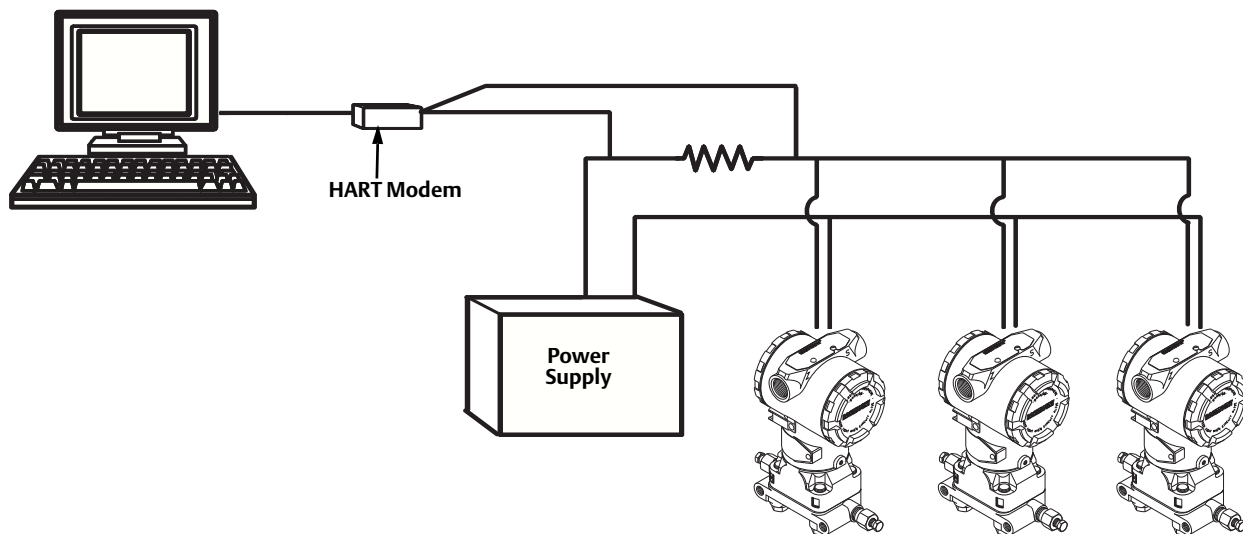
Multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Communication with transmitters can be accomplished with HART modems and a host implementing HART protocol. Each transmitter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

Figure 3-13 shows a typical multidrop network. This figure is not intended as an installation diagram.

Note

A transmitter in multidrop mode has the analog output fixed at 4 mA. If an LCD display is installed to a transmitter in multidrop mode, it will alternate the display between “current fixed” and the specified LCD display output(s).

Figure 3-13. Typical multidrop network



The 3051 is set to address zero (0) at the factory, which allows operation in the standard point-to-point manner with a 4–20 mA output signal. To activate multidrop communication, the transmitter address must be changed to a number from 1 to 15. This change deactivates the 4–20 mA analog output, sending it to 4 mA. It also disables the failure mode alarm signal, which is controlled by the upscale/downscale switch position. Failure signals in multidropped transmitters are communicated through HART messages.

3.15 Changing a transmitter address

To activate multidrop communication, the transmitter poll address must be assigned a number from 1 to 15, and each transmitter in a multidropped loop must have a unique poll address.

Field communicator

Traditional 4-20 mA Fast Keys	1, 4, 3, 3, 1
Traditional 1-5 Vdc Fast Keys	1, 4, 3, 3, 1
Device Dashboard Fast Keys	1, 2

AMS device manager

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

1. In the *HART* tab, in the *ID* box, enter poll address located in the *Poll addr* box, click Apply.
2. After carefully reading the warning provided, select yes.

3.15.1 Communicating with a multidropped transmitter

Field communicator

Traditional 4-20 mA Fast Keys	1, 4, 3, 3, 2
Traditional 1-5 Vdc Fast Keys	1, 4, 3, 3, 2
Device Dashboard Fast Keys	1, 2

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

1. From the *HOME* screen, enter the fast key sequence “Communicating with a Multidropped Transmitter.”
2. On the polling menu, scroll down and select “Digital Poll.” In this mode, the Field Communicator automatically polls for devices at addresses 0-15 upon start up.

AMS device manager

Click on the HART modem icon and select Scan All Devices.

3.15.2 Polling a multidropped transmitter

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

Field communicator

Traditional 4-20 mA Fast Keys	Left arrow, 4, 1
Traditional 1-5 Vdc Fast Keys	Left arrow, 4, 1
Device Dashboard Fast Keys	1, 2

AMS device manager

Click on the HART modem icon and select Scan All Devices.

Section 4 Operation and maintenance


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Safety messages	page 71
Calibration overview	page 72
Analog output trim	page 77
Sensor trim	page 81

4.1 Overview

This section contains information on calibrating and diagnostics messages on Rosemount 3051 Pressure Transmitters.

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

4.2 Safety messages

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

4.2.1 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 the 3051 reference manual for any restrictions associated with a safe installation.

- Before connecting a Field 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/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.

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.

4.3 Calibration overview

Calibration is defined as the process required to optimize transmitter accuracy over a specific range by adjusting the factory sensor characterization curve located in the microprocessor. Possible procedures are:

- Reranging: Setting the lower and upper range points (4 and 20 mA or 1 and 5 Vdc) points at required pressures. Reranging does not change the factory sensor characterization curve. Refer to [page 53](#).
- Analog Output Trim: Adjusts the transmitter's analog characterization curve to match the plant standard of the control loop. There are two types of digital-to-analog output trims. Refer to [page 77](#).
 - Digital-to-Analog Output Trim on 4-20 mA HART output ([page 77](#))
 - Digital-to-Analog Output Trim on 4-20 mA HART output Using Other Scale ([page 79](#))
- Sensor Trim: Adjusts the position of the factory sensor characterization curve due to a change in the sensor characteristics over time or a change in test equipment. Trimming has two steps, zero and sensor trims. Refer to [page 82](#) and [page 83](#).
- Zero Trim ([page 82](#))
- Sensor Trim ([page 83](#))

Figure 4-1 on page 73 illustrates 3051 transmitter data flow. Data flow can be summarized in four major steps:

1. A change in pressure is measured by a change in the sensor output (Sensor Signal).
2. The sensor signal is converted to a digital format that is understood by the microprocessor (Analog-to-Digital Signal Conversion). Sensor trim functions affect this value. Select these options to alter the digital signal on the LCD or Field Communicator.
3. Corrections are performed in the microprocessor to obtain a digital representation of the process input (Digital PV).
4. The Digital PV is converted to an analog value (Digital-to-Analog Signal Conversion). Rerange and Analog trim functions affect this value. Select these options to change the range points (4-20 mA or 1-5 Vdc).

For a summary of recommended calibration procedures, refer to Table 4-1 on page 4-74. Also, Figure 4-1 on page 73 identifies the approximate transmitter location for each calibration task. Data flows from left to right and a parameter change affects all values to the right of the changed parameter.

Figure 4-1. Transmitter data flow with calibration options

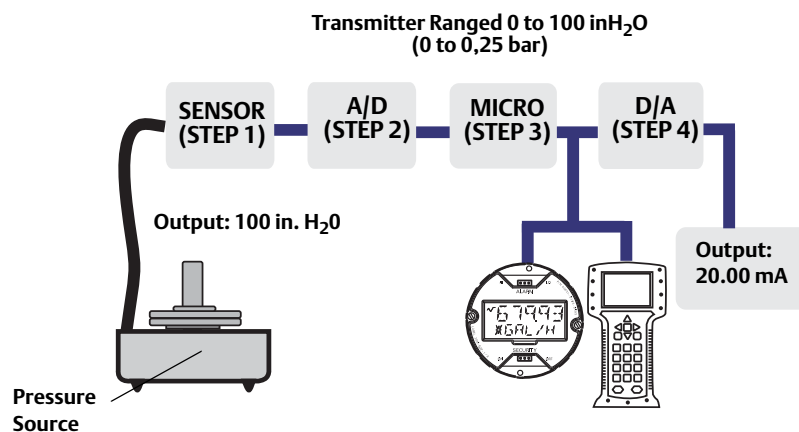


Table 4-1. Recommended calibration tasks

Transmitter	Bench calibration tasks	Field calibration tasks
3051CD 3051CG 3051L 3051TG, Range 1-4	<ol style="list-style-type: none"> 1. Set output configuration parameters: <ol style="list-style-type: none"> a. Set the range points. b. Set the output units. c. Set the output type. d. Set the damping value. 2. <i>Optional:</i> Perform a sensor trim. (Accurate pressure source required.) 	<ol style="list-style-type: none"> 1. Reconfigure parameters if necessary. 2. Zero trim the transmitter to compensate for mounting effects or static pressure effects. 3. <i>Optional:</i> Perform an analog output trim. (Accurate multimeter required)
3051CA 3051TA 3051TG, Range 5	<ol style="list-style-type: none"> 1. Set output configuration parameters: <ol style="list-style-type: none"> a. Set the range points. b. Set the output units. c. Set the output type. d. Set the damping value. 2. <i>Optional:</i> Perform a sensor trim if equipment available (accurate absolute pressure source required), otherwise perform the low trim value section of the sensor trim procedure. 	<ol style="list-style-type: none"> 1. Reconfigure parameters if necessary. 2. Perform low trim value section of the sensor trim procedure to correct for mounting position effects. 3. <i>Optional:</i> Perform an analog output trim (Accurate multimeter required)

Note

The 3051 has been carefully calibrated at the factory. Trimming adjusts the position of the factory characterization curve. It is possible to degrade performance of the transmitter if any trim is done improperly or with inaccurate equipment.

Note

A Field Communicator is required for all sensor and output trim procedures. Rosemount 3051C Range 4 and Range 5 transmitters require a special calibration procedure when used in differential pressure applications under high static line pressure (see “[Select Finish to acknowledge the method is complete.](#)” on page 84).

4.3.1 Determining calibration frequency

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

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

Sample calculation for a standard 3051C

Step 1: Determine the performance required for your application.

Required Performance: 0.30% of span

Step 2: Determine the operating conditions.

Transmitter: 3051CD, Range 2 [URL=250 inH₂O(623 mbar)]
 Calibrated Span: 150 inH₂O (374 mbar)
 Ambient Temperature Change: ± 50 °F (28 °C)
 Line Pressure: 500 psig (34,5 bar)

Step 3: Calculate total probable error (TPE).

$$TPE = \sqrt{(\text{Reference Accuracy})^2 + (\text{Temperature Effect})^2 + (\text{Static Pressure Effect})^2} = 0.117\% \text{ of span}$$

Where:

$$\text{Reference Accuracy} = \pm 0.065\% \text{ of span}$$

$$\text{Ambient Temperature Effect} = \left(\frac{0.0125 \text{ URL}}{\text{Span}} + 0.0625 \right) \% \text{ per } 50 \text{ }^\circ\text{F} = \pm 0.0833\% \text{ of span}$$

$$\text{Span Static Pressure Effect}^{(1)} =$$

$$0.1\% \text{ reading per } 1000 \text{ psi (69 bar)} = \pm 0.05\% \text{ of span at maximum span}$$

(1) Zero static pressure effect removed by zero trimming at line pressure.

Step 4: Calculate the stability per month.

$$\text{Stability} = \pm \left[\frac{0.125 \text{ URL}}{\text{Span}} \right] \% \text{ of span for } 5 \text{ years} = \pm 0.0035\% \text{ of span per month}$$

Step 5: Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - \text{TPE})}{\text{Stability per Month}} = \frac{(0.30\% - 0.117\%)}{0.0035\%} = (52) \text{ months}$$

Sample calculation for 3051C with P8 option (0.04% accuracy & 5-year stability)

Step 1: Determine the performance required for your application.

Required Performance: 0.30% of span

Step 2: Determine the operating conditions.

Transmitter:	3051CD, Range 2 [URL=250 inH ₂ O(623 mbar)]
Calibrated Span:	150 inH ₂ O (374 mbar)
Ambient Temperature Change:	± 50 °F (28 °C)
Line Pressure:	500 psig (34,5 bar)

Step 3: Calculate total probable error (TPE).

$$TPE = \sqrt{(\text{ReferenceAccuracy})^2 + (\text{TemperatureEffect})^2 + (\text{StaticPressureEffect})^2} = 0.105\% \text{ of span}$$

Where:

$$\text{Reference Accuracy} = \pm 0.04\% \text{ of span}$$

Ambient Temperature Effect =

$$\pm \left(\frac{0.0125 \times \text{URL}}{\text{Span}} + 0.0625 \right) \% \text{ per } 50 \text{ } ^\circ\text{F} = \pm 0.0833\% \text{ of span}$$

Span Static Pressure Effect⁽¹⁾ =

$$0.1\% \text{ reading per } 1000 \text{ psi (69 bar)} = \pm 0.05\% \text{ of span at maximum span}$$

(1) Zero static pressure effect removed by zero trimming at line pressure.

Step 4: Calculate the stability per month.

$$\text{Stability} = \pm \left[\frac{0.125 \times \text{URL}}{\text{Span}} \right] \% \text{ of span for } 5 \text{ years} = \pm 0.0035\% \text{ of span per month}$$

Step 5: Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - \text{TPE})}{\text{Stability per Month}} = \frac{(0.3\% - 0.105\%)}{0.0035\%} = 27 \text{ months}$$

4.3.2 Choosing a trim procedure

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

1. Connect a pressure source, a Field Communicator or AMS, and a digital readout device to the transmitter.
2. Establish communication between the transmitter and the Field Communicator.
3. Apply pressure equal to the upper range point pressure.
4. Compare the applied pressure to the pressure process variable valve on the Process Variables menu on the Field Communicator or the *Process Variables* screen in AMS. For instructions on how to access process variables, see [page 51](#) of [Section 3: Configuration](#).

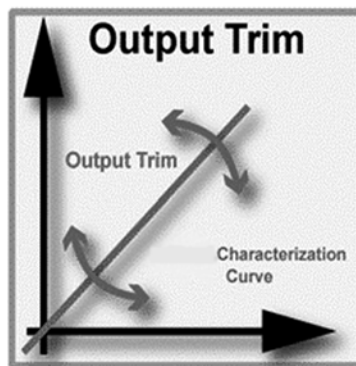
- a. If the pressure reading does not match the applied pressure (with high-accuracy test equipment), perform a sensor trim. See “Sensor trim overview” on page 81 to determine which trim to perform.
5. Compare the Analog Output (AO) line, on the Field Communicator or AMS, to the digital readout device.

If the AO reading does not match the digital readout device (with high-accuracy test equipment), perform an analog output trim. See “Analog output trim” on page 77.

4.4 Analog output trim

The Analog Output Trim commands allow you to adjust the transmitter’s current output at the 4 and 20 mA (1 and 5 Vdc) points to match the plant standards. This command adjusts the digital to analog signal conversion.

Figure 4-2. Output trim



4.4.1 Digital-to-Analog trim

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 2, 1
Traditional 1-5 Vdc Fast Keys	1, 2, 3, 2, 1
Device Dashboard Fast Keys	3, 4, 2

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

1. From the *HOME* screen, enter the fast key sequence “Digital-to-Analog Trim.” Select OK after setting the control loop to manual, see “[Setting the loop to manual](#)” on page 40.
2.
 - a. For 4-20 mA HART output, connect a reference meter to the transmitter by either connecting the meter to the test terminals on the terminal block, or shunting transmitter power through the meter at some point in the loop.
 - b. For 1-5 Vdc Low Power HART output, connect a reference meter to the V_{out} terminal.
3. Select OK after connecting the reference meter.
4. Select OK at the SETTING FLD DEV OUTPUT TO 4 MA (1 Vdc) prompt. The transmitter outputs 4.0 mA.
5. Record the actual value from the reference meter, and enter it at the ENTER METER VALUE prompt. The Field Communicator prompts you to verify whether or not the output value equals the value on the reference meter.
6. Select 1: Yes, if the reference meter value equals the transmitter output value, or 2: No if it does not.
 - a. If 1 is selected: Yes, proceed to [Step 7](#).
 - b. If 2 is selected: No, repeat [Step 5](#).
7. Select OK at the SETTING FLD DEV OUTPUT TO 20 MA (5 Vdc) prompt, and repeat Steps 5 and 6 until the reference meter value equals the transmitter output value.
8. Select OK after the control loop is returned to automatic control.

AMS Device Manager

Right click on the device and select Calibrate, then D/A Trim from the menu.

1. Click Next after setting the control loop to manual.
2. Click Next after connecting the reference meter.
3. Click Next at the *Setting fld dev output to 4 mA (1 Vdc)* screen.
4. Record the actual value from the reference meter, and enter it at the *Enter meter value* screen and click Next.
5. Select Yes, if the reference meter value equals the transmitter output value, or No if it does not. Click Next.
 - a. If Yes is selected, proceed to [Step 6](#).
 - b. If No is selected, repeat [Step 4](#).
6. Click Next at the *Setting fld dev output to 20 mA (5 Vdc)* screen.
7. Repeat [Step 4](#) - [Step 5](#) until the reference meter equals the transmitter output value.
8. Select Next to acknowledge the loop can be returned to automatic control.
9. Select Finish to acknowledge the method is complete.

4.4.2 Digital-to-Analog trim using other scale

The Scaled D/A Trim command matches the 4 and 20 mA (1 and 5 Vdc) points to a user selectable reference scale other than 4 and 20 mA (for example, 2 to 10 volts if measuring across a 500 ohm load, or 0 to 100 percent if measuring from a Distributed Control System (DCS)). To perform a scaled D/A trim, connect an accurate reference meter to the transmitter and trim the output signal to scale, as outlined in the Output Trim procedure.

Note

Use a precision resistor for optimum accuracy. If you add a resistor to the loop, ensure that the power supply is sufficient to power the transmitter to a 20 mA output with additional loop resistance. Refer to [“Power supply for 4-20 mA HART”](#) on page 25.

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 2, 2
Traditional 1-5 Vdc Fast Keys	1, 2, 3, 2, 2
Device Dashboard Fast Keys	3, 4, 2

AMS Device Manager

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

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

4.4.3 Recall factory trim—**analog output**

The Recall Factory Trim—Analog Output command allows the restoration of the as-shipped factory settings of the analog output trim. This command can be useful for recovering from an inadvertent trim, incorrect Plant Standard or faulty meter. This command is only available with 4-20 mA output.

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 4, 2
Device Dashboard Fast Keys	3, 4, 3

AMS Device Manager

Right click on the device and select Calibrate, then Recall Factory Trim from the menu.

1. Click Next after setting the control loop to manual.
2. Select Analog output trim under *Trim to recall* and click Next.
3. Click Next to acknowledge restoration of trim values is complete.
4. Select Next to acknowledge the loop can be returned to automatic control.
5. Select Finish to acknowledge the method is complete.

4.5 Sensor trim

4.5.1 Sensor trim overview

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

Zero trim is a single-point offset adjustment. It is useful for compensating for mounting position effects and is most effective when performed with the transmitter installed in its final mounting position. Since this correction maintains the slope of the characterization curve, it should not be used in place of a sensor trim over the full sensor range.

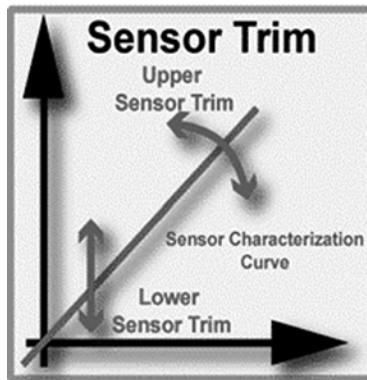
When performing a zero trim, ensure that the equalizing valve is open and all wet legs are filled to the correct levels.

Note

Do not perform a zero trim on Rosemount 3051T Absolute pressure transmitters. Zero trim is zero based, and absolute pressure transmitters reference absolute zero. To correct mounting position effects on a 3051T Absolute Pressure Transmitter, perform a low trim within the sensor trim function. The low trim function provides an offset correction similar to the zero trim function, but it does not require zero-based input.

Sensor trim is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. Always adjust the low trim value first to establish the correct offset. Adjustment of the high trim value provides a slope correction to the characterization curve based on the low trim value. The trim values allow you to optimize performance over your specified measuring range at the calibration temperature.

Figure 4-3. Sensor trim



4.5.2 Zero trim

Note

The transmitter PV at zero pressure must be within three percent of URL in order to calibrate using the zero trim function.

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 3, 1
Traditional 1-5 Vdc Fast Keys	1, 2, 3, 3, 1
Device Dashboard Fast Keys	3, 4, 1, 3

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

1. Vent the transmitter and attach a Field Communicator to the measurement loop.
2. From the *HOME* screen, follow the fast key sequence "Zero Trim."
3. Follow the commands provided by the Field Communicator to complete the zero trim adjustment.

AMS Device Manager

Right click on the device and select Calibrate, then Zero trim from the menu.

1. Click Next after setting the control loop to manual.
2. Click Next to acknowledge warning.
3. Click Next after applying appropriate pressure to sensor.
4. Select Next to acknowledge the loop can be returned to automatic control.
5. Select Finish to acknowledge the method is complete.

4.5.3 Sensor trim

Note

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

Field communicator

Traditional 4-20 mA Fast Keys	1, 2, 3, 3
Traditional 1-5 Vdc Fast Keys	1, 2, 3, 3
Device Dashboard Fast Keys	3, 4, 1

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

1. Assemble and power the entire calibration system including a transmitter, Field Communicator, power supply, pressure input source, and readout device.
2. From the *HOME* screen, enter the fast key sequence under “Sensor Trim.”
3. Select 2: Lower sensor trim. The lower sensor trim value should be the sensor trim point that is closest to zero.

Examples:

Calibration: 0 to 100" H₂O - lower trim = 0, upper trim = 100

Calibration: -100 to 0" H₂O - lower trim = 0, upper trim = -100

Calibration: -100 to 100" H₂O - lower trim = -100 or 100,
upper trim = -100 or 100

Note

Select pressure input values so that lower and upper values are equal to or outside the 4 and 20 mA (1 and 5 Vdc) points. Do not attempt to obtain reverse output by reversing the high and low points. This can be done by going to “Rerange” on page 53 of Section 3: Configuration. The transmitter allows approximately five percent deviation.

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

AMS Device Manager

Right click on the device and select Calibrate, then Sensor trim” from the menu.

1. Select Lower sensor trim. The lower sensor trim value should be the sensor trim point that is closest to zero.
2. Click Next after setting the control loop to manual.
3. Click Next after applying appropriate pressure to sensor.
4. Select Next to acknowledge the loop can be returned to automatic control.
5. Select Finish to acknowledge the method is complete.
6. Right click on the device and select Calibrate, select Sensor trim from the menu.
7. Select Upper sensor trim and repeat steps 5.

4.5.4 Recall factory trim—sensor trim

The Recall Factory Trim—Sensor Trim command allows the restoration of the as-shipped factory settings of the sensor trim. This command can be useful for recovering from an inadvertent zero trim of an absolute pressure unit or inaccurate pressure source. This command is only available with 4-20 mA output.

Field communicator

4-20 mA Fast Keys	1, 2, 3, 4, 1
Device Dashboard Fast Keys	3, 4, 3

AMS Device Manager

Right click on the device and select Calibrate, then Recall Factory Trim from the menu.

1. Click Next after setting the control loop to manual.
2. Select “Sensor trim” under *Trim to recall* and click Next.
3. Click Next to acknowledge restoration of trim values is complete.
4. Select Next to acknowledge the loop can be returned to automatic control.
5. Select Finish to acknowledge the method is complete.

4.5.5 Line pressure effect (range 2 and range 3)

The following specifications show the static pressure effect for the Rosemount 3051 Range 2 and Range 3 pressure transmitters used in differential pressure applications where line pressure exceeds 2000 psi (138 bar).

Zero effect

$\pm 0.1\%$ of the upper range limit plus an additional $\pm 0.1\%$ of upper range limit error for each 1000 psi (69 bar) of line pressure above 2000 psi (138 bar).

Example: Line pressure is 3000 psi (207 bar) for Ultra performance transmitter. Zero effect error calculation:

$$\pm [0.05 + 0.1 \times [3 \text{ kpsi} - 2 \text{ kpsi}]] = \pm 0.15\% \text{ of the upper range limit}$$

Span effect

Refer to “Line Pressure Effect” on [page 105](#).

4.5.6 Compensating for line pressure

Rosemount 3051 Range 4 and 5 pressure transmitters require a special calibration procedure when used in differential pressure applications. The purpose of this procedure is to optimize transmitter performance by reducing the effect of static line pressure in these applications. The 3051 differential pressure transmitters (Ranges 1, 2, and 3) do not require this procedure because optimization occurs in the sensor.

Applying high static pressure to 3051 Range 4 and Range 5 pressure transmitters causes a systematic shift in the output. This shift is linear with static pressure; correct it by performing the Sensor Trim procedure on [page 83](#).

The following specifications show the static pressure effect for 3051 Range 4 and Range 5 transmitters used in differential pressure applications:

Zero Effect:

$\pm 0.1\%$ of the upper range limit per 1000 psi (69 bar) for line pressures from 0 to 2000 psi (0 to 138 bar)

For line pressures above 2000 psi (138 bar), the zero effect error is $\pm 0.2\%$ of the upper range limit plus an additional $\pm 0.2\%$ of upper range limit error for each 1000 psi (69 bar) of line pressure above 2000 psi (138 bar).

Example: Line pressure is 3000 psi (3 kpsi). Zero effect error calculation:

$$\pm [0.2 + 0.2 \times [3 \text{ kpsi} - 2 \text{ kpsi}]] = \pm 0.4\% \text{ of the upper range limit}$$

Span Effect:

Correctable to $\pm 0.2\%$ of reading per 1000 psi (69 bar) for line pressures from 0 to 3626 psi (0 to 250 bar)

The systematic span shift caused by the application of static line pressure is -1.00% of reading per 1000 psi (69 bar) for Range 4 transmitters, and -1.25% of reading per 1000 psi (69 bar) for Range 5 transmitters.

Use the following example to compute corrected input values.

Example

A Range 4 transmitter with model number 3051_CD4 will be used in a differential pressure application where the static line pressure is 1200 psi (83 bar). The transmitter output is ranged with 4 mA at 500 inH₂O (1,2 bar) and 20 mA at 1500 inH₂O (3,7 bar).

To correct for systematic error caused by high static line pressure, first use the following formulas to determine corrected values for the low trim and high trim.

Low Trim Value

$$LT = LRV - (S/100 \times P/1000 \times LRV)$$

Where:	LT =	Corrected Low Trim Value
	LRV =	Lower Range Value
	S =	Span shift per specification (as a percent of reading)
	P =	Static Line Pressure in psi

In this example:

LRV =	500 inH ₂ O (1.24 bar)
S =	-1.00%
P =	1200 psi
LT =	$500 \text{ inH}_2\text{O} - (-1\%/100 \times 1200 \text{ psi}/1000 \times 500 \text{ inH}_2\text{O})$
LT =	506 inH ₂ O

High Trim Value

$$HT = (URV - (S/100 \times P/1000 \times URV))$$

Where:	HT =	Corrected High Trim Value
	URV =	Upper Range Value
	S =	Span shift per specification (as a percent of reading)
	P =	Static Line Pressure in psi

In this example:

URV =	1500 inH ₂ O (3.74 bar)
S =	-1.00%
P =	1200 psi
HT =	$1500 - (-1\%/100 \times 1200 \text{ psi}/1000 \times 1500 \text{ inH}_2\text{O})$
HT =	1518 inH ₂ O

Complete the Sensor Trim procedure as described on [page 83](#). In the example above, at step 4, apply the nominal pressure value of 500 inH₂O. However, enter the calculated correct lower trim (LT) value of 506 inH₂O with the Field Communicator. Repeat the procedure for the upper value.

Note

The range values for the 4 and 20 mA (1 and 5 Vdc) points should be at the nominal URV and LRV. In the example above, the values are 1500 inH₂O and 500 inH₂O respectively. Confirm the values on the *HOME* screen on the Field Communicator. Modify, if needed, by following the steps in the Rerange section on [page 53](#).

Section 5 Troubleshooting

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Disassembly procedures	page 97
Reassembly procedures	page 100

5.1 Overview

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

If you suspect malfunction despite the absence of any diagnostic messages on the Field Communicator display, consider using Table 5-1 on page 5-91 to identify any potential problem.

5.2 Safety messages

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

5.2.1 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 the 3051 reference manual for any restrictions associated with a safe installation.

- Before connecting a Field 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/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.

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.

Table 5-1. Rosemount 3051 troubleshooting table for 4-20 mA output

Symptom	Corrective actions
Transmitter milliamp reading is zero	Verify power is applied to signal terminals
	Check power wires for reversed polarity
	Verify terminal voltage is 10.5 to 42.4 Vdc
	Check for open diode across test terminal
Transmitter Not Communicating with Field Communicator	Verify the output is between 4 and 20 mA or saturation levels
	Verify terminal voltage is 10.5 to 42.4 Vdc
	Verify clean DC Power to transmitter (Max AC noise 0.2 volts peak to peak)
	Check loop resistance, 250 Ω minimum (PS voltage -transmitter voltage/loop current)
	Have Field Communicator poll for all addresses
Transmitter milliamp reading is low or high	Verify applied pressure
	Verify 4 and 20 mA range points
	Verify output is not in alarm condition
	Verify if 4 – 20 mA output trim is required
Transmitter will not respond to changes in applied pressure	Check test equipment
	Check impulse piping or manifold for blockage
	Verify the transmitter is not in multidrop mode
	Verify applied pressure is between the 4 and 20 mA set points
	Verify output is not in alarm condition
	Verify transmitter is not in Loop Test mode
Digital Pressure Variable reading is low or high	Check test equipment (verify accuracy)
	Check impulse piping for blockage or low fill in wet leg
	Verify transmitter is calibrated properly
	Verify pressure calculations for application
Digital Pressure Variable reading is erratic	Check application for faulty equipment in pressure line
	Verify transmitter is not reacting directly to equipment turning on/off
	Verify damping is set properly for application
Milliamp reading is erratic	Verify power source to transmitter has adequate voltage and current
	Check for external electrical interference
	Verify transmitter is properly grounded
	Verify shield for twisted pair is only grounded at one end

5.3 Diagnostic messages

In addition to the output, the LCD meter displays abbreviated operation, error, and warning messages for troubleshooting the transmitter. Messages appear according to their priority, with normal operating messages appearing last. To determine the cause of a message, use a Field Communicator or AMS to further interrogate the transmitter. A description of each LCD diagnostic message follows.

Error

Error messages appear on the LCD display to inform you of serious problems affecting the operation of the transmitter. The LCD displays an error message until the error condition is corrected, and the analog output is driven to the specified alarm level. No other transmitter information is displayed during an alarm condition.

Fail

The transmitter CPU board and the sensor module are incompatible. See [“Disassembly procedures” on page 97](#).

Fail Module

The sensor module is disconnected or is malfunctioning. Verify that the sensor module ribbon cable is connected to the back of the electronics board. If the ribbon cable is properly connected, there is a problem within the sensor module. Possible sources of problems include:

- Pressure or temperature updates are not being received in the sensor module.
- A non-volatile memory fault that will effect transmitter operation has been detected in the module by the memory verification routine.

Some non-volatile memory faults are user-repairable. Use a Field Communicator to diagnose the error and determine if it is repairable. Any error message that ends in “FACTORY” is not repairable. In cases of non user-repairable errors, you must replace the transmitter.

Fail Elect

The transmitter electronics board is malfunctioning due to an internal fault. Some of the FAIL ELECT errors are user-repairable. Use a 275 Field Communicator to diagnose the error and determine if it is repairable. Any error message that ends in “FACTORY” is not repairable. In cases of non user-repairable errors, you must replace the electronics board. See [“Disassembly procedures” on page 97](#).

Fail Config

A memory fault has been detected in a location that could affect transmitter operation, and is user-accessible. To correct this problem, use a Field Communicator to interrogate and reconfigure the appropriate portion of the transmitter memory.

Warnings

Warnings appear on the LCD display to alert you of user-repairable problems with the transmitter, or current transmitter operations. Warnings appear alternately with other transmitter information until the warning condition is corrected or the transmitter completes the operation that warrants the warning message.

Press Limit

The process variable read by the transmitter is outside of the transmitter's range.

Temp Limit

The secondary temperature variable read by the transmitter is outside of the transmitter's range.

Curr Fixed

The transmitter is in multidrop mode. The analog output is not tracking pressure changes.

Curr Saturd

The pressure read by the module is outside of the specified range, and the analog output has been driven to saturation levels.

Loop Test

A loop test is in progress. During a loop test or 4–20 mA trim, the analog output is set to a fixed value. The meter display alternates between the current selected in milliamps and "LOOP TEST."

Xmtr Info

A non-volatile memory fault has been detected in the transmitter memory by the memory verification routine. The memory fault is in a location containing transmitter information. To correct this problem, use a Field Communicator to interrogate and reconfigure the appropriate portion of the transmitter memory. This warning does not effect the transmitter operation.

Operation

Normal operation messages appear on the LCD meter to confirm actions or inform you of transmitter status. Operation messages are displayed with other transmitter information, and warrant no action to correct or alter the transmitter settings.

Zero Pass

The zero value, set with the local zero adjustment button, has been accepted by the transmitter, and the output should change to 4 mA (1 Vdc).

Zero Fail

The zero value, set with the local zero adjustment button, exceeds the maximum rangedown allowed for a particular range, or the pressure sensed by the transmitter exceeds the sensor limits.

Span Pass

The span value, set with the local span adjustment button, has been accepted by the transmitter, and the output should change to 20 mA (5 Vdc).

Span Fail

The span value, set with the local span adjustment button, exceeds the maximum rangedown allowed for a particular range, or the pressure sensed by the transmitter exceeds the sensor limits.

Local Dsblld

This message appears during reranging with the integral zero and span buttons and indicates that the transmitter local zero and span adjustments have been disabled. The adjustments may have been disabled by the transmitter security jumper on the transmitter circuit board or through software commands from the Field Communicator. See “[Security \(write protect\)](#)” on [page 20](#) for information on the position of the security jumper and information on software lockout.

