

Rosemount 3051S Series Pressure Transmitter Family

with FOUNDATION[™] fieldbus Protocol



ROSEMOUNT[®]

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EMERSON[™]
Process Management

Rosemount 3051S Series Pressure Transmitter with FOUNDATION fieldbus Protocol

NOTICE

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

Within the United States, Rosemount Inc. has two toll-free assistance numbers:

Customer Central

Technical support, quoting, and order-related questions.

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

North American Response Center

Equipment service needs.

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

Outside of the United States, contact your local Emerson Process Management representative.

CAUTION

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

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

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Section 1 Introduction

OVERVIEW

This manual is for the 3051S Series Pressure Transmitter with FOUNDATION fieldbus communications. This transmitter's scalable architecture allows putting a FOUNDATION fieldbus output board with any performance class 3051S supermodule and any of its process connections.

This manual only describes the topics required for installation, operation, configuration, and troubleshooting the FOUNDATION fieldbus transmitter.

For Rosemount 3051S with HART, see Manual 00809-0100-4801.

USING THIS MANUAL

The sections in this manual provide information on configuring, troubleshooting, operating and maintaining Rosemount 3051S Series Pressure Transmitters specifically for FOUNDATION fieldbus protocol.

The sections in this manual are organized as follows:

- **Section 2: Installation** contains mechanical and electrical installation instructions, and field upgrade options.
- **Section 3: Configuration** provides instruction on configuration of the Rosemount 3051S Series transmitters with fieldbus protocol. Information on software functions, configuration parameters, and other variables are also included.
- **Section 4: Operation and Maintenance** contains operation and maintenance techniques.
- **Section 5: Troubleshooting** provides troubleshooting techniques for the most common operating problems.
- **Appendix A: Foundation Fieldbus Block Information** supplies reference block information such as parameter tables.
- **Appendix B: Specifications and Reference Data** supplies reference and specification data, as well as ordering information.
- **Appendix C: Product Certifications** contains intrinsic safety approval information, European ATEX directive information, and approval drawings.
- **Appendix D: 3051S Foundation Fieldbus Revision 23 Release** contains new function block and new functionality information.

Service Support

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

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

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

CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. 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.

Rosemount National Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

DEVICE DESCRIPTION

Before configuring the device, ensure the host has the appropriate Device Description file revision for this device. The device descriptor can be found on www.fieldbus.org. The initial release of the Rosemount 3051S with FOUNDATION fieldbus protocol is device revision 20. This manual is for revision 23.

NODE ADDRESS

The transmitter is shipped at a temporary (248) address. This will enable FOUNDATION fieldbus host systems to automatically recognize the device and move it to a permanent address.

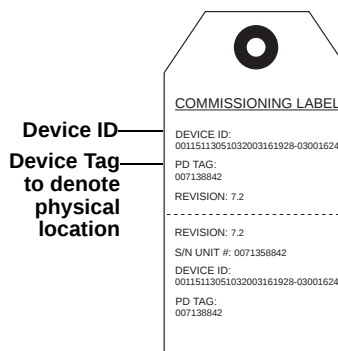
TAGGING

Commissioning Tag

The 3051S has been supplied with a removable commissioning tag that contains both the Device ID (the unique code that identifies a particular device in the absence of a device tag) and a space to record the device tag (PD_TAG) (the operational identification for the device as defined by the Piping and Instrumentation Diagram (P&ID)).

When commissioning more than one device on a fieldbus segment, it can be difficult to identify which device is at a particular location. The removable tag, provided with the transmitter, can aid in this process by linking the Device ID to its physical location. The installer should note the physical location of the transmitter on both the upper and lower location of the commissioning tag. The bottom portion should be torn off for each device on the segment and used for commissioning the segment in the control system.

Figure 1-1. Commissioning Tag



Transmitter Tag

If permanent tag is ordered:

- Transmitter is tagged in accordance with customer requirements
- Tag is permanently attached to the transmitter

Software (PD_TAG)

- If permanent tag is ordered, the PD Tag contains the permanent tag information up to 30 characters
- If permanent tag is NOT ordered, the PD Tag contains the transmitter serial number

FOUNDATION FIELDBUS FUNCTION BLOCKS

For reference information on the Resource, Sensor Transducer, AI, LCD Transducer, Advanced Diagnostics Transducer blocks refer to “Foundation Fieldbus Block Information” on page A-1. Reference information on the ISEL, INT, ARTH, SGCR and PID blocks can be found in the Function Block manual document number 00809-0100-4783.

Resource Block

The Resource block contains diagnostic, hardware and electronics information. There are no linkable inputs or outputs to the Resource Block.

Sensor Transducer Block

The Sensor Transducer Block contains sensor information including the sensor diagnostics and the ability to trim the pressure sensor or recall factory calibration.

LCD Transducer Block

The LCD Transducer Block is used to configure the LCD meter.

Advanced Diagnostics Transducer Block

The Advanced Diagnostics Transducer Block is optionally licensed. It will be licensed on a new transmitter if the D01 option is ordered or can be licensed in the field via a licensing code. Please contact your local sales person on how to acquire a license for a field upgrade.

This block allows a user to view, configure and monitor the plugged impulse line detection and statistical process monitoring diagnostics.

Analog Input Block

The Analog Input (AI) Function Block processes the measurements from the sensor and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The AI block is widely used for scaling functionality.

Input Selector Block

The Input Selector (ISEL) Function Block can be used to select the first good, Hot Backup, maximum, minimum, or average of as many as eight input values and place it at the output. The block supports signal status propagation.

Integrator Block

The Integrator (INT) Function Block integrates one or two variables over time. The block compares the integrated or accumulated value to pre-trip and trip limits and generates discrete output signals when the limits are reached.

Arithmetic Block

The Arithmetic (ARTH) Function Block provides the ability to configure a range extension function for a primary input. It can also be used to compute nine different arithmetic functions.

Signal Characterizer Block

The Signal Characterizer (SGCR) Function Block characterizes or approximates any function that defines an input/output relationship. The function is defined by configuring as many as twenty X,Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates. Two separate analog input signals can be processed simultaneously to give two corresponding separate output values using the same defined curve.

PID Block

The PID Function Block combines all of the necessary logic to perform proportional/integral/derivative (PID) control. The block supports mode control, signal scaling and limiting, feed forward control, override tracking, alarm limit detection, and signal status propagation.

The block supports two forms of the PID equation: Standard and Series. You can choose the appropriate equation using the MATHFORM parameter. The Standard ISA PID equation is the default selection.

Integrator Block

The Integrator Block is used as a totalizer. This block will accept up to two inputs, has six options how to totalize the inputs, and two trip outputs.

Control Selector Block

The Control Selector Function Block selects one of two or three inputs to be the output. The inputs are normally connected to the outputs of PID or other function blocks. One of the inputs would be considered Normal and the other two overrides.

Output Splitter Block

The Output Splitter Function Block provides the capability to drive two control outputs from a single input. It takes the output of one PID or other control block to control two valves or other actuators.

Multiple Analog Input Block

The Multiple Analog Input Block allows for up to 8 variables to be published in one macro cycle. The primary purpose of this block to publish data that is channeled to it from the Advanced Diagnostic Block.

Analog Output Block

The Analog Output Function Block accepts an output value from a field device and assigns it to a specified I/O channel.

Mass Flow Transducer Block

The Mass Flow Function Block is an optionally licensed transducer block (H01 option) that will output a fully compensated mass flow value. It accepts Differential pressure, gage or absolute pressure and temperature inputs and then uses the flow calculation equation generated by the Engineering Assistant configuration tool to derive the output. The user can enter a fixed temperature if a temperature device is not available.

Table 1-1. Block Index Numbers

Block Name	Revision 20	Revision 23
Advanced Diagnostic Block	1300	1300
Analog Input Block	1400, 1500	1400, 1500, 2100, 2200
PID Block	1600	1600
Input Selector Block	1700	1700, 2400
Signal Characterizer Block	1800	1800
Arithmetic Block	1900	1900
Integrator Block	2000	2000
Multiple Analog Input Block		2300
Control Selector Block		2500
Output Splitter Block		2600
Analog Output Block		2700, 2800
Mass Flow		2900

Section 2 Installation

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OVERVIEW

The information in this section covers installation considerations for 3051S with protocol. A Quick Installation Guide for this product (document number 00825-0200-4801) is shipped with every transmitter to describe basic installation, wiring, and startup procedures. Dimensional drawings for each Rosemount 3051S variation and mounting configuration are included in Appendix B: Specifications and Reference Data.

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.

Warnings

WARNING

Explosions can result in death or serious injury.

- Do not remove the transmitter covers in explosive environments when the circuit is live.
- Fully engage both transmitter covers to meet explosion-proof requirements.
- Before connecting a 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.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals.

Process leaks could result in death or serious injury.

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

Replacement equipment or spare parts not approved by Rosemount Inc. 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 Rosemount Inc. as spare parts.

Improper assembly of manifolds to traditional flange can damage SuperModule™ Platform.

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

Upper and lower unit labeling must match exactly to maintain hazardous location approvals.

- When upgrading, it is imperative that approval codes match between the SuperModule and the electronics housing.

CONSIDERATIONS

General

Measurement performance depends upon proper installation of the transmitter and impulse piping. 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.

IMPORTANT

Install the enclosed pipe plug (found in the box) in the unused conduit opening. For straight threads, a minimum of 6 threads must be engaged. For tapered threads, install the plug wrench-tight.

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

Mechanical

NOTE

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

NOTE

When the transmitter is mounted on its side, position the Coplanar flange to ensure proper venting or draining. Mount the flange as shown in Figure 2-2 on page 2-9, keeping drain/vent connections on the bottom for gas service and on the top for liquid service.

Draft Range

Installation

For the 3051S_CD0 draft range pressure transmitter, it is best to mount the transmitter with the isolators parallel to the ground. Installing the transmitter in this way reduces oil mounting effect and provides for optimal temperature performance.

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

Reducing Process Noise

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

Reference Side Filtering

In gage applications it is important to minimize fluctuations in atmospheric pressure to which the low side isolator is exposed. One method of reducing fluctuations in atmospheric pressure is to attach a length of tubing to the reference side of the transmitter to act as a pressure buffer.

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

Environmental

Access requirements and cover installation on page 2-4 can help optimize transmitter performance. Mount the transmitter to minimize ambient temperature changes, vibration, mechanical shock, and to avoid external contact with corrosive materials. Appendix B: Specifications and Reference Data lists temperature operating limits.

INSTALLATION PROCEDURES

For dimensional drawing information refer to Appendix B: Specifications and Reference Data on page B-15.

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.

Housing Rotation

See "Consider Housing Rotation" on page 2-11.

Terminal Side of Electronics Housing

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

Circuit Side of Electronics Housing

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

Cover Installation

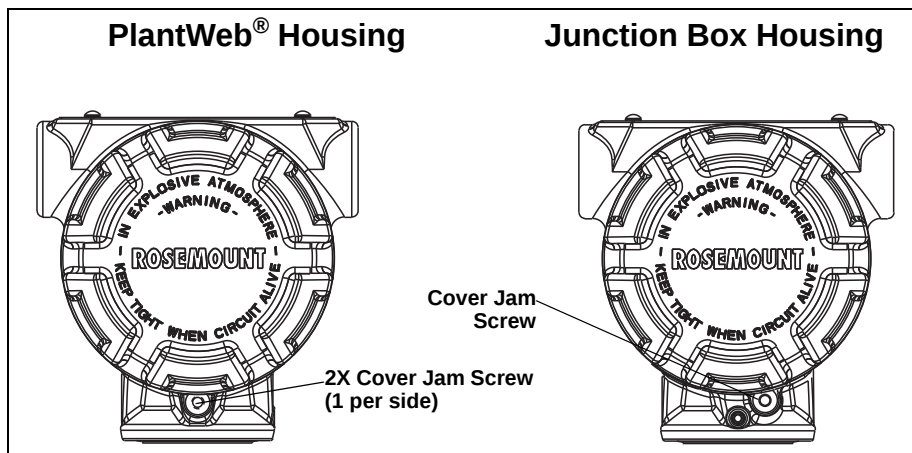
Always ensure a proper seal by installing the electronics housing cover(s) so that metal contacts metal. Use Rosemount O-rings.

Cover Jam Screw

For transmitter housings shipped with a cover jam screw, as shown in Figure 2-1, the screw should be properly installed once the transmitter has been wired and powered up. The cover jam screw is intended to disallow the removal of the transmitter cover in flameproof environments without the use of tooling. Follow these steps to install the cover jam screw:

1. Verify that the cover jam screw is completely threaded into the housing.
2. Install the transmitter housing cover and verify that the cover is tight against the housing.
3. Using an M4 hex wrench, loosen the jam screw until it contacts the transmitter cover.
4. Turn the jam screw an additional 1/2 turn counterclockwise to secure the cover. (Note: Application of excessive torque may strip the threads.)
5. Verify that the cover cannot be removed.

Figure 2-1. Cover Jam Screw



Mount the Transmitter

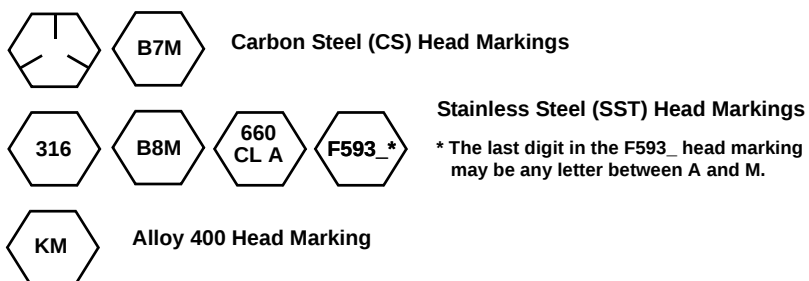
Mounting Brackets

Facilitate mounting transmitter to a 2-in. pipe, or to a panel. The B4 Bracket (SST) option is standard for use with the Coplanar and In-Line process connections. “Coplanar Flange Mounting Configurations” on page B-17 shows bracket dimensions and mounting configurations for the B4 option.

Options B1–B3 and B7–B9 are sturdy, epoxy/polyester-painted brackets designed for use with the traditional flange. The B1–B3 brackets have carbon steel bolts, while the B7–B9 brackets have stainless steel bolts. The BA and BC brackets and bolts are stainless steel. The B1/B7/BA and B3/B9/BC style brackets support 2-inch pipe-mount installations, and the B2/B8 style brackets support panel mounting.

Flange Bolts

The 3051S can be shipped with a Coplanar flange or a Traditional flange installed with four 1.75-inch flange bolts. Mounting bolts and bolting configurations for the Coplanar and Traditional flanges can be found on page 2-7. Stainless steel bolts supplied by Emerson Process Management are coated with a lubricant to ease installation. Carbon steel bolts do not require lubrication. No additional lubricant should be applied when installing either type of bolt. Bolts supplied by Emerson Process Management are identified by their head markings:



Bolt Installation



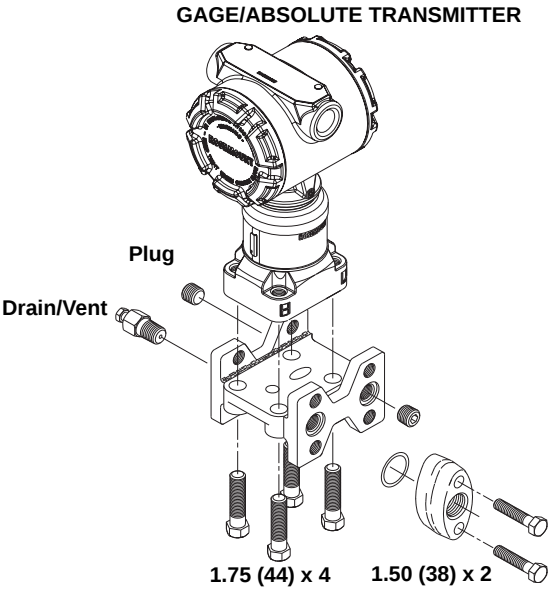
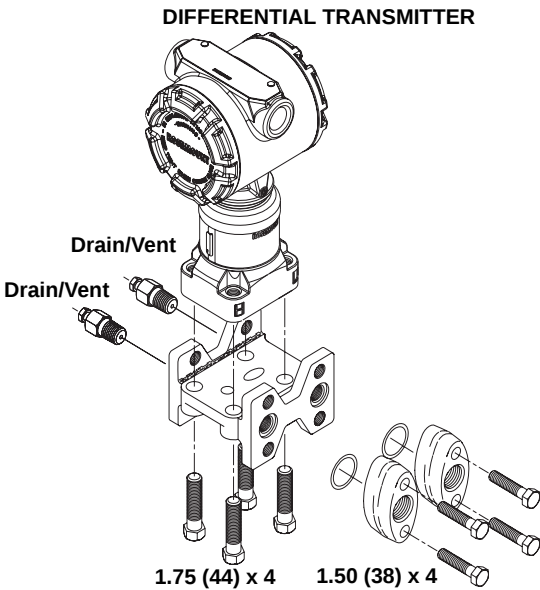
Only use bolts supplied with the Rosemount 3051S or sold by Emerson Process Management as spare parts. When installing the transmitter to one of the optional mounting brackets, torque the bolts to 125 in.-lb. (0,9 N-m). Use the following bolt installation procedure:

1. Finger-tighten the bolts.
2. Torque the bolts to the initial torque value using a crossing pattern.
3. Torque the bolts to the final torque value using the same crossing pattern.

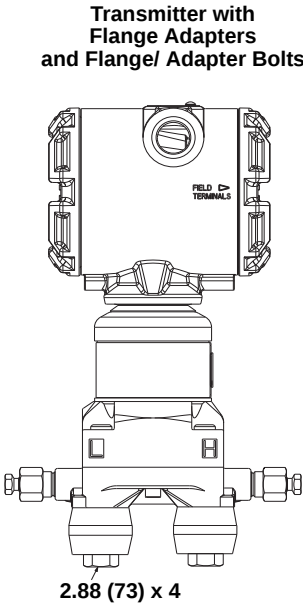
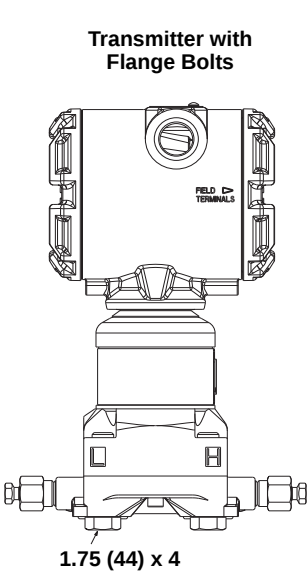
Torque values for the flange and manifold adapter bolts are as follows:

Table 2-1. Bolt Installation Torque Values

Bolt Material	Initial Torque Value	Final Torque Value
CS-ASTM-A445 Standard	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
316 SST—Option L4	150 in.-lb (17 N-m)	300 in.-lb (34 N-m)
ASTM-A-193-B7M—Option L5	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
Alloy 400 —Option L6	300 in.-lb (34 N-m)	650 in.-lb (73 N-m)
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)



NOTE
Dimensions are in inches (millimeters).



Description	Qty	Size in in. (mm)
Differential Pressure		
Flange Bolts	4	1.75 (44)
Adapter Bolts	4	1.50 (38) ⁽¹⁾
Flange/ Adapter Bolts	4	2.88 (73)
Gage/Absolute Pressure⁽²⁾		
Flange Bolts	4	1.75 (44)
Adapter Bolts	2	1.50 (38) ⁽¹⁾
Flange/ Adapter Bolts	2	2.88(73)

(1) DIN-compliant traditional flange requires 1.75 in. (44 mm) length adapter bolts.
(2) Rosemount 3051S In-line transmitters are direct mount and do not require bolts for process connection.

Impulse Piping

The piping between the process and the transmitter must accurately transfer the pressure to obtain accurate measurements. There are five possible sources of error: pressure transfer, leaks, friction loss (particularly if purging is used), trapped gas in a liquid line, liquid in a gas line, 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 inch per foot (8 cm per m) upward from the transmitter toward the process connection.
- For gas service, slope the impulse piping at least 1 inch per foot (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 and flanges.
- Prevent sediment deposits in the impulse piping.
- Keep the liquid head balanced on both legs of the impulse piping.
- Avoid conditions that might allow process fluid to freeze within the process flange.³

Mounting Requirements

Impulse piping configurations depend on specific measurement conditions. Refer to Figure 2-2 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.

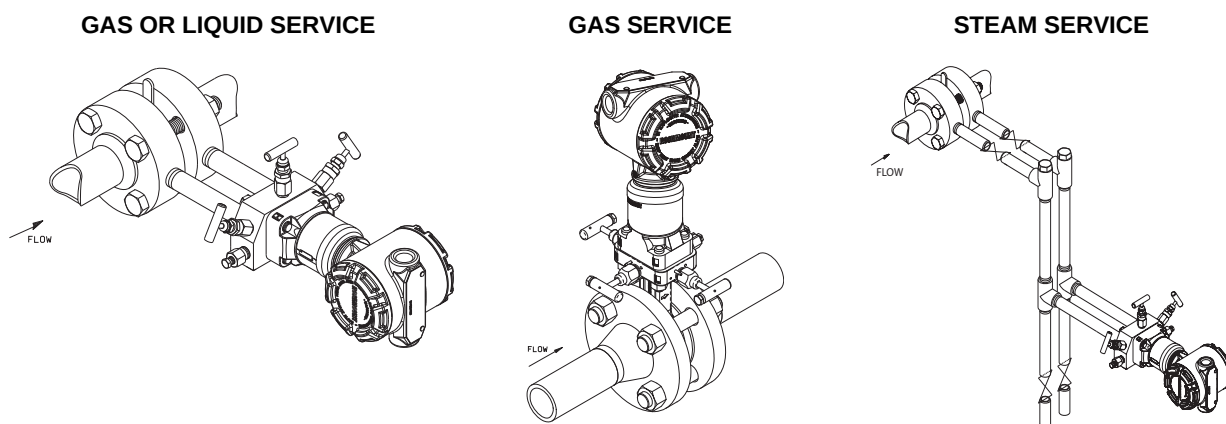
Steam Flow Measurement

- 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

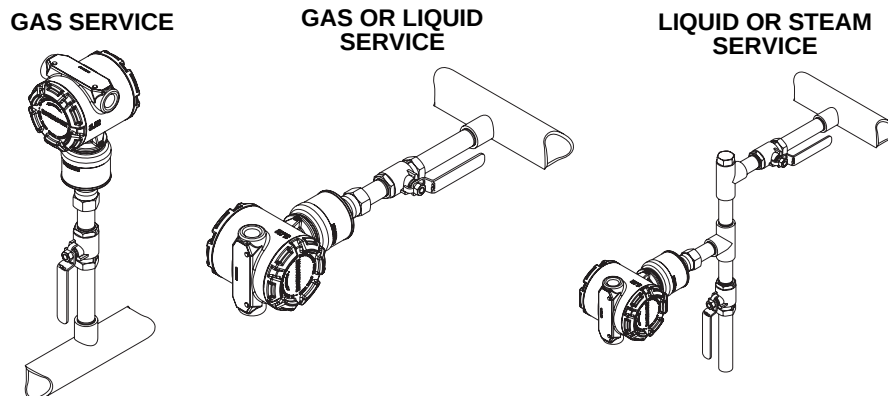
For steam or other elevated temperature services, it is important that temperatures at the process connection do not exceed the transmitter's process temperature limits. See "Process Temperature Limits" on page B-11 for details.

Figure 2-2. Coplanar Installation Examples



Rosemount 3051S Series

Figure 2-3. In-Line Installation Examples



Process Connections

3051S transmitter flange process connection size is $\frac{1}{4}$ –18 NPT. Flange adapters with $\frac{1}{2}$ –14 NPT connections are available as the D2 option. Use your plant-approved lubricant or sealant when making the process connections. The process connections on the transmitter flange are on $2\frac{1}{8}$ -inch (54 mm) centers to allow direct mounting to a three-valve or five-valve manifold. Rotate one or both of the flange adapters to attain connection centers of 2 inches (51 mm), $2\frac{1}{8}$ inches (54 mm), or $2\frac{1}{4}$ inches (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 housing. Do not attempt to loosen or remove the flange bolts while the transmitter is in service.

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

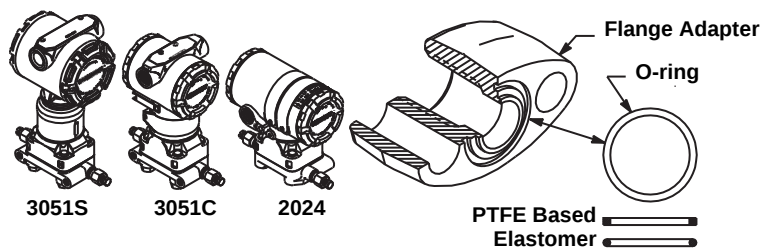
1. Remove the flange bolts.
2. Leaving the flange in place, move the adapters into position with the O-ring installed.
3. Clamp the adapters and the Coplanar flange to the transmitter module using the longer of the bolts supplied.
4. Tighten the bolts. Refer to Table 2-1 on page 2-6 for torque specifications.

⚠ WARNING

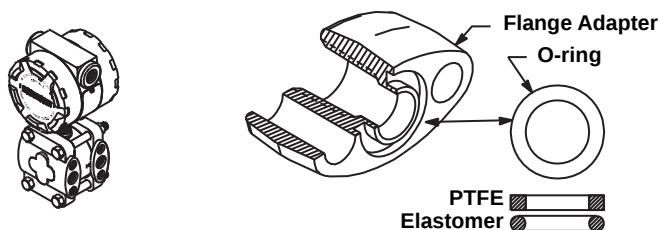
Failure to install proper flange adapter O-rings can cause process leaks, which can result in death or serious injury.

The two flange adapters are distinguished by unique O-ring grooves. Only use the O-ring that is designed for its specific flange adapter, as shown below.

ROSEMOUNT 3051S/ 3051/3001/3095/2024



ROSEMOUNT 1151



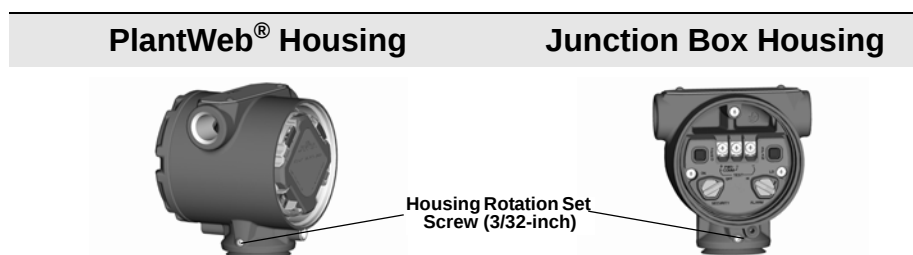
Refer to the Spare Parts list in Appendix B: Specifications and Reference Data for the correct part numbers of the flange adapters and O-rings designed for 3051S transmitters.

Whenever you remove flanges or adapters, visually inspect the PTFE O-rings. Replace them if there are any signs of damage, such as nicks or cuts. If you replace the O-rings, re-torque the flange bolts after installation to compensate for cold flow. Refer to the process sensor body reassembly procedure in Section 5 Troubleshooting on page 5-6.

Consider Housing Rotation

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

Figure 2-4. Housings



Rosemount 3051S Series

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

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

NOTE

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

Configure Security

The 3051S FOUNDATION fieldbus transmitter has a hierarchy of security. The SECURITY switch located on the electronics provides the highest level of security. In the ON position, all writes to the transmitter are disabled.



Simulate

The SIMULATE switch is located on the Electronics. It is used in conjunction with the transmitter simulate software to simulate process variables and/or alerts and alarms. To simulate variables and/or alerts and alarms, the SIMULATE switch must be moved to the ENABLE position and the software enabled through the host. To disable simulation, the switch must be in the DISABLE position.



NOTE

It is important to know that Simulate is enabled only when the hardware senses the switch changing from DISABLE to ENABLE. If the power is removed with the switch in ENABLE, Simulate is not enabled. You must move the switch from ENABLE to DISABLE and then back to ENABLE to be able to use the Simulate software.

WIRING

Transmitter Wiring

Wiring and power supply requirements can be dependent upon the approval certification. As with all FOUNDATION fieldbus requirements, a conditioned power supply and terminating resistors are required for proper operation. The standard 3051S pressure transmitter terminal block is pictured below. The terminals are not polarity sensitive. The transmitter requires 9-32 Vdc to operate. Type A FOUNDATION fieldbus wiring 18 awg twisted shielded pair is recommended.

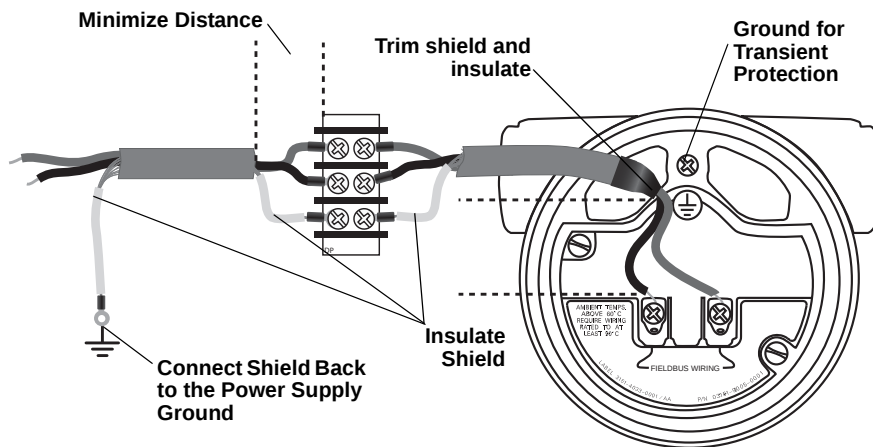
NOTE

Avoid running instrument cable next to power cables in cable trays or near heavy electrical equipment.

It is important that the instrument cable shield be:

- trimmed close and insulated from touching the transmitter housing
- continuously connected throughout the segment
- connected to a good earth ground at the power supply end

Figure 2-5.



Rosemount 3051S Series

Transmitter Grounding

Always ground the transmitter case in accordance with national and local electrical codes. A ground can be connected to the 3051S Transmitter either by an external ground lug or the internal ground lug. Both options can be seen in Figure 2-6.

Figure 2-6.



The most effective transmitter case grounding method is a direct connection to earth ground with minimal ($< 1\Omega$) impedance.

NOTE

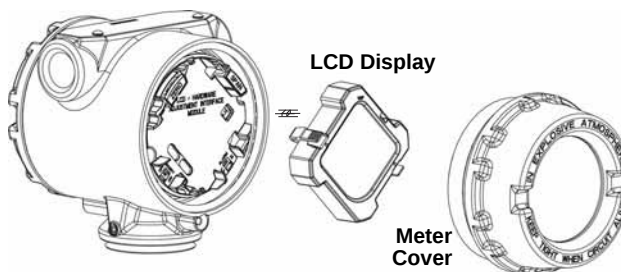
Grounding the transmitter case using the threaded conduit connection may not provide a sufficient ground. The transient protection terminal block (Option Code T1) will not provide transient protection unless the transmitter case is properly grounded. Use the above guidelines to ground the transmitter case. Do not run transient protection ground wire with signal wiring; the ground wire may carry excessive current if a lightning strike occurs.

ROTATING THE LCD DISPLAY

Transmitters ordered with the LCD display will be shipped with the display installed. The display can be rotated in 90 degree increments. To rotate the display:

1. Ensure the power is removed from the transmitter.
2. Remove the cover to expose the LCD Display.
3. Squeeze the two tabs that hold the meter in and gently pull.
4. Ensure the four-pin connector is still in the transmitter circuit board. If the connector stayed in the meter, remove it from the meter and insert it into the transmitter circuit board.
5. Get the LCD in the orientation desired, squeeze the two tabs to remove the meter and gently insert the meter in to the electronics circuit board. If the meter does not insert correctly, check the alignment of the four-pin connector and try again.
6. Install the meter cover and tighten to ensure metal-to-metal contact.

Figure 2-7. Optional LCD Display



Setting Units

Units for both the Sensor Transducer Block and the AI Block are set in the AI Block. To change units:

- Set the AI Block to OOS mode
- Select XD_Scale.units_index
- Select only one of the engineering units listed on page 3-10
- Return AI Block to Auto mode

ZEROING TRANSMITTER

Before operating the transmitter, perform a Zero Trim and set the Damping. Refer to page 4-4 for zeroing procedures.

Damping

⚠ The damping parameter in the Transducer Block may be used to filter measurement noise. By increasing the damping time, the transmitter will have a slower response time, but will decrease the amount of process noise that is translated to the Transducer Block Primary Value. Because both the LCD and AI Block get input from the Transducer Block, adjusting the damping parameter will effect both blocks.

NOTE

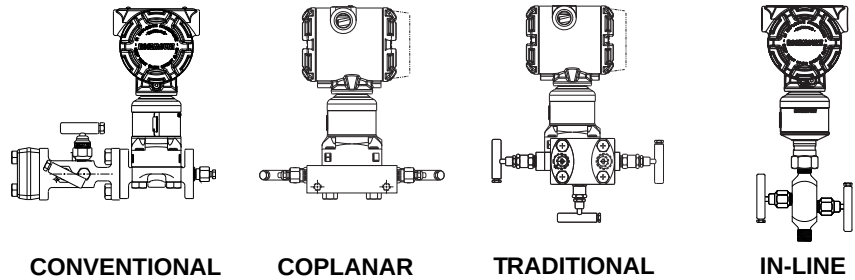
The AI Block has it's own filtering parameter called PV_FTIME. For simplicity, it is better to do filtering in the Transducer Block as damping will be applied to primary value on every sensor update. If filtering is done in AI block, damping will be applied to output every macrocycle.

ROSEMOUNT 305, 306 AND 304 MANIFOLDS

The Rosemount 305 is available in two designs: Traditional and Coplanar. The traditional 305 Integral Manifold can be mounted to most primary elements with mounting adapters in the market today. The Rosemount 306 In-Line Manifold is used with In-line transmitters to provide block-and-bleed valve capabilities of up to 10000 psi (690 bar). The Rosemount 304 comes in two basic styles: traditional (flange x flange and flange x pipe) and wafer. The 304 traditional manifold comes in 2, 3, and 5-valve configurations. The 304 wafer manifold comes in 3 and 5 valve configurations.

Rosemount 3051S Series

Figure 2-8. Integral Manifold Designs



Rosemount 305 Integral Manifold Installation Procedure

To install a 305 Integral Manifold to a 3051S transmitter:

1. Inspect the PTFE SuperModule O-rings. If the O-rings are undamaged, reusing them is recommended. If the O-rings are damaged (if they have nicks or cuts, for example), replace them with new O-rings.

IMPORTANT

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. 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 2-5 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the module housing.
3. If the PTFE SuperModule O-rings have been replaced, the flange bolts should be re-tightened after installation to compensate for cold flow 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.

NOTE

Always perform a zero trim on the transmitter/manifold assembly after installation to eliminate mounting effects. See Section 4 Operation and Maintenance, "Sensor Calibration, Zero Trim Method" on page 4-4.

Rosemount 306 In-Line Manifold Installation Procedure

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

1. Assemble the 306 Manifold to the 3051S In-line transmitter with a thread sealant.
2. Place transmitter into holding fixture.
3. Apply appropriate thread paste or tape to threaded instrument end of the manifold.
4. Count total threads on the manifold before starting assembly.
5. Start turning the manifold by hand into the process connection on the transmitter.

NOTE

If using thread tape, be sure the thread tape does not strip when the manifold assembly is started.

5. Wrench tighten manifold into process connection. (Note: Minimum torque value is 425 in-lbs)
6. Count how many threads are still showing. (Note: Minimum engagement is 3 revolutions)
7. Subtract the number of threads showing (after tightening) from the total threads to calculate the revolutions engaged. Further tighten until a minimum of 3 rotations is achieved.
8. For block and bleed manifold, verify the bleed screw is installed and tightened. For two-valve manifold, verify the vent plug is installed and tightened.
9. Leak-check assembly to maximum pressure range of transmitter.

Rosemount 304 Conventional Manifold Installation Procedure

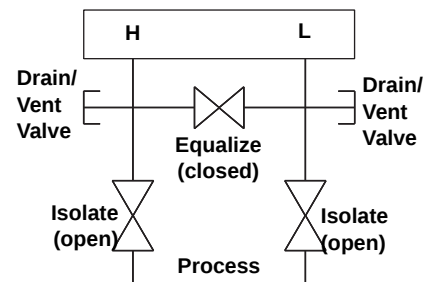
To install a 304 Conventional Manifold to a 3051S transmitter:

1. Align the Conventional Manifold with the transmitter flange. Use the four manifold bolts for alignment.
2. Finger tighten the bolts, then tighten the bolts incrementally in a cross pattern to final torque value. See "Flange Bolts" on page 2-5 for complete bolt installation information and torque values. When fully tightened, the bolts should extend through the top of the module housing plane of flange web (i.e. bolt hole) but must not contact module 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.

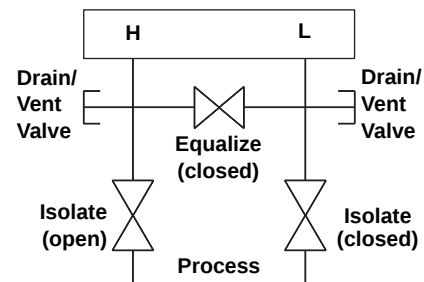
Manifold Operation

Three-valve configuration shown.

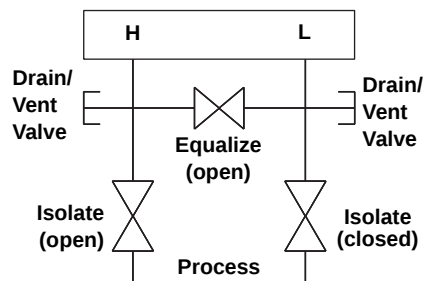
In normal operation the two block valves between the process and instrument ports will be open and the equalizing valve(s) will be closed.



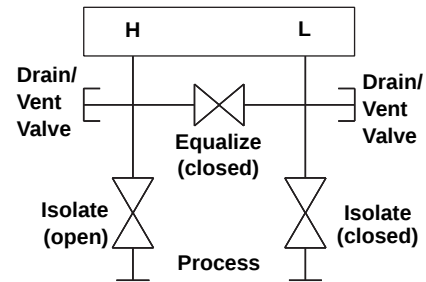
To zero the 3051S, close the block valve to the low pressure (downstream side) of the transmitter first.



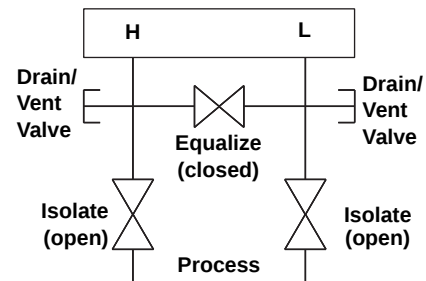
Next, open the center (equalize) valve(s) to equalize the pressure on both sides of the transmitter.



