Reference Manual
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Rosemount™ 3051S MultiVariable™ Transmitter

EMERSON

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Rosemount™ 3051S MultiVariable™ Transmitter

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure the contents are fully understood 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™ representative.

⚠ WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a Field 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.
- Both transmitter covers must be fully engaged to meet flameproof/explosion-proof requirements.
- Verify the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Electrical shock could cause death or serious injury.

- If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals.
- Use extreme caution when making 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 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 as spare parts.

Improper assembly of manifolds to traditional flange can damage the device.

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

Improper installation or repair of the SuperModule™ assembly with high pressure option (P0) could result in death or serious injury.

- For safe assembly, the high pressure SuperModule assembly must be installed with ASTM A193 Class 2 Grade B8M bolts and either a Rosemount 305 Manifold or a DIN-compliant traditional flange.

Static electricity can damage sensitive components.

- Observe safe handling precautions for static-sensitive components.

⚠ 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 Sales Representative.

Section 1 Introduction

1.1 Using this manual

The sections in this manual provide information on installing, operating, and maintaining the Rosemount™ 3051S MultiVariable™ Transmitter (Rosemount 3051SMV). The sections are organized as follows:

- Section 2: Configuration provides instruction on commissioning and operating Rosemount 3051SMV. Information on software functions, configuration parameters, and online variables is also included.
- Section 3: Installation contains mechanical and electrical installation instructions.
- Section 4: Operation and Maintenance contains operation and maintenance techniques.
- Section 5: Troubleshooting provides troubleshooting techniques for the most common operating problems.
- Section 6: Safety Instrumented Systems Requirements contains identification, commissioning, maintenance, and operations information for the Rosemount 3051S MultiVariable Safety Instrumented System (SIS) Safety Transmitter.
- 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.

Models covered

The following Rosemount 3051SMV Transmitters are covered in this manual:

Table 1-1. Rosemount 3051SMV Measurement with Fully Compensated Mass and Energy Flow Output

Measurement type	Multivariable type - M
1	Differential pressure, static pressure, temperature
2	Differential pressure and static pressure
3	Differential pressure and temperature
4	Differential pressure

Table 1-2. Rosemount 3051SMV Measurement with Direct Process Variable Output

Measurement type	Multivariable type - P
1	Differential pressure, static pressure, temperature
2	Differential pressure and static pressure
3	Differential pressure and temperature
5	Coplanar static pressure and temperature
6	In-line static pressure and temperature

1.2 Product recycling/disposal

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

Section 2 Configuration

2.1 Overview

This section contains information for configuring the flow and device configuration for the Rosemount™ 3051S MultiVariable™ Transmitter (Rosemount 3051SMV). Engineering Assistant installation and Flow configuration instructions apply to Engineering Assistant version 6.3 or later. Basic device configuration, Detailed device configuration, and Variable configuration are shown for AMS Device Manager version 9.0 or later, but also include Fast Key sequences for Field Communicator version 2.0 or later. Engineering Assistant and AMS Device Manager screens are similar and follow the same instructions for use and navigation. For convenience, Field Communicator Fast Key sequences are labeled "Fast Keys" for each software function below the appropriate headings. The functionality of each host as show in Table 2-1:

Note
Coplanar transmitter configurations measuring gage pressure and process temperature (measurement 5) will report as the pressure as differential pressure. This will be reflected on the LCD display, nameplate, digital interfaces, and other user interfaces.

Table 2-1. Host Functionality

• Available
— Not available

Multivariable type	Functionality	Rosemount 3051SMV Engineering Assistant	AMS Device Manager	Field Communicator
Fully compensated mass and energy flow (M)	Flow Configuration	•	•	—
	Device Configuration	•	•	•
	Test Calculation	•	•	•
	Calibration	•	•	•
	Diagnostics	•	•	•
Direct process variable output (P)	Device Configuration	—	•	•
	Calibration	—	•	•
	Diagnostics	—	•	•

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 with a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a Field 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.
- Both transmitter covers must be fully engaged to meet flameproof/explosion-proof requirements.
- Verify the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Electrical shock could cause death or serious injury.

- If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals.
- Use extreme caution when making 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™ 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 as spare parts.

Improper assembly of manifolds to traditional flange can damage the device.

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

Improper installation or repair of the SuperModule™ assembly with high pressure option (P0) could result in death or serious injury.

- For safe assembly, the high pressure SuperModule assembly must be installed with ASTM A193 Class 2 Grade B8M bolts and either a Rosemount 305 Manifold or a DIN-compliant traditional flange.

Static electricity can damage sensitive components.

- Observe safe handling precautions for static-sensitive components.

2.3 Engineering Assistant installation

2.3.1 Engineering Assistant version 6.3 or later

The Rosemount 3051SMV Engineering Assistant 6.3 or later is PC-based software that performs configuration, maintenance, diagnostic functions, and serves as the primary communication interface to the Rosemount 3051SMV with the fully compensated mass and energy flow feature board.

The Rosemount 3051SMV Engineering Assistant software is required to complete the flow configuration.

2.3.2 Installation and initial setup

The following are the minimum system requirements to install the Rosemount 3051SMV Engineering Assistant software:

- Pentium-grade Processor: 500 MHz or faster
- Operating system: Windows™ Professional 7, 8.1, 10
  - 32-bit
  - 64-bit
- 256 MB RAM
- 100 MB free hard disk space
- RS232 serial port or USB port (for use with HART® modem)
- CD-ROM

Installing the Rosemount 3051SMV Engineering Assistant version 6.3 or later

Engineering Assistant is available with or without the HART modem and connecting cables. The complete Engineering Assistant package contains the software CD and one HART modem with cables for connecting the computer to the Rosemount 3051SMV (See “Ordering information” on page 138.)

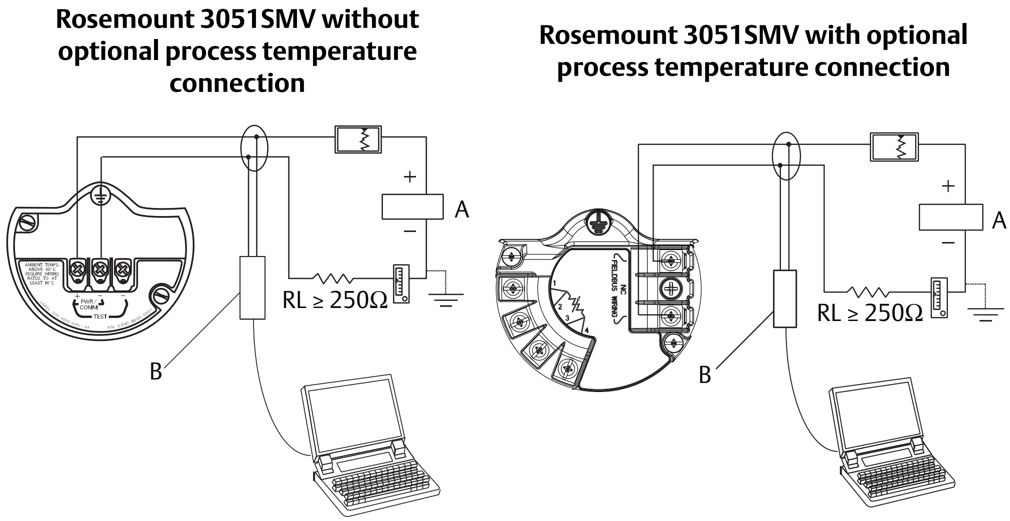
1. Uninstall any existing versions of Engineering Assistant 6 currently installed on the PC.
2. Insert the new Engineering Assistant disk into the CD-ROM.
3. Windows should detect the presence of a CD and start the installation program. Follow the on-screen prompts to finish the installation. If Windows does not detect the CD, use Windows Explorer or My Computer to view the contents of the CD-ROM, and then double select the **SETUP.EXE** program.
4. A series of screens (Installation Wizard) will appear and assist in the installation process. Follow the on-screen prompts. It is recommended the default installation settings are used.

Note
Engineering Assistant version 6.3 or later requires the use of Microsoft® .NET Framework version 4.0 or later. If .NET version 4.0 is not currently installed, the software will be automatically installed during the Engineering Assistant installation. Microsoft .NET version 4.0 requires an additional 200 MB of disk space.

Connecting to a PC

Figure 2-1 shows how to connect a computer to a Rosemount 3051SMV.

Figure 2-1. Connecting a PC to the Rosemount 3051SMV



A. Power supply
B. HART modem

1. Remove the cover from the field terminals side of the housing.
2. Power the device as outlined in "Connect wiring and power up" on page 75.
3. Connect the HART modem cable to the PC.
4. On the side marked "Field Terminals," connect the modem mini-grabbers to the two terminals marked "PWR/COMM."
5. Launch the Rosemount 3051SMV Engineering Assistant. For more information on launching Engineering Assistant, see "Launching Engineering Assistant" on page 9.
6. Once the configuration is complete, replace cover and tighten until metal contacts metal to meet flameproof/explosion-proof requirements. See "Cover installation" on page 69 for more information.

2.4 Flow configuration

2.4.1 Rosemount 3051SMV Engineering Assistant 6.3 or later

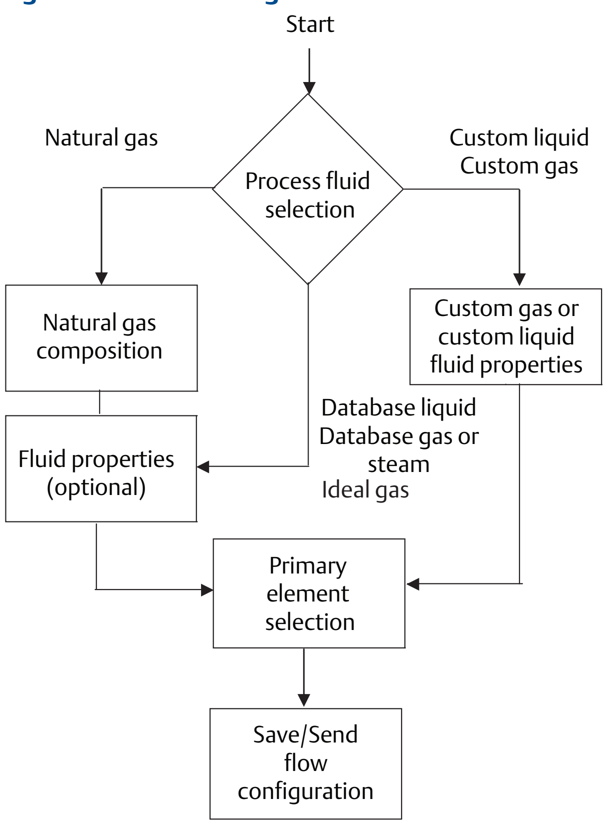
The Rosemount 3051SMV Engineering Assistant is designed to guide the user through the setup of the flow configuration of a Rosemount 3051SMV. The flow configuration screens allow the user to specify the fluid, operating conditions, and information about the primary element including the inside pipe diameter. This information will be used by the Rosemount 3051SMV Engineering Assistant to create the flow configuration parameters that can be sent to the transmitter or saved for future use.

NOTICE

To ensure correct operation, download the most current version of the Engineering Assistant software at Emerson.com/Rosemount-Engineering-Assistant-6.

Figure 2-2 shows the path in which the Rosemount 3051SMV Engineering Assistant will guide the user through a flow configuration. If a natural gas, custom liquid, or custom gas option is chosen, an extra screen will be provided to specify the gas composition or fluid properties.

Figure 2-2. Flow Configuration Flowchart

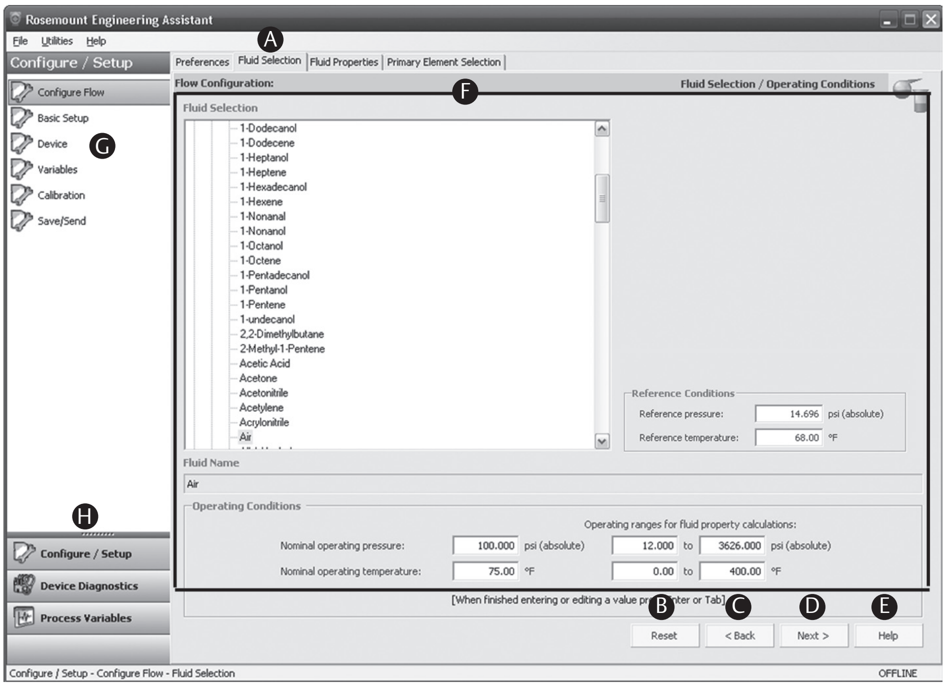


Online and offline mode

The Engineering Assistant software can be used in two modes: online and offline. In online mode, the user can receive the configuration from the transmitter, edit the configuration, send the changed configuration to the transmitter, or save the configuration to a file. In offline mode, the user may create a new flow configuration and save the configuration to a file or open and modify an existing file.

2.4.2 Basic navigation overview

Figure 2-3. Engineering Assistant Basic Navigation Overview



The Engineering Assistant software can be navigated in a variety of ways. The numbers below correspond to the numbers shown in Figure 2-3.

A. The navigation tabs contain the flow configuration information. In offline mode, each tab will not become active until the required fields on the previous tab are completed. In online mode, these tabs will be functional unless a change on a preceding tab is made.

B. The **Reset** button will return each field within all of the flow configuration tabs (*Fluid Selection*, *Fluid Properties*, and *Primary Element Selection*) to the values initially displayed at the start of the configuration.
  a. If editing a previously saved flow configuration, the values will return to those that were last saved.
  b. If starting a new flow configuration, all entered values will be erased.

C. The **Back** button is used to step backward through the flow configuration tabs.

D. The **Next** button is used to step forward through the flow configuration tabs. The **Next** button will not become active until all required fields on the current page are completed.

E. The **Help** button may be selected at any time to get a detailed explanation of the information required on the current configuration tab.

F. Any configuration information that needs to be entered or reviewed will appear in this portion of the screen.

G. These menus navigate to the *Configure Flow*, *Basic Setup*, *Device*, *Variables*, *Calibration*, and *Save/Send* tabs.

H. These buttons navigate to *Config/Setup*, *Device Diagnostics,* or *Process Variables* sections.

2.4.3 Launching Engineering Assistant

Flow configuration for the Rosemount 3051SMV is achieved by launching the Engineering Assistant Software from the *START* menu. The following steps show how to open the Engineering Assistant Software, and connect to a device:

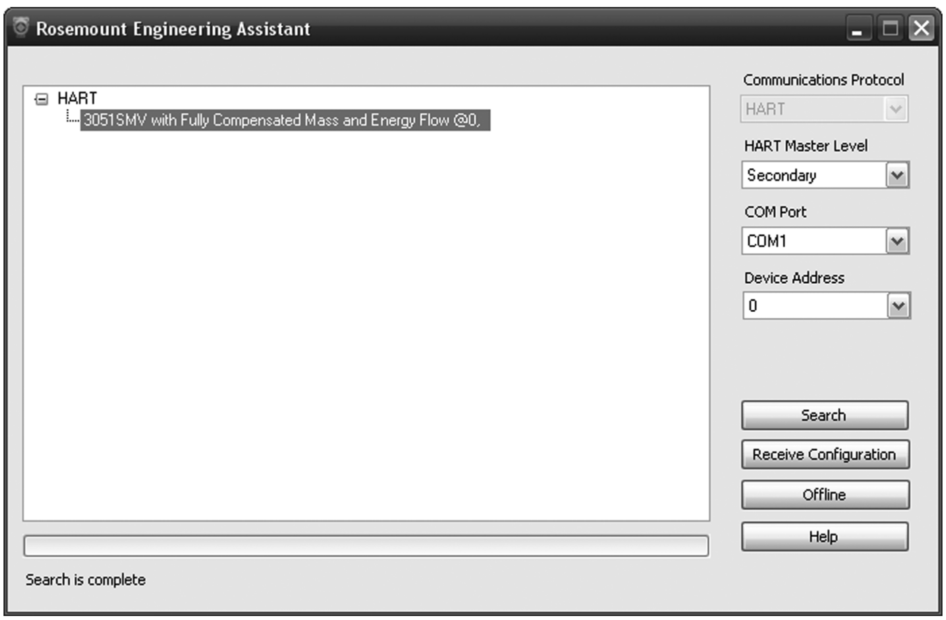
1. Select the *Start menu* > *All Programs* > **Engineering Assistant**. Engineering Assistant will open to screen as shown in Figure 2-4.
2. If working offline, select the **Offline** button located on the bottom of the screen as shown in Figure 2-4.

   OR

   If working online, select the **Search** button located on the lower right corner of the screen as shown in Figure 2-4. Engineering Assistant will begin to search for online devices. When the search is completed, select the device to communicate with and select **Receive Configuration** button.

The HART Master Level can be set to either primary or secondary. Secondary is the default and should be used when the transmitter is on the same segment as another HART communication device. The COM Port and device address may also be edited as needed.

Figure 2-4. Engineering Assistant Device Connection Screen

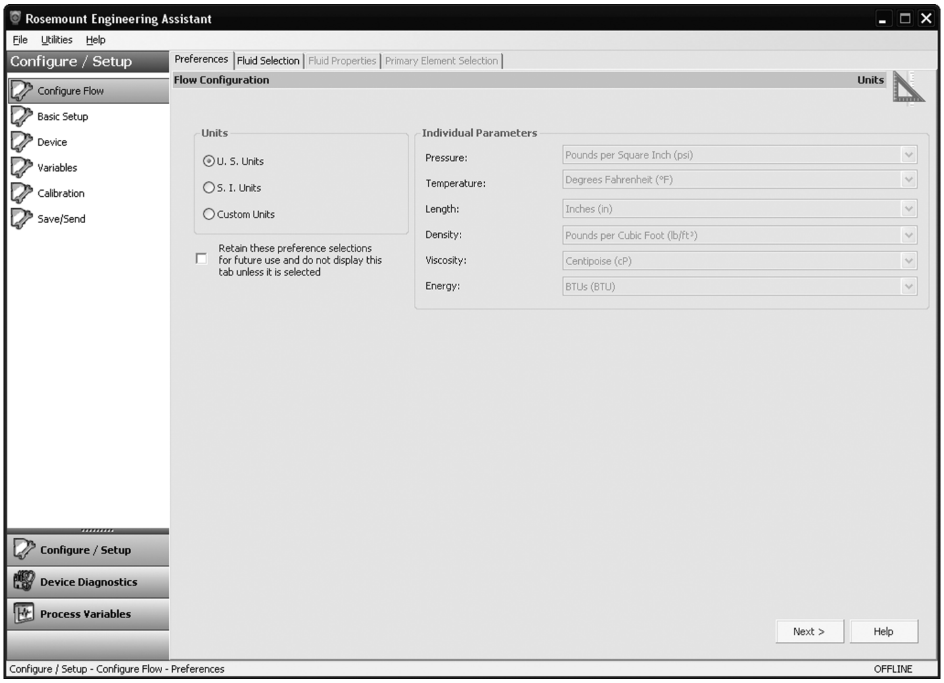


2.4.4 Preferences

The *Preferences* tab, shown in Figure 2-5 on page 10, allows the user to select the preferred engineering units to display and specify flow configuration information.

- Select the preferred engineering units. If units are needed other than the default U.S. or S.I. units, use the **Custom Units** setting. If **Custom Units** are selected, configure the *Individual Parameters* using the drop-down menus.
- Unit preferences selected will be retained for future Engineering Assistant sessions. Check the box to prevent the *Preferences* tab from being automatically shown in future sessions. The Preferences are always available by select the **Preferences** tab.

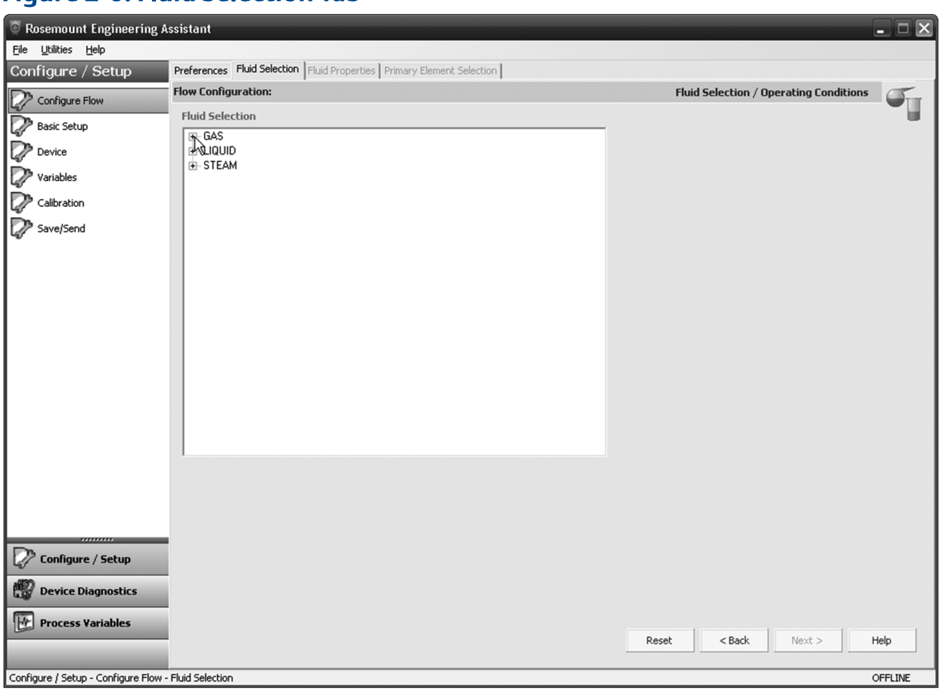
Figure 2-5. Preferences Tab



2.4.5 Fluid selection for database liquid/gas

The *Fluid Selection* tab (see Figure 2-6) allows the user to select the process fluid.

Figure 2-6. Fluid Selection Tab

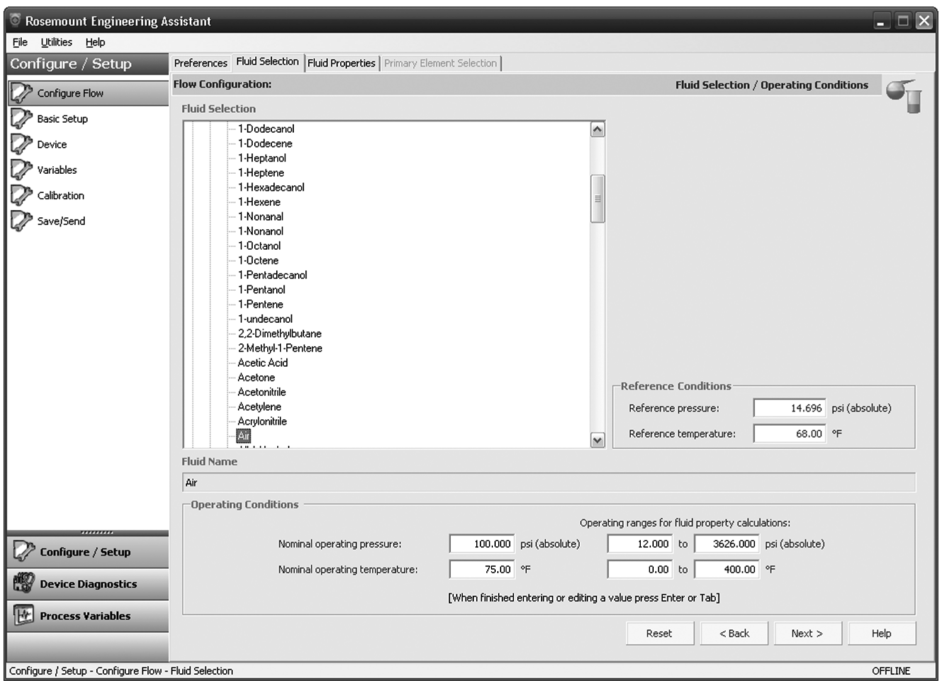


Note

The following example will show a flow configuration for an application with database gas air as the process fluid and a Rosemount 405C Conditioning Orifice Plate as the primary element. The procedure to configure an application with other fluids and other primary elements will be similar to this example. Natural gases, custom liquids, and custom gases require additional steps during the configuration. See "Other fluid configurations" on page 18 for more information.

1. Engineering Assistant may open to the *Preferences* tab. Using the tabs at the top of the screen, navigate to the *Fluid Selection* tab.
2. Expand the *Gas* category (select the **+** icon).
3. Expand the *Database Gas* category.
4. Select the appropriate fluid (Air for this example) from the list of database fluids.

Figure 2-7. Fluid Selection Tab - Database Gas Air



5. Enter the *Nominal Operating Pressure*, select the **Enter** or **Tab** key.

Note

The nominal operating pressure must be entered in absolute pressure units.

6. Enter the *Nominal Operating Temperature*, select the **Enter** or **Tab** key. Engineering Assistant will automatically fill in suggested operating ranges, as shown in . These values may be edited as needed by the user.
7. Verify the *Reference Conditions* are correct for the application. These values may be edited as needed.

Note

Reference pressure and temperature values are used by Engineering Assistant to convert the flow rate from mass units to mass units expressed as standard or normal volumetric units.

8. Select **Next >** to proceed to the *Fluid Properties* tab.

Table 2-2. Liquids and Gases Database

1,1,2,2–Tetrafluoroethane	Acrylonitrile	Formaldehyde	Nitrous Oxide
1,1,2–Trichloroethane	Air	Formic Acid	Nonanal
1,2,4–Trichlorobenzene	Allyl Alcohol	Furan	n–Butane
1,2–Butadiene	Ammonia	Helium–4	n–Butanol
1,2–Propylene Glycol	Aniline	Hydrazine	n–Butyraldehyde
1,3–Propylene Glycol	Argon	Hydrogen	n–Butyronitrile
1,3,5–Trichlorobenzene	Benzene	Hydrogen Chloride	n–Decane
1,3–Butadiene	Benzaldehyde	Hydrogen Cyanide	n–Dodecane
1,4–Dioxane	Benzyl Alcohol	Hydrogen Peroxide	n–Heptadecane
1,4–Hexadiene	Biphenyl	Hydrogen Sulfide	n-Heptane
1–Butene	Bromine	Isobutane	n–Hexane
1–Decanol	Carbon Dioxide	Isobutylbenzene	n-Nonane
1–Decene	Carbon Monoxide	Isohexane	n–Octane
1–Dodecanol	Carbon Tetrachloride	Isoprene	n–Pentane
1–Dodecene	Chlorine	Isopropanol	Oxygen
1–Heptanol	Chlorotrifluoroethylene	Melamine	Pentafluoroethane
1–Heptene	Chloroprene	Methane	Phenol
1–Hexadecanol	Cycloheptane	Methanol	Propane
1–Hexene	Cyclohexane	Methyl Acrylate	Propadiene
1–Octanol	Cyclopentane	Methyl Ethyl Ketone	Pyrene
1–Octene	Cyclopentene	Methyl Vinyl Ether	Propylene
1–Nonanol	Cyclopropane	m–Chloronitrobenzene	p-Nitroaniline
1–Pentadecanol	Decanal	m–Dichlorobenzene	Sorbitol
1–Pentanol	Divinyl Ether	Neon	Styrene
1–Pentene	Ethane	Neopentane	Sulfur Dioxide
1–Undecanol	Ethanol	Nitric Acid	Toluene
2,2–Dimethylbutane	Ethylamine	Nitric Oxide	Trichloroethylene
2–Methyl–1–Pentene	Ethylbenzene	Nitrobenzene	Vinyl Acetate
Acetic Acid	Ethylene	Nitroethane	Vinyl Chloride
Acetone	Ethylene Glycol	Nitrogen	Vinyl Cyclohexane
Acetonitrile	Ethylene Oxide	Nitrogen Trifluoride	Vinylacetylene
Acetylene	Fluorene	Nitromethane	Water

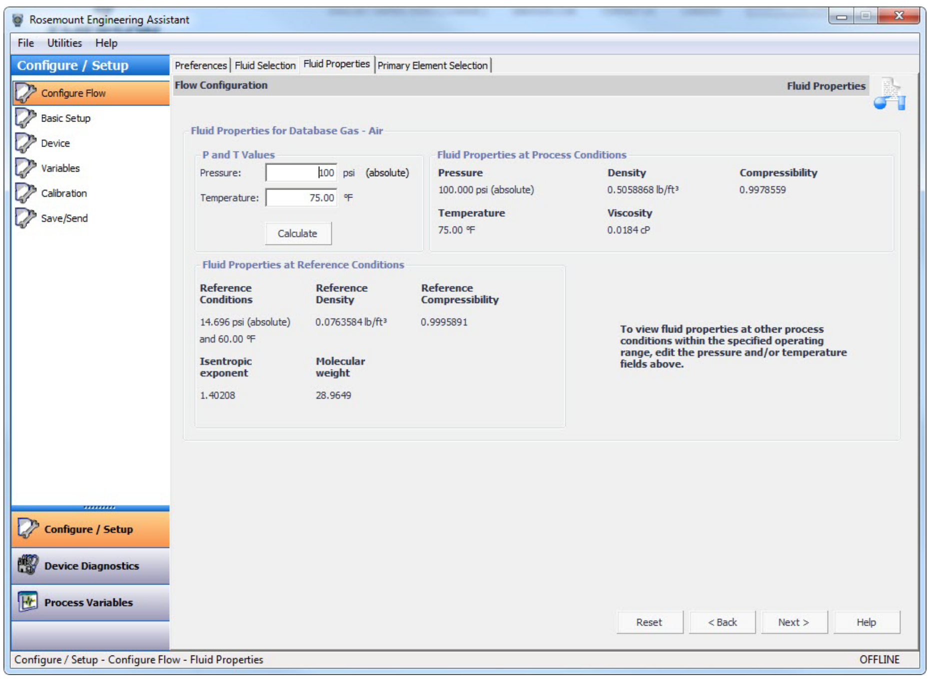
2.4.6 Fluid properties

Note
The *Fluid Properties* tab is an optional step and is not required to complete a flow configuration.

The *Fluid Properties* tab for the database gas air is shown in Figure 2-8. The user may view the properties of the chosen fluid. The fluid properties are initially shown at nominal conditions. To view density, compressibility, and viscosity of the selected fluid at other pressure and temperature values, enter a Pressure and Temperature and select **Calculate**.

Note
Changing the pressure and temperature values on the *Fluid Properties* tab does not affect the flow configuration.

Figure 2-8. Fluid Properties Tab

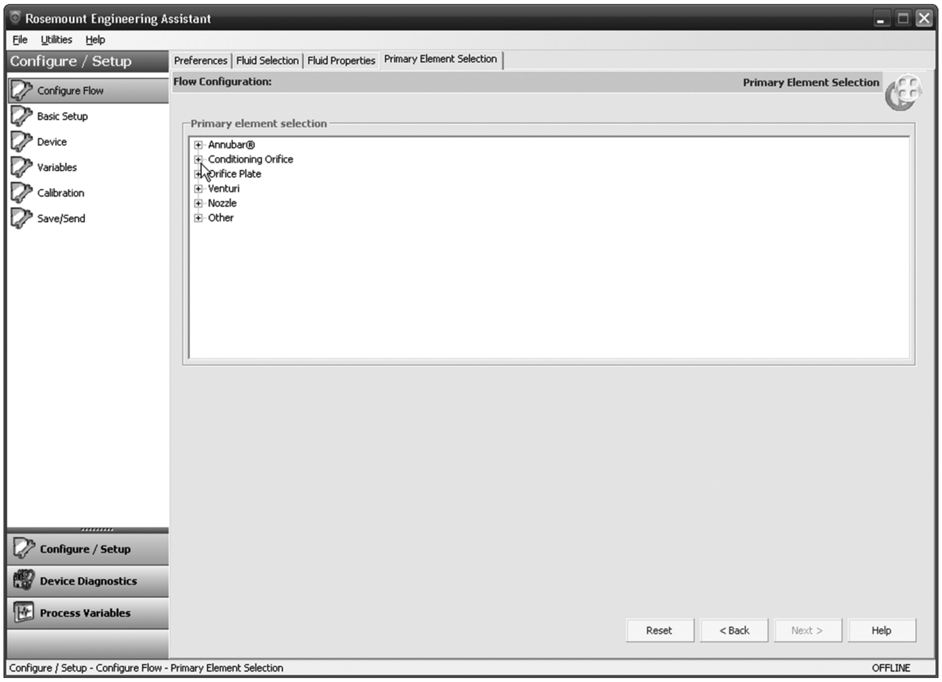


2.4.7 Primary element selection

The *Primary Element Selection* tab shown in Figure 2-9 on page 14 allows the user to select the primary element that will be used with the Rosemount 3051SMV. This database of primary elements includes:

- Rosemount proprietary elements such as the Rosemount Annubar™ and the conditioning orifice plate
- Standardized primary elements such as ASME, ISO, and AGA primary elements
- Other proprietary primary elements

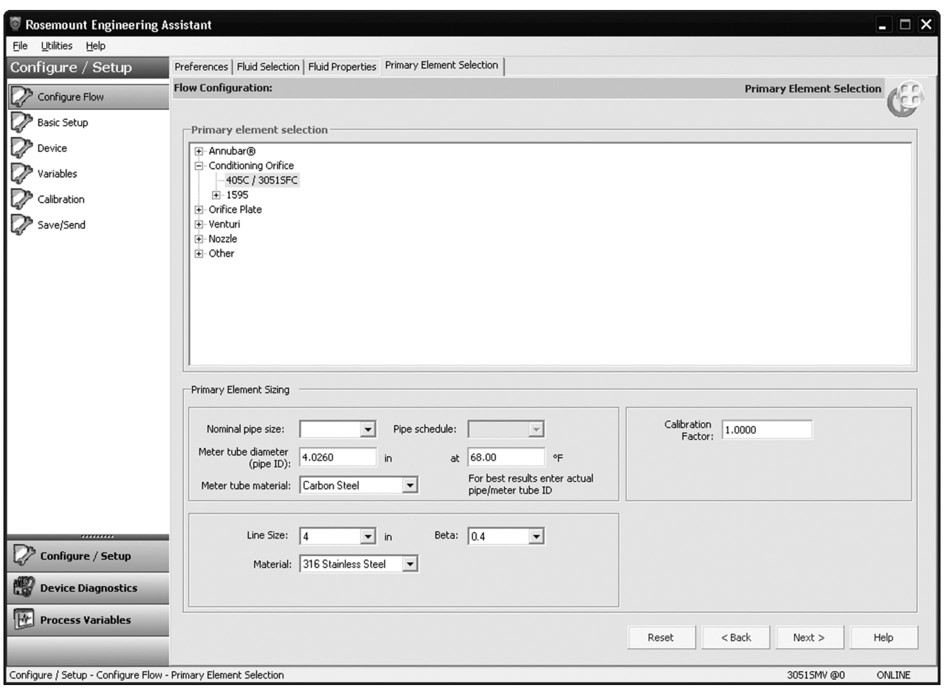
Figure 2-9. Primary Element Selection Tab



Continuing with the example configuration:

1. Expand the *Conditioning Orifice* category.

Figure 2-10. Primary Element Selection Tab - 405C/3051SFC



2. Select **405C/3051SFC**.
3. Enter the *Measured Meter Tube Diameter (pipe ID)* at a *Reference Temperature*. If the meter tube diameter cannot be measured, select a *Nominal Pipe Size* and *Pipe Schedule* to input an estimated value for the meter tube diameter (U.S. units only).
4. If necessary, edit the *Meter Tube Material*.
5. Enter the *Line Size* and select the *Beta* of the Conditioning Orifice Plate. The required primary element sizing parameters will be different depending on what primary element is selected.
6. If necessary, select a *Primary Element Material* from the drop-down menu.
7. A *calibration factor* may be entered if a calibrated primary element is being used.

Note
A *Joule-Thomson Coefficient* can be enabled to compensate for the difference in process temperature between the orifice plate location and the process temperature measurement point. The Joule-Thomson Coefficient is available with ASME MFC-3M-2 (2004) or ISO 5167-2.2003 (E) orifice plates used with Database Gases, Superheated Steam, or AGA DCM/ISO Molar Composition Natural Gas. For more information on the Joule-Thomson Coefficient, reference the appropriate orifice plate standard.

8. Select **Next >** to advance to the *Save/Send Configuration* tab.

Note
To be in compliance with appropriate national or international standards, beta ratios and differential producer diameters should be within the limits as listed in the applicable standards. The Engineering Assistant software will alert the user if a primary element value exceeds these limits, but will allow the user to proceed with the flow configuration.

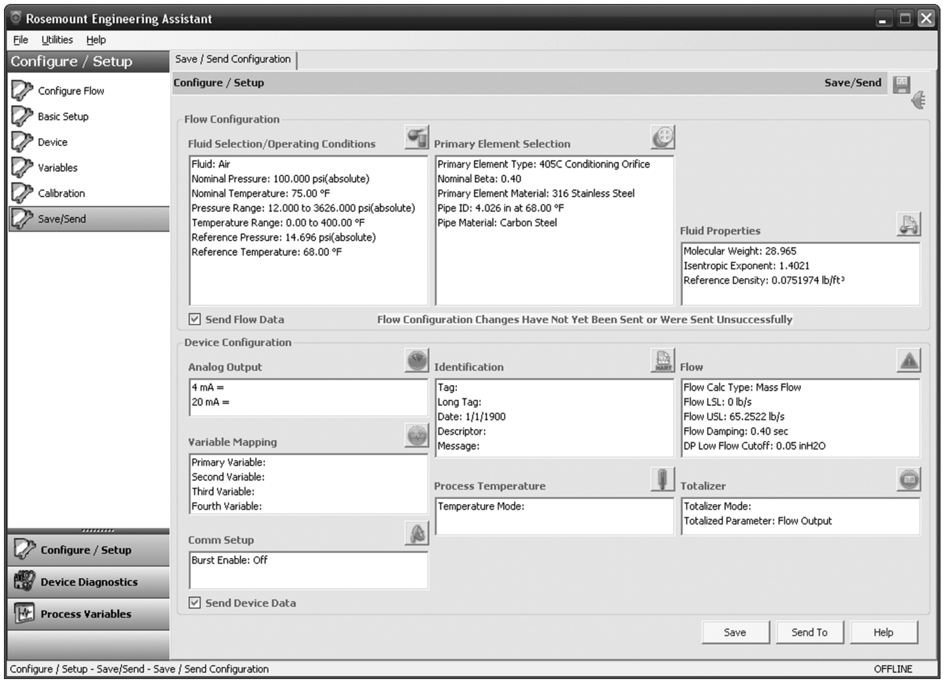
2.4.8 Save/send

The *Save/Send Configuration* tab shown in Figure 2-11 on page 16 allows the user to view, save, and send the configuration information to the Rosemount 3051SMV with the fully compensated mass and energy flow feature board.

1. Review the information under the Flow Configuration heading and Device Configuration heading.

Note
For more information on device configuration, see “Basic device configuration” on page 24.

Figure 2-11. Save/Send Configuration Tab (Offline Mode)



2. Select the icon above each window to be taken to the appropriate screen to edit the configuration information. To return to the *Save/Send* tab, select **Save/Send** in the left menu.
3. When all information is correct, see "Sending a configuration in offline mode" on page 16 or "Sending a configuration in online mode" on page 17.

Note
The user will be notified if the configuration has been modified since it was last sent to the transmitter. A warning message will be shown to the right of the *Send Flow Data* and/or *Send Device Data* check boxes.

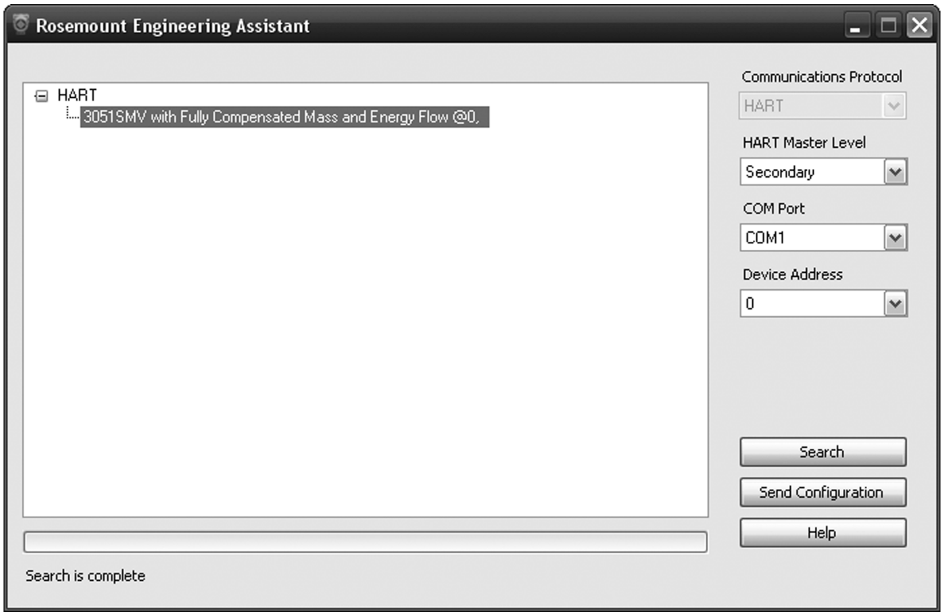
Sending a configuration in offline mode

1. To send the configuration, select the **Send To** button.

Note
The *Send Flow Data* and/or *Send Device Data* check boxes can be used to select what configuration data is sent to the transmitter. If the check box is unselected, the corresponding data will not be sent.

2. The Engineering Assistant Device Connection screen will appear, see Figure 2-12 on page 17.

Figure 2-12. Engineering Assistant Device Connection Screen



3. Select the **Search** button located in the lower right corner of the screen. Engineering Assistant will begin to search for connected devices.
4. When the search is completed, select the device to communicate with and select **Send Configuration** button.
5. Once the configuration is finished being sent to the device, a notification appears.
6. If finished with the configuration process, close Engineering Assistant.

Note
After the configuration is sent to the device, saving the configuration file is recommended. For more information on saving a configuration file, see "Saving a configuration" on page 17.

Sending a configuration in online mode

1. To send the configuration, select the **Send** button. Once the configuration is finished being sent to the device, a notification appears.
2. If finished with the configuration process, close Engineering Assistant.

Note
After the configuration is sent to the device, saving the configuration file is recommended. For more information on saving a configuration file, see "Saving a configuration".

Saving a configuration

1. To save the configuration, select the **Save** button.
2. Navigate to the save location for the configuration file, give the file a name, and select **Save**. The configuration will be saved as a ".smv" file type.

Sending a saved configuration

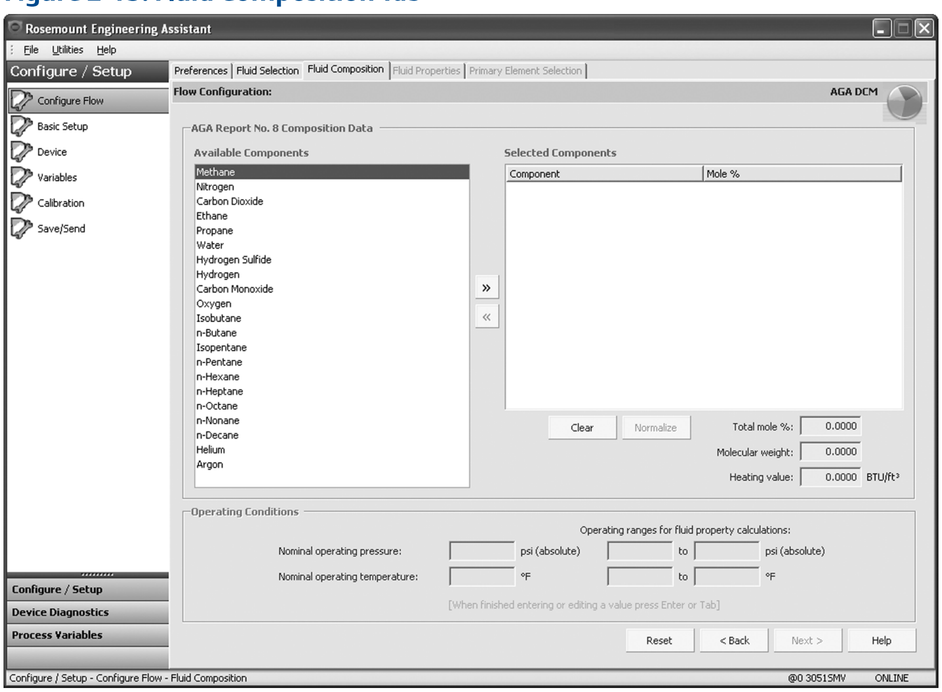
1. To send a saved configuration, open *Engineering Assistant* in offline mode and select **File>Open**.
2. Navigate to the saved .smv file to be sent. Select **Open**.
3. The *Engineering Assistant Device Connection* screen will appear, see Figure 2-12 on page 17.
4. Select the **Search** button located in the lower right corner of the screen. Engineering Assistant will begin to search for connected devices.
5. When the search is completed, select the device to communicate with and select **Send Configuration** button.
6. Once the configuration is finished being sent to the device, a notification appears.
7. If finished with the configuration process, close Engineering Assistant.

2.4.9 Other fluid configurations

Natural gas AGA No. 8 detail characterization or ISO 12213, molar composition flow configuration

1. Expand the *Gas* category.
2. Expand the *Natural Gas* category.
3. Select **AGA Report No. 8 Detail Characterization Method** or **ISO 12213, Molar Composition Method**.
4. Select **Next >** to proceed to the *Fluid Composition* tab. Figure 2-13 shows an example of the *Fluid Composition* tab for AGA Report No. 8 Detail Characterization Method. The ISO 12213, Molar Composition Method *Fluid Composition* tab will require the same information.

Figure 2-13. Fluid Composition Tab



5. In the *Available Components* window, select the required components and move them into the *Selected Components* window using the **>>** button. The **<<** button moves the components back to the *Available Components* window. The **Clear** button moves all components back to the *Available Components* window.
6. After all required components are in the *Selected Components* window, begin assigning the percent composition of each component in the *Mole %* column.

Note
These percent composition values should add to 100 percent. If they do not, select the **Normalize** button. This will adjust the mole percentages proportionally to a total of 100 percent.

7. Enter the *Nominal Operating Pressure*, then the *Nominal Operating Temperature* as the entry blanks become available. Engineering Assistant will automatically fill in suggested operating ranges. These values may be edited by the user.

Note
In order to comply with the AGA requirements the calculation accuracy must be within ±50 ppm (±0.005%). This is stated in AGA Report No. 3, Part 4, Section 4.3.1. The pressure and temperature operating ranges will be autofilled to comply with the standard.

8. Select **Next >**. This will bring the user to the *Fluid Properties* tab.
9. Proceed with the steps in "Fluid properties" on page 13.

Natural gas AGA No. 8 gross characterization flow configuration method 1, method 2, and natural gas ISO 12213, physical properties (SGERG 88) flow configuration

1. Expand the *Gas* category.
2. Select **AGA No. 8 Gross Characterization Method 1, AGA No. 8 Gross Characterization Method 2**, or **ISO 12213, Physical Properties (SGERG 88)**.
3. Select **Next** to proceed to the *Fluid Composition* tab.
4. Enter the required data for the Natural Gas Characterization Method that was selected in Step 2. Required data for each method is listed in Table 2-3.

Table 2-3. Required and Optional Data for Natural Gas Characterization Methods

Characterization method	Required data	Optional data
AGA Report No. 8 Gross Characterization Method 1	Relative Density(1) Mole Percent CO_2 Volumetric Gross Heating Value(2)	Mole Percent CO Mole Percent Hydrogen
AGA Report No. 8 Gross Characterization Method 2	Relative Density(1) Mole Percent CO_2 Mole Percent Nitrogen	Mole Percent CO Mole Percent Hydrogen
ISO 12213, Physical Properties (SGERG 88)	Relative Density(1) Mole Percent CO_2 Volumetric Gross Heating Value(2)	Mole Percent CO Mole Percent Hydrogen

1. Reference conditions for the relative density are 60 °F (15.56 °C) and 14.73 psia (101.56 kPa).
2. Reference conditions for the molar gross heating value are 60 °F (15.56 °C) and 14.73 psia (101.56 kPa) and reference conditions for molar density are 60 °F (15.56 °C) and 14.73 psia (101.56 kPa).

5. If appropriate, enter the optional data for the Natural Gas Characterization Method that was selected in Step 2. Optional data for each method is listed in Table 2-3 on page 19.
6. Enter the *Nominal Operating Pressure*, then the *Nominal Operating Temperature* as the entry blanks come available. Engineering Assistant will automatically fill in suggested operating ranges. Note that these values may be edited by the user.
7. Select **Next**. This will open the *Fluid Properties* tab.
8. Proceed with the steps in "Fluid properties" on page 13.

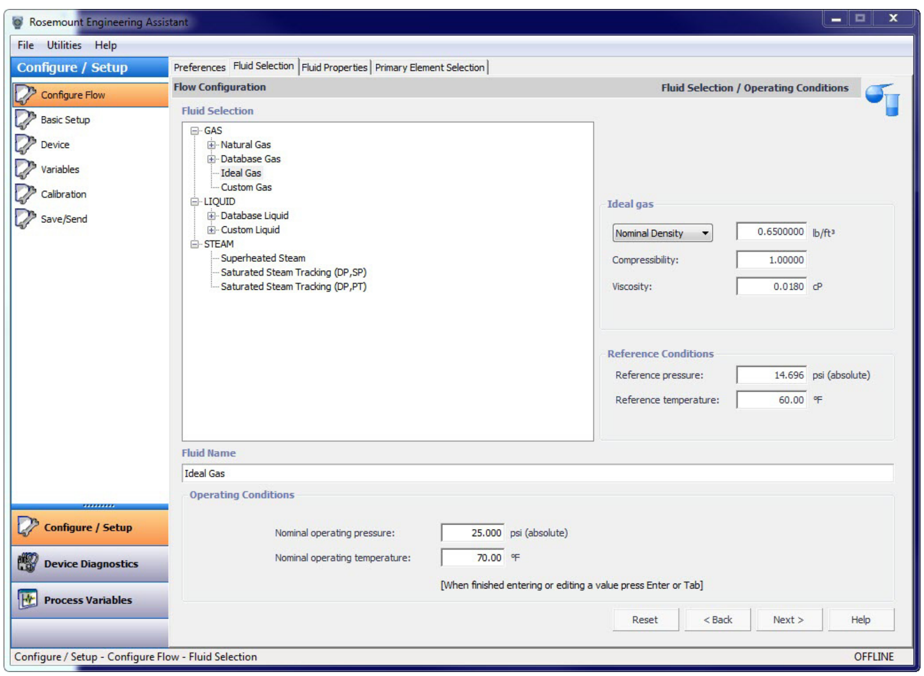
Ideal gas

The ideal gas option should be used when the fluid behavior can be modeled by the ideal gas law. This option uses a modified version of the ideal gas law with a constant value of compressibility. The default value for compressibility is 1.00 but it may be edited by the user. To use an ideal gas enter in the operating pressure and temperature followed by either the density, specific gravity, or molecular weight.

1. Expand the *GAS* category.
2. Select the **Ideal Gas** option.
3. Enter the *Nominal Operating Pressure* and *Temperature Ranges*. Engineering Assistant will use these ranges to identify the pressure and temperature values at which the fluid properties are required.

For the ideal gas being used the nominal density, specific gravity, or molecular weight must now be entered using the drop-down menu. Once these are entered the other data entry fields, compressibility and viscosity, are enabled as shown on Figure 2-14.