Write Protect

This message appears if you attempt to change the transmitter configuration data while the security jumper is in the ON position. See “[Security \(write protect\)](#)” on [page 20](#) for more information about the security jumper.

Field communicator diagnostics

[Table 5-2](#) is a list of messages used by the Field Communicator (HC) and their corresponding descriptions.

Variable parameters within the text of a message are indicated with *<variable parameter>*.

Reference to the name of another message is identified by *[another message]*.

Table 5-2. Field communicator messages


Message	Description
1k snsr EEPROM error-factory ON	Replace the transmitter
1k snsr EEPROM error-user-no out ON	Use the Field Communicator to reset the following parameters: remote seal isolator, remote seal fill fluid, flange material, o-ring material, transmitter type, remote seal type, flange type, meter type, number of remote seals.
1k snsr EEPROM error-user ON	Perform a full trim to recalibrate the transmitter.
4k micro EEPROM error-factory ON	Replace the electronics board.
4k micro EEPROM error-user-no out ON	Use the Field Communicator to reset the message field.
4k micro EEPROM error-user ON	Use the Field Communicator to reset the following parameters: units, range values, damping, analog output, transfer function, tag, scaled meter values. Perform a D/A trim to ensure that the error is corrected.

Message	Description
4k snsr EEPROM error-factory ON	Replace the transmitter.
4k snsr EEPROM error-user ON	Use the Field Communicator to reset the temperature units and the calibration type.
Add item for ALL device types or only for this ONE device type.	Asks the user whether the hot key item being added should be added for all device types or only for the type of device that is connected.
Command Not Implemented	The connected device does not support this function.
Communication Error	The communicator and the device are not communicating correctly. Check all connections between the Field Communicator and the device and resend the information.
Configuration memory not compatible with connected device	The configuration stored in memory is incompatible with the device to which a transfer has been requested.
CPU board not initialized ON	The electronics board is not initialized. Replace the electronics board.
CPU EEPROM write failure ON	Message sent to electronics board from HART signal failed. Replace the electronics board.
Device Busy	The connected device is busy performing another task.
Device Disconnected	The device failed to respond to a command. Check all connections between the Field Communicator and the device and resend the command.
Device write protected	Device is in write-protect mode. Data can not be written.
Device write protected. Do you still want to shut off?	Device is in write-protect mode. Press YES to turn the Field Communicator off and lose the unsent data.
Display value of variable on hotkey menu?	Asks whether the value of the variable should be displayed adjacent to its label on the hotkey menu if the item being added to the hotkey menu is a variable.
Download data from configuration memory to device	Press the SEND softkey to transfer information from the communicator memory to the device.
Exceed field width	Indicates that the field width for the current arithmetic variable exceeds the device-specified description edit format.
Exceed precision	Indicates that the precision for the current arithmetic variable exceeds the device-specified description edit format.
Ignore next 50 occurrences of status?	Select YES to ignore the next 50 occurrences of device status, or select no to display every occurrence.
Illegal character	An invalid character for the variable type was entered.
Illegal date	The day portion of the date is invalid.
Illegal month	The month portion of the date is invalid.
Illegal year	The year portion of the date is invalid.
Incompatible CPU board and module ON	Upgrade the electronics board or the sensor module to the current revision.
Incomplete exponent	The exponent of a scientific notation floating point variable is incomplete.
Incomplete field	The value entered is not complete for the variable type.

Message	Description
Looking for a device	Polling for multidropped devices at addresses 1–15.
Local buttons operator error ON	Illegal pressure applied during zero or span operation. Repeat the process after verifying the correct pressures.
Mark as read only variable on hotkey menu?	Asks whether the user should be allowed to edit the variable from the hotkey menu if the item being added to the hotkey menu is a variable.
Module EEPROM write failure ON	Message sent to the module from the HART signal failed. Replace the transmitter.
No device configuration in configuration memory	There is no configuration saved in memory available to re-configure off-line or transfer to a device.
No Device Found	Poll of address zero fails to find a device, or poll of all addresses fails to find a device if auto-poll is enabled.
No hotkey menu available for this device.	There is no menu named “hotkey” defined in the device description for this device.
No pressure updates ON	No pressure updates being received from the sensor module. Verify that the sensor module ribbon cable is attached correctly. Or replace the transmitter.
No offline devices available.	There are no device descriptions available to be used to configure a device offline.
No simulation devices available.	There are no device descriptions available to simulate a device.
No temperature updates ON	No temperature updates being received from the sensor module. Verify that the sensor module ribbon cable is attached correctly. Or replace the transmitter.
No UPLOAD_VARIABLES in ddl for this device	There is no menu named “upload_variables” defined in the device description for this device. This menu is required for offline configuration.
No Valid Items	The selected menu or edit display contains no valid items.
OFF KEY DISABLED	Appears when the user attempts to turn the HC off before sending modified data or before completing a method.
Online device disconnected with unsent data. RETRY or OK to lose data.	There is unsent data for a previously connected device. Press RETRY to send data, or press OK to disconnect and lose unsent data.
Out of memory for hotkey configuration. Delete unnecessary items.	There is no more memory available to store additional hotkey items. Unnecessary items should be deleted to make space available.
Overwrite existing configuration memory	Requests permission to overwrite existing configuration either by a device-to-memory transfer or by an offline configuration. User answers using the softkeys.
Press OK...	Press the OK softkey. This message usually appears after an error message from the application or as a result of HART communications.
Restore device value?	The edited value that was sent to a device was not properly implemented. Restoring the device value returns the variable to its original value.
ROM checksum error ON	Checksum of transmitter software has detected a fault. Replace the electronics board.
Save data from device to configuration memory	Prompts user to press SAVE softkey to initiate a device-to-memory transfer.

Message	Description
Saving data to configuration memory.	Data is being transferred from a device to configuration memory.
Sending data to device.	Data is being transferred from configuration memory to a device.
Sensor board not initialized ON	The sensor module electronics board is not initialized. Replace the transmitter.
There are write only variables which have not been edited. Please edit them.	There are write-only variables which have not been set by the user. These variables should be set or invalid values may be sent to the device.
There is unsent data. Send it before shutting off?	Press YES to send unsent data and turn the HC off. Press NO to turn the HC off and lose the unsent data.
Too few data bytes received	Command returns fewer data bytes than expected as determined by the device description.
Transmitter Fault	Device returns a command response indicating a fault with the connected device.
Units for <variable label> has changed. Unit must be sent before editing, or invalid data will be sent.	The engineering units for this variable have been edited. Send engineering units to the device before editing this variable.
Unsent data to online device. SEND or LOSE data	There is unsent data for a previously connected device which must be sent or thrown away before connecting to another device.
Upgrade 275 software to access XMTR function. Continue with old description?	The communicator does not contain the most recent 3051 Device Descriptors (DDs). Select YES to communicate using the existing DDs. Select NO to abort communication.
Use up/down arrows to change contrast. Press DONE when done.	Gives direction to change the contrast of the HC display.
Value out of range	The user-entered value is either not within the range for the given type and size of variable or not within the min/max specified by the device.
<message> occurred reading/writing <variable label>	Either a read/write command indicates too few data bytes received, transmitter fault, invalid response code, invalid response command, invalid reply data field, or failed pre- or post-read method; or a response code of any class other than SUCCESS is returned reading a particular variable.
<variable label> has an unknown value. Unit must be sent before editing, or invalid data will be sent.	A variable related to this variable has been edited. Send related variable to the device before editing this variable.

5.4 Disassembly procedures

 Do not remove the instrument cover in explosive atmospheres when the circuit is live.

5.4.1 Remove from service

Follow these steps:

- Follow all plant safety rules and procedures.
- Isolate and vent the process from the transmitter before removing the transmitter from service.
- Remove all electrical leads and disconnect conduit.
- Remove the transmitter from the process connection.
- The Rosemount 3051C transmitter is attached to the process connection by four bolts and two cap screws. Remove the bolts and separate the transmitter from the process connection. Leave the process connection in place and ready for re-installation.
- The Rosemount 3051T transmitter is attached to the process by a single hex nut process connection. Loosen the hex nut to separate the transmitter from the process. Do not wrench on neck of transmitter.
- Do not scratch, puncture, or depress the isolating diaphragms.
- Clean isolating diaphragms with a soft rag and a mild cleaning solution, and rinse with clear water.
- For the 3051C, whenever you remove the process flange or flange adapters, visually inspect the PTFE o-rings. Replace the o-rings if they show any signs of damage, such as nicks or cuts. Undamaged o-rings may be reused.


5.4.2 Remove terminal block

Electrical connections are located on the terminal block in the compartment labeled “FIELD TERMINALS.”

1. Remove the housing cover from the field terminal side.
2. Loosen the two small screws located on the assembly in the 9 o'clock and 5 o'clock positions.
3. Pull the entire terminal block out to remove it.

5.4.3 Remove the electronics board

The transmitter electronics board is located in the compartment opposite the terminal side. To remove the electronics board perform the following procedure:

1. Remove the housing cover opposite the field terminal side.
2. If you are disassembling a transmitter with a LCD display, loosen the two captive screws that are visible on the right and left side of the meter display.
3.  Loosen the two captive screws that anchor the board to the housing. The electronics board is electrostatically sensitive; observe handling precautions for static-sensitive components. Use caution when removing the LCD as there is an electronic pin connector that interfaces between the LCD and electronics board. The two screws anchor the LCD display to the electronics board and the electronics board to the housing.
4. Using the two captive screws, slowly pull the electronics board out of the housing. The sensor module ribbon cable holds the electronics board to the housing. Disengage the ribbon cable by pushing the connector release.

5.4.4 Remove the sensor module from the electronics housing

1. Remove the electronics board. Refer to “[Remove the electronics board](#)” on page 99.

Important

To prevent damage to the sensor module ribbon cable, disconnect it from the electronics board before you remove the sensor module from the electrical housing.

2. Carefully tuck the cable connector completely inside of the internal black cap.

 See “[Safety messages](#)” on page 89 for complete warning

Note

Do not remove the housing until after you tuck the cable connector completely inside of the internal black cap. The black cap protects the ribbon cable from damage that can occur when you rotate the housing.


3. Loosen the housing rotation set screw with a $5/64$ -inch hex wrench, and loosen one full turn.
4. Unscrew the module from the housing, making sure the black cap and sensor cable do not catch on the housing.

5.5 Reassembly procedures


1. Inspect all cover and housing (non-process wetted) O-rings and replace if necessary. Lightly grease with silicone lubricant to ensure a good seal.
2. Carefully tuck the cable connector completely inside the internal black cap. To do so, turn the black cap and cable counterclockwise one rotation to tighten the cable.
3. Lower the electronics housing onto the module. Guide the internal black cap and cable through the housing and into the external black cap.
4. Turn the module clockwise into the housing.

Important

Make sure the sensor ribbon cable and internal black cap remain completely free of the housing as you rotate it. Damage can occur to the cable if the internal black cap and ribbon cable become hung up and rotate with the housing.

-  5. Thread the housing completely onto the sensor module. The housing must be no more than one full turn from flush with the sensor module to comply with explosion proof requirements.
6. Tighten the housing rotation set screw using a $5/64$ -inch hex wrench.

5.5.1 Attach the electronics board

1. Remove the cable connector from its position inside of the internal black cap and attach it to the electronics board.
2. Using the two captive screws as handles, insert the electronics board into the housing. Make sure the posts from the electronics housing properly engage the receptacles on the electronics board. Do not force. The electronics board should slide gently on the connections.
3. Tighten the captive mounting screws.
-  4. Replace the electronics housing cover. The transmitter covers must be engaged metal-to-metal to ensure a proper seal and to meet Explosion-Proof requirements.

 See “Safety messages” on page 89 for complete warning

5.5.2 Install the terminal block

1. Gently slide the terminal block into place, making sure the two posts from the electronics housing properly engage the receptacles on the terminal block.
2. Tighten the captive screws.
3. Replace the electronics housing cover. The transmitter covers must be fully engaged to meet Explosion-Proof requirements.

5.5.3 Reassemble the 3051C process flange

1. Inspect the sensor module PTFE o-rings. Undamaged o-rings may be reused. Replace o-rings that show any signs of damage, such as nicks, cuts, or general wear.

Note

If you are replacing the o-rings, be careful not to scratch the o-ring grooves or the surface of the isolating diaphragm when removing the damaged o-rings.

2. Install the process connection. Possible options include:
 - a. Coplanar Process Flange:
 - Hold the process flange in place by installing the two alignment screws to finger tightness (screws are not pressure retaining). Do not overtighten as this will affect module-to-flange alignment.
 - Install the four 1.75-in. flange bolts by finger tightening them to the flange.
 - b. Coplanar Process Flange with Flange Adapters:
 - Hold the process flange in place by installing the two alignment screws to finger tightness (screws are not pressure retaining). Do not overtighten as this will affect module-to-flange alignment.
 - Hold the flange adapters and adapter o-rings in place while installing the four configurations, use four 2.88-in. bolts. For gage pressure configurations, use two 2.88-in. bolts and two 1.75-in. bolts.
 - c. Manifold:
 - Contact the manifold manufacturer for the appropriate bolts and procedures.
3. Tighten the bolts to the initial torque value using a crossed pattern. See [Table 5-3](#) for appropriate torque values.

Table 5-3. Bolt installation torque values

Bolt material	Initial torque value	Final torque value
CS-ASTM-A445 Standard	300 in.-lb. (34 N-m)	650 in.-lb. (73 N-m)
316 SST—Option L4	150 in.-lb. (17 N-m)	300 in.-lb. (34 N-m)
ASTM-A-19 B7M—Option L5	300 in.-lb. (34 N-m)	650 in.-lb. (73 N-m)
ASTM-A-193 Class 2, Grade B8M—Option L8	150 in.-lb (17 N-m)	300 in.-lb (34 N-m)

Note

If you replaced the PTFE sensor module o-rings, re-torque the flange bolts after installation to compensate for cold flow.

Note

After replacing o-rings on Range 1 transmitters and re-installing the process flange, expose the transmitter to a temperature of 185 °F (85 °C) for two hours. Then re-tighten the flange bolts in a cross pattern, and again expose the transmitter to a temperature of 185 °F (85 °C) for two hours before calibration.

5.5.4 Install the drain/vent valve

1. Apply sealing tape to the threads on the seat. Starting at the base of the valve with the threaded end pointing toward the installer, apply two clockwise turns of sealing tape.
2. Tighten the drain/vent valve to 250 in.-lb. (28.25 N-m).
3. Take care to place the opening on the valve so that process fluid will drain toward the ground and away from human contact when the valve is opened.

Appendix A Specifications and reference data

Performance specifications	page 103
Functional specifications	page 108
Physical specifications	page 116
Dimensional Drawings	page 120
Ordering Information	page 131
Options	page 156
Spare parts	page 164

A.1 Performance specifications

This product data sheet covers both HART and fieldbus protocols unless specified.

A.1.1 Conformance to specification ($\pm 3\sigma$ (Sigma))

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

A.1.2 Reference accuracy⁽¹⁾

Models ⁽¹⁾	Standard	High Accuracy Option
3051CD, 3051CG Range 0 (CD)	±0.10% of span For spans less than 2:1, accuracy = ±0.05% of URL	
Range 1	±0.10% of span For spans less than 15:1, accuracy = $\pm \left[0.025 + 0.005 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$	
Ranges 2-5	±0.065% of span For spans less than 10:1, accuracy = $\pm \left[0.015 + 0.005 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$	Ranges 2-4 High Accuracy Option, P8 ±0.04% of span For spans less than 5:1, accuracy = $\pm \left[0.015 + 0.005 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$
3051T Ranges 1-4	±0.065% of span For spans less than 10:1, accuracy = $\pm \left[0.0075 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$	Ranges 1-4 High Accuracy Option, P8 ±0.04% of span For spans less than 5:1, accuracy = $\pm \left[0.0075 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$
Range 5	±0.075% of span	
3051CA Ranges 1-4	±0.065% of span For spans less than 10:1, accuracy = $\pm \left[0.0075 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$	Ranges 2-4 High Accuracy Option, P8 ±0.04% of span For spans less than 5:1, accuracy = $\pm \left[0.0075 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$
3051H/3051L All Ranges	±0.075% of span For spans less than 10:1, accuracy = $\pm \left[0.025 + 0.005 \left(\frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}$	

(1) Total performance is determined by performing a root sum square calculation on reference accuracy, ambient temperature effect, and line pressure effect errors. For FOUNDATION fieldbus transmitters, use calibrated range in place of span. For zero based spans, reference conditions, silicone oil fill, SST materials, Coplanar flange (3051C) or 1/2 in. - 18 NPT (3051T) process connections, digital trim values set to equal range points.

A.1.3 Total performance

For ±50 °F (28 °C) temperature changes, up to 1000 psi (6,9 MPa) line pressure (CD only), from 1:1 to 5:1 rangedown.		
Models	Total Performance	
3051C Ranges 2-5	±0.15% of span	
3051T Ranges 1-4	±0.15% of span	

A.1.4 Long term stability

Models	Long Term Stability
3051C Ranges 2-5	±0.125% of URL for 5 years ±50 °F (28 °C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
3051CD Low/Draft Range Ranges 0-1	±0.2% of URL for 1 year
3051T Ranges 1-4	±0.125% of URL for 5 years ±50 °F (28 °C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
Rosemount 3051H Ranges 2-3 Ranges 4-5	±0.1% of URL for 1 year ±0.2% of URL for 1 year

A.1.5 Dynamic performance

	4 - 20 mA (HART protocol) ⁽¹⁾	Fieldbus protocol ⁽³⁾	Typical HART Transmitter Response Time
Total Response Time ($T_d + T_c$) ⁽²⁾ :			
3051C, Ranges 2-5: Range 1: Range 0: 3051T: 3051H/L:	100 ms 255 ms 700 ms 100 ms Consult factory	152 ms 307 ms 752 ms 152 ms Consult factory	
Dead Time (T_d)	45 ms (nominal)	97 ms	
Update Rate	22 times per second	22 times per second	
<p>⁽¹⁾ Dead time and update rate apply to all models and ranges; analog output only ⁽²⁾ Nominal total response time at 75 °F (24 °C) reference conditions. ⁽³⁾ Transmitter fieldbus output only, segment macro-cycle not included.</p>			

A.1.6 Line pressure effect per 1000 psi (6,9 MPa)⁽¹⁾

Models ⁽¹⁾	Line Pressure Effect
3051CD	Zero Error ⁽²⁾
Range 0	±0.125% of URL/100 psi (6,89 bar)
Range 1	±0.25% of URL/1000 psi (68,9 bar)
Ranges 2-3	±0.05% of URL/1000 psi (68,9 bar) for line pressures from 0 to 2000 psi (0 to 13,7 MPa)
Range 0	Span Error ±0.15% of reading/100 psi (6,89 bar)
Range 1	±0.4% of reading/1000 psi (68,9 bar)
Ranges 2-3	±0.1% of reading/1000 psi (68,9 bar)

Models ⁽¹⁾	Line Pressure Effect
3051HD	Zero Error ⁽¹⁾ ±0.1% of URL/1000 psi (68,9 bar) for line pressures from 0 to 2000 psi (0 to 13,7 MPa)
All Ranges	
All Ranges	Span Error ±0.1% of reading/1000 psi (68,9 bar)

(1) For zero error specifications for line pressures above 2000 psi (137,9 bar) or line pressure effect specifications for DP Ranges 4-5, see "Compensating for Line Pressure" on page 13.

(2) Can be calibrated out at line pressure.

A.1.7 Ambient temperature effect per 50 °F (28 °C)

Models	Ambient Temperature Effect
3051CD/CG	Range 0 ±(0.25% URL + 0.05% span)
	Range 1 ±(0.1% URL + 0.25% span)
	Ranges 2-5 ±(0.0125% URL + 0.0625% span) from 1:1 to 5:1 ±(0.025% URL + 0.125% span) from 5:1 to 100:1
3051T	Range 1 ±(0.025% URL + 0.125% span) from 1:1 to 10:1 ±(0.05% URL + 0.125% span) from 10:1 to 100:1
	Range 2-4 ±(0.025% URL + 0.125% span) from 1:1 to 30:1 ±(0.035% URL + 0.125% span) from 30:1 to 100:1
	Range 5 ±(0.1% URL + 0.15% span)
3051CA	All Ranges ±(0.025% URL + 0.125% span) from 1:1 to 30:1
	±(0.035% URL + 0.125% span) from 30:1 to 100:1
3051H	All Ranges ±(0.025% URL + 0.125% span + 0.35 inH ₂ O) from 1:1 to 30:1
	±(0.035% URL + 0.125% span + 0.35 inH ₂ O) from 1:1 to 30:1
3051L	See Rosemount Inc. Instrument Toolkit [®] software.

A.1.8 Mounting position effects

Models	Mounting Position Effects
3051C	Zero shifts up to ±1.25 inH ₂ O (3,11 mbar), which can be calibrated out. No span effect.
3051H	Zero shifts up to ±5 inH ₂ O (12,43 mbar), which can be calibrated out. No span effect.
3051L	With liquid level diaphragm in vertical plane, zero shift of up to 1 inH ₂ O (2,49 mbar). With diaphragm in horizontal plane, zero shift of up to 5 inH ₂ O (12,43 mbar) plus extension length on extended units. All zero shifts can be calibrated out. No span effect.
3051T/CA	Zero shifts up to 2.5 inH ₂ O (6,22 mbar), which can be calibrated out. No span effect.

A.1.9 Vibration effect

Less than ±0.1% of URL when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21 mm displacement peak amplitude / 60-2000 Hz 3g).

A.1.10 Power supply effect

Less than $\pm 0.005\%$ of calibrated span per volt.

A.1.11 Electromagnetic compatibility (EMC)

Meets all relevant requirements of EN 61326 and NAMUR NE-21.

A.1.12 Transient protection (option code T1)

Meets IEEE C62.41, Category Location B

6 kV crest (0.5 μ s - 100 kHz)

3 kV crest (8 \times 20 microseconds)

6 kV crest (1.2 \times 50 microseconds)

A.2 Functional specifications

A.2.1 Range and sensor limits

Table A-1. 3051CD, 3051CG, 3051L, and 3051H range and sensor limits

Range	Minimum span	
	3051CD ⁽¹⁾ , CG, L, H	Upper (URL)
0	0.1 inH2O (0,25 mbar)	3.0 inH2O(7,47 mbar)
1	0.5 inH2O (1,2 mbar)	25 inH2O(62,3 mbar)
2	2.5 inH2O (6,2 mbar)	250 inH2O (0,62 bar)
3	10 inH2O (24,9 mbar)	1000 inH2O (2,49 bar)
4	3 psi (0,20 bar)	300 psi (20,6 bar)
5	20 psi (1,38 bar)	2000 psi (137,9 bar)

(1) Range 0 only available with 3051CD. Range 1 only available with 3051CD or 3051CG.

Table A-2. 3051CD, 3051CG, 3051L, and 3051H range and sensor limits (cont.)

Range	Range and sensor limits					
	Lower (LRL)					
	3051C differential	3051C/ gage	3051L differential	3051L gage	3051H differential	3051H gage
0	-3.0 inH2O (-7,47 mbar)	NA	NA	NA	NA	NA
1	-25 inH2O (-62,1 mbar)	-25 inH2O (-62,1 mbar)	NA	NA	NA	NA
2	-250 inH2O (-0,62 bar)	-250 inH2O (-0,62 bar)	-250 inH2O (-0,62 bar)	-250 inH2O (-0,62 bar)	-250 inH2O (-0,62 bar)	-250 inH2O (-0,62 bar)
3	-1000 inH2O (-2,49 bar)	0.5 psia (34,5 mbar abs)	-1000 inH2O (-2,49 bar)	0.5 psia (34,5 mbar abs)	-1000 inH2O (-2,49 bar)	0.5 psia (34,5 mbar abs)
4	-300 psi (-20,6 bar)	0.5 psia (34,5 mbar abs)	-300 psi (-20,6 bar)	0.5 psia (34,5 mbar abs)	-300 psi (-20,6 bar)	0.5 psia (34,5 mbar abs)
5	-2000 psi (-137,9 bar)	0.5 psia (34,5 mbar abs)	NA	NA	-2000 psi (-137,9 bar)	0.5 psia (34,5 mbar abs)

Table A-3. Range and sensor limits

3051CA				Range	3051T			
Range	Minimum span	Range and sensor limits			Minimum span	Range and sensor limits		Lower ⁽¹⁾ (LRL) (Gage)
		Upper (URL)	Lower (LRL)			Upper (URL)	Lower (LRL)	
1	0.3 psia (20,6 mbar)	30 psia (2,07 bar)	0 psia (0 bar)	1	0.3 psi (20,6 mbar)	30 psi (2,07 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
2	1.5 psia (0,103 bar)	150 psia (10,3 bar)	0 psia (0 bar)	2	1.5 psi (0,103 bar)	150 psi (10,3 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
3	8 psia (0,55 bar)	800 psia (55,2 bar)	0 psia (0 bar)	3	8 psi (0,55 bar)	800 psi (55,2 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
4	40 psia (2,76 bar)	4000 psia (275,8 bar)	0 psia (0 bar)	4	40 psi (2,76 bar)	4000 psi (275,8 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)
				5	2000 psi (137,9 bar)	10000 psi (689,4 bar)	0 psia (0 bar)	-14.7 psig (-1,01 bar)

(1) Assumes atmospheric pressure of 14.7 psig.

A.2.2 Zero and Span Adjustment Requirements (HART and Low Power)

Zero and span values can be set anywhere within the range limits stated in Table A-1, Table A-2, and Table A-3.

Span must be greater than or equal to the minimum span stated in Table A-1, Table A-2, and Table A-3.

A.2.3 Service

Liquid, gas, and vapor applications

A.2.4 4–20 mA (Output Code A)

Output

Two-wire 4–20 mA, user-selectable for linear or square root output. Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the *HART* protocol.

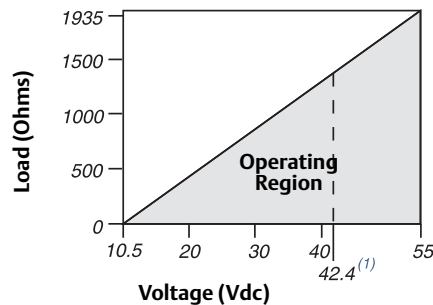
Power Supply

External power supply required. Standard transmitter (4–20 mA) operates on 10.5 to 55 Vdc with no load.

Load Limitations

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

$$\text{Max. Loop Resistance} = 43.5 (\text{Power Supply Voltage} - 10.5)$$



Communication requires a minimum loop resistance of 250 ohms.

(1) For CSA approval, power supply must not exceed 42.4 V.

A.2.5 FOUNDATION fieldbus (output code F) and Profibus (output code W)

Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 Vdc transmitter terminal voltage.

Current Draw

17.5 mA for all configurations (including LCD display option)

A.2.6 FOUNDATION fieldbus function block execution times

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	30 milliseconds
PID	45 milliseconds
Input Selector	30 milliseconds
Arithmetic	35 milliseconds
Signal Characterizer	40 milliseconds
Integrator	35 milliseconds

A.2.7 FOUNDATION fieldbus Parameters

Schedule Entries	7 (max.)
Links	20 (max.)
Virtual Communications Relationships (VCR)	12 (max.)

A.2.8 Standard Function Blocks

Resource Block

Contains hardware, electronics, and diagnostic information.

Transducer Block

Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

LCD Block

Configures the local display.

2 Analog Input Blocks

Processes the measurements for input into other function blocks. The output value is in engineering units or custom and contains a status indicating measurement quality.

PID Block

Contains all logic to perform PID control in the field including cascade and feedforward.

A.2.9 Backup Link Active Scheduler (LAS)

The transmitter can function as a Link Active Scheduler if the current link master device fails or is removed from the segment.

A.2.10 Advanced control function block suite (Option Code A01)

Input Selector Block

Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average or first “good.”

Arithmetic Block

Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal Characterizer Block

Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

Integrator Block

Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

A.2.11 FOUNDATION fieldbus Diagnostics Suite (Option Code D01)

The 3051C FOUNDATION fieldbus Diagnostics provide Abnormal Situation Prevention (ASP) indication. The integral statistical process monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second. The 3051C ASP algorithm uses these values and highly flexible configuration options for customization to many user-defined or application specific abnormal situations. The detection of plugged impulse lines is the first available predefined application.

A.2.12 Low Power (output code M)

Output

Three wire 1–5 Vdc or 0.8–3.2 Vdc (Option Code C2) user-selectable output. Also user selectable for linear or square root output configuration. Digital process variable superimposed on voltage signal, available to any host conforming to the HART protocol. Low-power transmitter operates on 6–14 Vdc with no load.

Power Consumption

3.0 mA, 18–36 mW

Minimum Load Impedance

100 k Ω (V_{out} wiring)

Indication

Optional 5-digit LCD display

Overpressure Limits

Rosemount 3051CD/CG

- Range 0: 750 psi (51,7 bar)
- Range 1: 2000 psig (137,9 bar)
- Ranges 2–5: 3626 psig (250 bar)
4500 psig (310,3 bar) for option code P9

Rosemount 3051CA

- Range 1: 750 psia (51,7 bar)
- Range 2: 1500 psia (103,4 bar)
- Range 3: 1600 psia (110,3 bar)
- Range 4: 6000 psia (413,7 bar)

Rosemount 3051H

- All Ranges: 3626 psig (25 MPa)

Rosemount 3051TG/TA

- Range 1: 750 psi (51,7 bar)
- Range 2: 1500 psi (103,4 bar)
- Range 3: 1600 psi (110,3 bar)
- Range 4: 6000 psi (413,7 bar)
- Range 5: 15000 psi (1034,2 bar)

For 3051L or Level Flange Option Codes FA, FB, FC, FD, FP, and FQ, limit is 0 psia to the flange rating or sensor rating, whichever is lower.

Table A-4. 3051L and level flange rating limits

Standard	Type	CS rating	SST rating
ANSI/ASME	Class 150	285 psig	275 psig
ANSI/ASME	Class 300	740 psig	720 psig
ANSI/ASME	Class 600	1480 psig	1440 psig
<i>At 100 °F (38 °C), the rating decreases with increasing temperature.</i>			
DIN	PN 10–40	40 bar	40 bar
DIN	PN 10/16	16 bar	16 bar
DIN	PN 25/40	40 bar	40 bar
<i>At 248 °F (120 °C), the rating decreases with increasing temperature.</i>			

A.2.13 Static Pressure Limit

Rosemount 3051CD Only

Operates within specifications between static line pressures of 0.5 psia and 3626 psig (4500 psig (310, 3 bar) for Option Code P9).

Range 0: 0.5 psia and 750 psig (3, 4 bar and 51, 7 bar)

Range 1: 0.5 psia and 2000 psig (3, 4 bar and 137, 9 bar)

A.2.14 Burst Pressure Limits

Burst pressure on Coplanar, traditional, or 3051H process flange is 10000 psig (69 MPa).

Burst pressure for the 3051T is:

Ranges 1–4: 11000 psi (75,8 MPa)

Range 5: 26000 psig (179 MPa)

A.2.15 Failure Mode Alarm

Output Code A

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 3.75 mA or to 21.75 mA to alert the user. NAMUR-compliant values are available, option code C4. High or low alarm signal is user-selectable by internal jumper.

Output Code M

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 0.94 V or above 5.4 V to alert the user (below 0.75 V or above 4.4 V for Option C2). High or low alarm signal is user-selectable by internal jumper.

Output Code F and W

If self-diagnostics detect a gross transmitter failure, that information gets passed as a status along with the process variable.

A.2.16 Temperature Limits

Ambient

–40 to 185 °F (–40 to 85 °C)

With LCD display⁽¹⁾: –40 to 175 °F (–40 to 80 °C)

Storage

–50 to 230 °F (–46 to 110 °C)

With LCD display: –40 to 185 °F (–40 to 85 °C)

Process

At atmospheric pressures and above. See [Table A-5](#)

(1) LCD display may not be readable and LCD updates will be slower at temperatures below –4 °F (–20 °C).

Table A-5. 3051 process temperature limits

3051CD, 3051CG, 3051CA	
Silicone Fill Sensor ⁽¹⁾	
with Coplanar Flange	–40 to 250 °F (–40 to 121 °C) ⁽²⁾
with Traditional Flange	–40 to 300 °F (–40 to 149 °C) ⁽²⁾⁽³⁾
with Level Flange	–40 to 300 °F (–40 to 149 °C) ⁽²⁾
with 305 Integral Manifold	–40 to 300 °F (–40 to 149 °C) ⁽²⁾
Inert Fill Sensor ⁽¹⁾	–40 to 185 °F (–40 to 85 °C) ⁽⁴⁾⁽⁵⁾
3051H (process fill fluid)	
D.C.® Silicone 200 ⁽¹⁾	–40 to 375 °F (–40 to 191 °C)
Inert ⁽¹⁾	–50 to 350 °F (–45 to 177 °C)
Neobee M-20® ⁽¹⁾	0 to 375 °F (–18 to 191 °C)
3051T (process fill fluid)	
Silicone Fill Sensor ⁽¹⁾	–40 to 250 °F (–40 to 121 °C) ⁽²⁾
Inert Fill Sensor ⁽¹⁾	–22 to 250 °F (–30 to 121 °C) ⁽²⁾
3051L low-side temperature limits	
Silicone Fill Sensor ⁽¹⁾	–40 to 250 °F (–40 to 121 °C) ⁽²⁾
Inert Fill Sensor ⁽¹⁾	0 to 185 °F (–18 to 85 °C) ⁽²⁾

3051L high-side temperature limits (process fill fluid)	
Syltherm® XLT	-100 to 300 °F (-73 to 149 °C)
D.C. Silicone 704®	32 to 400 °F (0 to 205 °C)
D.C. Silicone 200	-40 to 400 °F (-40 to 205 °C)
Inert	-50 to 350 °F (-45 to 177 °C)
Glycerin and Water	0 to 200 °F (-18 to 93 °C)
Neobee M-20	0 to 400 °F (-18 to 205 °C)
Propylene Glycol and Water	0 to 200 °F (-18 to 93 °C)

- (1) Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio (0.6:1 ratio for the 3051H).
 (2) 220 °F (104 °C) limit in vacuum service; 130 °F (54 °C) for pressures below 0.5 psia.
 (3) 3051CD0 process temperature limits are -40 to 212 °F (-45 to 100 °C)
 (4) 160 °F (71 °C) limit in vacuum service.
 (5) Not available for 3051CA.