The manifold valves are now in the proper configuration for zeroing the transmitter. To return the transmitter to service, close the equalizing valve(s) first.



Next, open the block valve on the low pressure side of the transmitter.



Section 3 Configuration

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Resource Block	page 3-4
Analog Input (AI) Function Block	page 3-8
Multiple Analog Input (MAI) Function Block	page 3-16
LCD Transducer Block	page 3-17
Mass Flow	page 3-20
Engineering Assistant Software	page 3-20

OVERVIEW

This section covers basic operation, software functionality, and basic configuration procedures for the Rosemount 3051S pressure transmitter with FOUNDATION fieldbus. This section is organized by block information. For detailed information about the function blocks used in the Rosemount3051S pressure transmitter, refer to “Foundation Fieldbus Block Information” on page A-1 and the FOUNDATION fieldbus Block manual (00809-0100-4783).

SAFETY MESSAGES

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

Warnings

WARNING

Explosions can result in death or serious injury.

- Do not remove the transmitter covers in explosive environments when the circuit is live.
- Transmitter covers must be fully engaged to meet explosion proof requirements.
- Before connecting a configuration tool in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or nonincendive field wiring practices.

WARNING

Electrical shock can result in death or serious injury.

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

DEVICE CAPABILITIES

Link Active Scheduler

The Rosemount 3051S can be designated to act as the backup Link Active Scheduler (LAS) in the event that the LAS is disconnected from the segment. As the backup LAS, the 3051S will take over the management of communications until the host is restored.

The host system may provide a configuration tool specifically designed to designate a particular device as a backup LAS. Otherwise, this can be configured manually as follows:

- ⚠ 1. Access the Management Information Base (MIB) for the 3051S.
2. To activate the LAS capability, write 0x02 to the BOOT_OPERAT_FUNCTIONAL_CLASS object (Index 605). To deactivate, write 0x01.

Restart the processor.

Capabilities

Virtual Communication Relationship (VCRs)

There are a total of 20 VCRs. One is permanent and 19 are fully configurable by the host system. Twenty-five link objects are available.

Network Parameter	Value
Slot Time	6
Maximum Response Delay	4
Maximum Inactivity to Claim LAS Delay	47
Minimum Inter DLPDU Delay	7
Time Sync class	4 (1ms)
Maximum Scheduling Overhead	21
Per CLPDU PhL Overhead	4
Maximum Inter-channel Signal Skew	0
Required Number of Post-transmission-gab-ext Units	0
Required Number of Preamble-extension Units	1

Host timer recommendations

T1 = 96000
T2 = 1920000
T3 = 480000

Block Execution times

Analog Input = 20 ms
PID = 25 ms
Arithmetic = 20 ms
Input Selection = 20 ms
Signal Characterizer = 20 ms
Integrator = 20 ms
Analog Output = 20 ms
Output Splitter = 20 ms
Multiple Analog Input = 20 ms
Control Selector = 20 ms

GENERAL BLOCK INFORMATION

Modes

The Resource, Transducer, and all function blocks in the device have modes of operation. These modes govern the operation of the block. Every block supports both automatic (AUTO) and out of service (OOS) modes. Other modes may also be supported.

Changing Modes

To change the operating mode, set the `MODE_BLK.TARGET` to the desired mode. After a short delay, the parameter `MODE_BLOCK.ACTUAL` should reflect the mode change if the block is operating properly.

Permitted Modes

It is possible to prevent unauthorized changes to the operating mode of a block. To do this, configure `MODE_BLOCK.PERMITTED` to allow only the desired operating modes. It is recommended to always select OOS as one of the permitted modes.

Types of Modes

For the procedures described in this manual, it will be helpful to understand the following modes:

AUTO

The functions performed by the block will execute. If the block has any outputs, these will continue to update. This is typically the normal operating mode.

Out of Service (OOS)

The functions performed by the block will not execute. If the block has any outputs, these will typically not update and the status of any values passed to downstream blocks will be "BAD". To make some changes to the configuration of the block, change the mode of the block to OOS. When the changes are complete, change the mode back to AUTO.

MAN

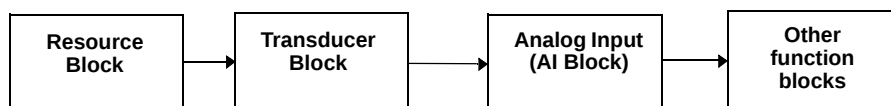
In this mode, variables that are passed out of the block can be manually set for testing or override purposes.

Other Types of Modes

Other types of modes are Cas, RCas, ROut, IMan and LO. Some of these may be supported by different function blocks in the Rosemount3051S. For more information, see the Function Block manual, document 00809-0100-4783.

NOTE

When an upstream block is set to OOS, this will impact the output status of all downstream blocks. The figure below depicts the hierarchy of blocks:



Block Instantiation

The Rosemount 3051S supports the use of Function Block Instantiation. When a device supports block instantiation, the number of blocks and block types can be defined to match specific application needs. The number of blocks that can be instantiated is only limited by the amount of memory within the device and the block types that are supported by the device. Instantiation does not apply to standard device blocks like the Resource, Sensor Transducer, LCD Transducer, and Advanced Diagnostics Blocks.

By reading the parameter "FREE_SPACE" in the Resource block you can determine how many blocks you can instantiate. Each block that you instantiate takes up 4.5573% of the "FREE_SPACE".

Block instantiation is done by the host control system or configuration tool, but not all hosts are required to implement this functionality. Please refer to your specific host or configuration tool manual for more information.

Simulation

Simulation is the functionality of the AI block. To support testing, either change the mode of the block to manual and adjust the output value or enable simulation through the configuration tool and manually enter a value for the measurement value and its status (this single value will apply to all outputs). In both cases, first set the ENABLE jumper on the field device.

NOTE

All fieldbus instruments have a simulation jumper. As a safety measure, the jumper has to be reset every time there is a power interruption. This measure is to prevent devices that went through simulation in the staging process from being installed with simulation enabled.

With simulation enabled, the actual measurement value has no impact on the OUT value or the status. The OUT values will all have the same value as determined by the simulate value.

RESOURCE BLOCK

FEATURES and FEATURES_SEL

The FEATURES parameter is read only and defines which features are supported by the 3051S. Below is a list of the FEATURES the 3051S supports.

FEATURES_SEL is used to turn on any of the supported features that are found in the FEATURES parameter. The default setting of the Rosemount 3051S does not select any of these features. Choose one or more of the supported features if any.

UNICODE

All configurable string variables in the 3051S, except tag names, are octet strings. Either ASCII or Unicode may be used. If the configuration device is generating Unicode octet strings, you must set the Unicode option bit.

REPORTS

The 3051S supports alert reports. The Reports option bit must be set in the features bit string to use this feature. If it is not set, the host must poll for alerts. If this bit is set, the transmitter will actively report alerts.

SOFT W LOCK and HARD W LOCK

Inputs to the security and write lock functions include the hardware security switch, the hardware and software write lock bits of the FEATURE_SEL parameter, the WRITE_LOCK parameter, and the DEFINE_WRITE_LOCK parameter.

The WRITE_LOCK parameter prevents modification of parameters within the device except to clear the WRITE_LOCK parameter. During this time, the block will function normally updating inputs and outputs and executing algorithms. When the WRITE_LOCK condition is cleared, a WRITE_ALM alert is generated with a priority that corresponds to the WRITE_PRI parameter.

The FEATURE_SEL parameter enables the user to select a hardware or software write lock or no write lock capability. To enable the hardware security function, enable the HW_SEL bit in the FEATURE_SEL parameter. When this bit has been enabled the WRITE_LOCK parameter becomes read only and will reflect the state of the hardware switch. In order to enable the software write lock, the SW_SEL bit must be set in the FEATURE_SEL parameter. Once this bit is set, the WRITE_LOCK parameter may be set to "Locked" or "Not Locked." Once the WRITE_LOCK parameter is set to "Locked" by either the software or the hardware lock, all user requested writes as determined by the DEFINE_WRITE_LOCK parameter shall be rejected.

The DEFINE_WRITE_LOCK parameter allows the user to configure whether the write lock functions (both software and hardware) will control writing to all blocks, or only to the resource and transducer blocks. Internally updated data such as process variables and diagnostics will not be restricted by the security switch.

The following table displays all possible configurations of the WRITE_LOCK parameter.

FEATURE_SEL HW_SEL bit	FEATURE_SEL SW_SEL bit	SECURITY SWITCH	WRITE_LOCK	WRITE_LOCK Read/Write	DEFINE_WRITE_LOCK	Write access to blocks
0 (off)	0 (off)	NA	1 (unlocked)	Read only	NA	All
0 (off)	1 (on)	NA	1 (unlocked)	Read/Write	NA	All
0 (off)	1 (on)	NA	2 (locked)	Read/Write	Physical	Function Blocks only
0 (off)	1 (on)	NA	2 (locked)	Read/Write	Everything	None
1 (on)	0 (off) ⁽¹⁾	0 (unlocked)	1 (unlocked)	Read only	NA	All
1 (on)	0 (off)	1 (locked)	2 (locked)	Read only	Physical	Function Blocks only
1 (on)	0 (off)	1 (locked)	2 (locked)	Read only	Everything	None

⁽¹⁾ The hardware and software write lock select bits are mutually exclusive and the hardware select has the highest priority. When the HW_SEL bit is set to 1 (on), the SW_SEL bit is automatically set to 0 (off) and is read only.

MAX_NOTIFY

The MAX_NOTIFY parameter value is the maximum number of alert reports that the resource can have sent without getting a confirmation, corresponding to the amount of buffer space available for alert messages. The number can be set lower, to control alert flooding, by adjusting the LIM_NOTIFY parameter value. If LIM_NOTIFY is set to zero, then no alerts are reported.

PlantWeb™ Alarms

The alarms and recommended actions should be used in conjunction with Section 2: Troubleshooting.

The Resource Block will act as a coordinator for PlantWeb alarms. There will be three alarm parameters (FAILED_ALARM, MAINT_ALARM, and ADVISE_ALARM) which will contain information regarding some of the device errors which are detected by the transmitter software. There will be a RECOMMENDED_ACTION parameter which will be used to display the recommended action text for the highest priority alarm. FAILED_ALARM will have the highest priority followed by MAINT_ALARM and ADVISE_ALARM will be the lowest priority.

NOTE

PlantWeb alerts for ADB and mass flow cannot be simulated.

FAILED_ALARMS

A failure alarm indicates a failure within a device that will make the device or some part of the device non-operational. This implies that the device is in need of repair and must be fixed immediately. There are five parameters associated with FAILED_ALARMS specifically, they are described below.

FAILED_ENABLED

This parameter contains a list of failures in the device which makes the device non-operational that will cause an alarm to be sent. Below is a list of the failures with the highest priority first.

1. Memory Failure
2. NV Memory Failure
3. Primary Value Failure
4. Secondary Value Failure
5. Sensor Module Memory Failure
6. Sensor Module Failure

FAILED_MASK

This parameter will mask any of the failed conditions listed in FAILED_ENABLED. A bit on means that the condition is masked out from alarming and will not be reported.

FAILED_PRI

Designates the alarming priority of the FAILED_ALM, see "Alarm Priority" on page 3-15. The default is 0 and the recommended value are between 8 and 15.

FAILED_ACTIVE

This parameter displays which of the alarms is active. Only the alarm with the highest priority will be displayed. This priority is not the same as the FAILED_PRI parameter described above. This priority is hard coded within the device and is not user configurable.

FAILED_ALM

Alarm indicating a failure within a device which makes the device non-operational.

MAINT_ALARMS

A maintenance alarm indicates the device or some part of the device needs maintenance soon. If the condition is ignored, the device will eventually fail. There are five parameters associated with MAINT_ALARMS, they are described below.

MAINT_ENABLED

The MAINT_ENABLED parameter contains a list of conditions indicating the device or some part of the device needs maintenance soon. If the condition is ignored, the device will eventually fail.

Below is a list of the conditions with the highest priority first.

1. Sensor Module Memory Warning
2. Primary Value Degraded
3. Secondary Value Degraded
4. Plugged Impulse Line Detected

MAINT_MASK

The MAINT_MASK parameter will mask any of the failed conditions listed in MAINT_ENABLED. A bit on means that the condition is masked out from alarming and will not be reported.

MAINT_PRI

MAINT_PRI designates the alarming priority of the MAINT_ALM, "Process Alarms" on page 3-15. The default is 0 and the recommended values is 3 to 7.

MAINT_ACTIVE

The MAINT_ACTIVE parameter displays which of the alarms is active. Only the condition with the highest priority will be displayed. This priority is not the same as the MAINT_PRI parameter described above. This priority is hard coded within the device and is not user configurable.

MAINT_ALM

An alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.

Advisory Alarms

An advisory alarm indicates informative conditions that do not have a direct impact on the device's primary functions. There are five parameters associated with ADVISE_ALARMS, they are described below.

ADVISE_ENABLED

The ADVISE_ENABLED parameter contains a list of informative conditions that do not have a direct impact on the device's primary functions. Below is a list of the advisories with the highest priority first.

1. Process Anomaly Detected (SPM)
2. LOI Failure
3. PWA Simulate Active
4. Defer NV Memory Write Detected
5. Mass Flow Transducer Block Reverse Flow
6. Mass Flow Transducer Block Sensor Out of Range
7. Mass Flow Transducer Block Out of Range
8. Process Anomaly Detected (SPM)

ADVISE_MASK

The ADVISE_MASK parameter will mask any of the failed conditions listed in ADVISE_ENABLED. A bit on means the condition is masked out from alarming and will not be reported.

ADVISE_PRI

ADVISE_PRI designates the alarming priority of the ADVISE_ALM, see "Process Alarms" on page 3-15. The default is 0 and the recommended values are 1 or 2.

ADVISE_ACTIVE

The ADVISE_ACTIVE parameter displays which of the advisories is active. Only the advisory with the highest priority will be displayed. This priority is not the same as the ADVISE_PRI parameter described above. This priority is hard coded within the device and is not user configurable.

ADVISE_ALM

ADVISE_ALM is an alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.

Recommended Actions for PlantWeb Alarms

RECOMMENDED_ACTION

The RECOMMENDED_ACTION parameter displays a text string that will give a recommended course of action to take based on which type and which specific event of the PlantWeb alarms is active (See Table 5-12 on page 5-10).

ANALOG INPUT (AI) FUNCTION BLOCK

Configure the AI block



A minimum of four parameters are required to configure the AI Block. The parameters are described below with example configurations shown at the end of this section.

CHANNEL

Select the channel that corresponds to the desired sensor measurement. The 3051S measures both pressure (channel 1) and sensor temperature (channel 2).

Table 3-1. I/O Channel Definitions

Channel Number	Channel Description
1	differential pressure in AI.XD_SCALE units
2	sensor temperature in AI.XD_SCALE units
3	differential pressure in inH ₂ O @68°F (ADB)
4	mean differential pressure
5	absolute pressure (AO.OUT)
6	process temperature (AO.OUT)
7	mass flow
8	absolute pressure (AO.CAS_IN shadow)
9	process temperature (AO.CAS_IN shadow)
10	differential pressure in inH ₂ O @68°F (MFTB)
11	All MAI channels (12-19 below)
12	SPM1 mean (ADB)
13	SPM1 standard deviation (ADB)
14	SPM2 mean (ADB)
15	SPM2 standard deviation (ADB)
16	SPM3 mean (ADB)
17	SPM3 standard deviation (ADB)
18	SPM4 mean (ADB)
19	SPM4 standard deviation (ADB)

NOTE

Channel 3 and channels 12-19 are only available when the Advanced Diagnostic Block is licensed. Channels 5-9 are only available when the Mass Flow Block is licensed.

L_TYPE

The L_TYPE parameter defines the relationship of the sensor measurement (pressure or sensor temperature) to the desired output of the AI Block (e.g. pressure, level, flow, etc.). The relationship can be direct, indirect, or indirect square root.

Direct

Select direct when the desired output will be the same as the sensor measurement (pressure or sensor temperature).

Indirect

Select indirect when the desired output is a calculated measurement based on the sensor measurement (e.g. a pressure measurement is made to determine level in a tank). The relationship between the sensor measurement and the calculated measurement will be linear.

Indirect Square Root

Select indirect square root when the desired output is an inferred measurement based on the sensor measurement and the relationship between the sensor measurement and the inferred measurement is square root (e.g. flow).

XD_SCALE and OUT_SCALE

The XD_SCALE and OUT_SCALE each include three parameters: 0%, 100%, and, engineering units. Set these based on the L_TYPE:

L_TYPE is Direct

When the desired output is the measured variable, set the XD_SCALE to the "Primary_Value_Range". This is found in the Sensor Transducer Block. Set OUT_SCALE to match XD_SCALE.

L_TYPE is Indirect

When an inferred measurement is made based on the sensor measurement, set the XD_SCALE to represent the operating range that the sensor will see in the process. Determine the inferred measurement values that correspond to the XD_SCALE 0 and 100% points and set these for the OUT_SCALE.

L_TYPE is Indirect Square Root

When an inferred measurement is made based on the sensor measurement AND the relationship between the inferred measurement and sensor measurement is square root, set the XD_SCALE to represent the operating range that the sensor will see in the process. Determine the inferred measurement values that correspond to the XD_SCALE 0 and 100% points and set these for the OUT_SCALE.:

Pressure (Channel 1)	Temperature (Channel 2)	Flow (Channel 7)
Pa	°C	lbm/sec
kPa	°F	lbm/min
bar	°K	lbm/hour
mPa		lbm/day
mbar		kg/sec
torr		kg/min
atm		kg/hour
psi		grams/sec
g/cm2		grams/min
kg/cm2		grams/hour
inH ₂ O at 68 °F		StdCuFt/sec
mmH ₂ O at 68 °F		StdCuFt/min
in.H ₂ O at 4 °F		StdCuFt/min
mmH ₂ O at 4 °F		StdCuFt/hour
ftH ₂ O at 68 °F		StdCuFt/day
inHg at 0 °C		StdCuM/hour
mmHg at 0 °C		StdCuM/day
		NmlCuM/hour
		NmlCuM/day

NOTE

When the engineering units of the XD_SCALE are selected, this causes the engineering units of the PRIMARY_VALUE_RANGE in the Transducer Block to change to the same units. THIS IS THE ONLY WAY TO CHANGE THE ENGINEERING UNITS IN THE SENSOR TRANSDUCER BLOCK, PRIMARY_VALUE_RANGE parameter.

Configuration Examples

Pressure transmitter

Situation #1

A pressure transmitter with a range of 0 – 100 psi.

Solution

Table 3-2 lists the appropriate configuration settings.

Table 3-2. Analog Input function block configuration for a typical pressure transmitter.

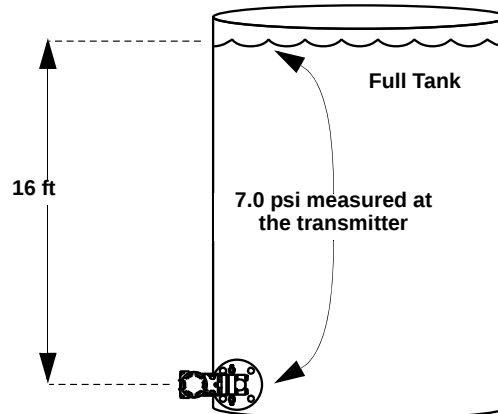
Parameter	Configured Values
L_TYPE	Direct
XD_SCALE	Primary_Value_Range
OUT_SCALE	Primary_Value_Range
Channel	1 - pressure

Pressure transmitter used to measure level in an open tank

Situation #2

The level of an open tank is to be measured using a pressure tap at the bottom of the tank. The maximum level at the tank is 16 ft. The liquid in the tank has a density that makes the maximum level correspond to a pressure of 7.0 psi at the pressure tap (see Figure 3-1).

Figure 3-1. Situation #2 Diagram.



Solution to Situation #2

Table 3-3 lists the appropriate configuration settings.

Table 3-3. Analog Input function block configuration for a pressure transmitter used in level measurement (situation #1).

Parameter	Configured Values
L_TYPE	Indirect
XD_SCALE	0 to 7 psi
OUT_SCALE	0 to 16 ft
Channel	1 - pressure

Output calculation for Situation #2

When the L_Type is configured as Indirect, the OUT parameter is calculated as:

$$OUT = \frac{PV - XD_SCALE_0\%}{XD_SCALE_100\% - XD_SCALE_0\%} * (OUT_SCALE_100\% - OUT_SCALE_0\%) + OUT_SCALE_0\%$$

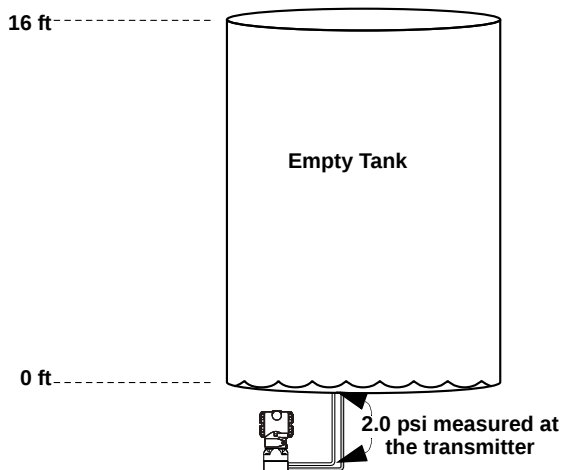
In this example, when PV is 5 psi, then the OUT parameter will be calculated as follows:

$$OUT = \frac{5 \text{ psi} - 0 \text{ psi}}{7 \text{ psi} - 0 \text{ psi}} * (16 \text{ ft.} - 0 \text{ ft.}) + 0 \text{ ft.} = 11.43 \text{ ft.}$$

Situation #3

The transmitter in situation #3 is installed below the tank in a position where the liquid column in the impulse line, with an empty tank, is equivalent to 2.0 psi (see Figure 3-2).

Figure 3-2. Situation #3 Diagram.



Solution to situation #3

Table 3-4 lists the appropriate configuration settings.

Table 3-4. Analog Input function block configuration for a pressure transmitter used in level measurement (Situation #3).

Parameter	Configured Values
L_TYPE	Indirect
XD_SCALE	2 to 9 psi
OUT_SCALE	0 to 16 ft
Channel	1 - pressure

In this example, when the PV is 4 psi, OUT will be calculated as follows:

$$\text{OUT} = \frac{4 \text{ psi} - 2 \text{ psi}}{9 \text{ psi} - 2 \text{ psi}} * (16 \text{ ft.} - 0 \text{ ft.}) + 0 \text{ ft.} = 4.57 \text{ ft.}$$

Differential pressure transmitter to measure flow

Situation #4

The liquid flow in a line is to be measured using the differential pressure across an orifice plate in the line. Based on the orifice specification sheet, the differential pressure transmitter was calibrated for 0 to 20 in.H₂O for a flow of 0 to 800 gal/min.

Solution

Table 3-5 lists the appropriate configuration settings.

Table 3-5. Analog Input Function Block Configuration for a Differential Pressure Transmitter.

Parameter	Configured Values
L_TYPE	Indirect Square Root
XD_SCALE	0 to 20 in.H ₂ O
OUT_SCALE	0 to 800 gal/min.
Channel	1 - pressure

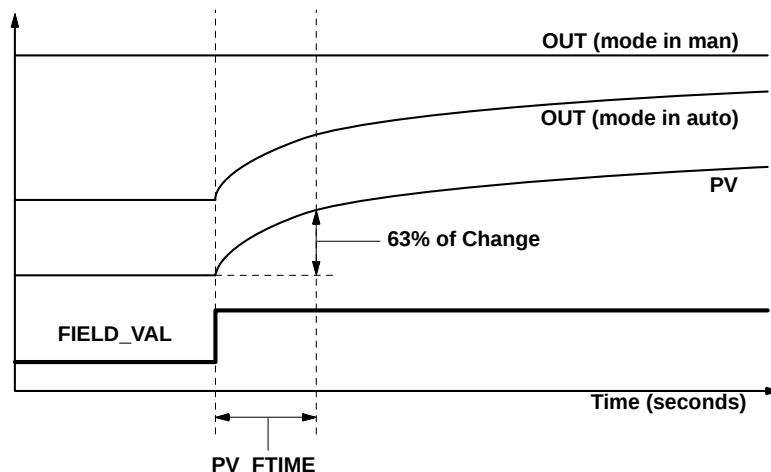
$$\text{Out} = \sqrt{\frac{\text{PV} - \text{XDSCALE0}}{\text{XDSCALE100}}} (\text{OUTSCALE100} - \text{OUTSCALE0}) + \text{OUTSCALE0}$$

$$\text{OUT} = \sqrt{\frac{8 \text{ inH}_2\text{O} - 0 \text{ inH}_2\text{O}}{20 \text{ inH}_2\text{O} - 0 \text{ inH}_2\text{O}}} (800 \text{ gal/min.} - 0 \text{ gal/min.}) + 0 \text{ gal/min.} = 505.96 \text{ gal/min.}$$

Filtering

⚠ The filtering feature changes the response time of the device to smooth variations in output readings caused by rapid changes in input. Adjust the filter time constant (in seconds) using the PV_FTIME parameter. Set the filter time constant to zero to disable the filter feature.

Figure 3-3. Analog Input
PV_FTIME filtering Diagram.



Low Cutoff

⚠ When the converted input value is below the limit specified by the LOW_CUT parameter, and the Low Cutoff I/O option (IO_OPTS) is enabled (True), a value of zero is used for the converted value (PV). This option is useful to eliminate false readings when the differential pressure measurement is close to zero, and it may also be useful with zero-based measurement devices such as flowmeters.

NOTE

Low Cutoff is the only I/O option supported by the AI block. Set the I/O option in **Manual** or **Out of Service** mode only.

Process Alarms

Process Alarm detection is based on the OUT value. Configure the alarm limits of the following standard alarms:

- High (HI_LIM)
- High high (HI_HI_LIM)
- Low (LO_LIM)
- Low low (LO_LO_LIM)

In order to avoid alarm chattering when the variable is oscillating around the alarm limit, an alarm hysteresis in percent of the PV span can be set using the ALARM_HYS parameter. The priority of each alarm is set in the following parameters:

- HI_PRI
- HI_HI_PRI
- LO_PRI
- LO_LO_PRI

Alarm Priority

Alarms are grouped into five levels of priority:

Priority Number	Priority Description
0	The alarm condition is not used.
1	An alarm condition with a priority of 1 is recognized by the system, but is not reported to the operator.
2	An alarm condition with a priority of 2 is reported to the operator.
3-7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8-15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.

Status Options

Status Options (STATUS_OPTS) supported by the AI block are shown below:

Propagate Fault Forward

If the status from the sensor is Bad, Device failure or Bad, Sensor failure, propagate it to OUT without generating an alarm. The use of these sub-status in OUT is determined by this option. Through this option, the user may determine whether alarming (sending of an alert) will be done by the block or propagated downstream for alarming.

Uncertain if Limited

Set the output status of the Analog Input block to uncertain if the measured or calculated value is limited.

BAD if Limited

Set the output status to Bad if the sensor is violating a high or low limit.

Uncertain if Man Mode

Set the output status of the Analog Input block to uncertain if the actual mode of the block is Man.

NOTES

The instrument must be in **Out of Service** mode to set the status option.

Advanced Features

The AI Function Block provides added capability through the addition of the following parameters:

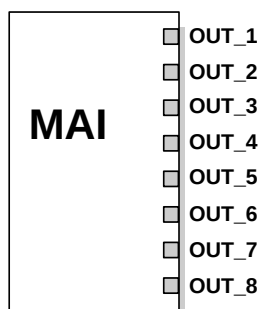
ALARM_TYPE

ALARM_TYPE allows one or more of the process alarm conditions detected by the AI function block to be used in setting its OUT_D parameter.

OUT_D

OUT_D is the discrete output of the AI function block based on the detection of process alarm condition(s). This parameter may be linked to other function blocks that require a discrete input based on the detected alarm condition.

MULTIPLE ANALOG INPUT (MAI) FUNCTION BLOCK



Out1 = The block output value and status for the first channel.

The Multiple Analog Input (MAI) function block has the ability to process up to eight field device measurements and make them available to other function blocks. The output values from the MAI block are in engineering units and contain a status indicating the quality of the measurement.

In the 3051S, the MAI function block is used to read the output statistical values from the Advanced Diagnostics Transducer Block. The CHANNEL parameter must be set to 11. The output values are the means and standard deviations from all four Statistical Process Monitoring (SPM) Blocks.

In Automatic mode, the block's output parameters (OUT_1 to OUT_8) reflect the SPM- values and status. In Manual mode, values may be set manually. The Manual mode is reflected on the output status.

See page 6-11 for further information on using the MAI block to trend Statistical Process Monitoring data.

Block Errors

Table 3-6 lists conditions reported in the BLOCK_ERR parameter. Conditions in **bold** are inactive for the MAI block and are given for reference.

Table 3-6. Block Error Conditions

Number	Name and Description
0	Other
1	Block Configuration Error: the selected channel carries a measurement that is incompatible with the engineering units selected in XD_SCALE, the L_TYPE parameter is not configured, or WRITE_CHECK = zero.
2	Link Configuration Error
3	Simulate Active: Simulation is enabled and the block is using a simulated value in its execution.
4	Local Override
5	Device Fault State Set
6	Device Needs Maintenance Soon
7	Input Failure/Process Variable has Bad Status: The hardware is bad, or a bad status is being simulated.
8	Output Failure: The output is bad based primarily upon a bad input.
9	Memory Failure
10	Lost Static Data
11	Lost NV Data
12	Readback Check Failed
13	Device Needs Maintenance Now
14	Power Up
15	Out of Service: The actual mode is out of service.

Modes

The MAI Function Block supports three modes of operation as defined by the MODE_BLK parameter:

Manual (Man)

The block output (OUT) may be set manually

Automatic (Auto)

OUT_1 to OUT_8 reflects the analog input measurement or the simulated value when simulation is enabled.

Out of Service (OOS)

The block is not processed. Values are not updated and the OUT status is set to Bad: Out of Service. The BLOCK_ERR parameter shows Out of Service. In this mode, changes can be made to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

LCD TRANSDUCER BLOCK

The LCD meter connects directly to the 3051S electronics FOUNDATION fieldbus output board. The meter indicates output and abbreviated diagnostic messages.

The meter features a four-line display and a 0-100% scaled bar graph. The first line of five characters displays the output description, the second line of seven digits displays the actual value, the third line of six characters displays engineering units and the fourth line displays "Error" when the transmitter is in alarm. The LCD meter can also display diagnostic messages.

Each parameter configured for display will appear on the LCD for a brief period before the next parameter is displayed. If the status of the parameter goes bad, the LCD will also cycle diagnostics following the displayed variable:

Figure 3-4. LCD Messaging



Custom Meter Configuration

Shipped from the factory, Parameter #1 is configured to display the Primary Variable (pressure) from the LCD Transducer Block. Parameters 2 – 4 are not configured. To change the configuration of Parameter #1 or to configure additional parameters 2 – 4, use the configuration parameters below.

The LCD Transducer Block can be configured to sequence four different process variables as long as the parameters are sourced from a function block that is scheduled to execute within the 3051S pressure transmitter. If a function block is scheduled in the 3051S that links a process variable from another device on the segment, that process variable can be displayed on the LCD.

Display Parameter 1	
Block Type #1	AI Block ▼
Block Tag #1	FFAI_RMT3
Param Index #1	OUT ▼
Custom Tag #1	
Units Type #1	Auto ▼
Custom Units #1	

DISPLAY_PARAM_SEL

The DISPLAY_PARAM_SEL parameter specifies how many process variables will be displayed. Select up to four display parameters.

BLK_TAG_#⁽¹⁾

Enter the Block Tag of the function block that contains the parameter to be displayed.

BLK_TYPE_#⁽¹⁾

Enter the Block Type of the function block that contains the parameter to be displayed. This parameter is generally selected via a drop-down menu with a list of possible function block types. (e.g. Transducer, PID, AI, etc.)

PARAM_INDEX_#⁽¹⁾

The PARAM_INDEX_# parameter is generally selected via a drop-down menu with a list of possible parameter names based upon what is available in the function block type selected. Choose the parameter to be displayed.

CUSTOM_TAG_#⁽¹⁾

The CUSTOM_TAG_# is an optional user-specified tag identifier that can be configured to be displayed with the parameter in place of the block tag. Enter a tag of up to five characters.

UNITS_TYPE_#⁽¹⁾

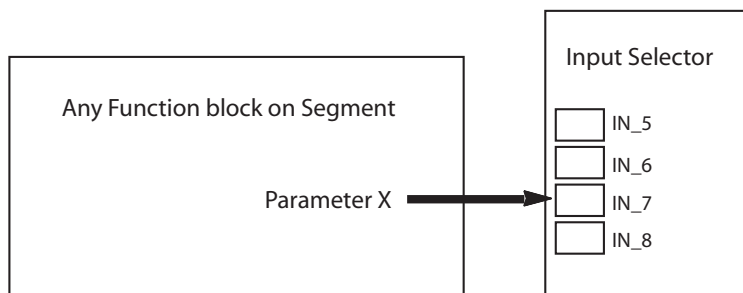
The UNITS_TYPE_# parameter is generally selected via a drop-down menu with three options: AUTO, CUSTOM, or NONE. Select AUTO only when the parameter to be displayed is pressure, temperature, or percent. For other parameters, select CUSTOM and be sure to configure the CUSTOM_UNITS_# parameter. Select NONE if the parameter is to be displayed without associated units.

CUSTOM_UNITS_#⁽¹⁾

Specify custom units to be displayed with the parameter. Enter up to six characters. To display Custom Units the UNITS_TYPE_# must be set to CUSTOM.

(1) _# represents the specified parameter number.

Displaying a variable from another device on the segment (Example)



Any variable from a device on the network can be displayed on the 3051S LDC but the variable must be on a regularly scheduled communications cycle and the variable must be linked to a block within the 3051S. A typical configuration to do this is to link the output of the function block of the variable to one of the unused inputs of the Input Selector Block.

Display bar graph

The 3051S LCD is equipped with a bar graph along the top portion of the display screen. The bar graph will display the percent of range of AI.OUT (see Figure 3-5) of the AI block configured for Channel 1 (pressure) of the Sensor Transducer Block.

The bar graph on the LCD can be enabled from the DISPLAY_PARAM_SEL parameter in the LCD block.

If no AI block is found to be configured for Channel 1 the bar graph (including annunciators) will remain blank. If more than one AI block is found to be configured for the Channel 1 the AI block with the lowest OD index will be used to calculate the bar graph value.

The following equation is used to calculate the percent of range of AI.OUT:

Figure 3-5. Bar Graph Value

$$\text{Bar Graph Value} = 100 * \frac{(\text{AI.OUT} - \text{AI.OUT_SCALE @ 0\%})}{(\text{AI.OUT_SCALE @ 100\%} - \text{AI.OUT_SCALE @ 0\%})}$$

If the bar graph value calculation returns a value less than 0%, the LCD will display a bar graph value of 0%.

If the bar graph value calculation returns a value greater than 100%, then the LCD will display a bar graph value of 100%.

MASS FLOW

The Mass Flow Function Block is a licensable block. It will be licensed on a new transmitter if the H01 option is ordered or it can be licensed in the field via a licensing code. Please contract your local sales person on how to acquire a license.

The Mass Flow Function Block has two distinct parts to its configuration. The first part is downloading the formula the block uses to calculate mass flow. The formula is generated by using the Engineering Assistant software. The two ways to download the formula is to have the factory do it on a new order which requires you to order and fill out a C2 Configuration Data Sheet or you can do it yourself by using a National Instruments Fieldbus interface.

The second part is configuring the Mass Flow Block to accept pressure and temperature inputs from other transmitters. The differential pressure is passed to the Mass Flow Block through a channel. The pressure and temperature inputs can be linked through any FOUNDATION fieldbus configurator.

If you already own a National Instruments Fieldbus interface device, you can go to rosemount.com to download the 3051S revision 23 Device Description. If you don't already own a National Instruments Fieldbus interface device, contact your local sales person for ordering options.

NOTE

Could affect block execution times.

ENGINEERING ASSISTANT SOFTWARE

Installation and Setup

Installing the 3051S Engineering Assistant for FOUNDATION Fieldbus

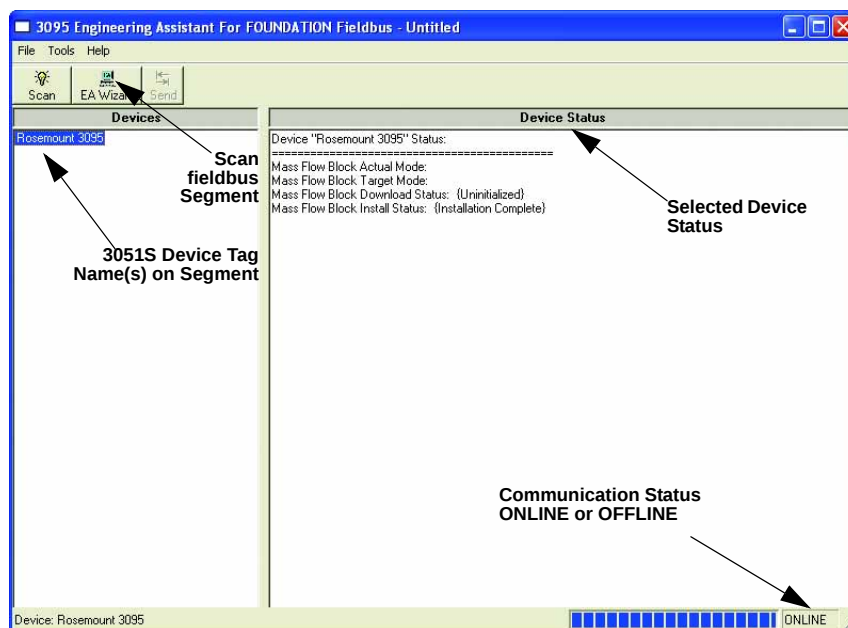
Operation of the software requires installation of both the 3051S Engineering Assistant (EA) for FOUNDATION Fieldbus program and FOUNDATION Fieldbus communication card drivers. The 3051S Engineering Assistant for FOUNDATION Fieldbus and 3051S Engineering Assistant for HART can be loaded onto the same computer. However, the programs cannot be opened simultaneously. Upgrades for the 3051S Engineering Assistant are available on www.rosemount.com.

1. Follow the instructions below to complete required software installation.
 - a. Place 3051S EA Software CD-ROM disk 2 into the disk drive.
 - b. Browse and select the EA-Ff folder using Windows NT, 2000, or XP.
 - c. **Open the ReadMe.txt file and follow the instructions provided.**
2. Install the FOUNDATION Fieldbus PCMCIA communications card into the machine by following instructions provided with the card. Installation of the communications card is not required for offline operation of the 3051S EA for FOUNDATION Fieldbus software program.