Figure 2-14. Fluid Selection Ideal Gas



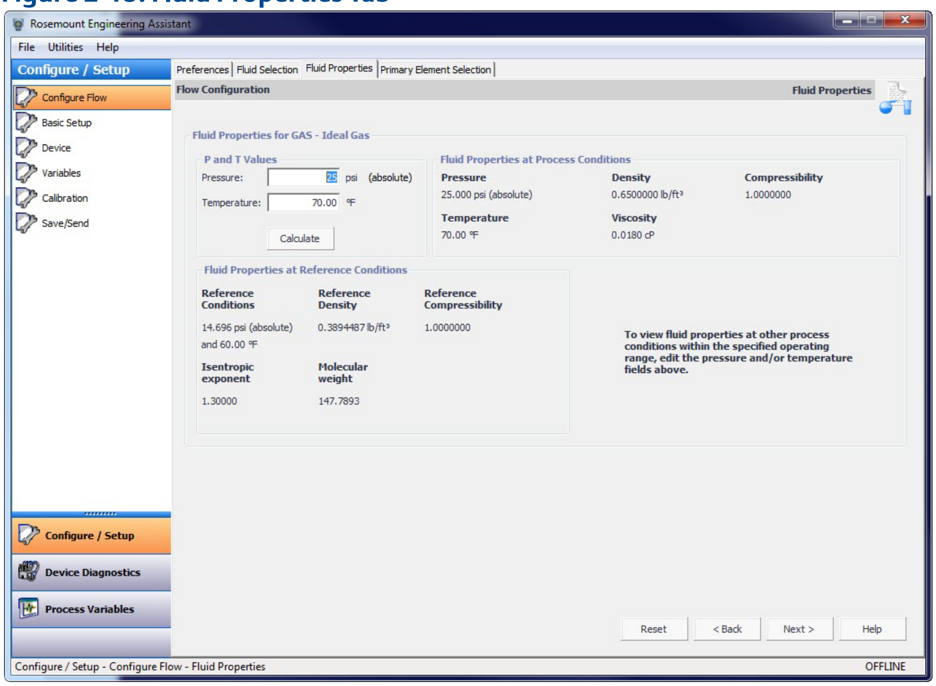
4. Adjust the compressibility and viscosity to fit the ideal gas of the process.
5. Select **Next** to proceed to the *Fluid Properties* tab.

Note
The *Fluid Properties* tab is an optional step and is not required to complete a flow configuration.

The Fluid Properties tab for the database gas air is shown in Figure 2-15. The user may view the properties of the chosen fluid. The fluid properties are initially shown at nominal conditions. To view density, compressibility, and viscosity of the selected fluid at other pressure and temperature values, enter a *Pressure* and *Temperature* and select **Calculate**.

Changing the pressure and temperature values on the *Fluid Properties* tab does not affect the flow configuration.

Figure 2-15. Fluid Properties Tab



6. Select **Next** to continue with the flow configuration on the *Primary Element Selection* tab.
7. Proceed with the steps in "Primary element selection" on page 13.

Custom gas

The custom gas option should be used for fluids not in the database such as proprietary fluids or gas mixtures. To properly calculate the fluid properties, the compressibility factor or density needs to be entered at specific pressure and temperature values based on the operating ranges entered by the user. The pressure and temperature values may be edited as needed. The editable values are shown in fields with white backgrounds. For best performance, it is recommended that, whenever possible, the compressibility or density values be entered at the suggested pressure and temperature values.
To ease entering the compressibility/density or viscosity values, data can be copied from a spreadsheet and pasted into the grid. The recommended process is to copy the pressure and temperature values from the table on the Engineering Assistant screen to assist in computing the density or compressibility values. Once the compressibility or density values are computed, they may then be copied from the spreadsheet and pasted into the grid on the *Custom Gas Fluid Properties* tab.

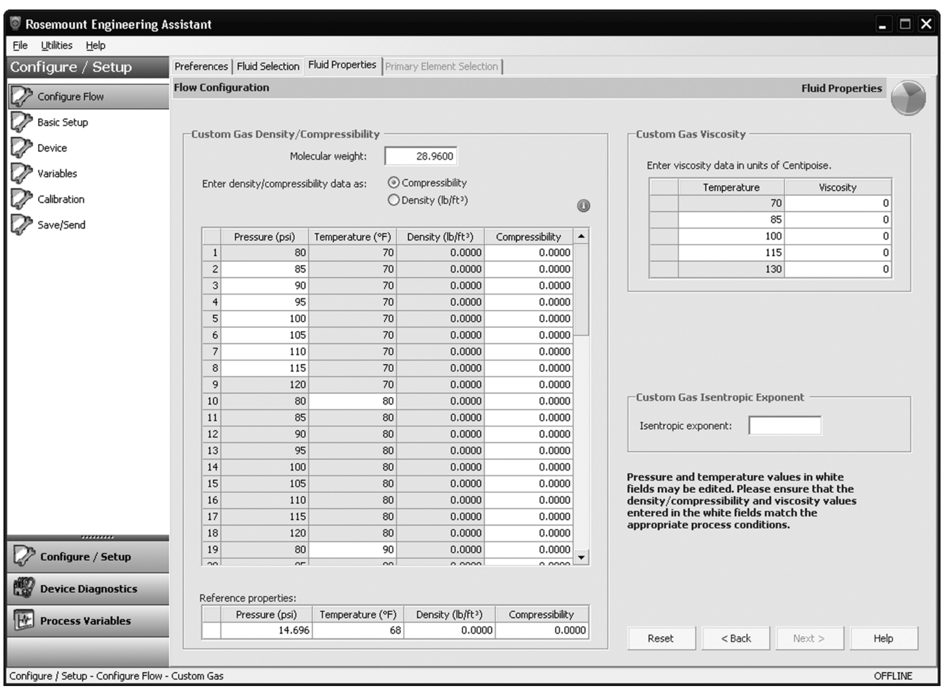
1. Expand the *Gas* category.
2. Select the **Custom Gas** option.
3. Enter the *Nominal Operating Pressure* and *Temperature Ranges*. Engineering Assistant will use these ranges to identify the pressure and temperature values at which the fluid properties are required.
4. Select **Next** to proceed to the *Custom Gas Fluid Properties* tab.
5. Enter the *Molecular Weight* of the Custom Gas. When the molecular weight of the gas is entered, the other data entry fields on the tab are enabled as shown in Figure 2-16 on page 22.
6. Select either **Density** or **Compressibility** and enter data.

Note

All pressure and temperature values may be edited except the minimum and maximum values. The minimum and maximum values were set on the *Fluid Selection* tab.

7. Enter the *Density* or *Compressibility* at reference conditions.
8. Enter the *Custom Gas Viscosity* at the given temperatures. Note that all temperature values may be edited except the minimum and maximum temperatures.
9. Enter the *Custom Gas Isentropic Exponent*.
10. Select **Next** to continue with the flow configuration on the *Primary Element Selection* tab.
11. Proceed with the steps in "Primary element selection" on page 13.

Figure 2-16. Custom Gas Fluid Properties Tab



Custom liquid (Density [T])

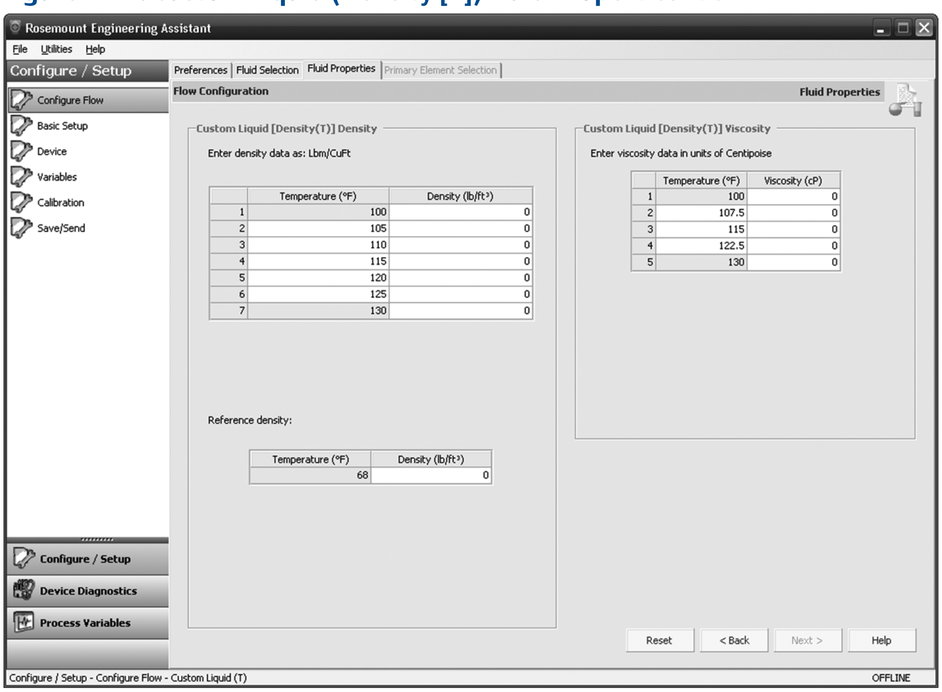
The Custom Liquid option should be used for fluids not in the database such as proprietary fluids.

1. Expand the *Liquid* category.
2. Expand the *Custom Liquid* category.
3. Select the **Custom Liquid (Density [T])** option.
4. Enter the *Nominal* and *Operating Temperature Range*. Engineering Assistant will use this range to identify the temperature values at which the fluid properties are required.
5. Select **Next** to continue the flow configuration on the *Fluid Properties* tab.
6. Enter the *Custom Liquid Density* at the given temperatures.

Note
All temperature values may be edited except the minimum and maximum temperatures.

7. Enter the *Reference Density* at the reference temperature.
8. Enter the *Custom Liquid Viscosity* at the given temperatures. Note that all temperature values may be edited except the minimum and maximum temperatures. The minimum and maximum values were set on the *Fluid Selection* tab.
9. Proceed with the steps in "Primary element selection" on page 13.

Figure 2-17. Custom Liquid (Density [T]) Fluid Properties Tab



2.5 Basic device configuration

Mass and energy flow Fast Keys	1, 3
Direct process variable output Fast Keys	1, 3

This section provides procedures for configuring the basic requirements to commission the Rosemount 3051SMV. The *Basic Setup* tab, shown in Figure 2-18 on page 25, can be used to perform all of the required transmitter configuration. The complete list of Field Communicator Fast Keys for basic setup are shown in Table 2-13 on page 62 and Table 2-14 on page 63.

Based on the configuration ordered, some measurements (i.e. static pressure, process temperature) and/or calculation types (i.e. mass, volumetric, and energy flow) may not be available for all fluid types. Available measurements and/or calculation types are determined by the multivariable type and measurement type codes ordered. See "Ordering information" on page 138 for more information.

All screens in this section are shown for multivariable type M (fully compensated mass and energy flow) with measurement type 1 (differential pressure, static pressure, and process temperature). Field Communicator Fast Keys are given for both multivariable type M and P (direct process variable output) with measurement type 1. Field Communicator Fast Keys and screens for other multivariable types and measurement types may vary.

Note

All screen shots in this section will be shown using AMS Device Manager. Engineering Assistant screens are similar and the instructions shown here apply to both AMS Device Manager and Engineering Assistant.

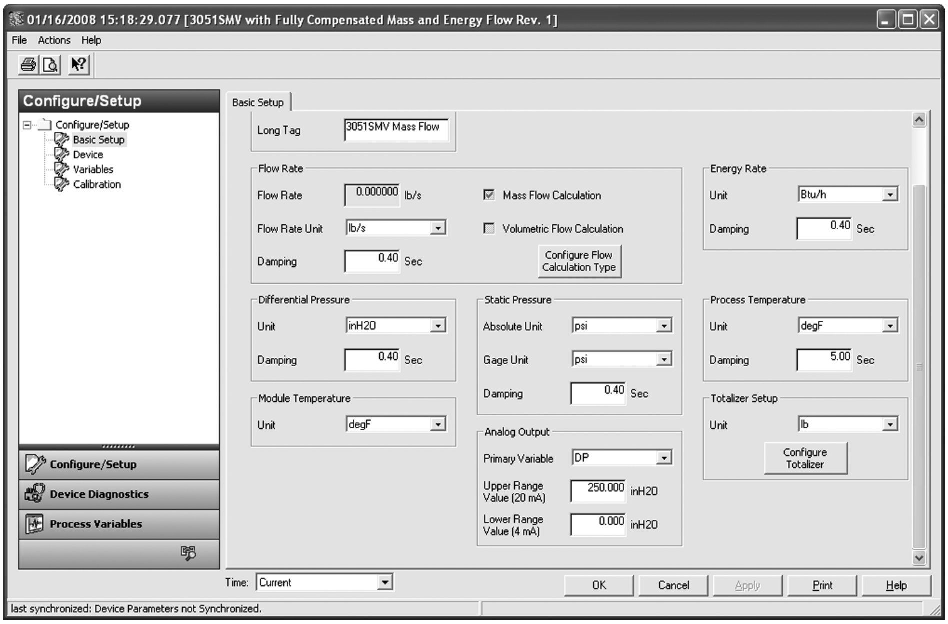
When using Engineering Assistant, a Reset Page button will be shown. In online mode, the **Reset Page** button will return all values on tab to the initial values received from the device before the start of the configuration. If editing a previously saved configuration, the **Reset Page** button will return all values on tab to those that were last saved. If starting a new configuration, all entered values on tab will be erased.

⚠ When information is edited on any AMS Device Manager tab, it will be highlighted in yellow. Edited information is not sent to the transmitter until the *Apply* or *OK* button is selected.

Units of measure

If a unit of measure is edited and the **Apply** button is selected, the unit of measure will be changed in the device memory and on screen, but the value may take up to 30 seconds to be updated on the AMS Device Manager screen.

Figure 2-18. Basic Setup Tab



- Verify the *Device Tag* information. The tag information is used to identify specific transmitters on the 4–20 mA loop. This tag information may be edited.
- Under the *Flow Rate* heading (fully compensated mass and energy flow feature board only), the type of flow calculation (mass or volumetric) is displayed by the indicators on the right side of the box. The *Flow Calculation Type* may be edited by selecting the **Configure Flow Calculation Type** button. The *Damping* and *Units* of the *Flow Rate* may also be edited under this heading.

Note

The flow calculation within the device uses undamped process variables. Flow rate damping is set independently of measured process variables.

- Under the *Energy Rate* heading (fully compensated mass and energy flow feature board only), the *Units* and *Damping* for the *Energy Rate* may be edited.

Note
Energy rate calculations are only available for steam and natural gas.

The energy rate calculation within the device uses undamped process variables. Energy rate damping is set independently of flow rate damping or measured process variables.

- Under the *Differential Pressure* heading, the *Units* and *Damping* for the *Differential Pressure* may be edited.
- Under the *Static Pressure* heading, the *Units* for both absolute and gage pressure and static pressure *Damping* may be edited.

Note
Both absolute and gage pressure are available as variables. The type of transmitter ordered will determine which variable is measured and which is calculated based on the user defined atmospheric pressure. For more information on configuring the atmospheric pressure, see "Static pressure" on page 53. Since only one of the static pressures is actually being measured, there is a single damping setting for both variables which may be edited under the *Static Pressure* heading.

- Under the *Process Temperature* heading, the *Units* and *Damping* for the *Process Temperature* may be edited.
- Under the *Module Temperature* heading, the *Units* for the sensor module temperature may be set. The sensor module temperature measurement is taken within the module, near the differential pressure and/or static pressure sensors and can be used to control heat tracing or diagnose device overheating.
- Under the *Analog Output* heading, the primary variable can be selected from the drop down menu and the upper and lower range values (4 and 20 mA points) for the primary variable may be edited.
- Under the *Totalizer* heading (fully compensated mass and energy flow feature board only), the Totalizer can be configured by selecting the **Configure Totalizer** button. This button allows the user to select the variable to be totalized. The Totalizer *Units* may also be edited under this heading.

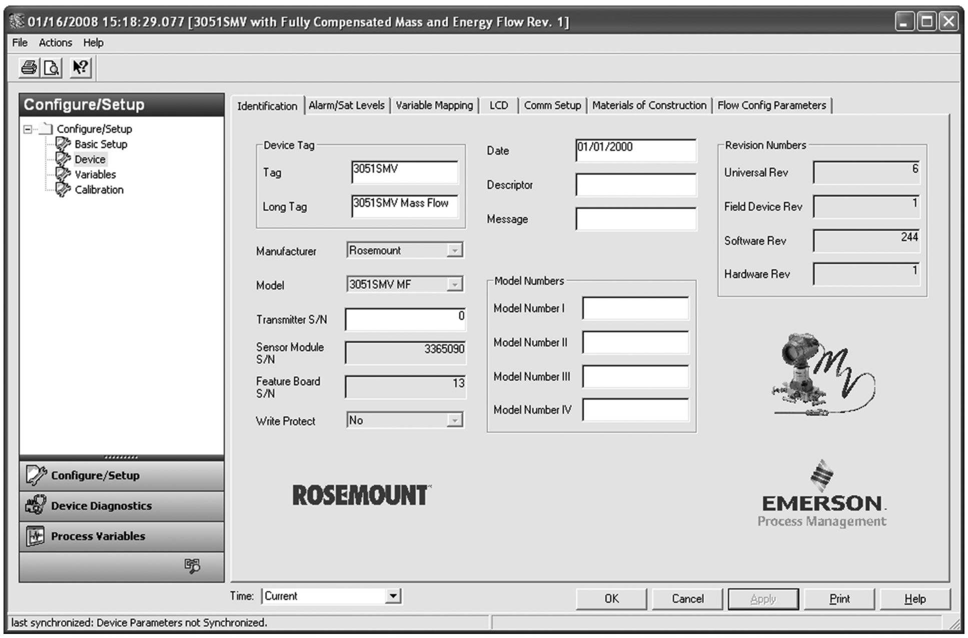
2.6 Detailed device configuration

2.6.1 Model identification

Mass and energy flow Fast Keys	1, 3, 5
Direct process variable output Fast Keys	1, 3, 5

The *Identification* tab displays the device identification information on one screen. The fields with white backgrounds may be edited by the user.

Figure 2-19. Device - Identification Tab



2.6.2 Alarm and saturation

The Rosemount 3051SMV automatically and continuously performs self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives the output to the configured alarm value. The transmitter will also drive the output to configured saturation values if the primary variable goes outside the 4–20 mA range values.

The alarm and saturation settings can be configured using Engineering Assistant, AMS Device Manager, or a Field Communicator. See "Alarm and saturation level configuration" on page 28 for more information. The alarm direction can be configured using the hardware switch on the feature board. See "Configure security (write protect)" on page 67 for more information on the hardware switch.

The Rosemount 3051SMV has three options for alarm and saturation levels:

- Rosemount (Standard), see Table 2-4 on page 28
- NAMUR, see Table 2-5 on page 28
- Custom (user-defined), see Table 2-6 on page 28

Table 2-4. Rosemount (Standard) Alarm and Saturation Values

Level	Saturation	Alarm
Low	3.9 mA	≤ 3.75 mA
High	20.8 mA	≥ 21.75 mA

Table 2-5. NAMUR-Compliant Alarm and Saturation Values

Level	Saturation	Alarm
Low	3.8 mA	≤ 3.6 mA
High	20.5 mA	≥ 22.5 mA

Table 2-6. Custom Alarm and Saturation Values

Level	Saturation	Alarm
Low	3.7 mA — 3.9 mA	3.6 mA — 3.8 mA
High	20.1 mA — 22.9 mA	20.2 mA — 23.0 mA

The following limitations exist for custom levels:

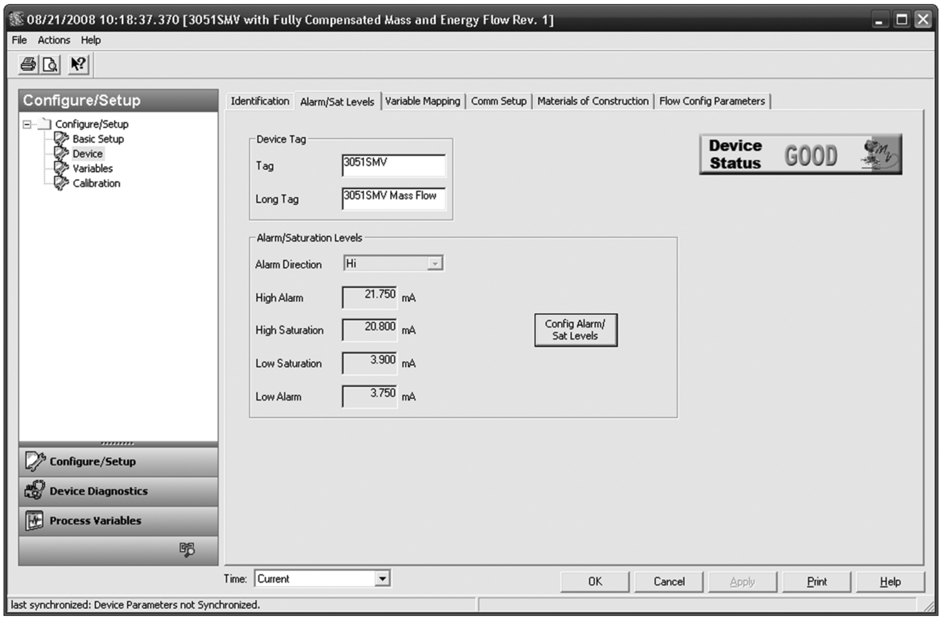
- Low alarm level must be less than the low saturation level
- High alarm level must be higher than the high saturation level
- Alarm and saturation levels must be separated by at least 0.1 mA

Alarm and saturation level configuration

Mass and energy flow Fast Keys	1, 4, 2, 6, 6
Direct process variable output Fast Keys	1, 4, 2, 6, 6

The *Alarm/Sat Levels* tab allows the Alarm and Saturation Levels to be configured. To change alarm/saturation level settings, select the **Config Alarm/Sat Levels** button.

Figure 2-20. Device - Alarm/Sat Levels Tab



Alarm level verification

The transmitter alarm level should be verified before returning the transmitter to service if alarm and saturation levels are changed.

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 Table 2-4, Table 2-5, and Table 2-6 on page 28, and "Analog output loop test" on page 96).

Variable saturation behavior

The analog output of the Rosemount 3051SMV may respond differently based on which measurement goes outside the sensor limits. This response will also depend on the device configuration. Table 2-7 lists the behaviors of the analog output under different conditions.

Table 2-7. Variable Saturation Behavior

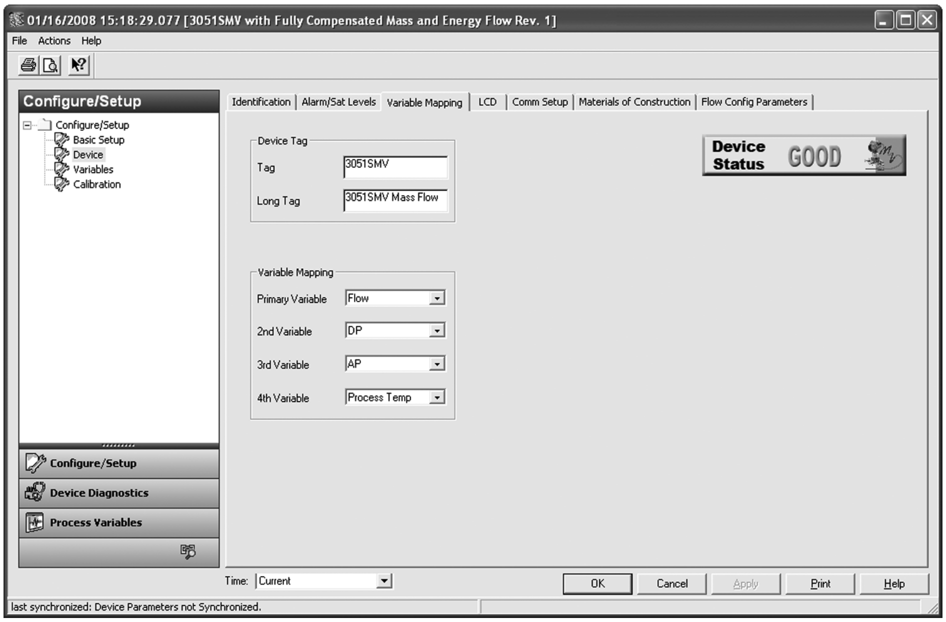
Primary variable	Action	Analog output behavior
Flow or Energy Flow	Differential Pressure goes outside the sensor limits	Analog output goes to high or low saturation
Flow or Energy Flow	Absolute Pressure or Gage Pressure goes outside the sensor limits	Analog output does not saturate
Flow or Energy Flow	Process Temperature goes outside the user defined sensor limits	Temperature mode is Normal: Analog output goes into high or low alarm. Temperature Mode is Backup: The Process Temp will go into backup mode and be fixed at the user defined value. Analog output will not saturate or go into alarm.
DP	Differential Pressure goes outside the sensor limits	Analog output goes to high or low saturation
AP or GP	Absolute Pressure or Gage Pressure goes outside the sensor limits	Analog output goes to high or low saturation
Process Temp	Process Temperature goes outside the user defined sensor limits	Direct process variable output: Analog output goes to high or low saturation Mass and Energy Flow: Analog output goes to high or low alarm

2.6.3 Variable mapping

Mass and energy flow Fast Keys	1, 4, 3, 4
Direct process variable output Fast Keys	1, 4, 3, 4

The *Variable Mapping* tab is used to define which process variable will be mapped to each HART variable. The primary variable represents the 4–20 mA analog output signal while the 2nd, 3rd, and 4th variables are digital. To edit the variable assignments, select the appropriate process variables from the drop-down menus and select **Apply**.

Figure 2-21. Device - Variable Mapping Tab



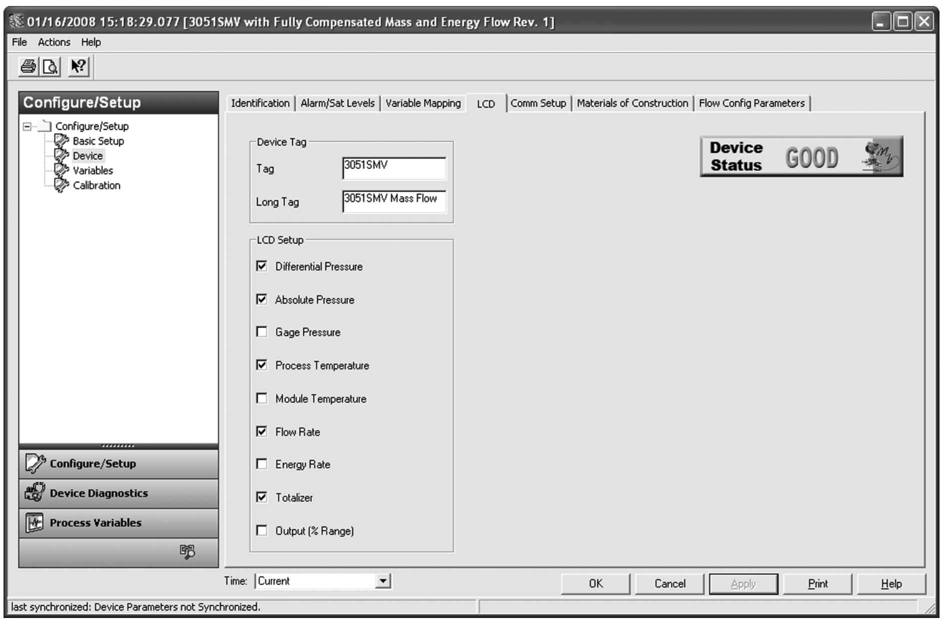
2.6.4 LCD display

Mass and energy flow Fast Keys	1, 3, 8
Direct process variable output Fast Keys	1, 3, 8

The LCD display features a four-line display and a 0–100 percent scaled bar graph. The first line of five characters displays the output description, the second line of seven digits displays the actual value, and the third line of six characters displays engineering units. The fourth line displays "Error" when there is a problem detected with the transmitter. The LCD display can also show diagnostic messages. These diagnostic messages are listed in Table 5-1 on page 108.

The *LCD* tab allows the user to configure which variables will be shown on the LCD display. Select the check box next to each variable to select a variable for display. The transmitter will scroll through the selected variables, showing each for three seconds.

Figure 2-22. Device - LCD Tab

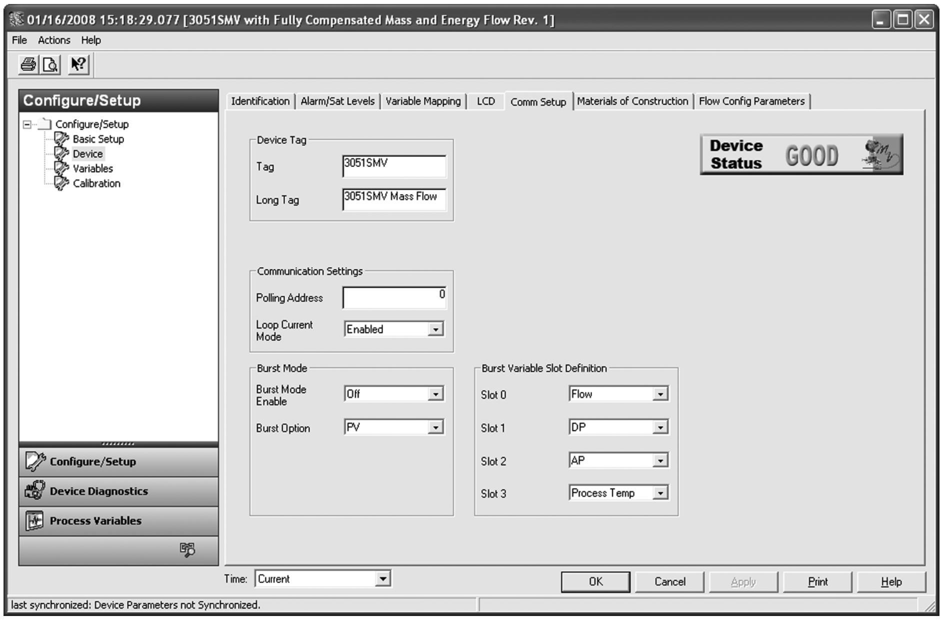


2.6.5 Communication setup

Mass and energy flow Fast Keys	1, 4, 3, 3
Direct process variable output Fast Keys	1, 4, 3, 3

The *Comm Setup* tab allows the settings for burst mode and multidrop communications to be configured.

Figure 2-23. Device - Comm Setup Tab



Burst mode

When *Burst Mode Enable* is set to on, the Rosemount 3051SMV sends up to four HART variables to the control system without the control system polling for information from the transmitter.

When operating with *Burst Mode Enable* set to on, the transmitter will continue to output a 4–20 mA 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 (process variables in engineering units, primary variable in percent of range, and/or analog output), and does not affect the way other transmitter data is accessed.

Access to information that is not burst can be obtained through the normal poll/response method of HART communication. A Field Communicator, AMS Device Manager, Engineering Assistant, or the control system may request any of the information that is normally available while the transmitter is in burst mode.

Enabling burst mode

Mass and energy flow Fast Keys	1, 4, 3, 3, 3
Direct process variable output Fast Keys	1, 4, 3, 3, 3

To enable burst mode, select **On** from the *Burst Mode Enable* drop-down menu under the *Burst Mode* heading.

Choosing a burst option

Mass and energy flow Fast Keys	1, 4, 3, 3, 4
Direct process variable output Fast Keys	1, 4, 3, 3, 4

This parameter selects the information to be burst. Make a selection from the *Burst Option* drop-down menu under the *Burst Mode* heading. The *Dyn vars/current* option is the most common, because it is used to communicate with the Rosemount 333 HART Tri-Loop™.

Table 2-8. Burst Options

HART command	Burst option	Description
1	PV	Primary variable
2	% range/current	Percent of range and milliamp output
3	Dyn vars/current	All process variables and milliamp output
9	Device vars w/ status	Burst variables and status information
33	Device variables	Burst variables

Choosing burst variable slot definition

Mass and energy flow Fast Keys	1, 4, 3, 3, 5
Direct process variable output Fast Keys	1, 4, 3, 3, 5

If the burst option *Device vars w/ status* or *Device variables* is selected, the user may select the four variables that will be burst. These are defined in slots 1–4 under the *Burst Variable Slot Definitions* heading. The variables defined in slots 1–4 can be different than the variables mapped to the primary, 2nd, 3rd, and 4th variable outputs.

Multidrop communication

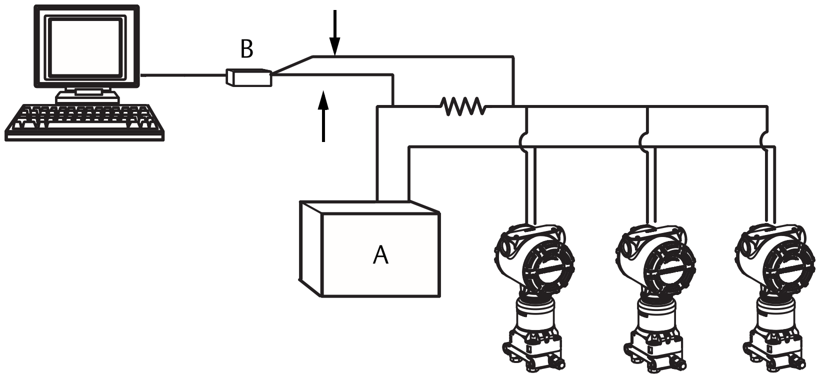
Multidropping transmitters refers to the connection of several transmitters to a single communications transmission line.

Note
Figure 2-24 on page 35 shows a typical multidrop network. This figure is not intended as an installation diagram.

Communication between the host and the transmitters takes place digitally with the analog output of the transmitters deactivated.

Note
⚠ A transmitter in multidrop mode with *Loop Current Mode* disabled has the analog output fixed at 4 mA.

Figure 2-24. Typical Multidrop Network



A. Power supply
B. HART modem

Enable multidrop communication

Mass and energy flow Fast Keys	1, 4, 3, 3, 1
Direct process variable output Fast Keys	1, 4, 3, 3, 1

The Rosemount 3051SMV 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 1–15 for HART 5 hosts or 1–63 for HART 6 hosts. This change deactivates the 4–20 mA analog output, sending it to a fixed value of 4 mA. It also disables the failure alarm signal, which is controlled by the HI/LO alarm switch position on the feature board. Failure signals in multidropped transmitters are communicated through HART messages.

Loop current mode

Mass and energy flow Fast Keys	1, 4, 3, 3, 2
Direct process variable output Fast Keys	1, 4, 3, 3, 2

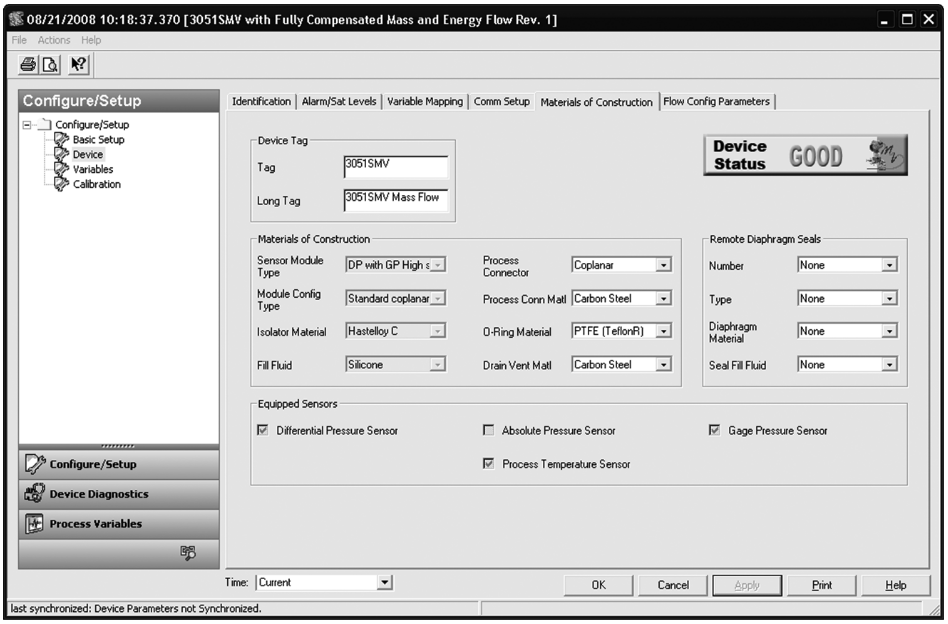
When using multidrop communication, the loop current mode drop-down menu defines how the 4–20 mA analog output behaves. When loop current mode is disabled, the analog output will be fixed at 4 mA. When the loop current mode is enabled, the analog output will follow the primary variable.

2.6.6 Materials of construction

Mass and energy flow Fast Keys	1, 4, 4, 2
Direct process variable output Fast Keys	1, 4, 4, 2

The *Materials of Construction* tab allows the materials of construction, remote seal, and equipped sensor information to be viewed. The parameters shown in white boxes may be edited by the user, but do not affect the operation of the device.

Figure 2-25. Device - Materials of Construction Tab



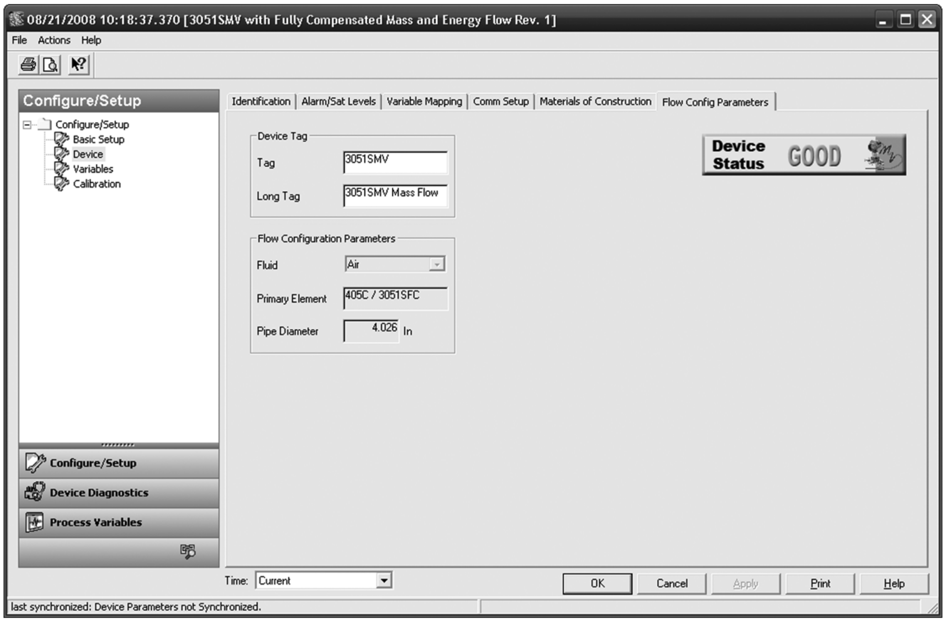
2.6.7 Flow configuration parameters

Mass and energy flow Fast Keys	1, 4, 4, 3

(Fully compensated mass and energy flow feature board only)

The *Flow Config Parameters* tab allows the *Process Fluid*, *Primary Element* type and *Pipe Diameter* used in the flow configuration to be viewed. These values may only be edited using Engineering Assistant version 6.3 or later.

Figure 2-26. Device - Flow Config Parameters Tab



2.7 Variable configuration

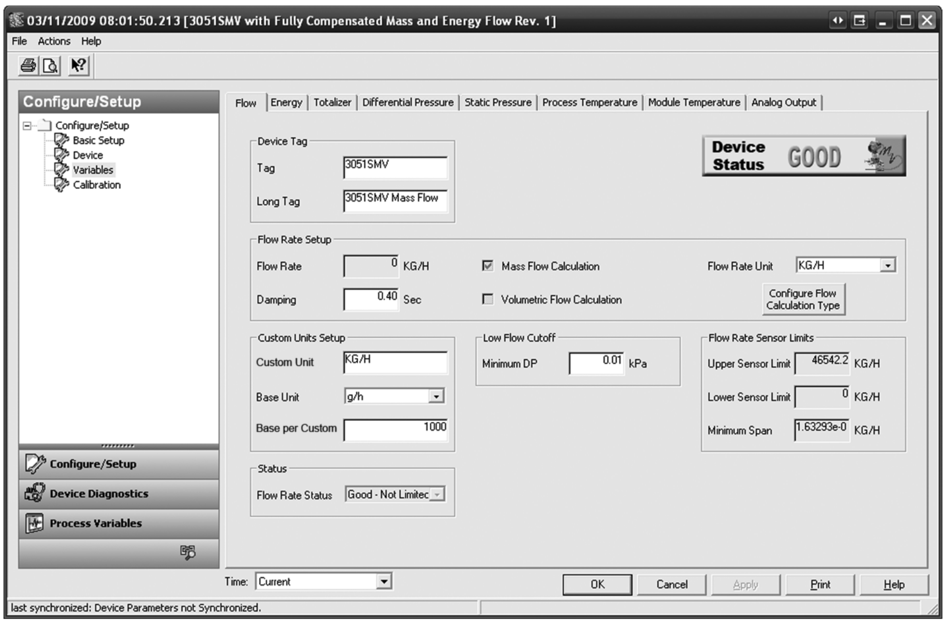
2.7.1 Flow rate

Mass and energy flow Fast Keys	1, 4, 1, 1

(Fully compensated mass and energy flow feature board only)

The *Flow* tab is used to configure the settings associated with the Flow Variable. Fluid and primary element information which defines the flow calculation is configured using Engineering Assistant.

Figure 2-27. Variables - Flow Tab



- Under the *Flow Rate Setup* heading, the type of flow calculation is indicated by the check boxes next to either *Mass Flow Calculation* or *Volumetric Flow Calculation*. To edit the flow calculation type, select the **Configure Flow Calculation Type** button.
- Edit the *Flow Rate Units* and *Damping* value as needed. The flow calculation within the device uses undamped process variables. Flow rate damping is set independently of the measured process variables.

Note
If the flow calculation type is changed, the totalizer will be stopped and reset automatically.

- Under the *Low Flow Cutoff* heading, edit the current *Minimum DP Value* as needed. The unit for this value is the user-selected DP unit. If the measured DP value is less than the minimum DP value, the transmitter will calculate the *Flow Rate* value to be zero.
- The *Sensor Limits* and *Minimum Span* can be viewed under the *Flow Rate Sensor Limits* heading.

Note

If the flow rate is configured as the primary variable and is being output via the 4–20 mA signal, verify the 4–20 mA range (LRV and URV) after completing the custom unit configuration. For more information on verifying the 4–20 mA range, see "Basic device configuration" on page 24.

Follow these steps to configure a custom unit:

a. **Custom Unit**: Enter the desired custom unit label to be displayed for the flow rate. Up to five characters including letters, numbers, and symbols can be entered in the custom unit field.

Note

It is recommended that the Custom Unit be entered in upper case letters. If lower case letters are entered, the LCD display will show upper case letters. Additionally, the following special characters are recognized by the LCD display: hyphens ("-"), percent symbols ("%"), asterisks ("*"), forward slashes ("/") and spaces. Any other character entered for the Custom Unit will be displayed as an asterisk ("*") on the LCD display. The following warning will be returned indicating these changes: "Custom Unit contains characters that will display in upper case or asterisks on LCD display. The DCS will display as entered."

b. **Base Unit**: From the drop-down menu, select a base unit to be used for the custom unit relationship.

c. **Base per Custom**: Enter a numeric value that represents the number of base units per one custom unit. The Rosemount 3051SMV uses the following convention:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}}$$

Example

Custom Unit: kg
Base Unit: g

Because:

1 kg (Kilogram) = 1000 g (Grams)

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}} = \frac{1000 \cdot g}{1 \cdot kg} = 1000$$

The values of Base per Custom for common flow units are shown in Table 2-9.

d. Select **Apply**.

e. **Flow Rate Unit**: From the drop-down menu, select the custom unit that was created in Step b.

Note

The custom unit may not be available as a selection in the *Flow Rate Unit* drop-down menu until the drop-down menu is refreshed. To refresh the drop-down menu, navigate to the *Basic Setup* tab and then return to the *Variables - Flow* tab.

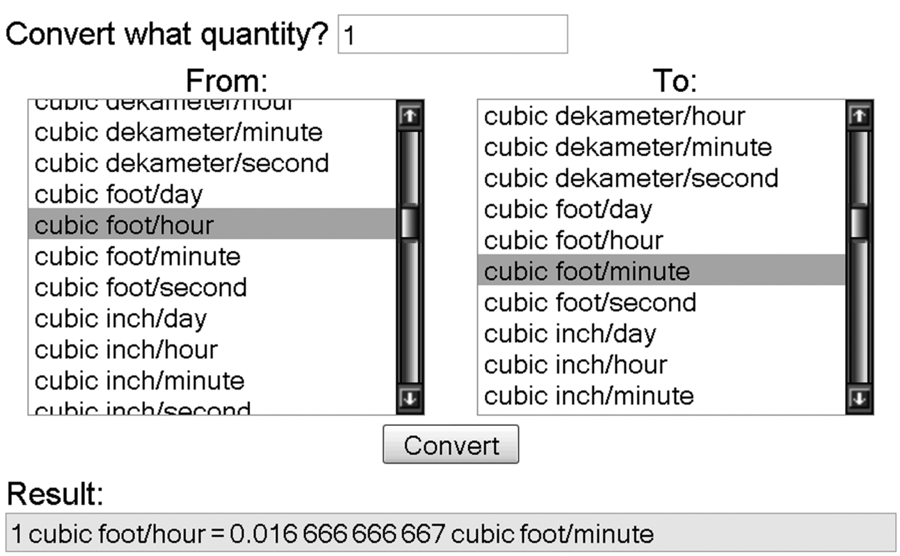
Table 2-9. Common Custom Units - Flow

Custom unit	Base unit	Base per custom
Barrels per Minute (BBL/M)	bbl/h	60
Cubic Meters per Day (CUM/D)	Cum/h	0.041667
Millions of Cubic Meters per Day (MMCMD)	Cum/h	41666.7

Table 2-9. Common Custom Units - Flow

Custom unit	Base unit	Base per custom
Millions of Gallons per Day (MGD)	gal/d	1000000
Millions of Liters per Day (MML/D)	L/h	41666.7
Millions of Standard Cubic Feet per Day (MMCFD)	StdCuft/min	694.444
Normal Cubic Meters per Day (NCM/D)	NmlCum/h	0.041667
Normal Cubic Meters per Minute (NCM/M)	NmlCum/h	60
Short Tons per Day (STOND)	lb/d	2000
Short Tons per Hour (STONH)	lb/h	2000
Standard Cubic Feet per Day (SCF/D)	StdCuft/min	0.000694
Standard Cubic Feet per Hour (SCF/H)	StdCuft/min	0.016667
Standard Cubic Feet per Second (SCF/S)	StdCuft/min	60
Standard Cubic Meters per Day (SCM/D)	StdCum/h	0.041667
Thousands of Gallons per Day (KGD)	gal/d	1000
Thousands of Pounds per Hour (KLB/H)	lb/h	1000
Thousands of Standard Cubic Feet per Day (KSCFD)	StdCuft/min	0.694444
Thousands of Standard Cubic Feet per Hour (KSCFH)	StdCuft/min	16.6666

If conversion factor tables or internet search engines are used to determine the Base per Custom value, it is important to enter the Custom Unit in the “From” field and the Base Unit in the “To” Field. An example of this is shown below:



To calculate the Base per Custom value for a custom unit not shown in Table 2-9 on page 39, see one of the following examples:

- Mass/volume conversion example: page 41
- Time conversion example: page 42
- Mass/volume and time conversion example: page 43

Mass/volume conversion example

To find the Base per Custom relationship for a custom unit of kilograms per hour (kg/h) and a base unit of grams per hour (g/h), input the following:

Custom Unit = kg/h
Base Unit = g/h

Because:

1 kg (Kilogram) = 1000 g (Grams)

Then:

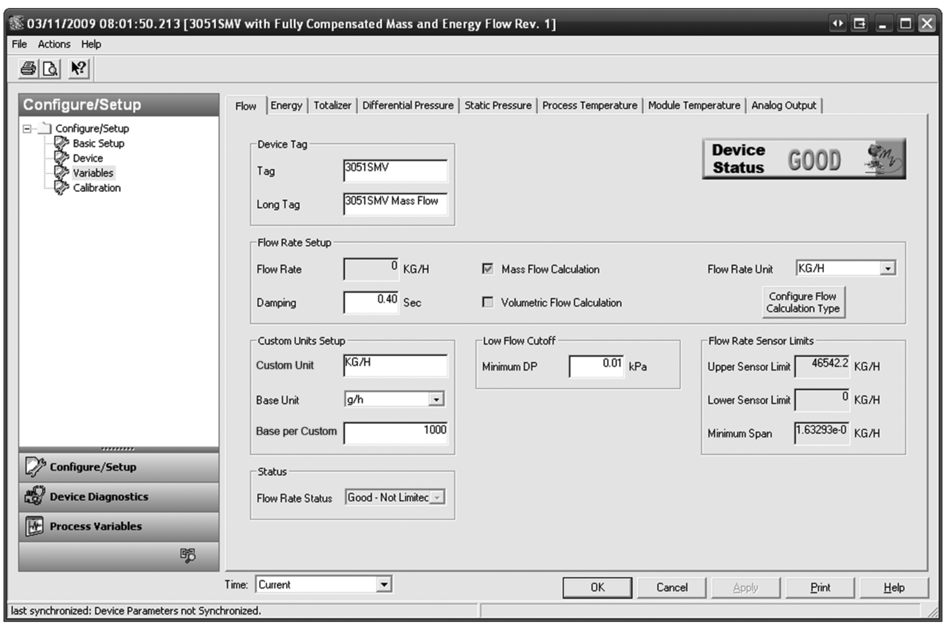
$$1\ \text{kg/h} = \frac{1 \cdot \text{kg}}{1 \cdot \text{h}} \times \frac{1000 \cdot \text{g}}{1 \cdot \text{kg}} = 1000\ \text{g/h}$$

1 kg/h = 1000 g/h

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}} = \frac{1000 \cdot \text{g/h}}{1 \cdot \text{kg/h}} = 1000$$

Figure 2-28. Flow Rate Custom Units - Mass/Volume Conversion Example



Time conversion example

To find the Base per Custom relationship for a custom unit of standard cubic feet per hour (scf/h) and a base unit of standard cubic feet per minute (StdCuft/min), input the following:

Custom Unit = scf/h
Base Unit = StdCuft/min

Because:

1 h (Hour) = 60 min (Minutes)

Then:

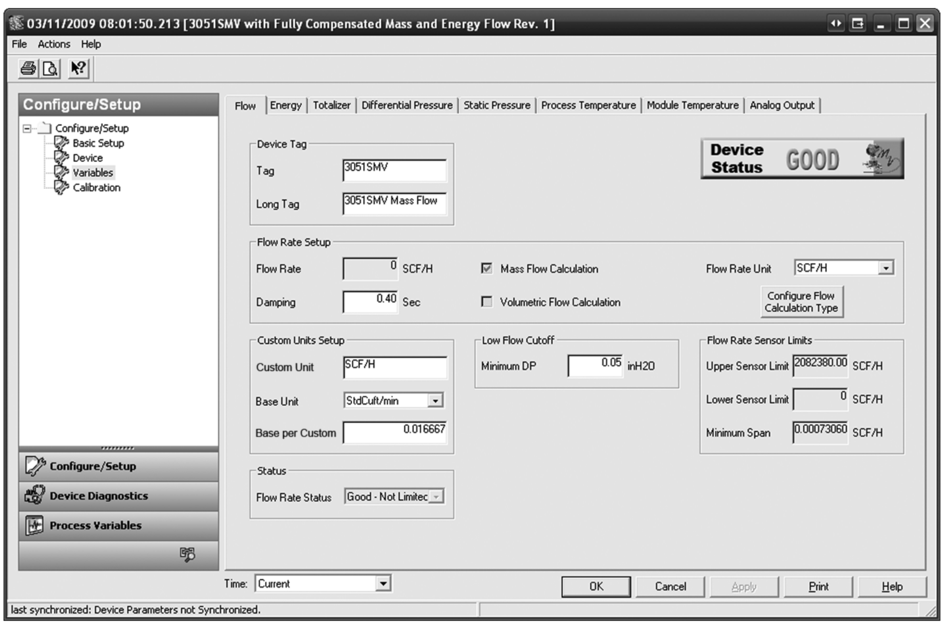
$$1\ \text{scf/h} = \frac{1 \cdot \text{scf}}{1 \cdot \text{h}} \times \frac{1 \cdot \text{h}}{60 \cdot \text{min}} = 0.016667\ \text{StdCuft/min}$$

1 scf/h = 0.016667 StdCuft/min

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{1\ \text{Custom Unit}} = \frac{0.016667 \cdot \text{StdCuft/min}}{1 \cdot \text{scf/h}} = 0.016667$$

Figure 2-29. Flow Rate Custom Units - Time Conversion Example



Mass/volume and time conversion example

To find the Base per Custom relationship for a custom unit of standard millions of standard cubic feet per day (mmcfd) and a base unit of standard cubic feet per minute (StdCuft/min), input the following:

Custom Unit = mmcfd
Base Unit = StdCuft/min

Because:

1 mmcf (Millions of Standard Cubic Feet) = 1000000 StdCuft (Standard Cubic Feet) and

1 d (Day) = 1440 min (Minutes)

Then:

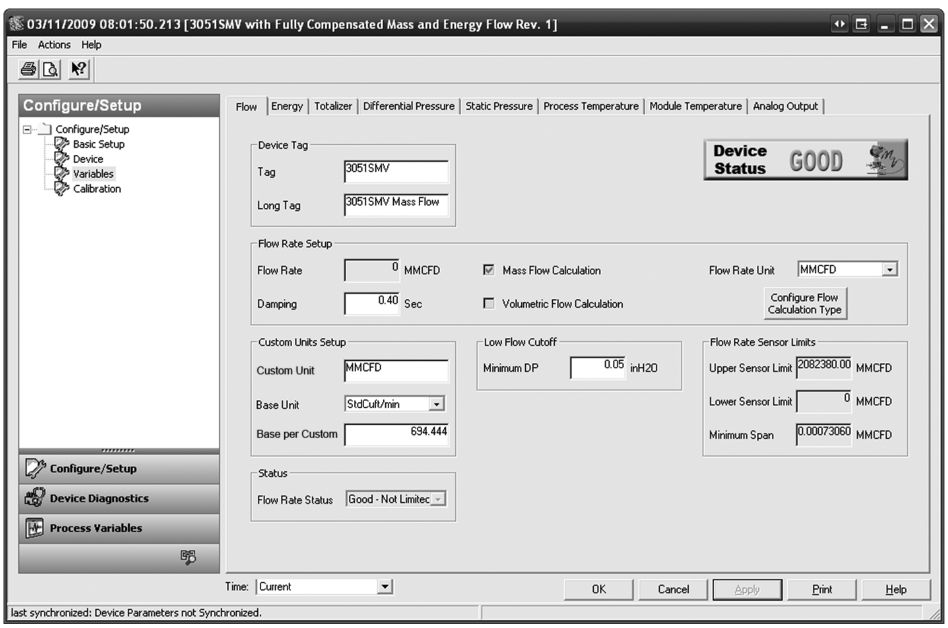
$$1\ \text{mmcfd} = \frac{1 \cdot \text{mmcf}}{1 \cdot \text{d}} \times \frac{1000000 \cdot \text{StdCuft}}{1 \cdot \text{mmcf}} \times \frac{1 \cdot \text{d}}{1440 \cdot \text{min}} = 694.444\ \text{StdCuft/min}$$

1 mmcfd = 694.444 StdCuft/min

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{1\ \text{Custom Unit}} = \frac{694.444 \cdot \text{StdCuft/min}}{1 \cdot \text{mmcfd}} = 694.444$$

Figure 2-30. Flow Rate Custom Units - Mass/Volume and Time Conversion Example



Under the *Custom Units Setup* heading, the user may configure a custom unit for the flow rate measurement. Custom units allow the flow rate to be displayed in units of measure that are not standard in the Rosemount 3051SMV.