Humidity Limits

0–100% relative humidity

Turn-On Time

Performance within specifications less than 2.0 seconds (10.0 s for Profibus protocol) after power is applied to the transmitter

Volumetric Displacement

Less than 0.005 in³ (0,08 cm³)

Damping

Analog output response to a step input change is user-selectable from 0 to 36 seconds for one time constant. This software damping is in addition to sensor module response time.

A.3 Physical specifications

A.3.1 Electrical Connections

1/2–14 NPT, G¹/2, and M20 × 1.5 (CM20) conduit. HART interface connections fixed to terminal block.

A.3.2 Process Connections

All Models except 3051L and 3051T

1/4–18 NPT on 2¹/8-in. centers

1/2–14 NPT on 2-, 2¹/8-, or 2¹/4-in. centers

Rosemount 3051L

High pressure side: 2-, 3-, or 4-in., ASME B 16.5 (ANSI) Class 150, 300 or 600 flange; 50, 80 or 100 mm, PN 40 or 10/16 flange

Low pressure side: 1/4-18 NPT on flange 1/2-14 NPT on adapter

Rosemount 3051T

1/2-14 NPT female. A DIN 16288 Male (available in SST for Range 1-4 transmitters only), or Autoclave type F-250-C (Pressure relieved 9/16-18 gland thread; 1/4 OD high pressure tube 60° cone; available in SST for Range 5 transmitters only).

A.3.3 Process-Wetted Parts

Drain/Vent Valves

316 SST, Alloy C-276, or Alloy 400/K-500⁽¹⁾ material
(Drain vent seat: Alloy 400, Drain vent stem: Alloy K-500)

(1) Alloy 400/K-500 is not available with 3051L or 3051H.

Process Flanges and Adapters

Plated carbon steel
SST: CF-8M (Cast 316 SST) per ASTM A743
Cast C-276: CW-12MW per ASTM A494
Cast Alloy 400: M-30C per ASTM A494

Wetted O-rings

Glass-filled PTFE or Graphite-filled PTFE

Process Isolating Diaphragms

Isolating diaphragm material	3051CD/CG	3051T	3051CA	3051H
316L SST	•	•	•	•
Alloy C-276	•	•	•	•
Alloy 400	•		•	
Tantalum	•			•
Gold-plated Alloy 400	•		•	
Gold-plated SST	•		•	

A.3.4 Rosemount 3051L Process Wetted Parts

Flanged Process Connection (Transmitter High Side)

Process Diaphragms, Including Process Gasket Surface

- 316L SST, Alloy C-276, or Tantalum
- Extension
- CF-3M (Cast version of 316L SST, material per ASTM-A743), or Alloy C-276. Fits schedule 40 and 80 pipe.
- Mounting Flange
- Zinc-cobalt plated CS or SST

Reference Process Connection (Transmitter Low Side)

Isolating Diaphragms

- 316L SST or Alloy C-276

Reference Flange and Adapter

- CF-8M (Cast version of 316 SST, material per ASTM-A743)

A.3.5 Non-Wetted Parts

Electronics Housing

Low copper aluminum or SST: CF-3M or CF-8M (Cast version of 316L or 316 SST, material per ASTM-A743). NEMA 4X, IP 65, IP 66

Coplanar Sensor Module Housing

CF-3M (Cast version of 316L SST, material per ASTM-A743)

Bolts

ASTM A449, Type 1 (zinc-cobalt plated carbon steel)
ASTM F593G, Condition CW1 (Austenitic 316 SST)
ASTM A193, Grade B7M (zinc plated alloy steel)
Alloy 400

Sensor Module Fill Fluid

Silicone oil (D.C. 200) or Fluorocarbon oil (Halocarbon or Fluorinert® FC-43 for 3051T)

Process Fill Fluid (3051L and 3051H only)

3051L: Syltherm XLT, D.C. Silicone 704,
D.C. Silicone 200, inert, glycerin and water, Neobee M-20 or propylene glycol and water

3051H: inert, Neobee M-20, or D.C. Silicone 200

Paint

Polyurethane

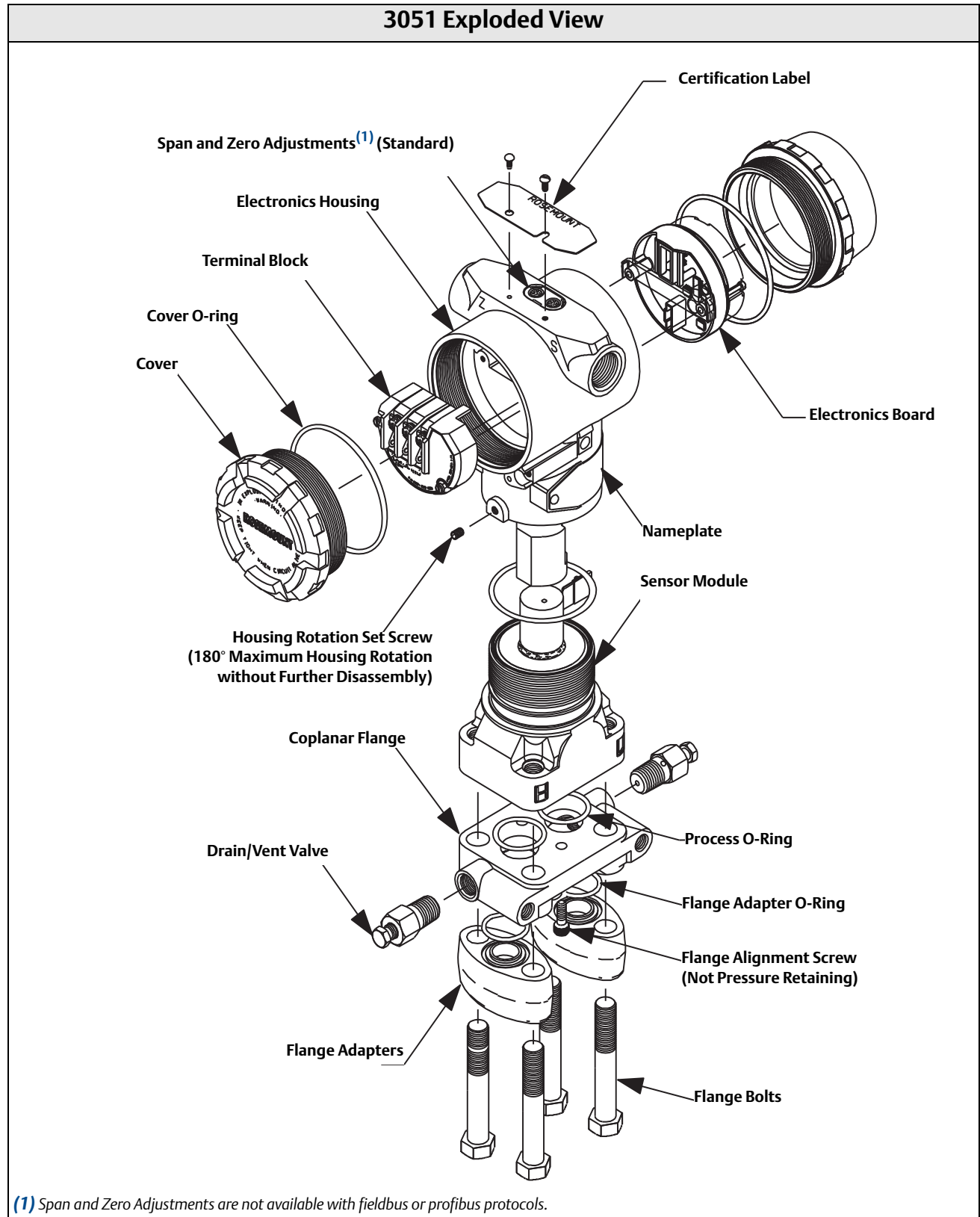
Cover O-rings

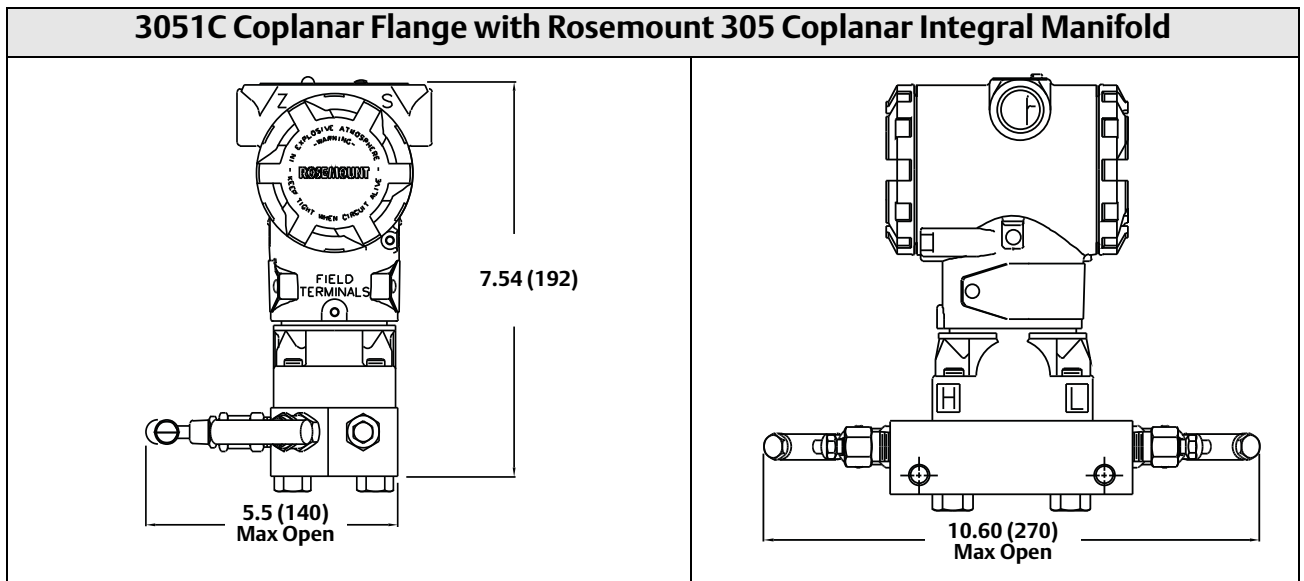
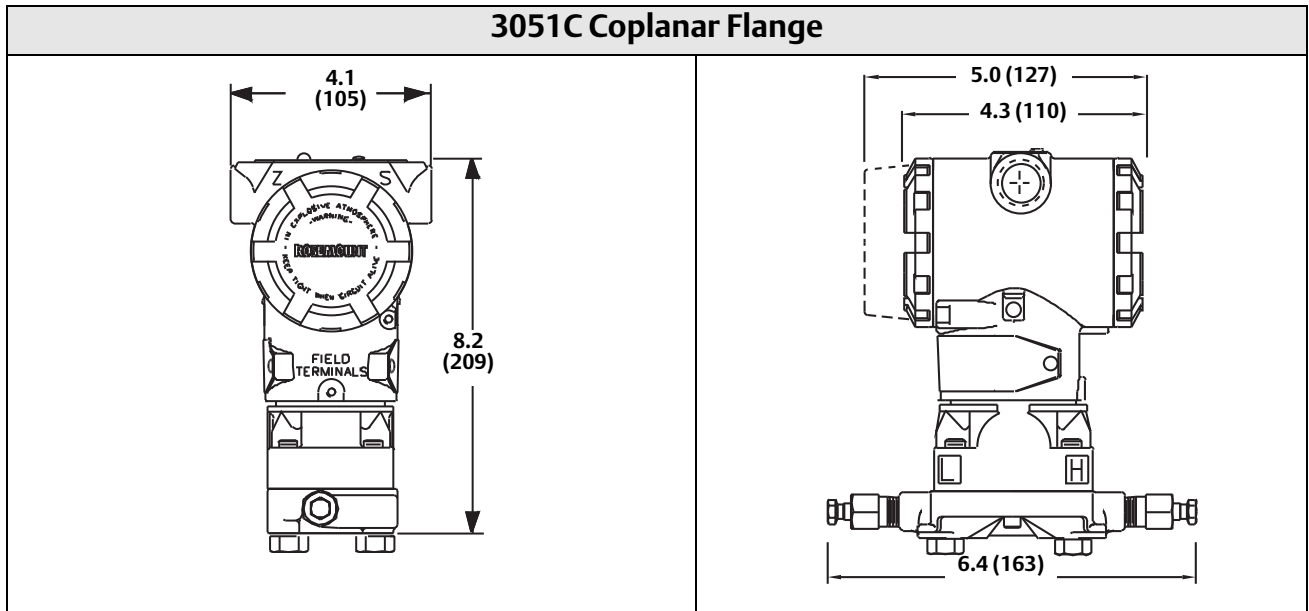
Buna-N

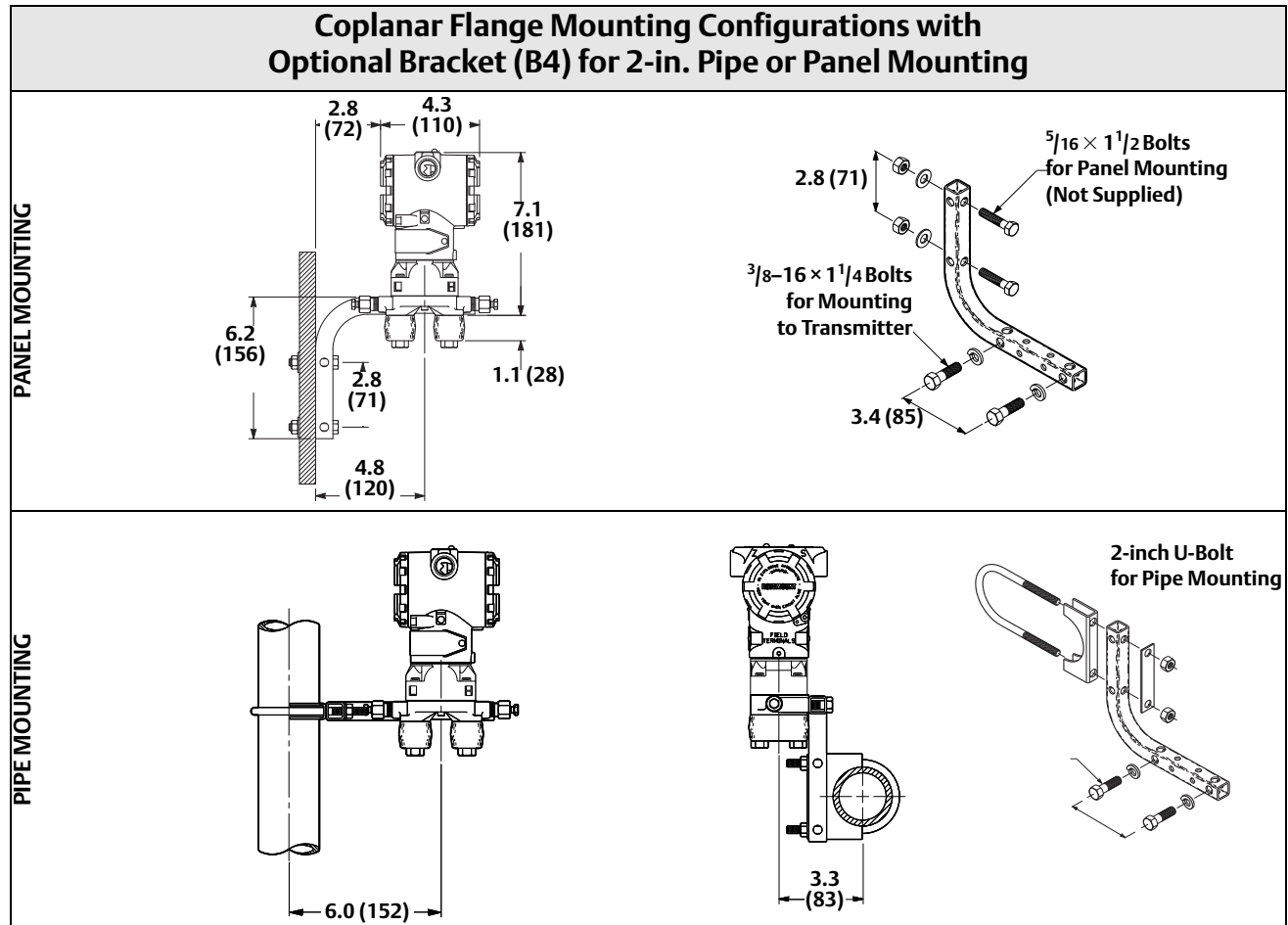
A.3.6 Shipping Weights

Refer to “Shipping weights” on page 159.

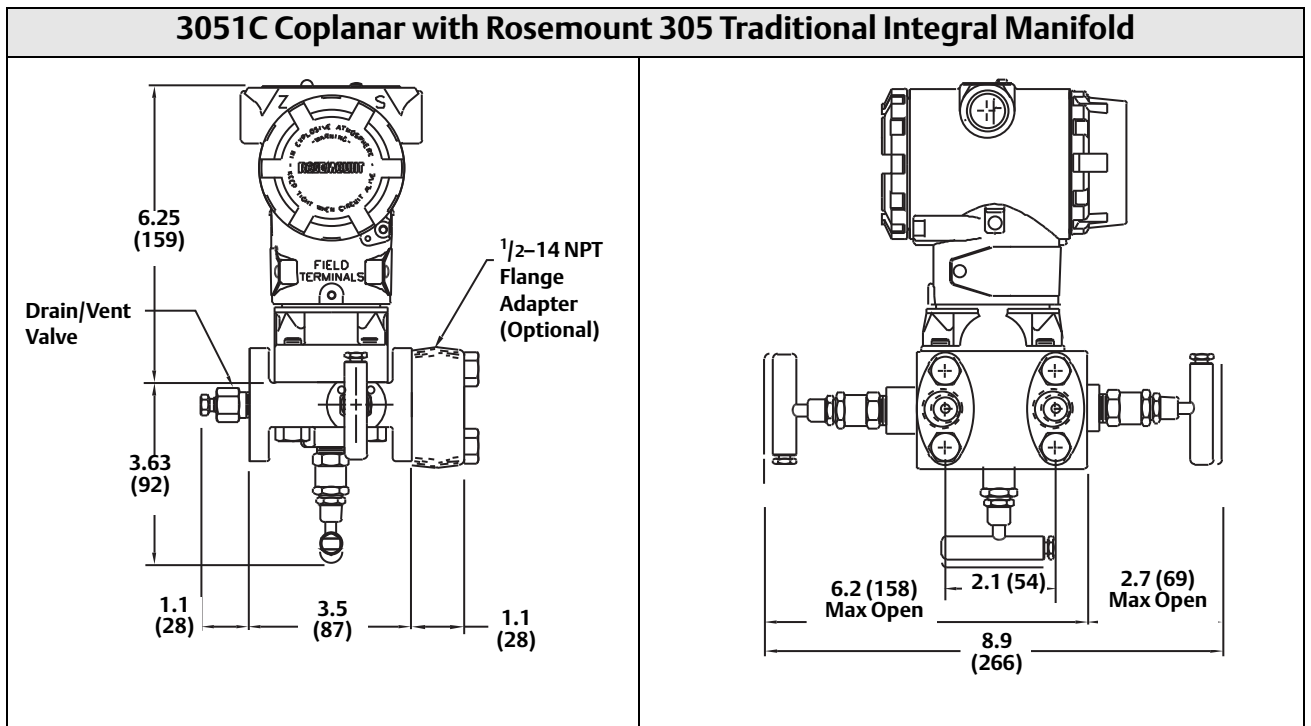
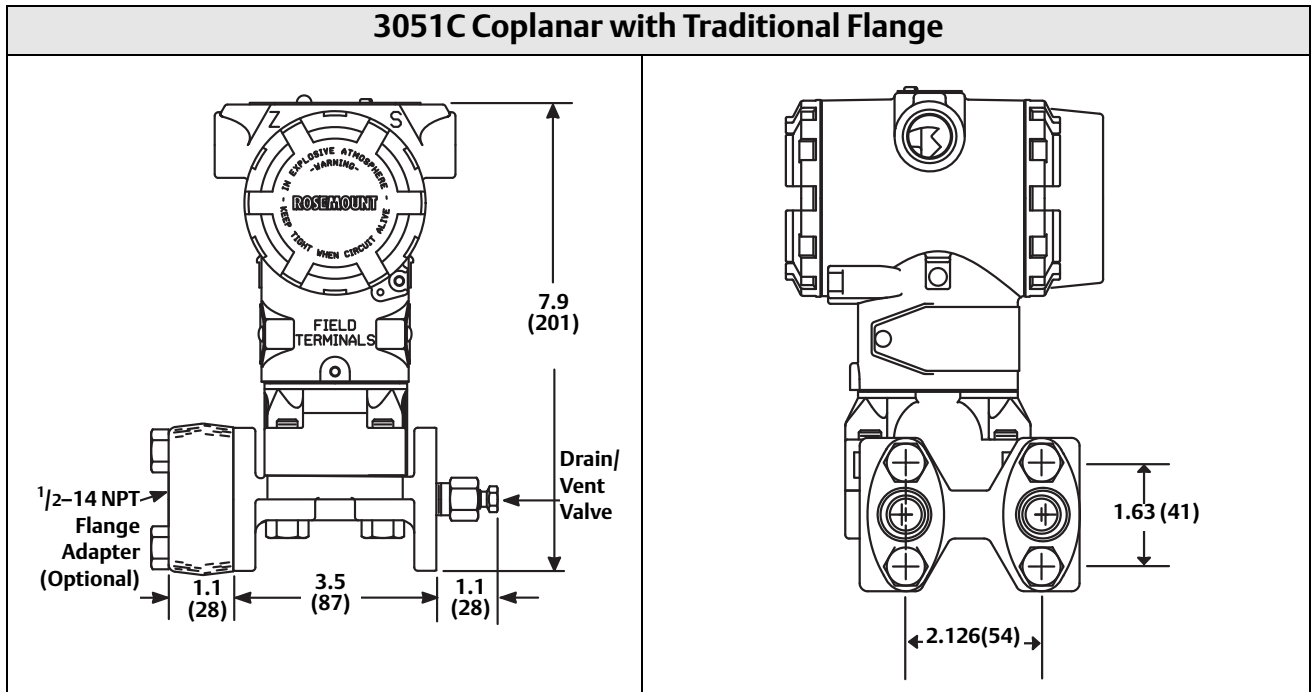
A.4 Dimensional Drawings

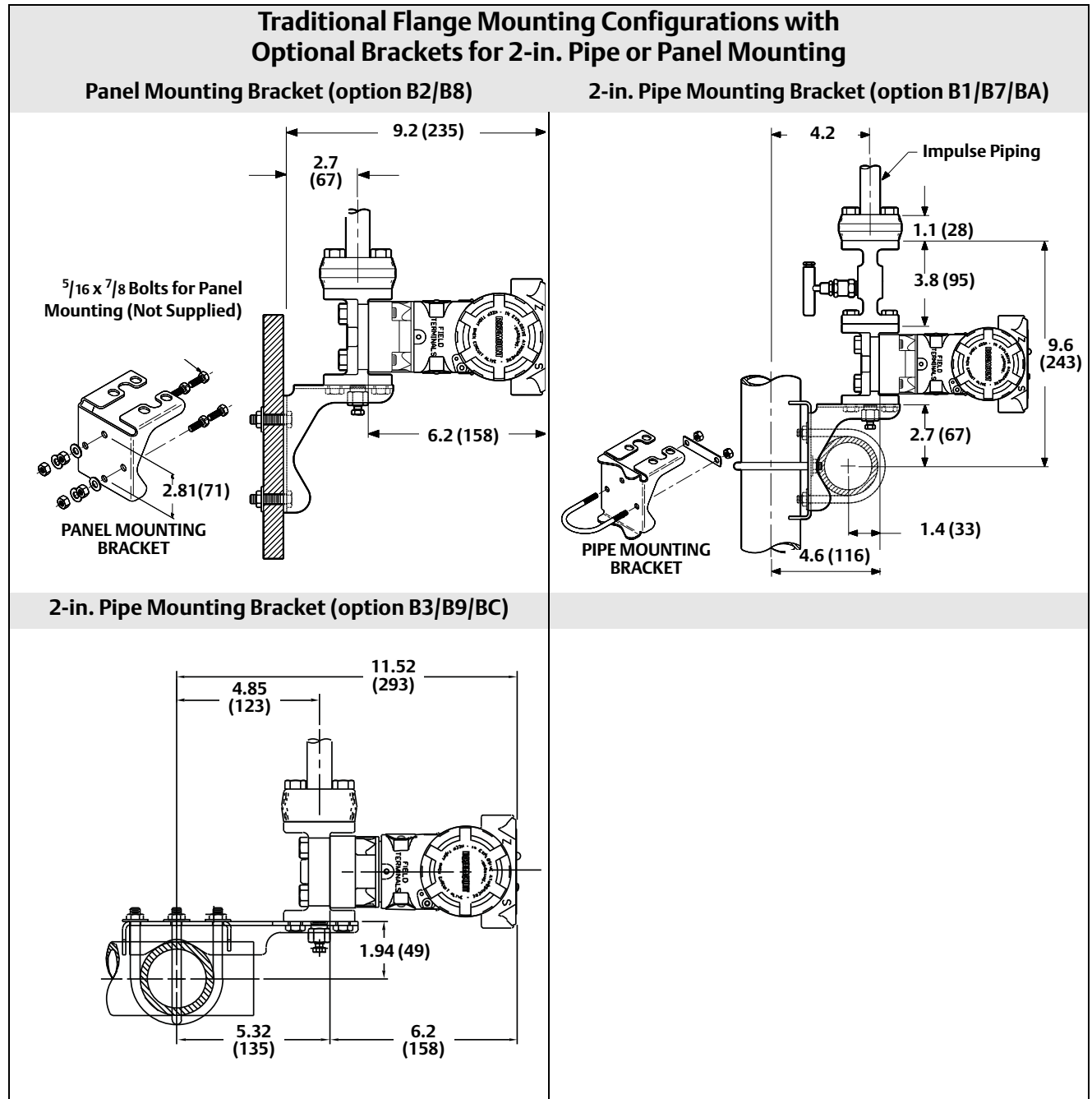


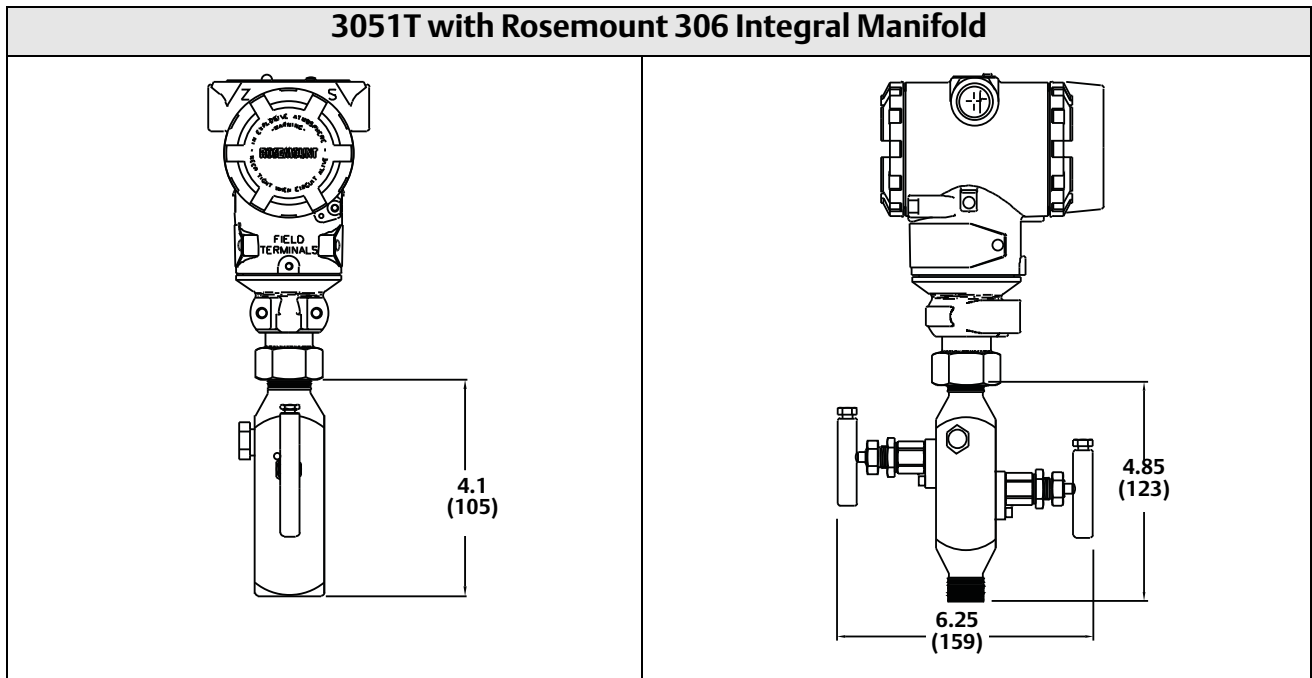
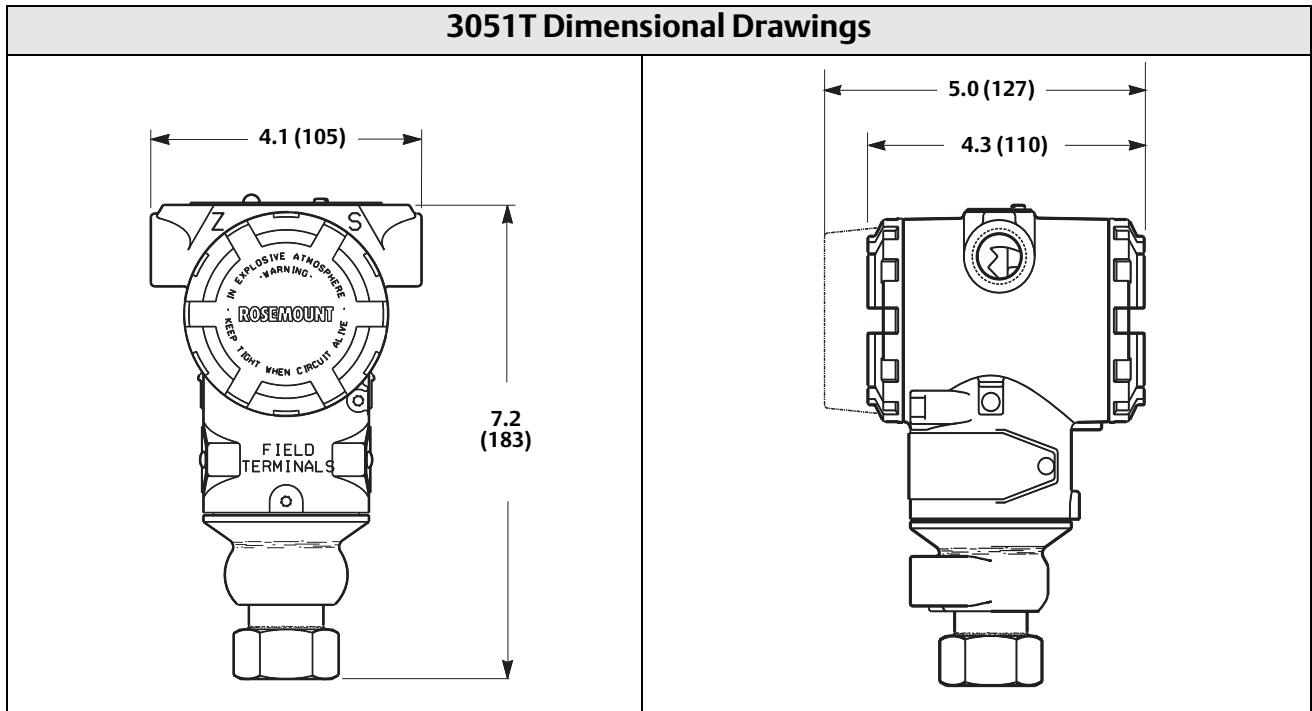


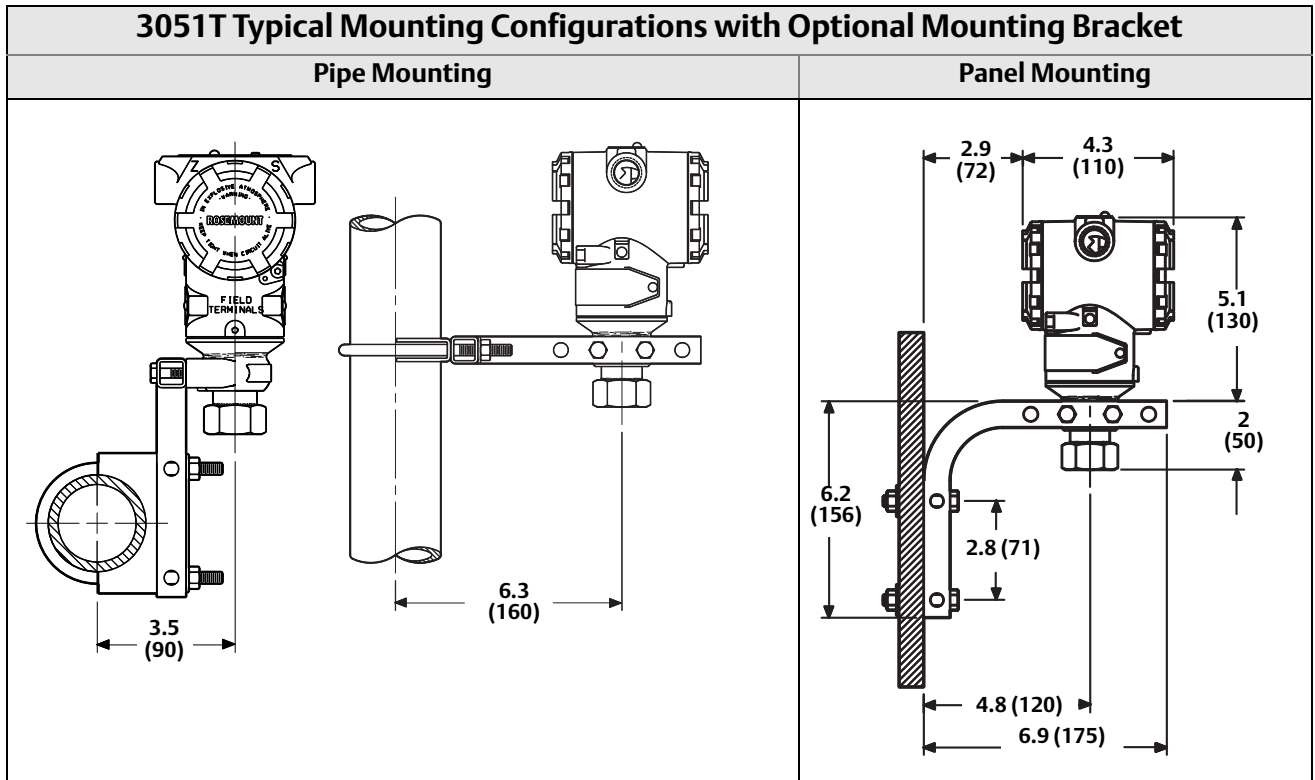


Dimensions are in inches (millimeters)