Establish Communications with the 3051S FOUNDATION fieldbus Transmitter using 3095 EA for FOUNDATION fieldbus

1. Connect the 9-pin communications cable into the PCMCIA card port located in the computer.
2. Connect communication wiring to the cable connectors labeled “D+” and “D-”.
3. Open the transmitter cover on the side marked “Field Terminals”. Connect the communication wires to the 3051S transmitter terminals labeled “Fieldbus Wiring”.
4. Verify device is properly powered to establish communications.
5. Open the 3051S Engineering Assistant for FOUNDATION Fieldbus program. Select the 3051S Engineering Assistant for FOUNDATION Fieldbus from the program menu or use the 3051S EA for FF shortcut icon.
6. Select Scan to scan the FOUNDATION fieldbus segment. Scanning will locate and present live 3051S or 3095 FOUNDATION fieldbus transmitters on the segment that has a licensed mass flow block. The transmitter device tag name will appear on the screen in the Device view. The Device Status view will publish the status of the transmitter.
7. FOUNDATION fieldbus communication status is represented in the lower right corner of the screen. If status is ONLINE, communication has been established. If status is OFFLINE, communication has not been established and/or communication has been disconnected.

Figure 3-6. Device View

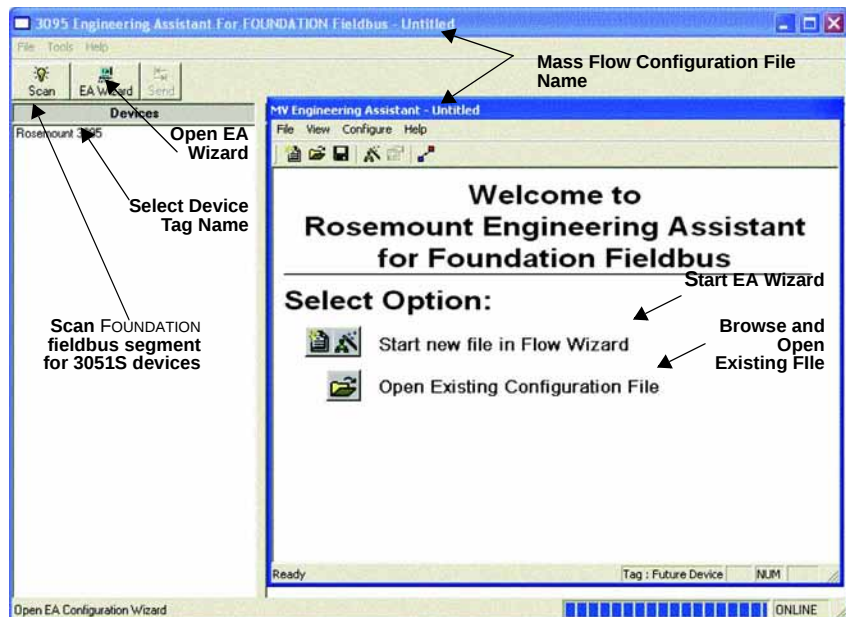


Create and Send a Mass Flow Configuration using 3051S EA for FOUNDATION fieldbus

A mass flow configuration file can be created in either OFFLINE or ONLINE mode.

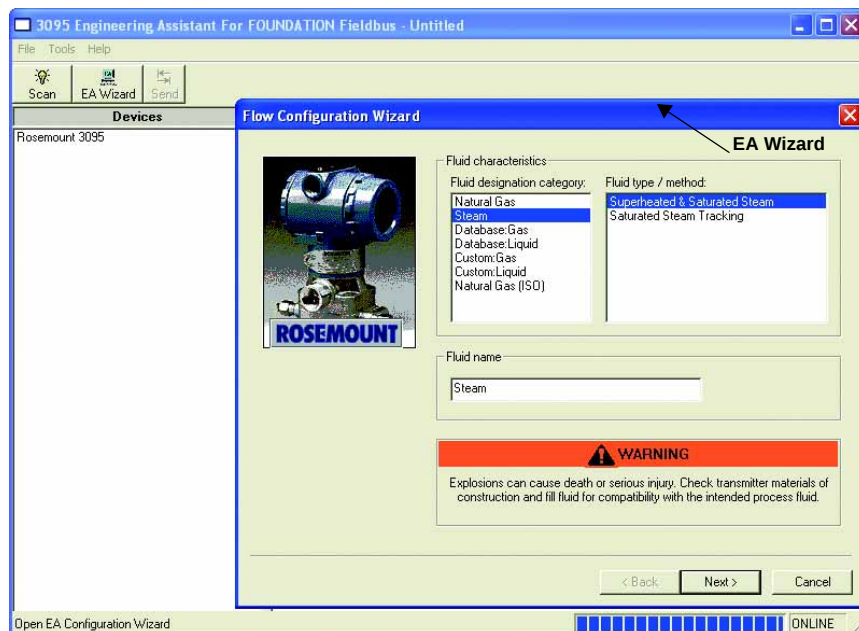
1. Select the device tag name requiring a new or updated mass flow configuration file. The selected device tag will become highlighted. Information about the selected device will appear on the Device Status portion of the screen.
2. Select the EA Wizard. A window stating, "Welcome to Rosemount Engineering Assistant for FOUNDATION fieldbus" will appear.

Figure 3-7. Open EA Wizard



3. 3. Select either "Start new file in Flow Wizard" or "Open existing configuration files" in Flow Wizard. Select either create a new file or open a current (saved) file and edit. Follow the EA Wizard and step through completing a mass flow configuration (see page 3-33 for details.)

Figure 3-8. EA Wizard View



4. Upon completing a mass flow configuration using the EA Wizard, the file can be saved to disk. The file must be saved for review or to edit the mass flow configuration file in the future. FOUNDATION fieldbus mass flow configuration files cannot be uploaded from the Mass Flow Transducer Block. If the file is not saved, it cannot be retrieved.
5. Select the "Send" button to download the mass flow configuration file to the Mass Flow Transducer Block. Sending the mass flow configuration file will overwrite the existing file in the Mass Flow Transducer Block. The transmitter must be out of service to send a mass flow configuration file.
6. A message box will appear confirming the action to send the mass flow configuration file to the Mass Flow Transducer Block. Select "OK" to send the mass flow configuration file.
7. Completing the download of the file to the Mass Flow Transducer Block, a screen that says "Installation Completed Successfully" will appear. Select OK.
8. The installation is now complete and will appear in the Device Status portion of the screen.
9. Bring the transmitter back into service using the host system, for example DeltaV.

Figure 3-9. Download Mass Flow Configuration File

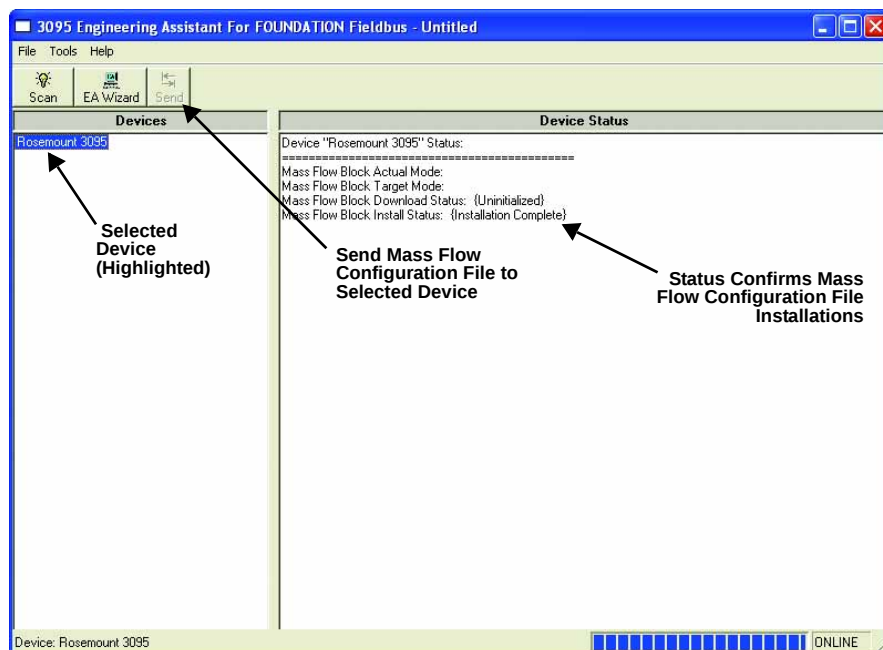


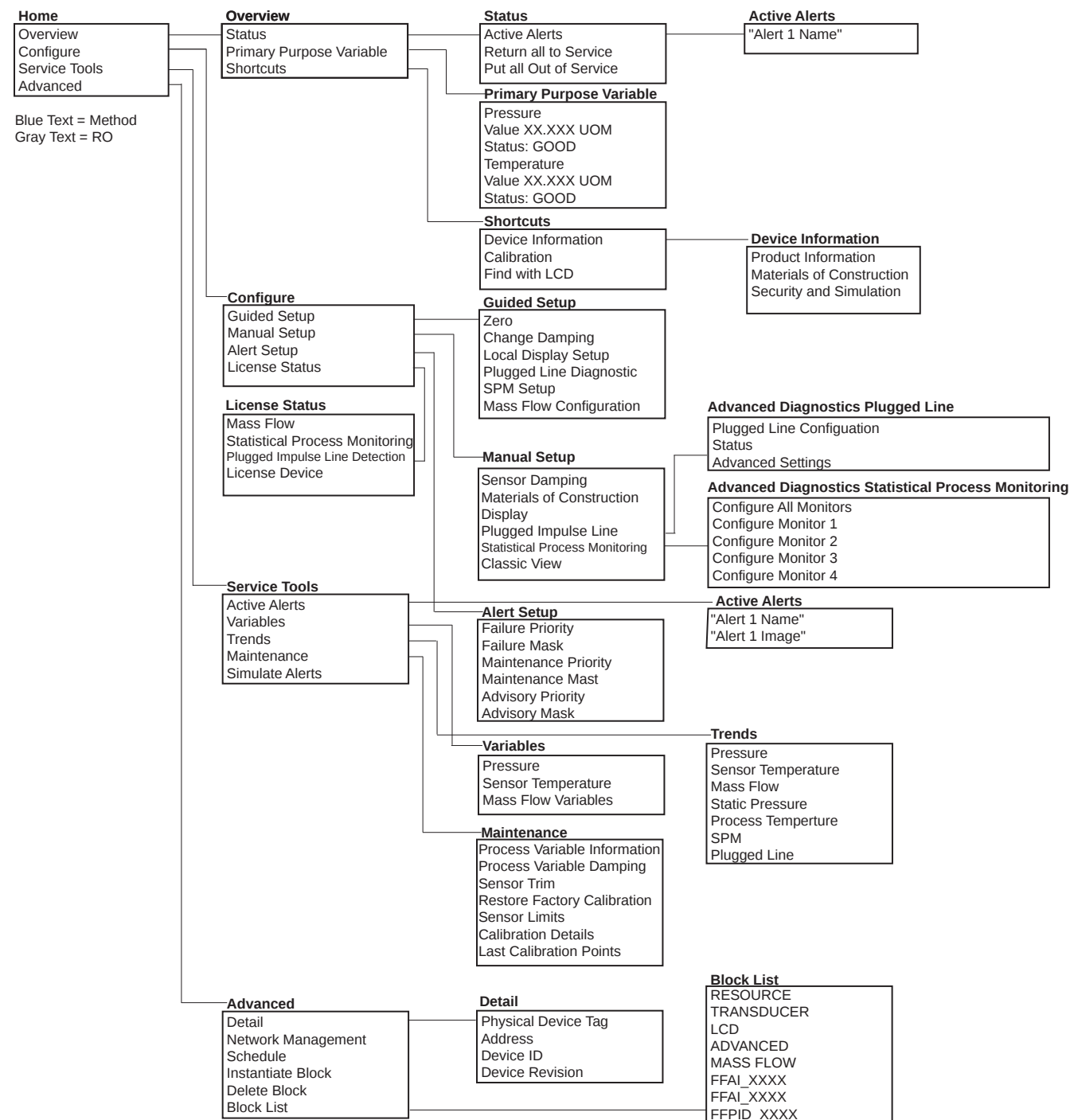
Table 3-7. Mass Flow Block Device - Specific Parameter Values

Index	Parameter	Data Type/Structure	Store	Size	Valid Range	Initial Value	Units	Mode	Description
14	DIFFERENTIAL_PRESSURE	DS-65	D	5			inH2O @68°F	MAN	The differential pressure status and value
15	DIFFERENTIAL_PRESSURE_SOURCE	Unsigned16	S	2	10: DP Sensor (scaled)	10	E	O/S	The channel through which the differential pressure is communicated (and converted to the proper units)
16	PRESSURE	DS-65	D	5			Psia	MAN, O/S ⁽¹⁾	The absolute pressure status and value
17	PRESSURE_SOURCE	Unsigned16	S	2	5: Absolute Pressure (AO.OUT) 8: Absolute Pressure (CAS_IN shadow) 255: Constant	8	E	O/S	The channel through which the absolute pressure is communicated. When AO.OUT value is used, FAULT_STATE is used if status goes bad. When CAS_IN shadow is used, bad status/value will be propagated to the mass flow block. If a value of "Constant" is specified, the PRESSURE parameter becomes writable in O/S and the constant value is used in the calculation.
18	TEMPERATURE	DS-65	D	5			°F	MAN, O/S ⁽²⁾	The process temperature status and value
19	TEMPERATURE_SOURCE	Unsigned16	S	2	6: Process Temperature (CAS_IN shadow) 9: Process Temperature (CAS_IN shadow) 255: Constant	9	E	O/S	The channel through which the process temperature is communicated. When AO.OUT value is used, FAULT_STATE is used if status goes bad. When CAS_IN shadow is used, bad status/value will be propagated to the mass flow block. If a value of "Constant" is specified, the TEMPERATURE parameter becomes writable in O/S and the constant value is used in the calculation.

(1) PRESSURE can be written in O/S mode if the PRESSURE_SOURCE is set to "Constant"

(2) TEMPERATURE can be written in O/S mode if the TEMPERATURE_SOURCE is set to "Constant"

Figure 3-10. Field Communicator Menu Tree



Section 4 Operation and Maintenance

Overview	page 4-1
Safety Messages	page 4-1
Status	page 4-2
Licensing Optional Blocks	page 4-2
Calibration	page 4-4

OVERVIEW

This section contains information on operation and maintenance procedures.

METHODS AND MANUAL OPERATION

Each FOUNDATION fieldbus host or configuration tool has different ways of displaying and performing operations. Some hosts will use Device Descriptions (DD) and DD Methods to complete device configuration and will display data consistently across platforms. The DD can found on Foundation's website at www.fieldbus.org. There is no requirement that a host or configuration tool support these features.

For DeltaV users, the DD can be found at www.easydeltav.com. The information in this section will describe how to use methods in a general fashion. In addition, if your host or configuration tool does not support methods this section will cover manually configuring the parameters involved with each method operation. For more detailed information on the use of methods, see your host or configuration tool manual.

SAFETY MESSAGES

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

Warnings

WARNING

Explosions can result in death or serious injury.

- Do not remove the transmitter covers in explosive environments when the circuit is live.
- Transmitter covers must be fully engaged to meet explosion proof requirements.
- Before connecting a communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or nonincendive field wiring practices.

WARNING

Electrical shock can result in death or serious injury.

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

WARNING

Performing a 'Restart with defaults' will set all function block information in the device to factory defaults. This includes the clearing of all function block links and schedule, as well as defaulting all Resource and Transducer Block user data (Advanced Diagnostic Block algorithm configurations, LCD Transducer Block parameter configuration, etc.).

STATUS

Along with the measured or calculated PV value, every FOUNDATION fieldbus block passes an additional parameter called STATUS. The PV and STATUS are passed from the Transducer Block to the Analog Input Block. The STATUS can be one of the following: GOOD, BAD, or UNCERTAIN. When there are no problems detected by the self-diagnostics of the block, the STATUS will be GOOD. If a problem occurs with the hardware in the device, or, the quality of the process variable is compromised for some reason, the STATUS will become either BAD or UNCERTAIN depending upon the nature of the problem. It is important that the Control Strategy that makes use of the Analog Input Block is configured to monitor the STATUS and take action where appropriate when the STATUS is no longer GOOD.

LICENSING OPTIONAL BLOCKS

The Rosemount 3051S has two licensable blocks. One is the Advanced Diagnostic Block (ADB) that can be configured to detect plugged impulse lines or monitor the mean or standard deviation of a process variable. The other block is the Mass Flow Block which will calculate a fully compensated Mass Flow. The license information for these blocks is in the Resource Block. If there is a need for either of these blocks after the transmitter has been purchased, the licensing can be done in the field. To license either of these blocks:

1. Open the Resource Block and get the Output Board Serial Number (OUTPUT_BD_SN).
2. Contact your local sales person and tell them you would like to place an order for these functions and give them the Output board serial number.
3. Your sales person will contact the factory to obtain the license key.
4. When you are ready to license the block, set the Resource Block OOS.
5. Run the Method - Upgrade Device.
6. Return the Resource Block to Auto Mode.

Master Reset Method

Resource Block

⚠ To perform a master reset, run the Master Reset Method. If your system does not support methods, manually configure the Resource Block parameters listed below.

1. Set the RESTART to one of the options below:

- Run - Default State
- Resource - Not Used



- Defaults - Sets all device parameters to FOUNDATION fieldbus default values
- Processor - Does a software reset of the CPU

Simulation

⚠ Simulate replaces the channel value coming from the Sensor Transducer Block. For testing purposes, it is possible to manually drive the output of the Analog Input Block to a desired value. There are two ways to do this.

Manual Mode

To change only the OUT_VALUE and not the OUT_STATUS of the AI Block, place the TARGET MODE of the block to MANUAL. Then, change the OUT_VALUE to the desired value.

Simulate

1. If the SIMULATE switch is in the OFF position, move it to the ON position. If the SIMULATE jumper is already in the ON position, you must move it to off and place it back in the ON position.

NOTE

As a safety measure, the switch must be reset every time power is interrupted to the device in order to enable SIMULATE. This prevents a device that is tested on the bench from getting installed in the process with SIMULATE still active.

2. To change both the OUT_VALUE and OUT_STATUS of the AI Block, set the TARGET MODE to AUTO.
3. Set SIMULATE_ENABLE_DISABLE to 'Active'.
4. Enter the desired SIMULATE_VALUE to change the OUT_VALUE and SIMULATE_STATUS_QUALITY to change the OUT_STATUS.
 - If errors occur when performing the above steps, be sure that the SIMULATE jumper has been reset after powering up the device.

CALIBRATION

Sensor Calibration, Upper and Lower Trim Methods

Sensor Transducer

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

1. Set MODE_BLK.TARGET to OOS
2. Set CAL_UNIT to supported engineering units in the Transducer Block
3. Apply physical pressure that corresponds to the lower calibration point and allow the pressure to stabilize. The pressure must be between the range limits defined in PRIMARY_VALUE_RANGE.
4. Set values of CAL_POINT_LO to correspond to the pressure applied to the sensor.
5. Apply pressure, upper cal point.
6. Set CAL_POINT_HI

NOTE

CAL_POINT_HI must be within PRIMARY_VALUE_RANGE and greater than CAL_POINT_LO + CAL_MIN_SPAN

7. Set SENSOR_CAL_DATE to the current date.
8. Set SENSOR_CAL_WHO to the person responsible for the calibration.
9. Set SENSOR_CAL_LOC to the calibration location.
10. Set SENSOR_CAL_METHOD to User Trim
11. Set MODE_BLK.TARGET to AUTO

Sensor Calibration, Zero Trim Method

Sensor Transducer Block

 In order to zero the transmitter, run the Zero Trim Method. If your system does not support methods, manually configure the Transducer Block parameters listed below.

1. Set MODE_BLK.TARGET to OOS
2. Apply zero pressure to the sensor and allow the to reading stabilize
3. Set values CAL_POINT_LO to 0
4. Set SENSOR_CAL_DATE to the current date.
5. Set SENSOR_CAL_WHO to the person responsible for the calibration.
6. Set SENSOR_CAL_LOC to the calibration location.
7. Set SENSOR_CAL_METHOD to User Trim
8. Set MODE_BLK.TARGET to AUTO

Factory Trim Recall Method

Sensor Transducer Block

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

1. Set MODE_BLK.TARGET to OOS
2. Set FACTORY_CAL_RECALL to Recall
3. Set SENSOR_CAL_DATE to the current date.
4. Set SENSOR_CAL_WHO to the person responsible for the calibration.
5. Set SENSOR_CAL_LOC to the calibration location.
6. Set SENSOR_CAL_METHOD to Factory Trim
7. Set MODE_BLK.TARGET to AUTO

Section 5 Troubleshooting

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OVERVIEW

This section provides summarized troubleshooting suggestions for the most common operating problems. This section contains Rosemount 3051S fieldbus troubleshooting information only. Disassembly and reassembly procedures can be found in the 3051S manual, document 00809-0100-4801 located in the Troubleshooting.

Follow the procedures described here to verify that transmitter hardware and process connections are in good working order. Always deal with the most likely checkpoints first.

SAFETY MESSAGES

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

Warnings

⚠WARNING

Explosions can result in death or serious injury.

- Do not remove the transmitter covers in explosive environments when the circuit is live.
- Transmitter covers must be fully engaged to meet explosion proof requirements.
- Before connecting a communicator in an explosive atmosphere, make sure that the instruments in the loop are installed according to intrinsically safe or nonincendive field wiring practices.

⚠CAUTION

Static electricity can damage sensitive components.

- Observe safe handling precautions for static-sensitive components.

TROUBLESHOOTING GUIDES

Figure 5-1. Rosemount 3051S troubleshooting flowchart

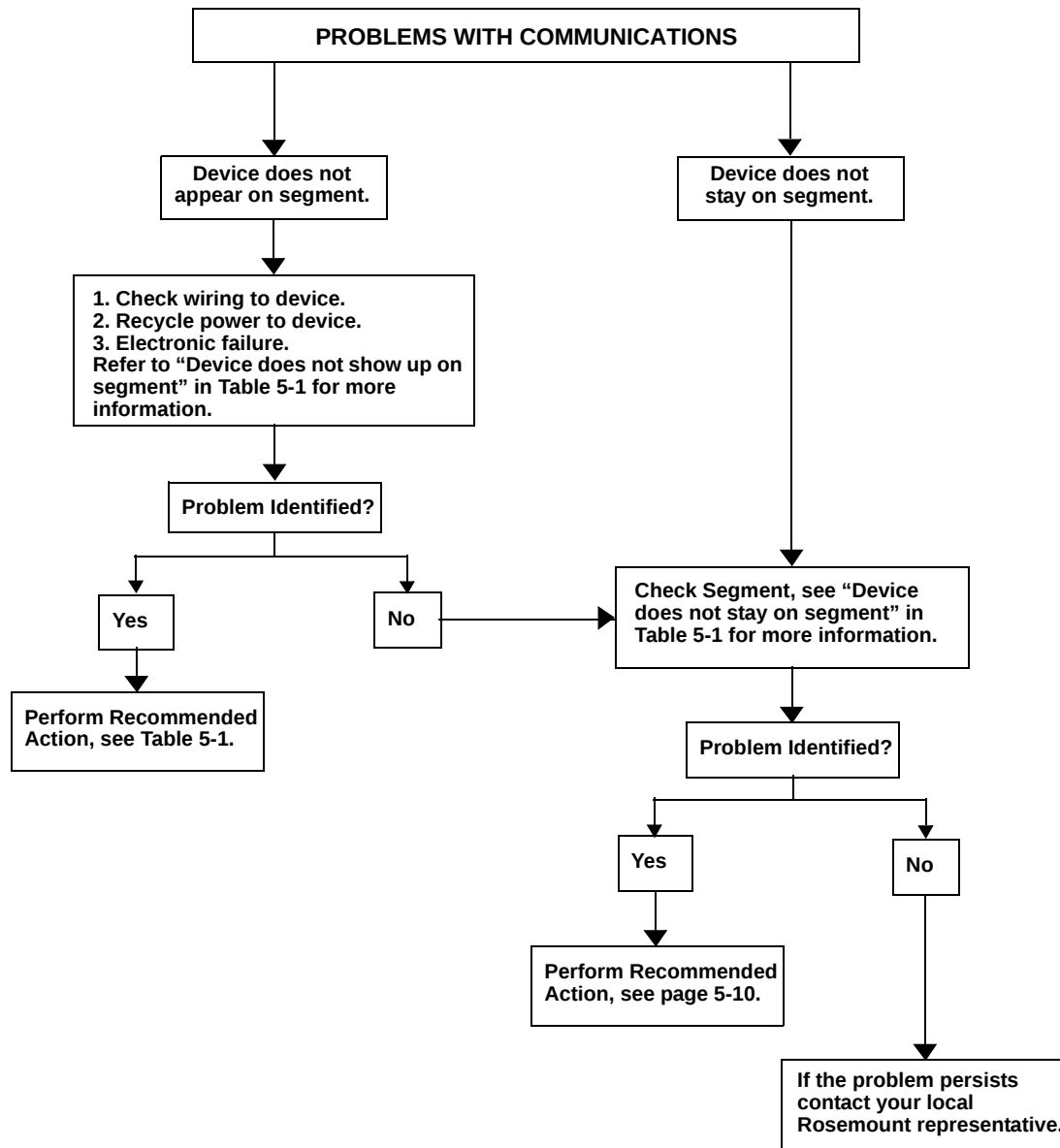


Figure 5-2. Problems with communications flowchart

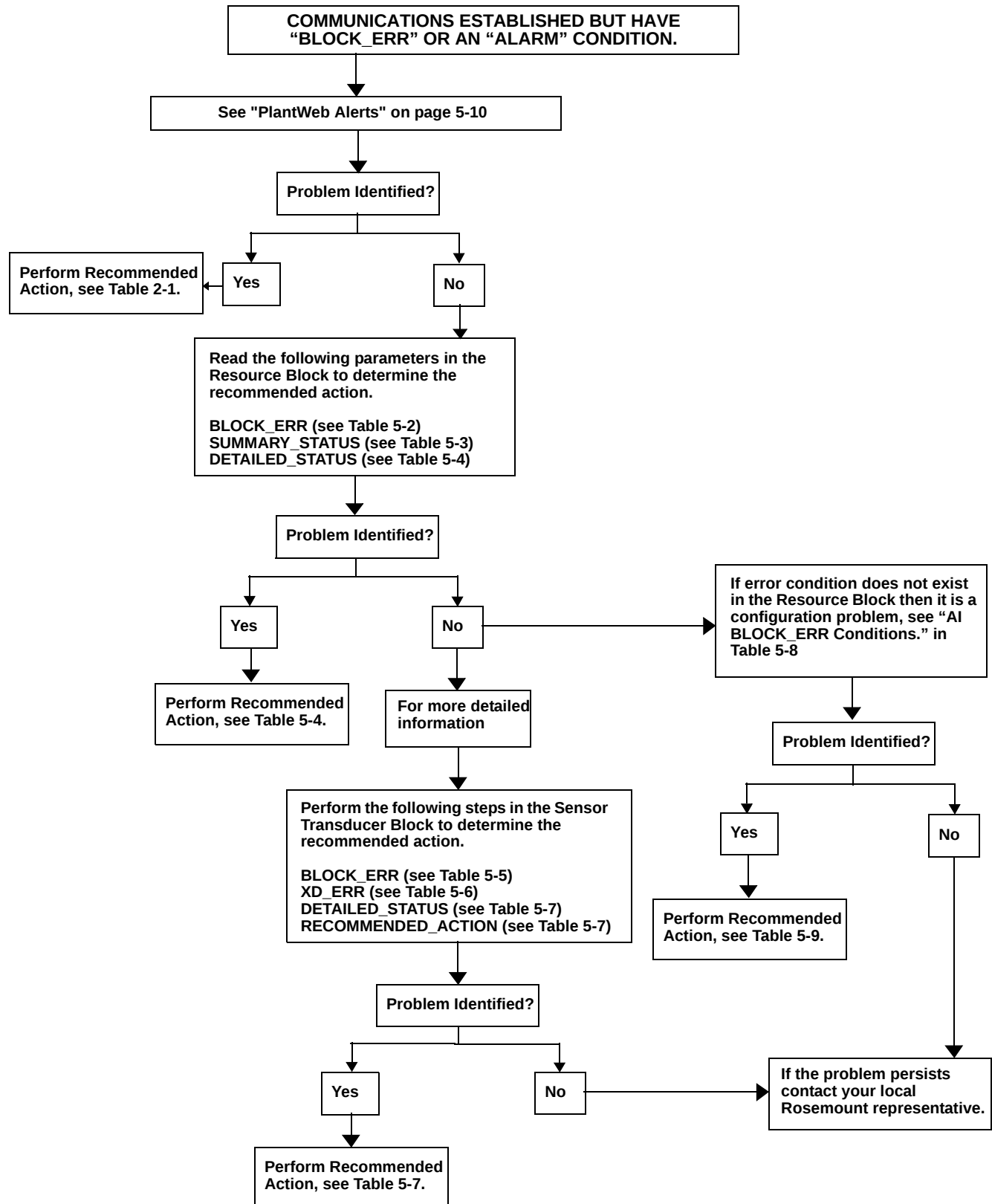


Table 5-1. Troubleshooting guide

Symptom ⁽¹⁾	Cause	Recommended Actions
Device does not show up on segment	Unknown	Recycle power to device
	No power to device	1. Ensure the device is connected to the segment. 2. Check voltage at terminals. There should be 9–32Vdc. 3. Check to ensure the device is drawing current. There should be approximately 17 mA.
	Segment problems	
	Electronics failing	1. Electronics board loose in housing. 2. Replace electronics.
	Incompatible network settings	Change host network parameters. Refer to host documentation for procedure.
Device does not stay on segment ⁽²⁾	Incorrect signal levels. Refer to host documentation for procedure.	1. Check for two terminators. 2. Excess cable length. 3. Bad Power supply or conditioner
	Excess noise on segment. Refer to host documentation for procedure.	1. Check for incorrect grounding. 2. Check for correct shielded wire. 3. Tighten wire connections. 4. Check for corrosion or moisture on terminals. 5. Check for Bad power supply.
	Electronics failing	1. Tighten electronics board. 2. Replace electronics.
	Other	1. Check for water in the terminal housing.

(1) The corrective actions should be done with consultation of your system integrator.

(2) Wiring and installation 31.25 kbit/s, voltage mode, wire medium application guide AG-140 available from the fieldbus Foundation.

RESOURCE BLOCK

This section describes error conditions found in the Resource block. Read Table 5-2 through Table 5-4 to determine the appropriate corrective action.

Table 5-2. Resource Block
BLOCK_ERR messages

Block Errors

Table 5-2 lists conditions reported in the BLOCK_ERR parameter.

Condition Name and Description
Other
Simulate Active: This indicates that the simulation switch is in place. This is not an indication that the I/O blocks are using simulated data.
Device Fault State Set
Device Needs Maintenance Soon
Memory Failure: A memory failure has occurred in FLASH, RAM, or EEPROM memory
Lost Static Data: Static data that is stored in non-volatile memory has been lost.
Lost NV Data: Non-volatile data that is stored in non-volatile memory has been lost.
Device Needs Maintenance Now
Out of Service: The actual mode is out of service.

Table 5-3. Resource Block
SUMMARY_STATUS messages

Condition Name
Uninitialized
No repair needed
Repairable
Call Service Center

Table 5-4. Resource Block
DETAILED_STATUS with
recommended action messages

Condition Name	Recommended Action
LOI Transducer block error	1. Restart processor 2. Check display connection 3. Call service center
Sensor Transducer block error.	1. Restart processor 2. Check SuperModule™ cable 3. Call service center
Mfg. Block integrity error	1. Restart processor 2. Call service center
Non-Volatile memory integrity error	1. Restart processor 2. Call service center
ROM integrity error	1. Restart processor 2. Call service center
ADB transducer block error	1. Check impulse lines 2. Check anomaly detected (SPM) 3. Call service center

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SENSOR TRANSDUCER BLOCK

This section describes error conditions found in the Sensor Transducer Block. Read Table 5-5 through Table 5-7 to determine the appropriate corrective action.

Table 5-5. Sensor Transducer Block BLOCK_ERR messages

Condition Name and Description
Other
Out of Service: The actual mode is out of service.

Table 5-6. Sensor Transducer Block XD_ERR messages

Condition Name and Description
Electronics Failure: An electrical component failed.
I/O Failure: An I/O failure occurred.
Data Integrity Error: Data stored in the device is no longer valid due to a non-volatile memory checksum failure, a data verify after write failure, etc.
Algorithm Error: The algorithm used in the transducer block produced an error due to overflow, data reasonableness failure, etc.

Diagnostics

Table 5-7 lists the potential errors and the possible corrective actions for the given values. The corrective actions are in order of increasing system level compromises. The first step should always be to reset the transmitter and then if the error persists, try the steps in Table 5-7. Start with the first corrective action and then try the second.

Table 5-7. Sensor Transducer Block DETAILED_XD_STATUS and RECOMMENDED_ACTION messages

Condition Name and Description	RECOMMENDED_ACTION
Pressure sensor not updating	1. Restart Processor 2. Reconnect SuperModule cable 3. Send to Service Center
Temperature sensor not updating	1. Restart Processor 2. Reconnect SuperModule cable 3. Send to Service Center
Sensor ROM Check sum failure	1. Restart Processor 2. Send to Service Center
Sensor NV write failure	1. Restart Processor 2. Send to Service Center
Sensor RAM check sum error	1. Restart Processor 2. Send to Service Center
Sensor NV factory data warning	1. Restart Processor 2. Send to Service Center
Sensor NV user data warning	1. Restart Processor 2. Send to Service Center
Sensor NV user data error	1. Restart Processor 2. Send to Service Center
Sensor NV factory data error	1. Restart Processor 2. Send to Service Center
Pressure sensor out of limits	1. Check pressure 2. Restart Processor
Sensor temperature out of limits	1. Check Temperature 2. Restart Processor
Sensor temperature beyond failure limits	1. Check Temperature 2. Restart Processor 3. Send to Service Center

ANALOG INPUT (AI) FUNCTION BLOCK

This section describes error conditions that are supported by the AI Block. Read Table 5-9 to determine the appropriate corrective action.

Table 5-8. AI BLOCK_ERR Conditions.

Condition Number	Condition Name and Description
0	Other
1	Block Configuration Error: the selected channel carries a measurement that is incompatible with the engineering units selected in XD_SCALE, the L_TYPE parameter is not configured, or CHANNEL = zero.
3	Simulate Active: Simulation is enabled and the block is using a simulated value in its execution.
7	Input Failure/Process Variable has Bad Status: The hardware is bad, or a bad status is being simulated.
14	Power Up
15	Out of Service: The actual mode is out of service.

Table 5-9. Troubleshooting the AI block

Symptom	Possible Causes	Recommended Actions
Bad or no pressure readings (Read the AI "BLOCK_ERR" parameter)	BLOCK_ERR reads OUT OF SERVICE (OOS)	1. AI Block target mode target mode set to OOS. 2. Resource Block OUT OF SERVICE.
	BLOCK_ERR reads CONFIGURATION ERROR	1. Check CHANNEL parameter (see "CHANNEL" on page 3-9) 2. Check L_TYPE parameter (see "L_TYPE" on page 3-9) 3. Check XD_SCALE engineering units. (see "XD_SCALE and OUT_SCALE" on page 3-10)
	BLOCK_ERR reads POWERUP	Download Schedule into block. Refer to host for downloading procedure.
	BLOCK_ERR reads BAD INPUT	1. Sensor Transducer Block Out Of Service (OOS) 2. Resource Block Out of Service (OOS)
	No BLOCK_ERR but readings are not correct. If using Indirect mode, scaling could be wrong.	1. Check XD_SCALE parameter. 2. Check OUT_SCALE parameter. (see "XD_SCALE and OUT_SCALE" on page 3-10)
	No BLOCK_ERR. Sensor needs to be calibrated or Zero trimmed.	See Section 3 Operation and Maintenance to determine the appropriate trimming or calibration procedure.
OUT parameter status reads UNCERTAIN and substatus reads EngUnitRangViolation.	Out_ScaleEU_0 and EU_100 settings are incorrect.	See "XD_SCALE and OUT_SCALE" on page 3-10.

MAI Block Troubleshooting

Symptom	Possible Causes	Corrective Action
Mode will not leave OOS	Target mode not set.	Set target mode to something other than OOS.
	Configuration error	BLOCK_ERR will show the configuration error bit set. Before the block is allowed out of OOS, the CHANNEL must be set to 11 for "All ADB-SPM Outputs".
	Resource block	The actual mode of the Resource block is OOS. See Resource Block Diagnostics for corrective action.
	Schedule	Block is not scheduled and therefore cannot execute to go to Target Mode. Typically, BLOCK_ERR will show "Power-Up" for all blocks that are not scheduled. Schedule the block to execute.

**LCD TRANSDUCER
BLOCK**

This section describes error conditions found in the LCD Transducer Block. Read Table 5-10 and to determine the appropriate corrective action.

Self Test Procedure for the LCD

The SELF_TEST parameter in the Resource block will test LCD segments. When running, the segments of the display should light up for about five seconds.

If your host system supports methods refer to your host documentation on how to run the "Self Test" method. If your host system does not support methods than you can run this test manually by following the steps below.

1. Put Resource block into "OOS" (Out of Service).
2. Go to the parameter called "SELF_TEST" and write the value Self test (0x2).
3. Observe the LCD screen when you are doing this. All of the segments should light up.
4. Put the Resource block back into "AUTO".

Table 5-10. LCD Transducer
Block BLOCK_ERR messages

Condition Name and Description
Other
Out of Service: The actual mode is out of service.

Symptom	Possible Causes	Recommended Action
The LCD displays "DSPLY#INVALID." Read the BLOCK_ERR and if it says "BLOCK CONFIGURATION" perform the Recommended Action	One or more of the display parameters are not configured properly.	See "LCD Transducer Block" on page 2-16.
The Bar Graph and the AI.OUT readings do not match.	The OUT_SCALE of the AI block is not configured properly.	See "Analog Input (AI) Function Block" on page 2-9 and "Display bar graph" on page 2-18.
"3051" is being displayed or not all of the values are being displayed.	The LCD block parameter "DISPLAY_PARAMETER_SELECT is not properly configured.	See "LCD Transducer Block" on page 2-16.
The display reads OOS	The resource and or the LCD Transducer block are OOS.	Verify that both blocks are in "AUTO,"
The display is hard to read.	Some of the LCD segments may have gone bad.	See XXXX (Self Test). If some of the segment is bad, replace the LCD.
	Device is out o the temperature limit for the LCD. (-20 to 80 °C)	Check ambient temperature of the device.