2.7.2 Energy rate

Mass and energy flow Fast Keys	1, 4, 1, 2

(Fully compensated mass and energy flow feature board only)

Note
Energy Rate calculations are only available for certain fluid types.

The *Energy* tab allows the user to configure the settings associated with the energy flow.

- Under the *Energy Rate Setup* heading, edit the Energy Rate *Units* and *Damping* values as needed. The energy rate calculation within the device uses undamped process variables. Energy rate damping is set independently of flow rate damping and measured process variables.
- Under the *Custom Units Setup* heading, the user may configure a custom unit for the energy rate measurement. Custom units allow the energy rate to be displayed in units of measure that are not standard in the Rosemount 3051SMV.

Note
If the energy rate is configured as the primary variable and is being output via the 4-20 mA signal, verify the 4–20 mA range (LRV and URV) after completing the custom unit configuration. For more information on verifying the 4–20 mA range, see "Basic device configuration" on page 24.

Follow these steps to configure a custom unit:

a. **Custom Unit**: Enter the desired custom unit label to be displayed for the energy rate. Up to five characters including letters, numbers, and symbols can be entered in the custom unit field.

Note
It is recommended that the Custom Unit be entered in upper case letters If lower case letters are entered, the LCD display will show upper case letters. Additionally, the following special characters are recognized by the LCD display: hyphens ("-"), percent symbols ("%"), asterisks ("*"), forward slashes ("/") and spaces. Any other character entered for the Custom Unit will be displayed as an asterisk ("*") on the LCD display. The following warning will be returned indicating these changes: "Custom Unit contains characters that will display in upper case or asterisks on LCD display. The DCS will display as entered."

b. **Base Unit**: From the drop-down menu, select a base unit to be used for the custom unit relationship.

c. **Base per Custom**: Enter a numeric value that represents the number of base units per one custom unit. The Rosemount 3051SMV uses the following convention:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}}$$

Example

Custom Unit: kg
Base Unit: g

Because:

1 kg (Kilogram) = 1000 g (Grams)

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}} = \frac{1000 \cdot g}{1 \cdot kg} = 1000$$

The values of Base per Custom for common energy units are shown in Table 2-10 on page 45.

d. Select **Apply**.

e. **Energy Rate Unit**: From the drop-down menu, select the custom unit that was created in Step b.

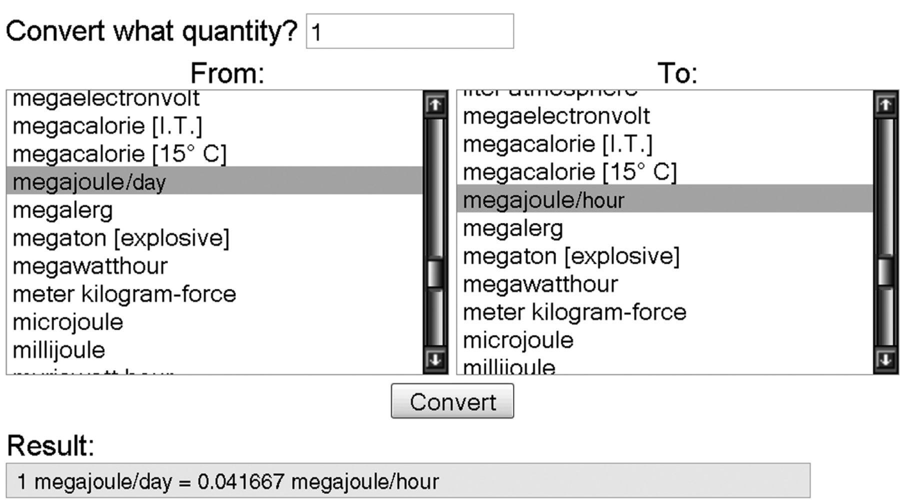
Note

The custom unit may not be available as a selection in the *Energy Rate Unit* drop-down menu until the drop-down menu is refreshed. To refresh the drop-down menu, navigate to the *Basic Setup* tab and then return to the *Variables - Energy* tab.

Table 2-10. Common Custom Units - Energy Flow

Custom unit	Base unit	Base per custom
BTU per Day (BTU/D)	Btu/h	0.041667
BTU per Minute (BTU/M)	Btu/h	60
Megajoules per Day (MJ/D)	MJ/h	0.041667
Megajoules per Minute (MJ/M)	MJ/h	60
Thousands of BTU per Day (KBTUD)	Btu/h	41.6667
Thousands of BTU per Hour (KBTUH)	Btu/h	1000

If conversion factor tables or internet search engines are used to determine the Base per Custom value, it is important to enter the Custom Unit in the “From” field and the Base Unit in the “To” Field. An example of this is shown below:



To calculate the Base per Custom value for a custom unit not shown in Table 2-10 on page 45, see one of the following examples:

- Energy conversion example: page 46
- Time conversion example: page 47
- Energy and time conversion example: page 47

Energy conversion example

To find the Base per Custom relationship for a custom unit of thousands of BTU per hour (kBtuh) and a base unit of BTU per hour (Btu/h), input the following:

Custom Unit = kBtuh

Base Unit = Btu/h

Because:

1 kBtu (Thousands of BTU) = 1000 Btu

Then:

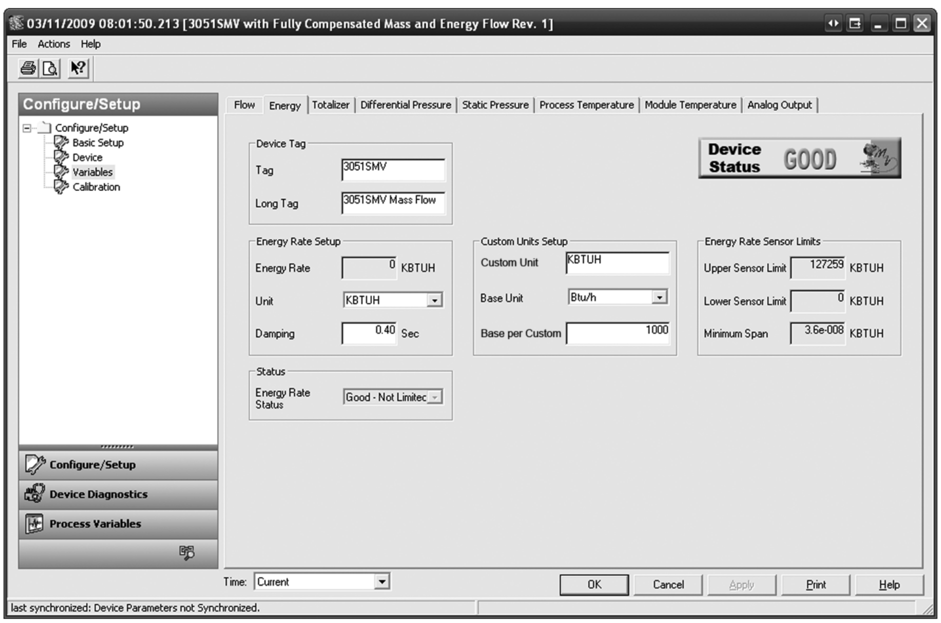
$$1\ \text{kBtuh} = \frac{1 \cdot \text{kBtu}}{1 \cdot \text{h}} \times \frac{1000 \cdot \text{Btu}}{1 \cdot \text{h}} = 1000\ \text{Btu/h}$$

1 kBtuh = 1000 Btu/h

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{1\ \text{Custom Unit}} = \frac{1000 \cdot \text{Btu/h}}{1 \cdot \text{kBtuh}} = 1000$$

Figure 2-31. Energy Rate Custom Units - Energy Conversion Example



Time conversion example

To find the Base per Custom relationship for a custom unit of BTU per day (Btu/d) and a base unit of BTU per hour (Btu/h), input the following:

Custom Unit = Btu/d
Base Unit = Btu/h

Because:

1 d (Day) = 24 h (Hours)

Then:

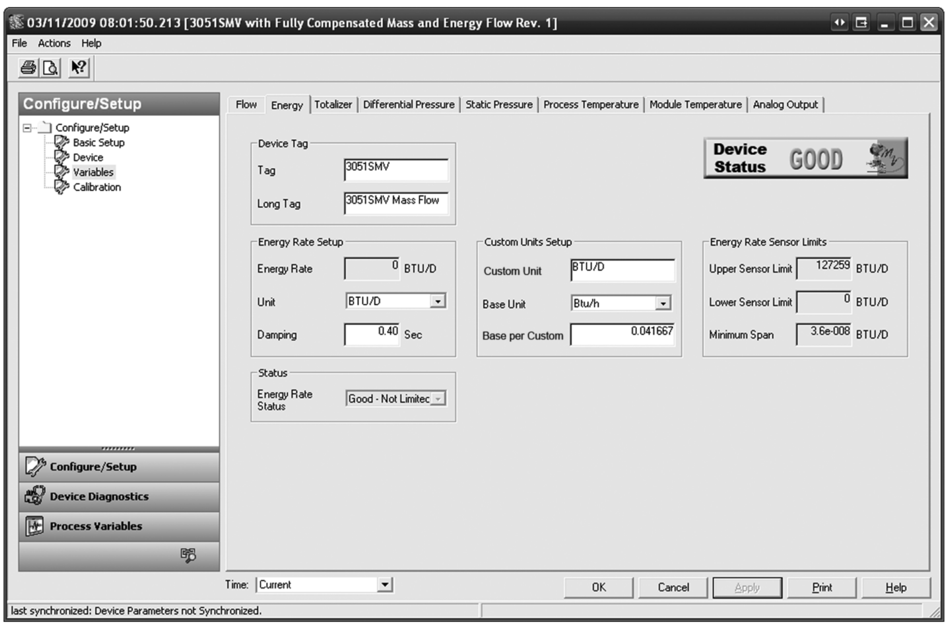
$$1\ \text{Btu/d} = \frac{1 \cdot \text{Btu}}{1 \cdot \text{d}} \times \frac{1 \cdot \text{d}}{24 \cdot \text{h}} = 0.041667\ \text{Btu/h}$$

1 Btu/d = 0.041667 Btu/h

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}} = \frac{0.041667 \cdot \text{Btu/h}}{1 \cdot \text{Btu/d}} = 0.041667$$

Figure 2-32. Energy Rate Custom Units - Time Conversion Example



Energy and time conversion example

To find the Base per Custom relationship for a custom unit of thousands of BTU per day (kBtud) and a base unit of BTU per hour (Btu/h), input the following:

Custom Unit = kBtud
Base Unit = Btu/h

Because:

1 kBtu (Thousands of BTU)= 1000 Btu and

1 d (Day) = 24 h (Hours)

Then:

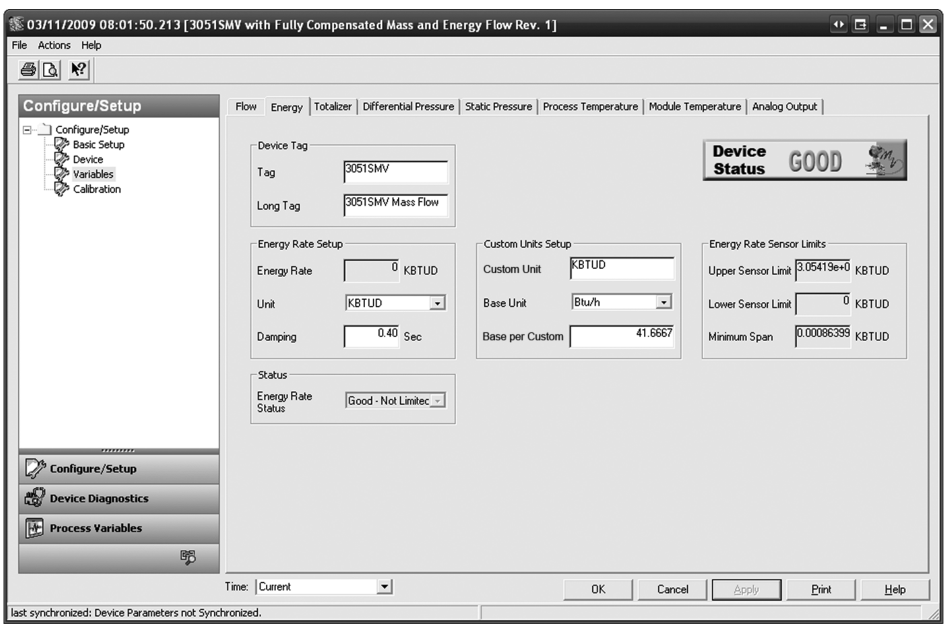
$$1\ \text{kBtud} = \frac{1 \cdot \text{kBtu}}{1 \cdot \text{d}} \times \frac{1000 \cdot \text{Btu}}{1 \cdot \text{kBtu}} \times \frac{1 \cdot \text{d}}{24 \cdot \text{h}} = 41.6667\ \text{Btu/h}$$

1 kBtud = 41.6667 Btu/h

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{1\ \text{Custom Unit}} = \frac{41.6667 \cdot \text{Btu/h}}{1 \cdot \text{kBtud}} = 41.6667$$

Figure 2-33. Energy Rate Custom Units - Energy and Time Conversion Example



- Under the *Low Flow Cutoff* heading, edit the current *Minimum DP Value* as needed. The unit for this value is the user-selected DP unit. If the measured DP value is less than the minimum DP value, the transmitter will calculate the energy value to be zero.
- The *Sensor Limits* and *Minimum Span* can be viewed under the *Energy Rate Sensor Limits* heading.

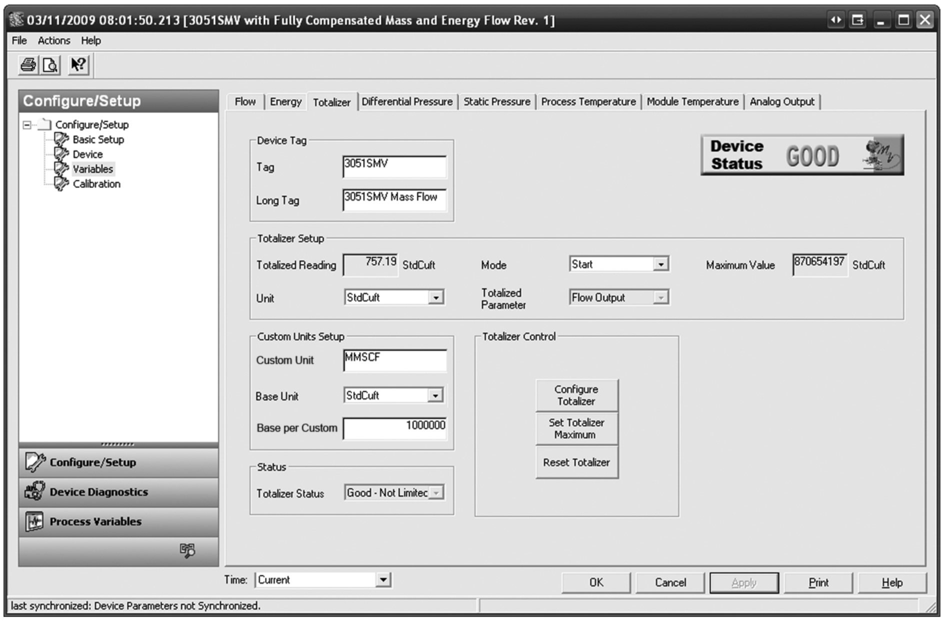
2.7.3 Totalizer

Mass and energy flow Fast Keys	1, 4, 1, 3

(Fully compensated mass and energy flow feature board only)

The *Totalizer* tab is used to configure the settings associated with the totalizer functionality within the transmitter.

Figure 2-34. Variables - Totalizer Tab



1. To turn the totalizer functionality on or off, select **Start** or **Stop** from the *Mode* drop down menu under the *Totalizer Setup* heading. The totalizer *Units* may also be edited under this heading.
2. Verify the *Totalized Parameter* and the *Totalizer Maximum* value. To edit the *Totalized Parameter*, select the **Configure Totalizer** button under the *Totalizer Control* heading.

Note
When the totalizer reaches its maximum value, it automatically resets to zero and continues totalizing. The default maximum is a value equivalent to 4.29 billion pounds, actual cubic feet, or BTU. To edit the *Totalizer Maximum* value, select the **Set Totalizer Maximum** button under the *Totalizer Control* heading.

3. To reset the *Totalized Reading* to zero, select the **Reset Totalizer** button under the *Totalizer Control* heading.
4. Under the *Custom Units Setup* heading, the user may configure a custom unit for the *Totalized Reading*. Custom units allow the totalizer rate to be displayed in units of measure that are not standard in the Rosemount 3051SMV.

Note
If the totalizer rate is configured as the primary variable and is being output via the 4–20 mA signal, verify the 4–20 mA range (LRV and URV) after completing the custom unit configuration. For more information on verifying the 4–20 mA range, see “Basic device configuration” on page 24.

Follow these steps to configure a custom unit:

a. **Custom Unit**: Enter the desired custom unit label to be displayed for the *Totalized Reading*. Up to five characters including letters, numbers, and symbols can be entered in the custom unit field.

Note
It is recommended that the Custom Unit be entered in upper case letters. If lower case letters are entered, the LCD display will show upper case letters. Additionally, the following special characters are recognized by the LCD display: hyphens ("-"), percent symbols ("%"), asterisks ("*"), forward slashes ("/") and spaces. Any other character entered for the Custom Unit will be displayed as an asterisk ("*") on the LCD display. The following warning will be returned indicating these changes: "Custom Unit contains characters that will display in upper case or asterisks on LCD display. The DCS will display as entered."

b. **Base Unit**: From the drop-down menu, select a base unit to be used for the custom unit relationship.

c. **Base per Custom**: Enter a numeric value that represents the number of base units per one custom unit. The Rosemount 3051SMV uses the following convention:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}}$$

Example

Custom Unit: kg
Base Unit: g

Because:

1 kg (Kilogram) = 1000 g (Grams)

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}} = \frac{1000 \cdot g}{1 \cdot kg} = 1000$$

The values of Base per Custom for common totalizer units are shown in Table 2-11.

d. Select **Apply**.

e. **Totalizer Unit**: From the drop-down menu, select the custom unit that was created in Step b.

Note
The custom unit may not be available as a selection in the *Totalizer Unit* drop-down menu until the drop-down menu is refreshed. To refresh the drop-down menu, navigate to the *Basic Setup* tab and then return to the *Variables - Totalizer* tab.

Table 2-11. Common Custom Units - Totalizer

Custom unit	Base unit	Base per custom
Millions of Normal Cubic Meters (MMNCM)	NmlCum	1000000
Millions of Standard Cubic Feet (MMSCF)	StdCuft	1000000
Millions of Standard Cubic Meters (MMSCM)	StdCum	1000000
Thousands of Metric Tons (KMTON)	MetTon	1000
Thousands of Normal Cubic Meters (KNCM)	NmlCum	1000
Thousands of Short Tons (KSTON)	STon	1000
Thousands of Standard Cubic Feet (KSCF)	StdCuft	1000
Thousands of Standard Cubic Meters (KSCM)	StdCum	1000

If conversion factor tables or internet search engines are used to determine the Base per Custom value, it is important to enter the Custom Unit in the “From” field and the Base Unit in the “To” Field.

To calculate the Base per Custom value for a custom unit not shown in Table 2-9 on page 39, see the example:

Totalizer conversion example

To find the Base per Custom relationship for a custom unit of millions of standard cubic feet (mmscf) and a base unit of standard cubic feet (StdCuft), input the following:

Custom Unit = mmscf

Base Unit = StdCuft

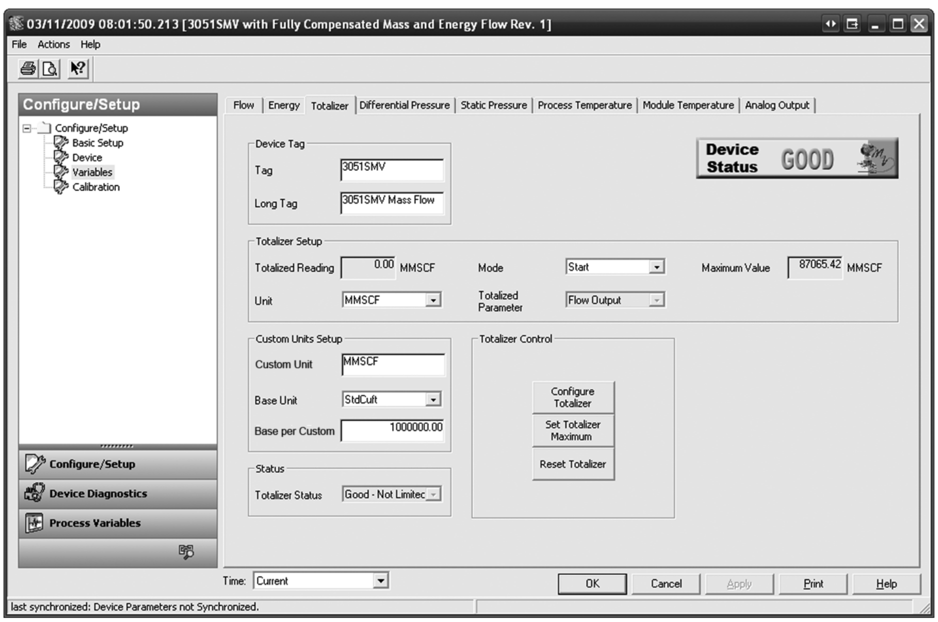
Because:

1 mmscf (Millions of Standard Cubic Feet) = 1000000 StdCuft (Standard Cubic Feet)

Therefore:

$$\text{Base per Custom} = \frac{\text{Number of Base Units}}{\text{1 Custom Unit}} = \frac{1000000 \cdot \text{StdCuft}}{1 \cdot \text{mmscf}} = 1000000$$

Figure 2-35. Totalizer Custom Units - Totalizer Example

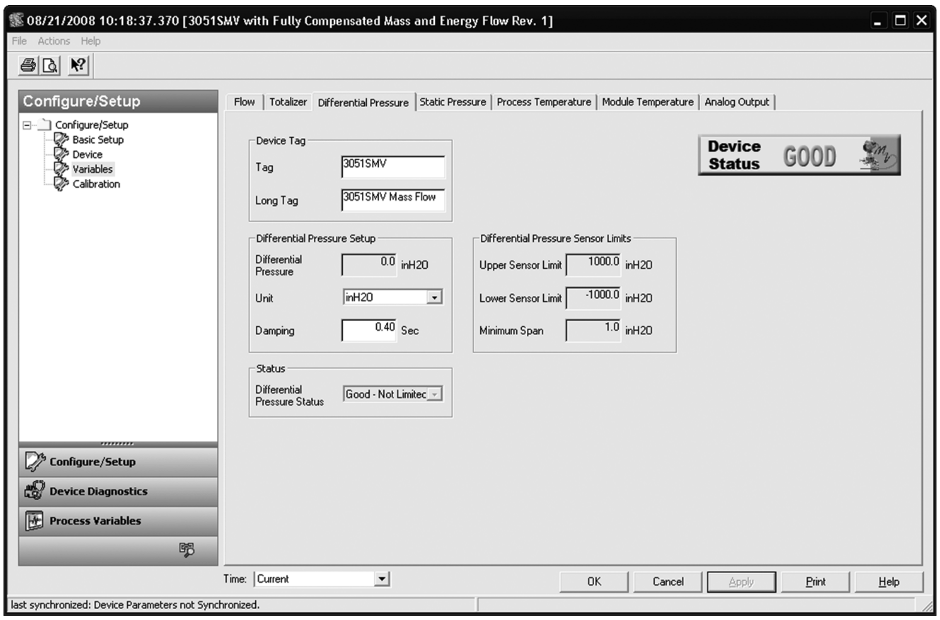


2.7.4 Differential pressure

Mass and energy flow Fast Keys	1, 4, 1, 4
Direct process variable output Fast Keys	1, 4, 1, 1

Note
For Differential pressure sensor calibration, see page 90.

Figure 2-36. Variables - Differential Pressure Tab



- Under the *Differential Pressure Setup* heading, edit the *DP Units* and *Damping* value as needed.
- The *Sensor Limits* and *Minimum Span* can be viewed under the *Differential Pressure Sensor Limits* heading.

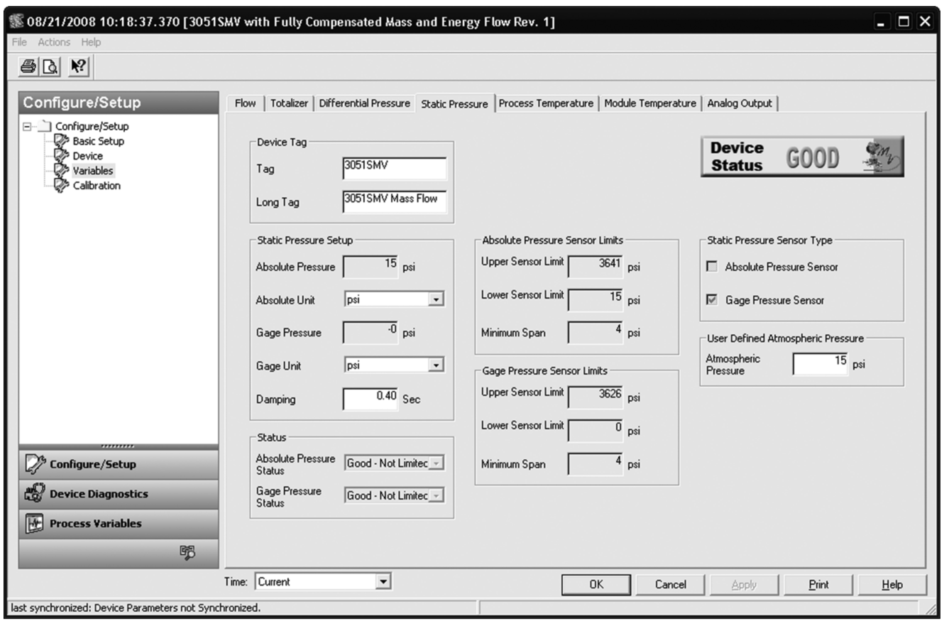
2.7.5 Static pressure

Mass and energy flow Fast Keys	1, 4, 1, 5
Direct process variable output Fast Keys	1, 4, 1, 2

Note

For Static pressure sensor calibration, see page 92.

Figure 2-37. Variables - Static Pressure Tab



- Under the *Static Pressure Setup* heading, edit the *Absolute Pressure Units* and *Gage Pressure Units* as needed. The static pressure *Damping* may also be edited.

Note

The transmitter may be equipped with either an absolute or gage static pressure sensor type depending on specified model code. The type of static pressure sensor equipped in the transmitter can be determined by referring to the *Static Pressure Sensor Type* heading. The static pressure type not being measured is a calculated value using the atmospheric pressure value as specified under the *User-Defined Atmospheric Pressure* heading.

- The *Sensor Limits* and *Minimum Span* for the absolute and gage static pressure can be viewed under the *Sensor Limit* headings.

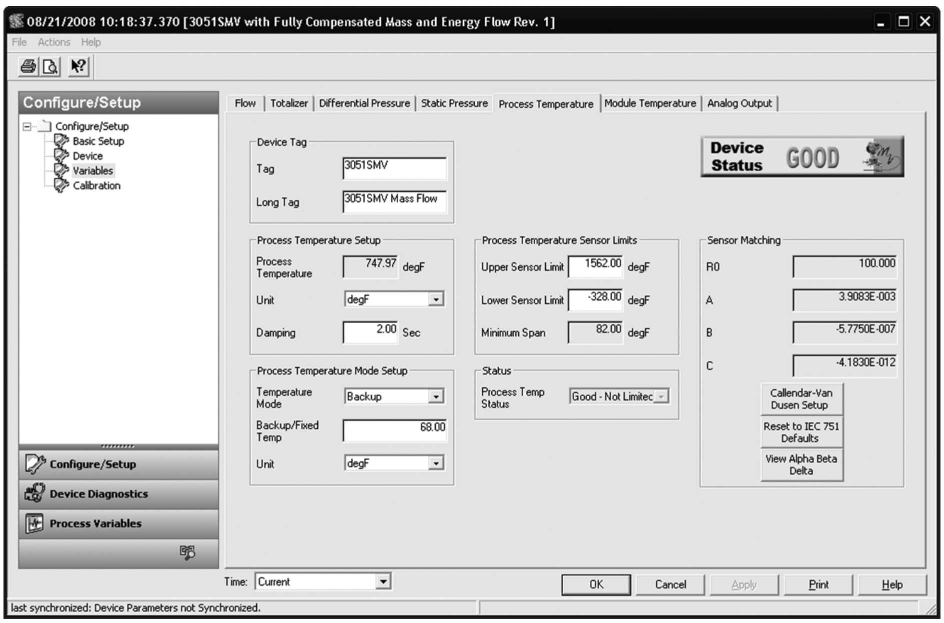
2.7.6 Process temperature

Mass and energy flow Fast Keys	1, 4, 1, 6
Direct process variable output Fast Keys	1, 4, 1, 3

Note

For Process temperature sensor calibration, see page 93.
If a transmitter was ordered with Fixed Process Temperature Only, the Fixed Temperature Value and Units can be edited on the *Fixed Temperature* tab.

Figure 2-38. Variables - Process Temperature Tab



- Under the *Process Temperature Setup* heading, edit the *Units* and *Damping* value as needed.
- Select the *Temperature Mode* under the *Process Temperature Setup* heading. See Table 2-12.

Table 2-12. Temperature Modes

Temperature mode	Description
Normal	The transmitter will only use the actual measured *Process Temperature* value. If the temperature sensor fails, the transmitter will put the analog signal into Alarm.
Backup	The transmitter will use the actual measured *Process Temperature* value. If the temperature sensor fails, the transmitter will use the value shown in the *Fixed/Backup Temperature* field.
Fixed	The transmitter will always use the temperature value shown in the *Fixed/Backup Temperature* field.

Note

Process Temperature Mode Setup only applies to transmitters with fully compensated mass and energy flow feature board.

- The *Sensor Limits* and *Minimum Span* can be viewed under the *Process Temperature Sensor Limits* heading. The upper and lower sensor limits may be edited as needed.

The Rosemount 3051SMV accepts Callendar-Van Dusen constants from a calibrated RTD schedule and generates a special custom curve to match that specific sensor Resistance vs. Temperature performance. Matching the specific sensor curve with the transmitter configuration enhances the temperature measurement accuracy.

- Under the *Sensor Matching* heading, the Callendar-Van Dusen constants R_0, A, B, and C can be viewed. If the Callendar-Van Dusen constants are known for the user's specific Pt 100 RTD sensor, the constants R_0, A, B, and C may be edited by selecting the Callendar-Van Dusen Setup button and following the on-screen prompts.

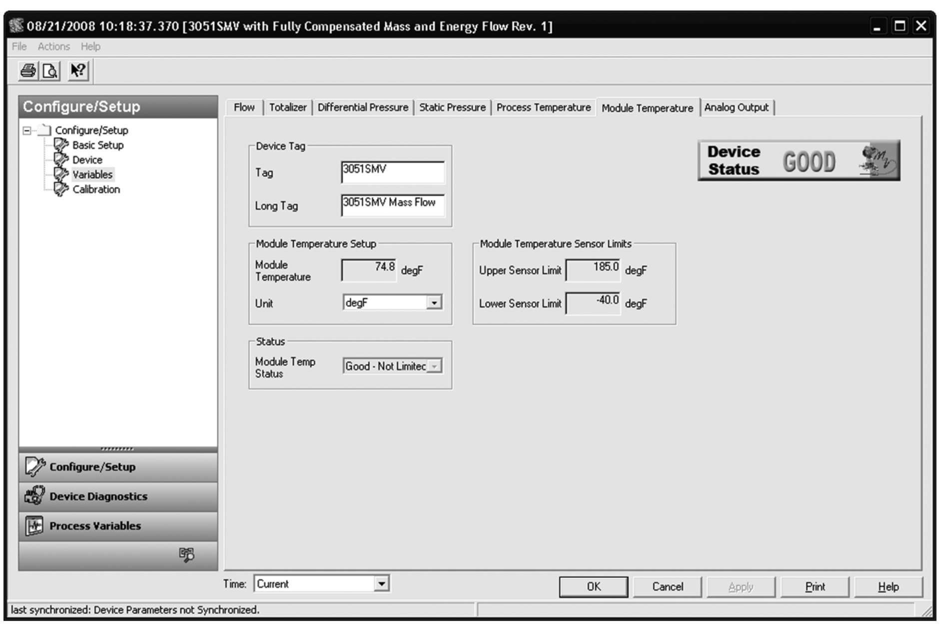
  The user may also view the α, β, and δ coefficients by selecting the **View Alpha**, **Beta**, **Delta** button. The constants R_0, α, β, and δ may be edited by selecting the **Callendar-Van Dusen Setup** button and following the on-screen prompts. To reset the transmitter to the IEC 751 Defaults, select the **Reset** to IEC 751 **Defaults** button.

2.7.7 Module temperature

Mass and energy flow Fast Keys	1, 4, 1, 7
Direct process variable output Fast Keys	1, 4, 1, 4

The sensor module temperature variable is the measured temperature of the sensors and electronics within the SuperModule assembly. The module temperature can be used to control heat tracing or diagnose device overheating.

Figure 2-39. Variables - Module Temperature Tab



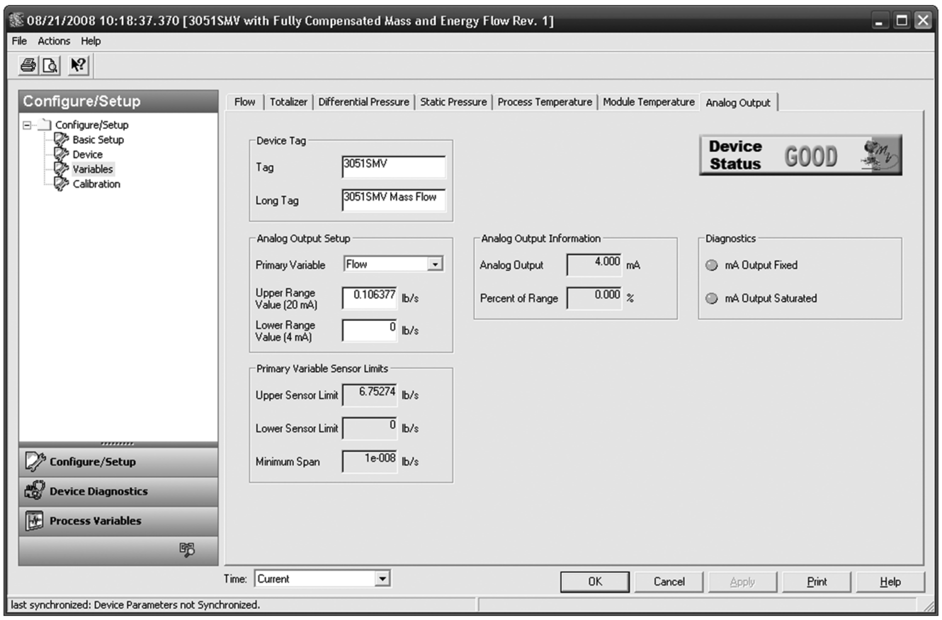
- Under the *Module Temperature Setup* heading, edit the *Units* as needed.
- The *Sensor Limits* can be viewed under the *Module Temperature Sensor Limits* heading.

2.7.8 Analog output

Mass and energy flow Fast Keys	1, 4, 3, 2
Direct process variable output Fast Keys	1, 4, 3, 2

Note
For Analog calibration, see page 95.

Figure 2-40. Variables - Analog Output Tab



1. Select the *Primary Variable* under the *Analog Output Setup* heading. The *Upper Range Value* and *Lower Range Value* may also be edited under this heading.
2. Verify the *Upper Sensor Limit* and *Lower Sensor Limit* and minimum span under the *Primary Variable Sensor Limits* heading.

Transfer function (direct process variable output feature board only)

The Rosemount 3051SMV with direct process variable output feature board has two analog output settings: Linear and Square Root. Activate the square root output option to make analog output proportional to flow. As input approaches zero, the Rosemount 3051SMV automatically switches to linear output in order to ensure a smooth, stable output near zero (see Figure 2-41 on page 57).

From 0 to 0.6 percent of the ranged pressure input, the slope of the curve is unity (y = x). This allows accurate calibration near zero. Greater slopes would cause large changes in output (for small changes at input). From 0.6 to 0.8 percent, curve slope equals 41.72 (y = 41.72x) to achieve continuous transition from linear to square root at the transition point.

Note
Do not set both the analog output of the device and the control system to square root.

Figure 2-41. Square Root Output Transition Point

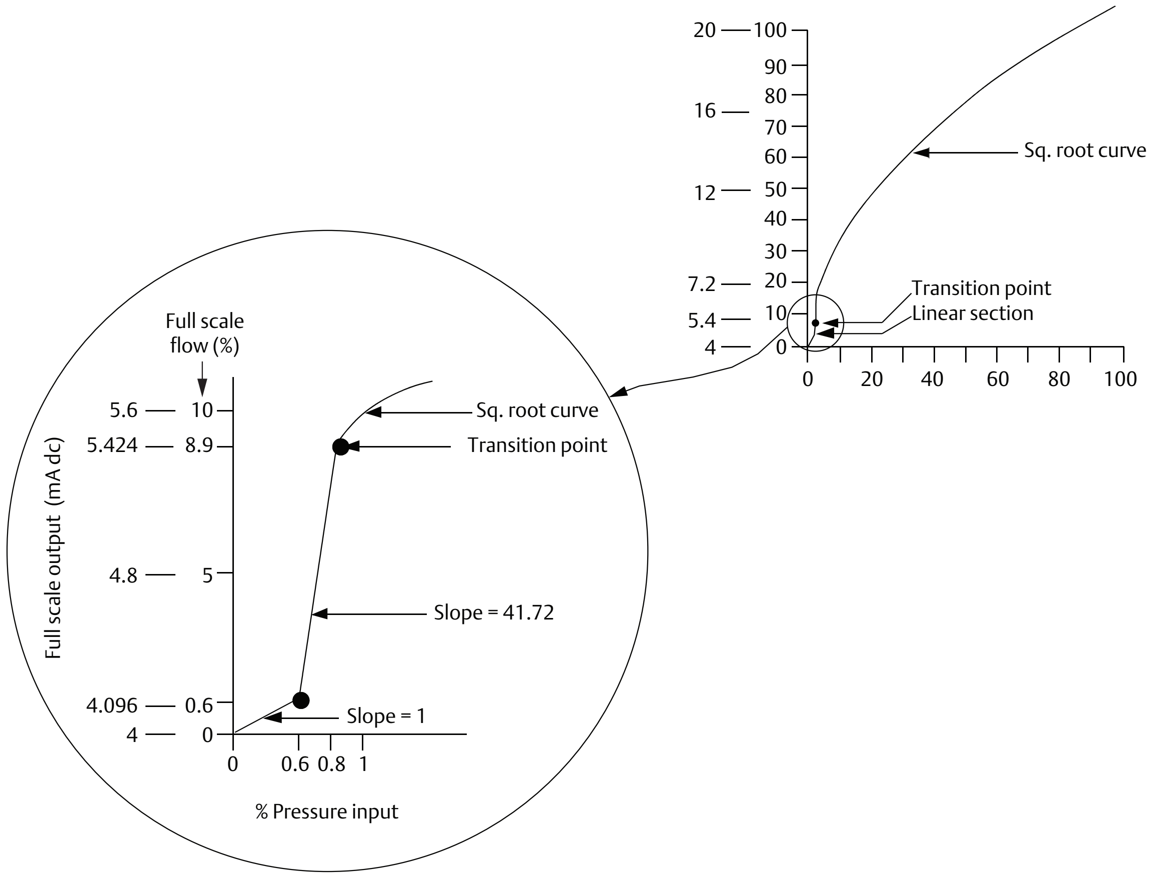


Figure 2-41 only applies to the square root output for the Rosemount 3051SMV with the direct process variable output feature board.

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

2.8 Menu trees and Field Communicator Fast Keys

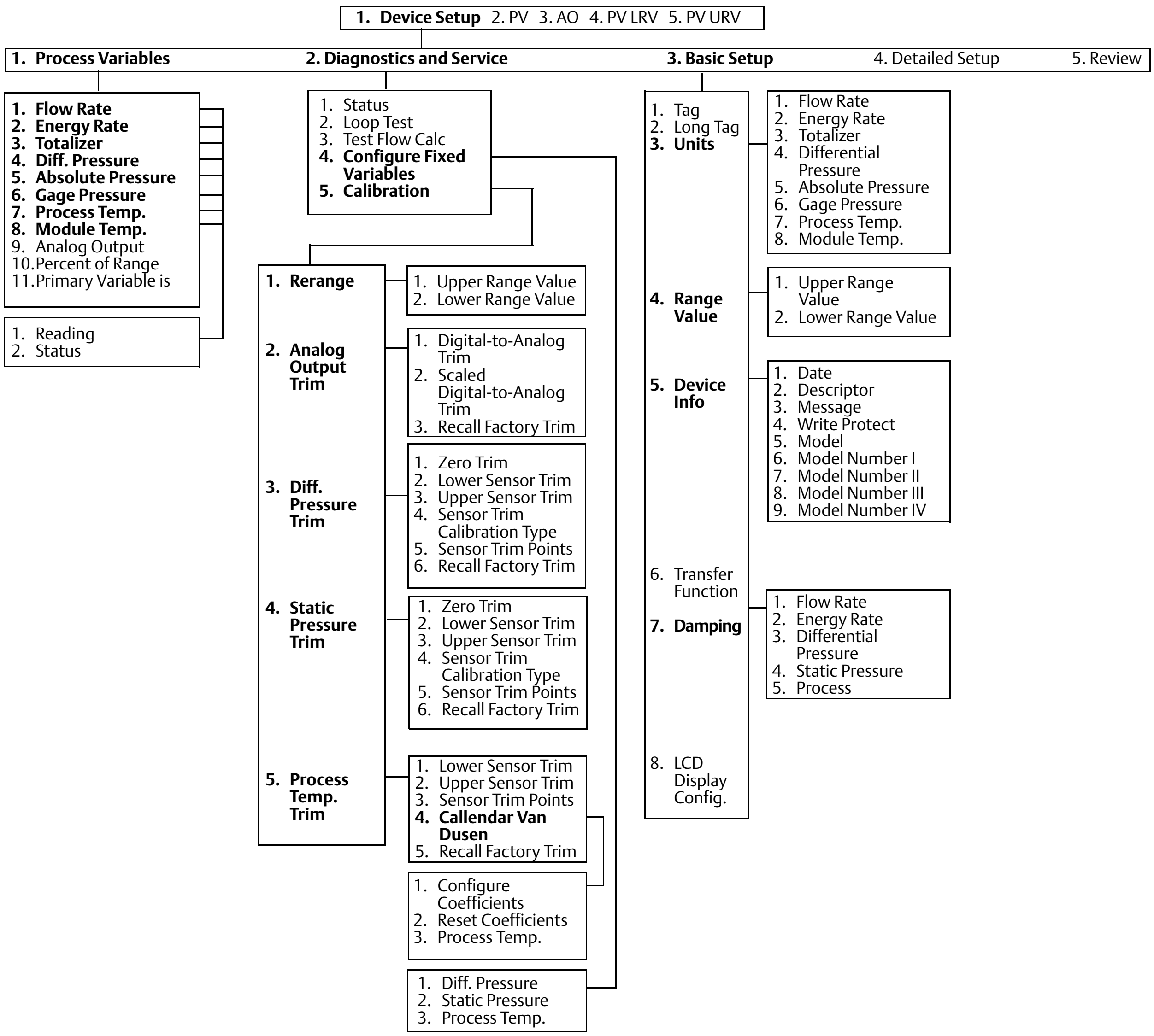
Based on the configuration ordered, some measurements (i.e. static pressure, process temperature) and/or calculation types (i.e. mass, volumetric, and energy flow) may not be available for all fluid types. Available measurements and/or calculation types are determined by the multivariable type and measurement type codes ordered. See "Ordering information" on page 138 for more information.

The menu trees and Field Communicator Fast Keys in this section are shown for the following model codes:

- Multivariable type M (fully compensated mass and energy flow) with measurement type 1 (differential pressure, static pressure, and process temperature)
- Multivariable type P (direct process variable output) with measurement type 1 (differential pressure, static pressure, and process temperature)

The menu trees and 475 Field Communicator Fast Keys for other model codes will vary.