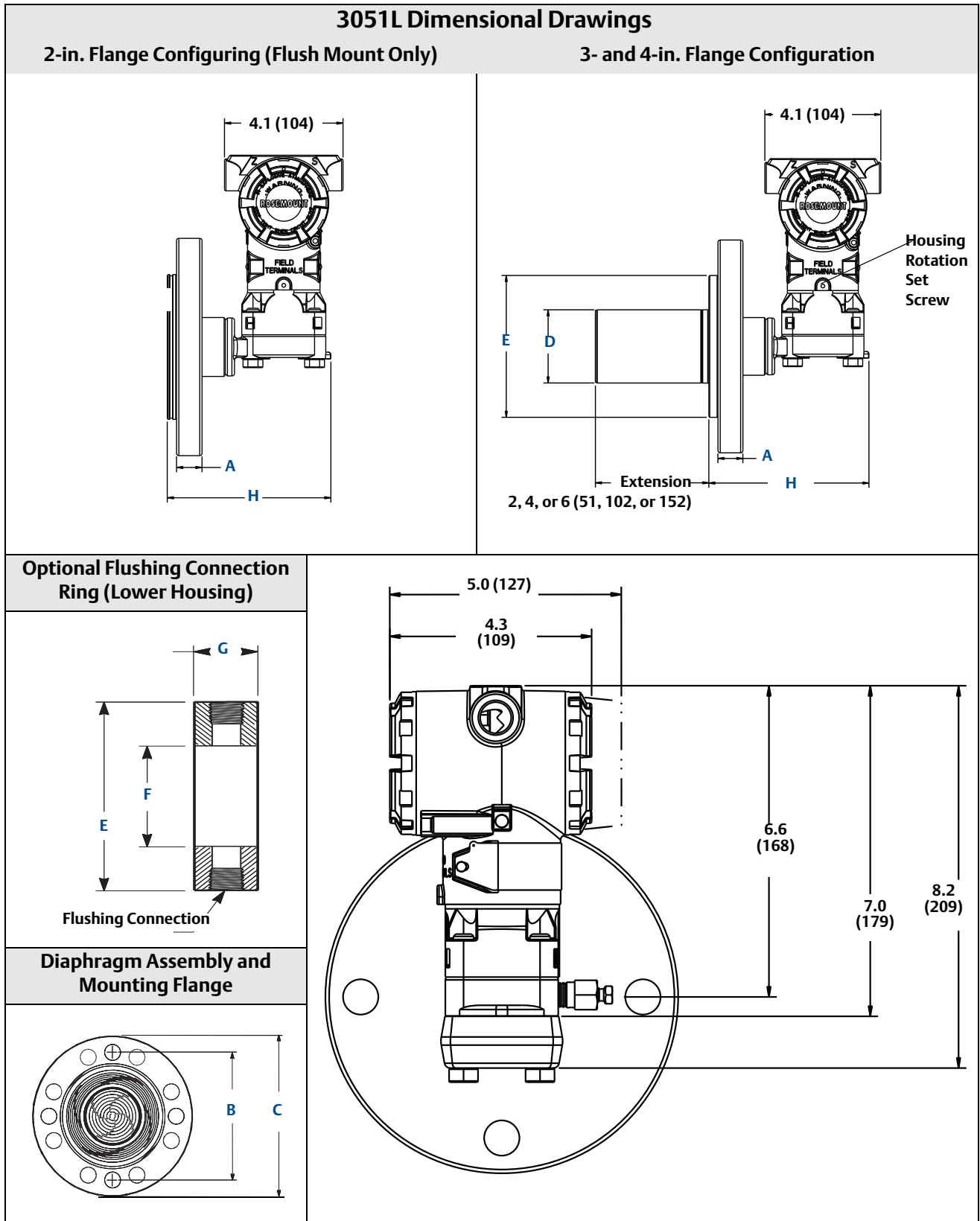








Dimensions are in inches (millimeters)



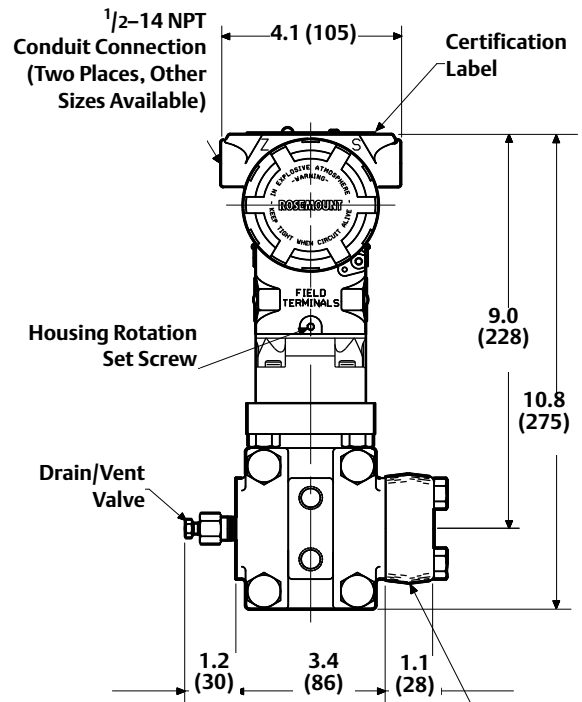
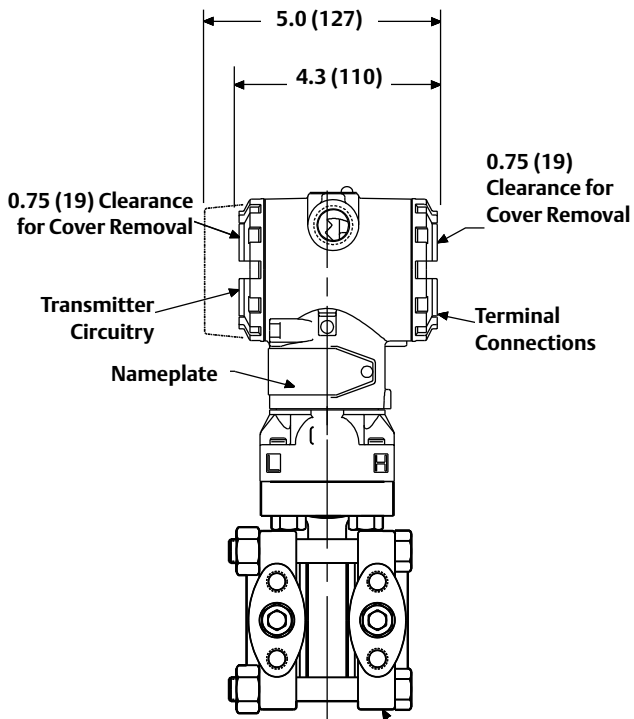
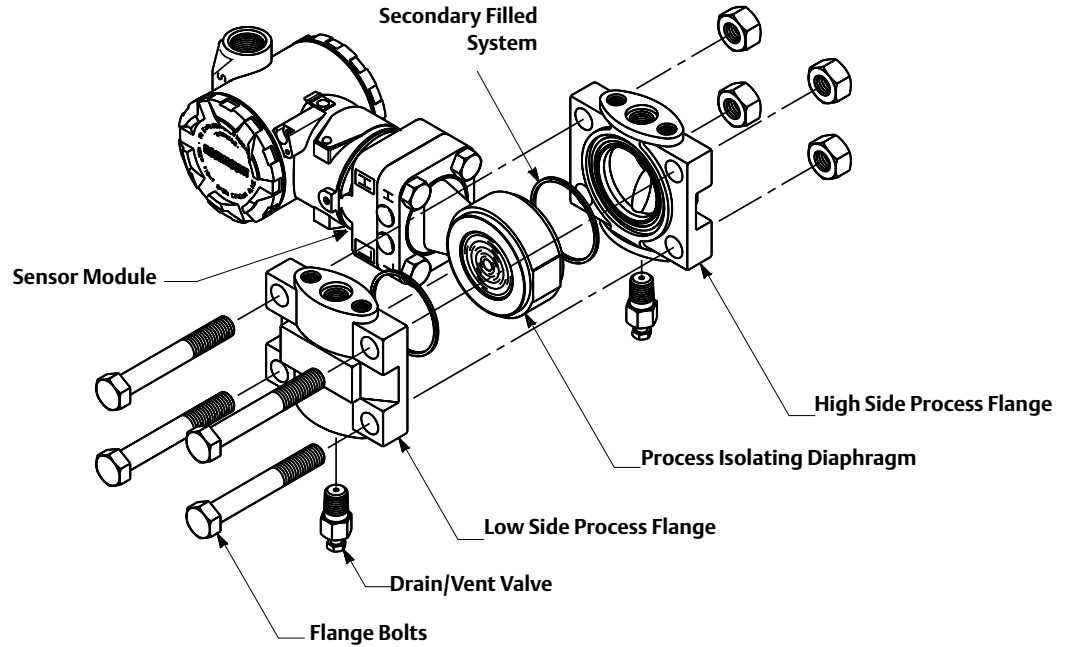
Dimensions are in inches (millimeters)

Class	Pipe size	Flange thickness A	Bolt circle diameter B	Outside diameter C	No. of bolts	Bolt hole diameter	Extension diameter ⁽¹⁾ D	O.D. gasket surface E
ASME B16.5 (ANSI) 150	2 (51)	0.69 (18)	4.75 (121)	6.0 (152)	4	0.75 (19)	NA	3.6 (92)
	3 (76)	0.88 (22)	6.0 (152)	7.5 (191)	4	0.75 (19)	2.58 (66)	5.0 (127)
	4 (102)	0.88 (22)	7.5 (191)	9.0 (229)	8	0.75 (19)	3.5 (89)	6.2 (158)
ASME B16.5 (ANSI) 300	2 (51)	0.82 (21)	5.0 (127)	6.5 (165)	8	0.75 (19)	NA	3.6 (92)
	3 (76)	1.06 (27)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)
	4 (102)	1.19 (30)	7.88 (200)	10.0 (254)	8	0.88 (22)	3.5 (89)	6.2 (158)
ASME B16.5 (ANSI) 600	2 (51)	1.00 (25)	5.0 (127)	6.5 (165)	8	0.75 (19)	NA	3.6 (92)
	3 (76)	1.25 (32)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)
DIN 2501 PN 10-40	DN 50	20 mm	125 mm	165 mm	4	18 mm	NA	4.0 (102)
DIN 2501 PN 25/40	DN 80	24 mm	160 mm	200 mm	8	18 mm	66 mm	5.4 (138)
	DN 100	24 mm	190 mm	235 mm	8	22 mm	89 mm	6.2 (158)
DIN 2501 PN 10/16	DN 100	20 mm	180 mm	220 mm	8	18 mm	89 mm	6.2 (158)

Class	Pipe size	Process side F	Lower housing G		H
			1/4 NPT	1/2 NPT	
ASME B16.5 (ANSI) 150	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	5.65 (143)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	4 (102)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
ASME B16.5 (ANSI) 300	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	5.65 (143)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	4 (102)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
ASME B16.5 (ANSI) 600	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	7.65 (194)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	7.65 (194)
DIN 2501 PN 10-40	DN 50	2.4 (61)	0.97 (25)	1.31 (33)	5.65 (143)
DIN 2501 PN 25/40	DN 80	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	DN 100	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
DIN 2501 PN 10/16	DN 100	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)

(1) Tolerances are 0.040 (1,02), -0.020 (0,51).

3051H Pressure Transmitter Exploded View and Dimensional Drawings

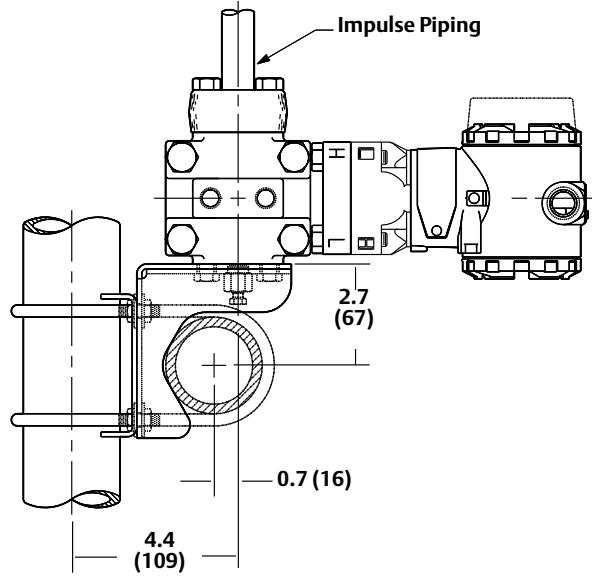
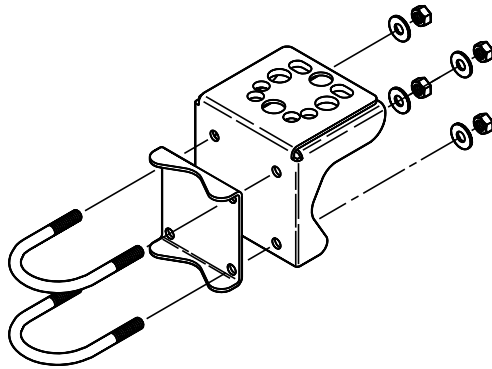


1/2-14 NPT on Optional Mounting Adapters. Adapters Can Be Rotated to Give Adapter Connection Centers of 2.00 (51), 2.126 (54), or 2.25 (57).

Dimensions are in inches (millimeters)

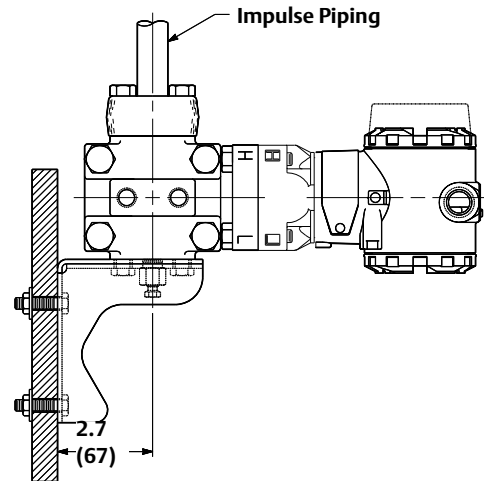
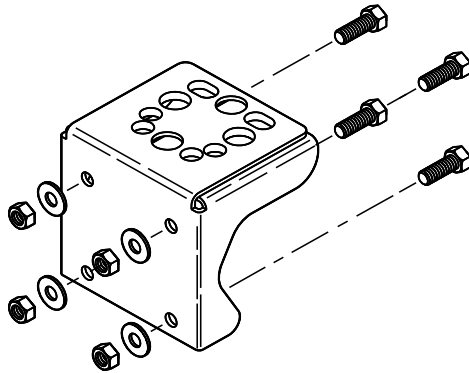
3051H Mounting Brackets for 2-in. Pipe and Panel Mount (Option Code B5/B6)

PIPE MOUNTING CONFIGURATION



PANEL MOUNTING CONFIGURATION

$\frac{7}{16}$ - $20 \times \frac{3}{4}$ Bolts Supplied for
Attaching Bracket to Transmitter



Dimensions are in inches (millimeters)

A.5 Ordering Information

Model	Transmitter Type			
3051C	Coplanar Pressure Transmitter			
Measurement Type				
Standard				Standard
D	Differential			★
G	Gage			★
Expanded				
A	Absolute			
Pressure Ranges (Range/Min. Span)				
	3051CD	3051CG ⁽¹⁾	3051CA	
Standard				Standard
1	-25 to 25 inH ₂ O/0.5 inH ₂ O (-62,2 to 62,2 mbar/1,2 mbar)	-25 to 25 inH ₂ O/0.5 inH ₂ O (-62,1 to 62,2 mbar/1,2 mbar)	0 to 30 psia/0.3 psia (0 to 2,1 bar/20,7 mbar)	★
2	-250 to 250 inH ₂ O/2.5 inH ₂ O (-623 to 623 mbar/6,2 mbar)	-250 to 250 inH ₂ O/2.5 inH ₂ O (-621 to 623 mbar/6,2 mbar)	0 to 150 psia/1.5 psia (0 to 10,3 bar/0,1 bar)	★
3	-1000 to 1000 inH ₂ O/10 inH ₂ O (-2,5 to 2,5 bar/25 mbar)	-393 to 1000 inH ₂ O/10 inH ₂ O (-0,98 to 2,5 bar/25 mbar)	0 to 800 psia/8 psia (0 to 55,2 bar/0,55 bar)	★
4	-300 to 300 psi/3 psi (-20,7 to 20,7 bar/0,2 bar)	-14.2 to 300 psi/3 psi (-0,98 to 20,7 bar/0,2 bar)	0 to 4000 psia/40 psia (0 to 275,8 bar/2,8 bar)	★
5	-2000 to 2000 psi/20 psi (-137,9 to 137,9 bar/1,4 bar)	-14.2 to 2000 psig/20 psi (-0,98 to 137,9 bar/1,4 bar)	Not Applicable	★
Expanded				
0 ⁽²⁾	-3 to 3 inH ₂ O/0.1 inH ₂ O (-7,5 to 7,5 mbar/0,25 mbar)	Not Applicable	Not Applicable	
Output				
Standard				Standard
A	4–20 mA with Digital Signal Based on HART Protocol			★
F	FOUNDATION fieldbus Protocol			★
W ⁽³⁾	Profibus PA Protocol			★
Expanded				
M ⁽⁴⁾	Low-Power, 1–5 Vdc with Digital Signal Based on HART Protocol (See Option C2 for 0.8–3.2 V dc)			

Materials of Construction				
	Process Flange Type	Flange Material	Drain/Vent	
Standard				Standard
2	Coplanar	SST	SST	★
3 ⁽⁵⁾	Coplanar	Cast C-276	Alloy C-276	★
4	Coplanar	Cast Alloy 400	Alloy 400/K-500	★
5	Coplanar	Plated CS	SST	★
7 ⁽⁵⁾	Coplanar	SST	Alloy C-276	★
8 ⁽⁵⁾	Coplanar	Plated CS	Alloy C-276	★
0	Alternate Flange—See Options on page 156			★
Isolating Diaphragm				
Standard				Standard
2 ⁽⁵⁾	316L SST			★
3 ⁽⁵⁾	Alloy C-276			★
Expanded				
4	Alloy 400			
5	Tantalum (Available on 3051CD and CG, Ranges 2–5 only. Not available on 3051CA)			
6	Gold-plated Alloy 400 (Use in combination with O-ring Option Code B.)			
7	Gold-plated SST			
O-ring				
Standard				Standard
A	Glass-filled PTFE			★
B	Graphite-filled PTFE			★
Sensor Fill Fluid				
Standard				Standard
1	Silicone			★
2	Inert fill (Differential and Gage only)			★
Housing Material		Conduit Entry Size		
Standard				Standard
A	Polyurethane-covered Aluminum		½–14 NPT	★
B	Polyurethane-covered Aluminum		M20 × 1.5 (CM20)	★
J	SST		½–14 NPT	★
K	SST		M20 × 1.5 (CM20)	★

Expanded			
D	Polyurethane-covered Aluminum	G½	
M	SST	G½	

A.5.1 Options (Include with selected model number)

Plantweb Control Functionality			
Standard			Standard
A01	FOUNDATION fieldbus Advanced Control Function Block Suite		★
Plantweb Diagnostic Functionality			
Standard			Standard
D01	FOUNDATION fieldbus Diagnostics Suite		★
Alternate Flange			
Standard			Standard
H2	Traditional Flange, 316 SST, SST Drain/Vent		★
H3 ⁽⁵⁾	Traditional Flange, Alloy C, Alloy C-276 Drain/Vent		★
H4	Traditional Flange, Monel, Monel Drain/Vent		★
H7 ⁽⁵⁾	Traditional Flange, 316 SST, Alloy C-276 Drain/Vent		★
HJ	DIN Compliant Traditional Flange, SST, 1/16 in. Adapter/Manifold Bolting		★
FA	Level Flange, SST, 2 in., ANSI Class 150, Vertical Mount		★
FB	Level Flange, SST, 2 in., ANSI Class 300, Vertical Mount		★
FC	Level Flange, SST, 3 in., ANSI Class 150, Vertical Mount		★
FD	Level Flange, SST, 3 in., ANSI Class 300, Vertical Mount		★
FP	DIN Level Flange, SST, DN 50, PN 40, Vertical Mount		★
FQ	DIN Level Flange, SST, DN 80, PN 40, Vertical Mount		★
Expanded			
HK	DIN Compliant Traditional Flange, SST, 10 mm Adapter/Manifold Bolting		
HL	DIN Compliant Traditional Flange, SST, 12mm Adapter/Manifold Bolting (Not available on 3051CD0)		
Integral Assembly			
Standard			Standard
S3 ⁽⁶⁾	Assemble to Rosemount 405 Compact Orifice Plate		★
S5 ⁽⁶⁾	Assemble to Rosemount 305 Integral Manifold (specified separately, see the Rosemount 305 and 306 Integral Manifolds PDS (document number 00813-0100-4733))		★
S6 ⁽⁶⁾	Assemble to Rosemount 304 Manifold or Connection System		★

Integral Mount Primary Element		
Standard		Standard
S4 ⁽⁶⁾	Assemble to Rosemount Annubar or Rosemount 1195 Integral Orifice <i>(With the primary element installed, the maximum operating pressure will equal the lesser of either the transmitter or the primary element. Option is available for factory assembly to range 1–4 transmitters only)</i>	★
Seal Assemblies		
Standard		Standard
S1 ⁽⁶⁾	Assemble to one Rosemount 1199 seal	★
S2 ⁽⁶⁾	Assemble to two Rosemount 1199 seals	★
All-Welded Seal Assemblies (for high vacuum applications)		
Standard		Standard
S0 ⁽⁶⁾	One Seal, All-Welded System (Direct Mount Connection Type)	★
S7 ⁽⁶⁾	One Seal, All-Welded System (Capillary Connection Type)	★
S8 ⁽⁶⁾	Two Seals, All-Welded System (Capillary Connection Type)	★
S9 ⁽⁶⁾	Two Seals, All-Welded System (One Direct Mount and One Capillary Connection Type)	★
Mounting Bracket		
Standard		Standard
B1	Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts	★
B2	Traditional Flange Bracket for Panel Mounting, CS Bolts	★
B3	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts	★
B4	Coplanar Flange Bracket for 2-in. Pipe or Panel Mounting, all SST	★
B7	B1 Bracket with Series 300 SST Bolts	★
B8	B2 Bracket with Series 300 SST Bolts	★
B9	B3 Bracket with Series 300 SST Bolts	★
BA	SST B1 Bracket with Series 300 SST Bolts	★
BC	SST B3 Bracket with Series 300 SST Bolts	★
Product Certifications		
Standard		Standard
C6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2	★
E2	INMETRO Flameproof	★

E3	China Flameproof	★
E4 ⁽¹²⁾	TIIS Flame-proof	★
E5	FM Explosion-proof, Dust Ignition-Proof	★
E7 ⁽⁷⁾	IECEx Flameproof, Dust Ignition-proof	★
E8	ATEX Flameproof and Dust	★
I1 ⁽⁷⁾	ATEX Intrinsic Safety and Dust	★
I2	INMETRO Intrinsic Safety	★
I3	China Intrinsic Safety	★
I4	TIIS Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I7 ⁽⁷⁾	IECEx Intrinsic Safety	★
IA	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only	★
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only	★
K2	INMETRO Flameproof, Instrinsic Safety	★
K5	FM Explosion-proof, Dust Ignition-Proof, Intrinsically Safe, and Division 2	★
K6 ⁽⁷⁾	CSA and ATEX Explosion-proof, Intrinsically Safe, and Division 2 (combination of C6 and K8)	★
K7 ⁽⁷⁾	IECEx Flame-proof, Dust Ignition-proof, Intrinsic Safety, and Type n (combination of I7, N7, and E7)	★
K8 ⁽¹²⁾	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E8, I1, and N1)	★
KB	FM and CSA Explosion-proof, Dust Ignition Proof, Intrinsically Safe, and Division 2 (combination of K5 and C6)	★
KD ⁽¹²⁾	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of K5, C6, I1, and E8)	★
N1 ⁽¹²⁾	ATEX Type n and Dust	★
N3	China Type n	★
N7 ⁽⁷⁾	IECEx Type n	★
Custody Transfer		
Standard		Standard
C5 ⁽⁹⁾	Measurement Canada Accuracy Approval <i>(Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative)</i>	★
Bolting Material		
Standard		Standard
L4	Austenitic 316 SST Bolts	★
L5	ASTM A 193, Grade B7M Bolts	★
L6	Alloy K-500 Bolts	★
Display Type		
Standard		Standard
M4 ⁽⁸⁾	LCD Display with Local Operator Interface	★
M5	LCD display for Aluminum Housing (Housing Codes A, B, C, and D only)	★
M6	LCD display for SST Housing (Housing Codes J, K, L, and M only)	★

Calibration Certificate		
Standard		Standard
Q4	Calibration Certificate	★
QG	Calibration Certificate and GOST Verification Certificate	★
QP	Calibration certification and tamper evident seal	★
Material Traceability Certification		
Standard		Standard
Q8	Material Traceability Certification per EN 10204 3.1 <i>(Only available for the sensor module housing and Coplanar or traditional flanges and adapters (3051C), and for the sensor module housing and low-volume Coplanar flange and adapter (3051C with Option Code S1))</i>	★
Quality Certification for Safety		
Standard		Standard
QS	Certificate of FMEDA Data	★
Zero/Span Adjustment		
Standard		Standard
J1 ⁽⁹⁾⁽¹⁰⁾	Local Zero Adjustment Only	★
J3 ⁽⁹⁾⁽¹⁰⁾	No Local Zero or Span Adjustment	★
Transient Protection Terminal Block		
Standard		Standard
T1	Transient Protection Terminal Block	★
Software Configuration		
Standard		Standard
C1 ⁽⁹⁾	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)	★
Low Power Output		
Expanded		
C2 ⁽⁹⁾	0.8–3.2 Vdc Output with Digital Signal Based on HART Protocol (Output Code M only)	
Gage Pressure Calibration		
Standard		Standard
C3	Gage Calibration (Model 3051CA4 only)	★
Alarm Limit		
Standard		Standard
C4 ⁽⁹⁾⁽¹¹⁾	Analog Output Levels Compliant with NAMUR Recommendation NE 43, Alarm High	★
CN ⁽⁹⁾⁽¹¹⁾	Analog Output Levels Compliant with NAMUR Recommendation NE 43, Alarm Low	★

Pressure Testing		
Expanded		
P1	Hydrostatic Testing with Certificate	
Cleaning Process Area		
Expanded		
P2	Cleaning for Special Service	
P3	Cleaning for <1 PPM Chlorine/Fluorine	
Pressure Calibration		
Expanded		
P4	Calibrate at Line Pressure (<i>Specify Q48 on order for corresponding certificate</i>)	
High Accuracy		
Standard		Standard
P8	0.04% accuracy to 5:1 turndown (Range 2-4)	★
Flange Adapters		
Standard		Standard
DF	1/2-14 NPT flange adapter(s)	★
D3	1/4-18 NPT Process Connections (No flange adapters), Hastelloy	★
D3	1/4-18 NPT Process Connections (No flange adapters), Monel	★
Vent/Drain Valves		
Expanded		
D7	Coplanar Flange Without Drain/Vent Ports	
Conduit Plug		
Standard		Standard
DO	316 SST Conduit Plug	★
RC^{1/4} RC^{1/2} Process Connection		
Expanded		
D9	JIS Process Connection—RC 1/4 Flange with RC 1/2 Flange Adapter, CS	
D9	JIS Process Connection—RC 1/4 Flange with RC 1/2 Flange Adapter, 316SST	
Max Static Line Pressure		
Standard		Standard
P9	4500 psig Static Pressure Limit (3051CD Ranges 2-5 only)	★

Ground Screw		
Standard		Standard
V5 ⁽¹²⁾	External Ground Screw Assembly	★
Drinking Water Approval		
Standard		Standard
DW	NSF drinking water approval	★
Surface Finish		
Standard		Standard
Q16	Surface finish certification for sanitary remote seals	★
Toolkit Total System Performance Reports		
Standard		Standard
QZ	Remote Seal System Performance Calculation Report	★
Conduit Electrical Connector		
Standard		Standard
GE	M12, 4-pin, Male Connector (eurofast®)	★
GM	A size Mini, 4-pin, Male Connector (minifast®)	★
Typical Model Number: 3051CD 2 A 2 2 A 1 A B4\$13857 780		

- (1) 3051CG lower range limit varies with atmospheric pressure.
- (2) 3051CD0 is available only with Output Code A, Process Flange Code 0 (Alternate Flange H2, H7, HJ, or HK), Isolating Diaphragm Code 2, O-ring Code A, and Bolting Option L4.
- (3) Option code M4 - LCD Display with Local Operator Interface required for local addressing and configuration.
- (4) Not available with hazardous locations certification Options Codes I1, N1, E4, K6 and K8.
- (5) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
- (6) "Assemble-to" items are specified separately and require a completed model number.
- (7) Not available with Low Power code M.
- (8) Available only with output code W - Profibus PA.
- (9) Not available with Fieldbus (output code F) or Profibus (output code W).
- (10) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.
- (11) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
- (12) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

Model	Transmitter Type	
3051T	Pressure Transmitter	
Pressure Type		
Standard		Standard
G	Gage	★
A	Absolute	★

Pressure Upper Range Limit - Configurable Description			
	3051TG ⁽¹⁾	3051TA	
Standard			Standard
1	30 psi (2,1 bar)	30 psia (2,1 bar)	★
2	150 psi (10,3 bar)	150 psia (10,3 bar)	★
3	800 psi (55,2 bar)	800 psia (55,2 bar)	★
4	4000 psi (275,8 bar)	4000 psia (275,8 bar)	★
5	10000 psi (689,5 bar)	10000 psia (689,5 bar)	★
Transmitter Output			
Standard			Standard
A	4–20 mA with Digital Signal Based on HART Protocol		★
F	FOUNDATION fieldbus Protocol		★
W ⁽²⁾	Profibus PA Protocol		★
Expanded			
M	Low-Power 1–5 Vdc with Digital Signal Based on HART Protocol		
Process Connection Style			
Standard			Standard
2B	1/2–14 NPT Female		★
2C	G½ A DIN 16288 Male (Available in SST for Range 1–4 only)		★
Expanded			
2F	Coned and Threaded, Compatible with Autoclave Type F-250-C (<i>Includes Gland and Collar, Available in SST for Range 5 only</i>)		
61	Non-threaded Instrument flange (Range 1-4 only)		
Isolating Diaphragm		Process Connection Wetted Parts Material	
Standard			Standard
2 ⁽³⁾	316L SST	316L SST	★
3 ⁽³⁾	Alloy C-276	Alloy C-276	★
Sensor Fill Fluid			
Standard			Standard
1	Silicone		★
2	Inert (Fluorinert® FC-43)		★

Housing Material		Conduit Entry Size	
Standard			Standard
A	Polyurethane-covered Aluminum	½–14 NPT	★
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)	★
J	SST	½–14 NPT	★
K	SST	M20 × 1.5 (CM20)	★
Expanded			
D	Polyurethane-covered Aluminum	G½	
M	SST	G½	

A.5.2 Options (Include with selected model number)

PlantWeb Control Functionality			
Standard			Standard
A01	Advanced Control Function Block Suite		★
PlantWeb Diagnostic Functionality			
Standard			Standard
D01	FOUNDATION fieldbus Diagnostics Suite		★
Integral Assembly			
Standard			Standard
S5 ⁽⁴⁾	Assemble to Rosemount 306 Integral Manifold		★
Seal Assemblies			
Standard			Standard
S1 ⁽⁴⁾	Assemble to one Rosemount 1199 seal		★
Mounting Bracket			
Standard			Standard
B4	Bracket for 2-in. Pipe or Panel Mounting, All SST		★
Product Certifications			
Standard			Standard
C6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2		★
E2	INMETRO Flameproof		★
E3	China Flameproof		★
E4 ⁽⁵⁾	TIIS Flameproof		★

E5	FM Explosion-proof, Dust Ignition-proof	★
E7 ⁽⁵⁾	IECEX Flameproof, Dust Ignition-proof	★
E8	ATEX Flameproof and Dust	★
I1 ⁽⁵⁾	ATEX Intrinsic Safety and Dust	★
I2	INMETRO Intrinsic Safety	★
I3	China Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I7 ⁽⁵⁾	IECEX Intrinsic Safety	★
IA	ATEX Intrinsic Safety for FISCO; for FOUNDATION fieldbus protocol only	★
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only	★
K2	INMETRO Flameproof, Intrinsic Safety	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2	★
K6 ⁽⁵⁾	CSA and ATEX Explosion-proof, Intrinsically Safe, and Division 2 (combination of C6 and K8)	★
K7 ⁽⁵⁾	IECEX Flameproof, Dust Ignition-proof, Intrinsic Safety, and Type n (combination of I7, N7, and E7)	★
K8 ⁽⁵⁾	ATEX Flame-proof, Intrinsic Safety, Type n, Dust (combination of E8, I1, and N1)	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2 (combination of K5 and C6)	★
KD ⁽⁵⁾	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of K5, C6, I1, and E8)	★
N1 ⁽⁵⁾	ATEX Type n Certification and Dust	★
N3	China Type n	★
N7 ⁽⁵⁾	IECEX Type n Certification	★
Custody Transfer		
Standard		Standard
C5	Measurement Canada Accuracy Approval (<i>Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative</i>)	★
Calibration Certification		
Standard		Standard
Q4	Calibration Certificate	★
QG	Calibration Certificate and GOST Verification Certificate	★
QP	Calibration Certification and tamper evident seal	★
Material Traceability Certification		
Standard		Standard
Q8	Material Traceability Certification per EN 10204 3.1 <i>NOTE: This option applies to the process connection only.</i>	★
Quality Certification for Safety		
Standard		Standard
QS	Certificate of FMEDA Data	★
QT	Safety certified to IEC 61508 with Certificate of FMEDA data	★

Zero/Span Adjustment		
Standard		Standard
J1 ⁽⁶⁾⁽⁷⁾	Local Zero Adjustment Only	★
J3 ⁽⁶⁾⁽⁷⁾	No Local Zero or Span Adjustment	★
Expanded		
D1	Hardware adjustments (zero, span, alarm, security)	
Display Type		
Standard		Standard
M4 ⁽⁸⁾	LCD Display with Local Operator Interface	★
M5	LCD display	★
M6	LCD display for SST Housing (Housing Codes J, K, L and M only)	★
Conduit Plug		
Standard		Standard
DO	316 SST Conduit Plug	★
Transient Terminal Block		
Standard		Standard
T1	Transient Protection Terminal Block	★
Software Configuration		
Standard		Standard
C1 ⁽⁶⁾	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)	★
Expanded		
C2 ⁽⁶⁾	0.8–3.2 Vdc Output with Digital Signal Based on HART Protocol (Output Code M only)	
Alarm Limit		
Standard		Standard
C4 ⁽⁷⁾⁽⁹⁾	Analog Output Levels Compliant with NAMUR Recommendation NE 43, Alarm High	★
CN ⁽⁷⁾⁽⁹⁾	Analog Output Levels Compliant with NAMUR Recommendation NE 43, Low Alarm	★
CR	Custom alarm and saturation signal levels, high alarm	★
CS	Custom alarm and saturation signal levels, low alarm	★
CT	Low alarm (standard Rosemount alarm and saturation levels)	★
Pressure Testing		
Expanded		
P1	Hydrostatic Testing with Certificate	

Cleaning Process Area		
Expanded		
P2	Cleaning for Special Service	
P3	Cleaning for <1 PPM Chlorine/Fluorine	
High Accuracy		
Standard		Standard
P8	0.04% accuracy to 5:1 turndown (Range 2-4)	★
Ground Screw		
Standard		Standard
V5 ⁽¹⁰⁾	External Ground Screw Assembly	★
Drinking Water Approval		
Standard		Standard
DW	NSF drinking water approval	★
Surface Finish		
Standard		Standard
Q16	Surface finish certification for sanitary remote seals	★
Toolkit Total System Performance Reports		
Standard		Standard
QZ	Remote Seal System Performance Calculation Report	★
Conduit Electrical Connector		
Standard		Standard
GE	M12, 4-pin, Male Connector (eurofast [®])	★
GM	A size Mini, 4-pin, Male Connector (minifast [®])	★
Typical Model Number: 3051T G 5 F 2A 2 1 A B4		

(1) 3051TG lower range limit varies with atmospheric pressure.