ADVANCED DIAGNOSTICS TRANSDUCER BLOCK (ADB)

This section describes error conditions found in the Advanced Diagnostics Transducer Block. Read Table 5-11 to determine the appropriate corrective action. Refer to Section 6 for complete information on Advanced Diagnostics.

Table 5-11. Advanced Diagnostic Block BLOCK_ERR messages

Condition Name and Description
Other
Out of Service: The actual mode is out of service.

Symptom	Possible Causes	Recommended Action
PIL or SPM will not go to Learning.	ADB Block is not licensed. The algorithm Status will indicate "Not Licensed."	1. Check DIAG_OPTIONS in the Resource Block. PIL/SPM or a hex value of 0x00000300 should be shown. See "Advanced Diagnostics Transducer Block" on page 1-3.
	Resource Block Actual Mode is OOS.	Determine why the Resource block is in OOS. Correct problem then put Resource Block into Auto mode
	ADB block Actual mode is OOS.	Put ADB block into Auto mode.
	The algorithms were not activated or configured properly..	To activate and configure SPM see page 6-6. To activate and configure PIL, see page 6-25
	For the SPM algorithm only: The variable to be monitored is in an unscheduled function block	Download a schedule into the function block. Consult your host documentation for downloading schedules.
	For SPM (only), the block in which the process variable is coming from is not in Auto mode.	Put monitored block into Auto mode.
PIL Status reads "Insufficient Dynamics."	There is not enough process noise or there is no flow in the line.	1. Check to see if the process is flowing. 2. Your process may have low process dynamics. You can turn off this check. This should only be done after considering the possible results, see "PLINE_Learn_Sensitivity" on page 6-30.
The SPM or PIL Status stays in Verifying.	The process dynamics are not stable.	Ensure that the process flow is stable.
	The learning period is too short	Ensure that the SPM Monitoring Cycle or PIL Learning Length is at least as long as any dominant cycling or oscillation in the process. See pages 6-7 and 6-29.
	(PIL Only) The PIL Learning Sensitivity is not properly configured.	The process may be varying by more than the algorithm is configured for. Adjust the learning sensitivity to compensate for this, see "PLINE_Learn_Sensitivity" on page 6-30
The PIL Status reads "Bad PV Status"	There is a problem in the Sensor Transducer Block.	See "Rosemount 3051S troubleshooting flowchart" on page 5-2.

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PLANTWEB ALERTS

Table 5-12. Failure Alerts

Failed Alert	What is this Alert Detecting?	What is the effect on the instrument?	Recommended Action	Help	Default Configuration "0" = Disabled, "1" = Enabled
Primary Value Failure	Pressure updates from the sensor module stopped.	PV holds last good value with a BAD status. Device remains in Auto.	Check the Interface Cable Between the Sensor Module and the Fieldbus Electronics Board.	"Pressure updates are not occurring. 1. Check the interface cable between the Sensor Module and the Fieldbus Electronics Board. 2. Replace the Sensor Module and Fieldbus Electronics Boards."	1
Secondary Value Failure	Sensor Module temperature updates have stopped.	SV holds last good value with a BAD status. This will also cause the PV's to go to a BAD status.	Check the Interface Cable Between the Sensor Module and the Fieldbus Electronics Board.	"The instrument body temperature measurement has failed. This is caused by the following. Sensor Module temperature updates are not occurring. 1. Check the interface cable between the Sensor Module and the Fieldbus Electronics Board. 2. Replace the Sensor Module and Fieldbus Electronics Board. The Sensor Module body temperature reading is outside the factory configured failure limits. 3. If the ambient temperature of the instrument is within the limits then there is temperature sensor malfunction. Replace the Sensor Module."	1
Memory Failure	The Fieldbus Electronics Board has reported a ROM memory integrity error.	The device will be placed in OOS mode and all PV's will go to a BAD status.	Replace the Fieldbus Electronics Board.	"The Fieldbus Electronics Board has reported a Rom memory integrity error. 1. Replace the Fieldbus Electronics Board."	1
NM Memory Failure	User configuration data has been corrupted or pending user configuration data has been lost due to loss of power before storage could complete.	Default values are loaded into the faulty block. Potential errors in stored data may cause unwanted behavior. The device will be placed in OOS mode and all PV's will go BAD status. Device recovery is possible.	Reset the Device then Download the Device Configuration.	"The Fieldbus Electronics Board has reported a EEPROM memory integrity error (corrupt data). Default values were loaded into the faulty block. 1. Reset the device. 2. Download the device configuration. 3. If the failure reoccurs replace the Fieldbus Electronics Board."	1
Sensor Module Failure	The Sensor Module on the instrument has reported a memory failure.	PV/SV holds last good value with a BAD status. Device remains in Auto.	Replace the Sensor Module.	"The Sensor Module on the instrument has reported a memory failure. 1. Replace the Sensor Module."	1
Sensor Module NV Memory Failure	The Fieldbus Electronics Board has reported a EEPROM memory integrity error (corrupt data). Default values are loaded into the faulty block.	PV/SV holds last good value with a BAD status. Device remains in Auto. Device recovery is possible.	Replace the Sensor Module.		1

Table 5-13. Maintenance Alerts

Maintenance Alert	What is this Alert Detecting?	What is the effect on the instrument?	Recommended Action	Help	Default Configuration "0" = Disabled, "1" = Enabled
Primary Value Degraded	The PV is outside the operating range of the transmitter.	PV status will go UNCERTAIN.	The Instrument Pressure may be too High or too Low. Confirm that it is within the Operating Range of the Transmitter.	"The PV is outside the operating range of the transmitter. 1. Confirm that the process pressure is within the operating range of the transmitter. 2. If the pressure applied to the device is within the limits then there is a pressure sensor malfunction. Replace the Sensor Module."	1
Secondary Value Degraded	The instrument body temperature is outside the operating range of the transmitter.	PV status will go UNCERTAIN.	The Instrument Body Temperature may be too Hot or too Cold. Confirm that it is within the Operating Range of the Transmitter.	"The instrument body temperature is outside the operating range of the transmitter. 1. If the ambient temperature of the instrument is within the limits then there is temperature sensor malfunction. Replace the Sensor Module."	1
Sensor Module Memory Warning	There is a non-critical integrity check failure in the sensor EEPROM memory. This warning does not affect device performance.	Device may lose non-critical data (serial number, materials of construction, etc...).	Replace the Sensor Module at the next scheduled Maintenance.	"There is a non-critical integrity check failure in the sensor EEPROM Memory. This warning does not affect device performance. 1. Replace the Sensor Module at the next scheduled maintenance."	1
Plugged Impulse Line Detected	The device diagnostics has reported a plugged impulse line(s).	1. This will have not affect of the device. Or 2. If this is configured to affect PV status then PV status will go UNCERTAIN.	Check the Device Impulse Line(s).	"The device diagnostics has reported a plugged impulse line(s). 1. Check the device impulse line(s). 2. Check for correct configuration of the impulse line parameters in the diagnostics transducer block."	Licensed

Table 5-14. Advisory Alerts

Advisory Alert	What is this Alert Detecting?	What is the effect on the instrument?	Recommended Action	Help	Default Configuration "0" = Disabled, "1" = Enabled
Process Anomaly Detected (SPM)	The statistical process monitor in the device diagnostics has reported that a user defined limit was exceeded.	Alert Only	Check the Statistical Process Monitor Status in the ADB Block.	The Statistical Process Monitor in the device diagnostics has reported that a user defined limit was exceeded. 1. Check the statistical process monitor status in the diagnostics transducer block.	Licensed
LOI Failure	Communications failure with LCD.	LCD will lose local PV Indication	Check Display and Sensor Connections.	The Fieldbus Electronics Board has reported a Local Display failure. 1. Check Local Display connection. 2. Check the interface cable between the Sensor Module and the Fieldbus Electronics Board. (Sensor Module must be connected). 3. Replace the Local Display.	1
NV Writes Deferred	A high number of configuration changes have been detected. To prevent premature memory failure, the write operations have been deferred; the transmitter must remain powered through completion to avoid data loss.	The device continues to work as is with no affect to the PV's. Barring a power cycle by the device, the software will eventually save the NV data and the error will clear.	Limit the number of periodic writes to all static or non-volatile parameters.	A high number of writes has been detected to non-volatile memory. To prevent premature failure of the memory, the write operations have been deferred. The data will be saved on a 6 hour cycle. This condition usually exists because a program has been written that writes to function block parameters not normally expected to be written to on a cyclic basis. Any such automated write sequence should be modified to write the parameter(s) only when needed. It is recommended that you limit the number of periodic writes to all static or non-volatile parameters such as HI_HI_LIM, LOW_CUT, SP, TRACK_IN_D, OUT, IO_OPTS, BIAS, STATUS_OPTS, SP_HI_LIM, and so on.	1
Mass Flow Transducer Block Reverse Flow	DP value is negative (and beyond a threshold) indicating that flow is in the wrong direction	Mass Flow PV status will go BAD.	Check DP sensor configuration and trim as needed.	DP input was so low as to that flow is reversed.	Licensed
Mass Flow Transducer Block Sensor Out of Range	DP value is outside of operating range or sensor limits	PV status will go UNCERTAIN.	Check Engineering Assistant (EA) has generated configuration for the proper range of DP values.	DP input outside of operating range and/or implementation limits.	Licensed
Mass Flow Transducer Block SP of PT Clipped	SP or PT value is out of range and has been clipped in calculations	PV status will go UNCERTAIN.	Check Engineering Assistant (EA) has generated configuration for the proper ranges of SP & PT values.	SP or PT input outside of operating range and limited (clipped) to operating range in calculations.	Licensed

Section 6 **Advanced Pressure Diagnostics for FOUNDATION fieldbus**

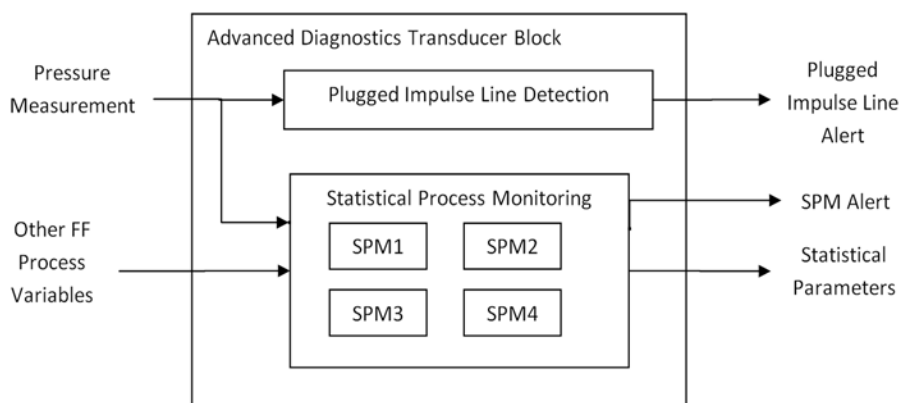
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SPM Configuration and Operation	page 6-6
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Configuration of Plugged Impulse Line Detection	page 6-25

OVERVIEW

The 3051S FOUNDATION fieldbus Pressure Transmitter with Advanced Diagnostics Suite is an extension of the Rosemount 3051S Scalable Pressure transmitter and takes full advantage of the architecture. The 3051S SuperModule™ Platform generates the pressure measurement. The Foundation fieldbus Feature Board is mounted in the PlantWeb housing and plugs into the top of the SuperModule. The Advanced Diagnostics Suite is a licensable option on the Foundation fieldbus feature board, and designated by the option code “D01” in the model number.

The Advanced Diagnostics Suite has two distinct diagnostic functions, Statistical Process Monitoring (SPM) and Plugged Impulse Line Detection (PIL), which can be used separately or in conjunction with each other to detect and alert users to conditions that were previously undetectable, or provide powerful troubleshooting tools. Figure 6-1 illustrates an overview of these two functions within the Fieldbus Advanced Diagnostics Transducer Block.

Figure 6-1. Advanced
Diagnostics Transducer Block
Overview



Statistical Process Monitoring (SPM)

The Advanced Diagnostics Suite features SPM technology to detect changes in the process, process equipment or installation conditions of the transmitter. This is done by modeling the process noise signature (using the statistical values of mean and standard deviation) under normal conditions and then comparing the baseline values to current values over time. If a significant change in the current values is detected, the transmitter can generate an alert. The SPM can perform its statistical processing on either the primary value of the field device (e.g. pressure measurement) or any other process variable available in one of the device's other Fieldbus function blocks (e.g. the device sensor temperature, control signal, valve position, or measurement from another device on the same fieldbus segment). SPM has the capability of modeling the noise signatures for up to four process variables simultaneously (SPM1-SPM4). When SPM detects a change in the process statistical characteristics, it generates an alert. The statistical values are also available as secondary variables from the transmitter via AI or MAI Function Blocks if a user is interested in their own analysis or generating their own alarms.

Plugged Impulse Line (PIL) Diagnostics

The Advanced Diagnostics Suite also implements a plugged impulse line detection algorithm. PIL leverages SPM technology and adds some additional features that apply SPM to directly detect plugging in pressure measurement impulse lines. In addition to detecting a change in the process noise signature, the PIL also provides the ability to automatically relearn new baseline values if the process condition changes. When PIL detects a plug, a "Plugged Impulse Line Detected" PlantWeb alert is generated. Optionally, the user can configure the PIL to, when a plugged impulse line is detected, change the pressure measurement status quality to "Uncertain", to alert an operator that the pressure reading may not be reliable.

IMPORTANT

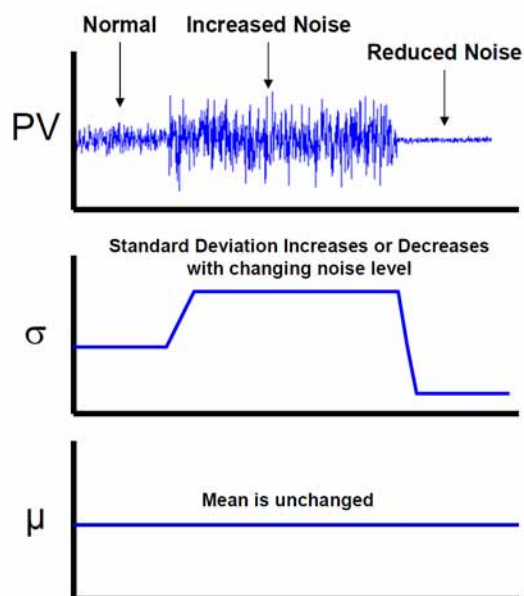
Running the Advanced Diagnostics Block could affect other block execution times. We recommend the device be configured as a basic device versus a Link Master device if this is a concern.

**STATISTICAL PROCESS
MONITORING
TECHNOLOGY**

Emerson has developed a unique technology, Statistical Process Monitoring, which provides a means for early detection of abnormal situations in a process environment. The technology is based on the premise that virtually all dynamic processes have a unique noise or variation signature when operating normally. Changes in these signatures may signal that a significant change will occur or has occurred in the process, process equipment, or transmitter installation. For example, the noise source may be equipment in the process such as a pump or agitator, the natural variation in the DP value caused by turbulent flow, or a combination of both.

The sensing of the unique signature begins with the combination of a high speed sensing device, such as the Rosemount 3051S Pressure Transmitter, with software resident in a FOUNDATION fieldbus Feature Board to compute statistical parameters that characterize and quantify the noise or variation. These statistical parameters are the mean and standard deviation of the input pressure. Filtering capability is provided to separate slow changes in the process due to setpoint changes from the process noise or variation of interest. Figure 6-2 shows an example of how the standard deviation value (σ) is affected by changes in noise level while the mean or average value (μ) remains constant. The calculation of the statistical parameters within the device is accomplished on a parallel software path to the path used to filter and compute the primary output signal (e.g. the pressure measurement used for control and operations). The primary output is not affected in any way by this additional capability.

Figure 6-2. Changes in process noise or variability and affect on statistical parameters



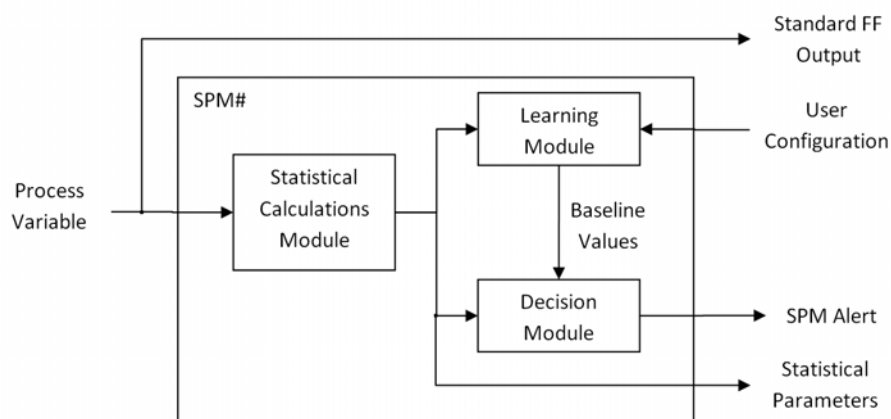
The device can provide the statistical information to the user in two ways. First, the statistical parameters can be made available to the host system directly via Foundation fieldbus communication protocol or FF to other protocol converters. Once available, the system may make use of these statistical parameters to indicate or detect a change in process conditions. In the simplest example, the statistical values may be stored in the DCS historian. If a process upset or equipment problem occurs, these values can be examined to determine if changes in the values foreshadowed or indicated the process upset. The statistical values can then be made available to the operator directly, or made available to alarm or alert software.

Second, the device has internal software that can be used to baseline the process noise or signature via a learning process. Once the learning process is completed, the device itself can detect significant changes in the noise or variation, and communicate an alarm via PlantWeb alert. Typical applications are change in fluid composition or equipment related problems.

SPM Functionality

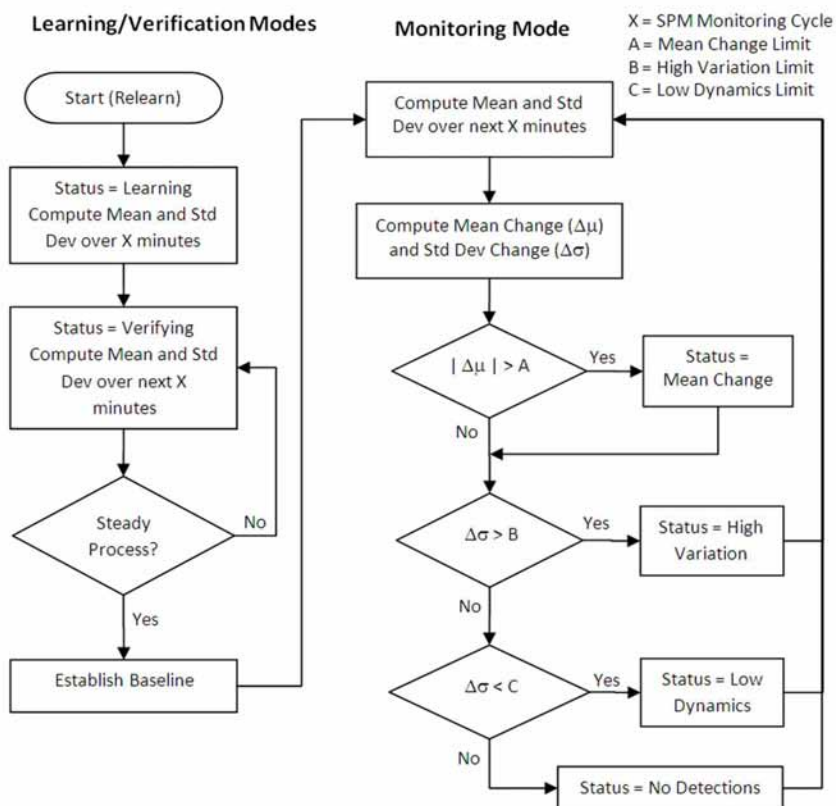
A block diagram of the Statistical Process Monitoring (SPM) diagnostic is shown in Figure 6-3. Note from Figure 6-1 that the 3051S FF has four Statistical Process Monitoring blocks (SPM1-SPM4). Figure 6-3 illustrates just one of the SPM blocks. The process variable (which could be either the measured pressure or some other variable from the fieldbus segment) is input to a Statistical Calculations Module where basic high pass filtering is performed on the pressure signal. The mean (or average) is calculated on the unfiltered pressure signal, the standard deviation calculated from the filtered pressure signal. These statistical values are available via handheld communication devices like the 375 Field Communicator or asset management software like Emerson Process Management's AMS™ Device Manager, or distributed control systems with Foundation fieldbus, such as DeltaV.

Figure 6-3. Diagram of 3051S
FF Statistical Process
Monitoring



SPM also contains a learning module that establishes the baseline values for the process. Baseline values are established under user control at conditions considered normal for the process and installation. These baseline values are made available to a decision module that compares the baseline values to the most current values of the mean and standard deviation. Based on sensitivity settings and actions selected by the user via the control input, the diagnostic generates a device alert when a significant change is detected in either mean or standard deviation.

Figure 6-4. Flow Chart of 3051S
FF Statistical Process
Monitoring



Further detail of the operation of the SPM diagnostic is shown in the Figure 6-4 flowchart. This is a simplified version showing operation using the default values. After configuration, SPM calculates mean and standard deviation, used in both the learning and the monitoring modes. Once enabled, SPM enters the learning/verification mode. The baseline mean and standard deviation are calculated over a period of time controlled by the user (SPM Monitoring Cycle; default is 15 minutes). The status will be “Learning”. A second set of values is calculated and compared to the original set to verify that the measured process is stable and repeatable. During this period, the status will change to “Verifying”. If the process is stable, the diagnostic will use the last set of values as baseline values and move to “Monitoring” status. If the process is unstable, the diagnostic will continue to verify until stability is achieved.

In the “Monitoring” mode, new mean and standard deviation values are continuously calculated, with new values available every few seconds. The mean value is compared to the baseline mean value, and the standard deviation is compared to the baseline standard deviation value. If either the mean or the standard deviation has changed more than user-defined sensitivity settings, an alert is generated via FOUNDATION fieldbus. The alert may indicate a change in the process, equipment, or transmitter installation.

NOTE:

The Statistical Process Monitoring diagnostic capability in the Rosemount 3051S FOUNDATION fieldbus Pressure Transmitter calculates and detects significant changes in statistical parameters derived from the input process variable. These statistical parameters relate to the variability of and the noise signals present in the process variable. It is difficult to predict specifically which noise sources may be present in a given measurement or control application, the specific influence of those noise sources on the statistical parameters, and the expected changes in the noise sources at any time. Therefore, Rosemount cannot absolutely warrant or guarantee that Statistical Process Monitoring will accurately detect each specific condition under all circumstances.

SPM CONFIGURATION AND OPERATION

SPM Configuration for Monitoring Pressure

The following section describes the process of configuring and using the Statistical Process Monitoring diagnostic.

Most Advanced Diagnostics Applications require using the device's pressure measurement as the SPM input. To configure the first SPM Block (SPM1) to monitor the pressure set the following parameters:

SPM1_Block_Tag = TRANSDUCER

NOTE:

By default, as shipped from the factory, the tag of the sensor transducer block is "TRANSDUCER". DeltaV does not change the transducer block tags when the device is installed and commissioned. However, it is possible that other Fieldbus host systems may change the transducer block tags. If this happens, SPM#_Block_Tag must be set to whatever tag was assigned by the host.

SPM1_Block_Type = TRANSDUCER Block

SPM1_Parameter_Index = Pressure (inH₂O @ 68 °F)

SPM1_User_Command = Learn

(optional) SPM_Monitoring_Cycle = [1 – 5] minutes (see "Other SPM Settings" on page 6-7)

(optional) SPM_Bypass_Verification = [Yes/No] (see page 6-7)

Apply all of these above changes to the device. Finally, set

SPM_Active = Enabled with 1st-order HP Filter

After SPM is enabled, it will spend the first 5 (whatever the SPM_Monitoring_Cycle is set to) minutes in the learning phase, and then another 5 minutes in the verification phase. If a steady process is detected at the end of the verification phase, the SPM will move into the monitoring phase. After 5 minutes in the monitoring phase, SPM will have the current statistical values (e.g. current mean and standard deviation), and will begin comparing them against the baseline values to determine if an SPM Alert is detected.

SPM Configuration for Monitoring Other Process Variables

Advanced users may wish use SPM to monitor other Fieldbus parameters available within the pressure transmitter. Examples of such parameters would include module sensor temperature, PID control output, valve position, or a process measurement from another device on the same Fieldbus segment. Configuration of SPM for other process variables is similar to what is done for pressure, except that the Block Tag, Block Type, and Parameter Index parameters are different.

Note that # should be replaced by the number of the SPM block which you are configuring (1, 2, 3, or 4).

SPM#_Block_Tag

The tag of the Fieldbus transducer or function block that contains the parameter to be monitored. Note that the tag must be entered manually – there is no pull-down menu to select the tag. SPM can also monitor “out” parameters from other devices. To do this, link the “out” parameter to an input parameter of a function block that resides in the device, and set up SPM to monitor the input parameter.

SPM#_Block_Type

The type of block which was entered into SPM#_Block_Tag. This could be either a Transducer block, or one of the function blocks.

SPM#_Parameter_Index

The parameter (e.g. OUT, PV, FIELD_VAL) of the transducer or function block which you want to monitor.

See “Example Configuration of SPM using Function Block” on page 6-12 for an example of this using DeltaV.

Other SPM Settings

Additional information on other SPM settings is shown below:

SPM_Bypass_Verification

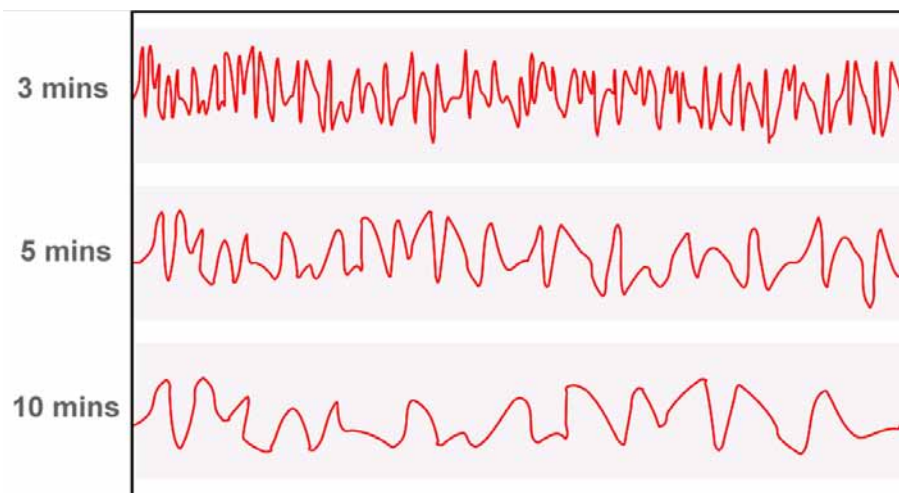
If this is set to “Yes”, SPM will skip the verification process, and the first mean and standard deviation from the learning phase will be taken as the baseline mean and standard deviation. By skipping the verification, the SPM can move into the monitoring phase more quickly. This parameter should only be set to “Yes” if you are certain that the process is at a steady-state at the time you start the Learning. The default (and recommended) setting is “No”.

SPM_Monitoring_Cycle

This is the length of the sample window over which mean and standard deviation are computed. A shorter sample window means that the statistical values will respond faster when there are process changes, but there is also a greater chance of generating false detections. A longer sample window means that mean and standard deviation will take longer to respond when there is a process change. The default value is 15 minutes. For most applications a Monitoring Cycle ranging from 1 to 10 minutes is appropriate. The allowable range is 1 to 1440 minutes (for software revisions 2.0.x or earlier, the minimum SPM Monitoring Cycle is 5 minutes).

Figure 6-5 illustrates the effect of the SPM Monitoring Cycle on the Statistical Calculations. Notice how with a shorter sampling window there is more variation (e.g. the plot looks noisier) in the trend. With the longer sampling window the trend looks smoother because the SPM uses process data averaged over a longer period of time.

Figure 6-5. Effect of the SPM Monitoring Cycle on the Statistical Values



SPM#_User_Command

Select “Learn” after all the parameters have been configured to begin the Learning Phase. The monitoring phase will start automatically after the learning process is complete. Select “Quit” to stop the SPM. “Detect” may be selected to return to the monitoring phase.

SPM_Active

The SPM_Active parameter starts the Statistical Process Monitoring when “Enabled”. “Disabled” (default) turns the diagnostic monitoring off. Must be set to “Disabled” for configuration. Only set to “Enabled” after fully configuring the SPM. When Enabling SPM, you may select one of two options:

Enabled with 1st-Order HP Filter

Applies a high-pass filter to the pressure measurement prior to calculating standard deviation. This removes the effect of slow or gradual process changes from the standard deviation calculation while preserving the higher-frequency process fluctuations. Using the high-pass filter reduces the likelihood of generating a false detection if there is a normal process or setpoint change. For most diagnostics applications, you will want to use the filter.

Enabled w/o Filter

This enables SPM without applying the high-pass filter. Without the filter, changes in the mean of the process variable will cause an increase in the standard deviation. Use this option only if there are very slow process changes (e.g. an oscillation with a long period), which you wish to monitor using the standard deviation.

Configuration of Alerts

In order to have SPM generate a PlantWeb alert, the alert limits must be configured on the mean and/or standard deviation. The three alert limits available are:

SPM#_Mean_Lim

Upper and lower limits for detecting a Mean Change

SPM#_High_Variation_Lim

Upper limit on standard deviation for detecting a High Variation condition

SPM#_Low_Dynamics_Lim

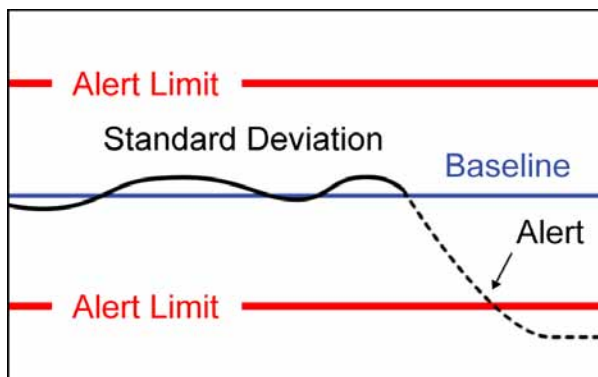
Lower limit on standard deviation for detecting a Low Dynamics condition (must be specified as a negative number)

All of these limits are specified as a percent change in the statistical value from its baseline. If a limit is set to 0 (the default setting) then the corresponding diagnostic is disabled. For example, if SPM#_High_Variation_Limit is 0, then SPM# does not detect an increase in standard deviation.

Figure 6-6 illustrates an example of the standard deviation, with its baseline value and alert limits. During the monitoring phase, the SPM will continuously evaluate the standard deviation and compare it against the baseline value. An alert will be detected if the standard deviation either goes above the upper alert limit, or below the lower alert limit.

In general, a higher value in any of these limits leads to the SPM diagnostic being less sensitive, because a greater change in mean or standard deviation is needed to exceed the limit. A lower value makes the diagnostic more sensitive, and could potentially lead to false detections.

Figure 6-6. Example Alerts for Standard Deviation



SPM Operations

During operation, the following values are updated for each SPM Block (e.g. SPM1-SPM4)

SPM#_Baseline_Mean

Baseline Mean (calculated average) of the process variable, determined during the Learning/Verification process, and representing the normal operating condition

SPM#_Mean

Current Mean of the process variable

SPM#_Mean_Change

Percent change between the Baseline Mean and the Current Mean

SPM#_Baseline_StDev

Baseline Standard Deviation of the process variable, determined during the Learning/Verification process, and representing the normal operating condition

SPM#_StDev

Current Standard Deviation of the process variable

SPM#_StDev_Change

Percent change between the Baseline Standard Deviation and the Current Standard Deviation

SPM#_Timestamp

Timestamp of the last values and status for the SPM

SPM#_Status

Current state of the SPM Block. Possible values for SPM Status are as follows:

Status Value	Description
Inactive	User Command in "Idle", SPM not Enabled, or the function block is not scheduled.
Learning	Learning has been set in the User Command, and the initial baseline values are being calculated
Verifying	Current baseline values and previous baseline values or being compared to verify the process is stable.
Monitoring	Monitoring the process and no detections are currently active.
Mean Change Detected	Alert resulting from the Mean Change exceeding the Threshold Mean Limit. Can be caused by a set point change, a load change in the flow, or an obstruction or the removal of an obstruction in the process.
High Variation Detected	Alert resulting from the Stdev Change exceeding the Threshold High Variation value. This is an indicator of increased dynamics in the process, and could be caused by increased liquid or gas in the flow, control or rotational problems, or unstable pressure fluctuations.
Low Dynamics Detected	Alert resulting from the Stdev Change exceeding the Threshold Low Dynamics value. This is an indicator for a lower flow, or other change resulting in less turbulence in the flow.
Not Licensed	SPM is not currently purchased in this device.

In most cases, only one of the above SPM status bits will be active at one time. However, it is possible for "Mean Change Detected" to be active at the same time as either "High Variation Detected" or "Low Dynamics Detected" is active.

PlantWeb Alert

When any of the SPM detections (Mean Change, High Variation, or Low Dynamics) is active, a Fieldbus PlantWeb alert in the device "Process Anomaly Detected (SPM)" will be generated and sent to the host system. However, note that there is just one SPM PlantWeb alert, and it applies to all the detections on all four SPM blocks.

Trending Statistical Values in Control System

SPM Mean and Standard Deviation values may be viewed and/or trended in a Fieldbus host system through the AI or MAI function blocks.

An Analog Input (AI) block may be used to read either the mean or the standard deviation from any one of the SPM Blocks. To use the AI block to trend SPM data, set the CHANNEL parameter to one of the following values:

Table 6-1. Valid SPM Channels for the AI Block

Channel	SPM Variable
12	SPM1 mean
13	SPM1 standard deviation
14	SPM2 mean
15	SPM2 standard deviation
16	SPM3 mean
17	SPM3 standard deviation
18	SPM4 mean
19	SPM4 standard deviation

See Table 3-1 for a complete listing of valid Channels for the AI Block.

The SPM Mean and Standard Deviation are always displayed in the unit inches of water, regardless of the measurement unit configured in the transducer block for the primary pressure measurement. Therefore, when configuring an AI Block to read one of the SPM values, the engineering unit of the XD_SCALE parameter must be set to "inH₂O at 68 °F".

The OUT_SCALE parameter should be set to the engineering unit and range which are desired for the mean and standard deviation output. For example, it is possible to use the OUT_SCALE parameter to convert mean and standard deviation to some other pressure unit. See "Analog Input (AI) Function Block" on page 3-8 for additional details on setting the XD_SCALE, OUT_SCALE, and L_TYPE parameters of the AI function block.

The Multiple Analog Input (MAI) function block can be used to read the mean and standard deviation from all four SPM blocks simultaneously. The Channel of the MAI block must be set to 11. The mapping between output parameters of the MAI and the SPM values is shown in Table 6-2:

Table 6-2. SPM Output Values for the MAI Block

Parameter	SPM Variable
OUT1	SPM1 mean
OUT2	SPM1 standard deviation
OUT3	SPM2 mean
OUT4	SPM2 standard deviation
OUT5	SPM3 mean
OUT6	SPM3 standard deviation
OUT7	SPM4 mean
OUT8	SPM4 standard deviation

The output values from the MAI block are always in the unit inH₂O.

SPM Configuration with EDDL

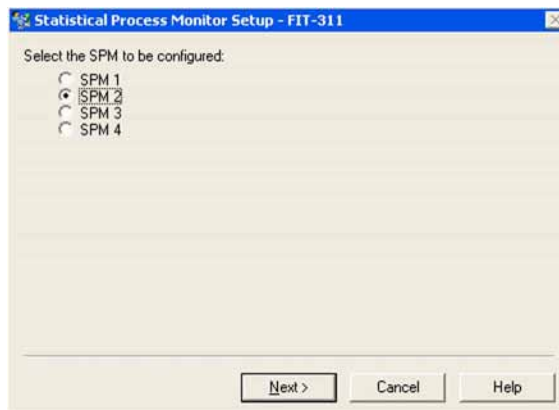
For host systems that support Electronic Device Description Language (EDDL), using SPM is made easier with step-by-step configuration guidance and graphical displays. This section of the manual uses AMS Device Manager version 10.5 for illustrations, although other EDDL hosts could be used as well.

The SPM Configuration Wizard can be launched by clicking the button "Statistical Process Monitor Setup" from the page Configure > Guided Setup

This Wizard will take you step-by-step through the parameters that need to be set in order to configure SPM. On the first screen (Figure 6-7), select which SPM block (1, 2, 3, or 4) that you want to configure.

Rosemount 3051S

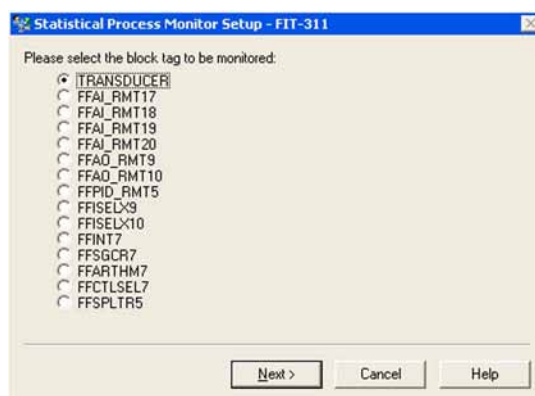
Figure 6-7. SPM Configuration Wizard - Selecting the SPM to Configure



The Wizard will then take you through the process of setting the parameters corresponding to the Block Tag, Block Parameter, Monitoring Cycle, and Bypass Verification.

On Fieldbus hosts that support Device-Dashboard functionality (e.g. AMS Device Manager 10.0 and later), you will be able to select from a list of valid function and transducer blocks (Figure 6-8), rather than having to manually enter the block tag. Once this parameter is selected, the SPM#_Block_Type parameter will be determined automatically. For non-device-dashboard hosts (e.g. AMS Device Manager 9.0 and previous) you will have to manually enter the Fieldbus block tag that was assigned by the host system, and select the Block Type.