Figure 2-42. Menu Tree for Fully Compensated Mass and Energy Flow



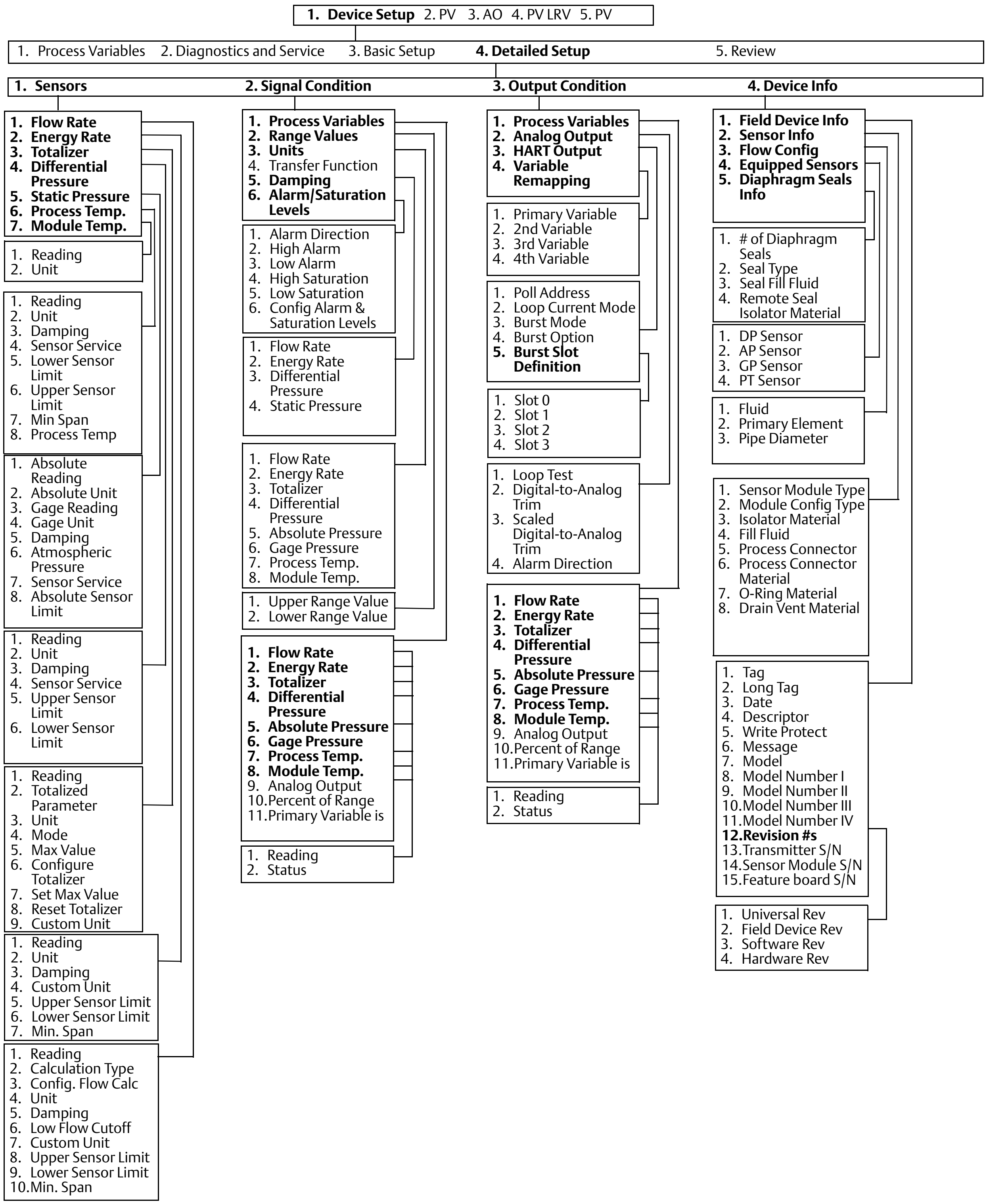
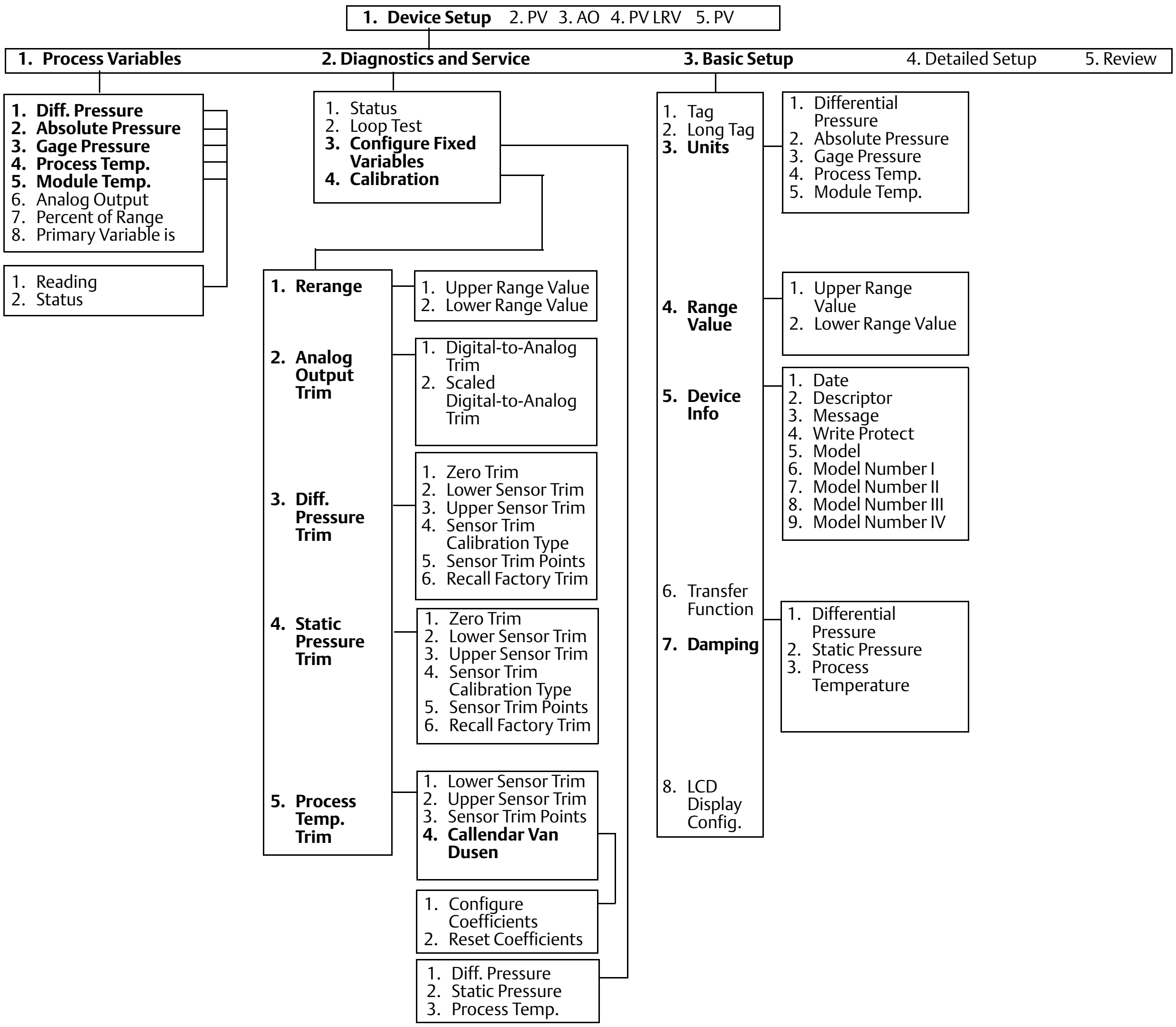
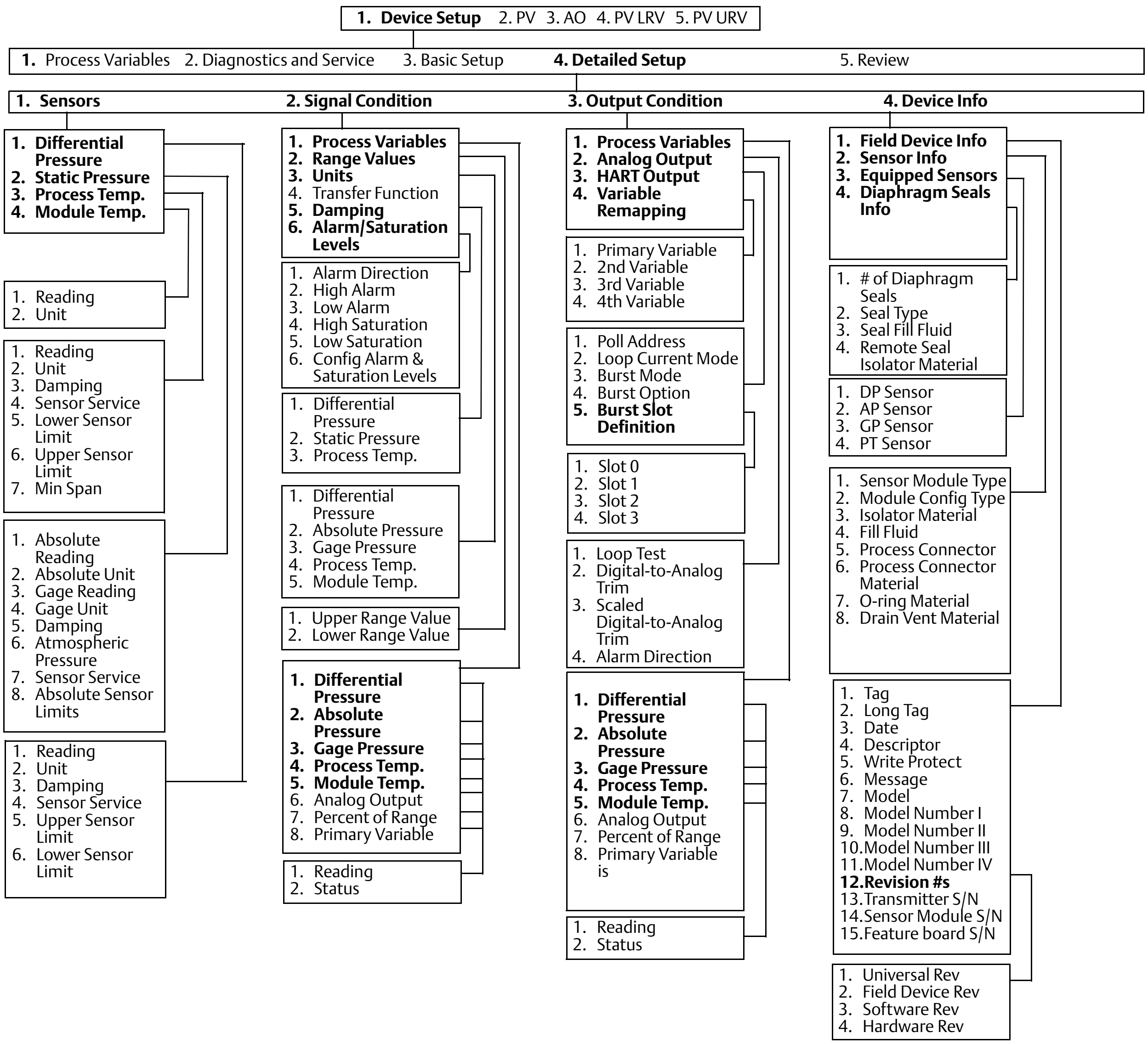

1. Device Setup 2. PV 3. AO 4. PV LRV 5. PV
1. Process Variables 2. Diagnostics and Service 3. Basic Setup 4. Detailed Setup 5. Review
1. Sensors
2. Signal Condition
3. Output Condition
4. Device Info
1. Flow Rate
2. Energy Rate
3. Totalizer
4. Differential Pressure
5. Static Pressure
6. Process Temp.
7. Module Temp.
1. Reading
2. Unit
1. Reading
2. Unit
3. Damping
4. Sensor Service
5. Lower Sensor Limit
6. Upper Sensor Limit
7. Min Span
8. Process Temp
1. Absolute Reading
2. Absolute Unit
3. Gage Reading
4. Gage Unit
5. Damping
6. Atmospheric Pressure
7. Sensor Service
8. Absolute Sensor Limit
1. Reading
2. Unit
3. Damping
4. Sensor Service
5. Upper Sensor Limit
6. Lower Sensor Limit
1. Reading
2. Totalized Parameter
3. Unit
4. Mode
5. Max Value
6. Configure Totalizer
7. Set Max Value
8. Reset Totalizer
9. Custom Unit
1. Reading
2. Unit
3. Damping
4. Custom Unit
5. Upper Sensor Limit
6. Lower Sensor Limit
7. Min. Span
1. Reading
2. Calculation Type
3. Config. Flow Calc
4. Unit
5. Damping
6. Low Flow Cutoff
7. Custom Unit
8. Upper Sensor Limit
9. Lower Sensor Limit
10. Min. Span
1. Process Variables
2. Range Values
3. Units
4. Transfer Function
5. Damping
6. Alarm/Saturation Levels
1. Alarm Direction
2. High Alarm
3. Low Alarm
4. High Saturation
5. Low Saturation
6. Config Alarm & Saturation Levels
1. Flow Rate
2. Energy Rate
3. Differential Pressure
4. Static Pressure
1. Flow Rate
2. Energy Rate
3. Totalizer
4. Differential Pressure
5. Absolute Pressure
6. Gage Pressure
7. Process Temp.
8. Module Temp.
1. Upper Range Value
2. Lower Range Value
1. Flow Rate
2. Energy Rate
3. Totalizer
4. Differential Pressure
5. Absolute Pressure
6. Gage Pressure
7. Process Temp.
8. Module Temp.
9. Analog Output
10. Percent of Range
11. Primary Variable is
1. Reading
2. Status
1. Process Variables
2. Analog Output
3. HART Output
4. Variable Remapping
1. Primary Variable
2. 2nd Variable
3. 3rd Variable
4. 4th Variable
1. Poll Address
2. Loop Current Mode
3. Burst Mode
4. Burst Option
5. Burst Slot Definition
1. Slot 0
2. Slot 1
3. Slot 2
4. Slot 3
1. Loop Test
2. Digital-to-Analog Trim
3. Scaled Digital-to-Analog Trim
4. Alarm Direction
1. Flow Rate
2. Energy Rate
3. Totalizer
4. Differential Pressure
5. Absolute Pressure
6. Gage Pressure
7. Process Temp.
8. Module Temp.
9. Analog Output
10. Percent of Range
11. Primary Variable is
1. Reading
2. Status
1. Field Device Info
2. Sensor Info
3. Flow Config
4. Equipped Sensors
5. Diaphragm Seals Info
1. # of Diaphragm Seals
2. Seal Type
3. Seal Fill Fluid
4. Remote Seal Isolator Material
1. DP Sensor
2. AP Sensor
3. GP Sensor
4. PT Sensor
1. Fluid
2. Primary Element
3. Pipe Diameter
1. Sensor Module Type
2. Module Config Type
3. Isolator Material
4. Fill Fluid
5. Process Connector
6. Process Connector Material
7. O-Ring Material
8. Drain Vent Material
1. Tag
2. Long Tag
3. Date
4. Descriptor
5. Write Protect
6. Message
7. Model
8. Model Number I
9. Model Number II
10. Model Number III
11. Model Number IV
12. Revision #s
13. Transmitter S/N
14. Sensor Module S/N
15. Feature board S/N
1. Universal Rev
2. Field Device Rev
3. Software Rev
4. Hardware Rev

Figure 2-43. Menu Tree for Direct Process Variable Output




1. Device Setup 2. PV 3. AO 4. PV LRV 5. PV URV
1. Process Variables 2. Diagnostics and Service 3. Basic Setup 4. Detailed Setup 5. Review
1. Sensors
2. Signal Condition
3. Output Condition
4. Device Info
1. Differential Pressure
2. Static Pressure
3. Process Temp.
4. Module Temp.
1. Reading
2. Unit
1. Reading
2. Unit
3. Damping
4. Sensor Service
5. Lower Sensor Limit
6. Upper Sensor Limit
7. Min Span
1. Absolute Reading
2. Absolute Unit
3. Gage Reading
4. Gage Unit
5. Damping
6. Atmospheric Pressure
7. Sensor Service
8. Absolute Sensor Limits
1. Reading
2. Unit
3. Damping
4. Sensor Service
5. Upper Sensor Limit
6. Lower Sensor Limit
1. Process Variables
2. Range Values
3. Units
4. Transfer Function
5. Damping
6. Alarm/Saturation Levels
1. Alarm Direction
2. High Alarm
3. Low Alarm
4. High Saturation
5. Low Saturation
6. Config Alarm & Saturation Levels
1. Differential Pressure
2. Static Pressure
3. Process Temp.
1. Differential Pressure
2. Absolute Pressure
3. Gage Pressure
4. Process Temp.
5. Module Temp.
1. Upper Range Value
2. Lower Range Value
1. Differential Pressure
2. Absolute Pressure
3. Gage Pressure
4. Process Temp.
5. Module Temp.
6. Analog Output
7. Percent of Range
8. Primary Variable
1. Reading
2. Status
1. Process Variables
2. Analog Output
3. HART Output
4. Variable Remapping
1. Primary Variable
2. 2nd Variable
3. 3rd Variable
4. 4th Variable
1. Poll Address
2. Loop Current Mode
3. Burst Mode
4. Burst Option
5. Burst Slot Definition
1. Slot 0
2. Slot 1
3. Slot 2
4. Slot 3
1. Loop Test
2. Digital-to-Analog Trim
3. Scaled Digital-to-Analog Trim
4. Alarm Direction
1. Differential Pressure
2. Absolute Pressure
3. Gage Pressure
4. Process Temp.
5. Module Temp.
6. Analog Output
7. Percent of Range
8. Primary Variable is
1. Reading
2. Status
1. Field Device Info
2. Sensor Info
3. Equipped Sensors
4. Diaphragm Seals Info
1. # of Diaphragm Seals
2. Seal Type
3. Seal Fill Fluid
4. Remote Seal Isolator Material
1. DP Sensor
2. AP Sensor
3. GP Sensor
4. PT Sensor
1. Sensor Module Type
2. Module Config Type
3. Isolator Material
4. Fill Fluid
5. Process Connector
6. Process Connector Material
7. O-ring Material
8. Drain Vent Material
1. Tag
2. Long Tag
3. Date
4. Descriptor
5. Write Protect
6. Message
7. Model
8. Model Number I
9. Model Number II
10.Model Number III
11.Model Number IV
12.Revision #s
13.Transmitter S/N
14.Sensor Module S/N
15.Feature board S/N
1. Universal Rev
2. Field Device Rev
3. Software Rev
4. Hardware Rev

2.8.1 Field Communicator Fast Keys

Use Rosemount 3051SMV Engineering Assistant or any HART-compliant master to communicate with and verify configuration of the Rosemount 3051SMV.

Table 2-13 shows the Field Communicator Fast Keys for the fully compensated mass and energy flow. Table 2-14 on page 63 shows the Fast Keys for the direct process variable output.

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

Table 2-13. Fast Keys for Fully Compensated Mass and Energy Flow Output

	Function	Fast Key sequence
	Absolute Pressure Reading and Status	1, 4, 2, 1, 5
	Absolute Pressure Sensor Limits	1, 4, 1, 5, 8
	Absolute Pressure Units	1, 3, 3, 5
	Alarm and Saturation Level Configuration	1, 4, 2, 6, 6
	Alarm and Saturation Levels	1, 4, 2, 6
	Analog Output Trim Options	1, 2, 5, 2
	Burst Mode Setup	1, 4, 3, 3, 3
	Burst Mode Options	1, 4, 3, 3, 4
	Callendar-van Dusen Sensor Matching	1, 2, 5, 5, 4
	Configure Fixed Variables	1, 2, 4
	Damping	1, 3, 7
	Diaphragm Seals Information	1, 4, 4, 5
√	Differential Pressure Low Flow Cutoff	1, 4, 1, 1, 6
	Differential Pressure Reading and Status	1, 4, 2, 1, 4
	Differential Pressure Sensor Trim Options	1, 2, 5, 3
√	Differential Pressure Zero Trim	1, 2, 5, 3, 1
	Differential Pressure Units	1, 3, 3, 4
	Energy Rate Units	1, 3, 3, 2
	Energy Reading and Status	1, 4, 2, 1, 2
	Equipped Sensors	1, 4, 4, 4
	Field Device Information	1, 4, 4, 1
	Flow Calculation Type	1, 4, 1, 1, 2
√	Flow Rate Units	1, 3, 3, 1
	Flow Reading and Status	1, 4, 2, 1, 1
	Gage Pressure Reading and Status	1, 4, 2, 1, 6
	Gage Pressure Sensor Limits	1, 4, 1, 5, 9
	Gage Pressure Units	1, 3, 3, 6
	LCD Display Configuration	1, 3, 8
	Loop Test	1, 2, 2

Table 2-13. Fast Keys for Fully Compensated Mass and Energy Flow Output

	Function	Fast Key sequence
	Module Temperature Reading and Status	1, 4, 2, 1, 8
	Module Temperature Units	1, 3, 3, 8
	Poll Address	1, 4, 3, 3, 1
	Process Temperature Reading and Status	1, 4, 2, 1, 7
√	Process Temperature Sensor Mode	1, 4, 1, 6, 8
	Process Temperature Sensor Trim Options	1, 2, 5, 5
	Process Temperature Unit	1, 3, 3, 7
√	Ranging the Analog Output	1, 2, 5, 1
	Recall Factory Trim Settings	1, 2, 5, 2, 3
	Sensor Information	1, 4, 4, 2
√	Static Pressure Sensor Lower Trim (AP Sensor)	1, 2, 5, 4, 2
	Static Pressure Sensor Trim Options	1, 2, 5, 4
√	Static Pressure Sensor Zero Trim (GP Sensor)	1, 2, 5, 4, 1
√	Status	1, 2, 1
√	Tag	1, 3, 1
	Test Flow Calculation	1, 2, 3
	Totalizer Configuration	1, 4, 1, 3
	Totalizer Reading and Status	1, 4, 2, 1, 3
	Totalizer Units	1, 3, 3, 3
	Variable Mapping	1, 4, 3, 4
	Write Protect	1, 3, 5, 4

Table 2-14. Fast Keys for Direct Process Variable Measurement

	Function	Fast Key sequence
	Absolute Pressure Reading and Status	1, 4, 2, 1, 2
	Absolute Pressure Sensor Limits	1, 4, 1, 2, 8
√	Absolute Pressure Units	1, 3, 3, 2
	Alarm and Saturation Level Configuration	1, 4, 2, 6, 6
	Alarm and Saturation Levels	1, 4, 2, 6
	Analog Output Trim Options	1, 2, 4, 2
	Burst Mode Setup	1, 4, 3, 3, 3
	Burst Mode Options	1, 4, 3, 3, 4
	Callendar-van Dusen Sensor Matching	1, 2, 4, 5, 4
	Damping	1, 3, 7
	Diaphragm Seals Information	1, 4, 4, 4

Table 2-14. Fast Keys for Direct Process Variable Measurement

	Function	Fast Key sequence
	Differential Pressure Reading and Status	1, 4, 2, 1, 1
	Differential Pressure Sensor Trim Options	1, 2, 4, 3
√	Differential Pressure Zero Trim	1, 2, 4, 3, 1
√	Differential Pressure Units	1, 3, 3, 1
	Equipped Sensors	1, 4, 4, 3
	Field Device Information	1, 4, 4, 1
	Gage Pressure Reading and Status	1, 4, 2, 1, 3
	Gage Pressure Sensor Limits	1, 4, 1, 2, 9
√	Gage Pressure Units	1, 3, 3, 3
	LCD Display Configuration	1, 3, 8
	Loop Test	1, 2, 2
	Module Temperature Reading and Status	1, 4, 2, 1, 5
	Module Temperature Units	1, 3, 3, 5
	Poll Address	1, 4, 3, 3, 1
	Process Temperature Reading and Status	1, 4, 2, 1, 4
	Process Temperature Sensor Trim Options	1, 2, 4, 5
√	Process Temperature Unit	1, 3, 3, 4
√	Ranging the Analog Output	1, 2, 4, 1
	Recall Factory Trim Settings	1, 2, 4, 2, 3
	Sensor Information	1, 4, 4, 2
√	Static Pressure Sensor Lower Trim (AP Sensor)	1, 2, 4, 4, 2
	Static Pressure Sensor Trim Options	1, 2, 4, 4
√	Static Pressure Sensor Zero Trim (GP Sensor)	1, 2, 4, 4, 1
√	Status	1, 2, 1
√	Tag	1, 3, 1
√	Transfer Function	1, 3, 6
	Variable Mapping	1, 4, 3, 4
	Write Protect	1, 3, 5, 4

Section 3 Installation

3.1 Overview

This section contains information that covers installation considerations for Rosemount™ 3051S MultiVariable™ Transmitter (Rosemount 3051SMV). The Rosemount 3051SMV Quick Start Guide is shipped with every transmitter to describe basic installation, wiring, configuration, and startup procedures. Dimensional drawings for each Rosemount 3051SMV type and mounting configuration are included in "Specifications and Reference Data" on page 125.

3.2 Safety messages

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

⚠WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a Field 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.
- Both transmitter covers must be fully engaged to meet flameproof/explosion-proof requirements.
- Verify the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Electrical shock could cause death or serious injury.

- If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals.
- Use extreme caution when making 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™ 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 as spare parts.

Improper assembly of manifolds to traditional flange can damage the device.

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

Improper installation or repair of the SuperModule™ assembly with high pressure option (P0) could result in death or serious injury.

- For safe assembly, the high pressure SuperModule assembly must be installed with ASTM A193 Class 2 Grade B8M bolts and either a Rosemount 305 Manifold or a DIN-compliant traditional flange.

Static electricity can damage sensitive components.

Observe safe handling precautions for static-sensitive components.

3.3 Installation considerations

3.3.1 General

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

Note
Install the enclosed pipe plug (found in the box) in the unused conduit opening if optional process temperature input is not used. For proper straight and tapered thread engagement requirements, see the appropriate approvals drawings in Appendix B: Product Certifications.

For material compatibility considerations, see Material Selection Technical Note.

3.3.2 Mechanical

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.

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 3-5 on page 72, keeping drain/vent connections on the bottom for gas service and on the top for liquid service.

3.3.3 Environmental

Access requirements and "Cover installation" on page 69 can help optimize transmitter performance. Mount the transmitter to minimize ambient temperature changes, vibration, mechanical shock, and to avoid external contact with corrosive materials. "Specifications and Reference Data" on page 125 lists temperature operating limits.

3.4 Installation procedures

3.4.1 Configure security (write protect)

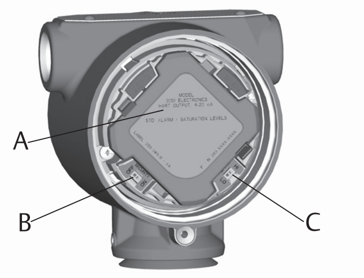
Changes to the transmitter configuration data can be prevented with the security (write protect) switch located on the feature board. See Figure 3-1 on page 68 for the location of the switch. Position the switch in the *ON* position to prevent accidental or deliberate change of configuration data.

If the transmitter write protection switch 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.

To reposition the switches, 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 of the housing.
3. To reposition the switches as desired, slide the security and alarm switches into the preferred position using a small screwdriver. See Figure 3-1 on page 68.

Figure 3-1. Switch Configuration



A. Feature board
B. Security
C. Alarm

4. Re-install the transmitter cover. Transmitter covers must be fully engaged so that metal contacts metal in order to meet flameproof/explosion-proof requirements.

3.4.2 Configure alarm direction

The transmitter alarm direction is set by repositioning the alarm switch. Position the switch in the HI position for fail high and in the *LO* position for fail low. See "Alarm and saturation" on page 27 for more information on alarm and saturation levels.

3.4.2 Mounting considerations

For dimensional drawing information refer to "Specifications and Reference Data" on page 125.

Housing rotation

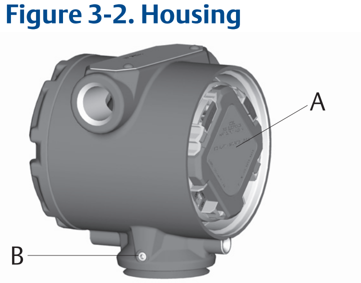
The housing can be rotated to improve field access to wiring or to better view the optional LCD display. To rotate the housing, perform the following procedure:

1. Loosen the housing rotation set screw.
2. Turn the housing up to 180° to the left or right of its original (as shipped) position.

Note
Do not rotate the housing more than 180° without first performing a disassembly procedure (see "Housing assembly including feature board electronics" on page 100). Over-rotation may sever the electrical connection between the sensor module and the feature board.

3. Retighten the housing rotation set screw.

Figure 3-2. Housing



A. Feature board
B. 3/32-in. housing rotation set screw

LCD display rotation

In addition to housing rotation, the optional LCD display can be rotated in 90° increments by squeezing the two tabs, pulling out, rotating and snapping back into place.

Note
If LCD display pins are inadvertently removed from the feature board, re-insert the pins before snapping the LCD display back into place.

Field terminal side of 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 if the optional Process Temperature Input is not installed.

Feature board side of housing

Provide 0.75-in. (19 mm) of clearance for units without an LCD display. Three inches of clearance is required for cover removal if an LCD display is installed.

Cover installation

Always ensure a proper seal by installing the housing covers so that metal contacts metal in order to prevent performance degradation due to environmental effects. For replacement cover O-rings, use Rosemount O-rings (part number 03151-9040-0001).

Conduit entry threads

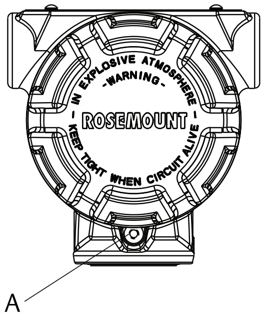
For NEMA® 4X, IP66, and IP68 requirements, use thread seal (PTFE) tape or paste on male threads to provide a watertight seal.

Cover jam screw

For transmitter housings shipped with a cover jam screw, as shown in Figure 3-3 on page 70, the screw should be properly installed once the transmitter has been wired and powered up. The cover jam screw is intended to prevent the removal of the transmitter cover in flameproof environments without the use of tools. Follow these steps to install the cover jam screw:

1. Verify the cover jam screw is completely threaded into the housing.
2. Install the transmitter housing covers and verify that metal contacts metal in order to meet flameproof/explosion-proof requirements.
3. Using an M4 hex wrench, turn the jam screw counterclockwise until it contacts the transmitter cover.
4. Turn the jam screw an additional 1/2 turn counterclockwise to secure the cover. Application of excessive torque may strip the threads.
5. Verify the covers cannot be removed.

Figure 3-3. Cover Jam Screw



A. Cover jam screw (one per side)

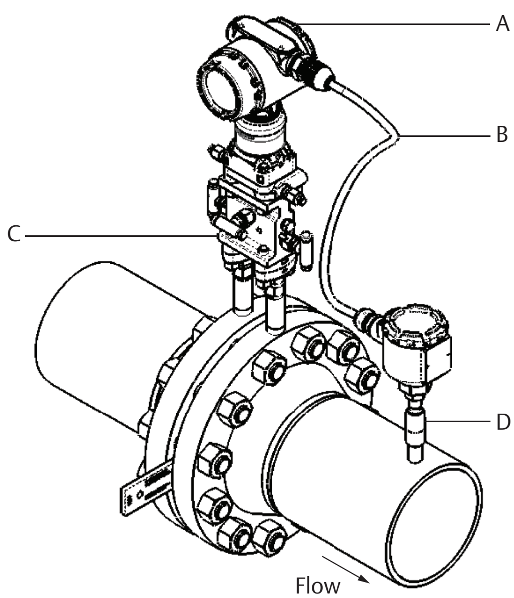
Process flange orientation

⚠ 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.

3.4.3 Mount the transmitter

Figure 3-4 illustrates a typical Rosemount 3051SMV installation site measuring dry gas with an orifice plate.

Figure 3-4. Typical Rosemount 3051SMV Installation Site



A. Rosemount 3051SMV
B. RTD cable
C. Pt 100 RTD sensor
D. Process connections

Mounting brackets

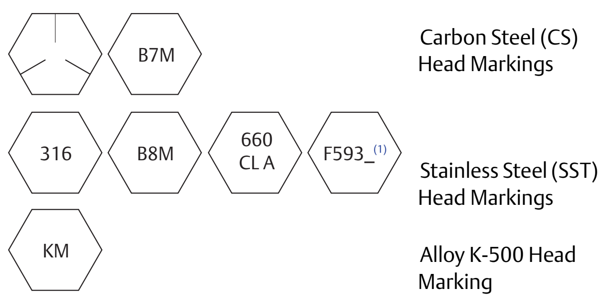
The Rosemount 3051SMV can be mounted to a 2-in. pipe or to a panel using an optional mounting bracket. The B4 Bracket (SST [Stainless steel]) option is for use with the coplanar flange process connection. "Coplanar Flange Mounting Configurations" on page 135 shows bracket dimensions and mounting configurations for the B4 option. Other bracket options are listed in Table 3-1. When installing the transmitter to one of the optional mounting brackets, torque the bolts to 125 in-lb (0,9 N-m).

Table 3-1. Mounting Brackets

Options	Description	Mounting type	Bracket material	Bolt material
B4	Coplanar flange bracket	2-in. pipe/panel	SST	SST
B1	Traditional flange bracket	2-in. pipe	Painted CS (Carbon steel)	CS
B2	Traditional flange bracket	Panel	Painted CS	CS
B3	Traditional flange flat bracket	2-in. pipe	Painted CS	CS
B7	Traditional flange bracket	2-in. pipe	Painted CS	SST
B8	Traditional flange bracket	Panel	Painted CS	SST
B9	Traditional flange flat bracket	2-in. pipe	Painted CS	SST
BA	Traditional flange bracket	2-in. pipe	SST	SST
BC	Traditional flange flat bracket	2-in. pipe	SST	SST

Flange bolts

The Rosemount 3051SMV can be shipped with a coplanar flange or a traditional flange installed with four 1.75-in. flange bolts. Mounting bolts and bolting configurations for the coplanar and traditional flanges can be found in Figure 3-5 on page 72. SST bolts supplied by Emerson are coated with a lubricant to ease installation. CS bolts do not require lubrication. No additional lubricant should be applied when installing either type of bolt. Bolts supplied by Emerson are identified by their head markings:



1. The last digit in the F593_ head marking may be any letter between A and M.

Bolt installation

⚠ Only use bolts supplied with the Rosemount 3051SMV or sold by Emerson as spare parts. Use the following bolt installation procedure to:

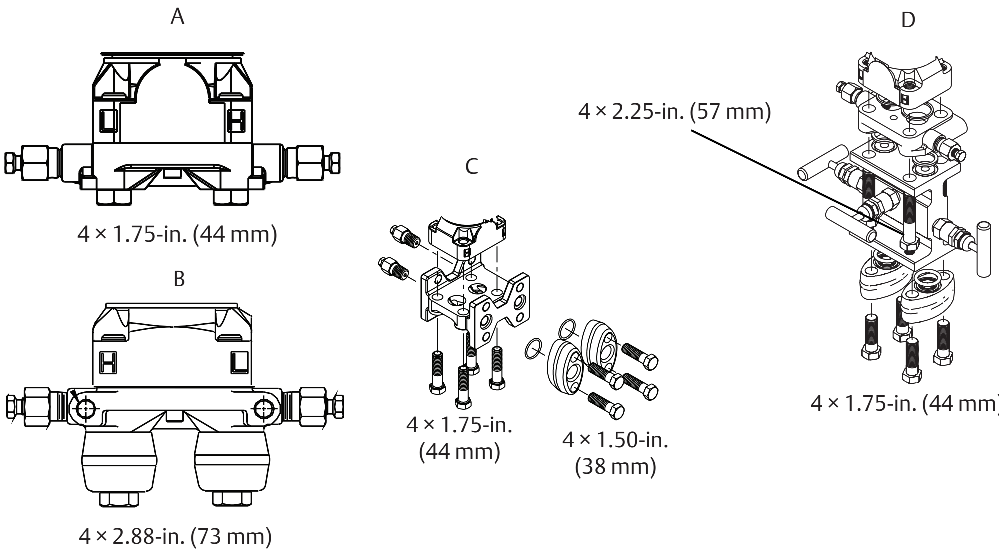
1. Finger-tighten the bolts.
2. Torque the bolts to the initial torque value using a crossing pattern. For initial torque values, see Table 3-2 on page 72.
3. Torque the bolts to the final torque value using the same crossing pattern. For final torque values, see Table 3-2 on page 72.

Torque values for the flange and manifold adapter bolts are as follows:

Table 3-2. Bolt Installation Torque Values

Bolt material	Option code	Initial torque value	Final torque value
CS-ASTM-A449	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-193-B7M	Option L5	300 in-lb (34 N-m)	650 in-lb (73 N-m)
Alloy K-500	Option L6	300 in-lb (34 N-m)	650 in-lb (73 N-m)
ASTM-A-453-660	Option L7	150 in-lb (17 N-m)	300 in-lb (34 N-m)
ASTM-A-193-B8M	Option L8	150 in-lb (17 N-m)	300 in-lb (34 N-m)

Figure 3-5. Common Transmitter Assemblies



A. Transmitter with coplanar flange
B. Transmitter with coplanar flange and optional flange adapters
C. Transmitter with traditional flange and optional flange adapters
D. Transmitter with coplanar flange and optional manifold and flange adapters

Mounting requirements

Impulse piping configurations depend on specific measurement conditions. Refer to Figure 3-6 on page 73 for examples of the following mounting configurations:

Liquid flow measurement

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

Gas flow measurement

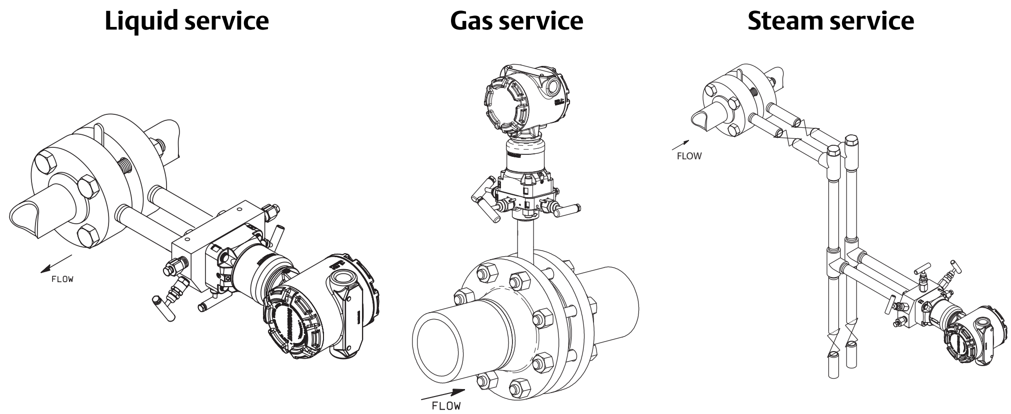
- Place taps in the top or side of the line.
- Mount the transmitter beside or above the taps so to drain liquid into the process line.

Steam flow measurement

- Place taps to the side of the line.
- Mount the transmitter below the taps to ensure that impulse piping will remain 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 transmitter process connection do not exceed the transmitter's operating limits.

Figure 3-6. Installation Examples

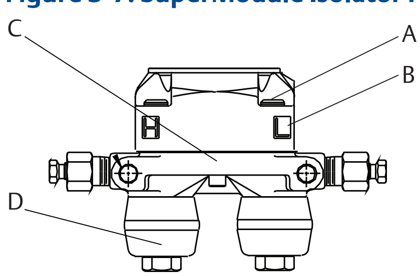


3.4.4 Process connections

The Rosemount 3051SMV flange process connection size is 1/4–18 NPT. Flange adapters with a 1/4–18 NPT to 1/2–14 NPT connection are available with the D2 option. Use a plant-approved lubricant or sealant when making the process connections. The process connections on the transmitter flange are on 21/8-in. (54 mm) centers to allow direct mounting to a 3- or 5-valve manifold. Rotate one or both of the flange adapters to attain connection centers of 2-in. (51 mm), 21/8-in. (54 mm), or 21/4-in. (57 mm).

⚠ Install and tighten all four flange bolts before applying pressure to avoid leakage. When properly installed, the flange bolts will protrude through the top of the SuperModule isolator plate. See Figure 3-7. Do not attempt to loosen or remove the flange bolts while the transmitter is in service.

Figure 3-7. SuperModule Isolator Plate



A. Bolt
B. SuperModule isolator plate
C. Coplanar flange
D. Flange adapters

To install adapters 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-rings installed.
3. Attach the adapters and the coplanar flange to the transmitter SuperModule assembly using the longer of the bolts supplied.
4. Tighten the bolts. Refer to Table 3-2 on page 72 for torque specifications.

Refer to "Service support" on page 117 for the correct part numbers of the flange adapters and O-rings designed for the Rosemount 3051SMV.

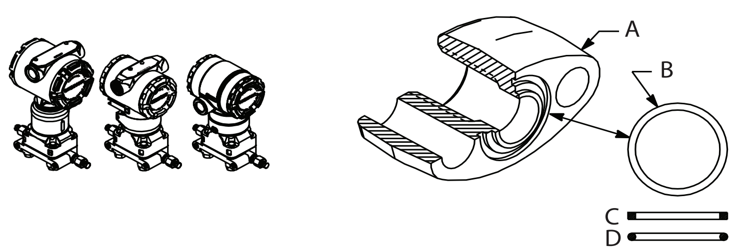
Note
The two styles of Rosemount flange adapters (Rosemount 3051S/3051/2051) each require a unique O-ring . Use only the O-ring designed for the corresponding flange adaptor.

O-ring

⚠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 designed for its specific flange adapter, as shown below:

Rosemount 3051S/3051/2051



A. Flange adapter
B. O-ring
C. PTFE-based profile (square)
D. Elastomer profile (round)

When removing flanges or adapters, visually inspect the PTFE O-rings. Replace them if there are any signs of damage, such as nicks or cuts. If replacing the O-rings, re-torque the flange bolts after installation to compensate for seating of the PTFE O-ring. Refer to "Flange and drain vent" on page 103.

Impulse piping considerations

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are many 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, density variations between the legs, and plugged impulse piping.

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

- Keep impulse piping as short as possible.
- For liquid service, slope the impulse piping at least 1 in. per ft. (8 cm per m) upward from the transmitter toward the process connection.

- For gas service, slope the impulse piping at least 1 in. per ft. (8 cm per 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 SuperModule process connection and flanges.
- Prevent sediment deposits in the impulse piping.
- Keep the liquid head balanced on both legs of the impulse piping.

Note
Take necessary steps to prevent process fluid from freezing within the process flange to avoid damage to the transmitter.

Note
Verify transmitter zero point after installation. To reset zero point, refer to "Sensor trim overview" on page 90.

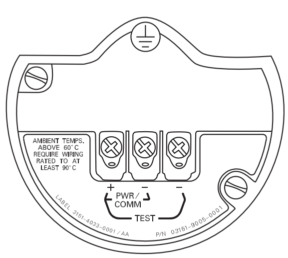
3.4.5 Connect wiring and power up

It is recommended to use twisted pair wiring. To ensure proper communication, use 24 to 14 AWG wire, and do not exceed 5000 ft. (1500 m).

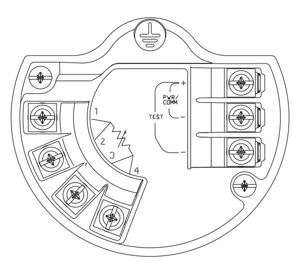
Note
Proper electrical installation is necessary to prevent errors due to improper grounding and electrical noise. Shielded wiring is recommended for environments with high EMI/RFI levels. Shielded wiring is required in order to comply with NAMUR requirements.

Figure 3-8. Terminal Blocks

Without optional process temperature connection



With optional process temperature connection



To make connections, perform the following procedure:

1. Remove the cover on the field terminals side of the housing.
2. Connect the positive lead to the "PWR/COMM +" terminal, and the negative lead to the "PWR/COMM –" terminal.

Note
Do not connect the power across the test terminals. Power could damage the test diode in the test connection.

3. If the optional process temperature input is not installed, plug and seal the unused conduit connection. If the optional process temperature input is being utilized, see "Install optional process temperature input (Pt 100 RTD sensor)" on page 76 for more information.

⚠ When the enclosed pipe plug is utilized in the conduit opening, it must be installed with a minimum engagement of five threads in order to comply with flameproof/explosion-proof requirements.

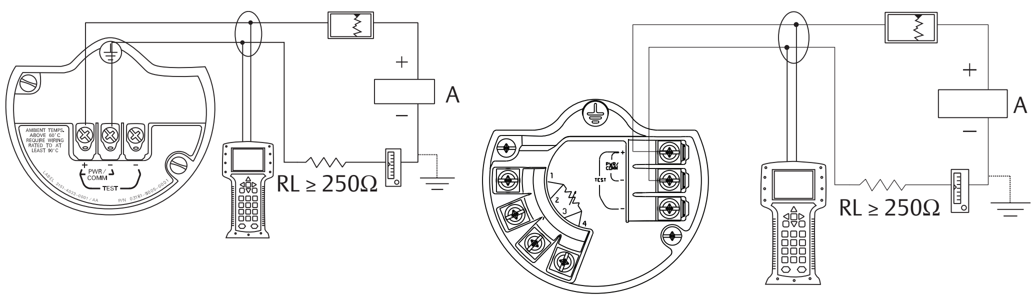
4. If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.

⚠ 5. Reinstall the housing cover and tighten so that metal contacts metal to meet flameproof/explosion-proof requirements.

Figure 3-9 shows the wiring connections necessary to power a Rosemount 3051SMV and enable communications with a Hand-held Field Communicator.

Figure 3-9. Transmitter Wiring

Without optional process temperature connection | **With optional process temperature connection**



A. Power supply

Note
Installation of the transient protection terminal block does not provide transient protection unless the Rosemount 3051SMV housing is properly grounded. See "Grounding" on page 79 for more information.

Install optional process temperature input (Pt 100 RTD sensor)

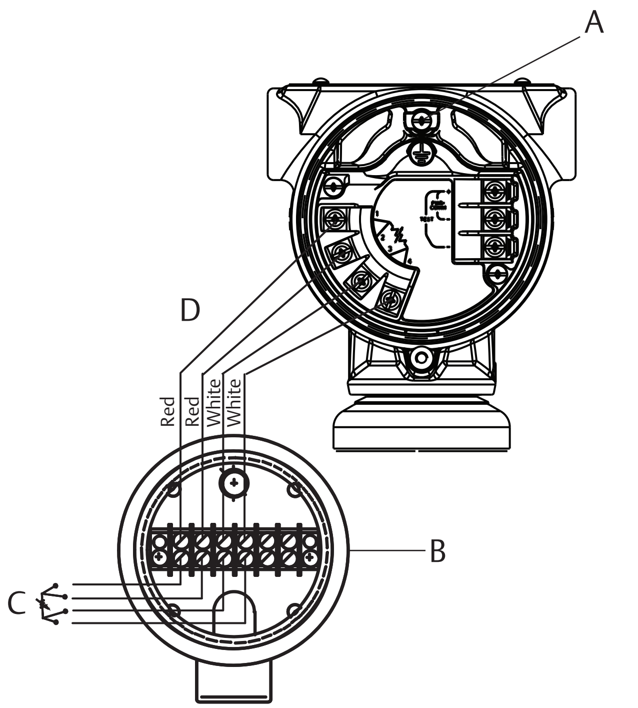
⚠ **Note**
To meet ATEX/IECEx Flameproof certification, only ATEX/IECEx Flameproof cables (temperature input code C30, C32, C33, C34 or customer supplied equivalent) may be used.

1. Mount the Pt 100 RTD Sensor in the appropriate location.

Note
Use shielded four-wire cable for the process temperature connection.

2. Connect the RTD cable to the Rosemount 3051SMV by inserting the cable wires through the unused housing conduit connection and connect to the four screws on the transmitter terminal block. An appropriate cable gland should be used to seal the conduit opening around the cable. See Figure 3-10 on page 77.
3. Connect the RTD cable shield wire to the ground lug in the housing.

Figure 3-10. RTD Wiring Connection



A. Ground lug
B. RTD connection head
C. Pt 100 RTD sensor
D. RTD cable assembly wires

Three-wire RTD

A four-wire Pt 100 RTD is required to maintain published performance specifications. A three-wire Pt 100 RTD may be used with degraded performance. If connecting to a three-wire RTD, use a four-wire cable to connect the Rosemount 3051SMV terminal block to the RTD connection head. Within the RTD connection head, connect two of the same colored wires from the Rosemount 3051SMV to the single colored wire of the RTD sensor.

Surges/transients

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

Optional transient protection terminal block

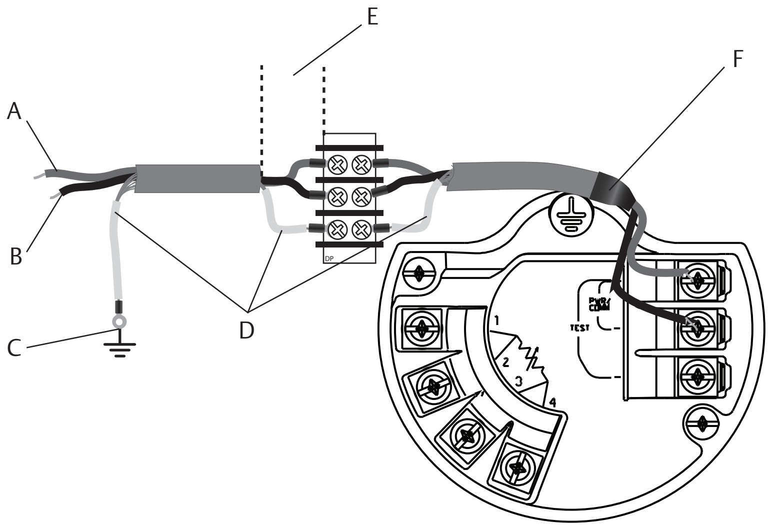
The transient protection terminal block can be ordered as an installed option (code T1 in the transmitter model number) or as a spare part to retrofit existing Rosemount 3051SMV in the field. For a complete listing of spare part numbers for transient protection terminal blocks, refer to "Service support" on page 117. A lightning bolt symbol on a terminal block identifies it as having transient protection.

Note
Grounding the transmitter case using the threaded conduit connection may not provide a sufficient ground. The transient protection terminal block (option code T1) will not provide transient protection unless the transmitter case is properly grounded. See "Grounding" on page 79 to ground the transmitter case. Do not run transient protection ground wire with signal wiring; the ground wire may carry excessive current if a lightning strike occurs.

Signal wire grounding

Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. Ground the shield of the signal wiring at any one point on the signal loop. See Figure 3-11. The negative terminal of the power supply is a recommended grounding point.

Figure 3-11. Signal Wire Grounding



A. Positive
B. Negative
C. Connect shield back to the power supply negative terminal
D. Insulate shield
E. Minimize distance
F. Trim shield and insulate

Power supply 4–20 mA transmitters

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

See "Load limitations" on page 131 for transmitter resistance load limits.

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

3.4.6 Conduit electrical connector wiring (option GE or GM)

For Rosemount 3051SMV with conduit electrical connectors GE or GM, refer to the cordset manufacturer's installation instructions for wiring details. For FM Intrinsically Safe, non-incendive hazardous locations, install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA® 4X and IP66.) For more information, see "Product Certifications" on page 155.

3.4.7 Grounding

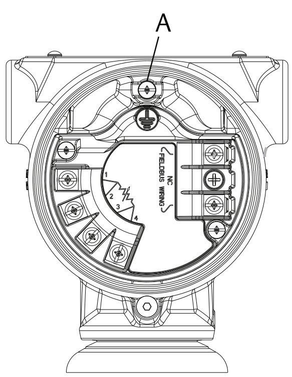
Transmitter case

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 (< 1Ω). Methods for grounding the transmitter case include:

Internal ground connection

The internal ground connection screw is inside the terminal side of the electronics housing. The screw is identified by a ground symbol (⏚), and is standard on all Rosemount 3051SMV.

Figure 3-12. Internal Ground Connection

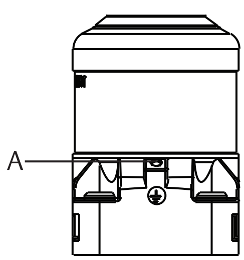


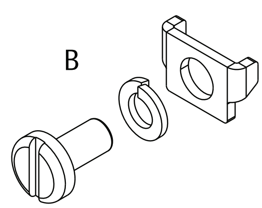
A. Ground lug

External ground connection

The external ground connection is on the outside of the SuperModule housing. The connection is identified by a ground symbol (⏚). An external ground assembly is included with the option codes shown in Table 3-3 on page 80 or is available as a spare part (03151-9060-0001).

Figure 3-13. External Ground Connection





A. External ground lug
B. External ground assembly (03151-9060-0001)

Table 3-3. External Ground Screw Approval Option Codes

Option code	Description
E1	ATEX Flameproof
I1	ATEX Intrinsic Safety
N1	ATEX Type n
ND	ATEX Dust
E4	TIIS Flameproof
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)
E7	IECEx Flameproof, Dust Ignition-proof
N7	IECEx Type n
K7	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, and Type n (combination of E7, I7, and N7)
KA	ATEX and CSA Explosion-proof, Intrinsically Safe, Division 2 (combination of E1, E6, I1, and I6)
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1)
T1	Transient terminal block
D4	External ground screw assembly

3.5 Rosemount 305 and 304 Manifolds

The Rosemount 305 Integral Manifold is available in two designs: coplanar and traditional. The traditional Rosemount 305 can be mounted to most primary elements with mounting adapters.

Figure 3-14. Rosemount 305 Manifold Styles

Rosemount 305 Integral Coplanar **Rosemount305 Integral Traditional**

The Rosemount 304 comes in two basic styles: traditional (flange × flange and flange × pipe) and wafer. The Rosemount 304 Traditional Manifold comes in 2-, 3-, and 5-valve configurations. The Rosemount 304 Wafer Manifold comes in 3- and 5-valve configurations.

Figure 3-15. Rosemount 304 Manifold Styles

Rosemount 304 Traditional **Rosemount 304 Wafer**

3.5.1 Rosemount 305 Integral Manifold installation procedure

To install a Rosemount 305 Integral Manifold to a Rosemount 3051SMV:

1. ⚠ Inspect the PTFE SuperModule O-rings. If the O-rings are undamaged, reusing them is recommended. If the O-rings are damaged (e.g. nicks), replace them with new O-rings.

Note
If replacing the O-rings, be careful not to scratch or deface the O-ring grooves or the surface of the isolating diaphragm when removing the damaged O-rings.

2. Install the Integral manifold on the SuperModule process connection. Use the four 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 71 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the SuperModule housing.
3. If the PTFE SuperModule O-rings have been replaced, the flange bolts should be re-tightened after installation to compensate for seating of the O-rings.
4. If applicable, install flange adapters on the process end of the manifold using the 1.75-in. flange bolts supplied with the transmitter.

3.5.2 Rosemount 304 Conventional Manifold installation procedure

To install a Rosemount 304 Conventional Manifold to a Rosemount 3051SMV:

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 71 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the SuperModule assembly bolt hole but must not contact the SuperModule housing.
3. If applicable, install flange adapters on the process end of the manifold using the 1.75-in. flange bolts supplied with the transmitter.

3.5.3 Manifold operation

⚠ WARNING

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

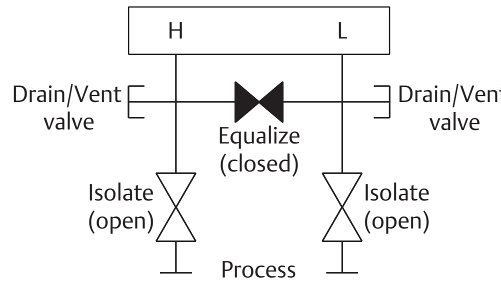
Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate any shift due to mounting effects. See “Sensor trim overview” on page 90.

Coplanar transmitters

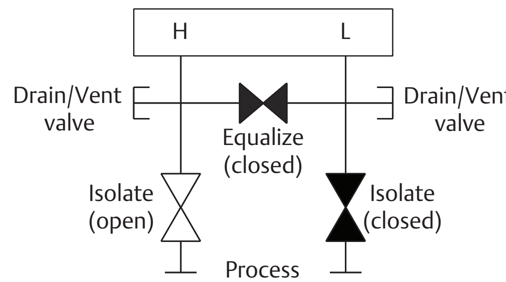
3-valve and 5-valve manifolds

Performing zero trim at static line pressure

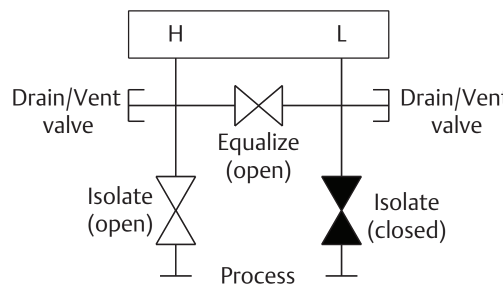
In normal operation the two isolate (block) valves between the process ports and transmitter will be open and the equalize valve will be closed.



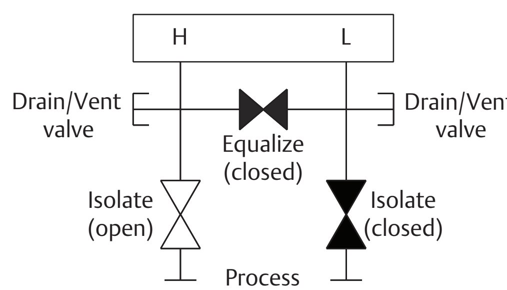
1. To zero trim the transmitter, close the isolate valve on the low side (downstream) side of the transmitter.



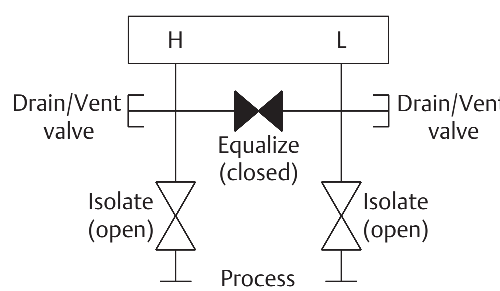
2. Open the equalize valve to equalize the pressure on both sides of the transmitter. The manifold is now in the proper configuration for performing a zero trim on the transmitter.



3. After performing a zero trim on the transmitter, close the equalize valve.



4. Finally, to return the transmitter to service, open the low side isolate valve.

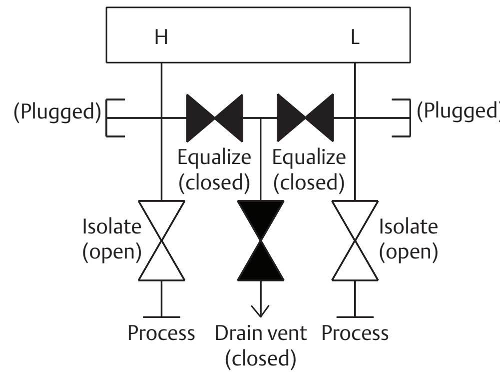


5-valve natural gas manifold

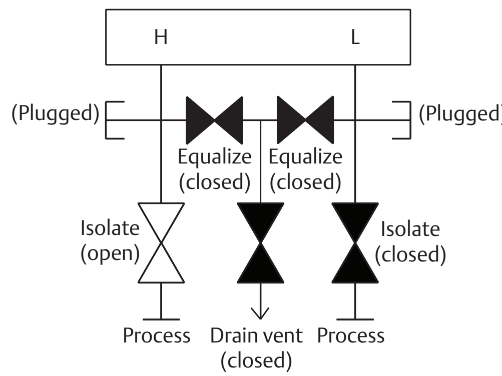
Performing zero trim at static line pressure

5-valve natural gas configurations shown:

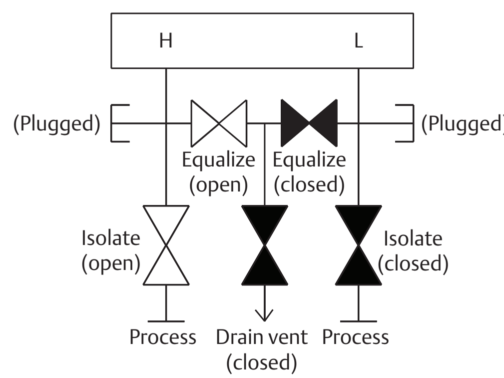
In normal operation, the two isolate (block) valves between the process ports and transmitter will be open, and the equalize valves will be closed. Vent valves may be opened or closed.