(2) Option code M4 - LCD Display with Local Operator Interface required for local addressing and configuration.

(3) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(4) "Assemble-to" items are specified separately and require a completed model number.

(5) Not available with low-power Option Code M.

(6) Not available with fieldbus (output code F) or Profibus protocols (output code W).

(7) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.

(8) Available only with output code W - Profibus PA.

(9) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(10) The V5 option is not needed with T1 option; external ground screw assembly is included with the T1 option.

Model	Transmitter Type			
3051L	Liquid Level Transmitter			
Pressure Range				
Standard				Standard
2	-250 to 250 inH ₂ O (-0,6 to 0,6 bar)			★
3	-1000 to 1000 inH ₂ O (-2,5 to 2,5 bar)			★
4	-300 to 300 psi (-20,7 to 20,7 bar)			★
Transmitter Output				
Standard				Standard
A	4-20 mA with Digital Signal Based on <i>HART</i> Protocol			★
F	FOUNDATION fieldbus Protocol			★
W ⁽¹⁾	Profibus PA Protocol			★
Expanded				
M ⁽²⁾	Low-Power 1-5 Vdc with Digital Signal Based on <i>HART</i> Protocol (See Option Code C2 for 0.8-3.2 Vdc Output)			
Process Connection Size, Material, Extension length (High Side)				
Standard				Standard
Code	Process Connection Size	Material	Extension Length	★
G0 ⁽³⁾	2-in./DN 50	316L SST	Flush Mount Only	★
H0 ⁽³⁾	2-in./DN 50	Alloy C-276	Flush Mount Only	★
J0	2-in./DN 50	Tantalum	Flush Mount Only	★
A0 ⁽³⁾	3-in./DN 80	316L SST	Flush Mount	★
A2 ⁽³⁾	3-in./DN 80	316L SST	2-in./50 mm	★
A4 ⁽³⁾	3-in./DN 80	316L SST	4-in./100 mm	★
A6 ⁽³⁾	3-in./DN 80	316L SST	6-in./150 mm	★
B0 ⁽³⁾	4-in./DN 100	316L SST	Flush Mount	★
B2 ⁽³⁾	4-in./DN 100	316L SST	2-in./50 mm	★
B4 ⁽³⁾	4-in./DN 100	316L SST	4-in./100 mm	★
B6 ⁽³⁾	4-in./DN 100	316L SST	6-in./150 mm	★
C0 ⁽³⁾	3-in./DN 80	Alloy C-276	Flush Mount	★
C2 ⁽³⁾	3-in./DN 80	Alloy C-276	2-in./50 mm	★
C4 ⁽³⁾	3-in./DN 80	Alloy C-276	4-in./100 mm	★
C6 ⁽³⁾	3-in./DN 80	Alloy C-276	6-in./150 mm	★
D0 ⁽³⁾	4-in./DN 100	Alloy C-276	Flush Mount	★
D2 ⁽³⁾	4-in./DN 100	Alloy C-276	2-in./50 mm	★

D4 ⁽³⁾	4-in./DN 100	Alloy C-276	4-in./100 mm	★
D6 ⁽³⁾	4-in./DN 100	Alloy C-276	6-in./150 mm	★
E0	3-in./DN 80	Tantalum	Flush Mount Only	★
F0	4-in./DN 100	Tantalum	Flush Mount Only	★
Mounting Flange Size, Rating, Material (High Side)				
	Size	Rating	Material	
Standard				Standard
M	2-in.	ANSI/ASME B16.5 Class 150	CS	★
A	3-in.	ANSI/ASME B16.5 Class 150	CS	★
B	4-in.	ANSI/ASME B16.5 Class 150	CS	★
N	2-in.	ANSI/ASME B16.5 Class 300	CS	★
C	3-in.	ANSI/ASME B16.5 Class 300	CS	★
D	4-in.	ANSI/ASME B16.5 Class 300	CS	★
P	2-in.	ANSI/ASME B16.5 Class 600	CS	★
E	3-in.	ANSI/ASME B16.5 Class 600	CS	★
X ⁽³⁾	2-in.	ANSI/ASME B16.5 Class 150	SST	★
F ⁽³⁾	3-in.	ANSI/ASME B16.5 Class 150	SST	★
G ⁽³⁾	4-in.	ANSI/ASME B16.5 Class 150	SST	★
Y ⁽³⁾	2-in.	ANSI/ASME B16.5 Class 300	SST	★
H ⁽³⁾	3-in.	ANSI/ASME B16.5 Class 300	SST	★
J ⁽³⁾	4-in.	ANSI/ASME B16.5 Class 300	SST	★
Z ⁽³⁾	2-in.	ANSI/ASME B16.5 Class 600	SST	★
L ⁽³⁾	3-in.	ANSI/ASME B16.5 Class 600	SST	★
Q	DN 50	PN 10-40 per EN 1092-1	CS	★
R	DN 80	PN 40 per EN 1092-1	CS	★
S	DN 100	PN 40 per EN 1092-1	CS	★
V	DN 100	PN 10/16 per EN 1092-1	CS	★
K ⁽³⁾	DN 50	PN 10-40 per EN 1092-1	SST	★
T ⁽³⁾	DN 80	PN 40 per EN 1092-1	SST	★
U ⁽³⁾	DN 100	PN 40 per EN 1092-1	SST	★
W ⁽³⁾	DN 100	PN 10/16 per EN 1092-1	SST	★
7 ⁽³⁾	4 in.	ANSI/ASME B16.5 Class 600	SST	★
Expanded				
1	—	10K per JIS B2238	CS	
2	—	20K per JIS B2238	CS	
3	—	40K per JIS B2238	CS	
4 ⁽³⁾	—	10K per JIS B2238	316 SST	

5 ⁽³⁾	—	20K per JIS B2238	316 SST	
6 ⁽³⁾	—	40K per JIS B2238	316 SST	
Process Fill-High Pressure Side		Specific Gravity	Temperature Limits (Ambient Temperature of 70 °F (21 °C))	
Standard				Standard
A	Syltherm XLT	0.85	-102 to 293 °F (-75 to 145 °C)	
C	Silicone 704	1.07	32 to 401 °F (0 to 205 °C)	
D	Silicone 200	0.93	-49 to 401 °F (-45 to 205 °C)	
H	Inert (Halocarbon)	1.85	-49 to 320 °F (-45 to 160 °C)	
G	Glycerine and Water	1.13	5 to 203 °F (-15 to 95 °C)	
N	Neobee M-20	0.92	5 to 401 °F (-15 to 205 °C)	
P	Propylene Glycol and Water	1.02	5 to 203 F (-15 to 95 °C)	
Low Pressure Side				
	Configuration	Flange Adapter	Diaphragm Material	Sensor Fill Fluid
Standard				Standard
11 ⁽³⁾	Gage	SST	316L SST	Silicone
21 ⁽³⁾	Differential	SST	316L SST	Silicone
22 ⁽³⁾	Differential	SST	Alloy C-276	Silicone
2A ⁽³⁾	Differential	SST	316L SST	Inert (Halocarbon)
2B ⁽³⁾	Differential	SST	Alloy C-276	Inert (Halocarbon)
31 ⁽³⁾	Tuned-System Assembly with Remote Seal	None	316L SST	Silicone (Requires Option Code S1)
O-ring				
Standard				Standard
A	Glass-filled PTFE			★
Housing Material			Conduit Entry Size	
Standard				Standard
A	Aluminum		½–14 NPT	
B	Aluminum		M20 × 1.5	
J	SST		½–14 NPT	
K	SST		M20 × 1.5	

Expanded			
D	Aluminum	G½	
M	SST	G½	

A.5.3 Options (Include with selected model number)

PlantWeb Control Functionality			
Standard			Standard
A01	FOUNDATION fieldbus Advanced Control Function Block Suite		★
PlantWeb Diagnostic Functionality			
Standard			Standard
D01	FOUNDATION fieldbus Diagnostics Suite		★
Seal Assemblies			
Standard			Standard
S1 ⁽⁴⁾	Assembled to One Rosemount 1199 Seal (Requires 1199M)		★
Product Certifications			
Standard			Standard
E5	FM Explosion-proof, Dust Ignition-proof		★
I5	FM Intrinsically Safe, Division 2		★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2		★
I1 ⁽⁵⁾	ATEX Intrinsic Safety and Dust		★
N1 ⁽⁵⁾	ATEX Type n Certification and Dust		★
E8	ATEX Flameproof and Dust		★
E4 ⁽⁵⁾	TIIS Flameproof		★
C6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2		★
K6 ⁽⁵⁾	CSA and ATEX Explosion-proof, Intrinsically Safe, and Division 2 (combination of C6 and K8)		★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2 (combination of K5 and C6)		★
K7 ⁽⁵⁾	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, and Type n (combination of I7, N7, and E7)		★
K8 ⁽⁵⁾	ATEX Flame-proof and Intrinsic Safety Approvals (combination of I1 and E8)		★
KD ⁽⁵⁾	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of K5, C6, I1, and E8)		★

I7 ⁽⁵⁾	IECEX Intrinsic Safety	★
E7 ⁽⁵⁾	IECEX Flameproof, Dust Ignition-proof	★
N7 ⁽⁵⁾	IECEX Type n Certification	★
IA	ATEX FISCO Intrinsic Safety	★
IE	FM FISCO Intrinsically Safe	★
E2	INMETRO Flameproof	★
I2	INMETRO Intrinsic Safety	★
K2	INMETRO Flameproof, Intrinsic Safety	★
E3	China Flameproof	★
I3	China Intrinsic Safety	★
N3	China Type n	★
Bolting Material		
Standard		Standard
L4	Austenitic 316 SST Bolts	★
L5	ASTM A 193, Grade B7M bolts	★
L6	Alloy K-500 Bolts	★
L8	ASTM A 193 Class 2, Grade B8M Bolts	★
Display Type		
Standard		Standard
M4 ⁽⁶⁾	LCD Display with Local Operator Interface	★
M5	LCD Display for Aluminum Housing (Housing Codes A, B, C, and D only)	★
M6	LCD Display for SST Housing (Housing Codes J, K, L, and M only)	★
Calibration Certification		
Standard		Standard
Q4	Calibration Certificate	★
QP	Calibration Certificate and tamper evident seal	★
QG	Calibration Certificate and GOST Verification Certificate	★
Material Traceability Certification		
Standard		Standard
Q8	Material Traceability Certification per EN 10204 3.1	★
Quality Certification for Safety		
Standard		Standard
QS ⁽⁷⁾	Prior-use certificate of FMEDA data	★

Toolkit Total System Performance Reports		
Standard		Standard
QZ	Remote Seal System Performance Calculation Report	★
Conduit Electrical Connector		
Standard		Standard
GE	M12, 4-pin, Male Connector (eurofast®)	★
GM	A size Mini, 4-pin, Male Connector (minifast®)	★
Hardware Adjustments		
Standard		Standard
J1 ⁽⁸⁾⁽⁹⁾	Local Zero Adjustment Only	★
J3 ⁽⁸⁾⁽⁹⁾	No Local Zero or Span Adjustment	★
Transient Protection		
Standard		Standard
T1 ⁽¹⁰⁾	Transient Protection Terminal Block	★
Software Configuration		
Standard		Standard
C1 ⁽⁸⁾	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)	★
Low Power Output		
Standard		Standard
C2 ⁽⁸⁾	0.8–3.2 Vdc Output with Digital Signal Based on HART Protocol (Available with Output code M only)	★
Alarm Limit		
Standard		Standard
C4 ⁽⁸⁾⁽¹¹⁾	NAMUR alarm and saturation levels, high alarm	★
CN ⁽⁸⁾⁽¹¹⁾	NAMUR alarm and saturation levels, low alarm	★
CR	Custom alarm and saturation signal levels, high alarm	★
CS	Custom alarm and saturation signal levels, low alarm	★
CT	Low alarm (standard Rosemount alarm and saturation levels)	★
Conduit Plug		
Standard		Standard
D0	316 SST Conduit Plug	★
Ground Screw		
Standard		Standard
V5 ⁽¹²⁾	External Ground Screw Assembly	★

Lower Housing Flushing Connection Options				
	Ring Material	Number	Size (NPT)	
Standard				Standard
F1	316 SST	1	1/4-18 NPT	★
F2	316 SST	2	1/4-18 NPT	★
F3	Alloy C-276	1	1/4-18 NPT	★
F4	Alloy C-276	2	1/4-18 NPT	★
F7	316 SST	1	1/2-14 NPT	★
F8	316 SST	2	1/2-14 NPT	★
F9	Alloy C-276	1	1/2-14 NPT	★
F0	Alloy C-276	2	1/2-14 NPT	★
Typical Model Number: 3051L 2 A A0 D 21 A A F1				

(1) Option code M4 - LCD Display with Local Operator Interface required for local addressing and configuration.

(2) Not available with hazardous certification Option Codes I1, N1, E4, K6, and K8.

(3) Materials of Construction comply with metallurgical requirements highlighted within NACE MR0175/ISO 15156 for sour oil field production environments.

Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(4) "Assemble-to" items are specified separately and require a completed model number.

(5) Not available with low-power Option Code M

(6) Available only with output code W - Profibus PA.

(7) Only available with HART 4-20 mA output (output code A).

(8) Not available with fieldbus (output code F) or profibus protocols (output code W).

(9) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.

(10) The T1 option is not needed with FISCO Product Certifications; transient protection is included in the FISCO product certification codes IA, IE, IF, and IG.

(11) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(12) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

Model	Transmitter Type (Select One)		HD	HG	
3051HD	Differential Pressure Transmitter for High Temperature Processes		•	—	
3051HG	Gage Pressure Transmitter High-Temperature Processes		•—	••	
Code	Pressure Ranges (Range/ Min. Span)				
	3051HD	3051HG			
2	-250 to 250 inH ₂ O/2.5 inH ₂ O (-0,62 to 0,62 bar/6,2 mbar)	-250 to 250 inH ₂ O/2.5 inH ₂ O (-0,62 to 0,62 bar/6,2 mbar)			
3	-1000 to 1000 inH ₂ O/10 inH ₂ O (-2,5 to 2,5 bar/25 mbar)	-407 to 1000 inH ₂ O/10 in H ₂ O (-1,01 to 2,5 bar/25 mbar)			
4	-300 to 300 psi (-20,7 to 20,7 bar/0.2 bar)	-14.7 to 300 psi/3 psi (-1,01 to 20,7 bar/0,2 bar)			
5	-2000 to 2000 psi (-138 to 138 bar/1,4 bar)	-14.7 to 2000 psi/20 psi (-1,01 to 138 bar/1,4 bar)			
NOTE: 3051HG lower range limit varies with atmospheric pressure.					
Code	Output		HD	HG	
Expanded					
A	4-20 mA with Digital Signal Based on HART Protocol		••	••	
F	FOUNDATION fieldbus Protocol		••	••	

M ⁽¹⁾	Low-Power, 1–5 Vdc with Digital Signal Based on HART Protocol		••	••	
W	Profibus – PA		••	••	
Code	Process Connection		HD	HG	
	Process Flange Material	Drain/Vent			
2	SST	SST	••	••	
7 ⁽²⁾	SST	Alloy C-276	••	••	
Code	Process Isolating Diaphragm		HD	HG	
2	316L SST		••	••	
3 ⁽²⁾	Alloy C-276		••	••	
5	Tantalum		••	••	
Code	O-ring Material		HD	HG	
Expanded					
A	Glass-Filled PTFE		••	••	
Code	Process Fill Fluid		HD	HG	
Expanded					
D	D.C. 200 Silicone		••	••	
H	Inert		••	••	
N	Neobee M-20		••	••	
P	Propylene glyco/water		••	••	
Code	Sensor Module Isolator Material		HD	HG	
Expanded					
2	316L SST		••	••	
Code	Sensor Module Fill Fluid		HD	HG	
Expanded					
1	Silicone		••	••	
2	Inert fill (Halocarbon)		••	••	
Code	Housing Material	Conduit Entry Size	HD	HG	
Expanded					
A	Polyurethane-covered Aluminum	½–14 NPT	•	•	
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)	•	••	
D	Polyurethane-covered Aluminum	G½	•	••	
J	SST	½–14 NPT	•	•	
K	SST	M20 × 1.5 (CM20)	•	••	
M	SST	G½	••	••	

A.5.4 Options (Include with selected model number)

Code	PlantWeb Control Anywhere Software	HD	HG
Expanded			
A01	Advanced Control Function Block Suite • •	• •	• •
Code	PlantWeb Advanced Diagnostic Software	HD	HG
Expanded			
D01	FOUNDATION fieldbus Diagnostics Suite	• •	• •
Code	Integral Mount Primary Elements (Optional)	HD	HG
Expanded			
S4 ⁽³⁾	Assemble to Rosemount Annubar or Rosemount 1195 Integral Orifice	• • •	— • —
Code	Mounting Bracket Options	HD	HG
Expanded			
B5	Universal Mounting Bracket for 2-in. Pipe or Panel Mount, CS Bolts	• •	• •
B6	Universal Mounting Bracket for 2-in. Pipe or Panel Mount, SST Bolts	• •	• •
Code	Product Certifications (Optional)	HD	HG
Expanded			
C6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2	•	•
E4 ⁽⁵⁾	TIIS Flameproof	•	•
E5	FM Explosion-proof, Dust Ignition-proof	•	•
E7	IECEx Flameproof, Dust Ignition-proof	•	•
E8	ATEX Flameproof and Dust Certification	•	•
I1 ⁽⁴⁾	ATEX Intrinsic Safety and Dust	•	•
I5	FM Intrinsically Safe, Division 2	•	•
I7	IECEx Intrinsic Safety	•	•
IA	ATEX FISCO Intrinsic Safety	•	•
IE	FM FISCO Intrinsically Safe	•	•
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, and Division 2	•	•
K6 ⁽⁵⁾	CSA and ATEX Explosion-proof, Intrinsically Safe, and Division 2 (combination of C6 and K8)	•	•
K7	SAA Flameproof, Dust Ignition-proof, Intrinsic Safety, and Type n (combination of I7, N7, and E7)	•	•
K8 ⁽⁵⁾	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E8, I1, and N1)	•	•
KB	FM and CSA Explosion-proof, Dust Ignition-Proof, Intrinsically Safe, and Division 2 (combination of K5 and C6)	•	•
KD ⁽⁵⁾	CSA, FM, and ATEX Explosion-proof and Intrinsically Safe (combination of K5, C6, I1, and E8)	•	•
N1 ⁽⁵⁾	ATEX Type n Certification and Dust	•	•

N7	IECEX Type n Certification	•	•	
E2	INMETRO Flameproof	—	•	
I2	INMETRO Intrinsic Safety	—	•	
K2	INMETRO Flameproof, Intrinsic Safety	—	•	
DW	NSF drinking water approval	•—	•	
Code	Bolting Material	HD	HG	
Expanded				
L4	Austenitic 316 SST Bolts	•	•••	
Code	Display and Interface Options	HD	HG	
Expanded				
M4	LCD Display with Local Operator Display	••	••	
M5	LCD Display for Aluminum Housing (<i>Housing codes A, B, C, and D only</i>)	••	••	
M6	LCD Display for SST Housing (<i>Housing codes J, K, L, and M only</i>)	•	•••	
Code	Calibration Certification	HD	HG	
Expanded				
Q4	Calibration Certificate	•	•	
QG	Calibration Certificate and GOST Verification Certificate	••	••	
QP	Calibration Certificate and tamper evident seal	••	••	
Code	Material Traceability Certification	HD	HG	
Expanded				
Q8	Material traceability certification per EN 10204 3.1	•	•	
Code	Zero/Span Adjustment	HD	HG	
Expanded				
J1 ⁽⁵⁾⁽⁶⁾	Local Zero Adjustment Only	•	•	
J3 ⁽⁵⁾⁽⁶⁾	No Local Zero or Span Adjustment	••	••	
Code	Transient Terminal Block	HD	HG	
Expanded				
T1	Transient Protection Terminal Block	•	•	
Code	Software Configuration	HD	HG	
Expanded				
C1 ⁽⁵⁾	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)	••	••	
Code	Lower Power Output	HD	HG	
Expanded				
C2 ⁽⁵⁾	0.8–3.2 Vdc Output with Digital Signal Based on HART Protocol (<i>Output Code M only</i>)	•	•	

Code	Alarm Limit	HD	HG
Expanded			
C4 ⁽⁵⁾⁽⁷⁾	Analog Output Levels Compliant with NAMUR Recommendation NE 43	••	••
CN ⁽⁵⁾⁽⁷⁾	Analog Output Levels Compliant with NAMUR Recommendation NE 43: Alarm Configuration—Low	•	•
Code	Pressure Testing	HD	HG
Expanded			
P1	Hydrostatic Testing with Certificate	••	••
Code	Cleaning Process Area	HD	HG
Expanded			
P2	Cleaning for Special Service	•	•
Code	Flange Adapters	HD	HG
Expanded			
DF	1/2–14 NPT flange adapters—SST	••	••
Code	Vent/Drain Valves	HD	HG
Expanded			
D8	Ceramic Ball Drain/Vents	•	•
Code	Conduit Plug	HD	HG
Expanded			
DO	316 SST Conduit Plug	••	••
Code	Ground Screw	HD	HG
Expanded			
V5 ⁽⁸⁾	External Ground Screw Assembly	••	••
Code	Bar Code Tag	HD	HG
Expanded			
BT	Customer Specified Barcode Tag	••	••
Code	Quality Certification for Safety	HD	HG
Expanded			
QS	Certificate of FMEDA Data	••	••
Code	Conduit Electrical Connector	HD	HG
Expanded			
GE	M12, 4-pin, Male Connector (<i>eurofast</i>)	••	••
GM	A size Mini, 4-pin, Male Connector (<i>minifast</i>)	••	••

Code	A Number Specials	HD	HG	
Expanded				
Axxxx	Specials	••	••	
Typical Model Number: 3051HG 2 A 2 2 A H 2 1 A B5				

- (1) Not available with hazardous certification Option Codes I1, N1, E4, K6, and K8.
- (2) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.
- (3) "Assemble-to" items are specified separately and require a completed model number.
- (4) Not available with Low Power code M.
- (5) Not available with fieldbus (output code F) or profibus protocols (output code W).
- (6) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.
- (7) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.
- (8) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

A.6 Options

Standard Configuration

Unless otherwise specified, transmitter is shipped as follows:

Engineering units <i>Differential/Gage:</i> <i>Absolute/3051T:</i>	inH ₂ O (Range 0, 1, 2, and 3) psi (Range 4 and 5) psi (all ranges)
4 mA (1 Vdc)⁽¹⁾:	0 (engineering units above)
20 mA (5 Vdc):	Upper range limit
Output:	Linear
Flange type:	Specified model code option
Flange material:	Specified model code option
O-ring material:	Specified model code option
Drain/vent:	Specified model code option
Integral meter:	Installed or none
Alarm⁽¹⁾:	Upscale
Software tag:	(Blank)

⁽¹⁾ Not applicable to fieldbus.

Custom Configuration HART protocol only⁽¹⁾

If Option Code C1 is ordered, the customer may specify the following data in addition to the standard configuration parameters.

- Output Information
- Transmitter Information
- LCD display Configuration
- Hardware Selectable Information
- Signal Selection

Refer to the “HART Protocol C1 Option Configuration Data Sheet” document number 00806-0100-4001.

⁽¹⁾Not applicable to fieldbus.

Tagging (3 options available)

- Standard SST hardware tag is wired to the transmitter. Tag character height is 0.125 in. (3,18 mm), 56 characters maximum.
- Tag may be permanently stamped on transmitter nameplate upon request, 56 characters maximum.
- Tag may be stored in transmitter memory (30 characters maximum). Software tag is left blank unless specified.

Commissioning tag (fieldbus only)

A temporary commissioning tag is attached to all transmitters. The tag indicates the device ID and allows an area for writing the location.

Optional Rosemount 304, 305, or 306 Integral Manifolds

Factory assembled to 3051C and 3051T transmitters. Refer to the following Product Data Sheet (document number 00813-0100-4839 for Rosemount 304 and 00813-0100-4733 for Rosemount 305 and 306) for additional information.

Optional Diaphragm and Sanitary Seals

Refer to Product Data Sheet 00813-0100-4016 or 00813-0201-4016 for additional information.

Output Information⁽¹⁾

Output range points must be the same unit of measure. Available units of measure include:

inH2O	inH2O@4 °C ⁽¹⁾	psi	Pa
inHg	ftH2O	bar	kPa
mmH2O	mmH2O@4 °C ⁽¹⁾	mbar	torr
mmHg	g/cm2	kg/cm2	atm

⁽¹⁾ Not available on low power or previous versions.

LCD display

M5 Digital Display, 5-Digit, 2-Line LCD

- Direct reading of digital data for higher accuracy
- Displays user-defined flow, level, volume, or pressure units
- Displays diagnostic messages for local troubleshooting
- 90-degree rotation capability for easy viewing

M6 Digital Display with 316 Stainless Steel Cover

- For use with stainless steel housing option (housing codes J, K, and L)

Local Span and Zero Adjustment⁽¹⁾

Transmitters ship with local span and zero adjustments standard unless otherwise specified.

- Non-interactive external zero and span adjustments ease calibration
- Magnetic switches replace standard potentiometer adjustments to optimize performance

J1 Local Zero Adjustment Only⁽¹⁾

J3 No Local Zero or Span Adjustment⁽¹⁾

Bolts for Flanges and Adapters

- Options permit bolts for flanges and adapters to be obtained in various materials
- Standard material is plated carbon steel per ASTM A449, Type 1

L4 Austenitic 316 Stainless Steel Bolts

L5 ASTM A 193, Grade B7M Bolts

L6 Alloy K-500 Bolts

Rosemount 3051C Coplanar Flange and 3051T Bracket Option

B4 Bracket for 2-in. Pipe or Panel Mounting

- For use with the standard Coplanar flange configuration
- Bracket for mounting of transmitter on 2-in. pipe or panel
- Stainless steel construction with stainless steel bolts

Rosemount 3051H Bracket Options

B5 Bracket for 2-in. Pipe or Panel Mounting

- For use with the 3051H Pressure Transmitter for high process temperatures
- Carbon steel construction with carbon steel bolts

B6 B5 Bracket with SST Bolts

- Same bracket as the B5 option with Series 300 stainless steel bolts.

Traditional Flange Bracket Options

B1 Bracket for 2-in. Pipe Mounting

- For use with the traditional flange option
- Bracket for mounting on 2-in. pipe
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

⁽¹⁾Not applicable to fieldbus.