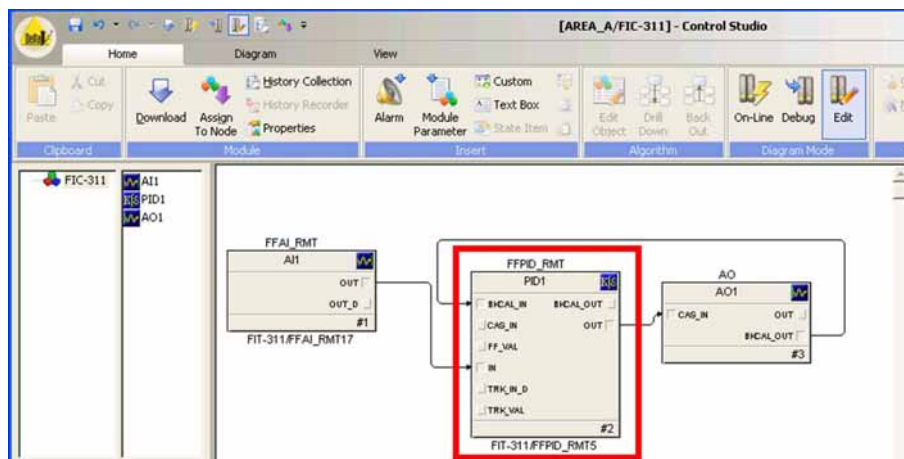
Figure 6-8. Device Dashboard Supported Hosts can Select Function Block for SPM



Example Configuration of SPM using Function Block

The following is an example of how to configure SPM using one of the function blocks within the transmitter. Figure 6-9 illustrates an example from DeltaV Control Studio of the PID Function Block (highlighted) within the 3051S Pressure Transmitter being used for Control in the Field. Note in this example that "FIT-311" is the tag given to the device when it was commissioned, and "FFPID_RMT5" is the tag of the function block that was automatically assigned by DeltaV.

Figure 6-9. Example of PID Control within a Pressure Transmitter



Using SPM, it is possible to detect problems in the control loop. For example, an increase in the cycling or oscillation of the control loop could be indicated by an increase in the standard deviation.

If SPM has already been enabled, it must first be disabled, before any additional SPM blocks can be configured. First, set

SPM_Active = Disabled

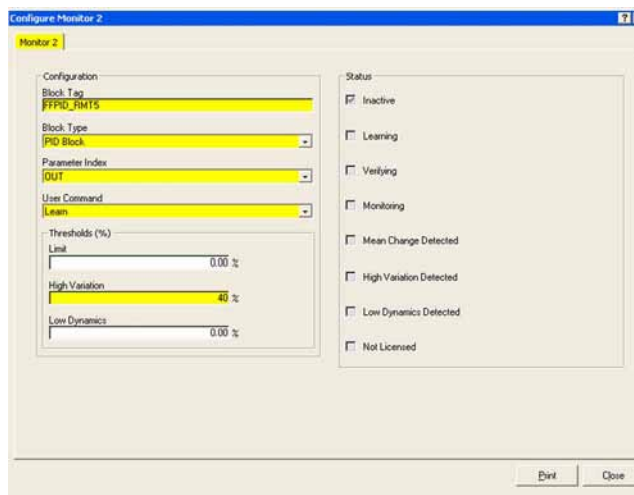
Next, to configure SPM2 to monitor the PID control loop, you would set the parameters as shown in Figure 6-10.

SPM2_Block_Tag = FFPID_RMT5

SPM2_Block_Type = PID Block

SPM2_Parameter_Index = OUT

Figure 6-10. Example Configuration of SPM Using a Function Block



Set the High Variation Limit (or other limits) as desired, and set the user command to “Learn” in order to begin the learning process for this SPM Block. Finally, verify that SPM_Monitoring_Cycle and SPM_Bypass_Verification are set as desired, and set the SPM_Active Parameter to “Enabled” (with or without the filter)

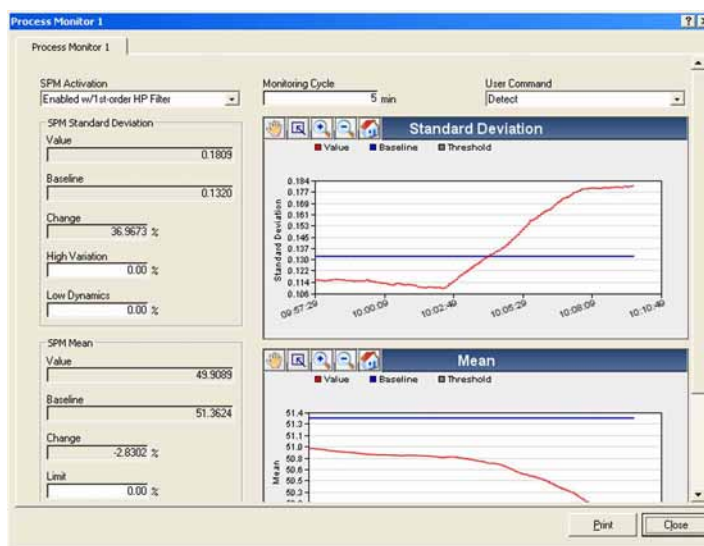
EDDL Trending of Mean and Standard Deviation

Once the SPM has been enabled, the EDDL user interface allows for easy viewing and trending of mean and standard deviation. To open up the trending screen, go to

Service Tools > Trends > SPM and click the desired “Process Monitor #” button

The EDDL Screen will show an on-line trend of mean and standard deviation, along with the baseline values, percent change, and detection limits (Figure 6-11).

Figure 6-11. EDDL Trend of Mean and Standard Deviation



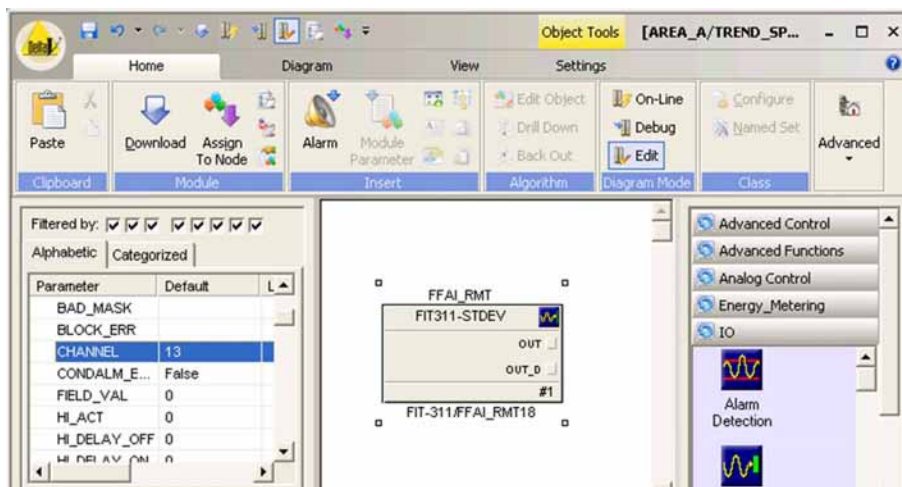
Note that data shown on the EDDL trends are not stored in a process historian or other database. When this screen is closed, all of the past data in the trends plots are lost. See “Trending SPM Data in DeltaV” on page 6-14 for configuring SPM data to be stored in a historian.

Trending SPM Data in DeltaV

Refer to “Trending Statistical Values in Control System” on page 6-10 for general information about accessing the SPM data through the AI and MAI function blocks. This section shows a specific example of how SPM Data can be accessed within the DeltaV host system, saved into the process historian, and used to generate a process alert.

In DeltaV Control Studio, add an AI function block, and assign it to one of the AI function blocks in the 3051S Device. Set the CHANNEL to one of the valid SPM channel values from Table 6-1 on page 6-11. For example, set the CHANNEL to 13 for SPM1 Standard Deviation, as shown in Figure 6-12.

Figure 6-12. Example AI Function Block for Trending Standard Deviation in DeltaV



Set the units and scaling for the function block as follows:

XD_SCALE = 0 to 1 in H₂O (68 °F)

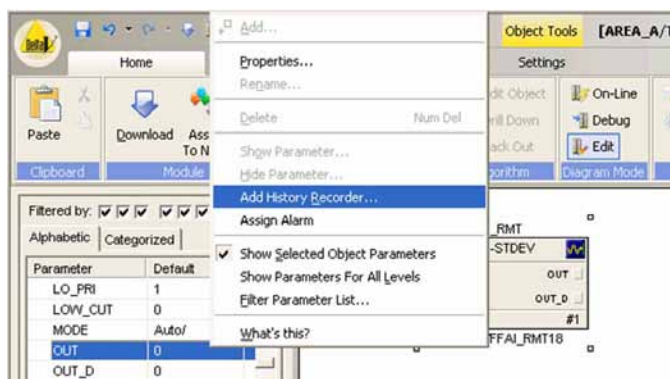
OUT_SCALE = 0 to 1 in H₂O (68 °F)

L_TYPE = Indirect

Note that the range set in the OUT_SCALE parameter will be the range that is shown by default when the variable is trended in the DeltaV Process History View. Standard deviation typically has a range much narrower than the process measurement, and so the scaling should be set accordingly. Also note that the units for XD_SCALE must be set to in H₂O (68 °F), but the units for OUT-SCALE can be set to any desired engineering unit.

If you want the standard deviation to be logged to DeltaV Continuous Historian, you need to add the appropriate parameter to the historian. Right-click on the OUT parameter of the AI Block, and select the option "Add History Recorder ..." (Figure 6-13)

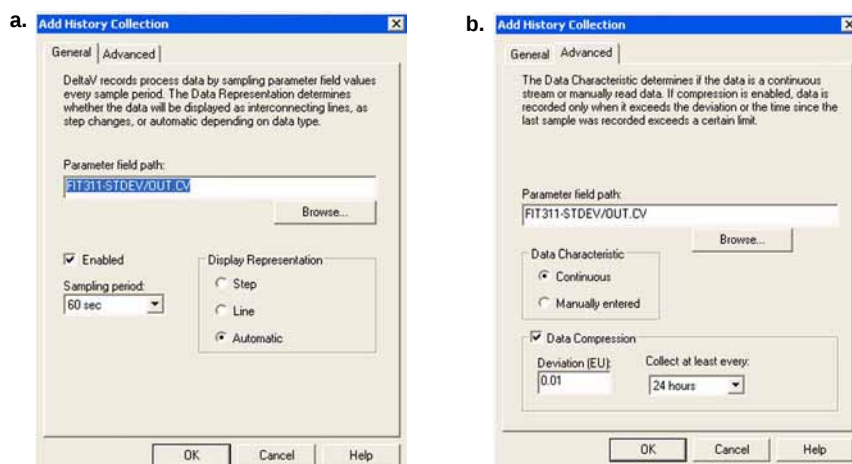
Figure 6-13. Adding History Recorder from DeltaV Control Studio



Follow through the “Add History Collection” dialog (Figure 6-14), to add the parameter to the DeltaV Historian with the desired sampling period, compression, etc. By default the sampling period is 60 seconds, as shown in a. of Figure 6-14. However, there are many diagnostics applications where one may want to look at changes in the standard deviation much faster than this. In that case, you will want to set the sampling period to something smaller.

When adding a standard deviation for history collection in DeltaV, it is recommended that you not use the default data compression settings. By default, the DeltaV Historian will log a new data point only when the process value deviates by 0.01 or more. There are many diagnostics applications where it is useful to look at changes in the standard deviation that are smaller than this. Therefore, it is recommended that when logging the standard deviation, either the Data Compression should be disabled (by unchecking the appropriate box in b. of Figure 6-14 on page 6-16) or the Deviation (EU) should be set to a much lower value, for example, 0.001 or 0.0001.

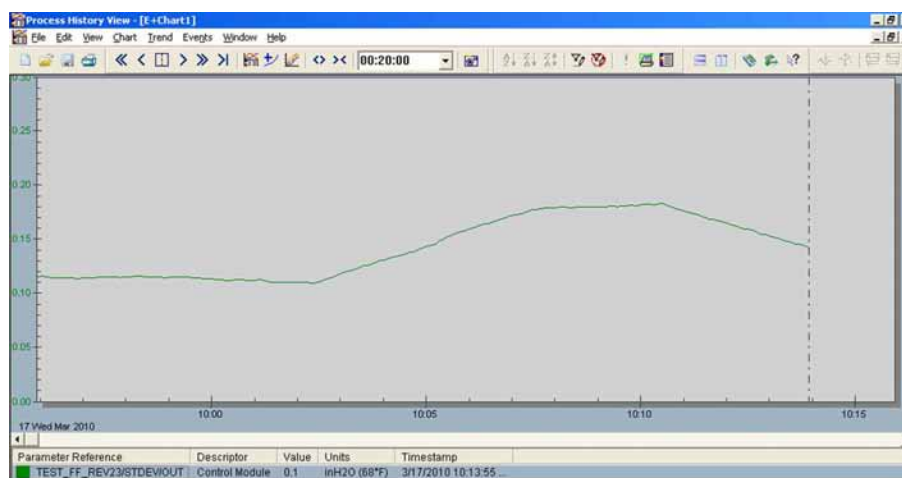
Figure 6-14. DeltaV Add History Collection: a.) General Configuration b.) Advanced Configuration



Refer to the DeltaV Books Online for more details on the DeltaV Continuous Historian.

After the SPM value has been saved to the historian, when the DeltaV Process History View is opened for the selected parameter, the graph will be populated with the historical data currently in the database (Figure 6-15).

Figure 6-15. Trend of Standard Deviation in DeltaV Process History View



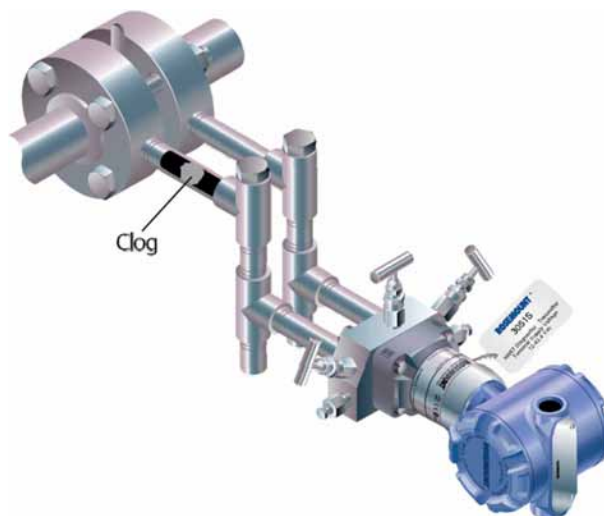
Finally, when the SPM data is trended in DeltaV, it is possible to configure HI and/or LO alarms on the mean or standard deviation via the AI Block. This can be done by right-clicking on the AI Function Block in Control Studio, and selecting the option "Assign Alarm". The Block Alarm configuration window will let you set up desired alarm limits. Refer to the DeltaV Books Online for detailed information on configuring alarms.

PLUGGED IMPULSE LINE DETECTION TECHNOLOGY

Introduction

Pressure transmitters are used in pressure, level, and flow measurement applications. Regardless of application, the transmitter is rarely connected directly to the pipe or vessel. Small diameter tubes or pipes commonly called impulse lines are used to transmit the pressure signal from the process to the transmitter. In some applications, these impulse lines can become plugged with solids or frozen fluid in cold environments, effectively blocking the pressure signals (Figure 6-16). The user typically does not know that the blockage has occurred. Because the pressure at the time of the plug is trapped, the transmitter may continue to provide the same signal as before the plug. Only after the actual process changes and the pressure transmitter's output remains the same may someone recognize that plugging has occurred. This is a typical problem for pressure measurement, and users recognize the need for a plugged impulse line diagnostic for this condition.

Figure 6-16. Basics of Plugged Impulse Line



Testing at Emerson Process Management and other sites indicates that Statistical Process Monitoring technology can detect plugged impulse lines. Plugging effectively disconnects the transmitter from the process, changing the noise pattern received by the transmitter. As the diagnostic detects changes in noise patterns, and there are multiple sources of noise in a given process, many factors can come into play. These factors play a large role in determining the success of diagnosing a plugged impulse line. This section of the product manual will acquaint users with the basics of the plugged impulse lines and the PIL diagnostic, the positive and negative factors for successful plugged line detection, and the do's and don'ts of installing pressure transmitters and configuring and operating the PIL diagnostic.

Plugged Impulse Line Physics

The physics of Plugged Impulse Line Detection begins with the fluctuations or noise present in most Pressure and Differential Pressure (DP) signals. In the case of DP flow measurements, these fluctuations are produced by the flowing fluid and are a function of the geometric and physical properties of the system. The noise can also be produced by the pump or control system. This is also true for Pressure measurements in flow applications, though the noise produced by the flow is generally less in relation to the average pressure value. Pressure level measurements may have noise if the tank or vessel has a source of agitation. The noise signatures do not change as long as the system is unchanged. In addition, these noise signatures are not affected significantly by small changes in the average value of the flow rate or pressure. These signatures provide the opportunity to identify a plugged impulse line.

When the lines between the process and the transmitter start to plug through fouling and build-up on the inner surfaces of the impulse tubing or loose particles in the main flow getting trapped in the impulse lines, the time and frequency domain signatures of the noise start to change from their normal states. In the simpler case of a Pressure measurement, the plug effectively disconnects the Pressure transmitter from the process. While the average value may remain the same, the transmitter no longer receives the noise signal from the process and the noise signal decreases significantly. The same is true for a DP transmitter when both impulse lines are plugged.

The case of the Differential Pressure measurement in a flow application with a single line plugged is more complicated, and the behavior of the transmitter may vary depending on a number of factors. First the basics: a differential pressure transmitter in a flow application is equipped with two impulse lines, one on the high pressure side (HP) and one on the low pressure side (LP) of the primary element. Understanding the results of a single plugged line requires understanding of what happens to the individual pressure signals on the HP and LP sides of the primary element. Common mode noise is generated by the primary element and the pumping system as depicted in Figure 6-17. When both lines are open, the differential pressure sensor subtracts the LP from the HP. When one of the lines are plugged (either LP or HP), the common mode cancellation no longer occurs. Therefore there is an increase in the noise of the DP signal. See Figure 6-18.

Figure 6-17. Differential Pressure Signals under Different Plugging Conditions

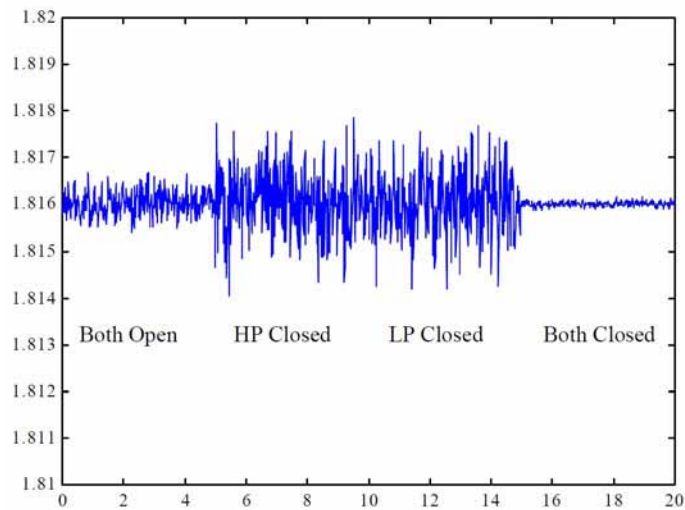
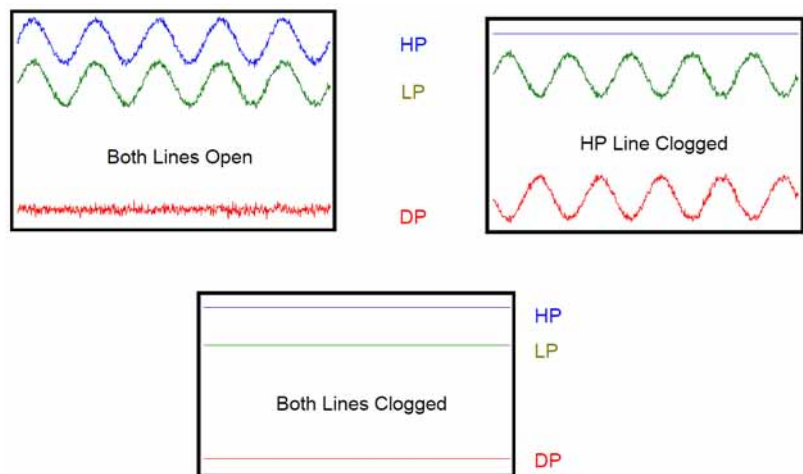


Figure 6-18. Differential Pressure (DP) Signals under Different Plugged Conditions



However, there is a combination of factors that may affect the output of the DP transmitter under single plugged line conditions. If the impulse line is filled with an incompressible fluid, no air is present in the impulse line or the transmitter body, and the plug is formed by rigid material, the noise or fluctuation will decrease. This is because the combination of the above effectively “stiffens” the hydraulic system formed by the DP sensor and the plugged impulse line. The PIL diagnostic can detect these changes in the noise levels through the operation described previously.

Plugged Line Detection Factors

The factors that may play a significant role in a successful or unsuccessful detection of a plugged impulse line can be separated into positive factors and negative factors, with the former increasing the chances of success and the latter decreasing the chances of success. Within each list, some factors are more important than others as indicated by the relative position on the list. If an application has some negative factors that does not mean that it is not a good candidate for the diagnostic. The diagnostic may require more time and effort to set up and test and the chances of success may be reduced. Each factor pair will be discussed.

Ability to Test Installed Transmitter

The single most important positive factor is the ability to test the diagnostic after the transmitter is installed, and while the process is operating. Virtually all DP flow and most pressure measurement installations include a root or manifold valve for maintenance purposes. By closing the valve, preferable the one(s) closest to the process to most accurately replicate a plug, the user can note the response of the diagnostic and the change in the standard deviation value and adjust the sensitivity or operation accordingly.

Stable, In-Control Process

A process that is not stable or in no or poor control may be a poor candidate for the PIL diagnostic. The diagnostic baselines the process under conditions considered to be normal. If the process is unstable, the diagnostic will be unable to develop a representative baseline value. The diagnostic may remain in the learning/verifying mode. If the process is stable long enough to establish a baseline, an unstable process may result in frequent relearning/verifications and/or false trips of the diagnostic.

Well Vented Installation

This is an issue for liquid applications. Testing indicates that even small amounts of air trapped in the impulse line of the pressure transmitter can have a significant effect on the operation of the diagnostic. The small amount of air can dampen the pressure noise signal as received by the transmitter. This is particularly true for DP devices in single line plugging situations and GP/AP devices in high pressure/low noise applications. See the next paragraph and “Impulse Line Length” on page 6-21 for further explanation. Liquid DP flow applications require elimination of all the air to insure the most accurate measurement.

DP Flow and Low GP/AP vs. High GP/AP Measurements

This is best described as a noise to signal ratio issue and is primarily an issue for detection of plugged lines for high GP/AP measurements. Regardless of the line pressure, flow generated noise tends to be about the same level. This is particularly true for liquid flows. If the line pressure is high and the flow noise is very low by comparison, there may not be enough noise in the measurement to detect the decrease brought on by a plugged impulse line. The low noise condition is further enhanced by the presence of air in the impulse lines and transmitter if a liquid application. The PIL diagnostic will alert the user to this condition during the learning mode by indicating "Insufficient Dynamics" status.

Flow vs. Level Applications

As previously described, flow applications naturally generate noise. Level applications without a source of agitation have very little or no noise, therefore making it difficult or impossible to detect a reduction in noise from the plugged impulse line. Noise sources include agitators, constant flow in and out of the tank maintaining a fairly consistent level, or bubblers.

Impulse Line Length

Long impulse lines potentially create problems in two areas. First, they are more likely to generate resonances that can create competing pressure noise signals with the process generated noise. When plugging occurs, the resonant generated noise is still present, and the transmitter does not detect a significant change in noise level, and the plugged condition is undetected. The formula that describes the resonant frequency is:

$$f_n = (2n-1) \cdot C / 4L \quad (2)$$

where:

f_n is the resonant frequency,

n is the mode number,

C is the speed of sound in the fluid, and

L is the impulse length in meters.

A 10 meter impulse line filled with water could generate resonant noise at 37 Hz, above the frequency response range of a typical Rosemount pressure transmitter. This same impulse line filled with air will have a resonance of 8.7 Hz, within the range. Proper support of the impulse line effectively reduces the length, increasing the resonant frequency.

Second, long impulse lines can create a mechanical low pass filter that dampens the noise signal received by the transmitter. The response time of an impulse line can be modeled as a simple RC circuit with a cutoff frequency defined by:

$$\tau = RC \text{ and } \tau = \frac{1}{2} \pi f_c$$

$$R = 8 \nu L / \pi r^4$$

$$C = \Delta \text{Volume} / \Delta \text{Pressure}$$

where:

f_c is the cut-off frequency

ν is the viscosity in centipoises,

L is the impulse line length in meters

r is the radius of the impulse line.

The “C” formula shows the strong influence of air trapped in a liquid filled impulse line, or an impulse line with air only. Both potential issues indicate the value of short impulse lines. One installation best practice for DP flow measurements is the use of the Rosemount 405 series of integrated compact orifice meters with the 3051S Pressure transmitter. These integrated DP flow measurement systems provide perhaps the shortest practical impulse line length possible while significantly reducing overall installation cost and improved performance. They can be specified as a complete DP flowmeter.

NOTE

The Plugged Impulse Line diagnostic capability in the Rosemount 3051S FOUNDATION fieldbus Pressure Transmitter calculates and detects significant changes in statistical parameters derived from the input process variable. These statistical parameters relate to the variability of the noise signals present in the process variable. It is difficult to predict specifically which noise sources may be present in a given measurement or control application, the specific influence of those noise sources on the statistical parameters, and the expected changes in the noise sources at any time. Therefore, it is not absolutely warranted or guaranteed that the Plugged Impulse Line Diagnostic will accurately detect each specific plugged impulse line condition under all circumstances.

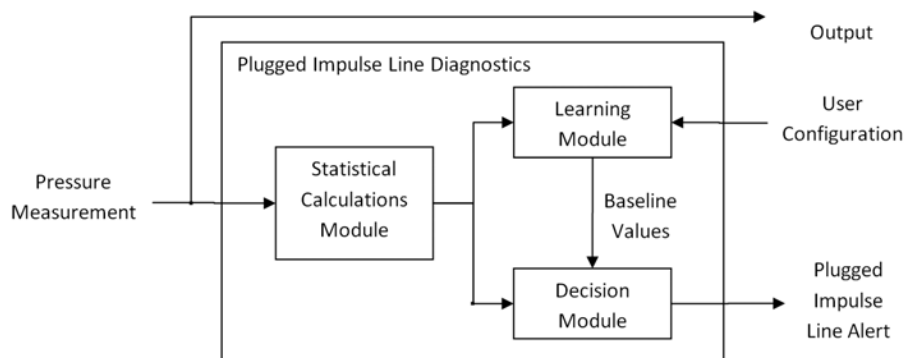
Plugged Impulse Line (PIL) Functionality

The Advanced Diagnostics Suite provides the Plugged Impulse Line (PIL) diagnostic, as an easy way to apply Statistical Process Monitoring technology specifically for detecting plugging in pressure measurement impulse lines. Similar to SPM, PIL also calculates the mean and standard deviation of the pressure measurement and generates an alert when the standard deviation exceeds an upper or lower limit.

Figure 6-19 illustrates a block diagram of the plugged impulse line diagnostic. Notice that it is very similar to the diagram for SPM shown in Figure 6-3. However, there are a couple of notable differences with PIL:

- The pressure measurement is fixed as the input
- Statistical values (mean and standard deviation) are not available as outputs
- The PlantWeb alert generated specifically indicates “Plugged Impulse Line Detected”

Figure 6-19. Overview of
Plugged Impulse Line
Diagnostics



PIL also includes some additional features to make it especially suitable for detecting plugging in pressure measurement impulse lines. PIL has the ability to:

- Automatically relearn new baseline values if the pressure measurement changes significantly
- Set the status quality of the pressure measurement to “Uncertain” if a plugged impulse line is detected
- Check for a minimum process dynamics during the learning process
- Adjust the verification settings
- Set separate learning and detection periods

Figure 6-20 shows a flow chart of the PIL algorithm. Note that this diagram shows the sequence of PIL steps using the default configuration settings. Information for adjusting these settings is found in “Configuration of Plugged Impulse Line Detection” on page 6-25. The specific steps that PIL goes through are as follows:

1. Learning Phase

PIL begins the Learning Process when the PIL is Enabled, when the User Command is set to “Relearn”, or when a Mean Change is detected during the Detection Phase. PIL collects the pressure values for 5-minutes and computes the mean and the standard deviation.

NOTE:

The length of the learning period is user-adjustable, with 5-minutes as the default value. During the Learning Phase the status is “Learning”.

2. Sufficient Variation?

During the Learning and the Verify modes, the PIL checks that the noise level (e.g. the standard deviation) is high enough for reliable detection of plugged impulse lines. If the noise level is too low, the status goes to “Insufficient Dynamics”, and the PIL stops. PIL will not resume learning again until a “Relearn” command is given.

3. Verification Phase

PIL collects the pressure values for an additional 5-minutes (or same length as Learning period) and computes a second mean and standard deviation. During this phase, the PIL status is “Verifying”

4. Steady Process?

At the end of the 5-minute verification phase, the PIL compares the last mean and standard deviation against the previous mean and standard deviation to determine if the process is at a steady state. If the process is at a steady-state, then the PIL moves into Detection phase. If not, then PIL repeats the Verification Phase

5. Establish Baseline

At the end of the Verification Phase, if the process has been determined to be at a steady state, the last mean and standard deviation are taken to be the "Baseline" values, representative of the normal process operating condition.

6. Detection Phase

During the Detection Phase, the PIL collects pressure data for 1 minute and computes the mean and the standard deviation.

NOTE:

The length of this "Detection Period" is user-adjustable, with 1-minute as the default value.

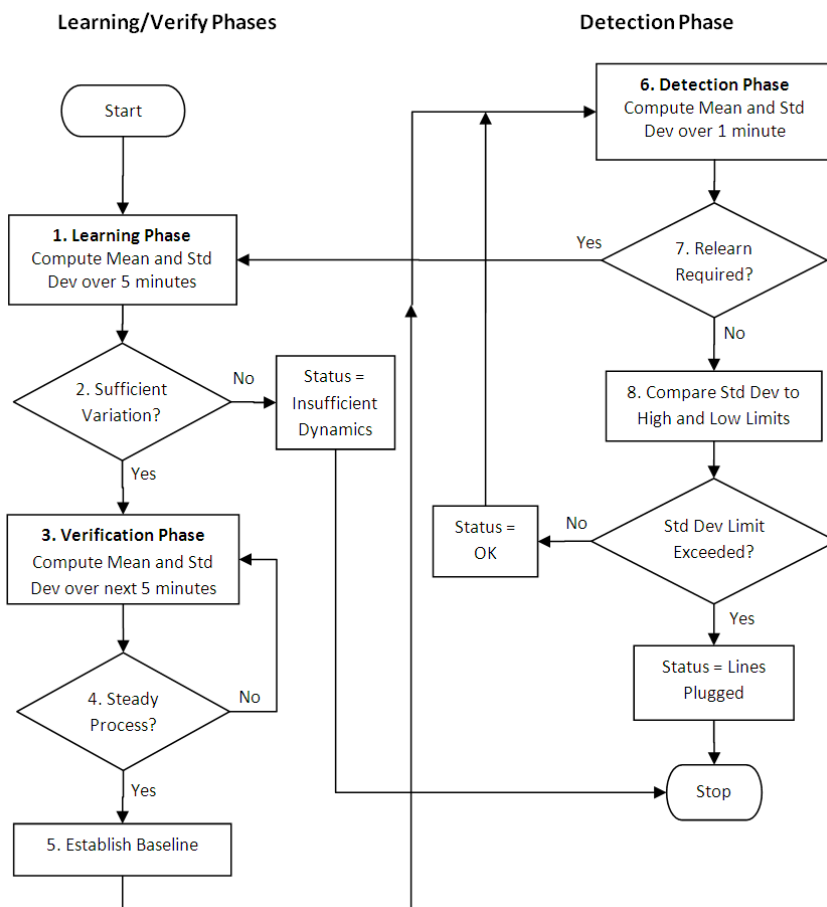
7. Relearn Required?

At the end of the 1-minute, PIL first compares the current mean with the baseline mean. If the two differ significantly, then the PIL goes back into the Learning Phase, because the process conditions have changed too much for a reliable detection of a plugged impulse line.

8. Compare Standard Deviations

If no relearn is required, the PIL compares the current standard deviation against the baseline standard deviation to determine if a plugged impulse line is detected. For all sensor types, the PIL checks if the standard deviation has decreased below a lower limit. For DP sensors, the PIL also checks if the standard deviation has increased above an upper limit. If either of these limits is exceeded, the status changes to "Lines Plugged" and the PIL stops, and will not resume again until a "Relearn" command is given. If a plugged impulse line is not detected, the status is "OK" and the Detection Phase is repeated.

Figure 6-20. Flow Chart for
Plugged Impulse Line
Diagnostics



CONFIGURATION OF PLUGGED IMPULSE LINE DETECTION

Basic Configuration

This section describes the configuration of the plugged impulse line diagnostic.

For some impulse line plugging applications there will be a very significant (> 80%) decrease in standard deviation. Examples of this would include a plug in the impulse line of a GP/AP measurement in a noisy process, or a plug in both impulse lines of a DP measurement. In these applications, configuring plugged impulse line detection requires nothing more than turning it on. To do this, set

PLINE_ON = Enabled

Once the PIL is enabled, it will automatically start the learning process, and move to the detection phase if there is sufficient variation and the process is stable.

Optionally, if, when a plugged impulse line is detected, you want to automatically have the status quality of the pressure measurement go to "Uncertain", set the parameter

PLINE_Affect_PV_Status = True

By default, the value of `PLINE_Affect_PV_Status` is “False”, meaning that the quality of the pressure measurement will not be changed if PIL detects a plugged impulse line. Setting this parameter to “True” will cause the status quality to change to “Uncertain” when a plugged impulse line is detected. Depending upon the DCS configuration, the “Uncertain” quality could be visible to the Operator, or it could affect the control logic.

If you ever want to re-start the PIL learning process, set the parameter

`PLINE_Relearn` = Relearn

Note for 3051S Software Version 1.11.x (x =5, 6, or 9)

For software revision 1.11.x, after the PIL has been enabled, it is necessary to restart the processor. The software revision can be seen via the parameter `RB_SFTWR_REV_ALL` the Resource Block (see Table A-1). In AMS Device Manager and the Field Communicator this parameter is labeled as “Software Revision String.”

To restart the processor, the sequence depends on the host system:

For AMS Device Manager, right-click on the device, and select the menu option `Methods > Diagnostics > Master Reset`. When prompted for the type of reset, select “Processor” or “Restart Processor”.

On a Field Communicator, choose the option `Resource Block > Diagnostic Methods > Master Reset > Processor`

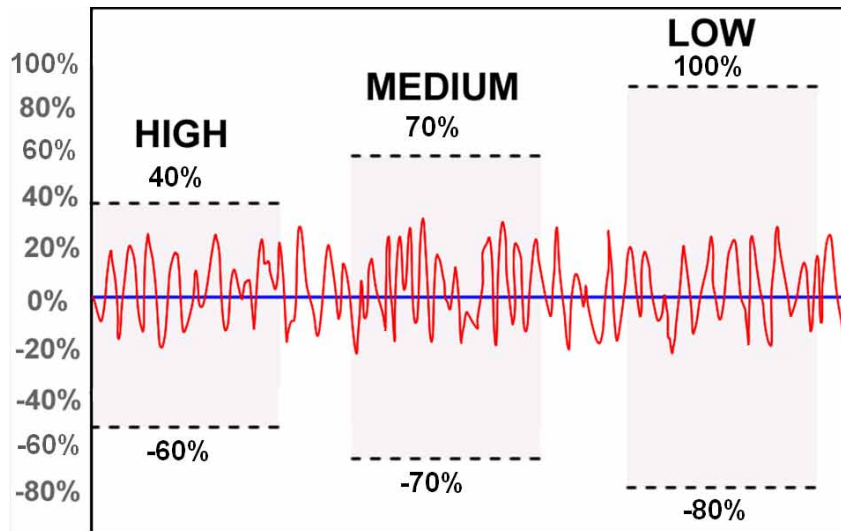
On most other fieldbus hosts, this is done by setting the `RESTART` parameter of the Resource block to the value: “Processor”

Configuration of Detection Sensitivity

Although a few impulse line applications can be configured just by enabling the PIL, the majority of applications will require configuring the detection sensitivity (that is, the upper and/or lower limit on the standard deviation at which an impulse line plug will be detected).

Figure 6-21 illustrates the basic detection sensitivity setting for PIL. In general, a higher sensitivity means that the PIL is more sensitive to changes in the process dynamics, while a lower sensitivity means that the PIL is less sensitive to process dynamics changes.

Figure 6-21. PIL Basic Detection Sensitivities



Detection sensitivities are specified as a percent change in the standard deviation from the baseline value. Note from Figure 6-21 that a higher detection limit (% change) actually corresponds to a lower sensitivity, because a greater change in the process dynamics is required to trigger a plugged impulse line alert. Likewise, a lower detection limit corresponds to a higher sensitivity.

In PIL, the Detection Sensitivity is determined by 3 parameters: PLINE_Sensitivity, PLINE_Detect_Sensitivity, and PLINE_Single_Detect_Sensitivity.

The **PLINE_Sensitivity** parameter provides the means to set a basic detection sensitivity (Figure 6-21). It can be set to the values: High, Medium (default), or Low. Each value has a corresponding upper and lower limit shown in the table Table 6-3. Note that setting the basic sensitivity affects both the upper and the lower detection limits.

Table 6-3. Basic PIL Detection Sensitivities

PLINE_Sensitivity Value	Upper Standard Deviation Limit	Lower Standard Deviation Limit
High	40%	60%
Medium	70%	70%
Low	100%	80%

So, for example, if the PLINE_Sensitivity is set to High, then a plugged impulse line will be detected if the standard deviation either increases by more than 40% above its baseline value, or decreases more than 60% below its baseline value.

NOTE:

For GP/AP sensors, the PIL does not check for an increase in standard deviation, and a plugged impulse line is detected only if the standard deviation goes below the lower limit. For DP sensors, the PIL checks for both an increase and a decrease in standard deviation.