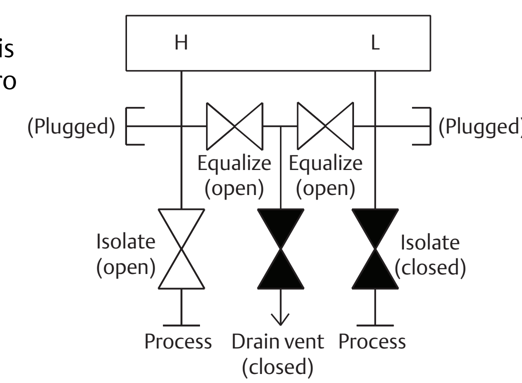
1. To zero trim the transmitter, first close the isolate valve on the low pressure (downstream) side of the transmitter and the vent valve.



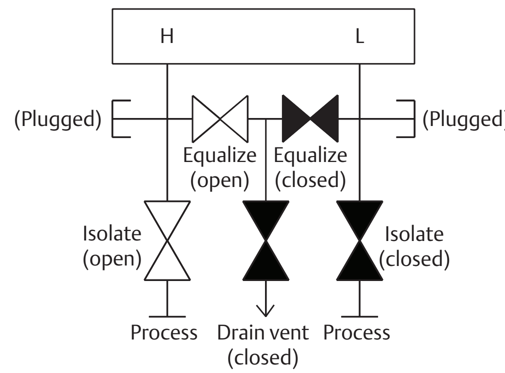
2. Open the equalize valve on the high pressure (upstream) side of the transmitter.



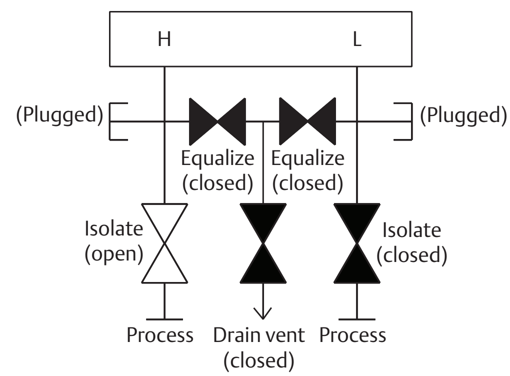
3. Open the equalize valve on the low pressure (downstream) side of the transmitter. The manifold is now in the proper configuration for performing a zero trim on the transmitter.



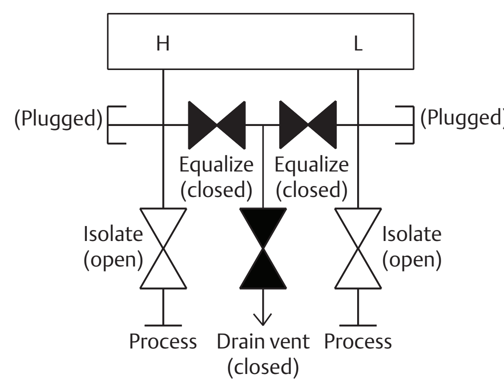
4. After performing a zero trim on the transmitter, close the equalize valve on the low pressure (downstream) side of the transmitter.



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



6. Finally, to return the transmitter to service, open the low side isolate valve and vent valve. The vent valve can remain open or closed during operation.

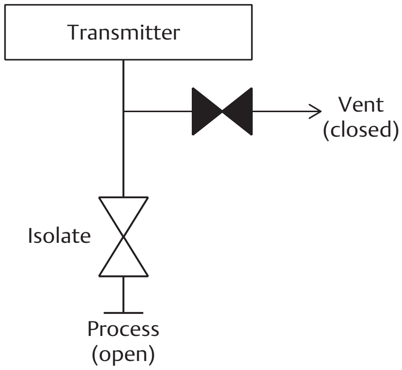


In-line transmitters

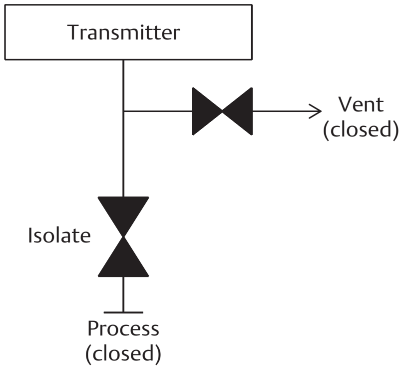
2-valve and block and bleed style manifolds

Isolating the transmitter

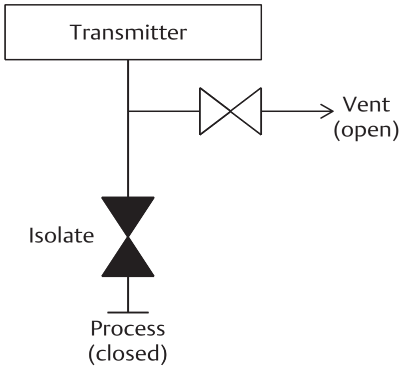
In normal operation the isolate (block) valve between the process port and transmitter will be open and the test/vent valve will be closed. On a block and bleed style manifold, a single block valve provides transmitter isolation and a bleed screw provides drain/vent capabilities.



1. To isolate the transmitter, close the isolate valve.

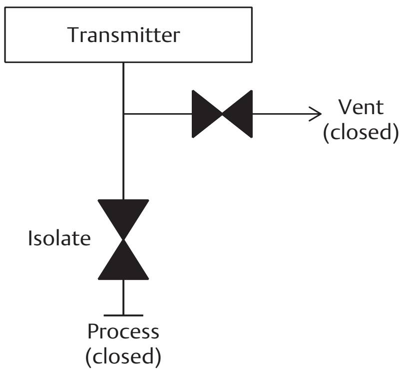


2. To bring the transmitter to atmospheric pressure, open the vent valve or bleed screw.

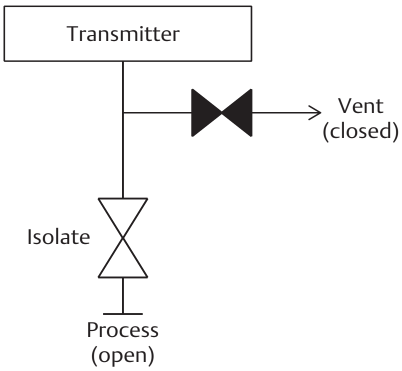


Note
A 1/4-in. male NPT pipe plug may be installed in the test/vent port and will need to be removed with a wrench in order to vent the manifold properly.
⚠ Always use caution when venting directly to atmosphere.

3. After venting to atmosphere, perform any required calibration and then close the test/vent valve or replace the bleed screw.



4. Open the Isolate (block) valve to return the transmitter to service.



Adjusting valve packing

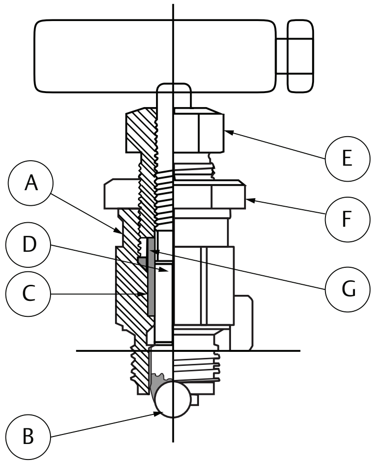
Over time, the packing material inside a Rosemount manifold may require adjustment in order to continue to provide proper pressure retention. Not all manifolds have this adjustment capability. The manifold model number will indicate what type of stem seal or packing material has been used.

The following steps are provided as a procedure to adjust valve packing:

1. Remove all pressure from device.
2. Loosen manifold valve jam nut.
3. Tighten manifold valve packing adjuster nut $^1/_4$ turn.
4. Tighten manifold valve jam nut.
5. Re-apply pressure and check for leaks.
6. Above steps can be repeated, if necessary.

If the above procedure does not result in proper pressure retention, the complete manifold should be replaced.

Figure 3-16. Adjusting Valve Packing



A. Bonnet
B. Ball seat
C. Packing
D. Stem
E. Packing adjuster
F. Jam nut
G. Packing follower

Section 4 Operation and Maintenance

4.1 Overview

This section contains information on operating and maintaining Rosemount™ 3051S MultiVariable™ Transmitters (Rosemount 3051SMV). Instructions for performing configuration and calibration procedures are given for Field Communicator version 2.0 or later, AMS Device Manager version 9.0 or later, and Engineering Assistant version 6.3 or later. Screen shots for this section are taken from AMS Device Manager version 9.0; Engineering Assistant screens will look similar and follow the same instructions for use and navigation. For convenience, Field Communicator Fast Key sequences are labeled "Fast Keys" for each software function below the appropriate headings.

Based on the configuration ordered, some measurements (i.e. static pressure, process temperature) and/or calculation types (i.e. mass, volumetric, and energy flow) may not be available for all fluid types. Available measurements and/or calculation types are determined by the multivariable type and measurement type codes ordered. See "Ordering information" on page 138 for more information.

All screens in this section are shown for multivariable type M (fully compensated mass and energy flow), measurement type 1 (differential pressure, static pressure, and process temperature). Field Communicator Fast Keys are given for both multivariable type M and P (direct process variable output) with measurement type 1. Field Communicator Fast Keys and screens for other multivariable types and measurement types may vary.

4.2 Safety messages

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

⚠WARNING

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

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a Field 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.
- Both transmitter covers must be fully engaged to meet flameproof/explosion-proof requirements.
- Verify the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Electrical shock could cause death or serious injury.

- If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on the transmitter leads and terminals.
- Use extreme caution when making 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™ 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 as spare parts.

Improper assembly of manifolds to traditional flange can damage the device.

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

Improper installation or repair of the SuperModule™ assembly with high pressure option (P0) could result in death or serious injury.

- For safe assembly, the high pressure SuperModule assembly must be installed with ASTM A193 Class 2 Grade B8M Bolts and either a Rosemount 305 Manifold or a DIN-compliant traditional flange.

Static electricity can damage sensitive components.

Observe safe handling precautions for static-sensitive components.

4.3 Transmitter calibration

4.3.1 Calibration overview

Complete configuration and calibration of the Rosemount 3051SMV involves the following tasks:

Configure the output parameters

- Basic setup screen
- Set process variable units
- Set primary variable
- Rerange
- Set transfer function (direct process variable feature board only)
- Set damping

Calibrate the sensor (DP, P, and/or T)

For each sensor, perform:

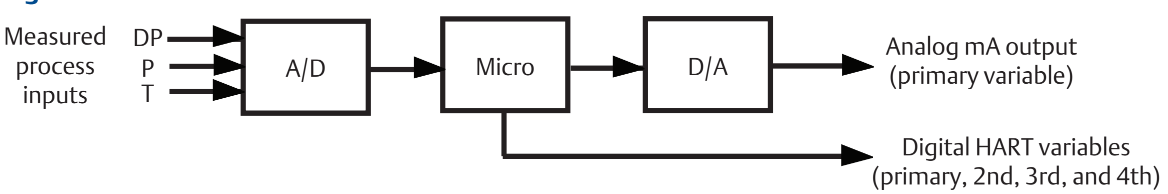
- Sensor trim (page 90)
- Zero or lower sensor trim (page 91)

Calibrate the 4–20 mA output

- 4–20 mA analog trim (page 95); or
- 4–20 mA scaled output trim (page 95)

Figure 4-1 summarizes the data flow for the Rosemount 3051SMV. 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



Data flow can be summarized in four major steps:

1. A change in a process variable (DP, P, and/or T) corresponds to a change in the sensor output (Sensor Signal).
2. The sensor signal is converted to a digital format that is understood by the microprocessor (Analog-to-Digital Signal Conversion).
3. Corrections and flow calculations are performed in the microprocessor to obtain a digital representation of the process output variables.
4. The Digital Primary Variable (PV) is converted to an analog value (Digital-to-Analog Signal Conversion).

Note
Coplanar transmitter configurations measuring gage pressure and process temperature (measurement 5) will report as the pressure as differential pressure. This will be reflected on the LCD display, nameplate, digital interfaces, and other user interfaces.

4.3.2 Sensor trim overview

Trim the sensors 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

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 with a manifold, refer to "Rosemount 305 and 304 Manifolds" on page 80.

Note
The transmitter must be within five percent or less of the maximum span of true zero (zero-based) in order to calibrate with zero trim function.

The transmitter will not allow the user to perform a zero trim on an absolute static pressure sensor. To correct mounting position effects on the absolute static pressure sensor, perform a lower sensor trim. The lower sensor trim function provides an offset correction similar to the zero trim function, but it does not require zero-based input.

Upper and lower sensor trim

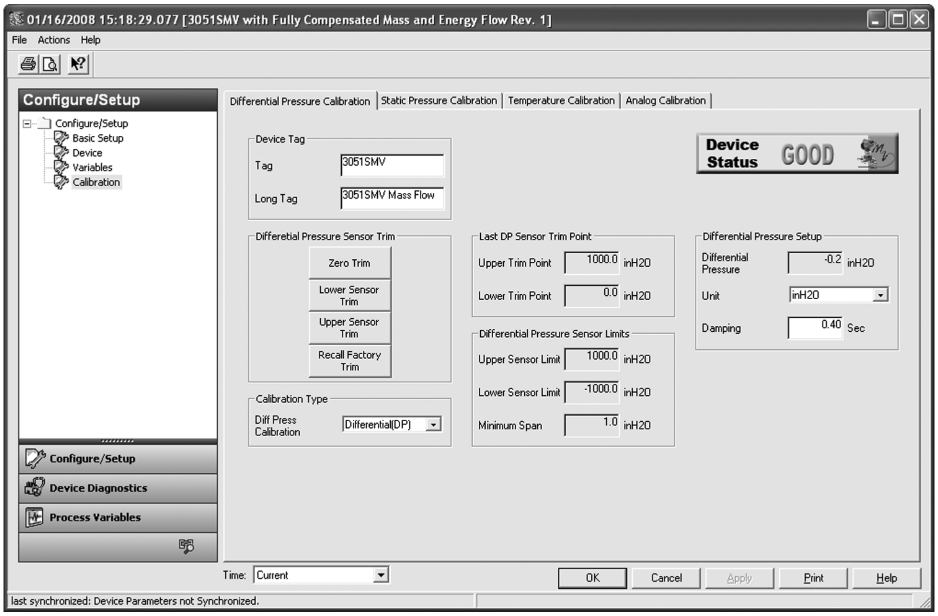
Sensor trim is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. Always adjust the lower sensor trim value first to establish the correct offset. Adjustment of the upper sensor trim value provides a slope correction to the characterization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

4.3.3 Differential pressure sensor calibration

Mass and energy flow Fast Keys	1, 2, 5, 3
Direct process variable output Fast Keys	1, 2, 4, 3

The *Differential Pressure Calibration* tab allows the user to complete a zero trim procedure or a full DP sensor trim, see Figure 4-2 on page 91.

Figure 4-2. Calibration - Differential Pressure Calibration Tab



Zero trim

To perform a DP sensor zero trim, select the **Zero Trim** button under the *Differential Pressure Sensor Trim* heading and follow the on-screen prompts. The transmitter must be within five percent or less of the maximum span of true zero (zero-based) in order to calibrate with zero trim function.

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

Upper and lower sensor trim

A reference pressure device is required to perform a full sensor trim. Use a reference pressure device that is at least three times more accurate than the transmitter and allow the pressure input to stabilize for ten seconds before entering any values. It is possible to degrade the performance of the transmitter if the full sensor trim is done improperly or with inaccurate calibration equipment.

To perform a DP full trim, perform the following procedure:

1. Select the **Lower Sensor Trim** button and follow the on-screen prompts.
2. Select the **Upper Sensor Trim** button and follow the on-screen prompts.

Note
Select process variable calibration input values so that low and high values are equal to or outside the upper and lower range limits. Do not attempt to obtain reverse output by reversing the high and low points. The transmitter allows approximately five percent URL deviation from the characterized curve established at the factory.

Calibration type

The calibration type drop-down menu allows the user to note the type of device last used to calibrate the sensor (either Differential, Gage, or Absolute). This field does not affect the calibration of the device.

Recall factory trim

The **Recall Factory Trim** button will restore the transmitter to the original factory characterization curve. The Recall Factory Trim button can be useful for recovering from an inadvertent zero trim or inaccurate pressure source.

When the recall factory trim function is used, the transmitter's upper and lower trim values are set to the values configured at the factory. If custom trim values were specified when the transmitter was ordered, the device will recall those values. If custom trim values were not specified, the device will recall the upper and lower sensor limits.

Last DP sensor trim point

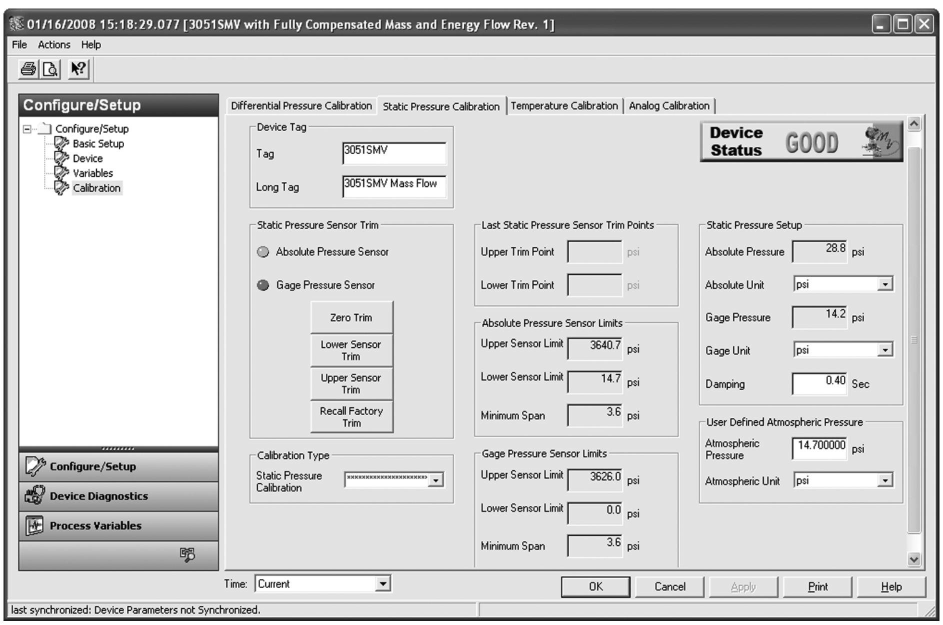
The current upper and lower trim points can be seen under the *Last DP Sensor Trim Point* heading.

4.3.4 Static pressure sensor calibration

Mass and energy flow Fast Keys	1, 2, 5, 4
Direct process variable output Fast Keys	1, 2, 4, 4

The *Static Pressure Calibration* tab allows the user to complete either a zero trim procedure or a full SP sensor trim, see Figure 4-3.

Figure 4-3. Calibration - Static Pressure Calibration Tab



Zero trim and lower sensor trim

The type of static pressure sensor equipped in the transmitter can be determined by referring to the *Static Pressure Sensor Type* heading. This determines whether a zero trim (gage sensor) or lower sensor trim (absolute sensor) required to correct for mounting position effects.

To perform a zero trim on a gage static pressure sensor, select the **Zero Trim** button under the *Static Pressure Sensor Trim* heading and follow the on-screen prompts. The transmitter must be within five percent or less of the maximum span of true zero (zero-based) in order to calibrate with zero trim function.

To correct for mounting position effects on transmitters equipped with an absolute static pressure sensor, perform a lower sensor trim. This is accomplished by selecting the **Lower Sensor Trim** button and following the on-screen prompts. The lower sensor trim function provides an offset correction similar to the zero trim function, but it does not require a zero-based input.

Upper and lower sensor trim

To perform a Static Pressure Full Sensor Trim, perform the following procedure:

1. Select the **Lower Sensor Trim** button and follow the on-screen prompts.
2. Select the **Upper Sensor Trim** button and follow the on-screen prompts.

Note
It is possible to degrade the performance of the transmitter if the full sensor trim is done improperly or with inaccurate calibration equipment. Use a pressure input source that is at least three times more accurate than the transmitter and allow the pressure input to stabilize for ten seconds before entering any values.

Recall factory trim

The **Recall Factory Trim** button will restore the transmitter to the original factory characterization curve. The **Recall Factory Trim** button can be useful for recovering from an inadvertent zero trim or inaccurate pressure source.

When the recall factory trim function is used, the transmitter's upper and lower trim values are set to the values configured at the factory. If custom trim values were specified when the transmitter was ordered, the device will recall those values. If custom trim values were not specified, the device will recall the upper and lower sensor limits.

Last static pressure sensor trim

The current upper and lower trim points can be seen under the *Last Static Pressure Sensor Trim Points* heading.

Calibration type

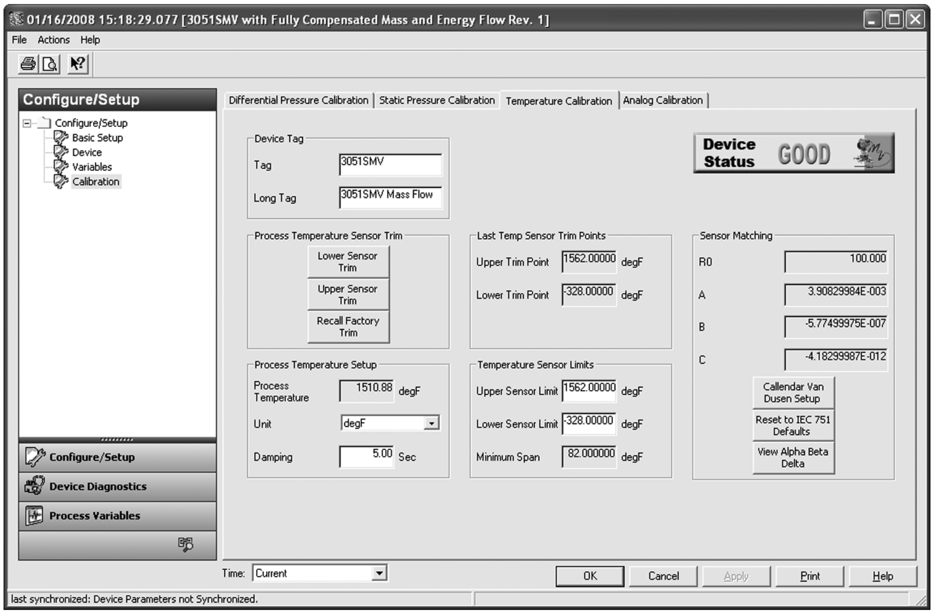
The calibration type drop-down menu allows the user to note the type of device last used to calibrate the sensor (either Differential, Gage, or Absolute). This field does not affect the calibration of the device.

4.3.5 Process temperature sensor calibration

Mass and energy flow Fast Keys	1, 2, 5, 5
Direct process variable output Fast Keys	1, 2, 4, 5

The *Temperature Calibration* tab allows the user to perform a sensor trim and configure the sensor matching of a process temperature sensor, see Figure 4-4 on page 94.

Figure 4-4. Calibration - Temperature Calibration Tab



Process temperature upper and lower sensor trim

To calibrate the Process Temperature Input using the sensor trim, follow the procedure shown below:

1. Set up a Temperature Calibrator to simulate a Pt 100 (100-ohm platinum, alpha 385 RTD). Wire the two red wires from the Rosemount 3051SMV terminal block to one connection, and the two white wires to the other connection. See “Install optional process temperature input (Pt 100 RTD sensor)” on page 76 for more information.
2. Adjust the calibrator/RTD simulator to a test point temperature value that represents a minimum process temperature (for example, 32 °F or 0 °C). Select the **Lower Sensor Trim** button under the *Process Temperature Sensor Trim* heading and follow the on-screen prompts.
3. Adjust the calibrator/RTD simulator to a test point temperature value that represents the maximum process temperature (for example, 140 °F or 60 °C). Select the **Upper Sensor Trim** button under the *Process Temperature Sensor Trim* heading and follow the on-screen prompts.

Recall factory trim

The **Recall Factory Trim** button will restore the transmitter to the original factory calibration settings.

When the recall factory trim function is used, the transmitter’s upper and lower trim values are set to the values configured at the factory. If custom trim values were specified when the transmitter was ordered, the device will recall those values. If custom trim values were not specified, the device will recall the upper and lower sensor limits.

Transmitter RTD sensor matching using Callendar-Van Dusen constants

The Rosemount 3051SMV accepts Callendar-Van Dusen constants from a calibrated RTD schedule and generates a special custom curve to match that specific sensor Resistance vs. Temperature performance. Matching the specific sensor curve with the transmitter configuration enhances the temperature measurement accuracy.

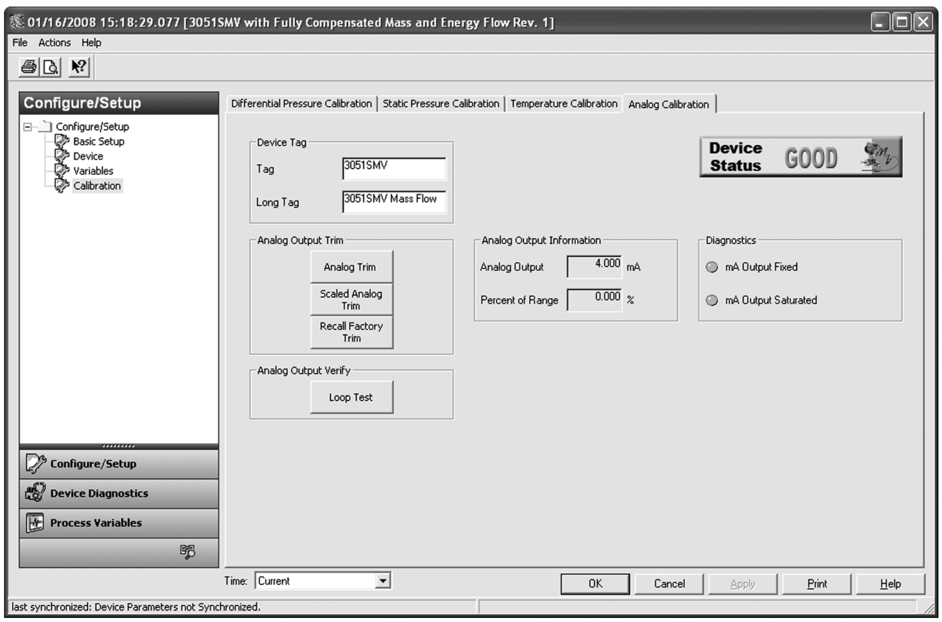
Under the *Sensor Matching* heading, the Callendar-Van Dusen constants R_0, A, B, and C can be viewed. If the Callendar-Van Dusen constants are known for the user's specific Pt 100 RTD sensor, the constants R_0, A, B, and C may be edited by selecting the Callendar-Van Dusen Setup button and following the on-screen prompts.

The user may also view the α, β, and δ Coefficients by selecting the **View Alpha, Beta, Delta** button. The constants R_0, α, β, and δ may be edited by selecting the **Callendar-Van Dusen Setup** button and following the on-screen prompts. To reset the transmitter to the IEC 751 Defaults, select the **Reset to IEC 751 Defaults** button.

4.3.6 Analog calibration

Mass and energy flow Fast Keys	1, 2, 5, 2
Direct process variable output Fast Keys	1, 2, 4, 5

Figure 4-5. Calibration - Analog Calibration Tab



Analog output trim

The Analog Output Trim commands allow the user to adjust the transmitter's current output at the 4 and 20 mA points to match the plant standards. This command adjusts the digital to analog signal conversion, see Figure 4-5.

To perform an analog trim, select the **Analog Trim** button and follow the on-screen prompts.

Scaled analog output trim

The scaled analog trim command matches the 4 and 20 mA points to a user selectable reference scale other than 4 and 20 mA (for example, 1 to 5 volts if measuring across a 250 ohm load, or 0 to 100 percent if measuring from a Distributed Control System [DCS]). To perform a scaled analog trim, connect an accurate reference meter, select the **Scaled Analog Trim** button, and follow the on-screen prompts.

Note
Use a precision resistor for optimum accuracy. When adding a resistor to the loop, ensure that the power supply is sufficient to power the transmitter to a 23 mA (maximum high alarm) output with the additional loop resistance.

Analog output loop test

Under the *Analog Output Verify* heading, a loop test can be performed by selecting the **Loop Test** button. 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.

Analog output diagnostic alerts

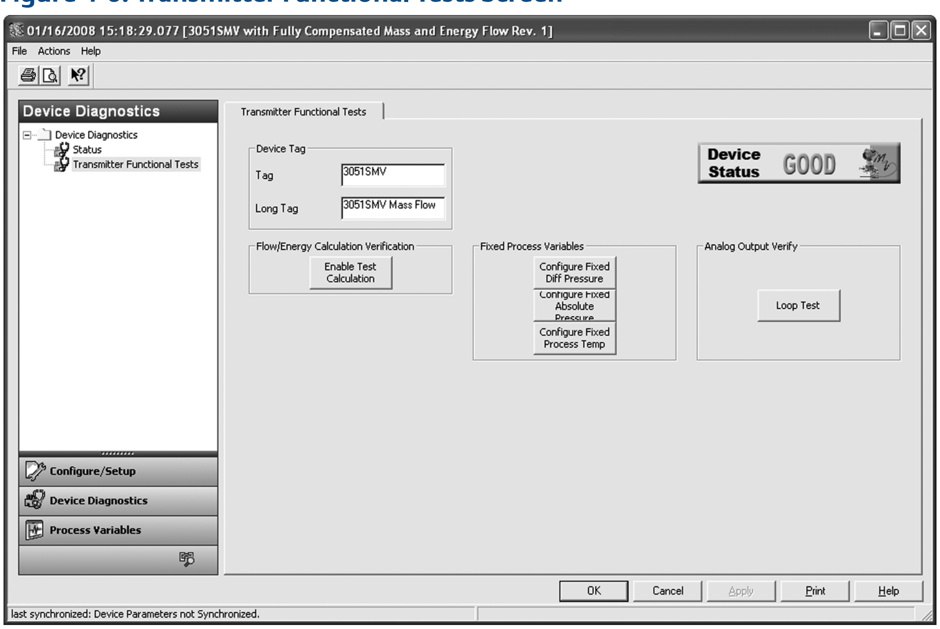
Two diagnostic alerts are shown under the *Diagnostics* heading.

The first is *mA Output Fixed*. This alerts the user that the 4–20 mA analog output signal is fixed at a constant value and is not representative of the HART Primary Variable. This diagnostic alert may also be triggered if “Loop Current Mode” is disabled, the device is in alarm, or if “Test Calculation” is running.

The second diagnostic is *mA Output Saturated*. This alerts the user that the measured Primary Variable has exceeded the range points defined for the 4–20 mA analog output signal. The analog output is fixed at the user-defined high or low saturation point and is not representative of the current HART Primary Variable.

4.4 Transmitter functional tests

Figure 4-6. Transmitter Functional Tests Screen



4.4.1 Flow/energy calculation verification (test calculation)

Mass and energy flow Fast Keys	1, 2, 3

(Fully compensated mass and energy flow feature board only):

The Flow and Energy Calculation Verification Test allows the user to verify the flow configuration of the Rosemount 3051SMV by entering expected values for the differential pressure, static pressure, and process temperature variables. Under the *Flow/Energy Calculation Verification* heading, perform the following steps:

1. Select the **Enable Test Calculation** button.
2. Select **Simulate DP** option. Select **Next**.
3. Select **DP Units** from the drop-down menu. Select **Next**.
4. Enter the DP Value corresponding to the desired flow rate simulation. Select **Next**.
5. Repeat steps 1–3 for static pressure (Simulate AP/GP) and process temperature (Simulate PT), if applicable.
6. Select **View Results**. Select **Next**. The simulated flow rate and corresponding flow properties will be shown. Select **Next**.
7. Select **Exit**. Select **Next**. Leaving the *Enable Test Calculation* window automatically returns all process variables fixed by the test calculation method to live process variable measurements.

4.4.2 Configuring fixed process variables

Mass and energy flow Fast Keys	1, 2, 4
Direct process variable output Fast Keys	1, 2, 3

Under the *Fixed Process Variables* heading, the user may temporarily set the differential pressure, static pressure or process temperature to a user defined fixed value for testing purposes. Once the user leaves the *Configure Fixed Variable* method, the fixed process variable will be automatically returned to a live process variable measurement.

4.4.3 Analog output loop test

Mass and energy flow Fast Keys	1, 2, 2
Direct process variable output Fast Keys	1, 2, 2

Under the *Analog Output Verify* heading, a Loop Test can be performed by selecting the **Loop Test** button. 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.

4.5 Process variables

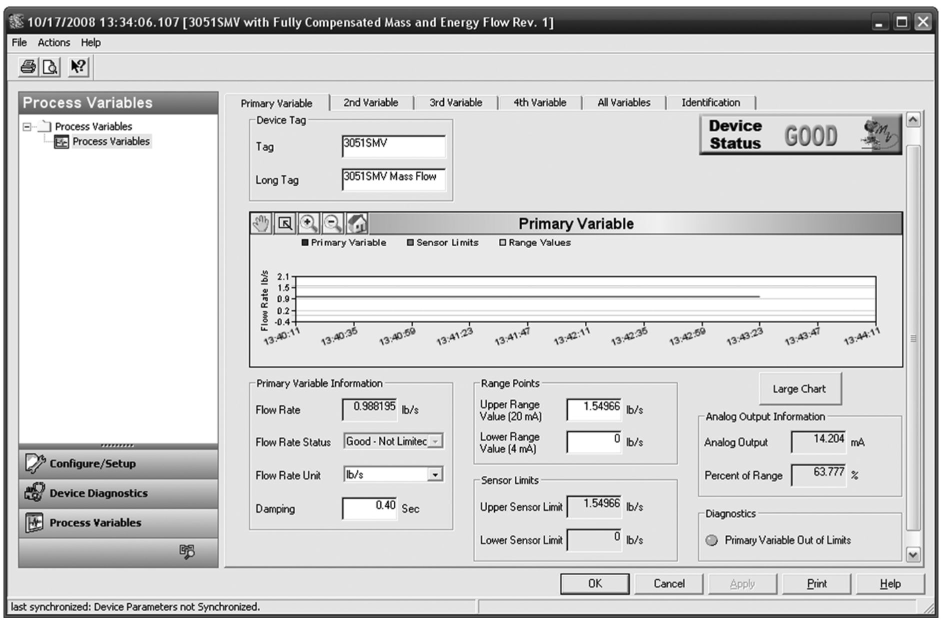
4.5.1 Process variable tabs

Mass and energy flow Fast Keys	1, 1
Direct process variable output Fast Keys	1, 1

The *Process Variables* screen shows a graphical representation of the respective variable. An example of the *Primary Variable* tab (as shown in Figure 4-7). The chart on these Process Variables tabs will begin plotting when the user first navigates to the screen, and will only continue plotting while the user is viewing this tab. The user may view a larger version of the chart by selecting the **Large Chart** button.

Each of the four digital output variables has a screen similar to the one shown in Figure 4-7.

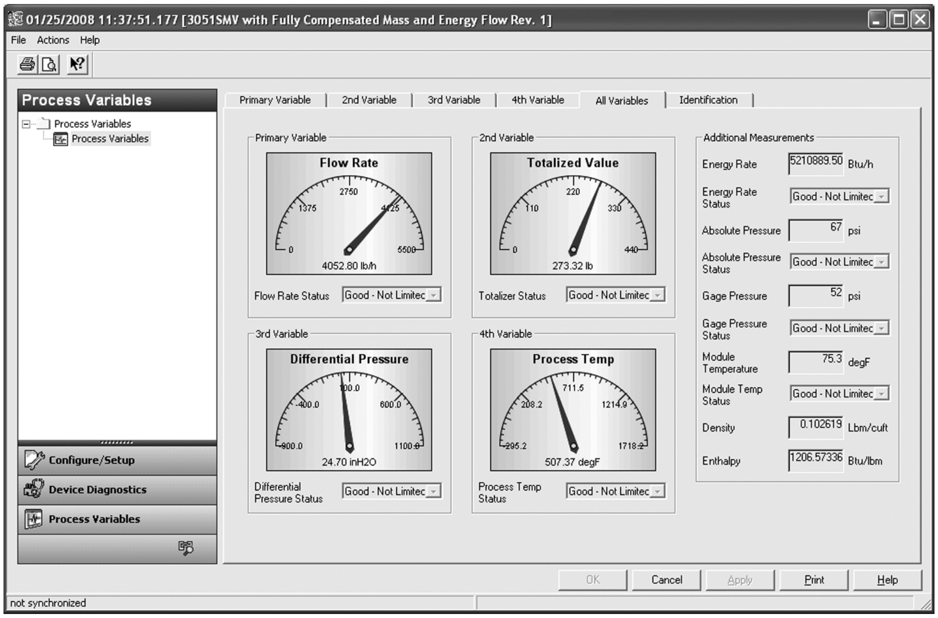
Figure 4-7. Process Variables - Primary Variable Tab



4.5.2 All variables tab

The *All Variables* tab allows the user to view a complete overview of all variables available within the device.

Figure 4-8. Process Variables - All Variables Tab



4.6 Field upgrades and replacements

4.6.1 Disassembly considerations

⚠ During disassembly, do not remove the instrument cover in explosive atmospheres when the circuit is live as this may result in serious injury or death. Also, be aware of the following:

- ⚠ Follow all plant safety rules and procedures.
- ⚠ Isolate and vent the process from the transmitter before removing the transmitter from service.
- Disconnect optional process temperature sensor leads and cable.
- Remove all other electrical leads and conduit.
- Detach the process flange by removing the four flange bolts and two alignment screws that secure it.
- Do not scratch, puncture, or depress the isolating diaphragms.
- Clean isolating diaphragms with a soft rag and a mild cleaning solution, then rinse with clear water.
- Whenever the process flange or flange adapters are removed, visually inspect the PTFE O-rings. Emerson recommends reusing O-rings if possible. If the O-rings show any signs of damage, such as nicks or cuts, they should be replaced.

4.6.2 Housing assembly including feature board electronics

Field device labels

The SuperModule label reflects the replacement model code for reordering a complete transmitter, including both the SuperModule assembly and Plantweb™ housing. The Rosemount 3051SMV model code stamped on the Plantweb housing nameplate can be used to reorder the Plantweb housing assembly.

Upgrading feature board electronics

The Rosemount 3051SMV allows feature board electronics upgrades. Different feature board electronics assemblies provide new functionality and are easily interchanged for upgrade. When replacing or upgrading the feature board electronics, use the "Rosemount 300SMV housing kit" on page 144 which also includes the appropriate Plantweb housing.

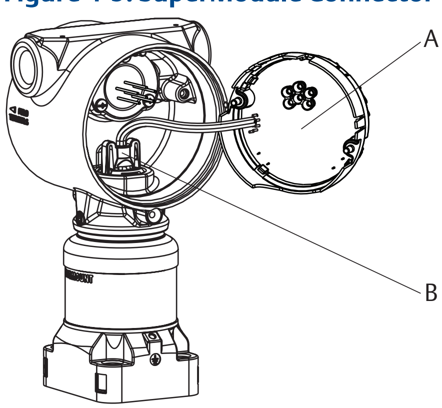
Upgrading or replacing the housing assembly including feature board electronics

Remove the feature board

The Rosemount 3051SMV feature board is located opposite the field terminal side in the Plantweb housing. To remove the feature board, perform the following procedure:

1. Remove the housing cover opposite the field terminal side.
2. Remove the LCD display, if applicable. To do this, hold in the two clips and pull outward. This will provide better access to the two screws located on the feature board.
3. Loosen the two captive screws located on the feature board.
4. Pull out the feature board to expose and locate the SuperModule connector, see Figure 4-10 on page 101.
5. Press the locking tabs and pull the SuperModule connector upwards (avoid pulling wires). Housing rotation may be required to access locking tabs. See "Housing rotation" on page 68 for more information.

Figure 4-9. SuperModule Connector View

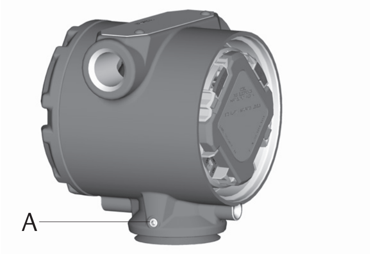


A. Feature board
B. SuperModule connector

Separate the SuperModule assembly from the housing

1. To prevent damage to the SuperModule connector, remove the feature board from the SuperModule assembly and remove the connector before separating the SuperModule assembly from the housing.
2. Loosen the housing rotation set screw by one full turn with a $^{3}/_{32}$-in. hex wrench.
3. Unscrew the housing from the SuperModule threads.

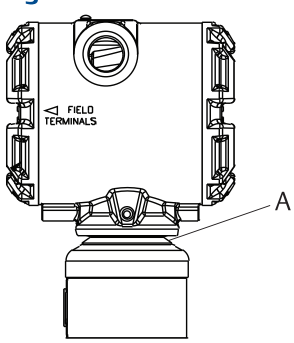
Figure 4-10. SuperModule Connector



A. $^{3}/_{32}$-in. housing rotation set screw

Note
The V-Seal (03151-9061-0001) must be installed at the bottom of the housing.

Figure 4-11. V-Seal



A. Black rubber V-seal

Attach the SuperModule assembly to the Plantweb housing

1. Apply a light coat of low temperature silicon grease to the SuperModule threads and O-ring.
2. Thread the housing completely onto the SuperModule assembly. The housing must be no more than one full turn from flush with the SuperModule assembly to comply with flameproof/explosion-proof requirements.
3. Tighten the housing rotation set screw using a $^{3}/_{32}$-in. hex wrench to a recommended torque of 30 in-lb (3.4 N-m).

Install feature board in the Plantweb housing

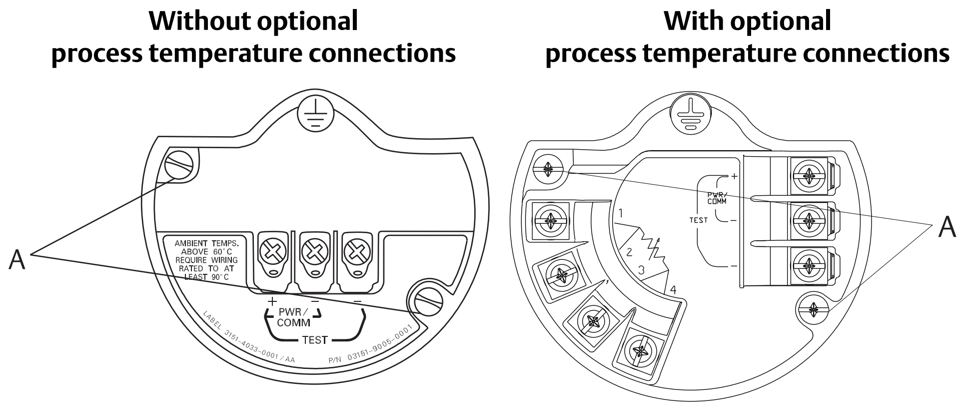
1. Apply a light coat of low temperature silicon grease to the SuperModule connector O-ring.
2. Insert the SuperModule connector into the top of the SuperModule assembly. Ensure the locking tabs are fully engaged.
3. Gently slide the feature board into the housing, making sure the pins from the Plantweb housing properly engage the receptacles on the feature board.
4. Tighten the captive screws.
5. ⚠ Attach the Plantweb housing cover and tighten so that metal contacts metal to meet flameproof/explosion-proof requirements.

4.6.3 Terminal block

Electrical connections are located on the terminal block in the compartment labeled "FIELD TERMINALS." The terminal block may be replaced or upgraded to add transient protection. Part numbers can be found in "Service support" on page 117.

Loosen the two captive screws (see Figure 4-12), and pull the entire terminal block out.

Figure 4-12. Terminal Blocks



A. Captive screws

1. Gently slide the terminal block into the housing, making sure the pins from the Plantweb housing properly engage the receptacles on the terminal block.
2. Tighten the captive screws on the terminal block.
3. ⚠ Attach the Plantweb housing cover and tighten so that metal contacts metal to meet flameproof/explosion-proof requirements.

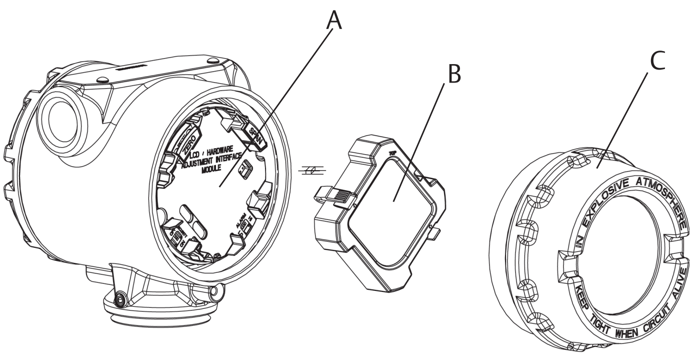
4.6.4 LCD display

Transmitters ordered with the LCD display will be shipped with the display installed. Installing the display on an existing Rosemount 3051SMV requires the LCD display kit (part number 03151-9193-0001 for aluminum housing and 03151-9193-0004 for stainless steel (SST) housing).

Use the following procedure and Figure 4-13 to install the LCD display:

1. If the transmitter is installed in a loop, then secure the loop and disconnect power.
2. ⚠ Remove the transmitter cover on the feature board side (opposite the field terminals side). Do not remove the instrument covers in explosive environments when the circuit is live.
3. Engage the four-pin connector into the feature board and snap the LCD display into place.
4. ⚠ Install the display cover and tighten to ensure metal to metal contact in order to meet flameproof/explosion-proof requirements.

Figure 4-13. Optional LCD Display



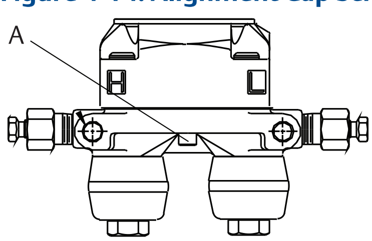
A. Feature board
B. LCD display
C. Display cover

4.6.5 Flange and drain vent

The Rosemount 3051SMV is attached to the process connection flange by four bolts and two alignment cap screws.

1. Remove the two alignment cap screws.

Figure 4-14. Alignment Cap Screws



A. Alignment cap screw

2. Remove the four bolts and separate the transmitter from the process connection, but leave the process connection flange in place and ready for re-installation.

Note
If the installation uses a manifold, see "Manifold operation" on page 81.

3. Inspect the SuperModule PTFE O-rings. If the O-rings are undamaged, they may be reused. Emerson recommends reusing O-rings if possible. If the O-rings show any signs of damage, such as nicks or cuts, they should be replaced (part number 03151-9042-0001 for glass-filled PTFE and part number 03151-9042-0002 for graphite-filled PTFE).

Note
If replacing the O-rings, be careful not to scratch or deface the O-ring grooves or the surface of the isolating diaphragm when removing the damaged O-rings.

4. Install the process flange on the SuperModule process connection. To hold the process flange in place, install the two alignment cap screws finger tight (these screws are not pressure retaining). Do not overtighten; this will affect module-to-flange alignment.
5. Install the appropriate flange bolts.
   a. If the installation requires a 1/4–18 NPT connection(s), use four 1.75-in. flange bolts. Finger tighten the bolts. Go to Step d.
   b. If the installation requires a 1/2–14 NPT connection(s), use flange adapters and four 2.88-in. process flange/adapter bolts.
   c. Hold the flange adapters and adapter O-rings in place while finger-tightening the bolts.
   d. Tighten the bolts to the initial torque value using a crossed pattern. See Table 4-1 for appropriate torque values.
   e. Tighten the bolts to the final torque value using a crossed pattern. See Table 4-1 for appropriate torque values. When fully tightened, the bolts should extend through the top of the module housing.
   f. Torque alignment screws to 30 in-lb (3.4 N-m). If the installation uses a conventional manifold, then install flange adapters on the process end of the manifold using the 1.75-in. flange bolts supplied with the transmitter.

Table 4-1. Bolt Installation Torque Values

Bolt material	Initial torque value	Final torque value
CS-ASTM-A449 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-193-B7M—Option L5	300 in-l (34 N-m)	650 in-lb (73 N-m)
Alloy K-500—Option L6	300 in-lb (34 N-m)	650 in-lb (73 N-m)
ASTM-A-453-660—Option L7	150 in-lb (17 N-m)	300 in-lb (34 N-m)
ASTM-A-193-B8M—Option L8	150 in-lb (17 N-m)	300 in-lb (34 N-m)

6. If the SuperModule PTFE O-rings are replaced, re-torque the flange bolts and alignment cap screws after installation to compensate for seating of the PTFE O-ring.
7. Install the drain/vent valve.
   a. 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.
   b. 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.
   c. Tighten the drain/vent valve to 250 in-lb (28.25 N-m).
   d. Tighten the stem to 70 in-lb (8 N-m).

Note

Due to the sensitivity of the Range 1 DP Sensor, extra steps are required to optimize performance. It is necessary to temperature soak the assembly using the following procedure.

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

4.6.6 SuperModule assembly

To reorder an upgrade or replacement SuperModule assembly, use the Rosemount 3051SMV "Ordering information" on page 138 but replace the housing option code with '00'.

1. Remove the housing assembly per "Upgrading or replacing the housing assembly including feature board electronics" on page 100.
2. Remove currently installed SuperModule assembly from process flange per "Flange and drain vent" on page 103.
3. Reassemble replacement or upgraded SuperModule assembly to process flange per "Flange and drain vent" on page 103.
4. Reassemble the housing assembly per "Upgrading or replacing the housing assembly including feature board electronics" on page 100.

Section 5 Troubleshooting

5.1 Overview

This section contains information for troubleshooting the Rosemount™ 3051S MultiVariable™ Transmitter (Rosemount 3051SMV). Diagnostic messages are communicated via the LCD display or a HART® host.

5.2 Device diagnostics

5.2.1 HART host diagnostics

The Rosemount 3051SMV provides numerous diagnostic alerts via a HART host. These alerts can be viewed in Engineering Assistant 6.3 or later, Field Communicator, or AMS Device Manager.

Table 5-1 on page 108 lists the possible diagnostic alerts that may be shown with the Rosemount 3051SMV. The tables also give a brief description of what each alert indicates and the recommended actions.

Table 5-2 on page 111 provides summarized maintenance and troubleshooting suggestions for the most common operating problems. If a malfunction is suspected despite the absence of any diagnostic messages on the Field Communicator or host, follow the procedures described here to verify that transmitter hardware and process connections are in good working order.

5.2.2 LCD display diagnostics

In addition to output, the LCD display shows abbreviated operation, error, and warning messages for troubleshooting. Messages appear according to their priority; normal operating messages appear last. To determine the cause of a message, use a HART host to further interrogate the transmitter.
A description of each LCD display diagnostic message follows.

Error messages

An error indicator message appears on the LCD display to warn of serious problems affecting the operation of the transmitter. The LCD display shows an error message until the error condition is corrected; *ERROR* appears at the bottom of the display.

Warning messages

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

Table 5-1. Diagnostic Message Troubleshooting

LCD display messages	Host diagnostic message	Possible problems	Recommended actions
AP GP LIMIT	Static Pressure Out of Limits	The static pressure is exceeding the sensor limits.	Verify process conditions are within the sensor limits.
BOARD COMM ERROR	Feature Board Communication Error	The feature board electronics are experiencing communication problems. This problem may be temporary and could clear automatically.	Cycle power to the device. If the problem persists, replace the feature board electronics.
CURR SAT	Primary Variable Analog Output Saturated	The primary variable has exceeded the range points defined for the 4–20 mA analog output signal. The analog output is fixed at the high or low saturation point and is not representative of the current process conditions.	Verify the process conditions and modify the analog range values if necessary.
DP LIMIT	Differential Pressure Out of Limits	The Differential Pressure is exceeding the sensor limits.	Verify that the process conditions are within the sensor limits.
FAIL BOARD ERROR	Feature Board Error	The feature board electronics have detected an unrecoverable failure.	Replace the feature board electronics.
FAIL PT ERROR	Process Temperature Sensor Failure	The process temperature sensor has failed or is incorrectly wired.	Check the sensor wiring and fix any shorts or open connections. If the sensor wiring is correct, check the PT sensor and replace if necessary. If the problems persists, replace the feature board electronics.
FAIL SENSOR ERROR	Sensor Module Failure	The SuperModule™ assembly is providing measurements that may no longer be valid.	Verify the sensor module temperature is within the operating limits of the transmitter. Replace SuperModule assembly if necessary.
FLOW CONFIG	Updating Flow Configuration - Flow Values Constant	A flow configuration is currently being downloaded to the transmitter. During the download, the flow output will be fixed at the last calculated value. Once the download is complete the transmitter will resume live calculations.	No action is required. Wait until the flow configuration download is complete before performing other configuration tasks.