- B2 Bracket for Panel Mounting
 - For use with the traditional flange option
 - Bracket for mounting transmitter on wall or panel
 - Carbon steel construction with carbon steel bolts
 - Coated with polyurethane paint
- B3 Flat Bracket for 2-in. Pipe Mounting
 - For use with the traditional flange option
 - Bracket for vertical mounting of transmitter on 2-in. pipe
 - Carbon steel construction with carbon steel bolts
 - Coated with polyurethane paint
- B7 B1 Bracket with SST Bolts
 - Same bracket as the B1 option with Series 300 stainless steel bolts
- B8 B2 Bracket with SST Bolts
 - Same bracket as the B2 option with Series 300 stainless steel bolts
- B9 B3 Bracket with SST Bolts
 - Same bracket as the B3 option with Series 300 stainless steel bolts
- BA Stainless Steel B1 Bracket with SST Bolts
 - B1 bracket in stainless steel with Series 300 stainless steel bolts
- BC Stainless Steel B3 Bracket with SST Bolts
 - B3 bracket in stainless steel with Series 300 stainless steel bolts

Shipping weights

Table A-6. Transmitter weights without options

Transmitter	Add weight In lb (kg)
3051C	6.0 (2,7)
3051L	Table A-7
3051H	13.6 (6,2)
3051T	3.0 (1,4)

Table A-7. 3051L weights without options

Flange	Flush lb. (kg)	2-in. Ext. lb (kg)	4-in. Ext. lb (kg)	6-in. Ext. lb (kg)
2-in., 150	12.5 (5,7)	—	—	—
3-in., 150	17.5 (7,9)	19.5 (8,8)	20.5 (9,3)	21.5 (9,7)
4-in., 150	23.5 (10,7)	26.5 (12,0)	28.5 (12,9)	30.5 (13,8)
2-in., 300	17.5 (7,9)	—	—	—
3-in., 300	22.5 (10,2)	24.5 (11,1)	25.5 (11,6)	26.5 (12,0)
4-in., 300	32.5 (14,7)	35.5 (16,1)	37.5 (17,0)	39.5 (17,9)
2-in., 600	15.3 (6,9)	—	—	—
3-in., 600	25.2 (11,4)	27.2 (12,3)	28.2 (12,8)	29.2 (13,2)
DN 50/PN 40	13.8 (6,2)	—	—	—
DN 80/PN 40	19.5 (8,8)	21.5 (9,7)	22.5 (10,2)	23.5 (10,6)
DN 100/ PN 10/16	17.8 (8,1)	19.8 (9,0)	20.8 (9,5)	21.8 (9,9)
DN 100/ PN 40	23.2 (10,5)	25.2 (11,5)	26.2 (11,9)	27.2 (12,3)

Table A-8. Transmitter options weights

Code	Option	Add lb (kg)
J, K, L, M	Stainless Steel Housing(T)	3.9 (1,8)
J, K, L, M	Stainless Steel Housing (C, L, H, P)	3.1 (1,4)
M5	LCD display for Aluminum Housing	0.5 (0,2)
M6	LCD display for SST Housing	1.25 (0,6)
B4	SST Mounting Bracket for Coplanar Flange	1.0 (0,5)
B1 B2 B3	Mounting Bracket for Traditional Flange	2.3 (1,0)
B7 B8 B9	Mounting Bracket for Traditional Flange	2.3 (1,0)
BA, BC	SST Bracket for Traditional Flange	2.3 (1,0)
B5 B6	Mounting Bracket for 3051H	2.9 (1,3)
H2	Traditional Flange	2.4 (1,1)
H3	Traditional Flange	2.7 (1,2)
H4	Traditional Flange	2.6 (1,2)
H7	Traditional Flange	2.5 (1,1)
FC	Level Flange—3 in., 150	10.8 (4,9)
FD	Level Flange—3 in., 300	14.3 (6,5)
FA	Level Flange—2 in., 150	10.7 (4,8)
FB	Level Flange—2 in., 300	14.0 (6,3)

Table A-8. Transmitter options weights

Code	Option	Add lb (kg)
FP	DIN Level Flange, SST, DN 50, PN 40	8.3 (3,8)
FQ	DIN Level Flange, SST, DN 80, PN 40	13.7 (6,2)

Table A-9. 3051C differential/gage pressure transmitter range limits

Units	Range 1 span		Range 2 span		Range 3 span		Range 4 span		Range 5 span	
	min	max	min	max	min	max	min	max	min	max
inH ₂ O	0.5	25	2.5	250	10	1000	83.040	8304	553.60	55360
inHg	0.03678	1.8389	0.18389	18.389	0.73559	73.559	6.1081	610.81	40.720	4072.04
ftH ₂ O	0.04167	2.08333	0.20833	20.8333	0.83333	83.3333	6.9198	691.997	46.13	4613.31
mmH ₂ O	12.7	635.5	63.553	6355	254	25421	2110.95	211095	14073	1407301
mmHg	0.93416	46.7082	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
psi	0.01806	0.903	0.0902	9.03183	0.36127	36.127	3	300	20	2000
bar	0.00125	0.06227	0.00623	0.62272	0.02491	2.491	0.20684	20.6843	1.37895	137.895
mbar	1.2454	62.2723	6.22723	622.723	24.9089	2490.89	206.843	20684.3	1378.95	137895
g/cm ²	1.26775	63.3875	6.33875	633.875	25.355	2535.45	210.547	21054.7	1406.14	140614
kg/cm ²	0.00127	0.0635	0.00635	0.635	0.0254	2.54	0.21092	21.0921	1.40614	140.614
Pa	124.545	6227.23	622.723	62160.6	2490.89	249089	20684.3	2068430	137895	13789500
kPa	0.12545	6.2272	0.62272	62.2723	2.49089	249.089	20.6843	2068.43	137.895	13789.5
torr	0.93416	46.7082	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
atm	0.00123	0.06146	0.00615	0.61460	0.02458	2.458	0.20414	20.4138	1.36092	136.092

When using a Field Communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

Table A-10. 3051L/3051H pressure transmitter range limits

Units	Range 2 span		Range 3 span		Range 4 span		Range 5 span	
	min	max	min	max	min	max	min	max
inH ₂ O	2.5	250	10	1000	83.040	8304	553.60	55360
inHg	0.18389	18.389	0.73559	73.559	6.1081	610.81	40.720	4072.04
ftH ₂ O	0.20833	20.8333	0.83333	83.3333	6.9198	691.997	46.13	4613.31
mmH ₂ O	63.553	6355	254	25421	2110.95	211095	14073	1407301
mmHg	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
psi	0.0902	9.03183	0.36127	36.127	3	300	20	2000
bar	0.00623	0.62272	0.02491	2.491	0.20684	20.6843	1.37895	137.895
mbar	6.22723	622.723	24.9089	2490.89	206.843	20684.3	1378.95	137895
g/cm ²	6.33875	633.875	25.355	2535.45	210.547	21054.7	1406.14	140614
kg/cm ²	0.00635	0.635	0.0254	2.54	0.21092	21.0921	1.40614	140.614
Pa	622.723	62160.6	2490.89	249089	20684.3	2068430	137895	13789500
kPa	0.62272	62.2723	2.49089	249.089	20.6843	2068.43	137.895	13789.5
torr	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
atm	0.00615	0.61460	0.02458	2.458	0.20414	20.4138	1.36092	136.092

When using a Field Communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

Table A-11. 3051T gage and absolute pressure transmitter range limits (cont. below with Ranges 3-5)

Units	Range 1 span		Range 2 span	
	min	max	min	max
inH ₂ O	8.30397	831.889	41.5198	4159.45
inHg	0.61081	61.0807	3.05403	305.403
ftH ₂ O	0.69199	69.3241	3.45998	345.998
mmH ₂ O	211.10	21130	1054.60	105460.3
mmHg	15.5145	1551.45	77.5723	7757.23
psi	0.3	30	1.5	150
bar	0.02068	2.06843	0.10342	10.3421
mbar	20.6843	2068.43	103.421	10342.11
g/cm ²	21.0921	2109.21	105.461	10546.1
kg/cm ²	0.02109	2.10921	0.10546	10.5461
Pa	2068.43	206843	10342.1	1034212
kPa	2.06843	206.843	10.3421	1034.21
torr	15.5145	1551.45	77.5726	7757.26
atm	0.02041	2.04138	0.10207	10.2069

When using a Field Communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

Table A-12. 3051T gage and absolute pressure transmitter range limits (cont.)

Units	Range 3 span		Range 4 span		Range 5 span	
	min	max	min	max	min	max
inH ₂ O	221.439	22143.9	1107.2	110720	55360	276799
inHg	16.2882	1628.82	81.441	8144.098	4072.04	20360.2
ftH ₂ O	18.4533	1845.33	92.2663	9226.63	4613.31	23066.6
mmH ₂ O	5634.66	563466	28146.1	2814613	1407301	7036507
mmHg	413.72	41372	2068.6	206860.0	103430	517151
psi	8	800	40	4000	2000	10000
bar	0.55158	55.1581	2.75791	275.7905	137.895	689.476
mbar	551.581	55158.1	2757.91	275790.5	137895	689476
g/cm ²	561.459	56145.9	2807.31	280730.6	140614	703067
kg/cm ²	0.56246	56.2456	2.81228	281.228	140.614	701.82
Pa	55158.1	5515811	275791	27579054	13789500	68947600
kPa	55.1581	5515.81	275.791	27579.05	13789.5	68947.6
torr	413.721	413721	2068.6	206859.7	103430	517151
atm	0.54437	54.4368	2.72184	272.1841	136.092	680.46

When using a Field Communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

Table A-13. 3051C absolute pressure transmitter range limits

Units	Range 1 span		Range 2 span		Range 3 span		Range 4 span	
	min	max	min	max	min	max	min	max
inH ₂ O	8.30397	831.889	41.5198	4151.98	221.439	22143.9	1107.2	110720
inHg	0.61081	61.0807	3.05403	305.403	16.2882	1628.82	81.441	8144.098
ftH ₂ O	0.69199	69.3241	3.45998	345.998	18.4533	1845.33	92.2663	9226.63
mmH ₂ O	211.10	21130	6.35308	635.308	5634.66	563466	28146.1	2814613
mmHg	15.5145	1551.45	1055.47	105547	413.72	41372	2068.6	206860.0
psi	0.3	30	1.5	150	8	800	40	4000
bar	0.02068	2.06843	0.10342	10.342	0.55158	55.1581	2.75791	275.7905
mbar	20.6843	2068.43	103.421	10342.1	551.581	55158.1	2757.91	275790.5
g/cm ²	21.0921	2109.21	105.27	105.27	561.459	56145.9	2807.31	280730.6
kg/cm ²	0.02109	2.10921	0.10546	10.546	0.56246	56.2456	2.81228	281.228
Pa	2068.43	206843	10342.1	1034210	55158.1	5515811	275791	27579054
kPa	2.06843	206.843	10.3421	1034.21	55.1581	5515.81	275.791	27579.05
torr	15.5145	1551.45	77.5726	7757.26	413.721	413721	2068.6	206859.7
atm	0.02041	2.04138	0.10207	10.207	0.54437	54.4368	2.72184	272.1841

When using a Field Communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

A.7 Spare parts

Model 3051C Sensor Modules (Min. Span/Range)	Silicone Fill	Inert Fill
	Part Number	Part Number
<i>Note: One spare part is recommended for every 50 transmitters.</i>		
<i>Note: Listed by Range and Process Isolator Order Numbers.</i>		
-3 to 3/0.1 inH₂O, Range 0 (includes Traditional SST flange and SST bolts).		
316L SST	03031-1045-0002	03031-1145-0002
-25 to 25 inH₂O/0.5 inH₂O, Range 1		
316L SST	03031-1045-0012	03031-1145-0012
Alloy C-276	03031-1045-0013	03031-1145-0013
Alloy	03031-1045-0014	03031-1145-0014
Gold-plated Alloy	03031-1045-0016	03031-1145-0016
Gold-plated 316 SST	03031-1045-0017	03031-1145-0017
-250 to 250 inH₂O/2.5 inH₂O, Range 2		
316L SST	03031-1045-0022	03031-1145-0022
Alloy C-276	03031-1045-0022	03031-1145-0022
Alloy	03031-1045-0024	03031-1145-0024
Tantalum	03031-1045-0025	03031-1145-0025
Gold-plated Alloy	03031-1045-0026	03031-1145-0026
Gold-plated 316 SST	03031-1045-0027	03031-1145-0027
-1000 to 1000 inH₂O/10 inH₂O, Range 3		
316L SST	03031-1045-0032	03031-1145-0032
Alloy C-276	03031-1045-0033	03031-1145-0033
Alloy	03031-1045-0034	03031-1145-0034
Tantalum	03031-1045-0035	03031-1145-0035
Gold-plated Alloy	03031-1045-0036	03031-1145-0036
Gold-plated 316 SST	03031-1045-0037	03031-1145-0037
-300 to 300 psi/3 psi, Range 4		
316L SST	03031-1045-2042	03031-1145-2042
Alloy C-276	03031-1045-2043	03031-1145-2043
Alloy	03031-1045-2044	03031-1145-2044
Tantalum	03031-1045-2045	03031-1145-2045
Gold-plated Alloy	03031-1045-2046	03031-1145-2046
Gold-plated 316 SST	03031-1045-2047	03031-1145-2047

-2000 to 2000/20 psi, Range 5		
316L SST	03031-1045-2052	03031-1145-2052
Alloy C-276	03031-1045-2053	03031-1145-2053
Alloy	03031-1045-2054	03031-1145-2054
Tantalum	03031-1045-2055	03031-1145-2055
Gold-plated Alloy	03031-1045-2056	03031-1145-2056
Gold-plated 316 SST	03031-1045-2057	03031-1145-2057

Rosemount 3051C gage and differential sensor modules (Min. Span/Range)			Silicone fill	Inert fill
			Part number	Part number
<i>Note: One spare part is recommended for every 50 transmitters.</i>				
<i>Note: Listed by Range and Process Isolator Order Numbers.</i>				
	Gage pressure range	Differential pressure range		
Range 1	-25 to 25 in H₂O/0.5 in H₂O	-25 to 25 in H₂O/0.5 in H₂O		
316L SST		03031-1045-0012	03031-1145-0012	
Alloy C-276		03031-1045-0013	03031-1145-0013	
Alloy 400		03031-1045-0014	03031-1145-0014	
Gold-plated Alloy 400		03031-1045-0016	03031-1145-0016	
Gold-plated 316 SST		03031-1045-0017	03031-1145-0017	
Range 2	-250 to 250 inH₂O/2.5 inH₂O	-250 to 250 inH₂O/2.5 inH₂O		
316L SST		03031-1045-0022	03031-1145-0022	
Alloy C-276		03031-1045-0023	03031-1145-0023	
Alloy 400		03031-1045-0024	03031-1145-0024	
Tantalum		03031-1045-0025	03031-1145-0025	
Gold-plated Alloy 400		03031-1045-0026	03031-1145-0026	
Gold-plated 316 SST		03031-1045-0027	03031-1145-0027	
Range 3	-407 to 1000 inH₂O/10 inH₂O	-1000 to 1000 inH₂O/10 inH₂O		
316L SST		03031-1045-0032	03031-1145-0032	
Alloy C-276		03031-1045-0033	03031-1145-0033	
Alloy 400		03031-1045-0034	03031-1145-0034	
Tantalum		03031-1045-0035	03031-1145-0035	
Gold-plated Alloy 400		03031-1045-0036	03031-1145-0036	
Gold-plated 316 SST		03031-1045-0037	03031-1145-0037	

Range 4	-14.2 to 300 psi/3 psi	-300 to 300 psi/3 psi		
316L SST			03031-1045-2042	03031-1145-2042
Alloy C-276			03031-1045-2043	03031-1145-2043
Alloy 400			03031-1045-2044	03031-1145-2044
Tantalum			03031-1045-2045	03031-1145-2045
Gold-plated Alloy 400			03031-1045-2046	03031-1145-2046
Gold-plated 316 SST			03031-1045-2047	03031-1145-2047
Range 5	-14.2 to 2000 psi/20 psi	-2000 to 2000psi/20 psi		
316L SST			03031-1045-2052	03031-1145-2052
Alloy C-276			03031-1045-2053	03031-1145-2053
Alloy 400			03031-1045-2054	03031-1145-2054
Tantalum			03031-1045-2055	03031-1145-2055
Gold-plated Alloy 400			03031-1045-2056	03031-1145-2056
Gold-plated 316 SST			03031-1045-2057	03031-1145-2057

Rosemount 3051C absolute sensor modules (Min. Span/Range)	Silicone fill	Inert fill
	Part number	Part number
<i>Note: One spare part is recommended for every 50 transmitters.</i>		
<i>Note: Listed by Range and Process Isolator Order Numbers.</i>		
Range 1, 0 to 30 psia/0.3 psia		
316L SST	03031-2020-0012	—
Alloy C-276	03031-2020-0013	—
Alloy 400	03031-2020-0014	—
Gold-plated Alloy 400	03031-2020-0016	—
Gold-plated 316 SST	03031-2020-0017	—
Range 2, 0 to 150/1.5 psia		
316L SST	03031-2020-0022	—
Alloy C-276	03031-2020-0023	—
Alloy 400	03031-2020-0024	—
Gold-plated Alloy 400	03031-2020-0026	—
Gold-plated 316 SST	03031-2020-0027	—
Range 3, 0 to 800 psia/8 psia		
316L SST	03031-2020-0032	—
Alloy C-276	03031-2020-0033	—
Alloy 400	03031-2020-0034	—
Gold-plated Alloy 400	03031-2020-0036	—
Gold-plated 316 SST	03031-2020-0037	—

Range 4, 0 to 400 psia/40 psia		
316L SST	03031-2020-0042	—
Alloy C-276	03031-2020-0043	—
Alloy 400	03031-2020-0044	—
Gold-plated Alloy 400	03031-2020-0046	—
Gold-plated 316 SST	03031-2020-0047	—

Electronics board assemblies	Part number
4-20 mA HART Standard	03031-0001-0002
4-20 mA HART NAMUR compliant	03031-0001-0003
1-5 Vdc HART Low Power	03031-0001-1001
FOUNDATION fieldbus	03031-0001-2001
PROFIBUS PA fieldbus	03031-0001-2101
LCD display	Part number
LCD Display Kits	
4-20 mA HART - Aluminum	03031-0193-0101
4-20 mA HART - 316 SST	03031-0193-0111
1-5 Vdc HART Low Power - Aluminum	03031-0193-0001
1-5 Vdc HART Low Power - 316 SST	03031-0193-0011
Fieldbus (FOUNDATION or PROFIBUS PA) - Aluminum	03031-0193-0104
Fieldbus (FOUNDATION or PROFIBUS PA) - 316 SST	03031-0193-0112
LCD Display Only	
4-20 mA HART	03031-0193-0103
1-5 Vdc HART Low Power	03031-0193-0003
Fieldbus (FOUNDATION or PROFIBUS PA)	03031-0193-0105
Terminal block assemblies	Part number
4-20 mA HART Output	
Standard terminal block	03031-0332-0003
Transient terminal block (option T1)	03031-0332-0004
1-5 Vdc HART Low Power Output	
Standard terminal block	03031-0332-1001
Transient terminal block (option T1)	03031-0332-1002
Fieldbus (FOUNDATION or PROFIBUS PA)	
Standard terminal block	03031-0332-2001
Transient terminal block (option T1)	03031-0332-2002
FISCO terminal block	03031-0332-2005

Electrical housings (without terminal block)	Part number
Standard - Aluminum	
1/2 - 14 NPT conduit entry	03031-0635-0001
M20 conduit entry	03031-0635-0002
G1/2 conduit entry	03031-0635-0004
Standard - 316 SST	
1/2 - 14 NPT conduit entry	03031-0635-0041
M20 conduit entry	03031-0635-0042
1-5 Vdc HART Low Power - Aluminum	
1/2 - 14 NPT conduit entry	03031-0635-0101
1-5 Vdc HART Low Power - 316 SST	
1/2 - 14 NPT conduit entry	03031-0635-0141
Housing conduit plugs	Part number
1/2 NPT Conduit plug	03031-0544-0003
M20 Conduit plug	03031-0544-0001
G1/2 Conduit plug	03031-0544-0004
Housing covers (include o-ring)	Part number
Field terminal cover - Aluminum	03031-0292-0001
Field terminal cover - 316 SST	03031-0292-0002
HART electronics cover - Aluminum	03031-0292-0001
HART electronics cover - 316 SST	03031-0292-0002
HART LCD Display cover - Aluminum	03031-0193-0002
HART LCD Display cover - 316 SST	03031-0193-0012
Fieldbus extended electronics cover - Aluminum	03031-0292-0003
Fieldbus extended electronics cover - 316 SST	03031-0292-0004
Fieldbus extended LCD Display cover - Aluminum	03031-0193-0007
Fieldbus extended LCD Display cover - 316 SST	03031-0193-0013
Miscellaneous hardware	Part number
Local Zero and Span Kit	03031-0293-0002
External ground screw assembly (option V5)	03031-0398-0001
Flanges	Part number
Differential Coplanar Flange	
316 SST	03031-0388-0022
Cast C-276	03031-0388-0023
Cast Alloy 400	03031-0388-0024
Nickel-plated carbon steel	03031-0388-0025

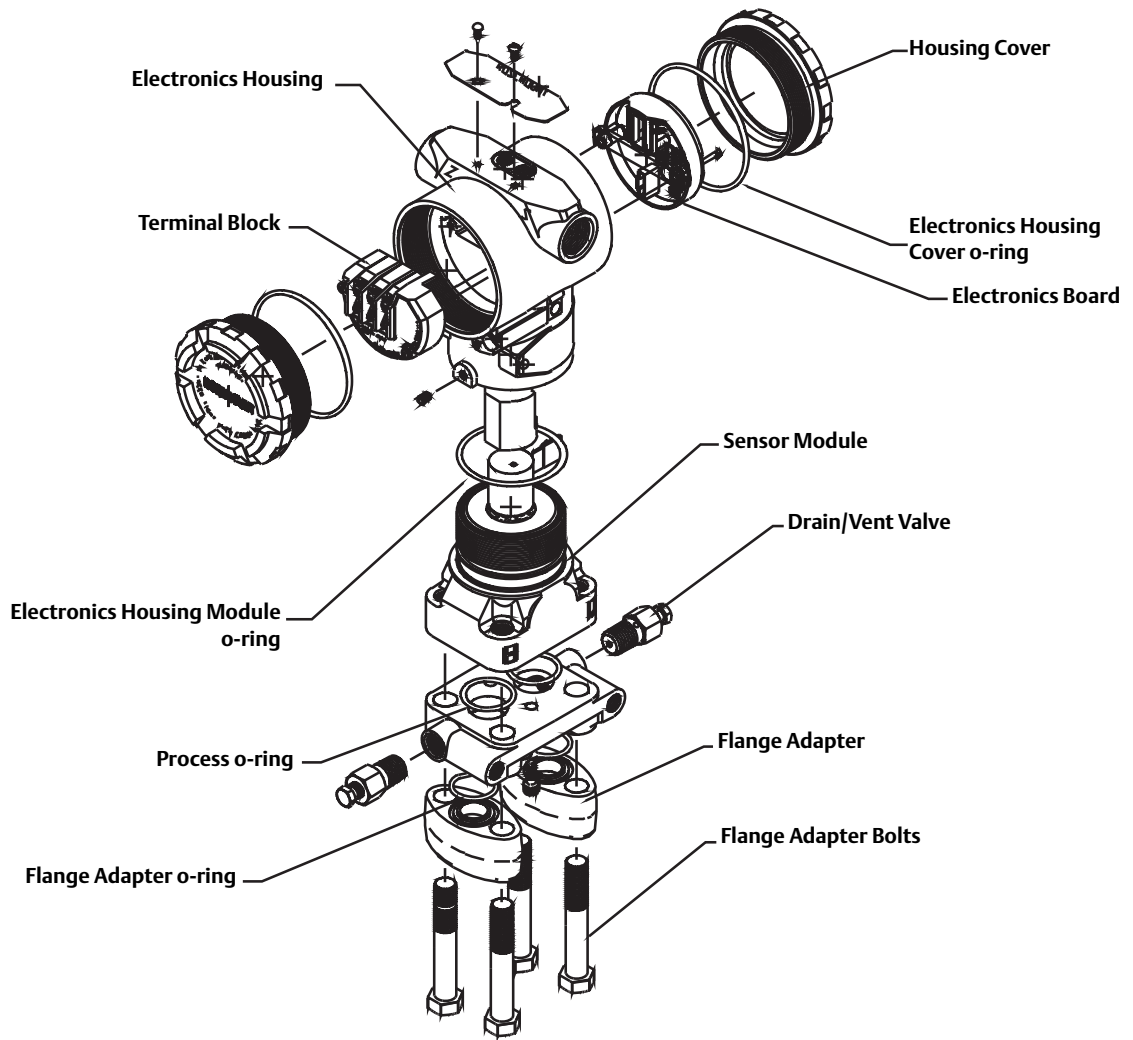
Gage/Absolute Coplanar Flange	
316 SST	03031-0388-1022
Cast C-276	03031-0388-1023
Cast Alloy 40	03031-0388-1024
Nickel-plated carbon steel	03031-0388-1025
Coplanar flange alignment screw (package of 12)	03031-0309-0001
Traditional Flange	
316 SST	03031-0320-0002
Cast C-276	03031-0320-0003
Cast Alloy 400	03031-0320-0004
316 SST - DIN Compliant (Option Code HJ)	03031-1350-0012
Level Flange, Vertical Mount	
2 in., class 150, SST	03031-0393-0221
2 in., class 300, SST	03031-0393-0222
3 in., class 150, SST	03031-0393-0231
3 in., class 300, SST	03031-0393-0232
DIN, DN 50, PN 40	03031-0393-1002
DIN, DN 80, PN 40	03031-0393-1012
Flange adapter kits (each kit contains parts for one DP transmitter or two GP/AP transmitters)	Part number
CS bolts, glass-filled PTFE O-Rings	
SST adapters	03031-1300-0002
Cast Alloy C-276 adapters	03031-1300-0003
Alloy 400 adapters	03031-1300-0004
Nickel-plated carbon steel adapters	03031-1300-0005
SST bolts, glass-filled PTFE O-Rings	
SST adapters	03031-1300-0012
Cast Alloy C-276 adapters	03031-1300-0013
Alloy 400 adapters	03031-1300-0014
Nickel-plated carbon steel adapters	03031-1300-0015
CS bolts, graphite-filled PTFE O-Rings	
SST adapters	03031-1300-0102
Cast Alloy C-276 adapters	03031-1300-0103
Alloy 400 adapters	03031-1300-0104
Nickel-plated carbon steel adapters	03031-1300-0105
SST bolts, graphite-filled PTFE O-Rings	
SST adapters	03031-1300-0112
Cast Alloy C-276 adapters	03031-1300-0113

Alloy 400 adapters	03031-1300-0114
Nickel-plated carbon steel adapters	03031-1300-0115
Flange adapters	Part number
1/2 - 14 NPT Adapters	
316 SST	02024-0069-0002
Cast C-276	02024-0069-0003
Cast Alloy 400	02024-0069-0004
Nickel-plated carbon steel	02024-0069-0005
Socket Weld Adapters	
316 SST	02024-0069-1002
Cast C-276	02024-0069-1003
Cast Alloy 400	02024-0069-1004
O-Ring packages (package of 12)	Part number
Electronics housing, cover	03031-0232-0001
Electronics housing, module	03031-0233-0001
Process flange, glass-filled PTFE (White)	03031-0234-0001
Process flange, graphite-filled PTFE (Black)	03031-0234-0002
Process flange for 3051H, PTFE (White)	02051-0167-0001
Flange adapter, glass-filled PTFE (Light Brown)	03031-0242-0001
Flange adapter, graphite-filled PTFE (Black)	03031-0242-0002
Bolt kits	Part number
COPLANAR FLANGE	
Flange Bolt Kit {44mm (1.75 in.)} (set of 4)	
Carbon steel	03031-0312-0001
316 SST	03031-0312-0002
ASTM A 193, Grade B7M	03031-0312-0003
Alloy K-500	03031-0312-0004
Flange/Adapter Bolt Kit {73mm (2.88 in.)} (set of 4)	
Carbon steel	03031-0306-0001
316 SST	03031-0306-0002
ASTM A 193, Grade B7M	03031-0306-0003
Alloy K-500	03031-0306-0004

TRADITIONAL FLANGE	
Differential Flange/Adapter Bolt Kit {44mm (1.75 in.)} (set of 8)	
Carbon steel	03031-0307-0001
316 SST	03031-0307-0002
ASTM A 193, Grade B7M	03031-0307-0003
Alloy K-500	03031-0307-0004
Gage/Absolute Flange/Adapter Bolt Kit {44mm (1.75 in.)} (set of 6)	
Carbon steel	03031-0307-1001
316 SST	03031-0307-1002
ASTM A 193, Grade B7M	03031-0307-1003
Alloy K-500	03031-0307-1004
Conventional Manifold/Traditional Flange Bolts	
Carbon steel	Use bolts supplied with manifold
316 SST	Use bolts supplied with manifold
Level Flange, Vertical Mount Bolt Kit (Set of 4)	
Carbon steel	03031-0395-0001
316 SST	03031-0395-0002
3051H Process Flange Bolt Kit (Set of 4)	
Carbon Steel	02051-0164-0001
316 SST	02051-0164-0002
Drain/Vent valve kits (each kit contains parts for one transmitter)	Part number
Differential Drain/Vent Kits	
316 SST stem and seat kit	01151-0028-0022
Alloy C-276 stem and seat kit	01151-0028-0023
Alloy K-500 stem and Alloy 400 seat kit	01151-0028-0024
316 SST ceramic ball drain/vent kit	03031-0378-0022
Alloy C-276 ceramic ball drain/vent kit	03031-0378-0023
Alloy 400/K-500 ceramic ball drain/vent kit	03031-0378-0024
Gage/Absolute Drain/Vent Kits	
316 SST stem and seat kit	01151-0028-0012
Alloy C-276 stem and seat kit	01151-0028-0013
Alloy K-500 stem and Alloy 400 seat kit	01151-0028-0014
316 SST ceramic ball drain/vent kit	03031-0378-0012
Alloy C-276 ceramic ball drain/vent kit	03031-0378-0013
Alloy 400/K-500 ceramic ball drain/vent kit	03031-0378-0014

Mounting brackets	Part number
3051C and 3051L Coplanar Flange Bracket kit	
B4 bracket, SST, 2-in. pipe mount, SST bolts	03031-0189-0003
3051T Inline Bracket Kit	
B4 bracket, SST, 2-in. pipe mount, SST bolts	03031-0189-0004
3051C Traditional Flange Bracket Kits	
B1 bracket, 2-in. pipe mount, CS bolts	03031-0313-0001
B2 bracket, panel mount, CS bolts	03031-0313-0002
B3 flat bracket, 2-in. pipe mount, CS bolts	03031-0313-0003
B7 (B1 bracket, SST bolts)	03031-0313-0007
B8 (B2 bracket, SST bolts)	03031-0313-0008
B9 (B3 bracket, SST bolts)	03031-0313-0009
BA (SST B1 bracket, SST bolts)	03031-0313-0011
BC (SST B3 bracket, SST bolts)	03031-0313-0013
3051H Bracket Kits	
B5 universal bracket, 2-in. pipe and panel mount, CS bolts	03051-1081-0001
B6 universal bracket, 2-in. pipe and panel mount, SST bolts	03051-1081-0002
FOUNDATION fieldbus upgrade kit	Part number
Aluminum Housing	03031-0198-0001
316 SST Housing	03031-0198-0002

Figure A-1. Spare parts diagram




Appendix B Product certifications

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Hazardous locations certifications	page 177
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B.1 Overview

This Appendix contains information on Approved manufacturing locations, European directive information, Ordinary Location certification, Hazardous Locations Certifications and approval drawings for HART protocol.

B.2 Safety messages

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

B.2.1 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 this section of the Model 3051 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/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.

Electrical shock can result in death or serious injury.

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

⚠ WARNING

Cable gland and plug must comply with the requirements listed on the certificates.

B.3 Approved manufacturing locations

Emerson Process Management - Rosemount Inc. — Chanhassen, Minnesota, USA
Emerson Process Management — Wessling, Germany
Emerson Process Management Asia Pacific Private Limited — Singapore
Emerson Process Management — Beijing, China
Emerson Process Management — Daman, India

B.4 European directive information

The most recent revision of the EC declaration of conformity can be found at www.emersonprocess.com.

B.4.1 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).

B.5 Hazardous locations certifications

B.5.1 North american certifications

FM Approvals

- E5** Explosion-Proof and Dust Ignition Proof
Certificate No: OT2H0.AE
Applicable Standards: FM Class 3600 – 1998, FM Class 3615 – 2006, FM Class 3810 – 2005, ANSI/NEMA 250 - 2003
Markings: Explosion-Proof for Class I, Division 1, Groups B, C, and D.
Dust-Ignition-Proof for Class II, Division 1, Groups E, F, G; and Class III, Division 1.
T5 (Ta = -50 °C to +85 °C), Factory Sealed, Enclosure Type 4x
- I5** Intrinsically Safe and Non-Incendive
Certificate No: 1Q4A4.AX
Applicable Standards: FM Class 3600 – 1998, FM Class 3610 – 2010, FM Class 3611 – 2004, FM Class 3810 – 2005
Markings: 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 when connected per Rosemount drawing 03031-1019 and 00375-1130 (When used with a Field Communicator);
Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Temperature Code: T4 (Ta = -50 °C to +40 °C), T3 (Ta = -50 °C to +85 °C), Enclosure Type 4x.
- Special Conditions for Safe Use:**
- 1.) The Rosemount 3051 transmitter housing contains aluminum and is considered a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact and friction.
 - 2.) The Rosemount 3051 transmitter with the transient terminal block (Option code T1) will not pass the 500Vrms dielectric strength test and this must be taken into account during installation.

CSA international

All CSA hazardous location approved transmitters are certified to ANSI/ISA 12.27.01-2003.

- E6** Explosion-Proof, Dust Ignition Proof and Class I Division 2
Certificate No.: 1053834
Applicable Standards: CSA Std. C22.2 No. 142 – M1987, CSA Std. C22.2 No. 30 – M1986, CSA Std. C22.2 No. 213 – M1987, ANSI/ISA 12.27.01-2003.
Markings: 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. Enclosure type 4X, factory sealed. Single Seal (See Drawing 03031-1053).
- I6** Intrinsically Safe
Certificate No.: 1053834
Applicable Standards: CSA Std. C22.2 No. 142 – M1987, CSA Std. C22.2 No. 157 – 92, ANSI/ISA 12.27.01-2003.
Markings: Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03031-1024. Temperature Code T3C. Enclosure Type 4X, Single Seal. Single Seal (See Drawing 03031-1053).

European certifications

- E8** ATEX Flame-Proof
 Certification No.: KEMA 00ATEX2013X
 Applicable Standards: EN60079-0: 2009, EN60079-1: 2007, EN60079-26: 2007, IEC 60079-0:2011
 Markings: ⓂII 1/2 G, Ex d IIC T6 ($-50 \leq T_a \leq 65 \text{ }^\circ\text{C}$) Ga/Gb,
 Ex d IIC T5 ($-50 \leq T_a \leq 80 \text{ }^\circ\text{C}$) Ga/Gb,
 CE1180

Process Temp	Ambient Temp	Temp Class
-50 to 65	-50 to 65	T6
-50 to 80	-50 to 80	T5

Special Conditions for Safe Use (X):

- 1.) In case of repair, contact the manufacturer for information on the dimensions of the flameproof joints.
- 2.) 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.
- 3.) The capacitance of the wrap around label to the enclosure, 1.6E-9 F, exceeds the limit in Table 9 of IEC 60079-0. The user shall determine suitability for the specific application.
- 4.) Wait at least 5 minutes after powering down device before opening covers, when a hazardous atmosphere is present.

- I1** ATEX Intrinsic Safety and Dust
 Certificate No.: BAS 97ATEX1089X
 Applicable Standards: IEC60079-0:2011, EN60079-11: 2012, EN60079-31: 2009,
 Markings: ⓂII 1 GD, Ex ia IIC T4 Ga ($-60 \leq T_a \leq +70 \text{ }^\circ\text{C}$),
 Ex ia IIC T5 Ga ($-60 \leq T_a \leq +40 \text{ }^\circ\text{C}$)
 Ex ta IIIC T50 °C T₅₀₀ 60°C Da, U_i = 30 V I_i = 200 mA P_i = 0.9 W C_i = 0.012 μF, IP66,
 CE1180

Special Conditions for Safe Use (X):

- 1.) The apparatus is not capable of withstanding the 500 V insulation test required by EN60079-11. This must be taken into account when installing the apparatus.
- 2.) The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however care should be taken to protect it from impact or abrasion if located in Zone 0.

- N1** ATEX Non-incendive/Type n and Dust
 Certification No.: BAS 00ATEX3105X
 Applicable Standards: IEC60079-0:2011, EN60079-15:2010, EN60079-31:2009
 Markings: Ⓜ II 3 GD, Ex nA IIC Gc T5 ($-40 \leq T_a \leq 70 \text{ }^\circ\text{C}$),
 Ex ta IIIC T50 $^\circ\text{C}$ T₅₀₀ 60 $^\circ\text{C}$ Da, IP66
 CE 1180

Specific Conditions for Safe Use (X):

- 1.) The apparatus is not capable of withstanding the 500 V insulation test required by EN60079-15. This must be taken into account when installing the apparatus.
- 2.) 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. In case of repair, contact the manufacturer for more information on the dimensions of the flameproof joints.