The upper and lower detection limits can be set to custom values, using the parameters:

PLINE_Detect_Sensitivity

Adjusts the Lower detection limit. If this value is 0 (default), the Lower limit is determined by PLINE_Sensitivity. If this value is greater than 0, then it overrides the basic sensitivity value. This value can be set in the range 0 – 100%

PLINE_Single_Detect_Sensitivity

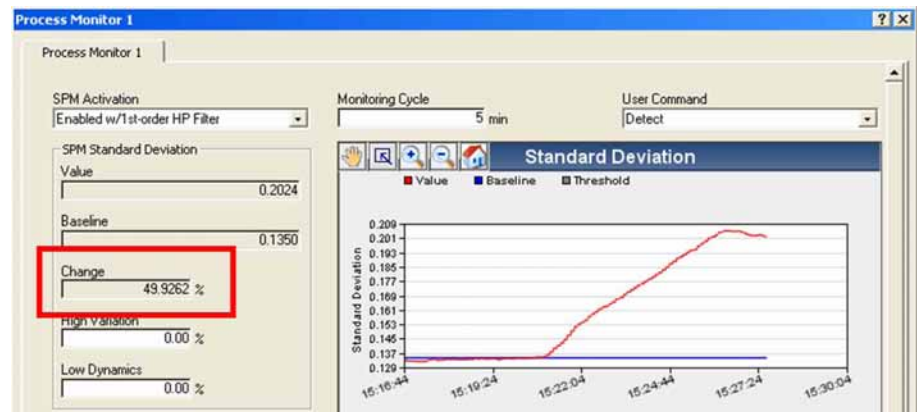
Adjusts the Upper detection limit. If this value is 0 (default), the Upper limit is determined by PLINE_Sensitivity. If this value is greater than 0, then it overrides the basic sensitivity value. This value can be set in the range 0 – 10000% (For software revisions 1.11.x or earlier, the allowable range for this parameter is 0-100%).

**Determining the
Detection Sensitivity**

Determining what values to configure for the upper and lower detection limits can be done by configuring SPM to monitor and trend the standard deviation, and then looking at how the standard deviation changes when impulse line plug is simulated, by closing the transmitter root valves or manifold valves.

First SPM needs to be configured to monitor the pressure as described in “SPM Configuration for Monitoring Pressure” on page 6-6. After SPM has been configured, the standard deviation needs to be trended, either in an EDDL-supported host (such as AMS Device Manager, shown in Figure 6-22), or in the DCS as described in “Trending Statistical Values in Control System” on page 6-10.

Figure 6-22. Trend of Standard Deviation in AMS Device Manager



After configuring SPM, wait long enough for the SPM to begin updating the % change in standard deviation. This will take at least 2-3 times the SPM Monitoring Cycle.

While the standard deviation is being trended, the impulse line valve (e.g. manifold or root) must be manually closed. After the impulse line is closed off, note in the SPM trend how much the standard deviation has changed. In the example in Figure 6-22 the standard deviation has increased by 49.9%.

This process needs to be repeated for each impulse line plugging condition that needs to be detected. For DP measurements, this should be done for both the high side and the low side impulse line. Optionally, you may also wish to do this for both sides plugged. For GP/AP measurements, this process would be done only for the single impulse line.

Upper and lower detection limits are chosen based on the degree of standard deviation change that was observed when the impulse lines were plugged. These limits should be less than the observed change in standard deviation, but more than changes in standard deviation that happen under normal process conditions. A lower detection limit will result in a plug being detected earlier and more often, but could also lead to false detections. A higher detection limit will reduce the likelihood of false detections, but also increase the probability that an impulse line plug will not be detected.

A good “rule of thumb” is to set the detection limit to half of the observed change in standard deviation, but no less than 20%

Advanced PIL Configuration

PIL provides the ability for advanced users to fine-tune some of the algorithm settings

PLINE_Relearn_Threshold

This adjusts the limit at which the PIL will automatically relearn new baseline values if the process mean changes. By default, this threshold is:

2 inches of water for DP Range 1 (-25 to 25 inH₂O) sensors

5 inches of water for DP Range 2 (-250 to 250 inH₂O) sensors

1% of Primary Value Range for All Other Sensors

When PLINE_Relearn_Threshold is at 0 (default) the above values are used for the relearn threshold. When a positive number is entered here, this value (in % of Primary Value range) overrides the default relearn threshold values. For example, if the sensor is type DP Range 3 (-1000 to 1000 inH₂O), and PLINE_Relearn_Threshold is set to 2%, then PIL will relearn if the mean changes by more than 20 inH₂O.

NOTE

In software revisions 2.0.x and previous, the Relearn Thresholds for DP Range 1 and DP Range 2 are fixed at the above default values. The PLINE_Relearn_Threshold parameter affects the Relearn Threshold for only the other sensors. In software revisions 2.1.x and later, the PLINE_Relearn_Threshold affects the Relearn threshold for all sensor types.

PLINE_Auto_Relearn

This can be used to turn off the automatic relearning. If set to "Disabled", the PIL will not go back into learning mode, even if there is a large mean change. In most cases, this parameter should be kept at "Enabled" because without this check, a large change in a flow rate could also cause a change in the standard deviation, triggering a false detection.

PLINE_Learn_Length

The length of time over which mean and standard deviation are calculated during the Learning and Verification phases. Default is 5 minutes.

Allowable range is 1-45 minutes. If the process has a periodic change in the mean over time (e.g. a slow oscillation), a longer learning cycle may provide a better baseline.

PLINE_Detect_Length

The length of time over which mean and standard deviation are calculated during the Detection Phase. Default is 1 minute. Allowable range is 1-45 minutes. This value should not be longer than the PLINE Learning Cycle. A shorter value will in general allow a plugged impulse line to be detected more quickly. However, if the process has a dominant cycling or oscillation, this parameter should be set to longer than the period of oscillation.

PLINE_Learn_Sensitivity

The PLINE_Learn_Sensitivity parameters provide very specific adjustments to the sensitivity during the learning phase. Most of the time, it is sufficient to use the default values

- Insufficient Dynamics Check: Ignores the insufficient dynamic check if not selected. Use only when there is very low process noise. This could result in a plugged impulse line not being detected.
- 10%, 20%, and 30% Stdev. Change Check: Allows for 10, 20, or 30% change in Standard Deviation while in the learning state. If this value is exceeded, the algorithm will stay in the verifying state until the value is not exceeded.
- Three or six Sigma Mean Change Check: Allows for a three or six standard deviations change in the mean while in the learning state. If this value is exceeded, algorithm will stay in the verifying state until the value is not exceeded.
- 2% Mean Change Check: The mean value of the baseline calculation cannot vary more than 2% during the learning or verifying states. If this value is exceeded, algorithm will stay in the verifying state until the value is not exceeded.

You may want to increase or disable one or more of these learning sensitivity settings, if you find that the PIL continues to stay in the verification phase.

PIL Operation

During operation the PIL_Status indicates the current status of the algorithm. The valid values are:

OK	Algorithm is in the detection state, and no plugged impulse line is detected.
Inactive	The algorithm is not enabled.
Learning	Algorithm is currently learning the process characteristics
Verifying	Algorithm is comparing the learned baseline with the current process.
Insufficient Dynamics	The process does not have enough dynamics to detect an impulse line plug
Bad PV Status	The Sensor Transducer Status is Bad, therefore the algorithm is paused. Algorithm will resume when a good or uncertain status returns.
Not Licensed	The ADB is not currently purchased in this device.
Plugged Line	Algorithm has detected a plugged line condition. This could be either one line or both lines plugged for a DP transmitter, or the one impulse line plugged for a GP or AP transmitter.

PIL also indicates the timestamp of the last detection of a plugged impulse line via the parameters:

PLINE_History_Timestamp

Timestamp when the last plugged impulse line was detected.

PLINE_History_Status

Indicates whether or not the PIL_History_Timestamp is available.

Plugged Impulse Line Configuration in EDDL

Host systems that support Electronic Device Description Language (EDDL) may use labels for the PIL configuration parameters that are slightly different from the Fieldbus parameter names described previously in this section. Table 6-2 below shows the correspondence between the fieldbus parameter names used in this document, and the labels used in EDDL hosts, such as AMS Device Manager.

Fieldbus Parameter Name	EDDL Label(s)
PLINE_ON	Plugged Line
PLINE_Learn_Length	Learning Cycle
PLINE_Sensitivity	Sensitivity Detection Detection Sensitivity
PLINE_Affect_PV_Status	Affect PV Status
PLINE_Relearn	User Command
PLINE_Auto_Relearn	Auto Relearn
PLINE_Relearn_Threshold	Relearn Threshold (% of URL)
PLINE_Learn_Sensitivity	Learning Sensitivity
PLINE_Detect_Length	Detecting Cycle
PLINE_Detect_Sensitivity	Custom Sensitivity
PLINE_Single_Detect_Sensitivity	DP Single Line Custom Sensitivity
PLINE_Status	Plugged Impulse Line Detection Commands Plugged Impulse Line Detection Status Plugged Impulse Line Status
PLINE_History_Status	Plugged Impulse Line History - Status
PLINE_History_Timestamp	Plugged Impulse Line History – Time Stamp

Viewing the Indication of a Plugged Impulse Line

When a plugged impulse line is detected, a PlantWeb alert is generated, and this alert can be seen in AMS Alert Monitor. Also (optionally), using the “Affect PV Status” parameter, the status of the pressure measurement can be made to change from “Good” to “Uncertain” when the line plug is detected. Dependent upon the DCS configuration, the uncertain status of the measurement may be indicated within the Operator Interface.

Appendix A FOUNDATION fieldbus Block Information

Overview	page A-1
Resource Block	page A-1
Sensor Transducer Block	page A-7
Analog Input (AI) Function Block	page A-9
LCD Display Transducer Block	page A-13
Advanced Diagnostics Transducer Block (ADB)	page A-15

OVERVIEW

Figure A-1. Analog Input
Function Block Schematic

RESOURCE BLOCK

This section contains information on the 3051S Resource Block. Descriptions of all Resource Block Parameters, errors, and diagnostics are included. Also the modes, alarm detection, status handling, and troubleshooting are discussed.

Definition

The resource block defines the physical resources of the device. The resource block also handles functionality that is common across multiple blocks. The block has no linkable inputs or outputs.

Table A-1. Resource Block Parameters

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
ST_REV	1	0-255			Read Only	The revision level of the static data associated with the function block.
TAG_DESC	2		spaces	N/A		The user description of the intended application of the block.
STRATEGY	3		0	N/A		The strategy field can be used to identify grouping of blocks.
ALERT_KEY	4	1-255	0	N/A		The identification number of the plant unit.
MODE_BLK	5		O/S	N/A		The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	6			E	Read Only	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
RS_STATE	7			N/A	Read Only	State of the function block application state machine.
TEST_RW	8			N/A		Read/write test parameter - used only for conformance testing.
DD_RESOURCE	9		NULL	N/A	Read Only	String identifying the tag of the resource which contains the Device Description for the resource.
MANUFAC_ID	10	Enumeration, controlled by FF	0x1151	E	Read Only	Manufacturer identification number - used by an interface device to locate the DD file for the resource.
DEV_TYPE	11		0x3051	E	Read Only	Manufacturer's model number associated with the resource - used by interface devices to locate the DD file for the resource.

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
DEV_REV	12		23	N/A	Read Only	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource.
DD_REV	13		3	N/A	Read Only	Revision of the DD associated with the resource - used by the interface device to locate the DD file for the resource.
GRANT_DENY	14			N/A		Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
HARD_TYPES	15		0x0003	N/A	Read Only	The types of hardware available as channel numbers. See <Ref 20> The supported hardware types are: SCALAR_INPUT, SCALAR_OUTPUT
RESTART	16	1: Run 2: Restart resource 3: Restart with defaults 4: Restart processor	1	E		Allows a manual restart to be initiated.
FEATURES	17	See Table 57	0x0C1F (Bits 0, 1, 2, 3, 4, 10, 11 set)	N/A	Read Only	Used to show supported resource block options. See <Ref 20> The supported features are: UNICODE_SUPPORT, REPORT_SUPPORT, FAULT_STATE_SUPPORT, SOFT_WRITE_LOCK_SUPPORT, HARD_WRITE_LOCK_SUPPORT, MULTI_BIT_ALARM_SUPPORT, and "restart/relink required"
FEATURE_SEL	18	See Table 57	0	N/A		Used to select resource block options. Default selected option is "restart/relink required"
CYCLE_TYPE	19		0x0003	N/A	Read Only	Identifies the block execution methods available for this resource. See <Ref 20> The supported cycle types are: SCHEDULED, and COMPLETION_OF_BLOCK_EXECUTION
CYCLE_SEL	20		0	N/A		Used to select the block execution method for this resource.
MIN_CYCLE_T	21		1760 (55 msec)	1/32 millisec	Read Only	Time duration of the shortest cycle interval of which the resource is capable.
MEMORY_SIZE	22	set by mfgr		kbytes	Read Only	Available configuration memory in the empty resource. To be checked before attempting a download.
NV_CYCLE_T	23		345600000 (180 min.)	1/32 millisec	Read Only	Minimum time interval specified by the manufacturer for writing copies of NV parameters to non-volatile memory. Zero means it will never be automatically copied. At the end of NV_CYCLE_T, only those parameters which have changed need to be updated in NVRAM.
FREE_SPACE	24	0-100%	5.5148	%	Read Only	Percent of memory available for further configuration. Zero in preconfigured resource.
FREE_TIME	25	0-100%	0	%	Read Only	Percent of the block processing time that is free to process additional blocks.
SHED_RCAS	26		640000	1/32 millisec		Time duration at which to give up on computer writes to function block RCas locations. Shed from RCas will never happen when SHED_RCAS = 0.
SHED_ROUT	27		640000	1/32 millisec		Time duration at which to give up on computer writes to function block ROut locations. Shed from ROut will never happen when SHED_ROUT = 0.
FAULT_STATE	28	1: Clear 2: Active		E	Read Only	Condition set by loss of communication to an output block, fault promoted to an output block or a physical contact. When Fault State condition is set, then output function blocks will perform their FSTATE actions.
SET_FSTATE	29	1: Off 2: Set	1	E		Allows the Fault State condition to be manually initiated by selecting Set.
CLR_FSTATE	30	1: Off 2: Clear	1	E		Writing a Clear to this parameter will clear the device fault state if the field condition, if any, has cleared.

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
MAX_NOTIFY	31	7		N/A	Read Only	Maximum number of unconfirmed notify messages possible.
LIM_NOTIFY	32	0 to MAX_NOTIFY	MAX_NOTIFY	N/A		Maximum number of unconfirmed alert notify messages allowed.
CONFIRM_TIME	33		640000	1/32 millisecc		The time the resource will wait for confirmation of receipt of a report before trying again. Retry will not happen when CONFIRM_TIME=0.
WRITE_LOCK	34	1: Unlocked 2: Locked	1	E		If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.
UPDATE_EVT	35			N/A		This alert is generated by any change to the static data.
BLOCK_ALM	36			N/A		The BLOCK_ALM is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
ALARM_SUM	37			N/A		The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
ACK_OPTION	38	0: Auto Ack Disabled 1: Auto Ack Enabled	0	N/A		Selection of whether alarms associated with the block will be automatically acknowledged.
WRITE_PRI	39	0 - 15	0	N/A		Priority of the alarm generated by clearing the write lock.
WRITE_ALM	40			N/A		This alert is generated if the write lock parameter is cleared.
ITK_VER	41	set by FF	5	N/A	Read Only	Major revision number of the interoperability test case used in certifying this device as interoperable. The format and range are controlled by the Fieldbus Foundation.
DISTRIBUTOR	42	"Rosemount"	0X26	E	Read Only	Reserved for use as distributor ID. No Foundation enumerations defined at this time.
DEV_STRING	43	0 to 0xFFFFFFFF	0	N/A		This is used to load new licensing into the device. The value can be written but will always read back with a value of 0.
XD_OPTION	44			E	Read Only	Indicates which transducer block licensing options are enabled.
FB_OPTION	45			E	Read Only	Indicates which function block licensing options are enabled.
DIAG_OPTION	46			E	Read Only	Indicates which diagnostics licensing options are enabled.
MISC_OPTION	47			E	Read Only	Indicates which miscellaneous licensing options are enabled.
RB_SFTWR_REV_MAJOR	48		set by build	N/A	Read Only	Major revision of software that the resource block was created with.
RB_SFTWR_REV_MINOR	49		set by build	N/A	Read Only	Minor revision of software that the resource block was created with.
RB_SFTWR_REV_BUILD	50		set by build	N/A	Read Only	Build of software that the resource block was created with.
RB_SFTWR_REV_ALL	51		set by build	N/A	Read Only	The string will contains the following fields: Major rev: 1-3 characters, decimal number 0-255 Minor rev: 1-3 characters, decimal number 0-255 Build rev: 1-5 characters, decimal number 0-255 Time of build: 8 characters, xx:xx:xx, military time Day of week of build: 3 characters, Sun, Mon, ... Month of build: 3 characters, Jan, Feb. Day of month of build: 1-2 characters, decimal number 1-31 Year of build: 4 characters, decimal Builder: 7 characters, login name of builder

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Parameter	Index	Valid Range	Initial Value	Units	Other	Description
HARDWARE_REV	52		3	N/A	Read Only	Hardware revision of that hardware that has the resource block in it.
OUTPUT_BOARD_SN	53	set by mfgr		N/A	Read Only	Output board serial number.
FINAL_ASSY_NUM	54	set by mfgr		N/A	Read Only	The same final assembly number placed on the neck label.
DETAILED_STATUS	55	See Table 22		E	Read Only	Indicates the state of the transmitter.
SUMMARY_STATUS	56	0: Uninitialized 1: No repair needed. 2: Repairable 3: Call service center	0	E	Read Only	An enumerated value of repair analysis.
MESSAGE_DATE	57		0	N/A		Date associated with the MESSAGE_TEXT parameter
MESSAGE_TEXT	58		spaces	N/A		Used to indicate changes made by the user to the device's installation, configuration, or calibration.
SELF_TEST	59	0: Uninitialized 1: No test 2: Self test	1	E		Used to self test the device. Tests are device specific.
DEFINE_WRITE_LOCK	60	0: Uninitialized 1: Everything Locked 2: Only physical device locked	1	E		Allows the operator to select how WRITE_LOCK behaves. The initial value is "lock everything". If the value is set to "lock only physical device" then the resource and transducer blocks of the device will be locked but changes to function blocks will be allowed.
SAVE_CONFIG_NOW	61	0: Uninitialized 1: No save 2: Burn EEPROM with latest values	1	E		Allows the user to optionally save all non-volatile information immediately.
SAVE_CONFIG_BLOCKS	62		0	N/A	Read Only	Number of EEPROM blocks that have been modified since last burn. This value will count down to zero when the configuration is saved.
START_WITH_DEFAULTS	63	0-4	1	E		0 = Uninitialized 1 = do not power-up with NV defaults 2 = power-up with default node address 3 = power-up with default pd_tag and node address 4 = power-up with default data for the entire communications stack (no application data)
SIMULATE_IO	64	0: Uninitialized 1: Off 2: On	0	E	Read Only	Status of Simulate jumper/switch
SECURITY_IO	65	0: Uninitialized 1: Off 2: On	0	E	Read Only	Status of Security jumper/switch
SIMULATE_STATE	66	0 - 3	1	E	Read Only	The state of the simulate jumper 0 = Uninitialized 1 = Jumper/switch off, simulation not allowed 2 = Jumper/switch on, simulation not allowed (need to cycle jumper/switch) 3 = Jumper/switch on, simulation allowed

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
DOWNLOAD_MODE	67	0 - 2	1	E		Gives access to the boot block code for over the wire downloads 0 = Uninitialized 1 = Run Mode 2 = Download Mode
RECOMMENDED_ACTION	68		0	E	Read Only	Enumerated list of recommended actions displayed with a device alert.
FAILED_PRI	69	0 - 15	0	N/A		Designates the alarming priority of the FAILED_ALM.
FAILED_ENABLE	70		0	E	Read Only	Enabled FAILED_ALM alarm conditions. Corresponds bit for bit to the FAILED_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.
FAILED_MASK	71	See Table 25	0	E		Mask of FAILED_ALM. Corresponds bit of bit to FAILED_ACTIVE. A bit on means that the condition is masked out from alarming.
FAILED_ACTIVE	72		0	E	Read Only	Enumerated list of failure conditions within a device.
FAILED_ALM	73			N/A		Alarm indicating a failure within a device which makes the device non-operational.
MAINT_PRI	74	0 - 15	0	N/A		Designates the alarming priority of the MAINT_ALM
MAINT_ENABLE	75		0	E	Read Only	Enabled MAINT_ALM alarm conditions. Corresponds bit for bit to the MAINT_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.
MAINT_MASK	76	See Table 26	0	E		Mask of MAINT_ALM. Corresponds bit of bit to MAINT_ACTIVE. A bit on means that the condition is masked out from alarming.
MAINT_ACTIVE	77		0	E	Read Only	Enumerated list of maintenance conditions within a device.
MAINT_ALM	78			N/A		Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.
ADVISE_PRI	79	0 - 15	0	N/A		Designates the alarming priority of the ADVISE_ALM
ADVISE_ENABLE	80		0		Read Only	Enabled ADVISE_ALM alarm conditions. Corresponds bit for bit to the ADVISE_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.
ADVISE_MASK	81	See Table 27	0	E		Mask of ADVISE_ALM. Corresponds bit of bit to ADVISE_ACTIVE. A bit on means that the condition is masked out from alarming.
ADVISE_ACTIVE	82		0	E	Read Only	Enumerated list of advisory conditions within a device.

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
ADVISE_ALM	83			N/A		Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.
HEALTH_INDEX	84	1-100	100	None	Read Only	Parameter representing the overall health of the device, 100 being perfect and 1 being non-functioning. The value will be set based on the active PWA alarms in accordance with the requirements stated in "Device Alerts and Health Index PlantWeb Implementation Rules". Each device may implement its own unique mapping between the PWA parameters and HEALTH_INDEX although a default mapping will be available based on the following rules. HEALTH_INDEX will be set based on the highest priority PWA *_ACTIVE bit as follows: FAILED_ACTIVE: 0 to 31 – HEALTH_INDEX = 10 MAINT_ACTIVE: 27 to 31 – HEALTH_INDEX = 20 MAINT_ACTIVE: 22 to 26 – HEALTH_INDEX = 30 MAINT_ACTIVE: 16 to 21 – HEALTH_INDEX = 40 MAINT_ACTIVE: 10 to 15 – HEALTH_INDEX = 50 MAINT_ACTIVE: 5 to 9 – HEALTH_INDEX = 60 MAINT_ACTIVE: 0 to 4 – HEALTH_INDEX = 70 ADVISE_ACTIVE: 16 to 31 – HEALTH_INDEX = 80 ADVISE_ACTIVE: 0 to 15 – HEALTH_INDEX = 90 NONE – HEALTH_INDEX = 100
PWA_SIMULATE	85	Off/On (0-1)	Off	None		Parameter that allows direct writes to PWA active parameters and the detailed status bytes that activate the Plant Web alerts. The simulate switch/jumper must be "ON" before PWA_SIMULATE can be turned on. 0 = Simulation off 1 = Simulation on

SENSOR TRANSDUCER BLOCK

The transducer block contains the actual measurement data, including a pressure and temperature reading. The transducer block includes information about sensor type, engineering units, linearization, reranging, temperature compensation, and diagnostics.

Table A-2. Sensor Transducer Block Parameters

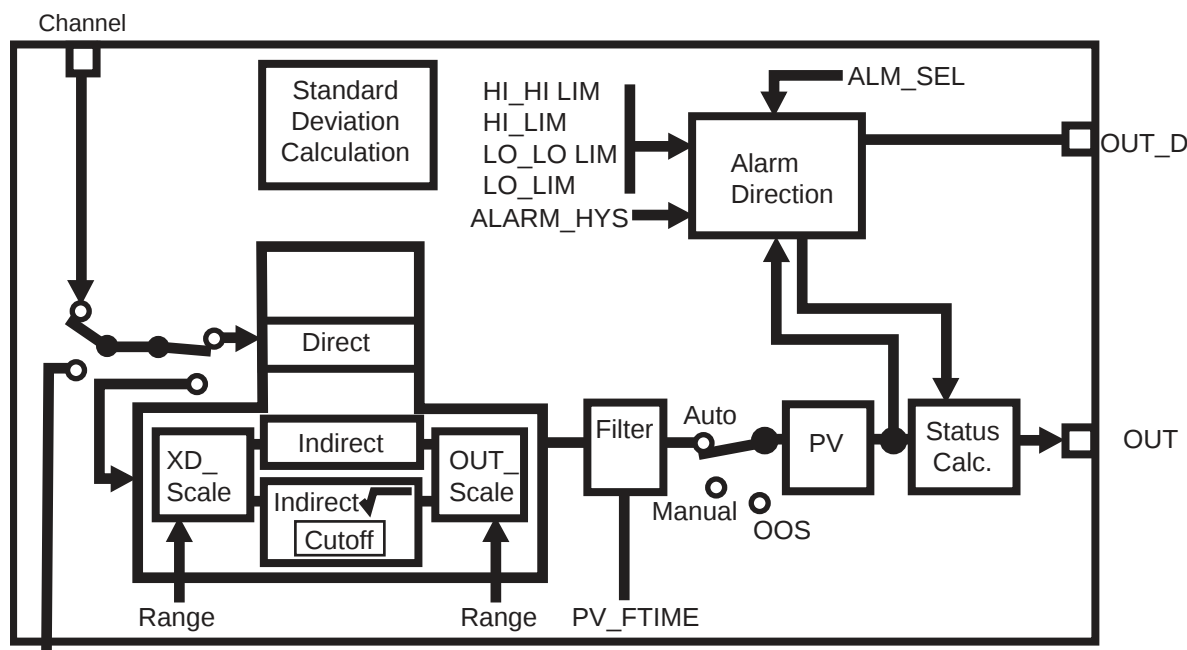
Parameter	Index	Valid Range	Initial Value	Units	Other	Description
ST_REV	1	0-255				The revision level of the static data associated with the function block.
TAG_DESC	2		spaces	N/A		The user description of the intended application of the block.
STRATEGY	3		0	N/A		The strategy field can be used to identify grouping of blocks.
ALERT_KEY	4	1-255	0	N/A		The identification number of the plant unit.
MODE_BLK	5		O/S	N/A		The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	6			E	Read Only	This parameter reflects the error status associated with the hardware or software components associated with a block. it is a bit string, so that multiple errors may be shown.
UPDATE_EVT	7			N/A		This alert is generated by any change to the static data.
BLOCK_ALM	8			N/A		The BLOCK_ALM is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
TRANSDUCER_DIRECTORY	9		0	N/A	Read Only	A directory that specifies the number and starting indices of the transducers in the transducer block.
TRANSDUCER_TYPE	10		100	E	Read Only	Identifies the transducer that follows.
XD_ERROR	11			E	Read Only	Provides additional error codes related to transducer blocks.
COLLECTION_DIRECTORY	12			N/A	Read Only	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer block.
PRIMARY_VALUE_TYPE	13	See Table 35 and footnote	0	E		The type of measurement represented by the primary value.
PRIMARY_VALUE	14			PVR	Read Only	The measured value and status available to the function block.
PRIMARY_VALUE_RANGE	15	0-100%		PVR	Read Only	The high and low range limit values, the engineering units code and the number of digits to the right of the decimal point to be used to display the final value.
CAL_POINT_HI	16		+INF	CU		The highest calibrated value.
CAL_POINT_LO	17		-INF	CU		The lowest calibrated value.
CAL_MIN_SPAN	18		0.0	CU	Read Only	The minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points are not too close together.
CAL_UNIT	19	See Table 19	%	E		The Device Description engineering units code index for the calibration values.
SENSOR_TYPE	20	See Table 37 and footnote4	0	E		The type of sensor connected with the transducer block.
SENSOR_RANGE	21	0-100%		SR	Read Only	The high and low range limit values, the engineering units code and the number of digits to the right of the decimal point for the sensor.
SENSOR_SN	22			N/A	Read Only	The sensor serial number.
SENSOR_CAL_METHOD	23	See Table 40	0	E		The method of last sensor calibration.

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
SENSOR_CAL_LOC	24		NULL	N/A		The location of the last sensor calibration. This describes the physical location at which the calibration was performed.
SENSOR_CAL_DATE	25		0	N/A		The date of the last sensor calibration. This is intended to reflect the calibration of that part of the sensor that is usually wetted by the process.
SENSOR_CAL_WHO	26			N/A		The name of the person responsible for the last sensor calibration.
SENSOR_ISOLATOR_MTL	27			E	Read Only	Defines the construction material for the isolating diaphragms.
SENSOR_FILL_FLUID	28			E	Read Only	Defines the type of fill fluid used in the sensor.
SECONDARY_VALUE	29			SVU	Read Only	The secondary value, related to the sensor.
SECONDARY_VALUE_UNIT	30	See Table 19 and footnote4		E		The engineering units to be used with the SECONDARY_VALUE.
TB_DETAILED_STATUS	31			N/A	Read Only	Indicates the state of the transmitter. The parameter contains specific codes relating to the transducer block and the pressure sensor specifically.
FACTORY_CAL_RECALL	32	1: No Recall 2: Recall 3: Save factory trim	1	E		Recalls the sensor calibration set at the factory. If the device is in "factory mode", a value of 3 may be entered to save the current trim values into a factory area of NV memory to be used for factory calibration recall
MODULE_TYPE	33		252: Unknown	E	Read Only	Indicates the type of sensor module.
SENSOR_CAL_TYPE	34	See Table 39	252: Unknown	E		The type of last sensor calibration.
FLANGE_TYPE	35	See Table 50	0	N/A		Indicates the type of flange that is attached to the device. See Flange Type Codes.
FLANGE_MTL	36	See Table 49	0	N/A		Indicates the type of material that the flange is made of. See Flange Material Codes.
REM_SEAL_NUM	37	See Table 45	0	N/A		Indicates the number of remote seals that are attached to the device. See Remote Seal Number Codes.
REM_SEAL_TYPE	38	See Table 46	0	N/A		Indicates the type of remote seals that are attached to the device. See Remote Seal Type Codes.
REM_SEAL_ISO_MTL	39	See Table 44	0	N/A		Indicates the type of material that the remote seal isolators are made of. See Remote Seal Isolator Material Codes.
REM_SEAL_FILL	40	See Table 43	0	N/A		Indicates the type of fill fluid used in the remote seals. See Remote Seal Fill Fluid Codes.
O_RING_MTL	41	See Table 48	0	N/A		Indicates the type of material that the flange o-rings are made of. See O-ring Material Codes.
DRAIN_VENT_MTL	42	See Table 47	0	N/A		Indicates the type of material that the drain vents on the flange are made of. See Drain Vent Material Codes.
PRIMARY_VALUE_DAMPING	43	≥0.0f	0.0	Sec.		Time constant of a single exponential filter for the PV, in seconds.

ANALOG INPUT (AI) FUNCTION BLOCK

The Analog Input (AI) function block processes field device measurements and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The measuring device may have several measurements or derived values available in different channels. Use the channel number to define the variable that the AI block processes.

The AI block supports alarming, signal scaling, signal filtering, signal status calculation, mode control, and simulation. In Automatic mode, the block's output parameter (OUT) reflects the process variable (PV) value and status. In Manual mode, OUT may be set manually. The Manual mode is reflected on the output status. A discrete output (OUT_D) is provided to indicate whether a selected alarm condition is active. Alarm detection is based on the OUT value and user specified alarm limits. Figure A-1 illustrates the internal components of the AI function block, and Table A-3 lists the AI block parameters and their units of measure, descriptions, and index numbers.



AI Parameter Table

Table A-3. Definitions of Analog Input Function Block System Parameters.

Parameter	Index No.	Available Values	Units	Default	Read/Write	Description
ACK_OPTION	23	0 = Auto Ack Disabled 1 = Auto Ack Enabled	None	0 all Disabled	Read and Write	Used to set auto acknowledgment of alarms.
ALARM_HYS	24	0 – 50	Percent	0.5	Read and Write	The amount the alarm value must return within the alarm limit before the associated active alarm condition clears.
ALARM_SEL	38	HI_HI, HI, LO, LO_LO	None	Non selected	Read and Write	Used to select the process alarm conditions that will cause the OUT_D parameter to be set.
ALARM_SUM	22	Enable/Disable	None	Enable	Read and Write	The summary alarm is used for all process alarms in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
ALERT_KEY	04	1 – 255	None	0	Read and Write	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
BLOCK_ALM	21	Not applicable	None	Not applicable	Read only	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
BLOCK_ERR	06	Not applicable	None	Not applicable	Read only	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
CAP_STDDEV	40	> = 0	Seconds	0	Read and Write	The time over which the VAR_INDEX is evaluated.
CHANNEL	15	1 = Pressure 2 = Housing temperature	None	AI ⁽¹⁾ : Channel = 1 AI2: Channel = 2	Read and Write	The CHANNEL value is used to select the measurement value. Refer to the appropriate device manual for information about the specific channels available in each device. You must configure the CHANNEL parameter before you can configure the XD_SCALE parameter.
FIELD_VAL	19	0 – 100	Percent	Not applicable	Read only	The value and status from the transducer block or from the simulated input when simulation is enabled.
GRANT_DENY	12	Program Tune Alarm Local	None	Not applicable	Read and Write	Normally the operator has permission to write to parameter values, but Program or Local remove that permission and give it to the host controller or a local control panel.
HI_ALM	34	Not applicable	None	Not applicable	Read only	The HI alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
HI_HI_ALM	33	Not applicable	None	Not applicable	Read only	The HI HI alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
HI_HI_LIM	26	Out_Scale ⁽²⁾	Out_Scale ⁽²⁾	Not applicable	Read and Write	The setting for the alarm limit used to detect the HI HI alarm condition.
HI_HI_PRI	25	0 – 15	None	1	Read and Write	The priority of the HI HI alarm.
HI_LIM	28	Out_Scale ⁽²⁾	Out_Scale ⁽²⁾	Not applicable	Read and Write	The setting for the alarm limit used to detect the HI alarm condition.
HI_PRI	27	0 – 15	None	1	Read and Write	The priority of the HI alarm.
IO_OPTS	13	Low Cutoff Enable/Disable	None	Disable	Read and Write	Allows the selection of input/output options used to alter the PV. Low cutoff enabled is the only selectable option.

Parameter	Index No.	Available Values	Units	Default	Read/Write	Description
L_TYPE	16	Direct Indirect Indirect Square Root	None	Direct	Read and Write	Linearization type. Determines whether the field value is used directly (Direct), is converted linearly (Indirect), or is converted with the square root (Indirect Square Root).
LO_ALM	35	Not applicable	None	Not applicable	Read only	The LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
LO_LIM	30	Out_Scale ⁽²⁾	Out_Scale ⁽²⁾	Not applicable	Read and Write	The setting for the alarm limit used to detect the LO alarm condition.
LO_LO_ALM	36	Not applicable	None	Not applicable	Read only	The LO LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
LO_LO_LIM	32	Out_Scale ⁽²⁾	Out_Scale ⁽²⁾	Not applicable	Read and Write	The setting for the alarm limit used to detect the LO LO alarm condition.
LO_LO_PRI	31	0 – 15	None	1	Read and Write	The priority of the LO LO alarm.
LO_PRI	29	0 – 15	None	1	Read and Write	The priority of the LO alarm.
LOW_CUT	17	> = 0	Out_Scale ⁽²⁾	0	Read and Write	If percentage value of transducer input fails below this, PV = 0.
MODE_BLK	05	Auto Manual Out of Service	None	Not applicable	Read and Write	The actual, target, permitted, and normal modes of the block. Target: The mode to "go to" Actual: The mode the "block is currently in" Permitted: Allowed modes that target may take on Normal: Most common mode for target
OUT	08	Out_Scale ⁽²⁾ ± 10%	Out_Scale ⁽²⁾	Not applicable	Read and Write	The block output value and status.
OUT_D	37	Discrete_State 1 – 16	None	Disabled	Read and Write	Discrete output to indicate a selected alarm condition.
OUT_SCALE	11	Any output range	All available	none	Read and Write	The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with OUT.
PV	07	Not applicable	Out_Scale ⁽²⁾	Not applicable	Read only	The process variable used in block execution.
PV_FTIME	18	> = 0	Seconds	0	Read and Write	The time constant of the first-order PV filter. It is the time required for a 63% change in the IN value.
SIMULATE	09	Not applicable	None	Disable	Read and Write	A group of data that contains the current transducer value and status, the simulated transducer value and status, and the enable/disable bit.
ST_REV	01	Not applicable	None	0	Read only	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
STATUS_OPTS	14	Propagate fault forward Uncertain if Limited Bad if Limited Uncertain if Man Mode		0	Read and Write	
STDDEV	39	0 – 100	Percent	0	Read and Write	The average absolute error between the PV and its previous mean value over that evaluation time defined by VAR_SCAN.
STRATEGY	03	0 – 65535	None	0	Read and Write	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.

Parameter	Index No.	Available Values	Units	Default	Read/Write	Description
TAG_DESC	02	32 text characters	None	none	Read and Write	The user description of the intended application of the block.
UPDATE_EVT	20	Not applicable	None	Not applicable	Read only	This alert is generated by any change to the static data.
XD_SCALE	10	Any sensor range	inH ₂ O (68 °F) inHg (0 °C) ftH ₂ O (68 °F) mmH ₂ O (68 °F) mmHg (0 °C) psi bar mbar g/cm ² kg/cm ² Pa kPa torr atm deg C deg F	AI1 ⁽¹⁾ : Customer specification or inH ₂ O (68 °F) for DP/GP rng 1, 2, 3) or psi for DP/GP rng 4, 5 AP/3051T all rng AI2 deg C		In all Rosemount devices the units of the transducer block is forced to match the unit code.

(1) The host system may write over default values pre-configured by Rosemount Inc.

(2) Assume that when L_Type = Direct, the user configures Out_Scale which is equal to XD_Scale

LCD DISPLAY TRANSDUCER BLOCK

Table A-4. LCD Display
Transducer Block Parameters

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
ST_REV	1	0-255				The revision level of the static data associated with the function block.
TAG_DESC	2		spaces	N/A		The user description of the intended application of the block.
STRATEGY	3		0	N/A		The strategy field can be used to identify grouping of blocks.
ALERT_KEY	4	1-255	0	N/A		The identification number of the plant unit.
MODE_BLK	5		O/S	N/A		The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	6			E	Read Only	This parameter reflects the error status associated with the hardware or software components associated with a block. it is a bit string, so that multiple errors may be shown.
UPDATE_EVT	7			N/A	Read Only	This alert is generated by any change to the static data.
BLOCK_ALM	8			N/A		The BLOCK_ALM is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
TRANSDUCER_DIRECTORY	9			N/A	Read Only	A directory that specifies the number and starting indices of the transducers in the transducer block.
TRANSDUCER_TYPE	10		100	E	Read Only	Identifies the transducer that follows.
XD_ERROR	11			E	Read Only	Provides additional error codes related to transducer blocks.
COLLECTION_DIRECTORY	12			N/A	Read Only	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer block.
DISPLAY_PARAM_SEL	13	Bit 0 – Bit 4	Bit 0 – DP1	E		This will determine which Display Parameters are active. Bit 0 = DP1 Bit 1 = DP2 Bit 2 = DP3 Bit 3 = DP4 Bit 4 = Bar Graph enable
BLK_TYPE_1	14	See Table 33	0x8001	E		The enumerated block type for DP1's block.
BLK_TAG_1	15		"TRANSDUCER"	N/A		The tag of the block containing DP1.
PARAM_INDEX_1	16		14	N/A		The relative index of DP1 within its block. See Table 34
CUSTOM_TAG_1	17		spaces	N/A		The block description that is displayed for DP1.
UNITS_TYPE_1	18	1: Auto 2: Custom 3: None	1	E		This parameter determines where the units for the display parameter come from.
CUSTOM_UNITS_1	19		spaces	N/A		This is the user entered units that are displayed when UNITS_TYPE_1=Custom.
BLK_TYPE_2	20	See Table 33	0	E		The enumerated block type for DP2's block.
BLK_TAG_2	21		spaces	N/A		The tag of the block containing DP2.
PARAM_INDEX_2	22		0	N/A		The relative index of DP2 within its block. See Table 34
CUSTOM_TAG_2	23		spaces	N/A		The block description that is displayed for DP2.