Table 5-1. Diagnostic Message Troubleshooting

LCD display messages	Host diagnostic message	Possible problems	Recommended actions
FLOW INCOMP ERROR	Energy Invalid for Flow Configuration	The energy flow variable is not compatible with the current flow configuration but is mapped to the totalizer, a process variable, or a burst variable.	These discrepancies can be fixed with the following actions: Verify configuration for the fluid type supports Energy Flow calculation. Do not specify energy flow for the totalizer, process variables or burst variables unless the transmitter has a compatible flow configuration.
FLOW INCOMP ERROR	Static Pressure Sensor Missing	A static pressure sensor is needed for the current flow configuration.	Download a flow configuration that is compatible with the sensors equipped in the device or replace the module with a model that includes a static pressure sensor.
FLOW INCOMP ERROR	Flow Configuration Download Error	The flow configuration did not successfully download to the transmitter.	Re-download the flow configuration using the Engineering Assistant software.
FLOW LIMIT	Flow Output Out of Limits	The flow output value is exceeding the flow rate operating limits.	Verify the process conditions, and modify the flow configuration parameters and operating ranges as needed.
FLOW LIMIT	Energy Flow Out of Limits	The energy flow value is exceeding the flow rate operating limits.	Verify the process conditions, and modify the flow configuration parameters and operating ranges as needed.
LCD UPDATE ERROR	LCD Update Error	The LCD display is not receiving updates from the feature board electronics.	Examine the LCD display Connector and reset the LCD display. If the problem persists, first replace the LCD display then replace the feature board electronics if necessary.
(LCD is blank)	LCD Update Error	The LCD display is no longer powered.	Examine the LCD display connector and reset the LCD display. If the problem persists, first replace the LCD display then replace the feature board electronics if necessary.
PT LIMIT	Process Temperature Out of Limits	The process temperature sensor is exceeding the user defined sensor limits.	Verify the process conditions and adjust limits if necessary. Check the process temperature sensor and replace if necessary.
RVRSE FLOW	Reverse Flow Detected	The transmitter is measuring a negative differential pressure.	Verify the process conditions and the transmitter installation.

Table 5-1. Diagnostic Message Troubleshooting

LCD display messages	Host diagnostic message	Possible problems	Recommended actions
SNSR COMM ERROR	Module Communication Failure	Communication between the sensor module and the feature board electronics have been lost.	Verify the connection between the sensor module and the feature board electronics. Replace the SuperModule assembly and/or feature board electronics if necessary.
SNSR INCOMP ERROR	Sensor Module Incompatibility	The SuperModule assembly is not compatible with the feature board electronics. The SuperModule assembly is not equipped with a differential pressure sensor or it is an older revision of the sensor module.	Replace the SuperModule assembly with one that is compatible with the Rosemount 3051SMV Plantweb™ Housing.
SNSR MISSING ERROR	Sensor Missing	The sensor mapped to the primary variable is not present.	Remap the primary variable to a sensor that is present.
SNSRT LIMIT	Sensor Temperature Out of Limits	The Sensor Module Temperature is exceeding the sensor limits.	Verify ambient conditions are within the sensor limits.
XMTR Info	Non-Volatile Memory Warning	Transmitter information data is incomplete. Transmitter operation will not be affected.	Replace the feature board electronics at next maintenance shutdown.
XMTR Info Error	Non-Volatile Memory Error	Non-volatile data of the device is corrupted.	Replace the feature board electronics.
(Other message)(1)	Maintenance Required	The transmitter may not be operating properly and requires attention.	Check other warning messages.
(Other message)(1)	mA Output Fixed	The 4–20 mA analog output signal is fixed at a constant value and is not representative of the HART primary variable.	Disable loop current mode.
(Other message)(1)	Primary variable out of limits	The primary variable is outside the range of the transmitter.	View other diagnostic messages to determine which variable is out of limits.
(Other message)(1)	Non-primary variable out of limits	A variable other than the primary variable is outside the range of the transmitter.	View other diagnostic messages to determine which variable is out of limits.
(LCD is reading normally)	Configuration changed	A modification has been made to the device configuration using a host other than AMS Device Manager.	No action is required; message will clear after a change is made using AMS.
(LCD is reading normally)	Cold start	Transmitter was restarted.	No action is required; message will clear automatically.

1. LCD display messages will vary as it is specific to the possible problem.

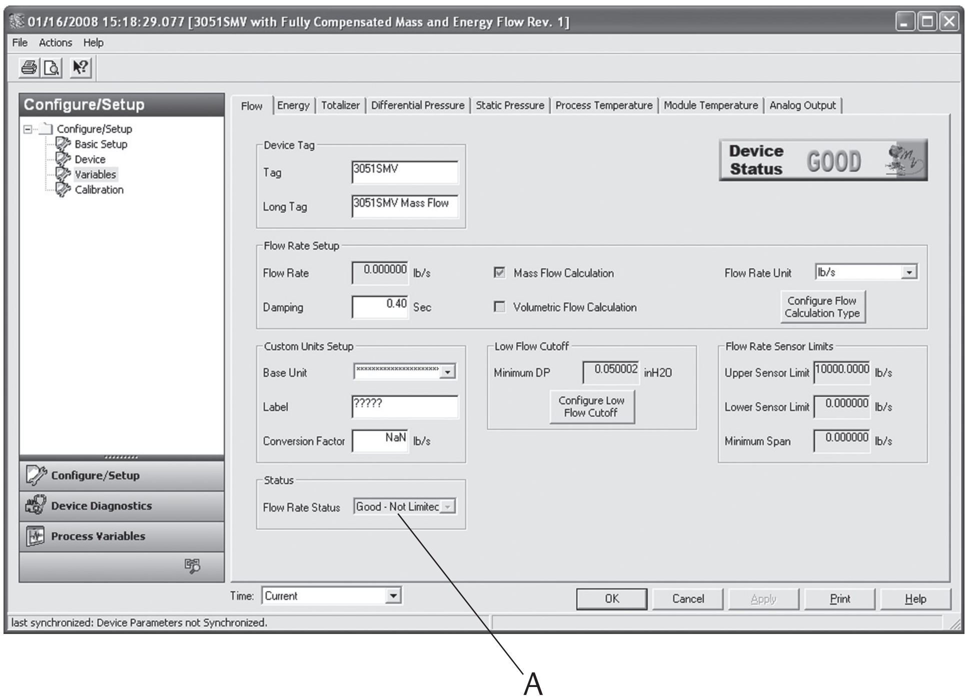
Table 5-2. Transmitter Troubleshooting

Symptom	Corrective actions
Transmitter milliamp output is zero	Verify power is applied to signal terminals. Check power wires for reversed polarity. Verify terminal voltage is 12 to 42.4 Vdc. Check for open diode across test terminal on Rosemount 3051SMV terminal block.
Transmitter not communicating with Field Communicator, AMS Device Manager, or Engineering Assistant	Verify the output is between 4 and 20 mA or saturation levels. Verify clean DC Power to transmitter (Max AC noise 0.2 volts peak to peak). Check loop resistance, 250–1321 Ω. Loop Resistance = (Power supply voltage - transmitter voltage)/loop current Check if unit is at an alternate HART address.
Transmitter milliamp output is low or high	Verify applied process variables. Verify 4 and 20 mA range points and flow configuration. Verify output is not in alarm or saturation condition. An analog output trim or sensor trim may be required.
Transmitter will not respond to changes in measured process variables	Check to ensure that the equalization valve is closed. Check test equipment. Check impulse piping or manifold for blockage. Verify primary variable measurement is between the 4 and 20 mA set points. Verify output is not in alarm or saturation condition. Verify transmitter is not in Loop Test, Multidrop, Test Calculation, or Fixed Variable mode.
Digital Variable output is low or high	Check test equipment (verify accuracy). Check impulse piping for blockage or low fill in wet leg. Verify transmitter sensor trim. Verify measured variables are within transmitter limits.
Digital Variable output is erratic	Check application for faulty equipment in process line. Verify transmitter is not reacting directly to equipment turning on/off. Verify damping is set properly for application.
Milliamp output 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.
Transmitter output is normal, but LCD display is off and diagnostics indicate an LCD display problem	Verify LCD display is installed correctly. Replace LCD display.
Transmitter indicating a flow value and/or DP value during no flow condition	Zero DP sensor Verify DP Low Flow Cutoff setting.

5.3 Measurement quality and limit status

The Rosemount 3051SMV is compliant with the HART Revision 6 Standard. One of the most noticeable enhancements available with the HART 6 standard is that each variable has a measurement quality and limit status. These statuses can be viewed in AMS Device Manager, on a Field Communicator, or with any HART 6 compatible host system. In AMS Device Manager, variable statuses can be viewed by selecting Variables in the upper left menu tree under the *Configure/Setup* heading.

Figure 5-1. Quality and Limit Status



A. Measurement quality and limit status

Each variable status reading consists of two parts separated by a hyphen; Measurement Quality and Limit Status.

Possible measurement quality readings

Good – Displayed during normal device operation.

Poor Accuracy – Indicates the accuracy of the variable measurement has been compromised. Example: The module temperature sensor failed and is no longer compensating the differential pressure and status pressure measurements.

Bad – Indicates the variable has failed. Example: A differential pressure, static pressure, or process temperature sensor failure.

Possible limit status readings

Not Limited – Displayed during normal device operation.

High Limited – Indicates the current variable reading has gone above the transmitter's maximum possible reading and is no longer representative of the actual variable measurement.

Low Limited – Indicates the current variable reading has gone below the transmitter's minimum possible reading and is no longer representative of the actual variable measurement.

Constant – Indicates the variable reading is set to a fixed value. Example: The totalizer has been stopped.

5.4 Engineering Assistant communication troubleshooting

Table 5-3 identifies the most common communication issues between the Engineering Assistant software and the Rosemount 3051SMV.

Table 5-3. Corrective Action for Engineering Assistant Communication Problems

Symptom	Corrective action
No Communication between the Engineering Assistant software and the Rosemount 3051SMV	Loop wiring (HART) • HART protocol communication requires a loop resistance value between 250 to 1321 ohms, inclusive. • Check for adequate voltage to the transmitter. See "Load limitations" on page 131. • Check for intermittent shorts, open circuits, and multiple grounds. • Check for capacitance across the load resistor. Capacitance should be less than 0.1 microfarad.
	Engineering Assistant • Verify correct COM port selected. • Verify laptop computer is not in low energy mode (certain laptops disable all COM ports in low energy mode). • Check if HART modem is properly connected. • Check if HART driver is loaded and installed. If using a HART USB port modem, install drivers from CD-ROM provided with USB modem. • Check if another HART configuration program, such as AMS Device Manager, is currently open. Only one HART configuration program may be opened at a time. • Verify the COM port buffer setting is set to the lowest setting (1) in the advanced COM port settings and re-boot the computer. • Set the *Device Address* to search All.

5.5 Measurement troubleshooting

The transmitter provides a means to display the current process variables and flow calculations. If the process variable reading is unexpected, this section provides the symptoms and possible corrective actions.

Table 5-4. Unexpected Process Variable (PV) Readings

Symptom	Corrective action
High PV Reading	Primary element • Check for restrictions at the primary element. • Check the installation and condition of the primary element. • Note any changes in process fluid properties that may affect output.
	Impulse piping • Check to ensure the pressure connection is correct. • Check for leaks or blockage. • Check to ensure that blocking valves are fully open. • Check for entrapped gas in liquid lines or for liquid in gas lines. • Check to ensure the density of fluid in impulse lines is unchanged. • Check for sediment in the transmitter process flange. • Make sure that process fluid has not frozen within the process flange.
	Power supply • Check the output voltage of the power supply at the transmitter. It should be 12 to 42.4 V dc for HART with no load at the transmitter terminals. **Note** Do not use higher than the specified voltage to check the loop, or damage to the transmitter may result.
	Feature board electronics • Connect a personal computer and use AMS Device Manager, Engineering Assistant Software, or the Field Communicator to check the sensor limits to ensure calibration adjustments are within the sensor range and that calibration is correct for the pressure being applied. • Confirm the electronics housing is properly sealed against moisture. • If the feature board electronics are still not functioning properly, substitute new feature board electronics.
	Flow configuration (fully compensated mass and energy flow feature board only) • Verify flow configuration is correct for current application
	Process temperature RTD input • Verify all wire terminations • Verify sensor is a Pt 100 RTD • Replace Pt 100 sensor
	Sensor module • The sensor module is not field repairable and must be replaced if found to be defective. Check for obvious defects, such as a punctured isolating diaphragm or fill fluid loss, and contact your nearest Emerson™ Service Center.

Table 5-4. Unexpected Process Variable (PV) Readings

Symptom	Corrective action
Erratic PV Reading	Primary element
	• Check the installation and condition of the primary element.
	Loop wiring
	• Check for adequate voltage to the transmitter. It should be 12 to 42.4 Vdc for HART with no load at the transmitter terminals. • Check for intermittent shorts, open circuits, and multiple grounds.
	Process pulsation
	• Adjust the damping.
	Feature board electronics
	• Connect a personal computer and use AMS Device Manager, Engineering Assistant Software, or the Field Communicator to check the sensor limits to ensure calibration adjustments are within the sensor range and that calibration is correct for the pressure being applied. • Confirm the electronics housing is properly sealed against moisture. • If the feature board electronics are still not functioning properly, substitute new feature board electronics.
	Impulse piping
	• Check for entrapped gas in liquid lines or for liquid in gas lines. • Make sure that process fluid has not frozen within the process flange. • Ensure that block valves are fully open and equalize valves are fully and tightly closed.
	Sensor module
	• The sensor module is not field repairable and must be replaced if found to be defective. Check for obvious defects, such as a punctured isolating diaphragm or fill fluid loss, and contact your nearest Emerson Service Center.
Low PV Reading or No PV Reading	Primary element
	• Check the installation and condition of the primary element. Note any changes in process fluid properties that may affect output.
	Loop wiring
	• Check for adequate voltage to the transmitter. It should be 12 to 42.4 Vdc for HART with no load at the transmitter terminals. • Check the milliamp rating of the power supply against the total current being drawn for all transmitters being powered. • Check for shorts and multiple grounds. • Check for proper polarity at the signal terminal. • Check loop impedance. • Check the wire insulation to detect possible shorts to ground.
	Impulse piping • Check to ensure the pressure connection is correct. • Check for leaks or blockage. • Check to ensure blocking valves are fully open and that bypass valves are tightly closed. • Check for entrapped gas in liquid lines or for liquid in gas lines. • Check for sediment in the transmitter process flange. • Make sure process fluid has not frozen within the process flange.

Table 5-4. Unexpected Process Variable (PV) Readings

Symptom	Corrective action
Low PV Reading or No PV Reading	Feature board electronics • Check the sensor limits to ensure calibration adjustments are within the sensor range and that calibration is correct for the pressure being applied. • Confirm the electronics housing is properly sealed against moisture. • If the feature board electronics are still not functioning properly, substitute new feature board electronics.
	Flow configuration (fully compensated mass and energy flow feature board only) • Verify flow configuration is correct for current application.
	Process temperature RTD input • Verify all wire terminations • Verify sensor is a Pt 100 RTD • Replace Pt 100 sensor
	Sensor module • The sensor module is not field repairable and must be replaced if found to be defective. Check for obvious defects, such as a punctured isolating diaphragm or fill fluid loss, and contact your nearest Emerson Service Center.
Sluggish Output Response/Drift	Primary element • Check for restrictions at the primary element.
	Impulse piping • Check for leaks or blockage. • Ensure blocking valves are fully open. • Check for sediment in the transmitter process flange. • Check for entrapped gas in liquid lines and for liquid in gas lines. • Ensure the density of fluid in impulse lines is unchanged. • Make sure process fluid has not frozen within the process flange.
	Feature board electronics • Confirm damping is correctly set. • Confirm the electronics housing is properly sealed against moisture.
	Sensor module • The sensor module is not field repairable and must be replaced if found to be defective. Check for obvious defects, such as a punctured isolating diaphragm or fill fluid loss, and contact your nearest Emerson Process Management Service Center. • Confirm the electronics housing is properly sealed against moisture.

Note

The following performance limitations may inhibit efficient or safe operation. Critical applications should have appropriate diagnostic and backup systems in place.

Pressure transmitters contain an internal fill fluid. It is used to transmit the process pressure through the isolating diaphragms to the pressure sensor module. In rare cases, oil loss paths in oil-filled pressure transmitters can be created. Possible causes include: physical damage to the isolator diaphragms, process fluid freezing, isolator corrosion due to an incompatible process fluid, etc.

A transmitter with oil fill fluid loss may continue to perform normally for a period of time. Sustained oil loss will eventually cause one or more of the operating parameters to exceed published specifications as the operating point output continues to drift. Symptoms of advanced oil loss and other unrelated problems include:

- Sustained drift rate in true zero and span or operating point output or both
- Sluggish response to increasing or decreasing pressure or both
- Limited output rate or very nonlinear output or both
- Change in output process noise
- Noticeable drift in operating point output
- Abrupt increase in drift rate of true zero or span or both
- Unstable output
- Output saturated high or low

5.6 Service support

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

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

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

CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

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

Section 6 Safety Instrumented Systems Requirements

6.1 Safety Instrumented Systems (SIS) Certification

The safety-critical output of the Rosemount 3051SMV is provided through a two-wire, 4–20 mA signal representing pressure. The Rosemount 3051SMV safety certified pressure transmitter is certified to: Low Demand; Type B.
SIL 2 for random integrity @ HFT=0
SIL 3 for random integrity @ HFT=1
SIL 3 for systematic integrity

The Rosemount 3051SMV must be installed per manufacturer's instructions, specifications and the materials must be compatible with process conditions.

The HART® Protocol is only used for setup, calibration, and diagnostic purposes and is not for safety critical operation.

6.2 Rosemount 3051SMV safety certified identification

All Rosemount 3051SMV Transmitters must be identified as safety certified before installing into SIS systems.

To identify a safety certified Rosemount 3051SMV:

1. Verify the model string contains Rosemount 3051SMV and QT.
   – If the transmitter was ordered as part of a flowmeter, verify the model string reads Rosemount 3051SFx(1–7) and QT.
2. Verify software revision is 3.

6.3 Installation in SIS applications

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

Environmental and operational limits are available in Appendix A: Specifications and Reference Data

The loop should be designed so the terminal voltage does not drop below 12.0 Vdc when the transmitter output is set to 23 mA.

Position the security switch to the ( ) position to prevent accidental or deliberate change of configuration data during normal operation.

6.4 Configuring in SIS applications

Use any HART capable configuration tool to communicate with and verify configuration of the Rosemount 3051SMV.

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

6.4.1 Damping

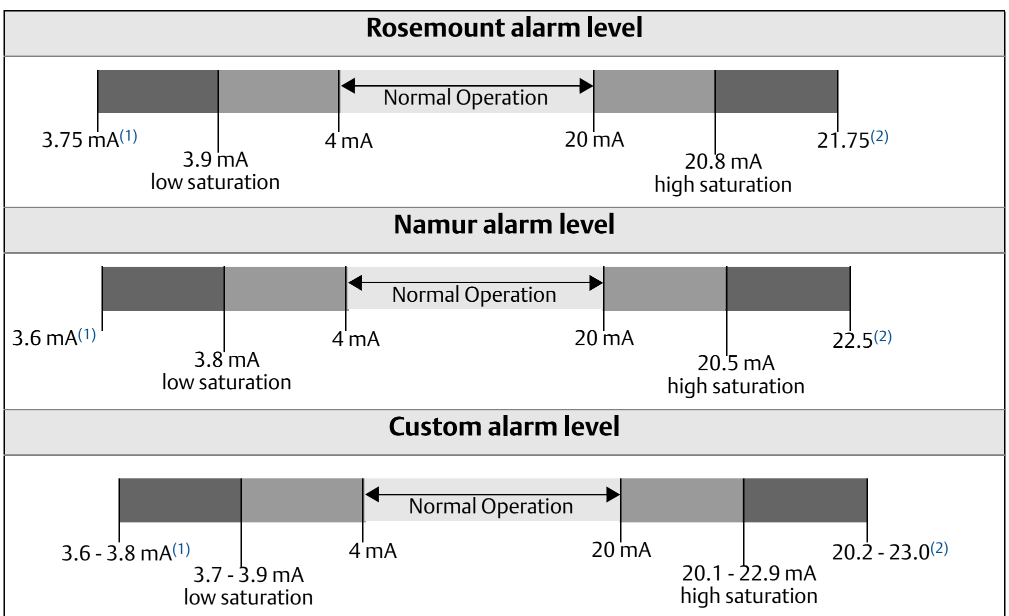
User-selected damping will affect the transmitters ability to respond to changes in the applied process. The *damping value + response time* must not exceed the loop requirements.

Reference "Damping" on page 132 to change damping value.

6.4.2 Alarm and saturation levels

DCS or safety logic solver should be configured to match transmitter configuration. Figure 6-1 identifies the three alarm levels available and their operation values.

Figure 6-1. Alarm Levels



1. Transmitter Failure, hardware or software alarm in LO position.
2. Transmitter Failure, hardware or software alarm in HI position.

6.5 Rosemount 3051SMV SIS operation and maintenance

6.5.1 Proof test

The following proof tests are recommended.
All proof test procedures must be carried out by qualified personnel.

Use “Field Communicator Fast Keys” on page 62 to perform a loop test, analog output trim, or sensor trim. security switch should be in the ( ) position during proof test execution and repositioned in the ( ) position after execution.

6.5.2 Partial proof test

The partial suggested proof test consists of a power cycle plus reasonability checks of the transmitter output. This test will detect ~48% of possible DU failures in the device.

FMEDA report can be found at Emerson.com/Automation-Solutions/Pressure/Rosemount-3051SMV and look at the certificates and approvals documentation.

Required tools: Field Communicator and mA meter.

1. Bypass the safety function and take appropriate action to avoid a false trip.
2. Use HART communications to retrieve any diagnostics and take appropriate action.
3. Send a HART command to the transmitter to go to the high alarm current output and verify that the analog current reaches that value.[1] See “Alarm level verification” on page 30.
4. Send a HART command to the transmitter to go to the low alarm current output and verify that the analog current reaches that value.[2]
5. Perform a “reasonability check” on the pressure sensor reading and the sensor temperature reading and if applicable the process temperature reading.[3]
6. Remove the bypass and otherwise restore the normal operation.
7. Place the Security switch in the ( ) position.

6.5.3 Comprehensive proof test

The comprehensive proof test consists of performing the same steps as the simple suggested proof test but with a two point calibration of the pressure and temperature sensors in place of the reasonability check of the sensors. This test will detect ~90% of possible DU failures in the device.

Required tools: Field Communicator and pressure calibration equipment.

1. Bypass the safety function and take appropriate action to avoid a false trip.
2. Use HART communications to retrieve any diagnostics and take appropriate action.
3. Send a HART command to the transmitter to go to the high alarm current output and verify that the analog current reaches that value.[1] See “Alarm level verification” on page 30.
4. Send a HART command to the transmitter to go to the low alarm current output and verify that the analog current reaches that value.[2]

1. This tests for compliance voltage problems such as a low loop power supply voltage or increased wiring resistance. This also tests for other possible failures.
2. This tests for possible quiescent current related failures.
3. This tests for faults in the input multiplexer and A to D converter.

5. Perform a two-point verification[1] of the transmitter pressure over the full working range (and process temperature where applicable).
6. Remove the bypass and otherwise restore the normal operation.
7. Place the Security switch in the (🔒) position.

Note

- The user determines the proof test requirements for impulse piping.
- Automatic diagnostics are defined for the corrected % DU: The tests performed internally by the device during runtime without requiring enabling or programming by the user.

6.6 Inspection

6.6.1 Visual inspection

Not required

6.6.2 Special tools

Not required

6.6.3 Product repair

The Rosemount 3051SMV is repairable with limited replacement options.

All failures detected by the transmitter diagnostics or by the proof-test must be reported. Feedback can be submitted electronically at Emerson.com/Rosemount/Report-A-Failure

All product repair and part replacement should be performed by qualified personnel.

6.6.4 Rosemount 3051SMV SIS reference

The Rosemount 3051SMV must be operated in accordance to the functional and performance specifications provided in "Specifications and Reference Data" on page 125.

6.6.5 Failure rate data

The FMEDA report includes failure rates and the assumptions for how these failure rates were derived.

The report is available under *Certificates and Approvals* at

Emerson.com/Automation-Solutions/Pressure/Rosemount-3051SMV

6.6.6 Failure values

Safety Deviation (defines what is dangerous in a FMEDA): ±2.0% of analog output span
Transmitter response time: provided in "Dynamic performance ambient temperature effect" on page 127.
Self-diagnostics Test Interval: At least once every 60 minutes

1. *If the two-point process temperature verification is performed with electrical instrumentation, this proof test will not detect any failures of the sensor.*

6.6.7 Product life

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

Appendix A Specifications and Reference Data

A.1 Specifications

A.1.1 Performance specifications

For zero-based spans, reference conditions, silicone oil fill, glass-filled PTFE O-rings, Stainless steel (SST) materials, or coplanar flange digital trim values set to equal range points.

Conformance to specification (±3σ [Sigma])

Technology leadership, advanced manufacturing techniques, and statistical process control ensure measurement specification conformance to ±3σ or better.

Reference accuracy(1)

Rosemount models	Classic MV	Ultra for Flow
3051SMV_ _1: Differential pressure, static pressure, and temperature 3051SMV_ _2: Differential pressure and static pressure		
DP Ranges 2–3	±0.04% of span; For spans less than 10:1, $\pm\left(0.01 + 0.004\left[\frac{URL}{span}\right]\right)$ % of span	±0.04% of reading up to 8:1 DP turndown from URL; ±(0.04 + 0.0023[URL/RDG(2)])% reading to 200:1 DP turndown from URL(3)
DP Range 1	±0.10% of span; For spans less than 15:1, $\pm\left(0.025 + 0.005\left[\frac{URL}{span}\right]\right)$ % of span	N/A
AP and GP Ranges 3–4	±0.055% of span; For spans less than 10:1, $\pm\left(0.0065\left[\frac{URL}{span}\right]\right)$ % of span	±0.025% of span; For spans less than 10:1, $\pm\left(0.004\left[\frac{URL}{span}\right]\right)$ % of span
Process Temp. RTD Interface(4)	±0.67 °F (0.37 °C)	±0.67 °F (0.37 °C)

Rosemount models	Ultra	Classic	Ultra for Flow
3051SMV_ _3: Differential pressure and temperature **3051SMV_ _4: Differential pressure**			
Ranges 2–4	±0.025% of span; For spans less than 10:1, $\pm\left(0.005 + 0.0035\left[\frac{URL}{span}\right]\right)$% of span	±0.055% of span; For spans less than 10:1, $\pm\left(0.015 + 0.005\left[\frac{URL}{span}\right]\right)$% of span	±0.04% of reading up to 8:1 DP turndown from URL; ±(0.04 + 0.0023[URL/RDG[2]])% reading to 200:1 DP turndown from URL[3]
Range 5	±0.05% of span; For spans less than 10:1, $\pm\left(0.005 + 0.0045\left[\frac{URL}{span}\right]\right)$% of span	±0.065% of span; For spans less than 10:1, $\pm\left(0.015 + 0.005\left[\frac{URL}{span}\right]\right)$% of span	N/A
Range 1	±0.09% of span; For spans less than 15:1, $\pm\left(0.015 + 0.005\left[\frac{URL}{span}\right]\right)$% of span	±0.10% of span; For spans less than 15:1, $\pm\left[0.025 + 0.005\left(\frac{URL}{span}\right)\right]$% of span	N/A
Range 0	±0.09% of span; For spans less than 2:1, ±0.045% of URL	±0.10% of span; For spans less than 2:1, ±0.05% of URL	N/A
Process Temp. RTD Interface[4]	±0.67 °F (0.37 °C)	±0.67 °F (0.37 °C)	±0.67 °F (0.37 °C)

1. Stated reference accuracy equations include terminal based linearity, hysteresis, and repeatability, but does not include analog only reference accuracy of ±0.005% of span.
2. RDG refers to transmitter DP reading.
3. Ultra for Flow is only available for Rosemount™ 3051SMV DP Ranges 2–3. For calibrated spans from 1:1 to 2:1 of URL, add ±0.005% of span analog output error.
4. Specifications for process temperature are for the transmitter portion only. The transmitter is compatible with any Pt 100 (100 ohm platinum) RTD. Examples of compatible RTDs include Rosemount Series 68 and 78 RTD Temperature Sensors.

Total performance[1]

Models		Ultra[1]	Classic and Classic MV	Ultra for Flow[2]
Rosemount 3051SMV	DP Ranges 2–3	±0.1% of span; for ±50 °F (28 °C) temperature changes; 0-100% relative humidity, up to 740 psi (51 bar) line pressure (DP only), from 1:1 to 5:1 rangedown	±0.15% of span; for ±50 °F (28 °C) temperature changes; 0-100% relative humidity, up to 740 psi (51 bar) line pressure (DP only), from 1:1 to 5:1 rangedown	±0.1% of reading; for ±50 °F (28 °C) temperature changes; 0-100% relative humidity, up to 740 psi (51 bar) line pressure, over 8:1 DP turndown from URL

1. Total performance is based on combined errors of reference accuracy, ambient temperature effect, and line pressure effect. Specifications apply only to differential pressure measurement.
2. Ultra for Flow is only available for Rosemount 3051SMV DP Ranges 2–3.

Multivariable flow performance[1]

Mass, energy, actual volumetric, and totalized flow reference accuracy[2]

Models[1][2]		Ultra for Flow	Classic MV
Rosemount 3051SMV	DP Ranges 2–3	±0.65% of flow rate over a 14:1 flow range (200:1 DP range)	±0.70% of flow rate over 8:1 flow range (64:1 DP range)
	DP Range 1	N/A	±0.90% of flow rate over 8:1 flow range (64:1 DP range)

1. Applies to the 3051SMV_M Multivariable™ type only. Flow performance specifications assume device is configured for full compensation of static pressure, process temperature, density, viscosity, gas expansion, discharge coefficient, and thermal correction variances over a specified operating range.
2. Uncalibrated differential producer (0.2 < beta < 0.6 Orifice) installed per ASME MFC 3M or ISO 5167-1. Uncertainties for discharge coefficient, producer bore, tube diameter, and gas expansion factor as defined in ASME MFC 3M or ISO 5167-1. Reference accuracy does not include RTD sensor accuracy.

Long term stability

Models		Ultra and Ultra for Flow[1]	Classic and Classic MV
Rosemount 3051SMV	DP Ranges 2–5 AP and GP Ranges 3–4	±0.15% of URL for 15 years; for ±50 °F (28 °C) temperature changes, up to 1000 psi (68,9 bar) line pressure	±0.20% of URL for 15 years; for ±50 °F (28 °C) temperature changes, up to 1000 psi (68,9 bar) line pressure
Process Temperature RTD Interface[2]		The greater of ±0.185 °F (0.103 °C) or 0.1% of reading per year (excludes RTD sensor stability).	

1. Ultra is only available for Rosemount 3051SMV_ _3, 4. Ultra for Flow is only available for Rosemount 3051SMV DP Ranges 2-3.
2. Specifications for process temperature are for the transmitter portion only. The transmitter is compatible with any Pt 100 (100 ohm platinum) RTD. Examples of compatible RTDs include Rosemount Series 68 and 78 RTD Temperature Sensors.

Warranty[1]

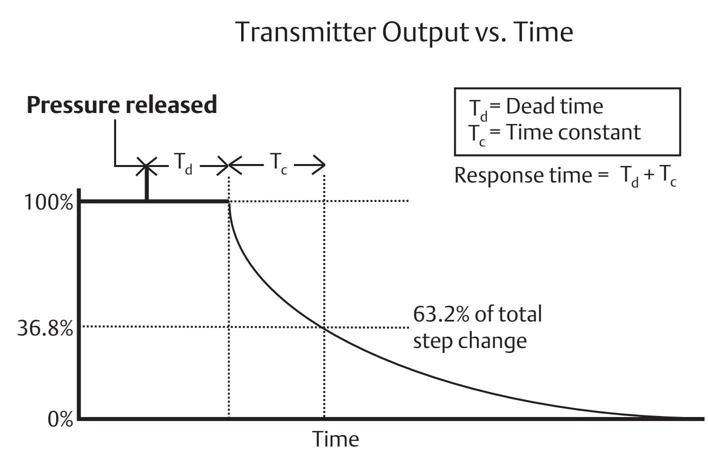
Models	Ultra and Ultra for Flow	Classic and Classic MV
Rosemount 3051S Scalable Products	12-year limited warranty[2]	1-year limited warranty[3]

1. Warranty details can be found in Emerson™ Terms & Conditions of Sale, Document 63445, Rev G (10/06).
2. Rosemount Ultra and Ultra for Flow transmitters have a limited warranty of twelve (12) years from date of shipment. All other provisions of Emerson standard limited warranty remain the same.
3. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by seller, whichever period expires first.

Dynamic performance ambient temperature effect

	4–20 mA (HART®)[1]
Total response time ($T_d + T_c$)[2]	
3051SMV_ _1: DP, SP, & T 3051SMV_ _2: DP & SP:	
DP Range 1: DP Range 2: DP Range 3: AP and GP:	310 milliseconds 170 milliseconds 155 milliseconds 240 milliseconds
3051SMV_ _3: DP & T 3051SMV_ _4: DP:	
DP Ranges 2–5: DP Range 1: DP Range 0:	145 milliseconds 300 milliseconds 745 milliseconds
Dead time (T_d)	
DP: AP and GP: Process Temp. RTD Interface:	100 milliseconds 140 milliseconds 1 second
Update rate	
Measured Variables:	
DP: AP and GP: Process Temp. RTD Interface:	22 updates per second 11 updates per second 1 update per second
Calculated Variables:	
Mass or Volumetric Flow Rate: Energy Flow Rate: Totalized Flow:	22 updates per second 22 updates per second 1 update per second

Typical transmitter response time



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.

Ambient temperature effect

Rosemount models	Ultra per 50 °F (28 °C)	Classic or Classic MV per 50 °F (28 °C)	Ultra for Flow[1] –40 to 185 °F (–40 to 85 °C)
3051SMV_ _1: Differential pressure, static pressure, and temperature **3051SMV_ _2: Differential pressure and static pressure**			
DP Ranges 2–3	N/A	± (0.0125% URL + 0.0625% span) from 1:1 to 5:1; ± (0.025% URL + 0.125% span) for > 5:1	±0.13% reading up to 8:1 DP turndown from URL; ±(0.13 + 0.0187 [URL/RDG[3]])% reading to 100:1 DP turndown from URL
DP Range 1	N/A	± (0.1% URL + 0.25% Span) from 1:1 to 50:1	N/A
AP and GP	N/A	± (0.0125% URL + 0.0625% span) from 1:1 to 10:1; ± (0.025% URL + 0.125% span) for >10:1	± (0.009% URL + 0.025% span) from 1:1 to 10:1; ± (0.018% URL + 0.08% span) for > 10:1
3051SMV_ _3: Differential pressure and temperature **3051SMV_ _4: Differential pressure**			
Range 2–5[2]	± (0.009% URL + 0.025% span) from 1:1 to 10:1; ± (0.018% URL + 0.08% span) from >10:1 to 200:1	± (0.0125% URL + 0.0625% span) from 1:1 to 5:1; ± (0.025% URL + 0.125% span) from >5:1 to 100:1	±0.13% reading up to 8:1 DP turndown from URL; ±(0.13 + 0.0187 [URL/RDG[3]])% reading to 100:1 DP turndown from URL
Range 0	± (0.25% URL + 0.05% span) from 1:1 to 30:1	± (0.25% URL + 0.05% span) from 1:1 to 30:1	N/A
Range 1	± (0.1% URL + 0.25% span) from 1:1 to 50:1	± (0.1% URL + 0.25% span) from 1:1 to 50:1	N/A
Process Temp. RTD Interface[4]	N/A	±0.39 °F (0,216 °C) per 50 °F (28 °C)	±0.39 °F (0,216 °C) per 50 °F (28 °C)

1. Ultra for Flow is only available for Rosemount 3051SMV DP Ranges 2–3.
2. Use classic specification for Rosemount 3051SMV DP Range 5 Ultra.
3. RDG refers to transmitter reading.
4. Specifications for process temperature are for the transmitter portion only. The transmitter is compatible with any Pt 100 (100 ohm platinum) RTD. Examples of compatible RTDs include Rosemount Series 68 and 78 RTD Temperature Sensors.

Line Pressure effect[1]

Models[1]	Ultra and Ultra for Flow	Classic and Classic MV
Rosemount 3051SMV: Differential pressure measurement only		
Zero error[2]		
Range 2–3 Range 0 Range 1	± 0.025% URL per 1000 psi (69 bar) ± 0.125% URL per 100 psi (6,89 bar) ± 0.25% URL per 1000 psi (69 bar)	± 0.05% URL per 1000 psi (69 bar) ± 0.125% URL per 100 psi (6,89 bar) ± 0.25% URL per 1000 psi (69 bar)
Span error[3]		
Range 2–3 Range 0 Range 1	± 0.1% of reading per 1000 psi (69 bar) ± 0.15% of reading per 100 psi (6,89 bar) ± 0.4% of reading per 1000 psi (69 bar)	± 0.1% of reading per 1000 psi (69 bar) ± 0.15% of reading per 100 psi (6,89 bar) ± 0.4% of reading per 1000 psi (69 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 the Rosemount 3051SMV Reference Manual.
2. Zero error can be zeroed.
3. Specifications for option code P0 are two times those shown above.

Mounting position effects

Rosemount models		Ultra, Ultra for Flow, Classic, and Classic MV
3051SMV_ _ 1, 2	DP: AP/GP:	Zero shifts up to ±1.25 inH_2O (3,11 mbar), which can be zeroed; no span effect Zero shifts to ±2.5 inH_2O (6,22 mbar), which can be zeroed; no span effect
3051SMV_ _ 3, 4		Zero shifts up to ±1.25 inH_2O (3,11 mbar), which can be zeroed; no span effect

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 0.21mm displacement peak amplitude/60–2000 Hz 3g).

For housing style codes 1J, 1K, and 1L:
Less than ±0.1% of URL when tested per the requirements of IEC60770-1 field with general application or pipeline with low vibration level (10–60 Hz 0.15mm displacement peak amplitude/
60–500 Hz 2g).

Power supply effect

Less than ±0.005% of calibrated span per volt change in voltage at the transmitter terminals

Electro Magnetic Compatibility (EMC)[1]

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

1. *Requires shielded cable for both temperature and loop wiring.*

Transient protection (Option T1)

Meets IEEE C62.41.2-2002, location category B

6 kV crest (0.5 µs - 100 kHz)
3 kA crest (8 × 20 microseconds)
6 kV crest (1.2 × 50 microseconds)

Meets IEEE C37.90.1-2002 surge withstand capability

SWC 2.5 kV crest, 1.0 MHz wave form

A.1.2 Functional specifications

Range and sensor limits

Table A-1. Rosemount 3051SMV Differential Pressure Range and Sensor Limits

Range	Minimum span		Range limits	
	Ultra and Ultra for Flow	Classic and classic MV	Upper (URL)	Lower (LRL)[1]
0	0.1 inH_2O (0,25 mbar)	0.1 inH_2O (0,25 mbar)	3.0 inH_2O (7,5 mbar)	–3.0 inH_2O (–7,5 mbar)
1	0.5 inH_2O (1,24 mbar)	0.5 inH_2O (1,24 mbar)	25.0 inH_2O (62,3 mbar)	–25.0 inH_2O (–62,3 mbar)
2	1.3 inH_2O (3,11 mbar)	2.5 inH_2O (6,23 mbar)	250.0 inH_2O (0,62 bar)	–250.0 inH_2O (–0,62 bar)
3	5.0 inH_2O (12,4 mbar)	10.0 inH_2O (24,9 mbar)	1000.0 inH_2O (2,49 bar)	–1000.0 inH_2O (–2,49 bar)
4	1.5 psi (103,4 mbar)	3.0 psi (206,8 mbar)	300.0 psi (20,7 bar)[2]	–300.0 psi (–20,7 bar)[2]
5	10.0 psi (689,5 mbar)	20.0 psi (1,38 bar)	2000.0 psi (137,9 bar)	– 2000.0 psi (–137,9 bar)

1. Lower (LRL) is 0 inH_2O (0 mbar) for Ultra for Flow.
2. For measurement type 1 and 2, URL = 150.0 psi (10,34 bar) and LRL = –150.0 psi (10,34 bar).

Table A-2. Rosemount 3051SMV Static Pressure Range and Sensor Limits

Range	Minimum span		Range limits		
	Ultra for Flow	Classic MV	Upper (URL)	Lower (LRL) (Absolute)	Lower (LRL)(Gage)[1][2]
3	4.0 psi (276 mbar)	8.0 psi (552 mbar)	800 psi (55,16 bar)	0.5 psia (34,5 mbar)	–14.2 psig (–0,98 bar)
4	18.13 psi (1,25 bar)	36.26 psi (2,50 bar)	3626 psi (250.0 bar)[3]	0.5 psia (34,5 mbar)	–14.2 psig (–0,98 bar)

1. Assumes atmospheric pressure of 14.7 psig (1 bar).
2. Inert fill: Minimum pressure = 1.5 psia (0,10 bar) or -13.2 psig (-0,91 bar).
3. For SP Range 4 and DP Range 1, the URL is 2000 psi (137,9 bar).

Table A-3. Process Temperature RTD Interface Range Limits[1]

Minimum Span	Upper (URL)	Lower (LRL)
50 °F (28 °C)	1562 °F (850 °C)	–328 °F (–200 °C)

1. Designed to accommodate a Pt 100 RTD sensor. Examples of compatible RTDs include Rosemount Series 68 and 78 RTD Temperature Sensors.

Service

Rosemount 3051SMV_P (direct process variable output)

Liquid, gas, and vapor applications

Rosemount 3051SMV_M (mass and energy flow output)

Some fluid types are only supported by certain measurement types

Fluid compatibility with pressure and temperature compensation

• Available — Not available

Ordering code	Measurement type	Fluid types			
		Liquids	Saturated steam	Superheated steam	Gas and natural gas
1	DP/P/T (full compensation)	•	•	•	•
2	DP/P	•	•	•	•
3	DP/T	•	•	—	—
4	DP only	•	•	—	—

4–20 mA/HART

Zero and span adjustment

Zero and span values can be set anywhere within the range.
Span must be greater than or equal to the minimum span.

Output

Two-wire 4–20 mA is 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

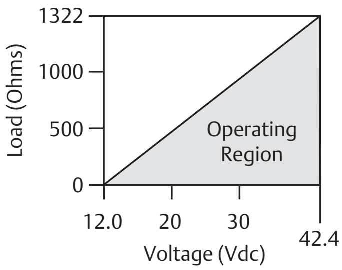
External power supply required.
Rosemount 3051SMV: 12 to 42.4 Vdc with no load

Load limitations

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

Rosemount 3051SMV Transmitter

Maximum loop resistance = 43.5 × (Power supply voltage – 12.0)



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

Overpressure limits

Transmitters withstand the following limits without damage:

Rosemount 3051SMV_ _1: Differential and Static Pressure, temperature

Rosemount 3051SMV_ _2: Differential Pressure and Static Pressure

Static Pressure	Differential Pressure		
	Range 1	Range 2	Range 3
Range 3 GP/AP	1600 psi (110,3 bar)	1600 psi (110,3 bar)	1600 psi (110,3 bar)
Range 4 GP/AP	2000 psi (137,9 bar)	3626 psi (250 bar)	3626 psi (250 bar)

Rosemount 3051SMV_ _3: Differential Pressure and temperature

Rosemount 3051SMV_ _4: Differential Pressure

Range 0	750 psi (51,7 bar)
Range 1	2000 psig (137,9 bar)
Ranges 2–5	3626 psig (250,0 bar)
Option code P9	4500 psig (310,3 bar)
Option code P0 (classic only)	6092 psig (420 bar)

Static pressure limit

Rosemount 3051SMV_ _1: Differential and Static Pressure, temperature

Rosemount 3051SMV_ _2: Differential Pressure and Static Pressure

Operates within 0.5 psia (0,03 bar) and the values in the table below:

Static Pressure	Differential Pressure		
	Range 1	Range 2	Range 3
Range 3 GP/AP	800 psi (57,91 bar)	800 psi (57,91 bar)	800 psi (57,91 bar)
Range 4 GP/AP	2000 psi (137,9 bar)	3626 psi (250 bar)	3626 psi (250 bar)

Rosemount 3051SMV_ _3: Differential Pressure and temperature

Rosemount 3051SMV_ _4: Differential Pressure

Operates within specifications between static line pressures of 0.5 psia and 3626 psig;

Option code P9	4500 psig (310,3 bar)
Option code P0 (classic only)	6092 psig (420 bar)
Range 0	0.5 psia to 750 psig (0,03 to 51,71 bar)
Range 1	0.5 psia to 2000 psig (0,03 to 137,9 bar)

Burst pressure limits

Rosemount 3051SMV with coplanar or traditional process flange

10000 psig (689,5 bar)

Temperature limits

Ambient

- –40 to 185 °F (–40 to 85 °C)
- with LCD display [1]: –40 to 175 °F (–40 to 80 °C)
- with option code P0: –20 to 185 °F (–29 to 85 °C)

Storage

- –50 to 185 °F (–46 to 85 °C)
- with LCD display: –40 to 185 °F (–40 to 85 °C)
- with wireless output: –40 to 185 °F (–40 to 85 °C)

Process temperature limits

At atmospheric pressures and above:

Silicone fill sensor[2][3]	
with coplanar flange	–40 to 250 °F (–40 to 121 °C)[4]
with traditional flange	–40 to 300 °F (–40 to 149 °C)[4][5]
with level flange	–40 to 300 °F (–40 to 149 °C)[4]
with Rosemount 305 Integral Manifold	–40 to 300 °F (–40 to 149 °C)[4][5]
Inert fill sensor[2][6]	–40 to 185 °F (–40 to 85 °C)[7]

1. CD display may not be readable and LCD display updates will be slower at temperatures below –4 °F (–20 °C).
2. Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio. For example, for process temperature of 195 °F (91 °C), new ambient temperature limit is equal to 170 °F (77 °C). This can be determined as follows:
(195 °F –185 °F) × 1.5 = 15 °F,
185 °F–15 °F = 170 °F
3. 212 °F (100 °C) is the upper process temperature limit for DP Range 0.
4. 220 °F (104 °C) limit in vacuum service; 130 °F (54 °C) for pressures below 0.5 psia.
5. –20 °F (–29 °C) is the lower process temperature limit with option code P0.
6. 32 °F (0 °C) is the lower process temperature limit for DP Range 0.
7. For Rosemount 3051SMV_ _ 1, 2, 140 ° F (60 °C) limit in vacuum service.

Humidity limits

0–100 percent relative humidity

Turn-on time

Performance within specifications less than five seconds for Rosemount 3051SMV (typical) after power is applied to the transmitter.

Volumetric displacement

Less than 0.005 in^3 (0,08 cm^3)

Damping

Analog output response to a step change is user-selectable from 0 to 60 seconds for one time constant. Each variable can be individually adjusted. This software damping is in addition to sensor module response time.

Failure mode alarm

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven offscale to alert the user. Rosemount standard (default), NAMUR, and custom alarm levels are available (see Table A-4).

High or low alarm signal is software-selectable or hardware-selectable via the optional switch (option D1).

Table A-4. Alarm Configuration

	High alarm	Low alarm
Default	≥ 21.75 mA	≤ 3.75 mA
NAMUR compliant[1]	≥ 22.5 mA	≤ 3.6 mA
Custom levels[2]	20.2–23.0 mA	3.6–3.8 mA

1. Analog output levels are compliant with NAMUR recommendation NE 43, see option codes C4 or C5.
2. Low alarm must be 0.1 mA less than low saturation and high alarm must be 0.1 mA greater than high saturation.

A.1.3 Physical specifications

Electrical connections

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

Process connections

- 1/4–18 NPT on 21/8-in. centers
- 1/2–14 NPT and RC 1/2 on 2-in.(50.8 mm), 21/8-in. (54.0 mm), or 21/4-in. (57.2 mm) centers (process adapters)

Process-wetted parts

Process isolating diaphragms

- 316L SST (UNS S31603)
- Alloy C-276 (UNS N10276)
- Alloy 400 (UNS N04400)
- Tantalum (UNS R05440)
- Gold-plated Alloy 400
- Gold-plated 316L SST

Drain/vent valves

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

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
(Graphite-filled PTFE with isolating diaphragm code 6)

Non-wetted parts

Electronics housing

- Low-copper aluminum alloy or SST: CF-3M (Cast 316L SST) or CF-8M (Cast 316 SST)
- NEMA® 4X, IP 66, IP 68 (66 ft. [20 m] for 168 hours)

Coplanar sensor module housing

SST: CF-3M (Cast 316L SST)

Bolts

- Plated carbon steel per ASTM A449, Type 1
- Austenitic 316 SST per ASTM F593
- ASTM A453, Class D, Grade 660 SST
- ASTM A193, Grade B7M alloy steel
- ASTM A193, Class 2, Grade B8M SST
- Alloy K-500

Sensor module fill fluid

Silicone or inert halocarbon

Paint

Polyurethane

Cover O-rings

Buna-N

Shipping weights for Rosemount 3051S MultiVariable Transmitter (3051SMV)

Rosemount 3051SMV with Plantweb™ housing: 6.7 lb (3,1 kg)

Table A-5. Transmitter Option Weights

Option code	Option	Add lb (kg)
1J, 1K, 1L	SST Plantweb housing	3.5 (1,6)
1A, 1B, 1C	Aluminum Plantweb housing	1.1 (0,5)
M5(1)	LCD display for Aluminum Plantweb housing	0.8 (0,4)
	LCD display for SST Plantweb housing	1.6 (0,7)
B4	SST mounting bracket for coplanar flange	1.2 (0,5)
B1, B2, B3	Mounting bracket for traditional flange	1.7 (0,8)
B7, B8, B9	Mounting bracket for traditional flange with SST bolts	1.7 (0,8)
BA, BC	SST bracket for traditional flange	1.6 (0,7)
B4	SST mounting bracket for In-Line	1.3 (0,6)
F12, F22(2)	SST traditional flange with SST drain vents	3.2 (1,5)
F13, F23(2)	Cast C-276 traditional flange with alloy C-276 drain vents	3.6 (1,6)
E12, E22(2)	SST coplanar flange with SST drain vents	1.9 (0,9)
F14, F24(2)	Cast alloy 400 traditional flange with alloy 400/K-500 drain vents	3.6 (1,6)
F15, F25(2)	SST traditional flange with alloy C-276 drain vents	3.2 (1,5)
G21	Level flange—3-in., 150	12.6 (5,7)
G22	Level flange—3-in., 300	15.9 (7,2)
G11	Level flange—2-in., 150	6.8 (3,1)
G12	Level flange—2-in., 300	8.2 (3,7)
G31	DIN Level flange, SST, DN 50, PN 40	7.8 (3,5)
G41	DIN Level flange, SST, DN 80, PN 40	13.0 (5,9)

1. Includes LCD display and display cover.
2. Includes mounting bolts.

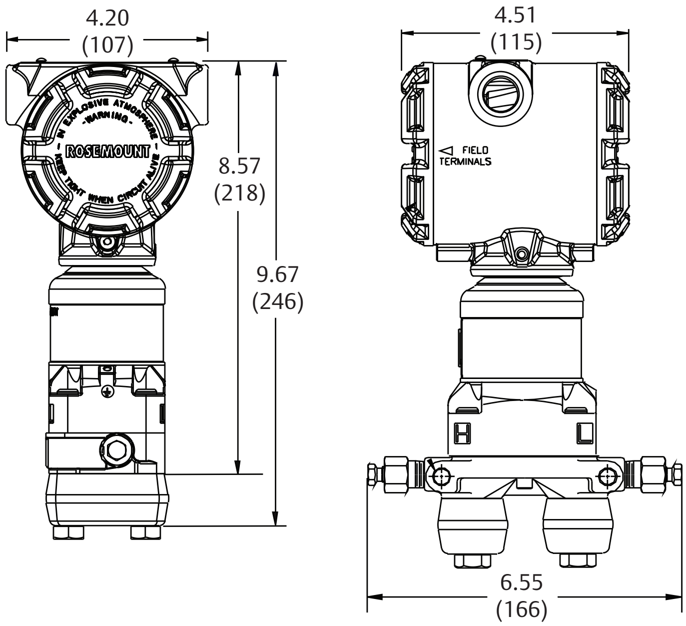
Item	Weight in lb (kg)
Aluminum standard cover	0.4 (0,2)
SST standard cover	1.3 (0,6)
Aluminum display cover	0.7 (0,3)
SST display cover	1.5 (0,7)
LCD display[1]	0.1 (0,04)
Plantweb terminal block	0.2 (0,1)

1. Display only.

A.2 Dimensional drawings

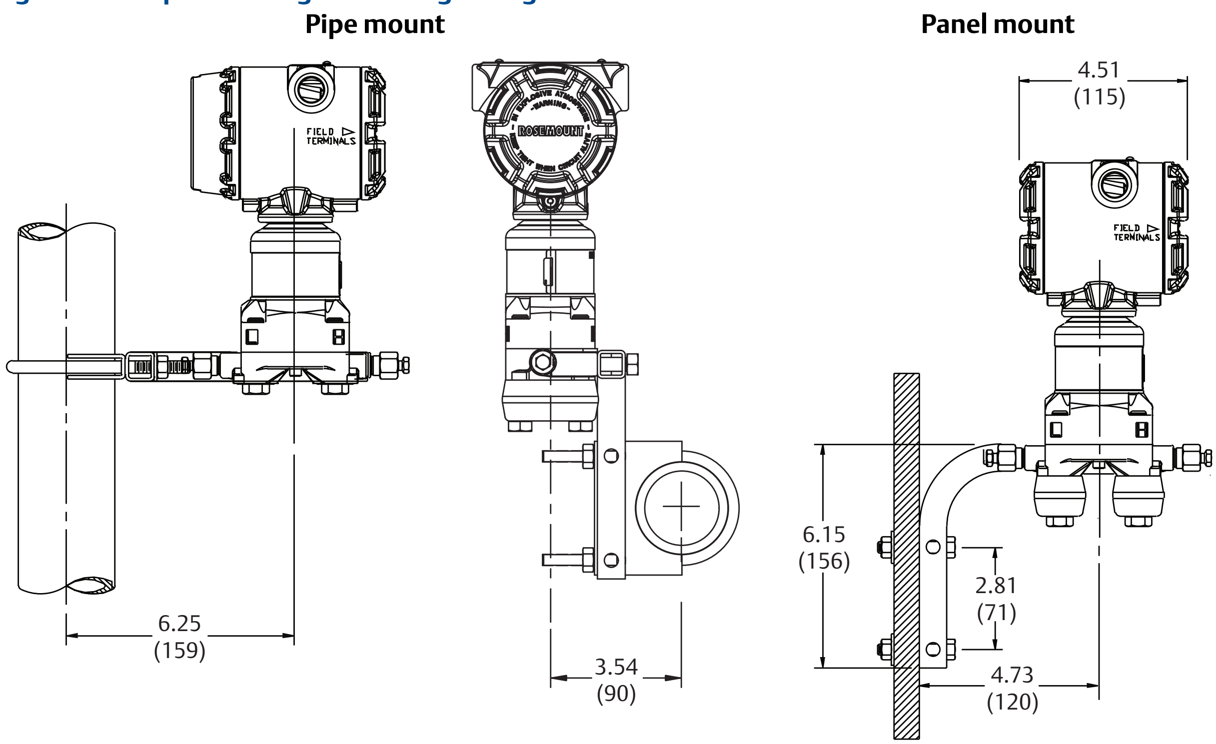
Process adapters (option D2) and Rosemount 305 integral manifolds must be ordered with the transmitter.