Japanese certifications

- E4** TIIS Flame-Proof

Certificate	Description
TC15850	3051C/D/1 4–20 mA HART — no meter
TC15851	3051C/D/1 4–20 mA HART — with meter
TC15854	3051T/G/1 4–20 mA HART, SST, Silicon — no meter
TC15855	3051T/G/1 4–20 mA HART, Alloy C-276, Silicon — no meter
TC15856	3051T/G/1 4–20 mA HART, SST, Silicon — with meter
TC15857	3051T/G/1 4–20 mA HART, Alloy C-276, Silicon — with meter

Markings: Ex d IIC T6

- I4** TIIS Intrinsic Safety
 Certification No.: TC16406
 Markings: Ex ia IIC T4

IECEx certifications

- E7** IECEx Flame-proof
 Certification No.: IECEx KEM 09.0034X
 Applicable Standards: IEC60079-0:2011, IEC60079-1:2007-04, IEC60079-26:2006,
 Markings: Ex d IIC T5...T6 Ga/Gb, T5 ($-50 \text{ }^\circ\text{C} \leq T_a \leq 80 \text{ }^\circ\text{C}$)/T6 ($-50 \text{ }^\circ\text{C} \leq T_a \leq 65 \text{ }^\circ\text{C}$)

Process Temp	Ambient Temp	Temp Class
-50 to 65	-50 to 65	T6
-50 to 80	-50 to 80	T5

Conditions of Certification (X):

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

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

3.) The capacitance of the wrap around label to the enclosure, 1.6E-9 F, exceeds the limit in Table 9 of IEC 60079-0. The user shall determine suitability for the specific application.

4.) Wait at least 5 minutes after powering down device before opening covers, when a hazardous atmosphere is present.

I7 IECEx Intrinsic Safety

Certification No.: IECEx BAS 09.0076X

Applicable Standards: IEC60079-0:2011, IEC 60079-11:2006

Markings: Ex ia IIC T5 Ga (-60°C ≤ Ta ≤ 40°C), Ex ia IIC T4 Ga (-60°C ≤ Ta ≤ 70°C)

Ui = 30V, li = 200mA, Pi = 0.9W, Ci = 0.012 μF, Li = 0

Conditions of Certification (X):

1.) If the apparatus is fitted with an optional 90V transient suppressor, it is not capable of withstanding the 500V insulation test required by IEC 60079-11. This must be taken into account when installing the apparatus.

2.) The enclosure may be made of aluminum alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in Zone 0.

N7 IECEx Type 'n'

Certification No.: IECEx BAS 09.0077X

Applicable Standards: IEC60079-0:2011, IEC60079-15:2010

Markings: Ex nA IIC T5 Gc (-40 ≤ Ta ≤ 70 °C)

Conditions of Certification (X):

The apparatus is not capable of withstanding the 500V insulation test required by IEC 60079-15. This must be taken into account when installing the apparatus.

Inmetro certifications

E2 Flameproof

Certificate No: CEPEL 97.0073X (Mfg USA and Singapore)

Certificate No: CEPEL 07.1383X (Mfg Brazil)

Applicable Standards: IEC60079-0:2008, IEC60079-1:2009, IEC60079-26:2008, IEC60529:2009

Markings: Ex d IIC T6 Ga/Gb (-50°C ≤ Ta ≤ +65°C)

Ex d IIC T5 Ga/Gb (-50°C ≤ Ta ≤ +80°C)

IP66W

I2 Intrinsic Safety

Certificate No.: CEPEL 97.0072X (Mfg USA and Singapore)

Certificate No.: CEPEL 07.1412X (Mfg Brazil)

Applicable Standards: IEC60079-0:2008, IEC60079-11:2009, IEC60079-26:2008, IEC60529:2009

Markings: Ex ia IIC Ga T5 (-20°C ≤ Ta ≤ +40°C)

Ex ia IIC Ga T4 (-20°C ≤ Ta ≤ +70°C)

IP66W, Ui=30V, li= 200mA, Pi=0.9W, Ci=0.012uF, Li=Desprezivel

Specific Conditions for Safe Use (X):

See Certificate.

China certifications

- E3** Flameproof and Dust
NEPSI Certificate No.: GYJ091065X
Applicable Standards: GB3836.1-2000, GB3836.4-2000, GB4208-1993, GB12476-2000
Markings: Ex d II C T5/T6, -50°~+80°C (T5), -50°~+65°C (T6), DIP A21 TA T90°C, IP66

Specific Conditions for Safe Use (X):

The symbol “X” placed after the certificate number indicates special condition for safe use, that is the transmitter contains a thin wall diaphragm. Installation, maintenance, and use shall not only take into account the environmental condition, but also follow the manufacturer’s instructions.

2.1 The relation between ambient temperature range and temperature class is as follows:

T_a	Temperature class
-50 °C to 80 °C	T5
-50 °C to 65 °C	T6

When used in combustible dust environment, the maximum ambient temperature is 80 °C.

2.2 The earth connection facility in the enclosure should be connected reliably.

2.3 Cable entry certified by notified body with type of protection Ex d II C in accordance with GB3836.1-2000 and GB3836.2-2000, should be applied when installing in hazardous location. When used in combustible dust environment, cable entry in accordance with IP66 or higher level should be applied.

2.4 Obey the warning “Keep tight when the circuit is alive.”

2.5 End users are not permitted to change any component’s insides.

2.6 When installing, using, and maintaining the transmitter, observe the following standards

GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”

GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”

GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”

GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”

GB12476.2-2006 “Electrical apparatus for use in the presence of combustible dust Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation-Selection, installation and maintenance”

GB15577-2007 “Safety regulations for dust explosion prevention and protection”

- I3** Intrinsic Safety and Dust
NEPSI Certificate No: GYJ091066X
Applicable Standards: GB3836.1-2000, GB3836.2-2000, GB4208-1993, GB12476-2000
Markings: Ex ia II C T4/T5, -60°~+40°C (T5), -60°~+70°C (T4), DIP A21 TA T80°C

Specific Conditions for Safe Use (X):

1. The relation between ambient temperature range and temperature class is as following:

T_a	Temperature Class
-60 °C +40 °C	T5
-60 °C +70 °C	T4

When used in combustible dust environment, the maximum ambient temperature is -20 °C+40 °C.

2. The earth connection facility in the enclosure should be connected reliably.
3. The maximum internal parameters of the transmitter are as following:
 $U_i = 30 \text{ V}$, $I_i = 200 \text{ mA}$, $P_i = 0.9 \text{ W}$, $L_i = 0 \text{ mH}$, $C_i = 0.012 \mu\text{F}$
4. End users is not permitted to change any components insides.
5. When installing, using, and maintaining transmitter, observe following standards:
GB3836.1 1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”
GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”
GB12476.2-2006 “Electrical apparatus for use in the presence of combustible dust Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation-Selection, installation and maintenance”
GB15577-2007 “Safety regulations for dust explosion prevention and protection”

$U_i = 30 \text{ V}$
$I_i = 200 \text{ mA}$
$P_i = 1 \text{ W}$
$C_i = 0.012 \mu\text{F}$
$L_i = 0$

- N3** China Type n - Non-Sparking
NEPSI Certificate No.: GYJ101111X
Applicable Standards: GB3836.1-2000, GB3836.8-2003
Markings: Ex nA nL IIC T5 (-40 °C < TA < 70 °C)

Specific Conditions for Safe Use (X):

1. Symbol "X" is used to denote specific conditions of use: The apparatus is not capable of withstanding the 500 V test to earth for one minute. This must be taken into consideration during installation.
2. The ambient temperature range is: $-40\text{ °C} \leq T_a \leq +70\text{ °C}$
3. Maximum input voltage: 42.4 V.
4. Cable glands, conduit or blanking plugs, certified by NEPSI with Ex e or Ex n protection type and IP66 degree of protection provided by enclosure, should be used on external connections and redundant cable entries.
5. Maintenance should be done in non-hazardous location.
6. End users are not permitted to change any components insides, but to settle the problem in conjunction with manufacturer to avoid damage to the product.
7. When installing, using, and maintaining transmitter, observe following standards:
GB3836.1 1997 "Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres"
GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)"
GB3836.16-2006 "Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)"
GB50257-1996 "Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering"

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 – E1, N1

K5 – E5, I5

K6 – E5, I5, E6, I6, E1, I1

K7 – E7, I7, N7

K8 – E8, I1

KA – E1, I1, N1, E6, I6


KB – E5, I5, E1, I1

KC – E5, I5, E1, I1

KD – E5, I5, E6, I6, I1

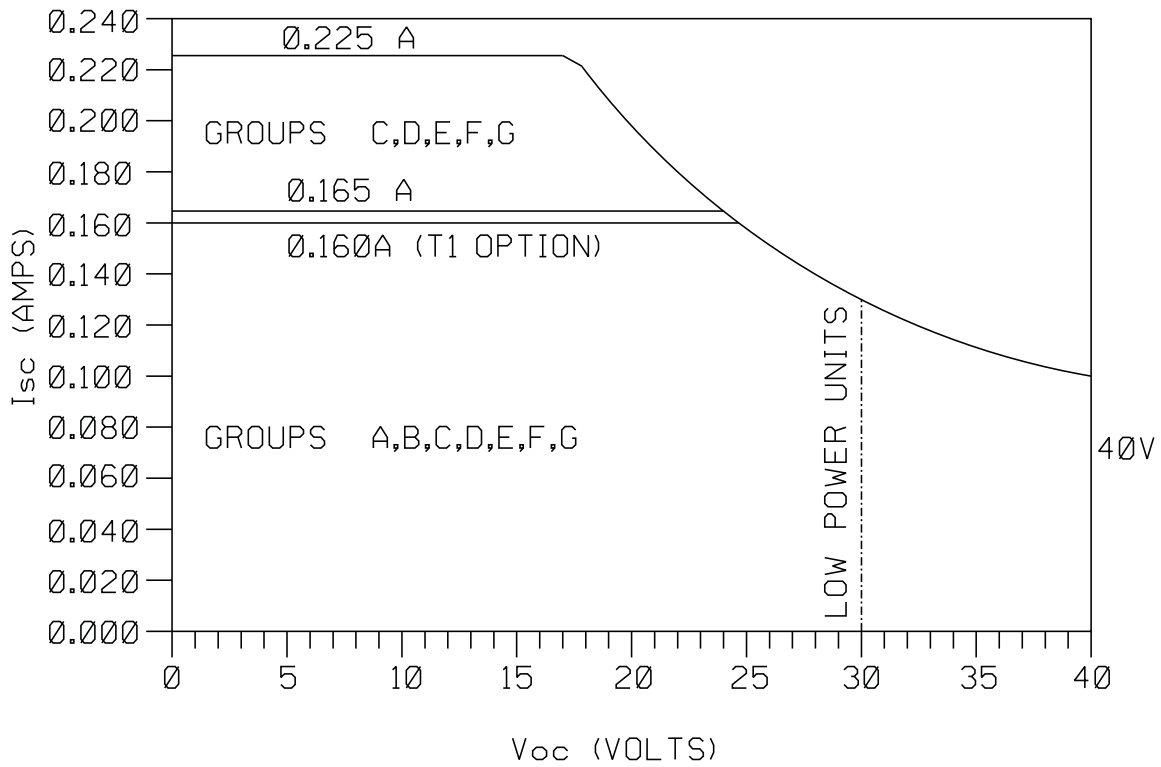
B.6 Approval drawings

B.6.1 Factory mutual 03031-1019

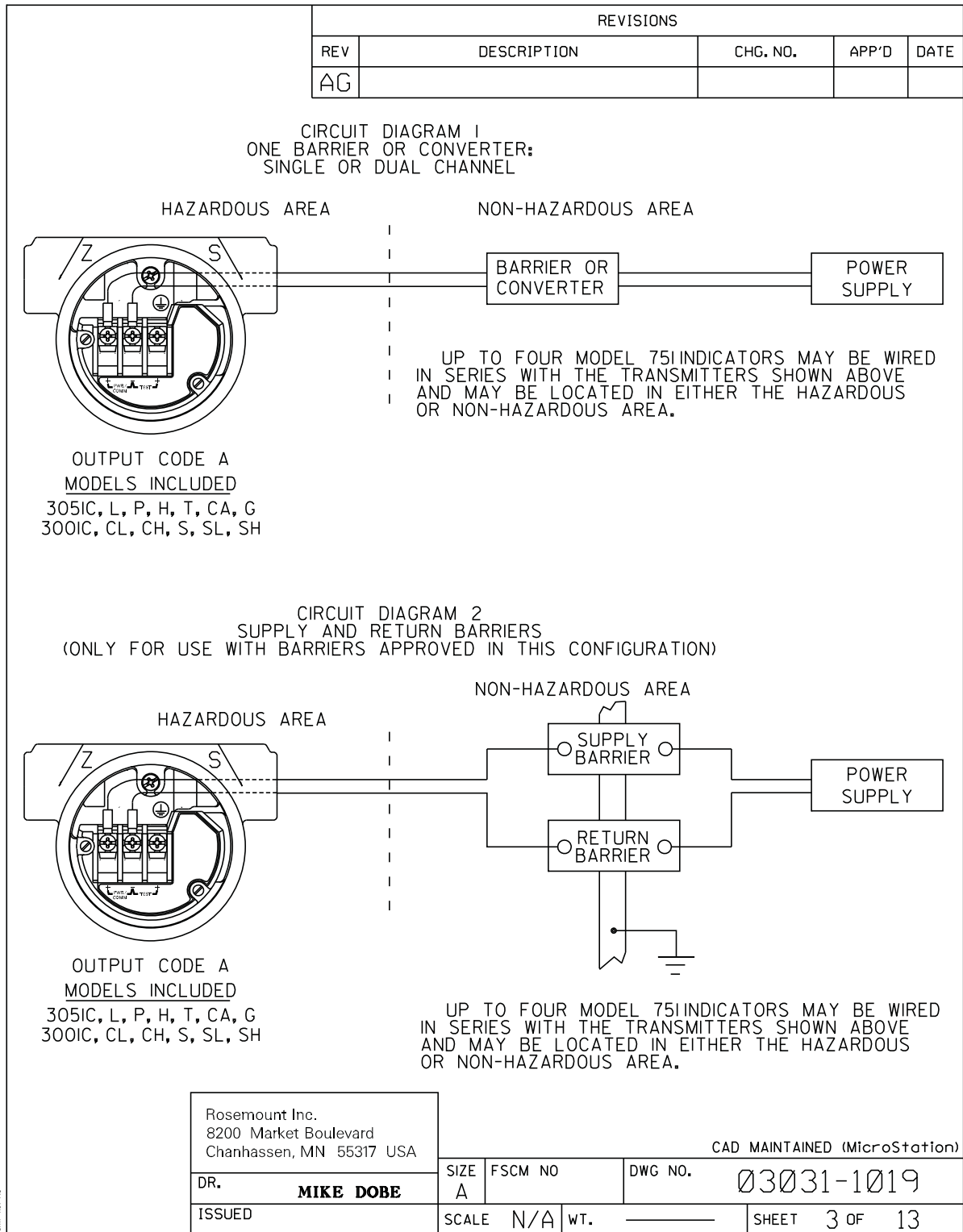
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY	REVISIONS			
	REV	DESCRIPTION	CHG. NO.	APP'D DATE
	AE	ADD 3Ø51G	RTC1Ø19922	J.G. 7/11/Ø5
	AF	ADD FISCO DETAILS	RTC1Ø21913	N.J.H. 7/9/Ø6
	AG	ADD FISCO ENTITY PARAMETERS TO SHT 12	RTC1Ø22876	N.J.H. 10/27/Ø6
<p>ENTITY APPROVALS FOR</p> <p>3Ø51C 3ØØ1C 3Ø51L 3ØØ1CL 3Ø51P 3ØØ1CH 3Ø51H 3ØØ1S 3Ø51CA 3ØØ1SL 3Ø51T 3ØØ1SH 3Ø51G</p> <p>OUTPUT CODE A (4-2Ø mA HART) I.S. SEE SHEETS 2-5 OUTPUT CODE M (LOW POWER) I.S. SEE SHEETS 6-7 OUTPUT CODE F/W (FIELDBUS) I.S. SEE SHEETS 8-12 ALL OUTPUT CODES NONINCENDIVE SEE SHEET 13</p> <p>THE ROSEMOUNT TRANSMITTERS LISTED ABOVE ARE F.M. APPROVED AS INTRINSICALLY SAFE WHEN USED IN CIRCUIT WITH F.M. APPROVED BARRIERS WHICH MEET THE ENTITY PARAMETERS LISTED IN THE CLASS I, II, AND III, DIVISION 1 GROUPS INDICATED, TEMP CODE T4. ADDITIONALLY, THE ROSEMOUNT 751 FIELD SIGNAL INDICATOR IS F.M. APPROVED AS INTRINSICALLY SAFE WHEN CONNECTED IN CIRCUIT WITH ROSEMOUNT TRANSMITTERS (FROM ABOVE) AND F.M. APPROVED BARRIERS WHICH MEET THE ENTITY PARAMETERS LISTED FOR CLASS I, II, AND III, DIVISION 1, GROUPS INDICATED, TEMP CODE T4.</p> <p>TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.</p>				
CAD MAINTAINED (MicroStation)				
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES (mm). REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH I25 -TOLERANCE- .X ± .1 [2,5] .XX ± .Ø2 [Ø,5] .XXX ± .Ø1Ø [Ø,25] FRACTIONS ± 1/32 ANGLES ± 2' DO NOT SCALE PRINT	CONTRACT NO.	 ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA		
	DR. MIKE DOBE 03/21/89			
	CHK'D	SIZE	FSCM NO	DWG NO.
	APP'D. KELLY ORTH 03/22/89	APP'D. GOVT.	A	
		SCALE	N/A	WT. _____ SHEET 1 OF 13

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BARRIER PARAMETERS (APPLICABLE TO OUTPUT CODES A & M)
 $P_{max} = 1WATT$



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DR.	MIKE DOBE	SIZE A	FSCM NO	DWG NO. 03031-1019
ISSUED		SCALE N/A	WT. _____	SHEET 2 OF 13



REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
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ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (V_{OC} OR V_t) AND MAX. SHORT CIRCUIT CURRENT (I_{SC} OR I_t) AND MAX. POWER ($V_{OC} \times I_{SC}/4$) OR ($V_t \times I_t/4$), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (V_{MAX}), MAXIMUM SAFE INPUT CURRENT (I_{MAX}), AND MAXIMUM SAFE INPUT POWER (P_{MAX}) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (C_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (L_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

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

CLASS I, DIV. 1, GROUPS A AND B

$V_{MAX} = 40V$	V_t OR V_{OC} IS LESS THAN OR EQUAL TO 40V
$I_{MAX} = 165mA$	I_t OR I_{SC} IS LESS THAN OR EQUAL TO 165mA
$P_{MAX} = 1 \text{ WATT}$	$(\frac{V_t \times I_t}{4})$ OR $(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
$C_i = .01\mu f$	C_a IS GREATER THAN $.01\mu f$
$L_i = 10\mu H$	L_a IS GREATER THAN $10\mu H$

* FOR T1 OPTION:

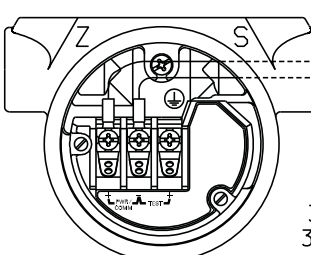
$I_{max} = 160mA$	I_t OR I_{SC} IS LESS THAN OR EQUAL TO 160mA
$L_i = 1.05mH$	L_a IS GREATER THAN 1.05mH

CLASS I, DIV. 1, GROUPS C AND D

$V_{MAX} = 40V$	V_t OR V_{OC} IS LESS THAN OR EQUAL TO 40V
$I_{MAX} = 225mA$	I_t OR I_{SC} IS LESS THAN OR EQUAL TO 225mA
$P_{MAX} = 1 \text{ WATT}$	$(\frac{V_t \times I_t}{4})$ OR $(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
$C_i = .01\mu f$	C_a IS GREATER THAN $.01\mu f$
$L_i = 10\mu H$	L_a IS GREATER THAN $10\mu H$

* FOR T1 OPTION:

$L_i = 1.05mH$	L_a IS GREATER THAN 1.05mH
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HAZARDOUS AREA

NON-HAZARDOUS AREA

ASSOCIATED APPARATUS

(SEE SHEET 3)

OUTPUT CODE A
MODELS INCLUDED
 305IC, L, P, H, T, CA, G
 300IC, CL, CH, S, SL, SH

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DR. MIKE DOBE	SIZE A	FSCM NO	DWG NO. 03031-1019
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MODEL 3051G

FOR OUTPUT CODE A

CLASS I, DIV. 1, GROUPS A AND B

$V_{MAX} = 30V$	V_t or V_{oc} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 165mA$	I_t or I_{sc} IS LESS THAN OR EQUAL TO 165mA
$P_{MAX} = 1 WATT$	$(V_{oc} \times I_{sc}/4)$ or $(V_t \times I_t/4)$ IS LESS THAN OR EQUAL TO 1 WATT
$C_l = 0.01 \mu F$	C_A IS GREATER THAN $0.01 \mu F + C_{CABLE}$
$L_l = 10 \mu H$	L_A IS GREATER THAN $10 \mu H + L_{CABLE}$

FOR T1 OPTION:

$I_{MAX} = 160mA$	I_t or I_{sc} IS LESS THAN OR EQUAL TO 145mA
$L_l = 1.06 mH$	L_A IS GREATER THAN $1.06 mH + L_{CABLE}$

CLASS I, DIV. 1, GROUPS C AND D

$V_{MAX} = 30V$	V_t or V_{oc} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 225mA$	I_t or I_{sc} IS LESS THAN OR EQUAL TO 225mA
$P_{MAX} = 1 WATT$	$(V_{oc} \times I_{sc}/4)$ or $(V_t \times I_t/4)$ IS LESS THAN OR EQUAL TO 1 WATT
$C_l = 0.01 \mu F$	C_A IS GREATER THAN $0.01 \mu F + C_{CABLE}$
$L_l = 10 \mu H$	L_A IS GREATER THAN $10 \mu H + L_{CABLE}$

FOR T1 OPTION:

$L_l = 1.06 mH$	L_A IS GREATER THAN $1.06 mH + L_{CABLE}$
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DR. Myles Lee Miller
ISSUED

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SIZE A	FSCM NO	DWG NO. 03031-1019
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REVISIONS				
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FOR OUTPUT CODE M

CLASS I, DIV. 1, GROUPS A AND B

$V_{MAX} = 30V$	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 165mA$	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 165mA
$P_{MAX} = 1 \text{ WATT}$	$(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
$C_I = .042\mu f$	C_A IS GREATER THAN $.042\mu f$
$L_I = 10\mu H$	L_A IS GREATER THAN $10\mu H$

* FOR T1 OPTION:

$L_I = 0.75mH$	L_A IS GREATER THAN $0.75mH$
----------------	--------------------------------

CLASS I, DIV. 1, GROUPS C AND D

$V_{MAX} = 30V$	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 225mA$	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 225mA
$P_{MAX} = 1 \text{ WATT}$	$(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
$C_I = .042\mu f$	C_A IS GREATER THAN $.042\mu f$
$L_I = 10\mu H$	L_A IS GREATER THAN $10\mu H$

* FOR T1 OPTION:

$L_I = 0.75mH$	L_A IS GREATER THAN $0.75mH$
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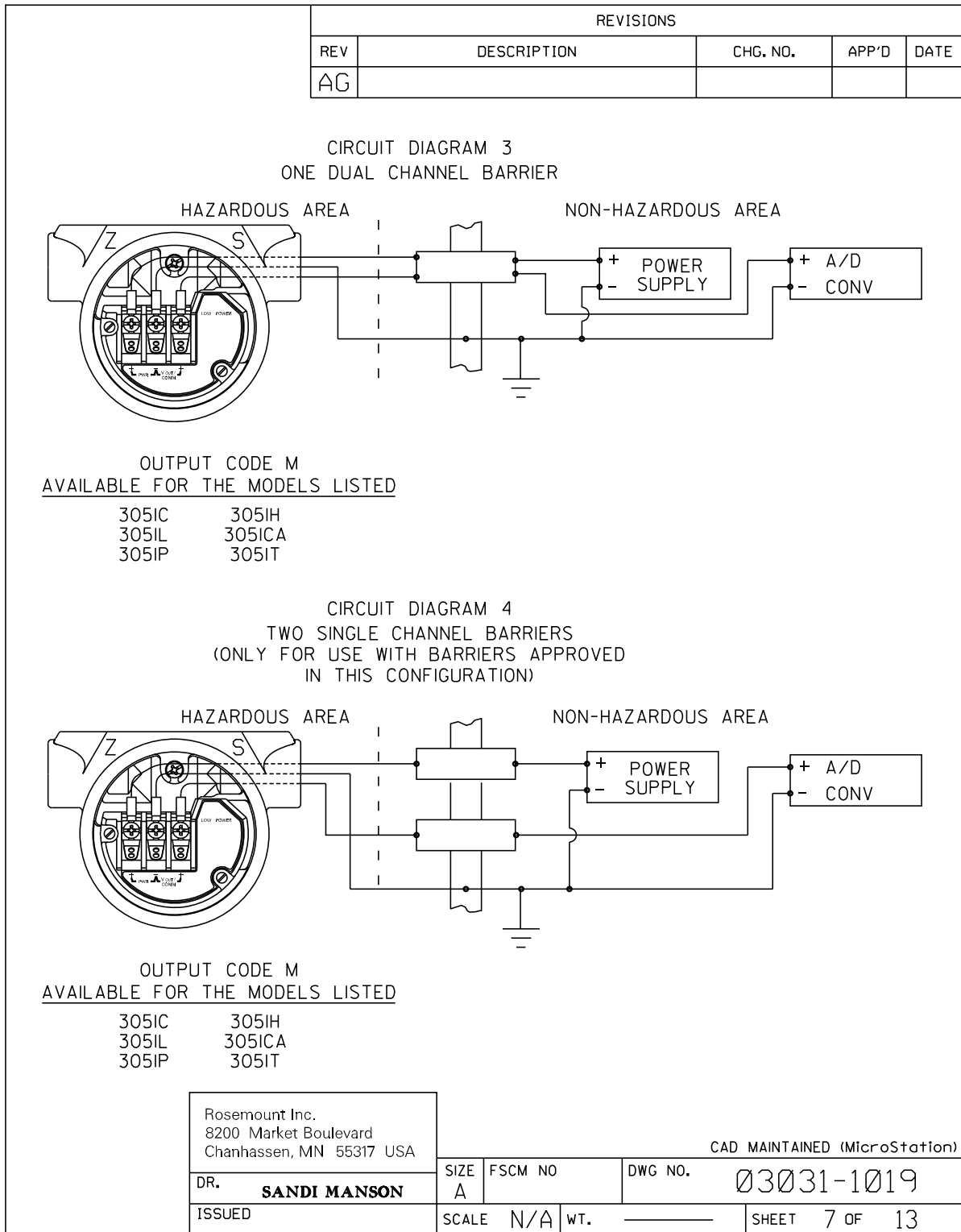
OUTPUT CODE M
AVAILABLE FOR THE MODELS LISTED

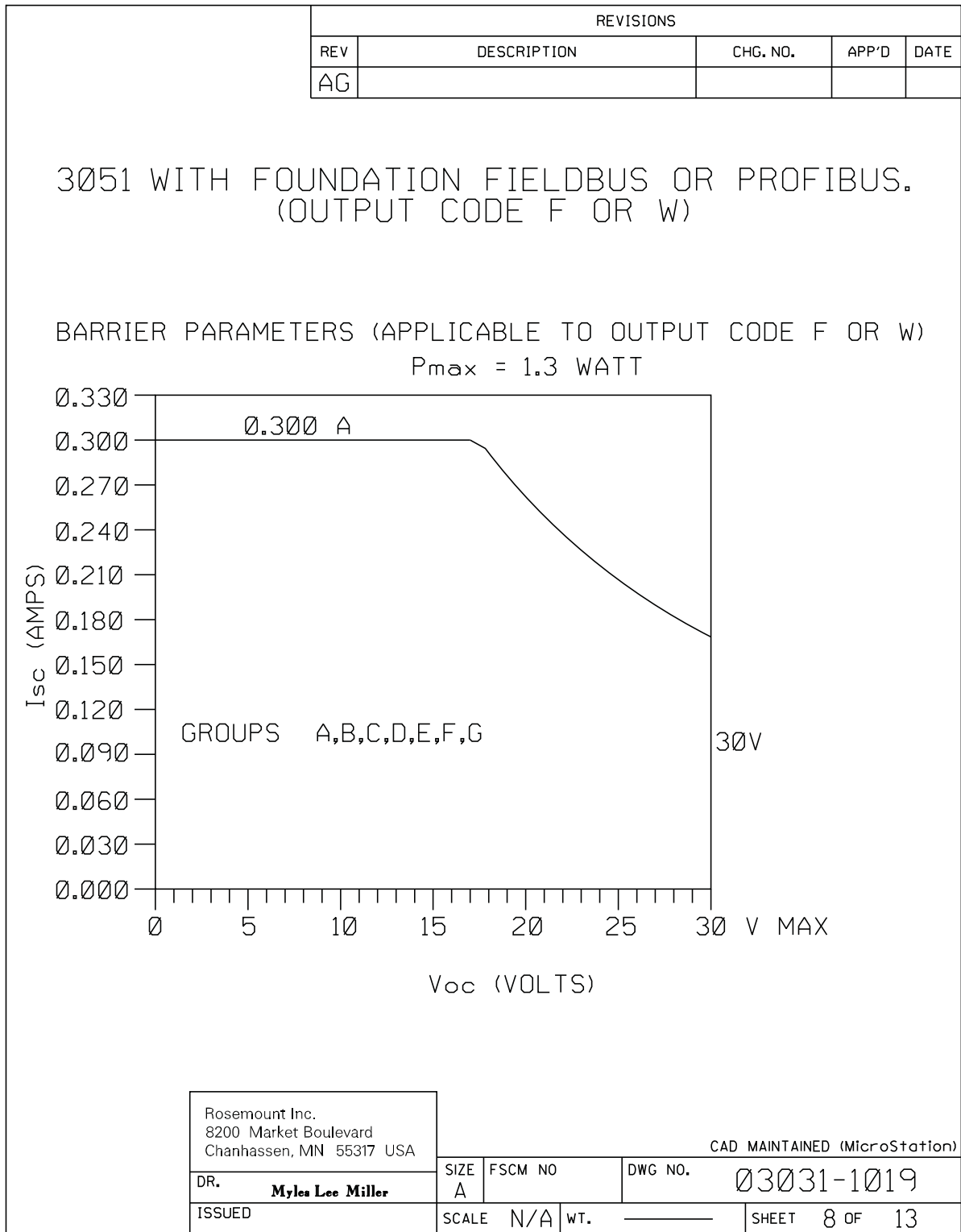
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305IL	305ICA
305IP	305IT

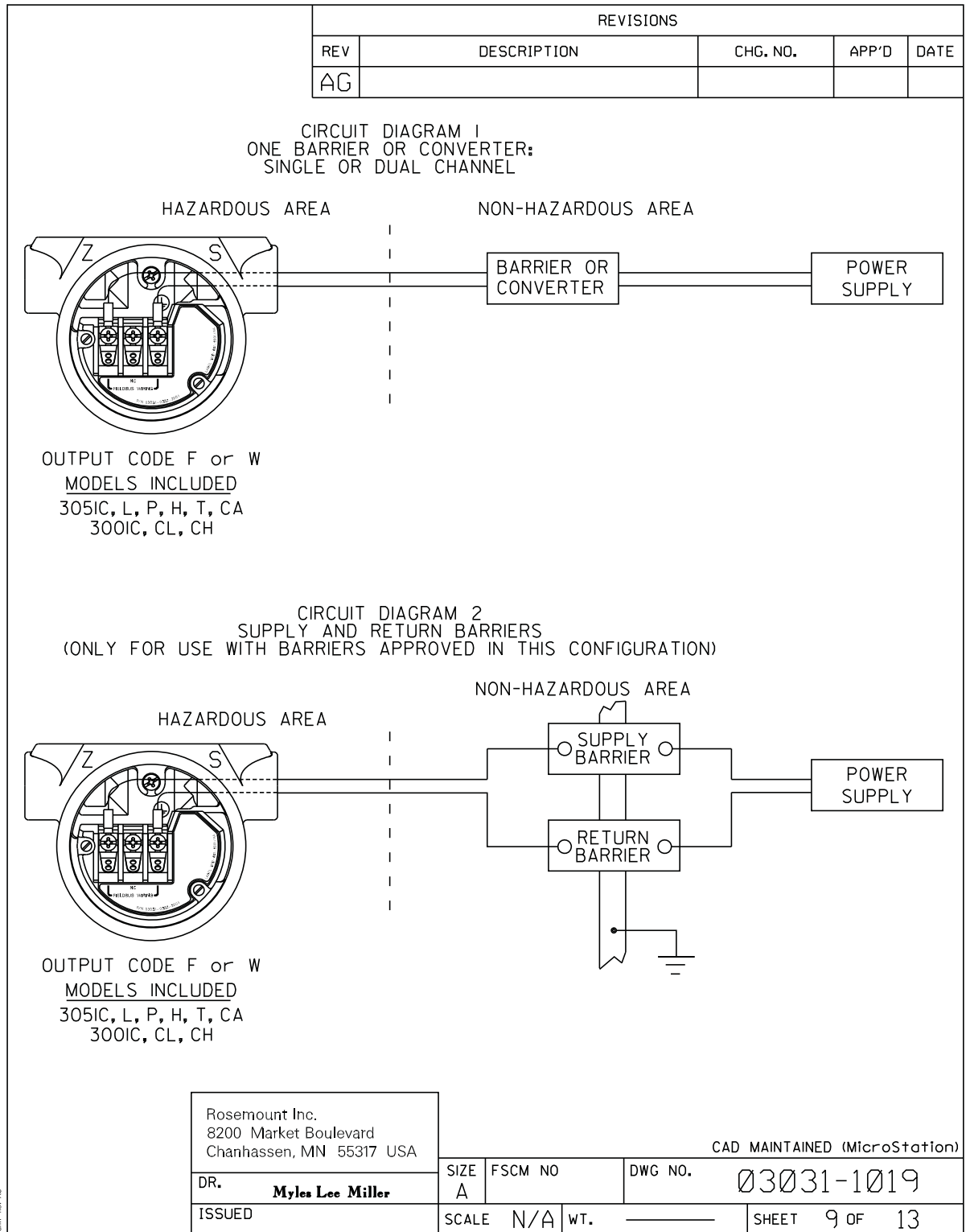
Rosemount Inc.
8200 Market Boulevard
Chanasssen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR.	MIKE DOBE	SIZE	FSCM NO	DWG NO.	03031-1019
ISSUED		SCALE	N/A	WT.	SHEET 6 OF 13