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Parameter	Index	Valid Range	Initial Value	Units	Other	Description
UNITS_TYPE_2	24	1: Auto 2: Custom 3: None		E		This parameter determines where the units for the display parameter come from.
CUSTOM_UNITS_2	25		spaces	N/A		This is the user entered units that are displayed when UNITS_TYPE_2=Custom.
BLK_TYPE_3	26	See Table 33	0	E		The enumerated block type for DP3's block.
BLK_TAG_3	27		spaces	N/A		The tag of the block containing DP3.
PARAM_INDEX_3	28		0	N/A		The relative index of DP3 within its block. See Table 34
CUSTOM_TAG_3	29		spaces	N/A		The block description that is displayed for DP3.
UNITS_TYPE_3	30	1: Auto 2: Custom 3: None		E		This parameter determines where the units for the display parameter come from.
CUSTOM_UNITS_3	31		spaces	N/A		This is the user entered units that are displayed when UNITS_TYPE_3=Custom.
BLK_TYPE_4	32	See Table 33	0	E		The enumerated block type for DP4's block.
BLK_TAG_4	33		spaces	N/A		The tag of the block containing DP4.
PARAM_INDEX_4	34		0	N/A		The relative index of DP4 within its block. See Table 34
CUSTOM_TAG_4	35		spaces	N/A		The block description that is displayed for DP4.
UNITS_TYPE_4	36	1: Auto 2: Custom 3: None		E		This parameter determines where the units for the display parameter come from.
CUSTOM_UNITS_4	37		spaces	N/A		This is the user entered units that are displayed when UNITS_TYPE_4=Custom.

ADVANCED DIAGNOSTICS TRANSDUCER BLOCK (ADB)

Table A-5. Advanced Diagnostic
block Parameters

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
ST_REV	1	0-255			Read Only	The revision level of the static data associated with the function block.
TAG_DESC	2		spaces	N/A		The user description of the intended application of the block.
STRATEGY	3		0	N/A		The strategy field can be used to identify grouping of blocks.
ALERT_KEY	4	1-255	0	N/A		The identification number of the plant unit.
MODE_BLK	5		O/S	N/A		The actual, target, permitted, and normal modes of the block.
BLOCK_ERR	6			E	Read Only	This parameter reflects the error status associated with the hardware or software components associated with a block. it is a bit string, so that multiple errors may be shown.
UPDATE_EVT NOT IMPLEMENTED	7			N/A	Read Only	This alert is generated by any change to the static data.
BLOCK_ALM NOT IMPLEMENTED	8			N/A		The BLOCK_ALM is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
TRANSDUCER_ DIRECTORY	9			N/A	Read Only	A directory that specifies the number and starting indices of the transducers in the transducer block.
TRANSDUCER_ TYPE	10		100	E	Read Only	Identifies the transducer that follows.
XD_ERROR	11			E	Read Only	Provides additional error codes related to transducer blocks.
COLLECTION_ DIRECTORY	12			N/A	Read Only	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer block.
ADB_STATUS	13		Quality: Good SubStatus: Non-Specific Limit: 0	N/A	Read Only	Status of Advanced Diagnostics Block.
DIAG_EVT	14		Unack: 0 Alarm State: 0 Time Stamp:0 Subcode: 0 Value: 0	N/A	Read Only	Diagnostic event
SPM_ACTIVE	15	0 = Disabled 0xfe = Enabled with HP filter 0xff = Enabled without filter	Disabled	N/A		Enables/Disables the Statistical Process Monitoring algorithm. Allows for activation of a high-pass filter for standard deviation calculations.
SPM_ MONITORING_ CYCLE	16	1 to 1440	15	min.		Time Period for Mean and Stdev calculations during Learning and Monitoring

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
SPM_BYPASS_VERIFICATION	17	0 = No 0xff = Yes	No	N/A		Enables/Disables Bypass of Process Stability Checks during Learning
SPM1_BLOCK_TYPE	18	All Function Blocks in the device (see Table 33)	0	N/A		The function block type for the SPM1 variable
SPM1_BLOCK_TAG	19	All Function Blocks in the device	NULL	N/A		Block tag for the SPM1 process variable
SPM1_PARAM_INDEX	20	All DS-65 parameters for the block type of the entered block tag. Any number can be entered, but an invalid index will result in a rejection of a "True" write to the SPM_ACTIVE parameter	0	N/A		OD Parameter index for the SPM1 Block Tag that is entered.
SPM1_STATUS	21	1.Inactive 2.Learning 3.Verifying 4.No Detections 5.Mean Change Detected 6.High Variation Detected 7.Low Dynamics Detected 8.Not Licensed	Inactive	N/A	Read Only	Status of the SPM1 Statistical Process Monitoring
SPM1_TIMESTAMP	22	All Times and Dates	0	time	Read Only	Timestamp of last SPM1 Statistical Process Monitoring status change
SPM1_USER_COMMAND	23	1.Detect 2.Learn 3.Quit 4.Idle	4	N/A		User control SPM1 for the Statistical Process Monitoring session.
SPM1_MEAN	24		0.0f	N/A	Read Only	Last Mean of SPM1
SPM1_MEAN_CHANGE	25		0.0f	%	Read Only	% Change in SPM1 Mean with respect to Baseline Mean
SPM1_STDEV	26		0.0f	N/A	Read Only	Last Stdev of SPM1
SPM1_STDEV_CHANGE	27		0.0f	%	Read Only	Change in SPM1 Stdev with respect to Baseline Stdev
SPM1_BASELINE_MEAN	28		0.0f	N/A	Read Only	Baseline Mean for SPM1
SPM1_BASELINE_STDEV	29		0.0f	N/A	Read Only	Baseline Stdev for SPM1
SPM1_MEAN_LIM	30	≥0.0f	0.0f	%		% Change in mean for SPM1 allowed by user
SPM1_HIGH_VARIATION_LIM	31	≥ 0.0f	0.0f	%		% Increase in dynamics for SPM1 allowed by user

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Parameter	Index	Valid Range	Initial Value	Units	Other	Description
SPM1_LOW_DYNAMICS_LIM	32	≤0.0f	0.0f	%		% Decrease in dynamics for SPM1 allowed by user
SPM2_BLOCK_TYPE	33	All Function Blocks in the device	0	N/A		The function block type for the SPM2 variable
SPM2_BLOCK_TAG	34	All Function Blocks in the device (see Table 33)	NULL	N/A		Block tag for the SPM2 process variable
SPM2_PARAM_INDEX	35	All DS-65 parameters for the block type of the entered block tag. Any number can be entered, but an invalid index will result in a rejection of a "True" write to the SPM_ACTIVE parameter	0	N/A		OD Parameter index for the SPM2 Block Tag that is entered.
SPM2_STATUS	36	1.Inactive 2.Learning 3.Verifying 4.No Detections 5.Mean Change Detected 6.High Variation Detected 7.Low Dynamics Detected 8.Not Licensed	Inactive	N/A	Read Only	Status of the SPM2 Statistical Process Monitoring
SPM2_TIMESTAMP	37	All Times and Dates	0	time	Read Only	Timestamp of last SPM2 Statistical Process Monitoring status change
SPM2_USER_COMMAND	38	1.Detect 2.Learn 3.Quit 4.Idle	4	N/A		User control for the SPM2 Statistical Process Monitoring session.
SPM2_MEAN	39		0.0f	N/A	Read Only	Last Mean of SPM2
SPM2_MEAN_CHANGE	40		0.0f	%	Read Only	% Change in SPM2 Mean with respect to Baseline Mean
SPM2_STDEV	41		0.0f	N/A	Read Only	Last Stdev of SPM2
SPM2_STDEV_CHANGE	42		0.0f	%	Read Only	Change in SPM2 Stdev with respect to Baseline Stdev
SPM2_BASELINE_MEAN	43		0.0f	N/A	Read Only	Baseline Mean for SPM2
SPM2_BASELINE_STDEV	44		0.0f	N/A	Read Only	Baseline Stdev for SPM2
SPM2_MEAN_LIM	45	≥0.0f	0.0f	%		% Change in mean for SPM2 allowed by user
SPM2_HIGH_VARIATION_LIM	46	≥ 0.0f	0.0f	%		% Increase in dynamics for SPM2 allowed by user
SPM2_LOW_DYNAMICS_LIM	47	≤0.0f	0.0f	%		% Decrease in dynamics for SPM2 allowed by user

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
SPM3_BLOCK_TYPE	48	All Function Blocks in the device	0	N/A		The function block type for the SPM3 variable
SPM3_BLOCK_TAG	49	All Function Blocks in the device (see Table 33)	NULL	N/A		Block tag for the SPM3 process variable
SPM3_PARAM_INDEX	50	All DS-65 parameters for the block type of the entered block tag. Any number can be entered, but an invalid index will result in a rejection of a "True" write to the SPM_ACTIVE parameter	0	N/A		OD Parameter index for the SPM3 Block Tag that is entered.
SPM3_STATUS	51	1.Inactive 2.Learning 3.Verifying 4.No Detections 5.Mean Change Detected 6.High Variation Detected 7.Low Dynamics Detected 8.Not Licensed	Inactive	N/A	Read Only	Status of the SPM3 Statistical Process Monitoring
SPM3_TIMESTAMP	52	All Times and Dates	0	time	Read Only	Timestamp of last SPM3 Statistical Process Monitoring status change
SPM3_USER_COMMAND	53	1.Detect 2.Learn 3.Quit 4.Idle	4	N/A		User control for the SPM3 Statistical Process Monitoring session.
SPM3_MEAN	54		0.0f	N/A	Read Only	Last Mean of SPM3
SPM3_MEAN_CHANGE	55		0.0f	%	Read Only	% Change in SPM3 Mean with respect to Baseline Mean
SPM3_STDEV	56		0.0f	N/A	Read Only	Last Stdev of SPM3
SPM3_STDEV_CHANGE	57		0.0f	%	Read Only	Change in SPM3 Stdev with respect to Baseline Stdev
SPM3_BASELINE_MEAN	58		0.0f	N/A	Read Only	Baseline Mean for SPM3
SPM3_BASELINE_STDEV	59		0.0f	N/A	Read Only	Baseline Stdev for SPM3
SPM3_MEAN_LIM	60	≥0.0f	0.0f	%		% Change in mean for SPM3 allowed by user
SPM3_HIGH_VARIATION_LIM	61	≥ 0.0f	0.0f	%		% Increase in dynamics for SPM3 allowed by user
SPM3_LOW_DYNAMICS_LIM	62	≤0.0f	0.0f	%		% Decrease in dynamics for SPM3 allowed by user
SPM4_BLOCK_TYPE	63	All Function Blocks in the device	0	N/A		The function block type for the SPM variable

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Parameter	Index	Valid Range	Initial Value	Units	Other	Description
SPM4_BLOCK_TAG	64	All Function Blocks in the device (see Table 33)	NULL	N/A		Block tag for the SPM4 process variable
SPM4_PARAM_INDEX	65	All DS-65 parameters for the block type of the entered block tag. Any number can be entered, but an invalid index will result in a rejection of a "True" write to the SPM_ACTIVE parameter	0	N/A		OD Parameter index for the SPM4 Block Tag that is entered.
SPM4_STATUS	66	1.Inactive 2.Learning 3.Verifying 4.No Detections 5.Mean Change Detected 6.High Variation Detected 7.Low Dynamics Detected 8.Not Licensed	Inactive	N/A	Read Only	Status of the SPM4 Statistical Process Monitoring
SPM4_TIMESTAMP	67	All Times and Dates	0	time	Read Only	Timestamp of last SPM4 Statistical Process Monitoring status change
SPM4_USER_COMMAND	68	1.Detect 2.Learn 3.Quit 4.Idle	4	N/A		User control for the SPM4 Statistical Process Monitoring session.
SPM4_MEAN	69		0.0f	N/A	Read Only	Last Mean of SPM4
SPM4_MEAN_CHANGE	70		0.0f	%	Read Only	% Change in SPM4 Mean with respect to Baseline Mean
SPM4_STDEV	71		0.0f	N/A	Read Only	Last Stdev of SPM4
SPM4_STDEV_CHANGE	72		0.0f	%	Read Only	Change in SPM4 Stdev with respect to Baseline Stdev
SPM4_BASELINE_MEAN	73		0.0f	N/A	Read Only	Baseline Mean for SPM4
SPM4_BASELINE_STDEV	74		0.0f	N/A	Read Only	Baseline Stdev for SPM4
SPM4_MEAN_LIM	75	≥0.0f	0.0f	%		% Change in mean for SPM4 allowed by user
SPM4_HIGH_VARIATION_LIM	76	≥ 0.0f	0.0f	%		% Increase in dynamics for SPM4 allowed by user
SPM4_LOW_DYNAMICS_LIM	77	≤0.0f	0.0f	%		% Decrease in dynamics for SPM4 allowed by user

Parameter	Index	Valid Range	Initial Value	Units	Other	Description
PLINE_STATUS	78	1.Inactive 2.Learning 3.Verifying 4.All Lines Plugged 5.OK 6.Insufficient Dynamics 7.BAD PV Status 8.Not Licensed	Inactive	N/A	Read Only	Last Impulse line status
PLINE_TIMESTAMP	79	All Times and Dates	0		Read Only	Last Timestamp for PLINE_STATUS
PLINE_ON	80	0 = FALSE 0xff = TRUE	FALSE	N/A		Turns algorithm On/Off
PLINE_RELEARN	81	1. Run 2. Relearn	1	N/A		Resets the algorithm and reinitiates learning
PLINE_SENSITIVITY	82	1. Low 2. Medium 3. High	Medium	N/A		Detection Sensitivity
PLINE_AFFECT_PV_STATUS	83	0 = FALSE 0xff = TRUE	FALSE	N/A		Determines whether the quality of the pressure measurement will be affected or unaffected when a plugged impulse line is detected
PLINE_HISTORY_STATUS	84	1. Lines Plugged 2. No History	3	N/A	Read Only	Last plugged Line determination status
PLINE_HISTORY_TIMESTAMP	85	All Times and Dates	0		Read Only	Timestamp of last plugged impulse line detection
PLINE_LEARN_LENGTH	86	1 to 45	5	Min.		Length of Learning and Verification Cycles in Minutes
PLINE_DETECT_LENGTH	87	1 to 45	1	Min.		Length of Detection Cycle Status Update in Minutes
PLINE_AUTO_RELEARN	88	0 = Disabled 0xff = Enabled	Enabled			Enables/Disables Auto Relearn on Process Mean Changes
PLINE_RELEARN_THRESHOLD	89	0 to 50	0.0	%URL		Threshold for Relearning in % Primary Value URL of Sensor
PLINE_LEARNING_SENSITIVITY	90	1. Insufficient Dynamics Check 2. 10% Stdev Change Check 3. 20% Stdev Change Check 4. 30% Stdev Change Check 5. 3*Stdev Mean Change Check 6. 6*Stdev Mean Change Check 7. 2% Mean Change Check	0x55			Learning Sensitivity Check Options. Only one of bits 2, 3 and 4 is allowed and only one of bits 5 and 6 is allowed.
PLINE_DETECT_SENSITIVITY	91	0 to 100	0.0	%		Overrides IL Plugging Sensitivity if a non-zero value is entered. Value corresponds to a percentage decrease in standard deviation.
PLINE_SINGLE_DETECT_SENSITIVITY	92	0 to 10000	0.0	%		Overrides IL Plugging Sensitivity if a non-zero value is entered. Value corresponds to a percentage increase in standard deviation. (Used by DP transmitters only)

Appendix B Specifications and Reference Data

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PERFORMANCE SPECIFICATIONS

For zero-based spans, reference conditions, silicone oil fill, glass-filled PTFE o-rings, SST materials, Coplanar flange (3051SMV, 3051S_C) or 1/2 in.- 14 NPT (3051S_T) process connections, digital trim values set to equal range points.

Conformance to Specification ($\pm 3\sigma$ (Sigma))

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

Reference Accuracy

Stated reference accuracy equations include terminal based linearity, hysteresis, and repeatability.

For FOUNDATION fieldbus and wireless devices, use calibrated range in place of span.

Transmitter with Coplanar Sensor Module (Single Variable)

Differential Pressure (3051S_CD) Gage Pressure (3051S_CG)			
	Ultra	Classic	Ultra for Flow ⁽¹⁾
Ranges 2 - 4	±0.025% of span; For spans less than 10:1, ±[0.005 + 0.0035(URL / Span)]% of span	±0.055% of span; For spans less than 10:1, ±[0.015 + 0.005(URL / Span)]% of span	±0.04% of reading up to 8:1 DP turndown from URL; ±[0.04 + 0.0023(URL / Reading)]% of reading to 200:1 DP turndown from URL
Range 5	±0.05% of span; For spans less than 10:1, ±[0.005 + 0.0045(URL / Span)]% of span	±0.065% of span; For spans less than 10:1, ±[0.015 + 0.005(URL / Span)]% of span	Not Available
Range 1	±0.09% of span; For spans less than 15:1, ±[0.015 + 0.005(URL / Span)]% of span	±0.10% of span; For spans less than 15:1, ±[0.025 + 0.005(URL / Span)]% of span	Not Available
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	Not Available
Absolute Pressure (3051S_CA)			
	Ultra	Classic	
Ranges 1 - 4	±0.025% of span; For spans less than 10:1, ±[0.004(URL / Span)]% of span	±0.055% of span; For spans less than 10:1, ±[0.0065(URL / Span)]% of span	
Range 0	±0.075% of span; For spans less than 5:1, ±[0.025 + 0.01(URL / Span)]% of span	±0.075% of span; For spans less than 5:1, ±[0.025 + 0.01(URL / Span)]% of span	

(1) Ultra for Flow is only available for 3051S_CD ranges 2-3 and 3051SMV DP ranges 2-3. For calibrated spans from 1:1 to 2:1 of URL, add ±0.005% of span analog output error.

Transmitter with In-Line Sensor Module

Absolute Pressure (3051S_TA) Gage Pressure (3051S_TG)		
	Ultra	Classic
Ranges 1 - 4	±0.025% of span For spans less than 10:1, ±[0.004(URL / Span)]% of span	±0.055% of span For spans less than 10:1, ±[0.0065(URL / Span)]% of span
Range 5	±0.04% of span	±0.065% of span

Transmitter with MultiVariable Sensor Module

Differential Pressure and Static Pressure (3051SMV_ _1 or 2)		
	Classic MV	Ultra for Flow ⁽¹⁾
DP Ranges 2-3	±0.04% of span For spans less than 10:1, ±[0.01 + 0.004(URL / Span)]% of span	±0.04% of reading up to 8:1 DP turndown from URL ±[0.04 + 0.0023(URL / Reading)]% of reading to 200:1 DP turndown from URL
DP Range 1	±0.10% of span For spans less than 15:1, ±[0.025 + 0.005(URL / Span)]% of span	Not Available
AP & GP Ranges 3-4	±0.055% of span For spans less than 10:1, ±[0.0065(URL / Span)]% of span	±0.025% of span For spans less than 10:1, ±[0.004(URL / Span)]% of span

(1) Ultra for Flow is only available for 3051SMV DP ranges 2-3. For calibrated DP spans from 1:1 to 2:1 of URL, add ±0.005% of span analog output error.

Liquid Level Transmitter

3051S_L		
	Ultra	Classic
	±0.065% of span For spans less than 10:1, ±[0.015 + 0.005(URL / Span)]% of span ±0.065% of span	±0.065% of span For spans less than 10:1, ±[0.015 + 0.005(URL / Span)]% of span±0.065% of span

Process Temperature RTD Interface⁽¹⁾

Process Temperature (3051SMV_ _1 or 3)
±0.67 °F (0.37 °C)

(1) 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.

Transmitter Total Performance

Total performance is based on combined errors of reference accuracy, ambient temperature effect, and line pressure effect.

Models		Ultra	Classic and Classic MV	Ultra for Flow ⁽¹⁾
3051S_CD	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
3051S_CG	Ranges 2-5			
3051S_CA	Ranges 2-4			
3051S_T	Ranges 2-4			
3051SMV ⁽²⁾	DP Ranges 2-3			
3051S_L		Use Instrument Toolkit or the QZ Option to quantify the total performance of a remote seal assembly under operating conditions.		

(1) Ultra for Flow is only available for 3051S_CD Ranges 2-3 and 3051SMV DP Ranges 2-3.

(2) For 3051SMV, Transmitter Total Performance specification applies to differential pressure measurement only.

MultiVariable Flow Performance⁽¹⁾

Mass, Energy, Actual Volumetric, and Totalized Flow Reference Accuracy

Models	Ultra for Flow	Classic MV
3051SMV⁽²⁾		
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	Not Available	±0.90% of Flow Rate over 8:1 flow range (64:1 DP range)
Annubar Flowmeter (3051SFA)		
Ranges 2-3	±0.85% of flow rate at 8:1 flow turndown	±0.80% of flow rate at 14:1 flow turndown
Compact Conditioning Orifice Flowmeter (3051SFC_C)		
Ranges 2-3		
$\beta = 0.4$	±0.60% of flow rate at 8:1 flow turndown	±0.55% of flow rate at 14:1 flow turndown
$\beta = 0.65$	±1.05% of flow rate at 8:1 flow turndown	±1.00% of flow rate at 14:1 flow turndown
Compact Orifice Flowmeter⁽³⁾ (3051SFC_P)		
Ranges 2-3		
$\beta = 0.4$	±1.30% of flow rate at 8:1 flow turndown	±1.25% of flow rate at 14:1 flow turndown
$\beta = 0.65$	±1.30% of flow rate at 8:1 flow turndown	±1.25% of flow rate at 14:1 flow turndown
Integral Orifice Flowmeter (3051SFP)		
Ranges 2-3		
$\beta < 0.1$	±2.55% of flow rate at 8:1 flow turndown	±2.50% of flow rate at 14:1 flow turndown
$0.1 < \beta < 0.2$	±1.35% of flow rate at 8:1 flow turndown	±1.30% of flow rate at 14:1 flow turndown
$0.2 < \beta < 0.6$	±0.85% of flow rate at 8:1 flow turndown	±0.80% of flow rate at 14:1 flow turndown
$0.6 < \beta < 0.8$	±1.55% of flow rate at 8:1 flow turndown	±1.50% of flow rate at 14:1 flow turndown

(1) 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.

(3) For smaller line sizes, see the Rosemount Compact Orifice Flowmeter Series Product Data Sheet (document number 00813-0100-4810).

Uncompensated Flow Performance

Flow performance specifications assume the device only uses DP readings without pressure and temperature compensation.

Models	Ultra	Classic	Ultra for Flow
Annubar Flowmeter (3051SFA)			
Ranges 2-3	±0.85% of flow rate at 8:1 flow turndown	±0.9% of flow rate at 8:1 flow turndown	±0.80% of flow rate at 14:1 flow turndown
Compact Conditioning Orifice Flowmeter (3051SFC_C)			
Ranges 2-3			
$\beta = 0.4$	±0.85% of flow rate at 8:1 flow turndown	±1.05% of flow rate at 8:1 flow turndown	±0.80% of flow rate at 14:1 flow turndown
$\beta = 0.65$	±1.20% of flow rate at 8:1 flow turndown	±1.35% of flow rate at 8:1 flow turndown	±1.15% of flow rate at 14:1 flow turndown
Compact Orifice Flowmeter⁽³⁾ (3051SFC_P)			
Ranges 2-3			
$\beta = 0.4$	±1.45% of flow rate at 8:1 flow turndown	±1.55% of flow rate at 8:1 flow turndown	±1.40% of flow rate at 14:1 flow turndown
$\beta = 0.65$	±1.45% of flow rate at 8:1 flow turndown	±1.55% of flow rate at 8:1 flow turndown	±1.40% of flow rate at 14:1 flow turndown
Integral Orifice Flowmeter (3051SFP)			
Ranges 2-3			
$\beta < 0.1$	±2.65% of flow rate at 8:1 flow turndown	±2.70% of flow rate at 8:1 flow turndown	±2.60% of flow rate at 14:1 flow turndown
$0.1 < \beta < 0.2$	±1.45% of flow rate at 8:1 flow turndown	±1.60% of flow rate at 8:1 flow turndown	±1.40% of flow rate at 14:1 flow turndown
$0.2 < \beta < 0.6$	±1.05% of flow rate at 8:1 flow turndown	±1.20% of flow rate at 8:1 flow turndown	±0.95% of flow rate at 14:1 flow turndown
$0.6 < \beta < 0.8$	±1.70% of flow rate at 8:1 flow turndown	±1.80% of flow rate at 8:1 flow turndown	±1.65% of flow rate at 14:1 flow turndown

Long Term Stability

Pressure

Models		Ultra and Ultra for Flow ⁽¹⁾	Classic and Classic MV
3051S_CD	Ranges 2-5	±0.20% of URL for 10 years; for ±50°F (28°C) temperature changes, up to 1000 psi (68,9 bar) line pressure	±0.125% of URL for 5 years; for ±50°F (28°C) temperature changes, up to 1000 psi (68,9 bar) line pressure
3051S_CG	Ranges 2-5		
3051S_CA	Ranges 1-4		
3051S_T	Ranges 1-5		
3051SMV 3051SF	DP Ranges 2-3 AP & GP Ranges 3-4		

(1) Ultra is only available for 3051S, 3051SMV_3 and 4, 3051SF_3, 4, 7 and D. Ultra for Flow is only available on 3051S_CD ranges 2-3, 3051SMV DP ranges 2-3, and 3051SF DP ranges 2-3.

Process Temperature⁽¹⁾

Models		
3051SMV 3051SF	RTD Interface	The greater of ±0.185°F (0.103°C) or 0.1% of reading per year (excludes RTD sensor stability).

(1) 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 the Rosemount Series 68 and 78 RTD Temperature Sensors.

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Warranty⁽¹⁾

Models	Ultra and Ultra for Flow	Classic and Classic MV
All 3051S Products	12-year limited warranty ⁽²⁾	1-year limited warranty ⁽³⁾

(1) Warranty details can be found in Emerson Process Management 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 Process Management 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

Total Time Response at 75 °F (24 °C), includes dead time⁽¹⁾

3051S_C 3051SF_D 3051S_L	3051S_T	3051SMV_1 or 2 3051SF_1, 2, 5, or 6	3051SMV_3 or 4 3051SF_3, 4, or 7
DP Ranges 2-5: 100 ms Range 1: 255 ms Range 0: 700 ms	100 ms	DP Range 1: 310 ms DP Range 2: 170 ms DP Range 3: 155 ms AP & GP: 240 ms	DP Ranges 2-5: 145 ms DP Range 1: 300 ms DP Range 0: 745 ms

(1) For FOUNDATION fieldbus (output code F), add 52 ms to stated values (not including segment macro-cycle).

For option code DA2, add 45 ms (nominal) to stated values.

Dead Time⁽¹⁾

3051S_C 3051S_T 3051SF_D 3051S_L	3051SMV 3051SF_1-7
45 ms (nominal)	DP: 100 ms AP & GP: 140 ms RTD Interface: 1 s

(1) For option code DA2, dead time is 90 milliseconds (nominal).

Update Rate⁽¹⁾

3051S_C or T 3051SF_D 3051S_L	3051SMV 3051SF_1-7
22 updates per sec.	DP: 22 updates per sec. AP & GP: 11 updates per sec. RTD Interface: 1 update per sec. <u>Calculated Variables:</u> Mass / Volumetric Flow Rate: 22 updates per sec. Energy Flow Rate: 22 updates per sec. Totalized Flow: 1 update per sec.

(1) Does not apply to Wireless (output code X). See "Wireless Self-Organizing Networks" on page B-15 for wireless update rate.

Ambient Temperature Effect

Transmitter with Coplanar Sensor Module (Single Variable)

Differential Pressure: (3051S_CD, 3051SMV_ _3 or 4) Gage Pressure: (3051S_CG)			
	Ultra per 50 °F (28 °C)	Classic per 50 °F (28 °C)	Ultra for Flow ⁽¹⁾ -40 to 185 °F (-40 to 85 °C)
Ranges 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% of reading up to 8:1 DP turndown from URL; ±[0.13 + 0.0187(URL/Reading)]% of reading to 100:1 DP turndown from URL
Range 0	±(0.025% URL + 0.05% span) from 1:1 to 30:1	±(0.025% URL + 0.05% span) from 1:1 to 30:1	Not Available
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	Not Available
Absolute Pressure: (3051S_CA)			
	Ultra per 50 °F (28 °C)	Classic per 50 °F (28 °C)	
Ranges 2-4	±(0.0125% URL + 0.0625% span) from 1:1 to 5:1; ±(0.025% URL + 0.125% span) from >5:1 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	
Range 0	±(0.1% URL + 0.25% span) from 1:1 to 30:1	±(0.1% URL + 0.25% span) from 1:1 to 30:1	
Range 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	±(0.0125% URL + 0.0625% span) from 1:1 to 5:1; ±(0.025% URL + 0.125% span) from >5:1 to 100:1	

(1) Ultra for Flow is only available for 3051S_CD Ranges 2-3 and 3051SMV DP Ranges 2-3.

(2) Use Classic specification for 3051SMV DP Range 5 Ultra and 3051S_CD Range 5 Ultra.

Transmitter with In-Line Sensor Module

Absolute Pressure: (3051S_TA) Gage Pressure: (3051S_TG)			
	Ultra per 50 °F (28 °C)	Classic per 50 °F (28 °C)	
Ranges 2-4	±(0.009% URL + 0.025% span) from 1:1 to 10:1; ±(0.018% URL + 0.08% span) from >10:1 to 100:1	±(0.0125% URL + 0.0625% span) from 1:1 to 5:1; ±(0.025% URL + 0.125% span) from >5:1 to 100:1	
Range 5	±(0.05% URL + 0.075% span) from 1:1 to 10:1	±(0.05% URL + 0.075% span) from 1:1 to 10:1	
Range 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	±(0.0125% URL + 0.0625% span) from 1:1 to 5:1; ±(0.025% URL + 0.125% span) from >5:1 to 100:1	

Transmitter with MultiVariable Sensor Module

Differential Pressure and Static Pressure (3051SMV__1 or 2)			
Models		Classic MV Per 50 °F (28 °C)	Ultra for Flow -40 to 185 °F (-40 to 85 °C)
DP Ranges 2-3		±(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/Reading)]% reading to 100:1 DP turndown from URL
DP Range 1		±(0.1% URL + 0.25% span) from 1:1 to 50:1	Not available
AP & GP		±(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

Ambient Temperature Effect

Liquid Level Transmitter

3051S_L			
		Ultra	Classic
		See <i>Instrument Toolkit</i>	See <i>Instrument Toolkit</i>

Process Temperature RTD Interface⁽¹⁾

Process Temperature (3051SMV__1 or 3)			
(1)		Classic MV Per 50 °F (28 °C)	Ultra for Flow -40 to 185 °F (-40 to 85 °C)
		±0.39 °F (0,216 °C) per 50 °F (28 °C)	±0.39 °F (0,216 °C) per 50 °F (28 °C)

(1) 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⁾

3051S_CD 3051SMV (DP Measurement Only)	Ultra and Ultra for Flow	Classic and Classic MV
Zero Error⁽²⁾		
Range 2-3	± 0.025% URL per 1000 psi (69 bar)	± 0.05% URL per 1000 psi (69 bar)
Range 0	± 0.125% URL per 100 psi (6,9 bar)	± 0.125% URL per 100 psi (6,9 bar)
Range 1	± 0.25% URL per 1000 psi (69 bar)	± 0.25% URL per 1000 psi (69 bar)
Span Error⁽³⁾		
Range 2-3	± 0.1% of reading per 1000 psi (69 bar)	± 0.1% of reading per 1000 psi (69 bar)
Range 0	± 0.15% of reading per 100 psi (6,9 bar)	± 0.15% of reading per 100 psi (6,9 bar)
Range 1	± 0.4% of reading per 1000 psi (69 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 3051SMV Reference Manual (document number 00809-0100-4803) or 3051S Reference Manual (document number 00809-0100-4801).

(2) Zero error can be removed by performing a zero trim at line pressure.

(3) Specifications for option code P0 are 2 times those shown above.

Mounting Position Effects

Models	Ultra, Ultra for Flow, Classic and Classic MV
3051S_CD or CG 3051SMV__3 or 4 3051SF_3, 4, 7, or D	Zero shifts up to ±1.25 inH ₂ O (3,11 mbar), which can be zeroed Span: no effect
3051S_CA 3051S_T	Zero shifts to ±2.5 inH ₂ O (6,22 mbar), which can be zeroed Span: no effect

Models		Ultra, Ultra for Flow, Classic and Classic MV
3051SMV_1 or 2 3051SF_1, 2, 5, or 6	DP Sensor:	Zero shifts up to ± 1.25 inH ₂ O (3,11 mbar), which can be zeroed Span: no effect
	GP/AP Sensor:	Zero shifts to ± 2.5 inH ₂ O (6,22 mbar), which can be zeroed Span: no effect
3051S_L		With liquid level diaphragm in vertical plane, zero shift of up to ± 1 inH ₂ O (2,5 mbar). With diaphragm in vertical plane, zero shift of up to ± 5 inH ₂ O (12,5 mbar) plus extension length on extended units. All zero shifts can be zeroed. Span: no effect.

Vibration Effect

Less than $\pm 0.1\%$ 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, 1L, 2J, and 2M:

Less than $\pm 0.1\%$ 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 $\pm 0.005\%$ of calibrated span per volt change in voltage at the transmitter terminals

Electromagnetic Compatibility (EMC)

Meets all relevant requirements of EN 61326 and NAMUR NE-21.⁽¹⁾⁽²⁾

(1) NAMUR NE-21 does not apply to wireless output code X.

(2) 3051SMV and 3051SF_1, 2, 3, 4, 5, 6, 7 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 μ s - 100 kHz)

3 kA crest (8 $\times$ 20 microseconds)

6 kV crest (1.2 $\times$ 50 microseconds)

Meets IEEE C37.90.1-2002 Surge Withstand Capability

SWC 2.5 kV crest, 1.0 MHz wave form

FUNCTIONAL SPECIFICATIONS

Range and Sensor Limits

Transmitter with Coplanar Sensor Module (Single Variable)

Range	DP Sensor ⁽¹⁾ (3051S_CD, 3051SMV__3, 4, or D 3051SF_3, 4, or 7, 3051S_LD)		GP Sensor (3051S_CG, 3051S_LG)		AP Sensor (3051S_CA, 3051S_LA)	
	Lower (LRL) ⁽²⁾	Upper (URL)	Lower (LRL) ⁽³⁾	Upper (URL)	Lower (LRL)	Upper (URL)
0	-3 inH ₂ O (-7,5 mbar)	3 inH ₂ O (7,5 mbar)	N/A	N/A	0 psia (0 bar)	5 psia (0,34 bar)
1	-25 inH ₂ O (-62,3 mbar)	25 inH ₂ O (62,3 mbar)	-25 inH ₂ O (-62,3 mbar)	25 inH ₂ O (62,3 mbar)	0 psia (0 bar)	30 psia (2,07 bar)
2	-250 inH ₂ O (-0,62 bar)	250 inH ₂ O (0,62 bar)	-250 inH ₂ O (-0,62 bar)	250 inH ₂ O (0,62 bar)	0 psia (0 bar)	150 psia (10,34 bar)
3	-1000 inH ₂ O (-2,49 bar)	1000 inH ₂ O (2,49 bar)	-1000 inH ₂ O (-2,49 bar)	1000 inH ₂ O (2,49 bar)	0 psia (0 bar)	800 psia (55,16 bar)
4	-300 psi (-20,7 bar)	300 psi (20,7 bar)	-300 psi (-20,7 bar)	300 psi (20,7 bar)	0 psia (0 bar)	4000 psia (275,8 bar)
5	-2000 psi (-137,9 bar)	2000 psi (137,9 bar)	-2000 psi (-137,9 bar)	2000 psi (137,9 bar)	N/A	N/A

(1) 3051SF flowmeters only available with ranges 1, 2, and 3.

(2) The Lower Range Limit (LRL) is 0 inH₂O (0 mbar) for Ultra for Flow performance class and 3051SF flowmeters.

(3) Assumes atmospheric pressure of 14.7 psig (1 bar).

Transmitter with In-Line Sensor Module

Range	GP Sensor (3051S_TG)		AP Sensor (3051S_TA)	
	Lower (LRL) ⁽¹⁾	Upper (URL)	Lower (LRL)	Upper (URL)
1	-14.7 psig (-1,01 bar)	30 psig (2,07 bar)	0 psia (0 bar)	30 psia (2,07 bar)
2	-14.7 psig (-1,01 bar)	150 psig (10,34 bar)	0 psia (0 bar)	150 psia (10,34 bar)
3	-14.7 psig (-1,01 bar)	800 psig (55,16 bar)	0 psia (0 bar)	800 psia (55,16 bar)
4	-14.7 psig (-1,01 bar)	4000 psig (275,8 bar)	0 psia (0 bar)	4000 psia (275,8 bar)
5	-14.7 psig (-1,01 bar)	10000 psig (689,5 bar)	0 psia (0 bar)	10000 psia (689,5 bar)

(1) Assumes atmospheric pressure of 14.7 psig (1 bar).

Transmitter with MultiVariable Sensor Module (3051SMV__1, 3051SMV__2, 3051SF_1, 3051SF_2, 3051SF_5, and 3051SF_6)

Range	DP Sensor	
	Lower (LRL) ⁽¹⁾	Upper (URL)
1	-25.0 inH ₂ O (-62,3 mbar)	25.0 inH ₂ O (62,3 mbar)
2	-250.0 inH ₂ O (-0,62 bar)	250.0 inH ₂ O (0,62 bar)
3	-1000.0 inH ₂ O (-2,49 bar)	1000.0 inH ₂ O (2,49 bar)

(1) Lower (LRL) is 0 inH₂O (0 mbar) for Ultra for Flow and 3051SF Flowmeters.