Figure A-1. Plantweb Housing with Coplanar™ SuperModule™ Platform and Rosemount 305 Coplanar Integral Manifold



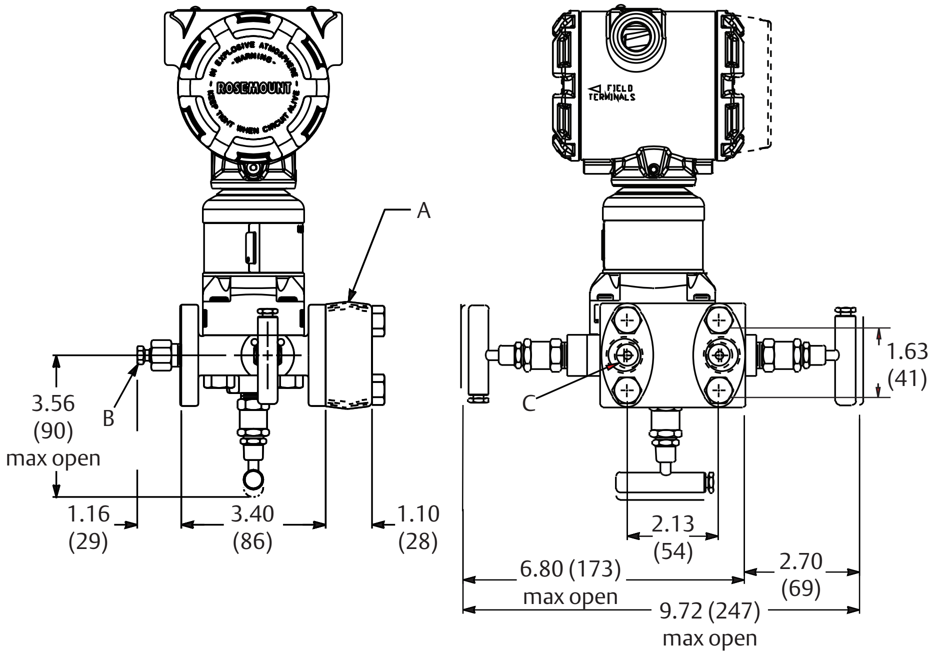
Dimensions are in inches (millimeters).

Figure A-2. Coplanar Flange Mounting Configurations



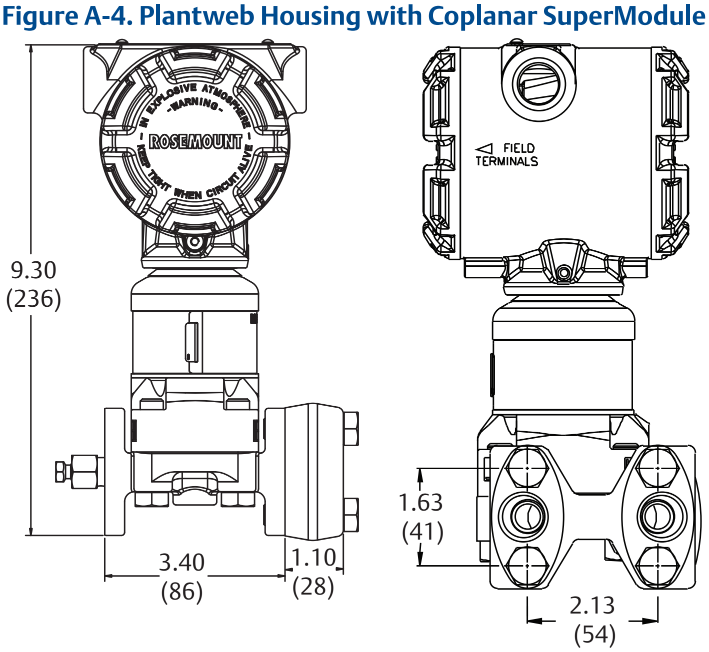
Dimensions are in inches (millimeters).

Figure A-3. Plantweb Housing with Coplanar SuperModule Platform and Rosemount 305 Traditional Integral Manifold



A. [1]/2–14 NPT on mounting adapters
B. Drain vent valve
C. [1]/4–18 NPT
Dimensions are in inches (millimeters).

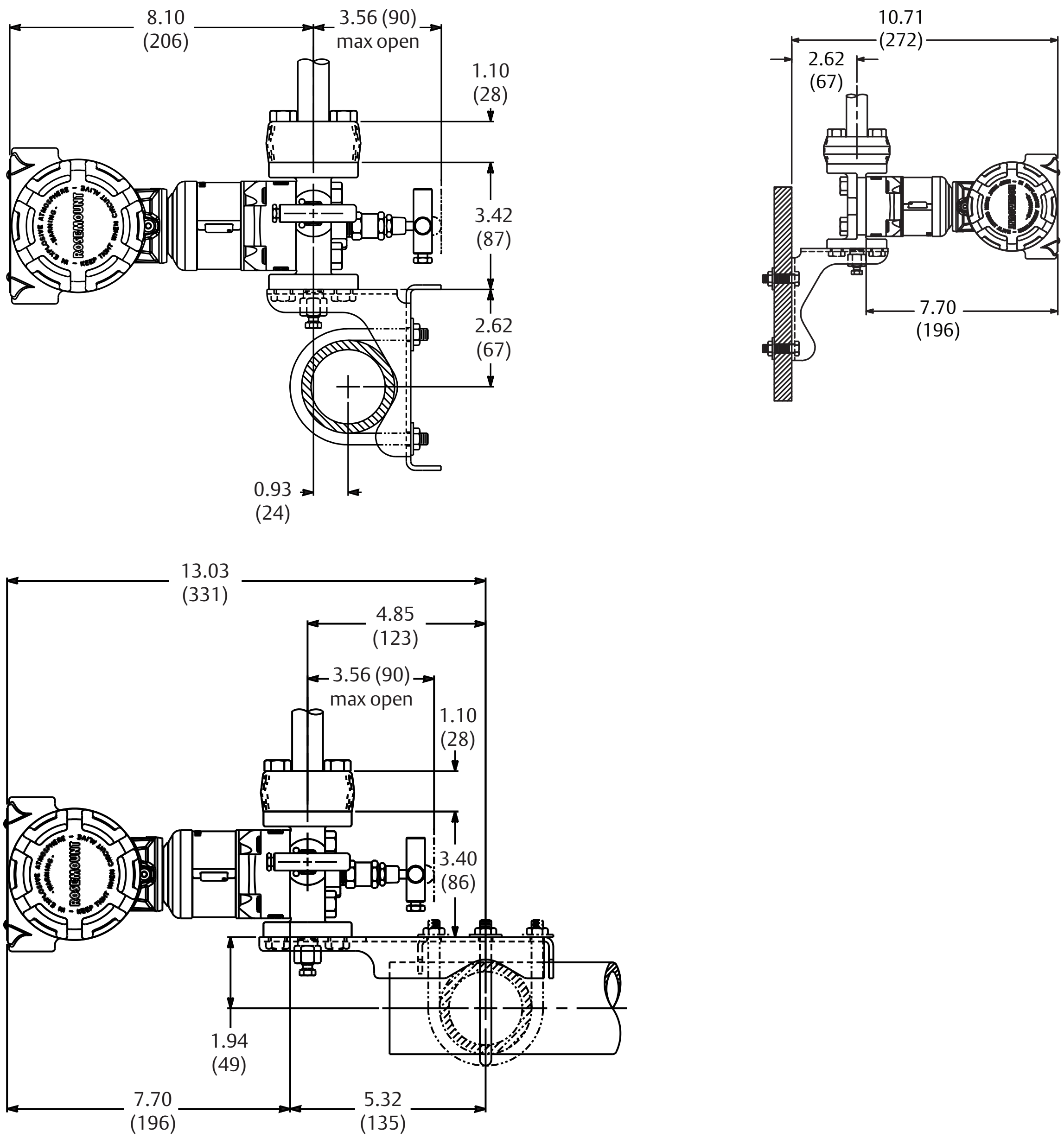
Figure A-4. Plantweb Housing with Coplanar SuperModule Platform and Traditional Flange



Dimensions are in inches (millimeters).

Figure A-5. Traditional Flange Mounting Configurations

Pipe mount Rosemount 305 Integral manifold **Panel mount**



Dimensions are in inches (millimeters).

A.3 Ordering information

A.3.1 Rosemount 3051S MultiVariable Transmitter

Table A-6. Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Rosemount model	Transmitter type			
3051SMV	Scalable MultiVariable Transmitter			
Performance class				
Rosemount 3051SMV multivariable SuperModule, measurement types 1 and 2				
3(1)	Ultra for Flow: 0.04% reading DP accuracy, 200:1 rangedown,15-year stability, 12-year limited warranty			★
5	Classic MV: 0.04% span DP accuracy, 100:1 rangedown, 15-year stability			★
Rosemount 3051SMV single variable SuperModule, measurement types 3 and 4				
1(2)	Ultra: 0.025% span DP accuracy, 200:1 rangedown, 10-year stability, 12-year limited warranty			★
2	Classic: 0.055% span DP accuracy, 100:1 rangedown, 5-year stability			★
3(1)	Ultra for Flow: 0.04% reading DP accuracy, 200:1 rangedown,10-year stability, 12-year limited warranty			★
Multivariable type				
M	Multivariable measurement with fully compensated mass and energy flow			★
P	Multivariable measurement with direct process variable output			★
Measurement type				
1	Differential pressure, static pressure, and temperature			★
2	Differential pressure and static pressure			★
3	Differential pressure and temperature			★
4	Differential pressure			★
Differential pressure range				
0(2)(3)	–3 to 3 inH_2O (–7,47 to 7,47 mbar)			★
1	–25 to 25 inH_2O (–62,2 to 62,2 mbar)			★
2	–250 to 250 inH_2O (–623 to 623 mbar)			★
3	–1000 to 1000 inH_2O (–2,5 to 2,5 bar)			★
4	–300 to 300 psi (–20,7 to 20,7 bar)			★
5	–2000 to 2000 psi (–137,9 to 137,9 bar)			★
Static pressure type				
N(4)	None			★
A	Absolute			★
G	Gage			★
Static pressure range		**Absolute**	**Gage**	
N(4)	None	N/A	N/A	★
3	Range 3	0.5 to 800 psia (0,03 to 55,2 bar)	–14.2 to 800 psig (–0,98 to 55,2 bar)	★
4(5)	Range 4	0.5 to 3626 psia (0,03 to 250 bar)	–14.2 to 3626 psig (–0,98 to 250 bar)	★
Temperature input				
N(6)	None			★
R(7)	RTD input (type Pt 100, –328 to 1562 °F [–200 to 850 °C])			★

Table A-6. Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Isolating diaphragm						
2[8]	316L SST					★
3[8]	Alloy C-276					★
5[9]	Tantalum					
7	Gold-Plated 316L SST					

Process connection		**Size**	**Material type**			
			Flange material	**Drain vent**	**Bolting**	
000	None					★
A11[10]	Assemble to Rosemount 305/306 Integral Manifold					★
A12[10]	Assemble to Rosemount 304 or AMF Manifold with SST traditional flange					★
B11[10][11]	Assemble to one Rosemount 1199 Seal					★
B12[10][11]	Assemble to two Rosemount 1199 Seals					★
C11[10]	Assemble to Rosemount 405 Primary Element					★
D11[10]	Assemble to Rosemount 1195 Integral orifice and Rosemount 305 Integral Manifold					★
EA2[10]	Assemble to Rosemount Annubar™ Primary Element with coplanar flange		SST	316 SST	N/A	★
EA3[10]	Assemble to Rosemount Annubar Primary Element with coplanar flange		Cast C-276	Alloy C-276	N/A	★
EA5[10]	Assemble to Rosemount Annubar Primary Element with coplanar flange		SST	Alloy C-276	N/A	★
E11	Coplanar flange	$^1/_4$–18 NPT	Carbon Steel (CS)	316 SST	N/A	★
E12	Coplanar flange	$^1/_4$–18 NPT	SST	316 SST	N/A	★
E13[8]	Coplanar flange	$^1/_4$–18 NPT	Cast C-276	Alloy C-276	N/A	★
E14	Coplanar flange	$^1/_4$–18 NPT	Cast alloy 400	Alloy 400/K-500	N/A	★
E15[8]	Coplanar flange	$^1/_4$–18 NPT	SST	Alloy C-276	N/A	★
E16[8]	Coplanar flange	$^1/_4$–18 NPT	CS	Alloy C-276	N/A	★
E21	Coplanar flange	RC $^1/_4$	CS	316 SST	N/A	★
E22	Coplanar flange	RC $^1/_4$	SST	316 SST	N/A	★
E23[8]	Coplanar flange	RC $^1/_4$	Cast C-276	Alloy C-276	N/A	★
E24	Coplanar flange	RC $^1/_4$	Cast alloy 400	Alloy 400/K-500	N/A	★
E25[8]	Coplanar flange	RC $^1/_4$	SST	Alloy C-276	N/A	★
E26[8]	Coplanar flange	RC $^1/_4$	CS	Alloy C-276	N/A	★
F12	Traditional flange	$^1/_4$–18 NPT	SST	316 SST	N/A	★
F13[8]	Traditional flange	$^1/_4$–18 NPT	Cast C-276	Alloy C-276	N/A	★
F14	Traditional flange	$^1/_4$–18 NPT	Cast alloy 400	Alloy 400/K-500	N/A	★
F15[8]	Traditional flange	$^1/_4$–18 NPT	SST	Alloy C-276	N/A	★
F22	Traditional flange	RC $^1/_4$	SST	316 SST	N/A	★
F23[8]	Traditional flange	RC $^1/_4$	Cast C-276	Alloy C-276	N/A	★
F24	Traditional flange	RC $^1/_4$	Cast alloy 400	Alloy 400/K-500	N/A	★
F25[8]	Traditional flange	RC $^1/_4$	SST	Alloy C-276	N/A	★
F52	DIN-compliant traditional flange	$^1/_4$–18 NPT	SST	316 SST	$^7/_{16}$-in. bolting	★
G11	Vertical mount level flange	2-in. ANSI class 150	SST	N/A	N/A	★

Table A-6. Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

G12	Vertical mount level flange	2-in. ANSI class 300	SST	N/A	N/A	★
G14[8]	Vertical mount level flange	2-in. ANSI class 150	Cast C-276	N/A	N/A	★
G15[8]	Vertical mount level flange	2-in. ANSI class 300	Cast C-276	N/A	N/A	★
G21	Vertical mount level flange	3-in. ANSI class 150	SST	N/A	N/A	★
G22	Vertical mount level flange	3-in. ANSI class 300	SST	N/A	N/A	★
G31	Vertical mount level flange	DIN- DN 50 PN 40	SST	N/A	N/A	★
EB6	Assemble to primary element with manifold and coplanar flange, CS, Alloy C-276					
F32	Bottom vent traditional flange	1/4–18 NPT	SST	316 SST	N/A	
F42	Bottom vent traditional flange	RC 1/4	SST	316 SST	N/A	
F62	DIN-compliant traditional flange	1/4–18 NPT	SST	316 SST	M10 bolting	
F72	DIN-compliant traditional flange	1/4–18 NPT	SST	316 SST	M12 bolting	
G41	Vertical mount level flange	DIN- DN 80 PN 40	SST	N/A	N/A	
Transmitter output						
A	4–20 mA with digital signal based on HART Protocol					★
Housing style			**Material**	**Conduit entry size**		
1A	Plantweb housing		Aluminum	1/2–14 NPT		★
1B	Plantweb housing		Aluminum	M20 × 1.5		★
1J	Plantweb housing		SST	1/2–14 NPT		★
1K	Plantweb housing		SST	M20 × 1.5		★
1C	Plantweb housing		Aluminum	G1/2		
1L	Plantweb housing		SST	G1/2		

Options (include with selected model number)

RTD cable (RTD sensor must be ordered separately)		
C12	RTD input with 12 ft. (3,66 m) of shielded cable	★
C13	RTD input with 24 ft. (7,32 m) of shielded cable	★
C14	RTD input with 75 ft. (22,86 m) of shielded cable	★
C20[12]	RTD input with 27-in. (69 cm) of armored shielded cable	★
C21	RTD input with 4 ft. (1,22 m) of armored shielded cable	★
C22	RTD input with 12 ft. (3,66 m) of armored shielded cable	★
C23	RTD input with 24 ft. (7,32 m) of armored shielded cable	★
C24	RTD input with 75 ft. (22,86 m) of armored shielded cable	★
C30[12]	RTD input with 25-in. (64 cm) of ATEX/IECEx Flameproof cable	★
C32	RTD input with 12 ft. (3,66 m) of ATEX/IECEx Flameproof cable	★
C33	RTD input with 24 ft. (7,32 m) of ATEX/IECEx Flameproof cable	★
C34	RTD input with 75 ft. (22,86 m) of ATEX/IECEx Flameproof cable	★
C40[12]	RTD input with 34-in. (86,36 cm) shielded cable and 24-in. (60,96 cm) FM Approved coupling flex	★
C41[12]	RTD input with 40-in. (101,60 cm) shielded cable and 30-in. (76,20 cm) FM Approved coupling flex	★

Table A-6. Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Mounting brackets(13)		
B4	Coplanar flange bracket, all SST, 2-in. pipe and panel	★
B1	Traditional flange bracket, CS, 2-in. pipe	★
B2	Traditional flange bracket, CS, panel	★
B3	Traditional flange flat bracket, CS, 2-in. pipe	★
B7	Traditional flange bracket, B1 with SST bolts	★
B8	Traditional flange bracket, B2 with SST bolts	★
B9	Traditional flange bracket, B3 with SST bolts	★
BA	Traditional flange bracket, B1, all SST	★
BC	Traditional flange bracket, B3, all SST	★
Software configuration		
C1	Custom software configuration (Rosemount 3051SMV Configuration Data Sheet required.)	★
C2	Custom flow configuration (Rosemount 3051SMV Configuration Data Sheet required.)	★
C4	NAMUR alarm and saturation levels, high alarm	★
C5	NAMUR alarm and saturation levels, low alarm	★
C6	Custom alarm and saturation signal levels, high alarm	★
C7	Custom alarm and saturation signal levels, low alarm	★
C8	Low alarm (standard Rosemount alarm and saturation levels)	★
Flange adapter(13)		
D2	1/2–14 NPT flange adapter	★
D9	RC 1/2 SST flange adapter	
Ground screw		
D4	External ground screw assembly	★
Drain/vent valve(13)		
D5	Delete transmitter drain/vent valves (install plugs)	★
D7	Coplanar flange without drain/vent ports	
Conduit plug(14)		
DO	316 SST Conduit Plug	★
Product certifications		
E1	ATEX Flameproof	★
I1	ATEX Intrinsic Safety	★
N1	ATEX Type n	★
ND	ATEX Dust	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)	★
E4	TIIS Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
I5	FM Intrinsically Safe, Division 2	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
E6(15)	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
I6	CSA Intrinsically Safe	★
K6(15)	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★

Table A-6. Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

E7	IECEx Flameproof, Dust Ignition-proof	★
I7	IECEx Intrinsic Safety	★
N7	IECEx Type n	★
K7	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, and Type n (combination of E7, I7, and N7)	★
E2	INMETRO Flameproof	★
I2	INMETRO Intrinsic Safety	★
E3	China Flameproof	★
I3	China Intrinsic Safety	★
KA(15)(16)	ATEX and CSA Explosion-proof, Intrinsically Safe, Division 2 (combination of E1, E6, I1, and I6)	★
KB(15)(16)	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	★
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1)	★
KD(15)(16)	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, E6, E1, I5, I6, and I1)	★
DW(17)	NSF Drinking Water Certification	★
Alternate materials of construction		
L1(18)	Inert sensor fill fluid (differential and gage sensors only)	★
L2	Graphite-filled PTFE O-ring	★
L4(13)	Austenitic 316 SST bolts	★
L5(8)(13)	ASTM A193, Grade B7M bolts	★
L6(13)	Alloy K-500 bolts	★
L7(8)(13)	ASTM A453, Class D, Grade 660 bolts	★
L8(13)	ASTM A193, Class 2, Grade B8M bolts	★
Digital display		
M5	Plantweb LCD display	★
Special procedures		
P1(19)	Hydrostatic testing with certificate	★
P9(2)	4500 psig (310 bar) static pressure limit	★
P0(2)(20)	6092 psig (420 bar) static pressure limit	★
P2(13)	Cleaning for special services	
P3(13)	Cleaning for less than 1PPM chlorine/fluorine	
Special certifications		
Q4	Calibration Certificate	★
QP	Calibration Certificate and Tamper Evident Seal	★
Q8	Material Traceability Certification per EN 10204 3.1B	★
Q16	Surface Finish Certification for Sanitary Remote Seals	★
QZ	Remote Seal System Performance Calculation Report	★
Quality Certification for Safety(21)		
QS	Prior-use certificate of FMEDA data	★
QT	Safety certified to IEC 61508 with certificate of FMEDA data	★
Transient protection		
T1	Transient terminal block	★

Table A-6. Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Conduit electrical connector[(22)]		
GE	M12, 4-pin, male connector (eurofast®)	★
GM	A size Mini, 4-pin, male connector (minifast®)	★
Cold temperature		
BRR	–60 °F (–51 °C) cold temperature start-up	★
Typical model number: 3051SMV 3 M 1 2 G 4 R 2 E12 A 1A B4 C2 M5		

1. Only available with DP range codes 2 and 3, 316L SST or Alloy C-276 isolating diaphragm and silicone fill fluid.
2. Only available with measurement type codes 3 and 4.
3. DP Range 0 is only available with traditional flange, 316L SST diaphragm material, and bolting option L4.
4. Required for measurement type codes 3 and 4.
5. For measurement type 1 and 2 with DP range 1, absolute limits are 0.5 to 2000 psi (0,03 to 137,9 bar) and gage limits are –14.2 to 2000 psig (–0,98 to 137,9 bar).
6. Required for measurement type codes 2 and 4.
7. Required for measurement type codes 1 and 3. RTD Sensor must be ordered separately.
8. 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.
9. Tantalum diaphragm material is only available for DP ranges 2–5.
10. "Assemble to" items are specified separately and require a completed model number.
11. Consult an Emerson representative for performance specifications.
12. For use with Flowmeters with integral RTDs.
13. Not available with process connection option code A11.
14. Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
15. Not available with M20 or G $^{1}/_{2}$ conduit entry size.
16. RTD cable not available with this option.
17. Requires 316L SST diaphragm material, glass-filled PTFE O-ring (standard), and process connection code E12 or F12.
18. Silicone fill fluid is standard.
19. Not available with DP range 0.
20. Requires 316L SST or Alloy C-276 diaphragm material, assemble to Rosemount 305 Integral Manifold or DIN-compliant traditional flange process connection, and bolting option L8. Limited to differential pressure ranges 2–5.
21. Not available with output code F or X.
22. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Non-Incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

A.3.2 Rosemount 300SMV housing kit

Table A-7. Ordering Information

Rosemount model				
300SMV	Housing kit for Rosemount 3051SMV			
Multivariable type				
M	Multivariable measurement with fully compensated mass and energy flow			★
P	Multivariable measurement with direct process variable output			★
Temperature input				
N	None			★
R[1]	RTD input (type Pt 100, –328 to 1562 °F [–200 to 850 °C])			★
Transmitter output				
A	4–20 mA with digital signal based on HART Protocol			★
Housing style		**Material[2]**	**Conduit entry**	
1A	Plantweb housing	Aluminum	1/2–14 NPT	★
1B	Plantweb housing	Aluminum	M20 × 1.5 (CM20)	★
1J	Plantweb housing	SST	1/2–14 NPT	★
1K	Plantweb housing	SST	M20 × 1.5 (CM20)	★
1C	Plantweb housing	Aluminum	G1/2	
1L	Plantweb housing	SST	G1/2	

Options (include with selected model number)

RTD cable (RTD sensor must be ordered separately)		
C12	RTD input with 12 ft. (3,66 m) of shielded cable	★
C13	RTD input with 24 ft. (7,32 m) of shielded cable	★
C14	RTD input with 75 ft. (22,86 m) of shielded cable	★
C20[3]	RTD input with 27-in. (69 cm) of armored shielded cable	★
C21	RTD input with 4 ft. (1,22 m) of armored shielded cable	★
C22	RTD input with 12 ft. (3,66 m) of armored shielded cable	★
C23	RTD input with 24 ft. (7,32 m) of armored shielded cable	★
C24	RTD input with 75 ft. (22,86 m) of armored shielded cable	★
C30[3]	RTD input with 25-in. (64 cm) of ATEX/IECEx Flameproof cable	★
C32	RTD input with 12 ft. (3,66 m) of ATEX/IECEx Flameproof cable	★
C33	RTD input with 24 ft. (7,32 m) of ATEX/IECEx Flameproof cable	★
C34	RTD input with 75 ft. (22,86 m) of ATEX/IECEx Flameproof cable	★
C40[3]	RTD input with 34-in. (86,36 cm) shielded cable and 24-in. (60,96 cm) FM Approved coupling flex	★
C41[3]	RTD input with 40-in. (101,60 cm) shielded cable and 30-in. (76,20 cm) FM Approved coupling flex	★

Table A-7. Ordering Information

Alarm limit		
C4	NAMUR alarm and saturation levels, high alarm	★
C5	NAMUR alarm and saturation levels, low alarm	★
C8	Low alarm (standard Rosemount alarm and saturation levels)	★
External ground screw assembly		
D4	External ground screw assembly	★
Product certifications		
E1	ATEX Flameproof	★
I1	ATEX Intrinsic Safety	★
N1	ATEX Type n	★
ND	ATEX Dust	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)	★
E4	TIIS Flameproof	★
I4	TIIS Intrinsic Safety	★
K4	TIIS Flameproof and Intrinsic Safety (combination E4 and I4)	★
E5	FM Explosion-proof, Dust Ignition-proof	★
I5	FM Intrinsically Safe, Division 2	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5 and I5)	★
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
I6	CSA Intrinsically Safe	★
K6	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E6 and I6)	★
E7	IECEx Flameproof, Dust Ignition-proof	★
I7	IECEx Intrinsic Safety	★
N7	IECEx Type n	★
K7	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)	★
E2(4)	INMETRO Flameproof	★
I2(4)	INMETRO Intrinsic Safety	★
K2(4)	INMETRO Flameproof, Intrinsic Safety (combination of E2 and I2)	★
E3(4)	China Flameproof	★
I3(4)	China Intrinsic Safety	★
KA(5)	ATEX and CSA Explosion-proof, Intrinsically Safe, Division 2 (combination of E1, E6, I1, and I6)	★
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6)	★
KC(5)	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1)	★
KD(5)	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, E6, E1, I5, I6, and I1)	★
Digital display		
M5	Plantweb LCD display	★

Table A-7. Ordering Information

Terminal blocks		
T1	Transient terminal block	★
Conduit electrical connector(6)		
GE	M12, 4-pin, male connector (eurofast)	★
GM	A size mini, 4-pin, male connector (minifast)	★
Typical model number: 300SMV M R 1A C22 M5		

1. RTD Sensor must be ordered separately.
2. Material specified is cast as follows: CF-8M is the cast version of 316 SST, CF-3M is the cast version of 316L SST, CW-12MW is the cast version of Alloy C-276, M-30C is the cast version of alloy 400. For housing, material is aluminum with polyurethane paint.
3. For use with Flowmeters with integral RTDs.
4. Contact an Emerson representative for availability.
5. RTD cable not available with this option.
6. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Non-Incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1206 to maintain outdoor rating (NEMA 4X and IP66).

A.4 Accessories

A.4.1 Rosemount Engineering Assistant (EA) software packages

The Rosemount Engineering Assistant software supports flow configuration for the Rosemount 3051SMV. The package is available with or without modem and connecting cables. All configurations are packaged separately.

For best performance of the EA Software, the following computer hardware and software is recommended:

- Pentium-grade Processor: 500 MHz or faster
- Operating system: Windows™ Professional 7, 8.1, or 10.
  - 32-bit
  - 64-bit
- 256 MB RAM
- 100 MB of available hard disk space
- RS232 serial port or USB port (for use with HART modem)
- CD-ROM

Engineering Assistant software packages

Code	Product description
EA	Engineering Assistant software program
Software media	
3	EA Rev. 6 (compatible with Rosemount 3051SMV only)
Language	
E	English
Modem and connecting cables	
O	None
H	Serial Port HART modem and cables
B	USB Port HART modem and cables
License	
N1	Single PC license
N2	Site license
Typical model number: EA 3 E O N1	

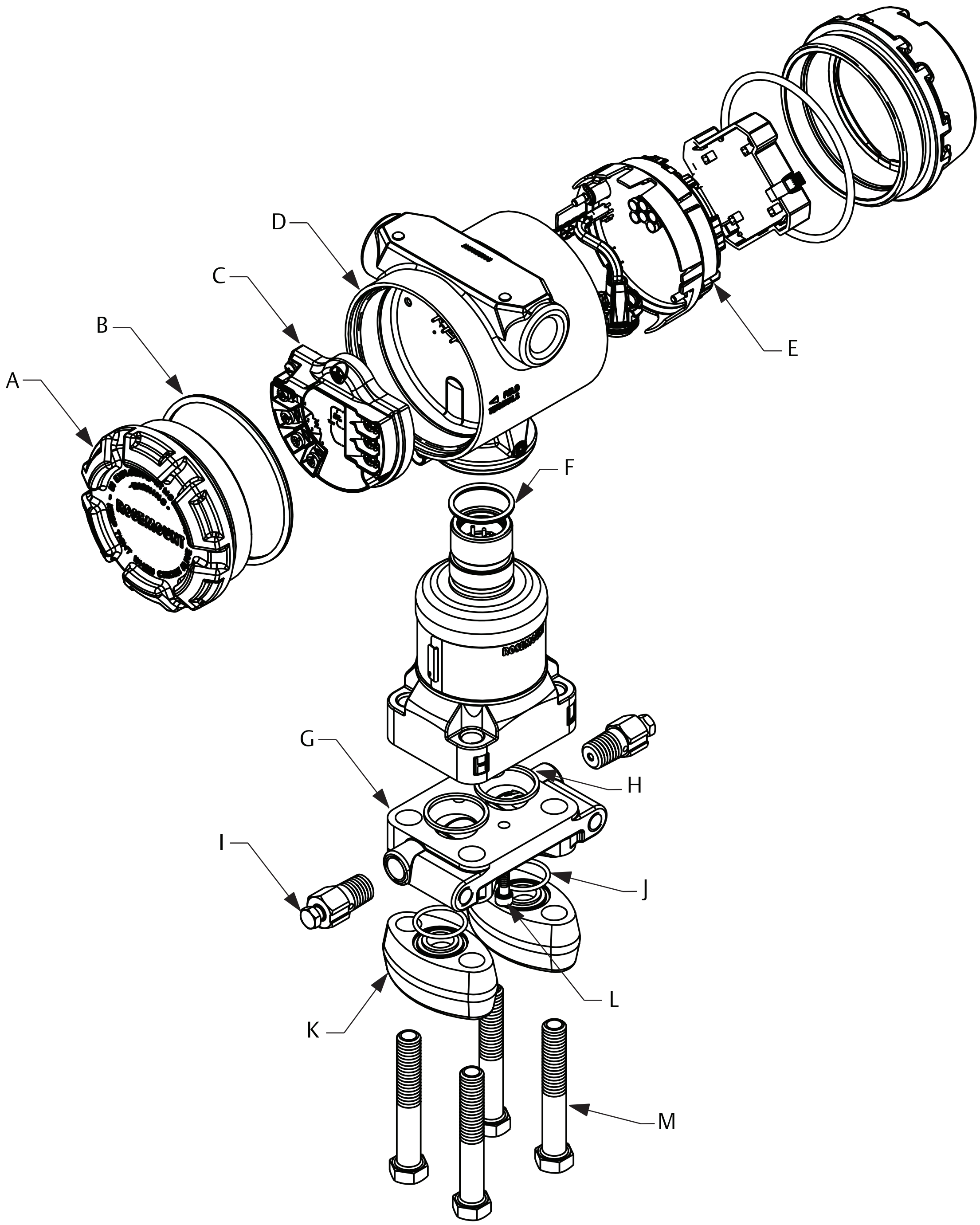
Accessories

Item description	Part number
Serial Port HART modem and cables only	03095-5105-0001
USB Port HART modem and cables only[1]	03095-5105-0002

1. Supported by SNAP-ON™ EA with AMS Device Manager version 6.2 or higher.

Figure A-6. Exploded View Diagram

The following drawing shows the name and location for commonly ordered spare parts:



A. Cover
B. Cover O-ring
C. Terminal block
D. Plantweb housing
E. Feature board
F. Module O-ring
G. Coplanar flange
H. Process flange O-ring
I. Drain/vent valve
J. Flange adapter O-ring
K. Flange adapters
L. Flange alignment screw (not pressure retaining)
M. Flange/adapters bolts

A.5 Spare parts

Sensor modules
See "Rosemount 3051S Scalable MultiVariable Transmitter Ordering Information" on page 138 for ordering spare sensor modules. Use housing style code 00 within the Rosemount 3051SMV model number.
Typical model number: 3051SMV 3 M 1 2 G 3 R 2 E11 A 00 C21

Feature board electronics and housing assembly
See "Rosemount 300SMV housing kit" on page 144 for ordering spare housings or feature boards.
Typical model number: 300SMV M R A 1A C21

LCD display	Part number
Aluminum Plantweb housing	
LCD display kit: LCD display assembly, 4-pin interconnection header and aluminum cover assembly	03151-9193-0001
LCD display only: LCD display assembly, 4-pin interconnection header	03151-9193-0002
Cover assembly kit: Aluminum cover assembly	03151-9193-0003
Rosemount 316L SST Plantweb housing	
LCD display kit: LCD display assembly, 4-pin interconnection header, 316L SST cover assembly	03151-9193-0004
LCD display only: LCD display assembly, 4-pin interconnection header	03151-9193-0002
Cover assembly kit: 316L SST cover assembly	03151-9193-0005
Electrical housing, terminal blocks	
Plantweb housing terminal block, HART (4–20 mA)	
Standard terminal block assembly with Temperature input	03151-9006-0001
Standard terminal block assembly without Temperature input	03151-9005-0001
Transient protection terminal block assembly with Temperature input	03151-9006-0002
Transient protection terminal block assembly without Temperature input	03151-9005-0002
Covers	
Aluminum electronics cover; cover and O-ring	03151-9030-0001
316L SST electronics cover; cover and O-ring	03151-9030-0002
Housing miscellaneous	
External ground screw assembly (option D4): screw, clamp, washer	03151-9060-0001
Housing V-seal for both Plantweb and Junction Box housings	03151-9061-0001
Plantweb housing header cable O-ring (package of 12)	03151-9011-0001

Flanges	Part number
Differential coplanar flange	
Nickel-plated CS	03151-9200-0025
SST	03151-9200-0022
Cast C-276	03151-9200-0023
Cast alloy 400	03151-9200-0024
Gage/absolute coplanar flange	
Nickel-plated CS	03151-9200-1025
SST	03151-9200-1022
Cast C-276	03151-9200-1023
Cast alloy 400	03151-9200-1024
Coplanar flange alignment screw (package of 12)	03151-9202-0001
Traditional flange	
SST	03151-9203-0002
Cast C-276	03151-9203-0003
Cast Alloy 400	03151-9203-0004
Flange adapter kits (each kit contains adapters, bolts, and O-ring for one DP transmitter or two GP/AP transmitters)	
CS bolts, glass-filled PTFE O-rings	
SST adapters	03031-1300-0002
Cast C-276 adapters	03031-1300-0003
Cast alloy 400 adapters	03031-1300-0004
Nickel-plated CS adapters	03031-1300-0005
SST bolts, glass-filled PTFE O-rings	
SST adapters	03031-1300-0012
Cast C-276 adapters	03031-1300-0013
Cast Alloy 400 adapters	03031-1300-0014
Ni-plated CS adapters	03031-1300-0015
CS bolts, Graphite PTFE O-rings	
SST adapters	03031-1300-0102
Cast C-276 adapters	03031-1300-0103
Cast alloy 400 adapters	03031-1300-0104
Ni-plated CS adapters	03031-1300-0105
SST bolts, Graphite PTFE O-rings	
SST adapters	03031-1300-0112
Cast C-276 adapters	03031-1300-0113
Cast Alloy 400 adapters	03031-1300-0114
Ni-plated CS adapters	03031-1300-0115

Flange adapter	Part number
Nickel-plated CS	03151-9259-0005
SST	03151-9259-0002
Cast C-276	03151-9259-0003
Cast alloy 400	03151-9259-0004
Drain/vent valve kits (each kit contains parts for one transmitter)	
Differential drain/vent kits	
SST valve stem and seat kit	03151-9268-0022
Alloy C-276 valve stem and seat kit	03151-9268-0023
Alloy K-500 valve stem and alloy 400 seat kit	03151-9268-0024
SST Ceramic ball drain/vent kit	03151-9268-0122
Alloy C-276 ceramic ball drain/vent kit	03151-9268-0123
Alloy 400/K-500 ceramic ball drain/vent kit	03151-9268-0124
Gage/absolute drain/vent kits	
SST valve stem and seat kit	03151-9268-0012
Alloy C-276 valve stem and seat kit	03151-9268-0013
Alloy K-500 valve stem and Alloy 400 Seat Kit	03151-9268-0014
SST ceramic ball drain/vent kit	03151-9268-0112
Alloy C-276 ceramic ball drain/vent kit	03151-9268-0113
Alloy 400 ceramic ball drain/vent kit	03151-9268-0114
O-ring packages (package of 12)	
Electronic housing, cover (Standard and LCD display)	03151-9040-0001
Electronics housing, module	03151-9041-0001
Process flange, glass-filled PTFE	03151-9042-0001
Process flange, Graphite-filled PTFE	03151-9042-0002
Flange adapter, glass-filled PTFE	03151-9043-0001
Flange adapter, graphite-filled PTFE	03151-9043-0002
Gland and collar kits	
Gland and collar kits	03151-9250-0001
Mounting brackets	
Coplanar flange bracket kit	
B4 bracket, SST, 2-in. pipe mount, SST bolts	03151-9270-0001
Traditional flange bracket kits	
B1 bracket, 2-in. pipe mount, CS bolts	03151-9272-0001
B2 bracket, panel mount, CS bolts	03151-9272-0002
B3 Flat bracket for 2-in. pipe mount, CS bolts	03151-9272-0003

B7 (B1 style bracket with SST bolts)	03151-9272-0007
B8 (B2 style bracket with SST bolts)	03151-9272-0008
B9 (B3 style bracket with SST bolts)	03151-9272-0009
BA (SST B1 bracket with SST bolts)	03151-9272-0011
BC (SST B3 bracket with SST bolts)	03151-9272-0013
DIN compliant traditional flange bracket kits – M10 threads (F62 process connection)	
B1 bracket, 2-in. pipe mount, CS bolts	03151-9272-0101
B2 bracket, panel mount, CS bolts	03151-9272-0101
B3 flat bracket for 2-in. pipe mount, CS bolts	03151-9272-0103
B7 (B1 style bracket with SST bolts)	03151-9272-0107
B8 (B2 style bracket with SST bolts)	03151-9272-0108
B9 (B3 style bracket with SST bolts)	03151-9272-0109
BA (SST B1 bracket with SST bolts)	03151-9272-0111
BC (SST B3 bracket with SST bolts)	03151-9272-0113
DIN compliant traditional flange bracket kits – M12 threads (F72 process connection)	
B1 bracket, 2-in. pipe mount, CS bolts	03151-9272-0201
B2 bracket, panel mount, CS bolts	03151-9272-0202
B3 flat bracket for 2-in. pipe mount, CS bolts	03151-9272-0203
B7 (B1 style bracket with SST bolts)	03151-9272-0207
B8 (B2 style bracket with SST bolts)	03151-9272-0208
B9 (B3 style bracket with SST bolts)	03151-9272-0209
BA (SST B1 bracket with SST bolts)	03151-9272-0211
BC (SST B3 bracket with SST bolts)	03151-9272-0213
Bolt kits	
Coplanar flange	
Flange bolt kit (44 mm [1.75-in.])	
CS (set of four)	03151-9280-0001
316 SST (set of four)	03151-9280-0002
ANSI/ASTM-A-193-B7M (set of four)	03151-9280-0003
Alloy K-500 (set of four)	03151-9280-0004
ASTM A 453, Class D Grade 660 (set of four)	03151-9280-0005
ASTM A193, Grade B8M, Class 2 (set of four)	03151-9280-0006
Flange/adapter bolt kit (73 mm [2.88-in.])	
CS (set of four)	03151-9281-0001
316 SST (set of four)	03151-9281-0002
ANSI/ASTM-A-193-B7M (set of four)	03151-9281-0003
Alloy K-500 (set of four)	03151-9281-0004

ASTM A 453, Class D Grade 660 (set of four)	03151-9281-0005
ASTM A193, Grade B8M, Class 2 (set of four)	03151-9281-0006
Manifold/flange kit (57 mm [2.25-in.])	
CS (set of four)	03151-9282-0001
316 SST (set of four)	03151-9282-0002
ANSI/ASTM-A-193-B7M (set of four)	03151-9282-0003
Alloy K-500 (set of four)	03151-9282-0004
ASTM A 453, Class D, Grade 660 (set of four)	03151-9282-0005
ASTM A193, Grade B8M, Class 2 (set of four)	03151-9282-0006
Traditional flange	
Differential flange and adapter bolt kit	
CS (set of eight)	03151-9283-0001
316 SST (set of eight)	03151-9283-0002
ANSI/ASTM-A-193-B7M (set of eight)	03151-9283-0003
Alloy K-500 (set of eight)	03151-9283-0004
ASTM A 453, Class D, Grade 660 (set of eight)	03151-9283-0005
ASTM A193, Grade B8M, Class 2 (set of eight)	03151-9283-0006
Gage/absolute flange and adapter bolt kit	
Carbon Steel (set of six)	03151-9283-1001
316 SST (set of six)	03151-9283-1002
ANSI/ASTM-A-193-B7M (set of six)	03151-9283-1003
Alloy K-500 (set of six)	03151-9283-1004
ASTM A 453, Class D, Grade 660 (set of six)	03151-9283-1005
ASTM A193, Grade B8M, Class 2 (set of six)	03151-9283-1006
Manifold/traditional flange bolts	
CS	Use bolts supplied with manifold
316 SST	Use bolts supplied with manifold

Appendix B Product Certifications

Rev 1.19

B.1 European Directive Information

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

B.2 Ordinary Location Certification

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

B.3 Installing Equipment in North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

B.4 USA

E5 US Explosionproof (XP) and Dust-Ignitionproof (DIP)
Certificate: FM16US0089X
Standards: FM Class 3600 – 2011, FM Class 3615 – 2006, FM Class 3616 – 2011, FM Class 3810 – 2005, ANSI/NEMA 250 – 2003
Markings: XP CL I, DIV 1, GP B, C, D; T5; DIP CL II, DIV 1, GP E, F, G; CL III; T5(–50 °C ≤ T_a ≤ +85 °C); Factory Sealed; Type 4X

I5 US Intrinsic Safety (IS) and Nonincendive (NI)
Certificate: FM16US0233
Standards: FM Class 3600 – 2011, FM Class 3610 – 2007, FM Class 3611 – 2004, FM CLASS 3616 - 2006, FM Class 3810 – 2005, NEMA 250 – 1991
Markings: IS CL I, DIV 1, GP A, B, C, D; CL II, DIV 1, GP E, F, G; Class III; Class 1, Zone 0 AEx ia IIC T4; NI CL 1, DIV 2, GP A, B, C, D; T4(–50 °C ≤ T_a ≤ +70 °C) when connected per Rosemount™ drawing 03151-1206; Type 4X

Note
Transmitters marked with NI CL 1, DIV 2 can be installed in Division 2 locations using general Division 2 wiring methods or Nonincendive Field Wiring (NIFW). See Drawing 03151-1206.

IE US FISCO Intrinsically Safe
Certificate: FM16US0233
Standards: FM Class 3600 – 2011, FM Class 3610 – 2010, FM Class 3611 – 2004, FM Class 3616 – 2006, FM Class 3810 – 2005, NEMA 250 – 1991
Markings: IS CL I, DIV 1, GP A, B, C, D; T4(–50 °C ≤ T_a ≤ +70 °C); when connected per Rosemount drawing 03151-1006; Type 4X

B.5 Canada

E6 Canada Explosionproof, Dust-Ignitionproof, Division 2
Certificate: 1143113
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 25-1966,
CSA Std C22.2 No. 30-M1986,
CSA C22.2 No. 94.2-07,
CSA Std C22.2 No. 213-M1987,
CAN/CSA C22.2 60079-11:14,
CAN/CSA-C22.2 No. 61010-1-12,
ANSI/ISA 12.27.01-2003,
CSA Std C22.2 No. 60529:05 (R2010)
Markings: Explosionproof Class I, Division 1, Groups B, C, D; Dust-Ignitionproof Class II, Division 1, Groups E, F, G; Class III; suitable for Class I, Division 2, Groups A, B, C, D; Type 4X

I6 Canada Intrinsically Safe
Certificate: 1143113
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 25-1966,
CSA Std C22.2 No. 30-M1986,
CSA C22.2 No. 94.2-07,
CSA Std C22.2 No. 213-M1987,
CAN/CSA C22.2 60079-11:14,
CAN/CSA-C22.2 No. 61010-1-12,
ANSI/ISA 12.27.01-2003,
CSA Std C22.2 No. 60529:05 (R2010)
Markings: Intrinsically Safe Class I, Division 1; Groups A, B, C, D; suitable for Class 1, Zone 0, IIC, T3C, T_a = 70 °C; when connected per Rosemount drawing 03151-1207; Type 4X

IF Canada FISCO Intrinsically Safe
Certificate: 1143113
Standards: CAN/CSA C22.2 No. 0-10,
CSA Std C22.2 No. 25-1966,
CSA Std C22.2 No. 30-M1986,
CSA C22.2 No. 94.2-07,
CSA Std C22.2 No. 213-M1987,
CAN/CSA C22.2 60079-11:14,
CAN/CSA-C22.2 No. 61010-1-12,
ANSI/ISA 12.27.01-2003,
CSA Std C22.2 No. 60529:05 (R2010)
Markings: FISCO Intrinsically Safe Class I, Division 1; Groups A, B, C, D; suitable for Class I, Zone 0; T3C, T_a = 70 °C; when installed per Rosemount drawing 03151-1207; Type 4X

B.6 Europe

E1 ATEX Flameproof
Certificate: KEMA 00ATEX2143X
Standards: EN 60079-0:2012+A11:2013, EN 60079-1: 2014, EN 60079-26:2015
Markings: Ex II 1/2 G Ex db IIC T6…T4 Ga/Gb, T6(–60 °C ≤ T_a ≤ +70 °C), T5/T4(–60 °C ≤ T_a ≤ +80 °C)

Temperature class	Process temperature
T6	–60 °C to +70 °C
T5	–60 °C to +80 °C
T4	–60 °C to +120 °C

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between EPL Ga (process connection) and EPL Gb (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. 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. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
4. Appropriate cable, glands and plugs need to be suitable for a temperature of 5 °C greater than maximum specified temperature for location where installed.

I1 ATEX Intrinsic Safety
Certificate: Baseefa08ATEX0064X
Standards: EN 60079-0: 2012, EN 60079-11: 2012
Markings: Ex II 1 G Ex ia IIC T4 Ga, T4(–60 °C ≤ T_a ≤ +70 °C)

Parameter	HART®	FOUNDATION™ Fieldbus	SuperModule™ only
Voltage U_i	30 V	30 V	7.14 V
Current I_i	300 mA	300 mA	300 mA
Power P_i	1 W	1.3 W	887 mW
Capacitance C_i	14.8 nF	0	0.11 µF
Inductance L_i	0	0	0

Parameter	RTD (for 3051SFx) (HART)	RTD (for 3051SFx) (Fieldbus)
Voltage U_i	30 V	30 V
Current I_i	2.31 mA	18.24 mA
Power P_i	17.32 mW	137 mA
Capacitance C_i	0	0.8 nF
Inductance L_i	0	1.33 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with the optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
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 a Zone 0 environment.

IA ATEX FISCO
Certificate: Baseefa08ATEX0064X
Standards: EN 60079-0: 2012, EN 60079-11: 2012
Markings: Ex II 1 G Ex ia IIC T4 Ga, T4(–60 °C ≤ T_a ≤ +70 °C)

Parameter	FISCO
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0
Inductance L_i	0

ND ATEX Dust
Certificate: BAS01ATEX1374X
Standards: EN 60079-0: 2012+A11:2013, EN 60079-31:2009
Markings: Ex II 1 D Ex ta IIIC T105 °C T_{500} 95 °C Da, (–20 °C ≤ T_a ≤ +85 °C), V_{max} = 42.4 V

Special Conditions for Safe Use (X):

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient temperature range of the apparatus and capable of withstanding a 7J impact test.
4. The SuperModule(s) must be securely screwed in place to maintain the ingress protection of the enclosure(s).

N1 ATEX Type n
Certificate: Baseefa08ATEX0065X
Standards: EN 60079-0: 2012, EN 60079-15: 2010
Markings: Ex II 3 G Ex nA IIC T4 Gc, (-40 °C ≤ T_a ≤ 70 °C), V_{max} = 45 V

Special Condition for Safe Use (X):

1. If fitted with a 90 V transient suppressor, the equipment is not capable of withstanding the 500 V electrical strength test as defined in Clause 6.5.1 of EN 60079-15:2010. This must be taken into account during installation.

B.7 International

E7 IECEx Flameproof and Dust
Certificate: IECEx KEM 08.0010X (Flameproof)
Standards: IEC 60079-0:2011, IEC 60079-1:2014, IEC 60079-26:2014
Markings: Ex db IIC T6…T4 Ga/Gb, T6(–60 °C ≤ T_a ≤ +70 °C), T5/T4(–60 °C ≤ T_a ≤ +80 °C)

Temperature class	Process temperature
T6	–60 °C to +70 °C
T5	–60 °C to +80 °C
T4	–60 °C to +120 °C

Special Conditions for Safe Use (X):

1. This device contains a thin wall diaphragm less than 1 mm thickness that forms a boundary between EPL Ga (process connection) and EPL Gb (all other parts of the equipment). The model code and datasheet are to be consulted for details of the diaphragm material. 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. Flameproof joints are not intended for repair.
3. Non-standard paint options may cause risk from electrostatic discharge. Avoid installations that could cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.
4. Appropriate cable, glands and plugs need to be suitable for a temperature of 5 °C greater than maximum specified temperature for location where installed.

Certificate: IECEx BAS 09.0014X (Dust)
Standards: IEC 60079-0:2011, IEC 60079-31:2008
Markings: Ex ta IIIC T105 °C T_{500} 95 °C Da, (–20 °C ≤ T_a ≤ +85 °C), V_{max} = 42.4 V

Special Conditions for Safe Use (X):

1. Cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
2. Unused cable entries must be filled with suitable blanking plugs which maintain the ingress protection of the enclosure to at least IP66.
3. Cable entries and blanking plugs must be suitable for the ambient temperature range of the apparatus and capable of withstanding a 7J impact test.
4. The Rosemount 3051S - SuperModule must be securely screwed in place to maintain the ingress protection of the enclosure.