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ENTITY CONCEPT APPROVALS

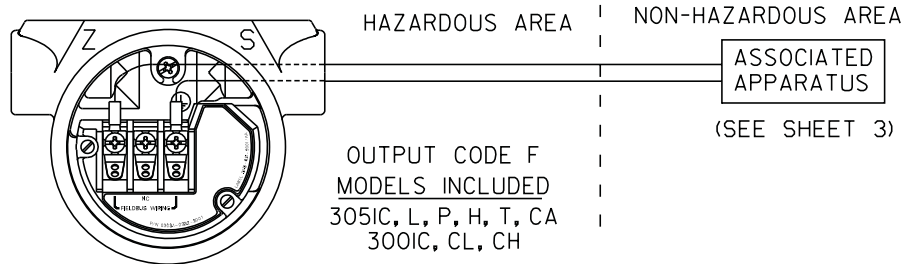
THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (V_{oc} OR V_t) AND MAX. SHORT CIRCUIT CURRENT (I_{sc} OR I_t) AND MAX. POWER ($V_{oc} \times I_{sc}/4$) OR ($V_t \times I_t/4$), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (V_{max}), MAXIMUM SAFE INPUT CURRENT (I_{max}), AND MAXIMUM SAFE INPUT POWER (P_{max}) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (C_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (L_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

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

FOR OUTPUT CODE F or W

CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_T OR V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_T OR I_{SC} IS LESS THAN OR EQUAL TO 300mA
$P_{MAX} = 1.3 \text{ WATT}$	$(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
$C_i = 0 \mu f$	C_A IS GREATER THAN $0 \mu f$
$L_i = 0 \mu H$	L_A IS GREATER THAN $0 \mu H$



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Chanhassen, MN 55317 USA

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DR.	Myles Lee Miller	SIZE	A	FSCM NO		DWG NO.	03031-1019
ISSUED		SCALE	N/A	WT.		SHEET	10 OF 13

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FISCO CONCEPT APPROVALS

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. FOR THIS INTERCONNECTION TO BE VALID THE VOLTAGE (U_1 or V_{max}), THE CURRENT (I_1 or I_{max}), AND THE POWER (P_1 or P_{ma}) THAT INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE, INCLUDING FAULTS, MUST BE EQUAL OR GREATER THAN THE VOLTAGE (U_0 , V_{oc} , or V_t), THE CURRENT (I_0 , I_{sc} , or I_t), AND THE POWER (P_0 or P_{max}) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. ALSO, THE MAXIMUM UNPROTECTED CAPACITANCE (C_1) AND THE INDUCTANCE (L_1) OF EACH APPARATUS (BESIDES THE TERMINATION) CONNECTED TO THE FIELD BUS MUST BE LESS THAN OR EQUAL TO 5nF AND 10μH RESPECTIVELY. ONLY ONE ACTIVE DEVICE IN EACH SECTION (USUALLY THE ASSOCIATED APPARATUS) IS ALLOWED TO CONTRIBUTE THE DESIRED ENERGY FOR THE FIELD BUS SYSTEM. THE ASSOCIATED APPARATUS' VOLTAGE U_0 (or V_{oc} or V_t) IS LIMITED TO A RANGE OF 14V TO 24 V.D.C. ALL OTHER EQUIPMENT COMBINED IN THE BUS CABLE MUST BE PASSIVE (THEY CANNOT PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50 μA FOR EACH CONNECTED DEVICE) SEPARATELY POWERED EQUIPMENT REQUIRES A GALVANIC ISOLATION TO AFFIRM THAT THE INTRINSICALLY SAFE FIELD BUS CIRCUIT WILL REMAIN PASSIVE. THE PARAMETER OF THE CABLE USED TO INTERCONNECT THE DEVICES MUST BE IN THE FOLLOWING RANGE:

LOOP RESISTANCE R': 15...150 OHM/km
 INDUCTANCE PER UNIT LENGTH L': 0.4...1mH/KM
 CAPACITANCE PER UNLIT LENGTH C': 80...200nF

$C' = C' \text{ LINE/LINE} + 0.5C' \text{ LINE/SCREEN}$, IF BOTH LINES ARE FLOATING, OR
 $C' = C' \text{ LINE/LINE} + C' \text{ LINE/SCREEN}$, IF THE SCREEN IS CONNECTED TO ONE LINE
 TRUNK CABLE LENGTH: ≤ 1000 m
 SPUR CABLE LENGTH: ≤ 30 m
 SPLICE LENGTH: ≤ 1 m

AN APPROVED INFALLIBLE LINE TERMINATION TO EACH END OF THE TRUNK CABLE, WITH THE FOLLOWING PARAMETERS IS APPROPRIATE:

$R = 90...100 \text{ OHMS}$ $C = 2.2\mu F$

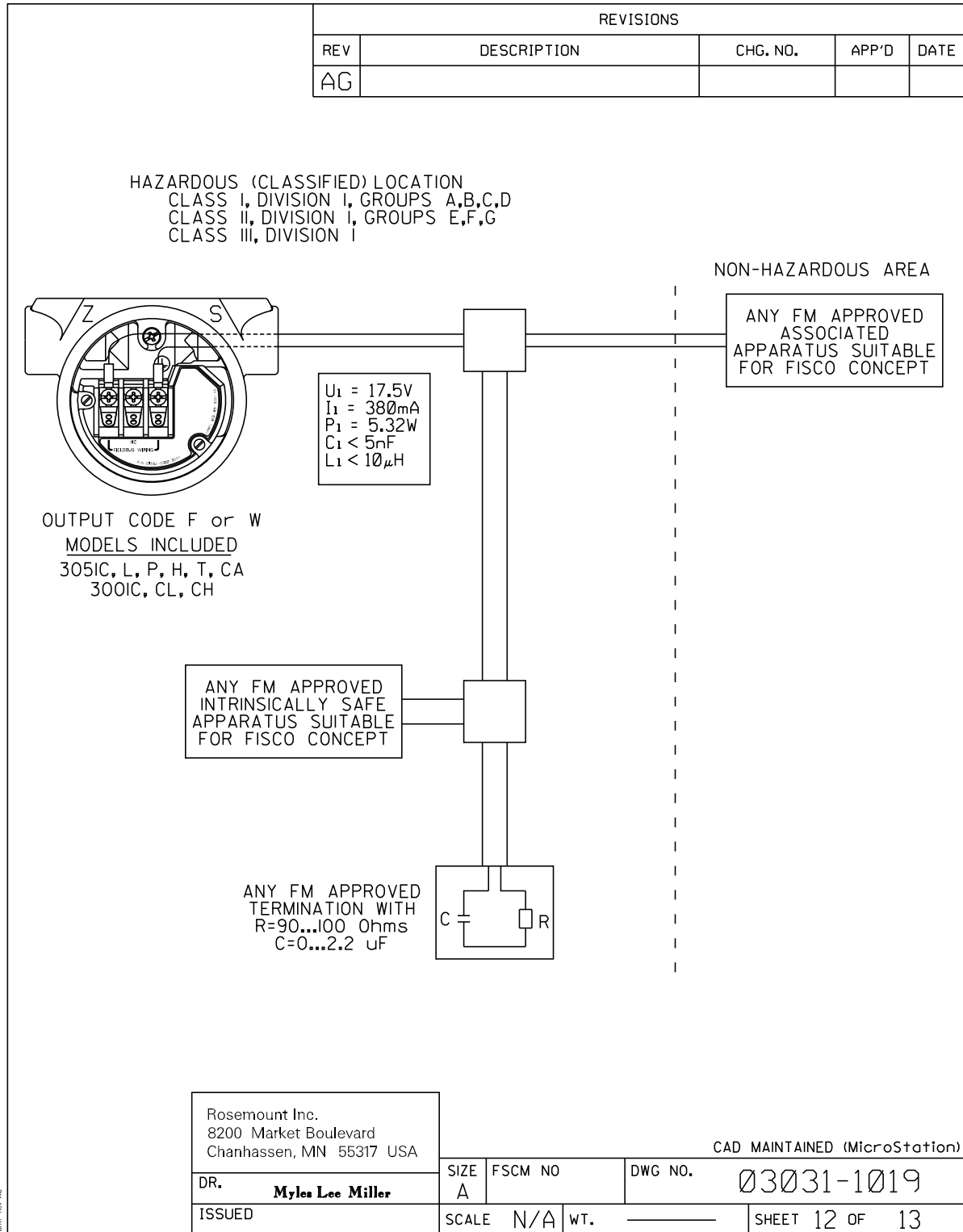
AN ALLOWED TERMINATION MIGHT ALREADY BE LINKED IN THE ASSOCIATED APPARATUS. DUE TO I.S. REASONS, THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED. IF THE RULES ABOVE ARE FOLLOWED, UP TO A TOTAL LENGTH OF 1000 m (THE SUMMATION OF TRUNK AND ALL SPUR CABLES), THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT DAMAGE THE INTRINSIC SAFETY OF THE SYSTEM.

NOTES:
INTRINSICALLY SAFE CLASS I, DIV. 1, GROUPS A, B, C, D

1. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250 V.
2. CAUTION: ONLY USE SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING TEMPERATURE.
3. WARNING: REPLACEMENT OF COMPONENTS MAY DAMAGE INTRINSIC SAFETY.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA	CAD MAINTAINED (MicroStation)			
DR. Myles Lee Miller	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">SIZE A</td> <td style="width: 25%;">FSCM NO</td> <td style="width: 60%;">DWG NO. 03031-1019</td> </tr> </table>	SIZE A	FSCM NO	DWG NO. 03031-1019
SIZE A	FSCM NO	DWG NO. 03031-1019		
ISSUED	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">SCALE N/A</td> <td style="width: 20%;">WT. _____</td> <td style="width: 60%;">SHEET 11 OF 13</td> </tr> </table>	SCALE N/A	WT. _____	SHEET 11 OF 13
SCALE N/A	WT. _____	SHEET 11 OF 13		

Form Rev. AC



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**NONINCENDIVE FIELD CIRCUIT
CLASS 1, DIV. 2 LOCATIONS**

NON-HAZARDOUS
LOCATION

DIVISION 2 HAZARDOUS (CLASSIFIED) LOCATION

APPROVED
NONINCENDIVE
SUPPLY

V_{max1}
 C_{I1}
 L_{I1}
 I_{max1}

V_{max2}
 C_{I2}
 L_{I2}
 I_{max2}

V_{max3}
 C_{I3}
 L_{I3}
 I_{max3}

V_{maxN}
 C_{IN}
 L_{IN}
 I_{maxN}

(D)

(D)

(D)

(D)

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

IN NORMAL OPERATION

DEVICES CONTROL THROUGH-CURRENT

PARAMETERS	DEVICE	ROSEMOUNT 3051/3001
V_{oc}	\leq Minimum of $(V_{max1}, V_{max2}, \dots, V_{maxN})$	4-20mA / HART FIELDBUS (F or W)
I_{max1}	$\geq I_{q1} + I_{signal1}$	V_{max} 40v 30v
I_{max2}	$\geq I_{q1} + I_{signal2}$	Maximum normal operating current 22mA 27mA
.	.	C_a .010uF 0uF
.	.	L_a 10uH 0uH
.	.	
I_{maxN}	$\geq I_{qN} + I_{signalN}$	

ROSEMOUNT 3051 TRANSMITTERS ARE CURRENT CONTROLLERS ON INDIVIDUAL PARALLEL BRANCHES WITH RESPECT TO THE POWER SUPPLY. IN NONINCENDIVE INSTALLATIONS THE I_{max} FOR EACH TRANSMITTER IS NOT RELATED TO THE MAXIMUM CURRENT OF THE POWER SUPPLY (I_{sc}) IN THE SAME MANNER AS FOR TRANSMITTER INSTALLED PER I.S. REQUIREMENTS, BECAUSE NONINCENDIVE REQUIREMENTS INCLUDE ONLY NORMAL OPERATING CONDITIONS.

REFERENCE: APPENDIX A7.3 (FM3611)


Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

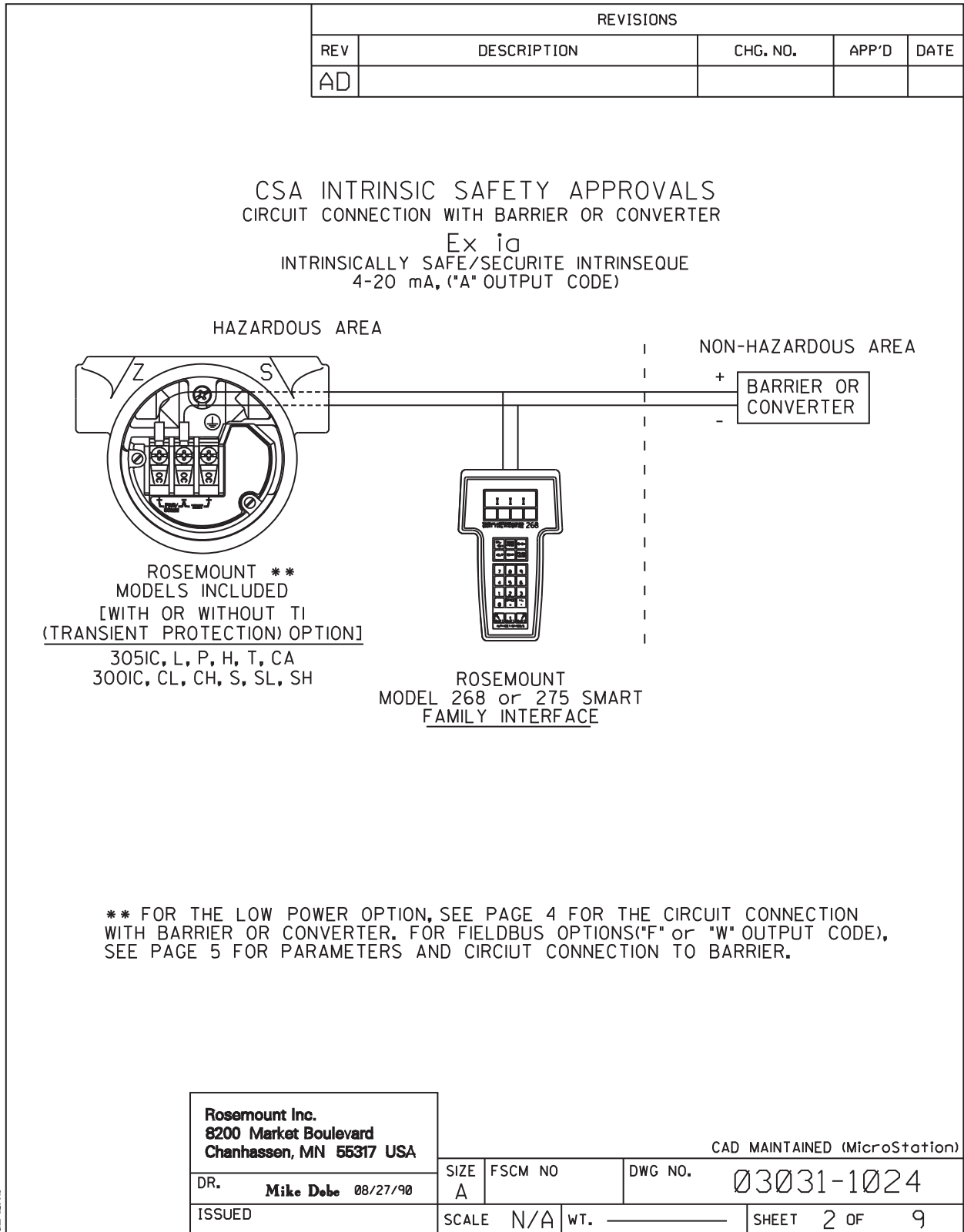
CAD MAINTAINED (MicroStation)

DR.	Jon Steffens	SIZE	FSCM NO	DWG NO.	03031-1019
ISSUED		SCALE	N/A	WT.	
				SHEET	13 OF 13

From Rev. A/C

B.6.2 Canadian standards association (CSA) 03031-1024

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	REV	DESCRIPTION	CHG. NO.	APP'D DATE	
	AA	ADD FIELDBUS	RTC1004232	M.L.M. 5/28/98	
	AB	ADD PROFIBUS, ENTITY PARAMETERS	RTC1008326	P.C.S. 2/4/00	
	AC	REM It, Vt FROM ENTITY PARAMETERS	RTC1009279	W.C.R. 7/11/00	
	AD	ADD FISCO FIELDBUS	RTC1012624	J.P.W. 4/4/02	
<p>APPROVALS FOR</p> <p>3051C 3001C 3051L 3001CL 3051P 3001CH 3051H 3001S 3051CA 3001SL 3051T 3001SH</p> <p>OUTPUT CODE A (4-20 mA HART) I.S. SEE SHEETS 2-3 OUTPUT CODE M (LOW POWER) I.S. SEE SHEETS 3-4 OUTPUT CODE F/W (FIELDBUS) I.S. SEE SHEETS 5-7 OUTPUT CODES A,F,W I.S. ENTITY PARAMETERS SHEET 8-9</p> <p>TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.</p> <p>WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2. AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMBLEMES DE CLASSE I, DIVISION 2.</p> <p style="text-align: right;">CAD MAINTAINED (MicroStation)</p>					
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES, MACHINE SURFACE FINISH 125 -TOLERANCE- .X ± .1 [2,5] .XX ± .02 [0,5] .XXX ± .010 [0,25] FRACTIONS ANGLES ± 1/32 ± 2° DO NOT SCALE PRINT	CONTRACT NO.	 ROSEMOUNT® <small>8200 Market Boulevard • Champlin, MN 55917 USA</small>			
	DR. Mike Dobe 08/27/90	TITLE INDEX OF I.S. CSA FOR 3051C/L/P/H/T & 3001C/S			
	CHK'D	APP'D. GLEN MONZO 8/31/90	SIZE A	FSCM NO	DWG NO. 03031-1024
	APP'D. GOVT.	SCALE N/A	WT.	SHEET 1 OF 9	



		REVISIONS			
REV	DESCRIPTION	CHG. NO.	APP'D	DATE	
AD					
4-20 mA, ("A" OUTPUT CODE)					
DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I			
CSA APPROVED SAFETY BARRIER	30 V OR LESS * 330 OHMS OR MORE * 28 V OR LESS * 300 OHMS OR MORE 25 V OR LESS 200 OHMS OR MORE * 22 V OR LESS * 180 OHMS OR MORE	GROUPS A, B, C, D			
FOXBORO CONVERTER 2AI-I2V-CGB, 2AI-I3V-CGB, 2AS-I3I-CGB, 3A2-I2D-CGB, 3A2-I3D-CGB, 3AD-I3I-CGB, 3A4-I2D-CGB, 2AS-I2I-CGB, 3F4-I2DA		GROUPS B, C, D			
CSA APPROVED SAFETY BARRIER	30 V OR LESS 150 OHMS OR MORE	GROUPS C, D			
LOW POWER, ("M" OUTPUT CODE)					
DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I			
CSA APPROVED SAFETY BARRIER	Supply $\leq 28V, \geq 300 \Omega$ Return $\leq 10V, \geq 47 \Omega$	GROUPS A, B, C, D			
CSA APPROVED SAFETY BARRIER	Supply $\leq 30V, \geq 150 \Omega$ Return $\leq 10V, \geq 47 \Omega$	GROUPS C, D			
* MAY BE USED WITH ROSEMOUNT MODEL 268 or 275 SMART FAMILY INTERFACE.					
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DR.	Mike Dobe	SIZE A	FSCM NO	DWG NO. 03031-1024	
ISSUED		SCALE N/A	WT. _____	SHEET 3 OF 9	

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

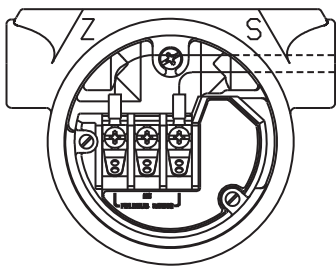
FIELDBUS, ("F" or "W" OUTPUT CODE)

DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV. I
CSA APPROVED SAFETY BARRIER	30 V OR LESS 300 OHMS OR MORE	GROUPS A, B, C, D
	28 V OR LESS 235 OHMS OR MORE	
	25 V OR LESS 160 OHMS OR MORE	
	22 V OR LESS 100 OHMS OR MORE	

CSA INTRINSIC SAFETY APPROVALS
CIRCUIT CONNECTION WITH BARRIER OR CONVERTER

Ex ia
INTRINSICALLY SAFE/SECURITE INTRINSEQUE
FIELDBUS, ("F" or "W" OUTPUT CODE)

HAZARDOUS AREA



NON-HAZARDOUS AREA

+
BARRIER OR
- CONVERTER

ROSEMOUNT **
MODELS INCLUDED
[WITH OR WITHOUT TI
(TRANSIENT PROTECTION) OPTION]
305IC, L, P, H, T, CA
300IC, CL, CH, S, SL, SH

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS
MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS
PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMBLEMES
DE CLASSE I, DIVISION 2.

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DR.	Myles Lee Miller	SIZE	FSCM NO	DWG NO. 03031-1024
ISSUED		SCALE	N/A	WT. _____ SHEET 5 OF 9

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

FISCO CONCEPT APPROVALS

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. FOR THIS INTERCONNECTION TO BE VALID THE VOLTAGE (U_i or V_{max}), THE CURRENT (I_i or I_{max}), AND THE POWER (P_i or P_{ma}) THAT INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE, INCLUDING FAULTS, MUST BE EQUAL OR GREATER THAN THE VOLTAGE (U_o , V_{oc} , or V_t), THE CURRENT (I_o , I_{sc} , or I_t), AND THE POWER (P_o or P_{max}) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. ALSO, THE MAXIMUM UNPROTECTED CAPACITANCE (C_i) AND THE INDUCTANCE (L_i) OF EACH APPARATUS (BESIDES THE TERMINATION) CONNECTED TO THE FIELD BUS MUST BE LESS THAN OR EQUAL TO 5nF AND 10μH RESPECTVELY.

ONLY ONE ACTIVE DEVICE IN EACH SECTION (USUALLY THE ASSOCIATED APPARATUS) IS ALLOWED TO CONTRIBUTE THE DESIRED ENERGY FOR THE FIELD BUS SYSTEM. THE ASSOCIATED APPARATUS' VOLTAGE U_o (or V_{oc} or V_t) IS LIMITED TO A RANGE OF 14V TO 24 V.D.C. ALL OTHER EQUIPENT COMBINED IN THE BUS CABLE MUST BE PASSIVE (THEY CANNOT PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50 μA FOR EACH CONNECTED DEVICE) SEPARATELY POWERED EQUIPMENT REQUIRES A GALVANIC ISOLATION TO AFFIRM THAT THE INTRINSICALLY SAFE FIELD BUS CIRCUIT WILL REMAIN PASSIVE. THE PARAMETER OF THE CABLE USED TO INTERCONNECT THE DEVICES MUST BE IN THE FOLLOWING RANGE:

LOOP RESISTANCE R': 15...150 OHM/km
 INDUCTANCE PER UNIT LENGTH L': 0.4...1mH/KM
 CAPACITANCE PER UNLIT LENGTH C': 80...200nF

C' = C' LINE/LINE +0.5C' LINE/SCREEN, IF BOTH LINES ARE FLOATING, OR
 C' = C' LINE/LINE +C' LINE/SCREEN, IF THE SCREEN IS CONNECTED TO ONE LINE
 TRUNK CABLE LENGTH: ≤1000 m
 SPUR CABLE LENGTH: ≤30 m
 SPLICE LENGTH: ≤1 m

AN APPROVED INFALLIBLE LINE TERMINATION TO EACH END OF THE TRUNK CABLE, WITH THE FOLLOWING PARAMETERS IS APPROPRIATE:

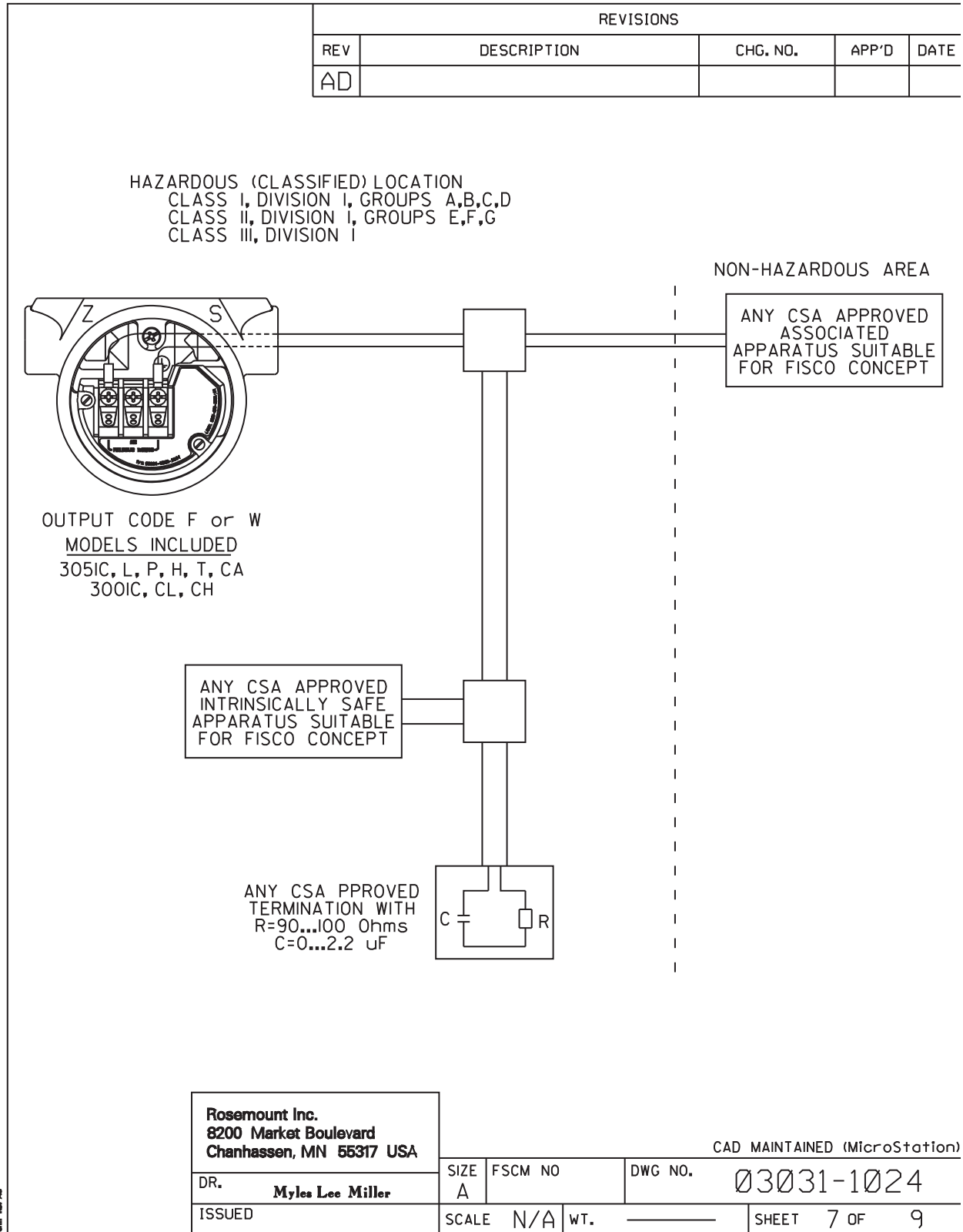
R = 90...100 OHMS C = 2.2μF

AN ALLOWED TERMINATION MIGHT ALREADY BE LINKED IN THE ASSOCIATED APPARATUS. DUE TO I.S. REASONS, THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED. IF THE RULES ABOVE ARE FOLLOWED, UP TO A TOTAL LENGTH OF 1000 m (THE SUMMATION OF TRUNK AND ALL SPUR CABLES), THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT DAMAGE THE INTRINSIC SAFETY OF THE SYSTEM.

NOTES:
INTRINSICALLY SAFE CLASS I, DIV. 1, GROUPS A, B, C, D

1. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250 V.
2. CAUTION: ONLY USE SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING TEMPERATURE.
3. WARNING: REPLACEMENT OF COMPONENTS MAY DAMAGE INTRINSIC SAFETY.

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ISSUED	SCALE N/A	WT. _____	SHEET 6 OF 9

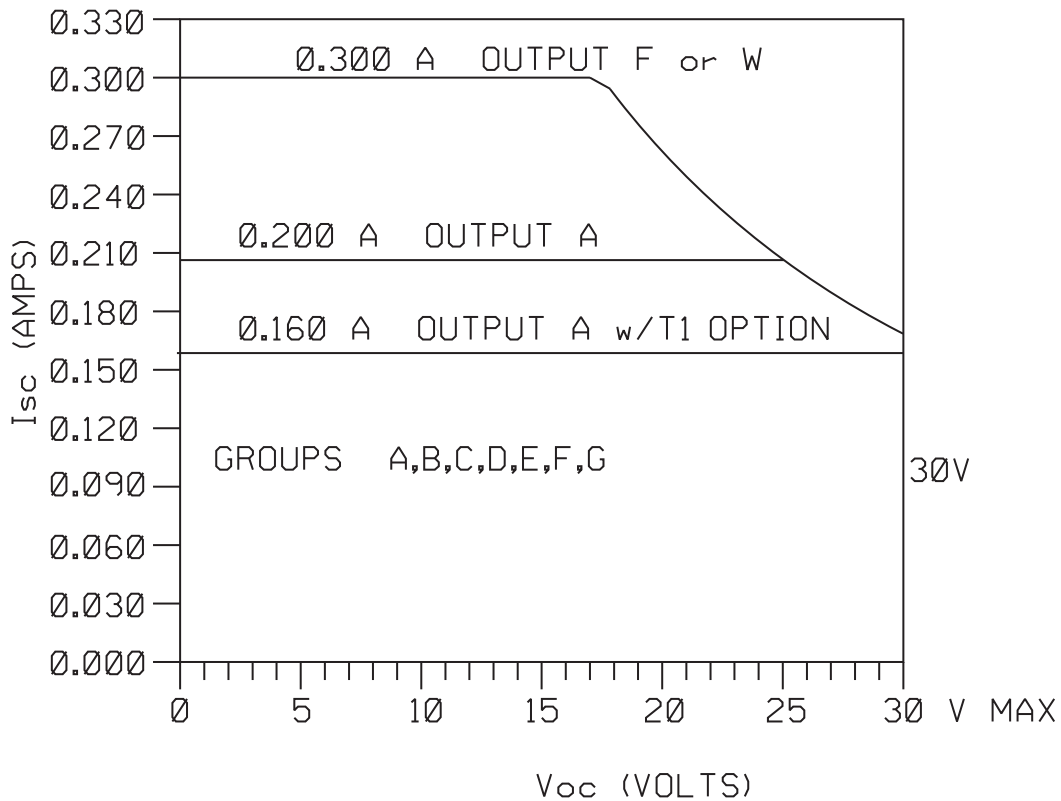


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REV	DESCRIPTION	CHG. NO.	APP'D	DATE
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3051 I.S. ENTITY PARAMETERS.
(OUTPUT CODE A,F, or W)

BARRIER PARAMETERS (APPLICABLE TO OUTPUT CODE A,F, or W)

$P_{max} = 1.3$ WATT OUTPUT F or W
 $P_{max} = 1.0$ WATT OUTPUT A



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DR.	JON STEFFENS	SIZE	A	DWG NO.	03031-1024
ISSUED		SCALE	N/A	WT.	
				SHEET	8 OF 9

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

ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (V_{oc}) AND MAX. SHORT CIRCUIT CURRENT (I_{sc}) AND MAX. POWER ($V_{oc} \times I_{sc}/4$), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (V_{max}), MAXIMUM SAFE INPUT CURRENT (I_{max}), AND MAXIMUM SAFE INPUT POWER (P_{max}) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (C_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_i) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (L_a) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_i) OF THE INTRINSICALLY SAFE APPARATUS.

FOR OUTPUT CODE A

CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 200mA$	I_{SC} IS LESS THAN OR EQUAL TO 200mA
$P_{MAX} = 1 \text{ WATT}$	$(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1 WATT
$C_i = .01\mu f$	C_A IS GREATER THAN $.01\mu f + C$ CABLE
$L_i = 10\mu H$	L_A IS GREATER THAN $10\mu H + L$ CABLE

* FOR T1 OPTION:

$I_{max} = 160mA$	I_{sc} IS LESS THAN OR EQUAL TO 160mA
$L_i = 1.05mH$	L_A IS GREATER THAN $1.05mH + L$ CABLE

FOR OUTPUT CODE F or W

CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$P_{MAX} = 1.3 \text{ WATT}$	$(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
$C_i = 0\mu f$	C_A IS GREATER THAN $0\mu f + C$ CABLE
$L_i = 0\mu H$	L_A IS GREATER THAN $0\mu H + L$ CABLE

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

205

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)		
DR.	JON STEFFENS	SIZE	FSCM NO	DWG NO. 03031-1024
ISSUED		SCALE	N/A	WT. _____ SHEET 9 OF 9

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