I7 IECEx Intrinsic Safety
Certificate: IECEx BAS 08.0025X
Standards: IEC 60079-0: 2011, IEC 60079-11: 2011
Markings: Ex ia IIC T4 Ga, T4(–60 °C ≤ T_a ≤ +70 °C)

Parameter	HART	FOUNDATION Fieldbus	SuperModule only
Voltage U_i	30 V	30 V	7.14 V
Current I_i	300 mA	300 mA	300 mA
Power P_i	1 W	1.3 W	887 mW
Capacitance C_i	14.8 nF	0	0.11 µF
Inductance L_i	0	0	0

Parameter	RTD (for 3051SFx) (HART)	RTD (for 3051SFx) (Fieldbus)
Voltage U_i	30 V	30 V
Current I_i	2.31 mA	18.24 mA
Power P_i	17.32 mW	137 mA
Capacitance C_i	0	0.8 nF
Inductance L_i	0	1.33 mH

Special Conditions for Safe Use (X):

1. If the equipment is fitted with the optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
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 a Zone 0 environment.

IG IECEx FISCO
Certificate: IECEx BAS 08.0025X
Standards: IEC 60079-0: 2011, IEC 60079-11: 2011
Markings: Ex ia IIC T4 Ga, T4(–60 °C ≤ T_a ≤ +70 °C)

Parameter	FISCO
Voltage U_i	17.5 V
Current I_i	380 mA
Power P_i	5.32 W
Capacitance C_i	0
Inductance L_i	0

N7 IECEx Type n
Certificate: IECEx BAS 08.0026X
Standards: IEC 60079-0: 2011, IEC 60079-15: 2010
Markings: Ex nA IIC T5 Gc, (–40 °C ≤ T_a ≤ 70 °C)

Special Condition for Safe Use (X):

1. If fitted with a 90 V transient suppressor, the equipment is not capable of withstanding the 500 V electrical strength test as defined in Clause 6.5.1 of IEC 60079-15:2010. This must be taken into account during installation.

B.8 Brazil

E2 INMETRO Flameproof
Certificate: UL-BR 15.0393X
Standards: ABNT NBR IEC 60079-0:2008 + Corrigendum 1:2011,
ABNT NBR IEC 60079-1:2009 + Corrigendum 1:2011,
ABNT NBR IEC 60079-26:2008 + Corrigendum 1: 2008
Markings: Ex d IIC T* Ga/Gb, T6(–60 °C ≤ T_a ≤ +70 °C), T5/T4(-60 °C ≤ T_a ≤ +80 °C), IP66

Special Conditions for Safe Use (X):

1. The 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.

I2 INMETRO Intrinsic Safety
Certificate: UL-BR 15.0357X
Standards: ABNT NBR IEC 60079-0:2008 + Addendum 1:2011, ABNT NBR IEC 60079-11:2009
Markings: Ex ia IIC T4 Ga (–60 °C ≤ T_a ≤ +70 °C)

Special Conditions for Safe Use (X):

1. If the equipment is fitted with the optional 90 V transient suppressor, it is incapable of withstanding the 500 V isolation from earth test and this must be taken into account during installation.
2. For processes with temperatures above 135 °C, the user must assess whether the SuperModule temperature class is suitable for such applications, because in this situation there is a risk of the SuperModule temperature being above T4.

Parameter	HART		FOUNDATION Fieldbus	
	Input	RTD	Input	RTD
Voltage U_i	30 V	30 V	30 V	30 V
Current I_i	300 mA	2.31 mA	300 mA	18.24 mA
Power P_i	1 W	17.32 W	1.3 W	137 mW
Capacitance C_i	14.8 nF	0	0	0.8 nF
Inductance L_i	0	0	0	1.33 mH

B.9 China

E3 China Flameproof and Dust Ignition-proof
Certificate: 3051SMV: GYJ14.1039X
[Mfg USA, China, Singapore]
3051SFx: GYJ11.1466X
[Mfg USA, China, Singapore]
Standards: 3051SMV: GB3836.1-2010, GB3836.2-2010, GB3836.20-2010
3051SFx: GB3836.1-2010, GB3836.2-2010, GB3836.20-2010, GB12476.1-2013, GB12476.5-2013
Markings: 3051SMV: Ex d IIC T6/T5 Ga/Gb
3051SFx: Ex d IIC T4...T6 Ga/Gb; Ex tD A20 T_A 105 °C T_{500}95 °C; IP66

Special Conditions for Safe Use (X):

1. Symbol “X” is used to denote specific conditions of use: For information on the dimensions of the flameproof joints the manufacturer shall be contacted.
2. The relationship between T code and ambient temperature range for the Rosemount 3051SMV are as follows:

T code	Ambient temperature range
T6	–50 °C ~ +65 °C
T5	–50 °C ~ +80 °C

3. The relationship between T code and ambient temperature range for the Rosemount 3051SFx are as follows:

T code	Ambient temperature range
T6	–60 °C ~ +70 °C
T4/T5	–60 °C ~ +80 °C

4. The earth connection facility in the enclosure should be connected reliably.
5. During installation, use and maintenance of the product in explosive atmosphere, observe the warning “Do not open cover when circuit is alive”. During installation, use, and maintenance in explosive dust atmosphere, observe the warning “Do not open when an explosive dust atmosphere is present”.
6. During installation there should be no mixture harmful to the housing.
7. During installation, use and maintenance in explosive dust atmosphere, product enclosure should be cleaned to avoid dust accumulation, but compressed air should not be used.
8. During installation in a hazardous location, cable glands and blanking plugs certified by state appointed inspection bodies with Ex d II C Gb or Ex d IIC Gb DIP A20 [Flowmeters] IP66 type of protection should be used. Redundant cable entries should be blocked with blanking plugs.
9. End users are not permitted to change any components, but to contact the manufacturer to avoid damage to the product.
10. Maintenance should be done when no explosive gas and dust atmosphere is present.
11. During installation, use and maintenance of this product, observe 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”
GB15577-2007 “Safety regulations for dust explosion prevention and protection”
GB12476.2-2010 “Electrical apparatus for use in the presence of combustible dust”

I3 China Intrinsic Safety
Certificate: 3051SMV: GYJ14.1040X
[Mfg USA, China, Singapore]
3051SFx: GYJ16.14
[Mfg USA, China, Singapore]
Standards: 3051SMV: GB3836.1-2010, GB3836.4-2010, GB3836.20-2010
3051SFx: GB3836.1/4-2010, GB3836.20-2010, GB12476.1-2000
Markings: 3051SMV: Ex ia IIC T4 Ga
3051SFx: Ex ia IIC T4 Ga, Ex tD A20 T_A105 °C T_{500} 95 °C; IP66

Special Conditions for Safe Use (X):

1. The enclosure may contain light metal, attention should be taken to avoid ignition hazard due to impact or friction.
2. The apparatus is not capable of withstanding the 500 V electrical strength test defined in Clause 6.3.12 of GB3836.4-2010.
3. Ambient temperature range: –60 °C ~ +70 °C.
4. Intrinsically safe electric parameters:

Maximum input voltage: U_i (V)	Maximum input current: I_i (mA)	Maximum input power: P_i (W)	Maximum internal parameters:	
			C_i (nF)	L_i (μH)
30	300	1.0	14.8	0

Model	Maximum output voltage: U_i (V)	Maximum output current: I_i (mA)	Maximum output power: P_i (W)	Maximum external parameters:	
				C_i (nF)	L_i (μH)
RTD	30	2.31	17.32	0	0
SuperModule	7.14	300	8871.0	110	0

5. The cables between this product and associated apparatus should be shielded cables. The shield should be grounded reliably in non-hazardous area.
6. The product should be used with Ex certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of the product and associated apparatus.
7. End users are not permitted to change any components, contact the manufacturer to avoid damage to the product.
8. During installation in hazardous location, cable glands, conduit, and blanking plugs certified by state-appointed inspection bodies with DIP A20 IP66 type of protection should be used. Redundant cable entries should be blocked with blanking plugs.
9. During installation, use, and maintenance in explosive dust atmosphere, observe the warning "Do not open when an explosive dust atmosphere is present".
10. Maintenance should be done when no explosive dust atmosphere is present.
11. During installation, use and maintenance of this product, observe following standards:
GB3836.13-2013 "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)"
GB3836.18-2010 "Intrinsically Safe System"
GB50257-1996" - Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering"
GB15577-2007 Safety regulations for dust explosion prevention and protection
GB12476.2-2010 "Electrical apparatus for use in the presence of combustible dust"

B.10 EAC – Belarus, Kazakhstan, Russia

EM Technical Regulation Customs Union (EAC) Flameproof and Dust Ignition-proof
Certificate: RU C-US.AA87.B.00378
Markings: Ga/Gb Ex d IIC T6…T4 X
Ex tb IIIC T105 °C T_{500}95 °C Db X
Ex ta IIIC T105 °C T_{500}95 °C Da X

IM Technical Regulation Customs Union (EAC) Intrinsic Safety
Certificate: RU C-US.AA87.B.00378
Markings: 0Ex ia IIC T4 Ga X

B.11 Japan

E4 Japan Flameproof
Certificate:TC19070, TC19071, TC19072, TC19073
Markings: Ex ia IIC T4

B.12 Republic of Korea

EP Republic of Korea Flameproof
Certificate: 12-KB4BO-0180X [Mfg USA],
11-KB4BO-0068X [Mfg Singapore]
Markings: Ex d IIC T5 or T6

IP Republic of Korea Intrinsic Safety [HART Only]
Certificate: 10-KB4BO-0021X [Mfg USA, SMMC]
Markings: Ex ia IIC T4

B.13 Combinations

K1 Combination of E1, I1, N1, and ND
K2 Combination of E2 and I2
K5 Combination of E5 and I5
K6 Combination of E6 and I6
K7 Combination of E7, I7, and N7
KA Combination of E1, I1, E6, and I6
KB Combination of E5, I5, E6, and I6
KC Combination of E1, I1, E5, and I5
KD Combination of E1, I1, E5, I5, E6, and I6
KM Combination of EM and IM
KP Combination of EP and IP

B.14 Additional Certifications

SBS American Bureau of Shipping (ABS) Type Approval
Certificate: 00-HS145383
Intended Use: Measure gauge or absolute pressure of liquid, gas or vapor applications on ABS classed vessels, marine, and offshore installations. [HART Only]

SBV Bureau Veritas (BV) Type Approval
Certificate: 31910 BV
Requirements: Bureau Veritas Rules for the Classification of Steel Ships
Application: Class Notations: AUT-UMS, AUT-CCS, AUT-PORT and AUT-IMS. [HART Only]

SDN Det Norske Veritas (DNV) Type Approval
Certificate: A-14186
Intended Use: Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft, and Det Norske Veritas' Offshore Standards. [HART Only]

Application:

Location classes	
Type	**Rosemount 3051S**
Temperature	D
Humidity	B
Vibration	A
EMC	A
Enclosure	D/IP66/IP68

SLL Lloyds Register (LR) Type Approval
Certificate: 11/60002
Application: Environmental categories ENV1, ENV2, ENV3, and ENV5. [HART Only]

B.15 Installation drawings

Figure B-1. Factory Mutual (FM)

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REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	NEW RELEASE	RTC1025256	A.J.W.	1/2/08
AB	UPDATE NOTES & ADD RTD TO DIAGRAMS	RTC1025712	A.J.W.	2/28/08
AC	UPDATES FOR FIELDBUS SUBMITTAL	RTC1058998	A.S.	2/5/14

ENTITY APPROVALS FOR MODEL 3051SMV

OUTPUT CODE "A" and "F" I.S. ENTITY PARAMETERS SHEET 2
OUTPUT CODE "A" (4-20 mA HART) I.S. SEE SHEET 3
OUTPUT CODE "F" (FIELDBUS) I.S. SEE SHEET 4
FISCO SEE SHEETS 5-6
ALL OUTPUT CODE NONINCENDIVE SEE SHEET 7

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

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

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.
DR. Myles Lee Miller 12/17/07
CHK'D
APP'D.
APP'D. GOVT.

EMERSON Process Management
ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE: INDEX OF I.S. & NONINCENDIVE F.M. FOR 3051SMV

SIZE: A | FSCM NO | DWG NO. 03151-1206
SCALE: N/A | WT. ——— | SHEET 1 OF 8

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

ENTITY CONCEPT APPROVALS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM. THE APPROVED VALUES OF MAX. OPEN CIRCUIT VOLTAGE (Voc, Uo OR Vt) AND MAX. SHORT CIRCUIT CURRENT (Isc, Io, OR It) AND MAX.POWER Po(Voc X Isc/4) OR (Vt X It/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax, OR U_1), MAXIMUM SAFE INPUT CURRENT (Imax OR I_1), AND MAXIMUM SAFE INPUT POWER (Pmax OR P_1) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (Ca) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (C_1) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (La) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (L_1) OF THE INTRINSICALLY SAFE APPARATUS.

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

FOR OUTPUT CODE "A" MODEL 3051SMV CLASS I, DIV. 1, GROUPS A, B, C AND D

U_1 or V_{MAX} = 30V	Uo, V_T or V_{OC} IS LESS THAN OR EQUAL TO 30V
I_1 or I_{MAX} = 300mA	Io, I_T or I_{SC} IS LESS THAN OR EQUAL TO 300mA
P_1 or P_{MAX} = 1.0 WATT	$(\frac{V_T \times I_T}{4})$ or $(\frac{V_{OC} \times I_{OS}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
C_1 = 14.8nF	C_A IS GREATER THAN 14.8nF
L_1 = 0μH	L_A IS GREATER THAN 0μH
T4 (Ta=-50°C to +70°C)	

FOR OUTPUT CODE "F" MODEL 3051SMV CLASS I, DIV. 1, GROUPS A, B, C AND D

U_1 or V_{MAX} = 30V	Uo, V_T, OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_1 or I_{MAX} = 300mA	Io, I_T, OR I_{SC} IS LESS THAN OR EQUAL TO 300mA
P_1 or P_{MAX} = 1.3 WATT	P_1 $(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
C_1 = 0μf	C_A IS GREATER THAN 0μf
L_1 = 0μH	L_A IS GREATER THAN 0μH
T4 (Ta = -50°C TO +60°C)	

HART RTD SENSOR PARAMETERS

Vt = 7.14
It = 3.64mA
Po = 6.5mW
Ca = 13.5nF
La = 1 H

FIELDBUS RTD SENSOR PARAMETERS

Vt = 30V
It = 18.24mA
Po = 137mW
Ca = 65.2nF
La = 239 mH

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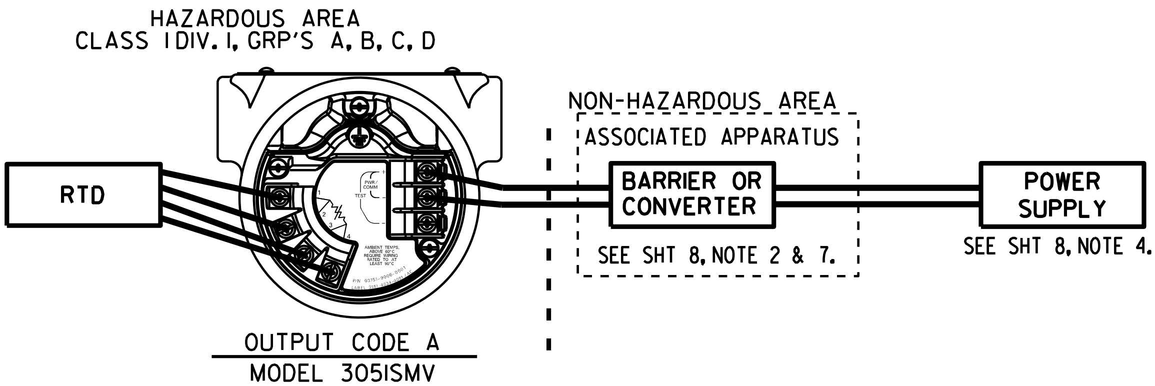
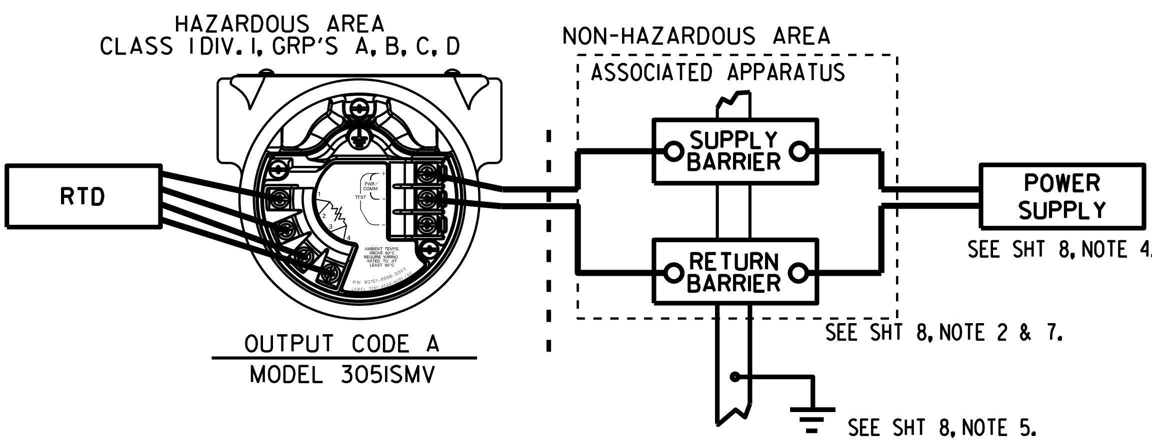
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1206	
ISSUED	SCALE N/A	WT. ————	SHEET 2 OF 8	

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

CIRCUIT DIAGRAM 1
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL



CIRCUIT DIAGRAM 2
SUPPLY AND RETURN BARRIERS
(ONLY FOR USE WITH BARRIERS APPROVED IN THIS CONFIGURATION)



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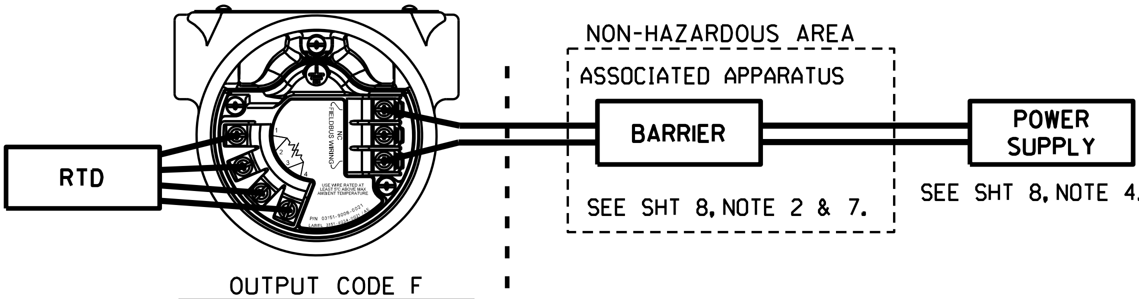
ISSUED	SCALE N/A	WT.		SHEET 3 OF 8

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

CIRCUIT DIAGRAM I
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL

HAZARDOUS AREA
CLASS I, DIV. I, GRP'S A, B, C, D



OUTPUT CODE F

MODELS INCLUDED
305ISMV WITH 300SMV
PLANTWEB HOUSING

Rosemount Inc.
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DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1206
ISSUED	SCALE N/A	WT. ———	SHEET 4 OF 8

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

FISCO CONCEPT

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (U_i OR V_{max}), THE CURRENT (I_i OR I_{max}), AND THE POWER (P_i or P_{max}) WHICH AN INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE CONSIDERING FAULTS, MUST BE EQUAL OR GREATER THAN 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. IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (C_i) AND THE INDUCTANCE (L_i) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 μH RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE U_o (OR V_{oc} OR V_t) OF THE ASSOCIATED APPARATUS IS LIMITED TO A RANGE OF 14V TO 24Vd.c. ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.

THE CABLE USED TO INTERCONNECT DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

Loop Resistance R':	15.....150 Ohm/km
Inductance per unit length L':	0.4.....1 mH/km
Capacitance per unit length C':	80.....200 nF

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

Length of trunk cable:	less than or equal to 1000m
Length of spur cable:	less than or equal to 30m
Length of spur splice:	less than or equal to 1m

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE LINE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE:

R = 90.....100Ohm C = 0.....2.2uF

ONE OF THE ALLOWED TERMINATIONS MIGHT ALREADY BE INTEGRATED IN THE ASSOCIATED APPARATUS. THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED DUE TO I.S. REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF TRUNK AND ALL SPUR CABLES) OF CABLE IS PERMITED. THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

Rosemount Inc.
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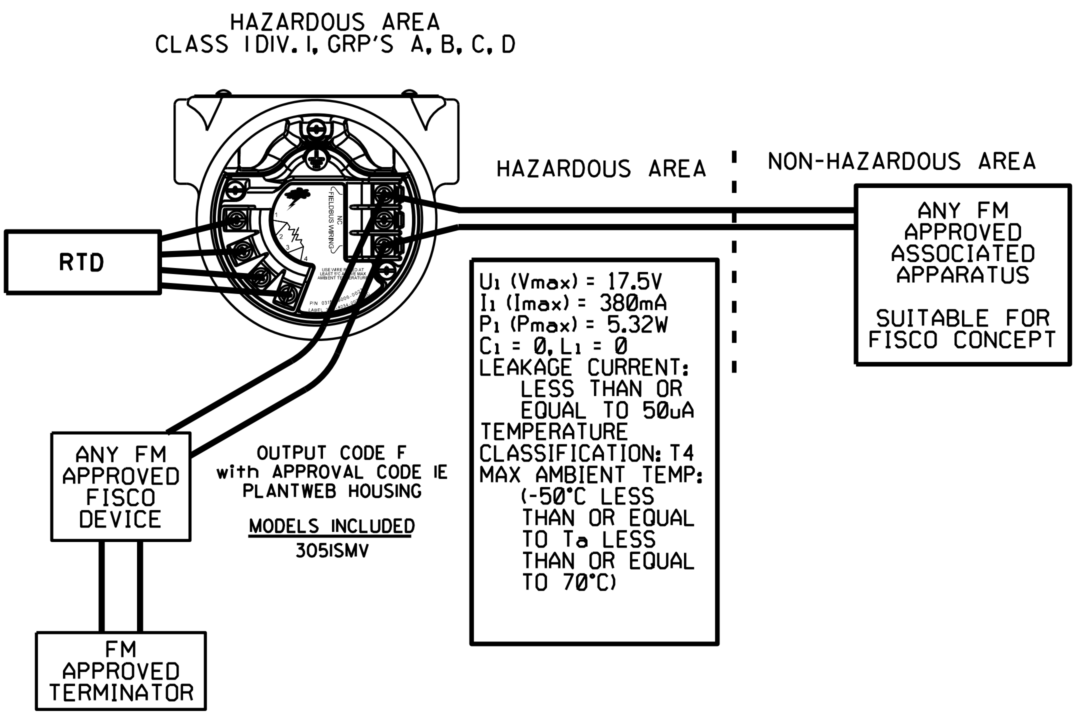
CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO.	03151-1206
ISSUED	SCALE N/A	WT. ————	SHEET 5 OF 8	

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



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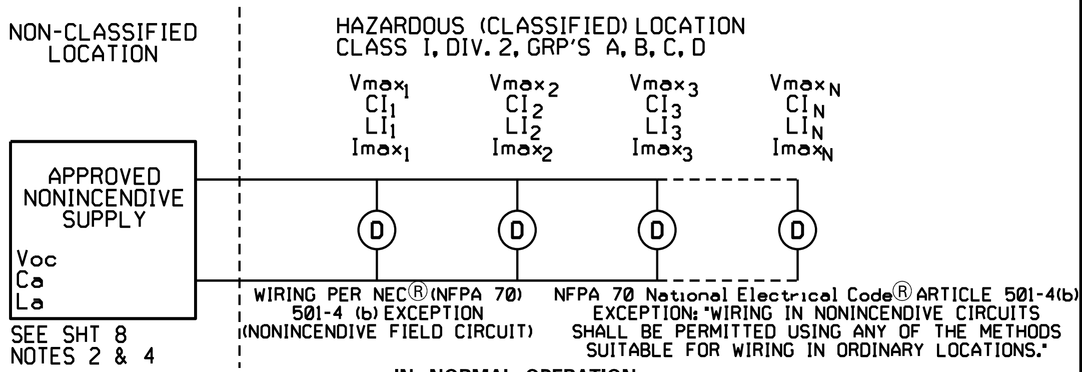
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1206
ISSUED	SCALE N/A	WT. ———	SHEET 6 OF 8

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

NONINCENDIVE FIELD CIRCUIT
CLASS I, DIV. 2 LOCATIONS



IN NORMAL OPERATION

DEVICES CONTROL THROUGH–CURRENT

PARAMETERS (NON-INCENDIVE FIELD WIRING) **DEVICE**

ROSEMOUNT 3051SMV

	4-20mA / HART	FIELDBUS	FISCO
Vmax	42.4v	32v	17.5v
Maximum normal operating current	22mA	17.5mA	17.5mA
Ci	14.8nF	0nF	0nF
Li	0uH	0uH	0uH

$Imax_N >= Iq_N + Isignal_N$

Imax for an individual device = Iq + Isignal

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

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

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

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

TEMP CODE: T4 (Ta = -50°C TO +70°C

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CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1206
ISSUED	SCALE N/A	WT. ————	SHEET 7 OF 8

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

NOTES:

1. NO REVISION TO THIS DRAWING WITHOUT PRIOR FM APPROVAL.
2. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
3. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
4. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms or Vdc.
5. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 OHM.
6. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA-RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).
7. THE ASSOCIATED APPARATUS MUST BE FM APPROVED.
8. WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
9. THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:
   V_{max} or U_1 IS GREATER THAN or EQUAL TO V_{oc}, V_t or U_o
   I_{max} or I_1 IS GRETER THAN or EQUAL TO I_{sc}, I_t or I_o
   P_{max} or P_1 IS GRETER THAN or EQUAL TO P_o
   C_a IS GREATER THAN or EQUAL TO THE SUM OF ALL C_1's PLUS C_{cable}
   L_a IS GREATER THAN or EQUAL TO THE SUM OF ALL L_1's PLUS L_{cable}
10. WARNING - TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.
11. THE ASSOCIATED APPARATUS MUST BE A RESISTIVELY LIMITED SINGLE OR MULTIPLE CHANNEL FM APPROVED BARRIER HAVEING PARAMETERS LESS THAN THOSE QUOTED, AND FOR WHICH THE OUTPUT AND THE COMBINATIONS OF OUTPUTS IS NON-IGNITION CAPABLE FOR THE CLASS, DIVISION AND GROUP OF USE.
12. USE WIRE RATED AT LEAST 5°C ABOVE MAXIMUM AMBIENT TEMPERATURE.

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Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO		DWG NO.	03151-1206
ISSUED	SCALE N/A	WT.		SHEET 8 OF 8	

Figure B-2. Canadian Standards Association (CSA)

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REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	NEW RELEASE	RTC1025256	A.J.W.	1/2/08
AB	ADD NOTE 7	RTC1026347	A.J.W.	6/24/08
AC	ADD NOTE 8; UPDATE COMMUNICATOR	RTC1057766	T.J.L.	9/6/13
AD	UPDATES FOR FIELDBUS SUBMITTAL	RTC1058998	A.S.	2/5/14

APPROVALS FOR

OUTPUT CODE "A" and "F" I.S. ENTITY PARAMETERS SHEET 2
OUTPUT CODE "A" (4-20 mA HART) I.S. SEE SHEETS 3 & 4
OUTPUT CODE "F (FIELDBUS) I.S. SEE SHEET 5
FISCO SEE SHEETS 6 & 7

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

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

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

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]

FRACTIONS ± 1/32 — ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.
DR. Myles Lee Miller 12/17/07
CHK'D
APP'D.
APP'D. GOVT.

EMERSON Process Management

ROSEMOUNT®
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TITLE INDEX OF I.S. CSA FOR 3051SMV

SIZE A | FSCM NO | DWG NO. 03151-1207

SCALE N/A | WT. | SHEET 1 OF 8

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 (Voc) AND MAX. SHORT CIRCUIT CURRENT (Isc) AND MAX.POWER (Voc X Isc/4), FOR THE ASSOCIATED APPARATUS MUST BE LESS THAN OR EQUAL TO THE MAXIMUM SAFE INPUT VOLTAGE (Vmax), MAXIMUM SAFE INPUT CURRENT (Imax), AND MAXIMUM SAFE INPUT POWER (Pmax) OF THE INTRINSICALLY SAFE APPARATUS. IN ADDITION, THE APPROVED MAX. ALLOWABLE CONNECTED CAPACITANCE (Ca) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE CAPACITANCE AND THE UNPROTECTED INTERNAL CAPACITANCE (Ci) OF THE INTRINSICALLY SAFE APPARATUS, AND THE APPROVED MAX. ALLOWABLE CONNECTED INDUCTANCE (La) OF THE ASSOCIATED APPARATUS MUST BE GREATER THAN THE SUM OF THE INTERCONNECTING CABLE INDUCTANCE AND THE UNPROTECTED INTERNAL INDUCTANCE (Li) OF THE INTRINSICALLY SAFE APPARATUS.

FOR OUTPUT CODE "A" MODEL 3051SMV CLASS I, DIV. 1, GROUPS A, B, C AND D

U_I or V_{MAX} = 30V	U_O, V_T or V_{OC} IS LESS THAN OR EQUAL TO 30V
I_I or I_{MAX} = 300mA	I_O, I_T or I_{SC} IS LESS THAN OR EQUAL TO 300mA
P_I or P_{MAX} = 1.0 WATT	$(\frac{V_T \times I_T}{4})$ or $(\frac{V_{OC} \times I_{OS}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
C_I = 14.8nF	C_A IS GREATER THAN 14.8nF
L_I = 0μH	L_A IS GREATER THAN 0μH
T4 (Ta=-50°C to +70°C)	

FOR OUTPUT CODE "F" MODEL 3051SMV CLASS I, DIV. 1, GROUPS A, B, C AND D

U_I or V_{MAX} = 30V	U_O, V_T, OR V_{OC} IS LESS THAN OR EQUAL TO 30V
I_I or I_{MAX} = 300mA	I_O, I_T, OR I_{SC} IS LESS THAN OR EQUAL TO 300mA
P_I or P_{MAX} = 1.3 WATT	P_I $(\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
C_I = 0μf	C_A IS GREATER THAN 0μf
L_I = 0μH	L_A IS GREATER THAN 0μH
T4 (Ta = -50°C TO +60°C)	

HART RTD SENSOR PARAMETERS

Vt = 30V
It = 2.31mA
Po = 17.32mW
Ca = 65.2nF
La = 1 H

FIELDBUS RTD SENSOR PARAMETERS

Vt = 30V
It = 18.24mA
Po = 137mW
Ca = 65.2nF
La = 239 mH

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

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA	CAD MAINTAINED (MicroStation)				
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1207		
ISSUED	SCALE N/A	WT. ——	SHEET 2 OF 8		

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

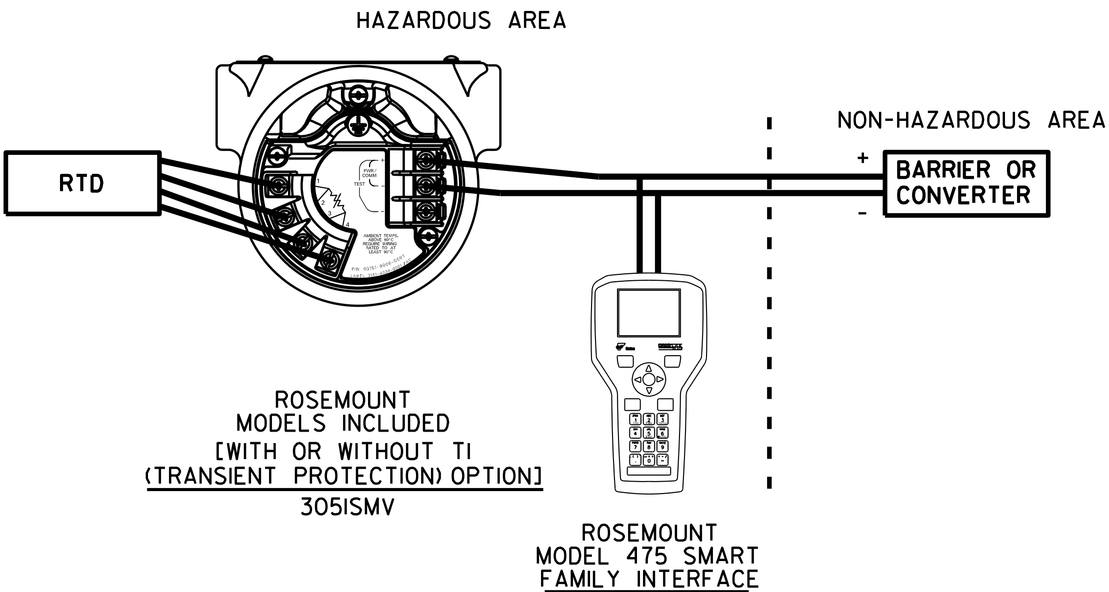
CSA INTRINSIC SAFETY APPROVALS

CIRCUIT CONNECTION WITH BARRIER OR CONVERTER

Ex ia

INTRINSICALLY SAFE/SECURITE INTRINSEQUE

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



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Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller 12/17/07	SIZE A	FSCM NO	DWG NO. 03151-1207	
ISSUED	SCALE N/A	WT.	SHEET 3 OF 8	

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-12V-CGB, 2AI-13V-CGB, 2AS-131-CGB, 3A2-12D-CGB, 3A2-13D-CGB, 3AD-131-CGB, 3A4-12D-CGB, 2AS-121-CGB, 3F4-12DA		GROUPS B, C, D
CSA APPROVED SAFETY BARRIER	30 V OR LESS 150 OHMS OR MORE	GROUPS C, D

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA	CAD MAINTAINED (MicroStation)			
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1207	
ISSUED	SCALE N/A	WT. ————	SHEET 4 OF 8	

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

FIELDBUS, ("F" OUTPUT CODE)

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

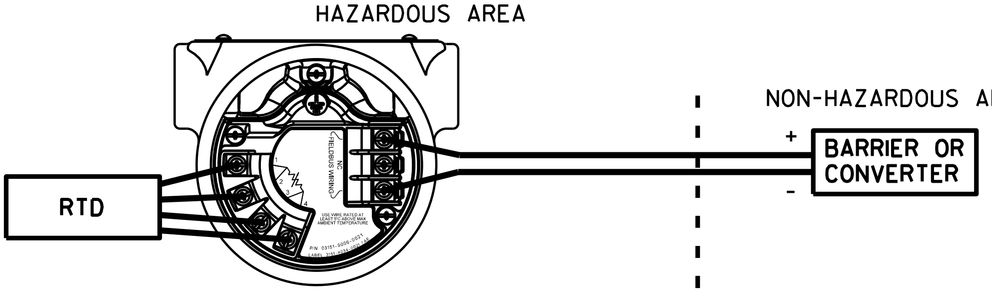
CSA INTRINSIC SAFETY APPROVALS

CIRCUIT CONNECTION WITH BARRIER OR CONVERTER

Ex ia

INTRINSICALLY SAFE/SECURITE INTRINSEQUE
FIELDBUS, ("F" OUTPUT CODE)

HAZARDOUS AREA



ROSEMOUNT **
MODELS INCLUDED
[WITH OR WITHOUT TI
(TRANSIENT PROTECTION) OPTION]

305ISMV with
PLANTWEB HOUSING

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

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

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CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1207	
ISSUED	SCALE N/A	WT. ————	SHEET 5 OF 8	

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

FISCO CONCEPT

THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (Vmax), THE CURRENT (Imax), AND THE POWER (Pmax) WHICH AN INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE CONSIDERING FAULTS, MUST BE EQUAL OR GREATER THAN VOLTAGE (Voc), AND CURRENT (Isc) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (C_i) AND THE INDUCTANCE (L_i) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 µH RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE (Voc) OF THE ASSOCIATED APPARATUS IS LIMITED TO A RANGE OF 14V TO 24Vd.c. ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT A LEAKAGE CURRENT OF 50uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.
THE CABLE USED TO INTERCONNECT DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

Loop Resistance R': 15.....150 Ohm/km
Inductance per unit length L': 0.4.....1 mH/km
Capacitance per unit length C': 80.....200 nF
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
Length of trunk cable: less than or equal to 1000m
Length of spur cable: less than or equal to 30m
Length of spur splice: less than or equal to 1m

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE LINE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE:

R = 90.....100Ohm C = 0.....2.2uF

ONE OF THE ALLOWED TERMINATIONS MIGHT ALREADY BE INTEGRATED IN THE ASSOCIATED APPARATUS. THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED DUE TO I.S. REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF TRUNK AND ALL SPUR CABLES) OF CABLE IS PERMITED. THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

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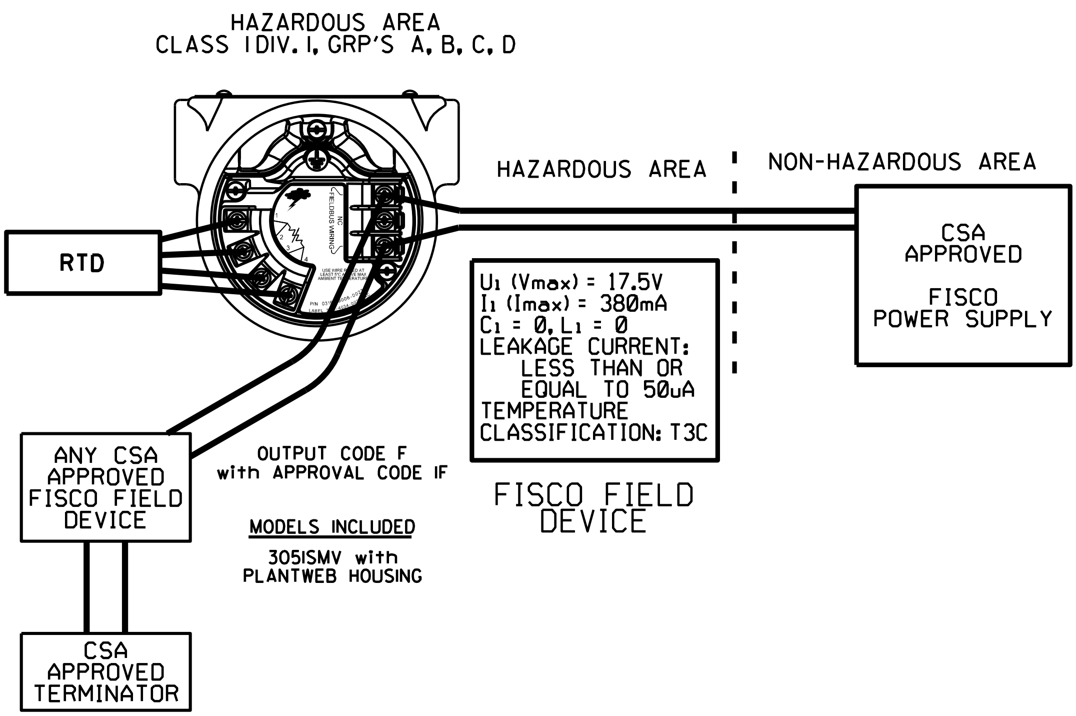
CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO.	03151-1207
ISSUED	SCALE N/A	WT. ———	SHEET 6 OF 8	

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



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CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO.	03151-1207
ISSUED	SCALE N/A	WT. ———	SHEET 7 OF 8	

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

NOTES:

1. APPROVED ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. CSA APPROVED ASSOCIATED APPARATUS MUST MEET THE FOLLOWING PARAMETERS: Voc/Uo LESS THAN OR EQUAL TO Vmax/V_1 AND Isc/Io LESS THAN OR EQUAL TO Imax/I_1.
3. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250V.
4. THE INSTALLATION MUST BE IN ACCORDANCE WITH CANADIAN ELECTRICAL CODE, SECTION 18.
5. USE WIRE RATED AT LEAST 5°C ABOVE MAXIMUM AMBIENT TEMPERATURE.
6. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
7. THIS PRODUCT MEETS THE DUAL SEAL REQUIREMENTS OF ANSI/ISA 12.27.01. NO ADDITIONAL PROCESS SEALING IS REQUIRED. THE DUAL SEAL PROCESS TEMPERATURE RANGE IS -50°C TO 315°C. FOR THE IN-SERVICE LIMITS APPLICABLE TO A SPECIFIC MODEL, SEE "PROCESS TEMPERATURE LIMITS" IN APPENDIX "A" OF THE PRODUCT MANUAL.
8. TEMPERATURE CODE T3C AT 70°C MAXIMUM OPERATING TEMPERATURE.

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Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1207	
ISSUED	SCALE N/A	WT. ——	SHEET 8 OF 8	

Figure B-3. GE/GM Option NEMA® 4X

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

REVISIONS				
REV	DESCRIPTION	ECO NO.	APP'D	DATE
AA	NEW RELEASE	RTC1022362	B.L.H.	9/1/06

NOTES:

1. USE TURCK CORDSETS AS SPECIFIED IN THIS DRAWING WITH GE / GM OPTION TO ENSURE OUTDOOR RATING (NEMA 4X or IP66).
2. (△) LOK-FAST GUARD IS REQUIRED FOR CLASS I DIVISION 2 INSTALLATIONS.
3. (△) (X)XXV 49-4.5IN/14.5 IS INSTALLED INTO 1/2-14 NPT CONDUIT ENTRY THREADS. (X)XXV 49-4.5IN/M20 IS INSTALLED INTO CM20 CONDUIT ENTRY THREADS.
4. eurofast® AND minifast® ARE REGISTERED TRADEMARKS OF TURCK INC.

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCES-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]

FRACTIONS ± 1/32 ANGLES ± 2°

DO NOT SCALE PRINT

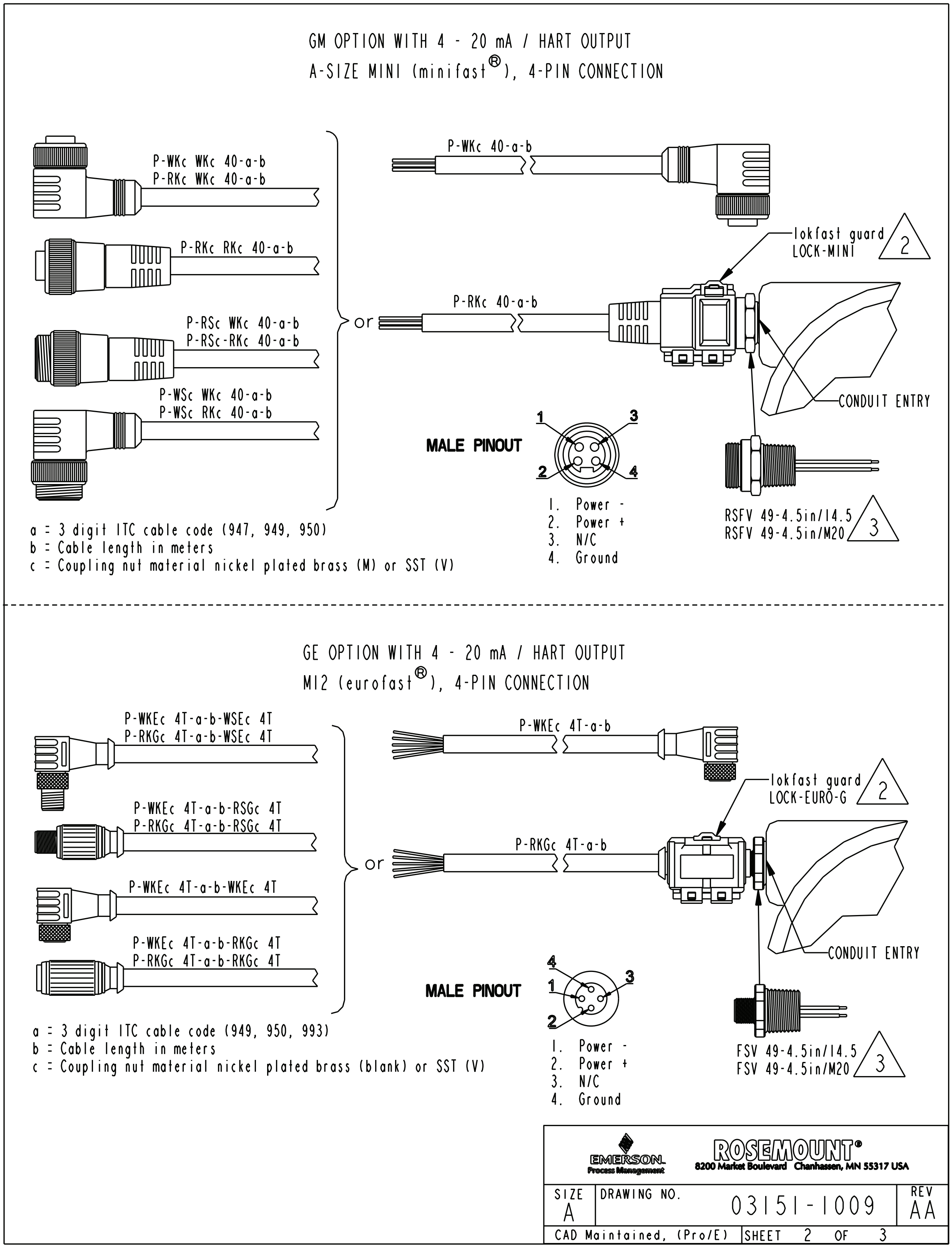
Form Rev AA

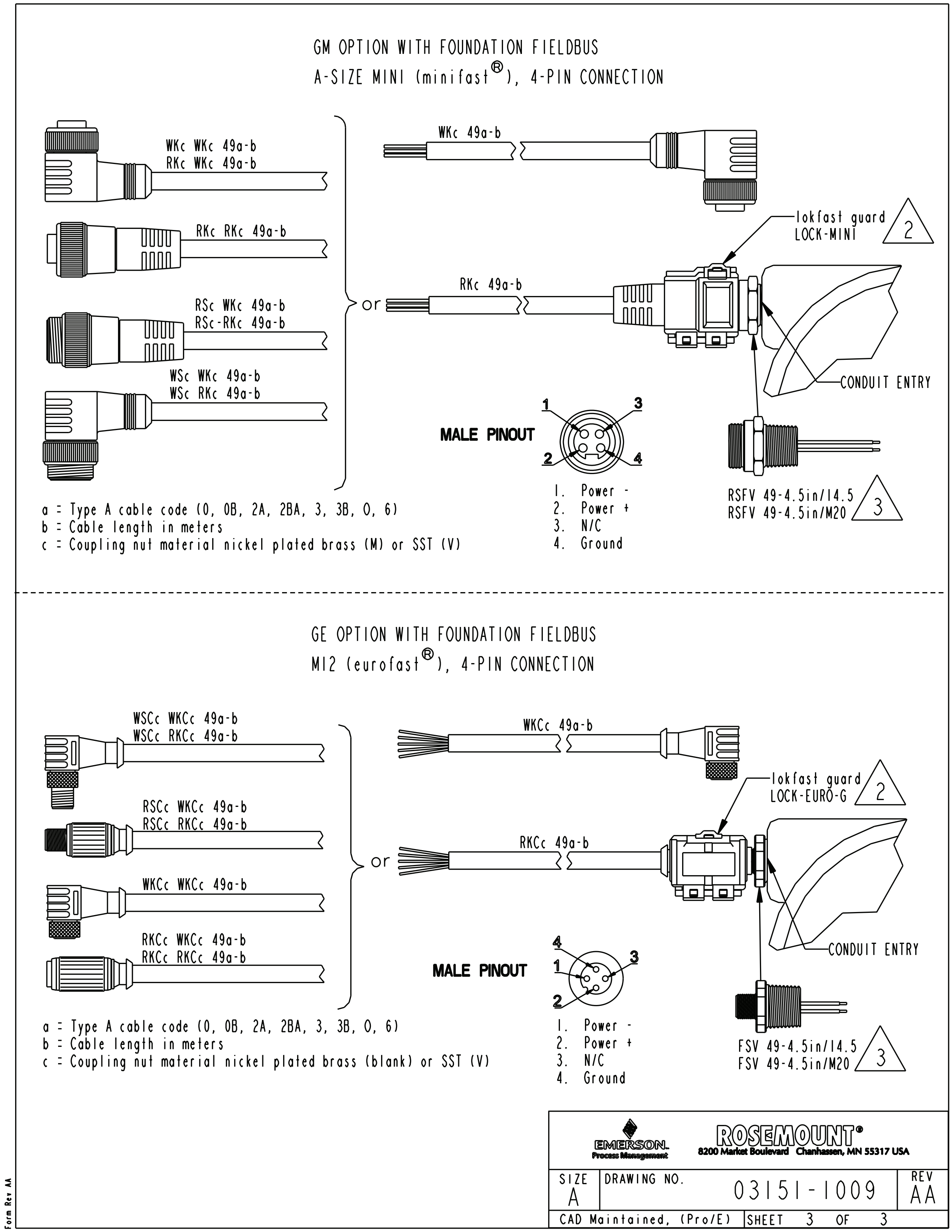
EMERSON. Process Management
ROSEMOUNT®
8200 Market Boulevard Chanhassen, MN 55317 USA

TITLE: GE / GM OPTION NEMA 4X INSTALLATION, FM

DR.	Myles Lee Miller	8/29/06	SIZE	DRAWING NO.	REV
APP'D	Bryce Hagbom	8/30/06	A	03151-1009	AA

CAD MAINTAINED, (PRO/E) SHEET 1 OF 3


GM OPTION WITH 4 - 20 mA / HART OUTPUT
A-SIZE MINI (minifast®), 4-PIN CONNECTION
P-WKc WKc 40-a-b
P-RKc WKc 40-a-b
P-RKc RKc 40-a-b
P-RSc WKc 40-a-b
P-RSc-RKc 40-a-b
P-WSc WKc 40-a-b
P-WSc RKc 40-a-b
or
P-WKc 40-a-b
P-RKc 40-a-b
lokfast guard
LOCK-MINI
2
CONDUIT ENTRY
MALE PINOUT
1
2
3
4
1. Power -
2. Power +
3. N/C
4. Ground
RSFV 49-4.5in/14.5
RSFV 49-4.5in/M20
3
a = 3 digit ITC cable code (947, 949, 950)
b = Cable length in meters
c = Coupling nut material nickel plated brass (M) or SST (V)
GE OPTION WITH 4 - 20 mA / HART OUTPUT
M12 (eurofast®), 4-PIN CONNECTION
P-WKEc 4T-a-b-WSEc 4T
P-RKGc 4T-a-b-WSEc 4T
P-WKEc 4T-a-b-RSGc 4T
P-RKGc 4T-a-b-RSGc 4T
P-WKEc 4T-a-b-WKEc 4T
P-WKEc 4T-a-b-RKGc 4T
P-RKGc 4T-a-b-RKGc 4T
or
P-WKEc 4T-a-b
P-RKGc 4T-a-b
lokfast guard
LOCK-EURO-G
2
CONDUIT ENTRY
MALE PINOUT
4
1
2
3
1. Power -
2. Power +
3. N/C
4. Ground
FSV 49-4.5in/14.5
FSV 49-4.5in/M20
3
a = 3 digit ITC cable code (949, 950, 993)
b = Cable length in meters
c = Coupling nut material nickel plated brass (blank) or SST (V)
EMERSON
Process Management
ROSEMOUNT®
8200 Market Boulevard Chanhassen, MN 55317 USA
SIZE
A
DRAWING NO.
03151-1009
REV
AA
CAD Maintained, (Pro/E)
SHEET 2 OF 3


GM OPTION WITH FOUNDATION FIELDBUS
A-SIZE MINI (minifast®), 4-PIN CONNECTION
WKc WKc 49a-b
RKc WKc 49a-b
RKc RKc 49a-b
RSc WKc 49a-b
RSc-RKc 49a-b
WSc WKc 49a-b
WSc RKc 49a-b
or
WKc 49a-b
RKc 49a-b
lokfast guard
LOCK-MINI
2
CONDUIT ENTRY
MALE PINOUT
1
2
3
4
RSFV 49-4.5in/14.5
RSFV 49-4.5in/M20
3
a = Type A cable code (0, 0B, 2A, 2BA, 3, 3B, O, 6)
b = Cable length in meters
c = Coupling nut material nickel plated brass (M) or SST (V)
1. Power -
2. Power +
3. N/C
4. Ground
GE OPTION WITH FOUNDATION FIELDBUS
M12 (eurofast®), 4-PIN CONNECTION
WSCc WKCc 49a-b
WSCc RKCc 49a-b
RSCc WKCc 49a-b
RSCc RKCc 49a-b
WKCc WKCc 49a-b
RKCc WKCc 49a-b
RKCc RKCc 49a-b
or
WKCc 49a-b
RKCc 49a-b
lokfast guard
LOCK-EURO-G
2
CONDUIT ENTRY
MALE PINOUT
4
1
3
2
FSV 49-4.5in/14.5
FSV 49-4.5in/M20
3
a = Type A cable code (0, 0B, 2A, 2BA, 3, 3B, O, 6)
b = Cable length in meters
c = Coupling nut material nickel plated brass (blank) or SST (V)
1. Power -
2. Power +
3. N/C
4. Ground
EMERSON. Process Management
ROSEMOUNT®
8200 Market Boulevard Chanhassen, MN 55317 USA
SIZE A
DRAWING NO. 03151-1009
REV AA
CAD Maintained, (Pro/E)
SHEET 3 OF 3
Form Rev AA

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ROSEMOUNT

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