Range	Static Pressure Sensor (GP/AP)	
	Lower (LRL)	Upper (URL) ⁽¹⁾
3	GP ⁽²⁾ : -14.2 psig (0,98 bar) AP: 0.5 psia (34,5 mbar)	GP: 800 psig (55,16 bar) AP: 800 psia (55,16 bar)
4	GP ⁽²⁾ : -14.2 psig (0,98 bar) AP: 0.5 psia (34,5 mbar)	GP: 3626 psig (250 bar) AP: 3626 psia (250 bar)

(1) For SP Range 4 with DP Range 1, the URL is 2000 psi (137,9 bar).

(2) Inert Fill: Minimum pressure = 1.5 psia (0,10 bar) or -13.2 psig (-0,91 bar).

Process Temperature RTD Interface
(3051SMV__1 or 3, 3051SF_1, 3, 5 or 7)⁽¹⁾

Lower (LRL)	Upper (URL)
-328 °F (-200 °C)	1562 °F (850 °C)

(1) Transmitter is compatible with any Pt 100 RTD sensor. Examples of compatible RTDs include Rosemount Series 68 and 78 RTD Temperature Sensors.

Minimum Span Limits

Transmitter with Coplanar Sensor Module (Single Variable)

Range	DP Sensor ⁽¹⁾ (3051S_CD, 3051SMV__3 or 4, 3051SF_D, 3, 4 or 7, 3051S_LD)		GP Sensor (3051S_CG, 3051S_LG)		AP Sensor (3051S_CA, 3051S_LA)	
	Ultra & Ultra for Flow	Classic	Ultra	Classic	Ultra	Classic
0	0.1 inH ₂ O (0,25 mbar)	0.1 inH ₂ O (0,25 mbar)	N/A	N/A	0.167 psia (11,5 mbar)	0.167 psia (11,5 mbar)
1	0.5 inH ₂ O (1,24 mbar)	0.5 inH ₂ O (1,24 mbar)	0.5 inH ₂ O (1,24 mbar)	0.5 inH ₂ O (1,24 mbar)	0.3 psia (20,7 mbar)	0.3 psia (20,7 mbar)
2	1.3 inH ₂ O (3,11 mbar)	2.5 inH ₂ O (6,23 mbar)	1.3 inH ₂ O (3,11 mbar)	2.5 inH ₂ O (6,23 mbar)	0.75 psia (51,7 mbar)	1.5 psia (103,4 mbar)
3	5.0 inH ₂ O (12,4 mbar)	10.0 inH ₂ O (24,9 mbar)	5.0 inH ₂ O (12,4 mbar)	10.0 inH ₂ O (24,9 mbar)	4 psia (275,8 mbar)	8 psia (0,55 bar)
4	1.5 psi (103,4 mbar)	3.0 psi (206,8 mbar)	1.5 psig (103,4 mbar)	3.0 psig (206,8 mbar)	20 psia (275,8 mbar)	40 psia (2,76 bar)
5	10.0 psi (689,5 mbar)	20.0 psi (1,38 bar)	10.0 psig (689,5 mbar)	20.0 psig (1,38 bar)	N/A	N/A

(1) 3051SF flowmeters only available with ranges 1, 2, and 3.

**Transmitter with In-Line
Sensor Module**

Range	GP Sensor (3051S_TG)		AP Sensor (3051S_TA)	
	Ultra	Classic	Ultra	Classic
1	0.3 psig (20,7 mbar)	0.3 psig (20,7 mbar)	0.3 psia (20,7 mbar)	0.3 psia (20,7 mbar)
2	0.75 psig (51,7 mbar)	1.5 psig (0,103 bar)	0.75 psia (51,7 mbar)	1.5 psia (0,103 bar)
3	4 psig (275,8 mbar)	8 psig (0,55 bar)	4 psia (275,8 mbar)	8 psia (0,55 bar)
4	20 psig (1,58 bar)	40 psig (2,76 bar)	20 psia (1,58 bar)	40 psia (2,76 bar)
5	1000 psig (68,9 bar)	2000 psig (137,9 bar)	1000 psia (68,9 bar)	2000 psia (137,9 bar)

Transmitter with MultiVariable Sensor Module
(3051SMV__1 or 2, 3051SF_1, 2, 5, or 6)

Range	DP Sensor	
	Ultra for Flow	Classic MV
1	0.5 inH ₂ O (1,24 mbar)	0.5 inH ₂ O (1,24 mbar)
2	1.3 inH ₂ O (3,11 mbar)	2.5 inH ₂ O (6,23 mbar)
3	5.0 inH ₂ O (12,4 mbar)	10.0 inH ₂ O (24,9 mbar)
Range	Static Pressure Sensor (GP/AP)	
	Ultra for Flow	Classic MV
3	4.0 psi (276 mbar)	8.0 psi (522 mbar)
4	18.13 psi (1,25 bar)	36.26 psi (2,50 bar)

Process Temperature RTD Interface (3051SMV__1 or 3, 3051SF_1, 3, 5 or 7)

Minimum Span = 50 °F (28 °C)

Service

3051S, 3051SMV_P, and 3051SF_5, 6, 7, or D (Direct Process Variable Output):

Liquid, gas, and vapor applications

3051SMV_M and 3051SF_1, 2, 3, or 4 (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.

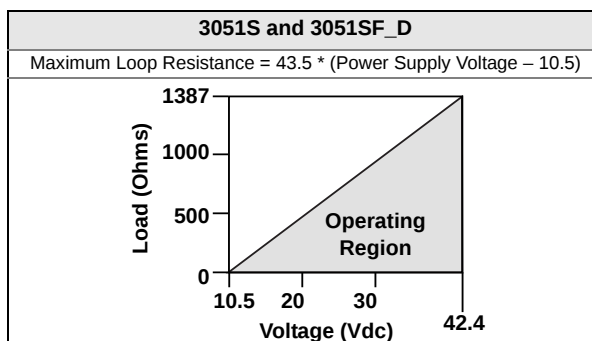
Power Supply

External power supply required.

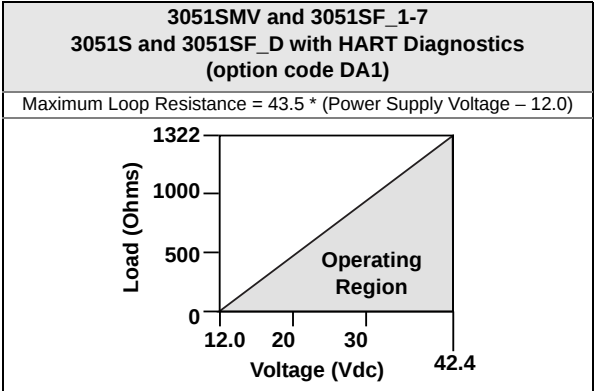
- 3051S and 3051SF_D: 10.5 to 42.4 Vdc with no load
- 3051S and 3051SF_D with Advanced HART Diagnostics Suite: 12 to 42.4 Vdc with no load
- 3051SMV and 3051SF_1-7: 12 to 42.4 Vdc with no load

Load Limitations

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



The HART communicator requires a minimum loop resistance of 250Ω for communication.



The HART communicator requires a minimum loop resistance of 250Ω for communication.

**Advanced HART Diagnostics Suite
(Option Code DA2)**

The 3051S provides Abnormal Situation Prevention indication for a breakthrough in diagnostic capability. The 3051S ASP Diagnostics Suite for HART includes Statistical Process Monitoring (SPM), variable logging with time stamp and advanced process alerts. The enhanced EDDL graphic display provides an intuitive and user-friendly interface to better visualize these diagnostics.

The integral SPM technology calculates the mean and standard deviation of the process variable 22 times per second and makes them available to the user. The 3051S uses these values and highly flexible configuration options for customization to detect many user-defined or application specific abnormal situations (e.g. detecting plugged impulse lines and fluid composition change). Variable logging with time stamp and advanced process alerts capture valuable process and sensor data to enable quick troubleshooting of application and installation issues.

FOUNDATION fieldbus

Power Supply

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

Current Draw

17.5 mA for all configurations (including LCD display option)

FOUNDATION fieldbus Parameters

Schedule Entries	14 (max.)
Links	30 (max.)
Virtual Communications Relationships (VCR)	20 (max.)

Standard Function Blocks

Resource Block

- Contains hardware, electronics, and diagnostic information.

Transducer Block

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

LCD Block

- Configures the local display.

2 Analog Input Blocks

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

PID Block with Auto-tune

- Contains all logic to perform PID control in the field including cascade and feedforward. Auto-tune capability allows for superior tuning for optimized control performance.

Backup Link Active Scheduler (LAS)

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

Software Upgrade in the Field

Software for the 3051S with FOUNDATION fieldbus is easy to upgrade in the field using the FOUNDATION fieldbus Common Device Software Download procedure.

PlantWeb Alerts

Enable the full power of the PlantWeb digital architecture by diagnosing instrumentation issues, communicating advisory, maintenance, and failure details, and recommending a solution.

**Advanced Control Function Block Suite
(Option Code A01)****Input Selector Block**

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

Arithmetic Block

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

Signal Characterizer Block

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

Integrator Block

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

Output Splitter Block

- Splits the output of one PID or other control block so that the PID will control two valves or other actuators.

Control Selector Block

- Selects one of up to three inputs (highest, middle, or lowest) that are normally connected to the outputs of PID or other control function blocks.

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	20 milliseconds
PID with Auto-tune	35 milliseconds
Input Selector	20 milliseconds
Arithmetic	20 milliseconds
Signal Characterizer	20 milliseconds
Integrator	20 milliseconds
Output Splitter	20 milliseconds
Control Selector	20 milliseconds

Fully Compensated Mass Flow Block (Option Code H01)

Calculates fully compensated mass flow based on differential pressure with external process pressure and temperature measurements over the fieldbus segment. Configuration for the mass flow calculation is easily accomplished using the Rosemount Engineering Assistant.

ASP Diagnostics Suite for FOUNDATION fieldbus (Option Code D01)

The 3051S ASP Diagnostics Suite for FOUNDATION fieldbus provides Abnormal Situation Prevention indication and enhanced EDDL graphic displays for easy visual analysis. The integral Statistical Process Monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second and makes them available to the user. The 3051S uses these values and highly flexible configuration options for customization to detect many user-defined or application specific abnormal situations (e.g. detecting plugged impulse lines and fluid composition change).

Wireless Self-Organizing Networks

Output

WirelessHART, 2.4 GHz DSSS.

Local Display

The optional seven-digit LCD can display user-selectable information such as primary variable in engineering units, percent of range, sensor module temperature, and electronics temperature. Display updates at the user-configured update rate.

Update Rate

WirelessHART, user selectable 4 sec. to 60 min.

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Ten-year life at one minute update rate.⁽¹⁾

(1) Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.

NOTE: Continuous exposure to ambient temperature limits of -40 °F or 185 °F (-40 °C or 85 °C) may reduce specified life by less than 20 percent.

Overpressure Limits

Transmitters withstand the following limits without damage:

Coplanar Sensor Module (Single Variable)

Range	DP ⁽¹⁾ & GP	AP
	3051S_CD, 3051S_CG 3051SMV_3 or 4 3051SF_3, 4, 7, or D	3051S_CA
0	750 psi (51,7 bar)	60 psia (4,13 bar)
1	2000 psi (137,9 bar)	750 psia (51,7 bar)
2	3626 psi (250,0 bar)	1500 psia (103,4 bar)
3	3626 psi (250,0 bar)	1600 psia (110,3 bar)
4	3626 psi (250,0 bar)	6000 psia (413,7 bar)
5	3626 psi (250,0 bar)	N/A

(1) The overpressure limit of a DP Sensor with the P9 option is 4500 psig (310,3 bar). The overpressure limit of a DP Sensor with the P0 option is 6092 psig (420 bar).

In-Line Sensor Module

Range	GP	AP
	3051S_TG	3051S_TA
1	750 psi (51,7 bar)	
2	1500 psi (103,4 bar)	
3	1600 psi (110,3 bar)	
4	6000 psi (413,7 bar)	
5	15000 psi (1034,2 bar)	

Coplanar MultiVariable Sensor Module (3051SMV__1 or 2, 3051SF_1, 2, 5, or 6)

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)

Liquid Level Transmitter (3051S_L)

Overpressure limit is dependent on the flange rating or sensor rating (whichever is lower). Use *Instrument Toolkit* to ensure the seal system meets all pressure and temperature limits.

Static Pressure Limits

Coplanar Sensor Module (Single Variable)

Operates within specifications between static line pressures of:

Range	DP Sensor ⁽¹⁾
	3051S_CD 3051SMV__3 or 4 3051SF_3, 4, 7, or D
0	0.5 psia to 750 psig (0,03 to 51,71 bar)
1	0.5 psia to 2000 psig (0,03 to 137,9 bar)
2	0.5 psia to 3626 psig (0,03 to 150 bar)
3	0.5 psia to 3626 psig (0,03 to 150 bar)
4	0.5 psia to 3626 psig (0,03 to 150 bar)
5	0.5 psia to 3626 psig (0,03 to 150 bar)

(1) The static pressure limit of a DP Sensor with the P9 option is 4500 psig (310,3 bar). The static pressure limit of a DP Sensor with the P0 option is 6092 psig (420 bar).

Coplanar MultiVariable Sensor Module (3051SMV__1 or 2, 3051SF_1, 2, 5, or 6)

Operates within specifications between static line pressures of 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)

Burst Pressure Limits

Coplanar Sensor Module (3051S_C, 3051SMV, 3051SF)

10000 psig (689,5 bar)

In-Line Sensor Module (3051S_T)

- Ranges 1-4: 11000 psi (758,4 bar)
- Range 5: 26000 psi (1792,64 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)

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

Coplanar Sensor Module 3051S_C, 3051SMV, 3051SF	
Silicone Fill Sensor ⁽¹⁾⁽²⁾	
with Coplanar Flange	-40 to 250 °F (-40 to 121 °C) ⁽³⁾
with Traditional Flange	-40 to 300 °F (-40 to 149 °C) ⁽³⁾⁽⁴⁾
with Level Flange	-40 to 300 °F (-40 to 149 °C) ⁽³⁾
with 305 Integral Manifold	-40 to 300 °F (-40 to 149 °C) ⁽³⁾⁽⁴⁾
Inert Fill Sensor ⁽¹⁾⁽⁵⁾	-40 to 185 °F (-40 to 85 °C) ⁽⁶⁾⁽⁷⁾
In-Line Sensor Module 3051S_T	
Silicone Fill Sensor ⁽¹⁾	-40 to 250 °F (-40 to 121 °C) ⁽³⁾
Inert Fill Sensor ⁽¹⁾	-22 to 250 °F (-30 to 121 °C) ⁽³⁾
3051S_L Level Transmitter	
Syltherm® XLT	-102 to 293 °F (-75 to 145 °C)
Silicone 704 ⁽⁸⁾	32 to 401 °F (0 to 205 °C)
Silicone 200	-49 to 401 °F (-45 to 205 °C)
Inert (Halocarbon)	-49 to 320 °F (-45 to 160 °C)
Glycerin and Water	5 to 203 °F (-15 to 95 °C)
Neobee M-20 [®]	5 to 401 °F (-15 to 205 °C)
Propylene Glycol and Water	5 to 203 °F (-15 to 95 °C)

⁽¹⁾ 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:

$(195\text{ °F} - 185\text{ °F}) \times 1.5 = 15\text{ °F}$

$185\text{ °F} - 15\text{ °F} = 170\text{ °F}$

⁽²⁾ 212 °F (100 °C) is the upper process temperature limit for DP Range 0.

⁽³⁾ 220 °F (104 °C) limit in vacuum service; 130 °F (54 °C) for pressures below 0.5 psia.

⁽⁴⁾ -20 °F (-29 °C) is the lower process temperature limit with option code P0.

⁽⁵⁾ 32 °F (0 °C) is the lower process temperature limit for DP Range 0.

⁽⁶⁾ For 3051S_C, 160 °F (71 °C) limit in vacuum service.

For 3051SMV__1, 2, 140 °F (60 °C) limit in vacuum service.

⁽⁷⁾ Not available for 3051S_CA.

⁽⁸⁾ Upper limit of 600 °F (315 °C) is available with 1199 seal assemblies mounted away from the transmitter with the use of capillaries and up to 500 °F (260 °C) with direct mount extension.

Humidity Limits

0–100% relative humidity

Turn-On Time⁽¹⁾

When power is applied to the transmitter during startup, performance will be within specifications per the time period described below:

Transmitter	Turn-On Time (Typical)
3051S, 3051SF_D, 3051S_L	2 seconds
Diagnostics	5 seconds
3051SMV, 3051SF_1-7	5 seconds

(1) Does not apply to wireless option code X.

Volumetric DisplacementLess than 0.005 in³ (0,08 cm³)**Damping⁽¹⁾**

Analog output response time to a step change is user-selectable from 0 to 60 seconds for one time constant. For 3051SMV, 3051SF_1-7, each variable can be individually adjusted. Software damping is in addition to sensor module response time.

(1) Does not apply to wireless option code X.

Failure Mode Alarm**HART 4-20 mA (output option code A)**

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 Alarm Configuration below).

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

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	3.4 - 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.

Safety-Certified Transmitter Failure Values⁽²⁾Safety accuracy: 2.0%⁽¹⁾

Safety response time: 1.5 seconds

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

(2) Does not apply to wireless option code X.

PHYSICAL SPECIFICATIONS**Electrical Connections**

¹/₂–14 NPT, G¹/₂, and M20 × 1.5 conduit. HART interface connections fixed to terminal block for Output code A and X.

Process Connections

Coplanar Sensor Module (3051S_C, 3051SMV, 3051SF)	
Standard	$\frac{1}{4}$ -18 NPT on 2 $\frac{1}{8}$ -in. centers
Process Adapters (D2 Option)	$\frac{1}{2}$ -14 NPT and RC $\frac{1}{2}$ on 2-in. (50.8 mm), 2 $\frac{1}{8}$ -in. (54.0 mm), or 2 $\frac{1}{4}$ -in. (57.2 mm) centers
In-Line Sensor Module (3051S_T)	
Standard	$\frac{1}{2}$ -14 NPT Female
F11 Code	Non-threaded instrument flange (available in SST for sensor ranges 1-4 only)
G11 Code	G $\frac{1}{2}$ A DIN 16288 Male (available in SST for sensor ranges 1-4 only)
H11 Code	Autoclave type F-250C (Pressure relieved 9/16-18 gland thread; $\frac{1}{4}$ OD high pressure tube 60° cone; available in SST for sensor range 5 only)
Level Transmitter (3051S_L)	
FF Seal	2-in. (DN 50), 3-in. (DN 80), or 4-in. (DN 100);
EF Seal	ANSI Class 150, 300, or 600 flange; JIS 10K, 20K, or 40K flange; PN 10/16 or PN 40 flange

Process-Wetted Parts

Process Isolating Diaphragms

Coplanar Sensor Module (3051S_C, 3051SMV)	
316L SST (UNS S31603), Alloy C-276 (UNS N10276), Alloy 400 (UNS N04400), Tantalum (UNS R05440), Gold-Plated Alloy 400, Gold-plated 316L SST	
In-Line Sensor Module (3051S_T)	
316L SST (UNS S31603), Alloy C-276 (UNS N10276)	
Level Transmitter (3051S_L)	
FF Seal	316L SST, Alloy C-276, Tantalum
EF Seal	

Drain/Vent Valves

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

(1) Alloy 400/K-500 is not available with 3051S_L.

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 CF-8M (Cast 316 SST)

NEMA 4X, IP 66, IP 68 (66 ft (20 m) for 168 hours)

Note: IP 68 not available with Wireless Output.

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 (Inert is not available with 3051S_CA). In-Line series uses Fluorinert[®] FC-43.

Process Fill Fluid (Liquid Level Only)

3051S_L: Syltherm XLT, Silicone 704, Silicone 200, inert, glycerin and water, Neobee M-20, propylene glycol and water.

Paint

Polyurethane

Cover O-rings

Buna-N

Wireless Antenna

PBT/ polycarbonate (PC) integrated omnidirectional antenna

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation, Intrinsically Safe Lithium-thionyl chloride Power Module with PBT enclosure

Shipping Weights

Sensor Module Weights

Coplanar Sensor Module ⁽¹⁾
3.1 lb (1,4 kg)
In-Line Sensor Module
1.4 lb (0,6 kg)

(1) Flange and bolts not included.

Transmitter Weights⁽¹⁾

Transmitter with Coplanar Sensor Module (3051S_C, 3051SMV, 3051SAM_G or A)	
Junction Box Housing, SST Flange	6.3 lb (2,8 kg)
PlantWeb Housing, SST Flange	6.7 lb (3,1 kg)
Wireless PlantWeb Housing, SST Flange	7.3 lb (3,3 kg)
Transmitter with In-Line Sensor Module (3051S_T, 3051SAM_T or E)	
Junction Box Housing, SST Flange	3.2 lb (1,4 kg)
PlantWeb Housing, SST Flange	3.7 lb (1,7 kg)
Wireless PlantWeb Housing, SST Flange	4.2 lb (1,9 kg)

(1) Fully functional transmitter with sensor module, housing, terminal block, and covers. Does not include LCD display.

Transmitter Option Weights

Option Code	Option	Add lb (kg)
1J, 1K, 1L	SST PlantWeb Housing	3.5 (1,6)
2J	SST Junction Box Housing	3.4 (1,5)
7J	SST Quick Connect	0.4 (0,2)
2A, 2B, 2C	Aluminum Junction Box Housing	1.1 (0,5)
1A, 1B, 1C	Aluminum PlantWeb Housing	1.1 (0,5)
M5	LCD Display for Aluminum PlantWeb Housing ⁽¹⁾ , LCD Display for SST PlantWeb Housing ⁽¹⁾	0.8 (0,4) 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	SST Traditional Flange with SST Drain Vents ⁽²⁾	3.2 (1,5)
F13, F23	Cast C-276 Traditional Flange with Alloy C-276 Drain Vents ⁽²⁾	3.6 (1,6)
E12, E22	SST Coplanar Flange with SST Drain Vents ⁽²⁾	1.9 (0,9)
F14, F24	Cast Alloy 400 Traditional Flange with Alloy 400/K-500 Drain Vents ⁽²⁾	3.6 (1,6)
F15, F25	SST Traditional Flange with Alloy C-276 Drain Vents ⁽²⁾	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)
Wireless Extended Cover	0.7 (0,3)
LCD Display ⁽¹⁾	0.1 (0,04)
Junction Box Terminal Block	0.2 (0,1)
PlantWeb Terminal Block	0.2 (0,1)
Power Module	0.5 (0,2)

(1) Display only.

3051S_L Weights Without SuperModule Platform, Housing, or Transmitter Options

Flange	Flush lb. (kg)	2-in. Ext. lb (kg)	4-in. Ext. lb (kg)	6-in. Ext. lb (kg)
2-in., 150	9.5 (4,3)	—	—	—
3-in., 150	15.7 (7,1)	16.4 (7,4)	17.6 (8,0)	18.9 (8,6)
4-in., 150	21.2 (9,6)	20.9 (9,5)	22.1 (10,0)	23.4 (10,6)
2-in., 300	11.3 (5,1)	—	—	—
3-in., 300	19.6 (8,9)	20.3 (9,2)	21.5 (9,8)	22.8 (10,3)
4-in., 300	30.4 (13,8)	30.3 (13,7)	31.5 (14,3)	32.8 (14,9)
2-in., 600	12.8 (5,8)	—	—	—
3-in., 600	22.1 (10,0)	22.8 (10,3)	24.0 (10,9)	25.3 (11,5)
DN 50 / PN 40	11.3 (5,1)	—	—	—
DN 80 / PN 40	16.0 (7,3)	16.7 (7,6)	17.9 (8,1)	19.2 (8,7)
DN 100 / PN 10/16	11.2 (5,1)	11.9 (5,4)	13.1 (5,9)	14.4 (6,5)
DN 100 / PN 40	12.6 (5,7)	13.3 (6,0)	14.5 (6,6)	15.8 (7,1)

DIMENSIONAL DRAWINGS

Figure B-1. Transmitter with Coplanar Sensor Module and Flange

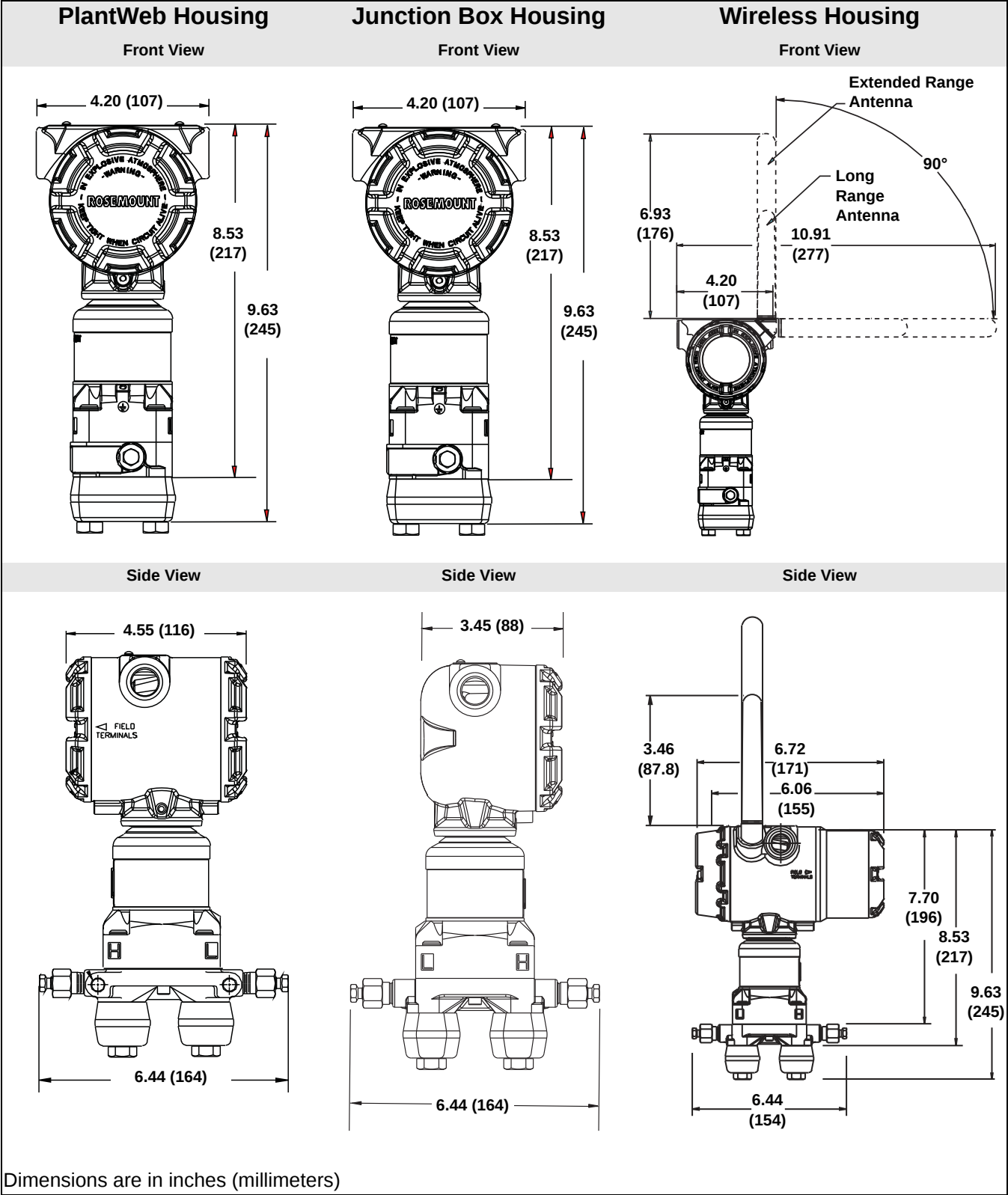


Figure B-2. Transmitter with Coplanar Sensor Module and Traditional Flange

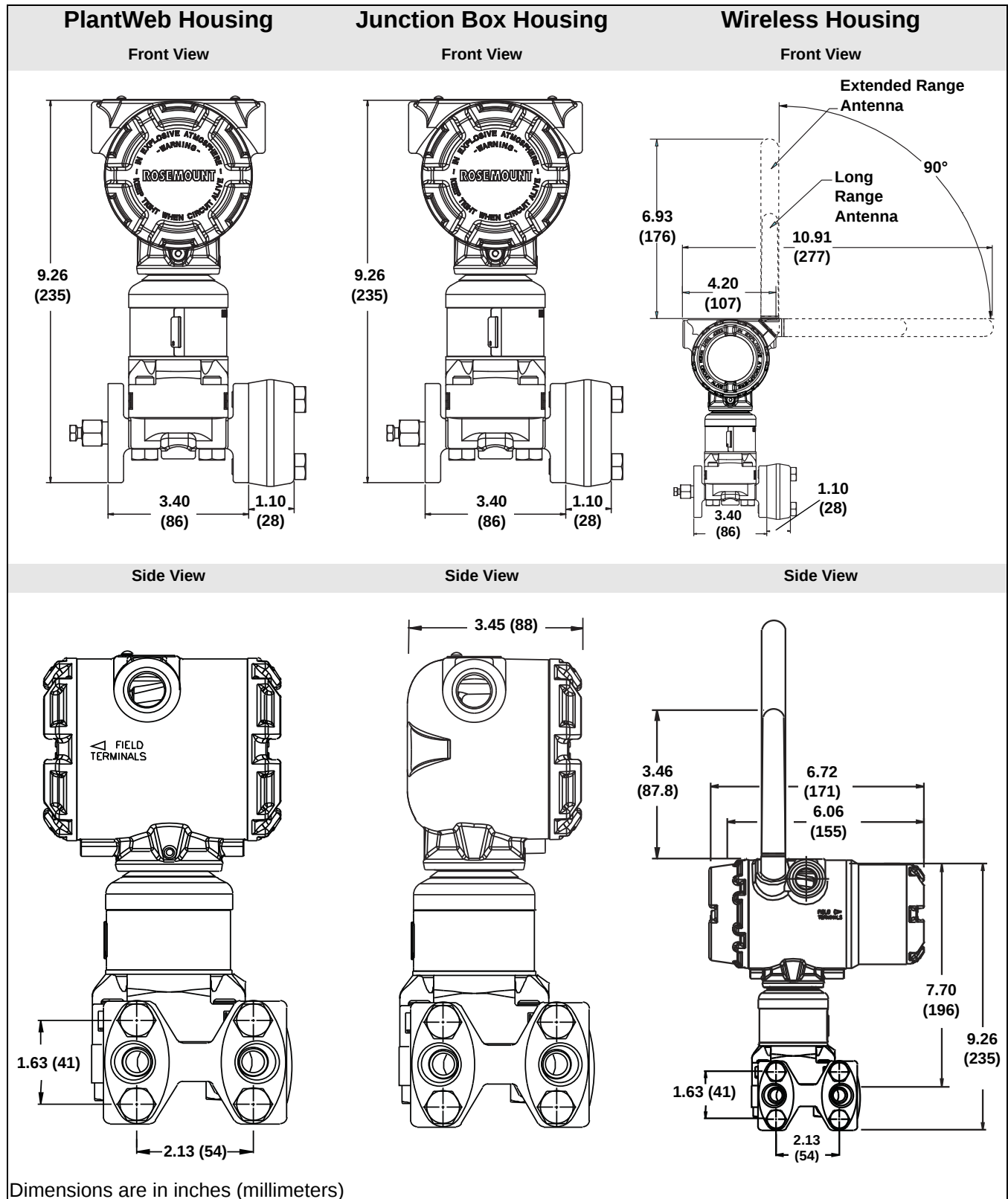


Figure B-3. Transmitter with In-Line Sensor Module

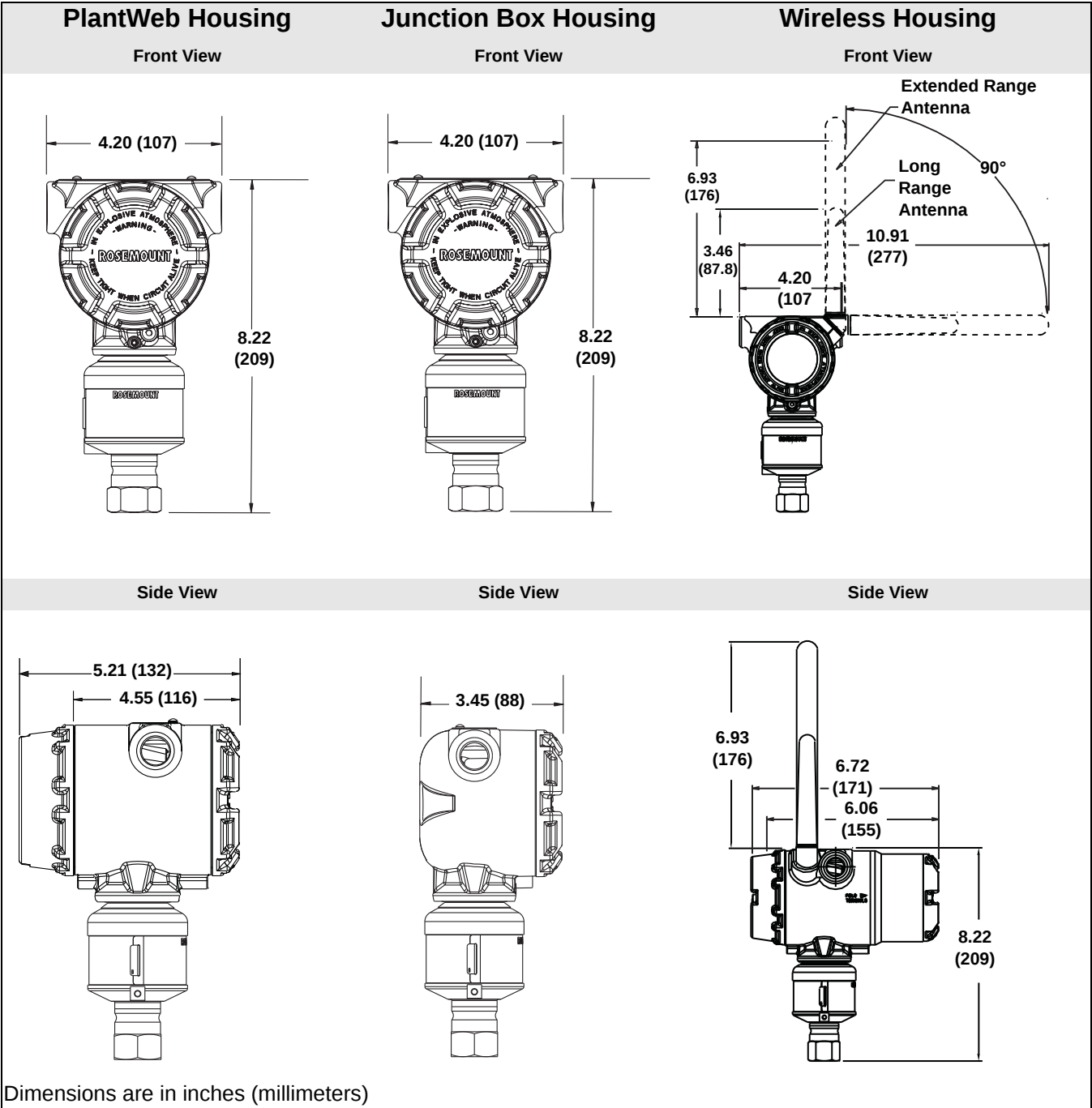


Figure B-4. Coplanar Mounting Configurations (B4 Bracket)

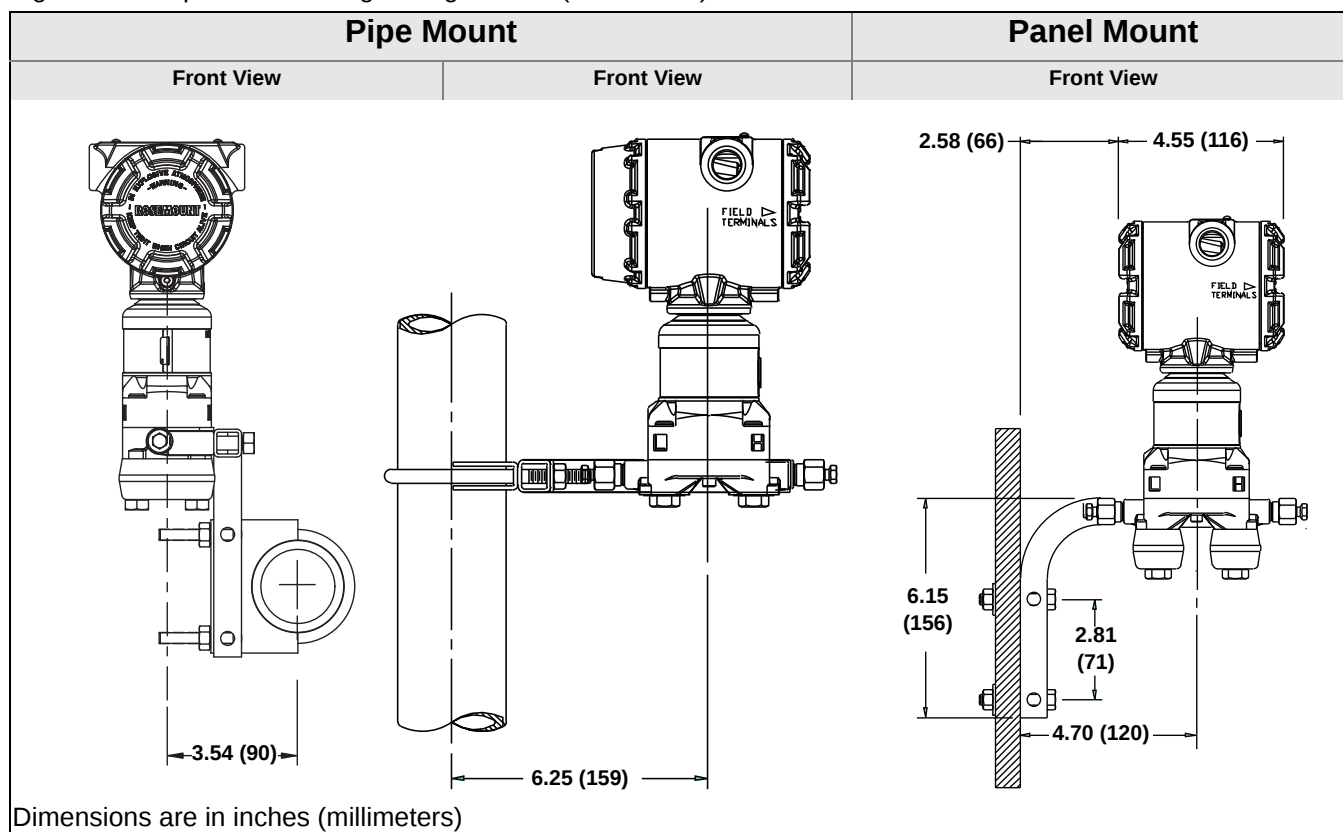


Figure B-5. Traditional Mounting Configurations

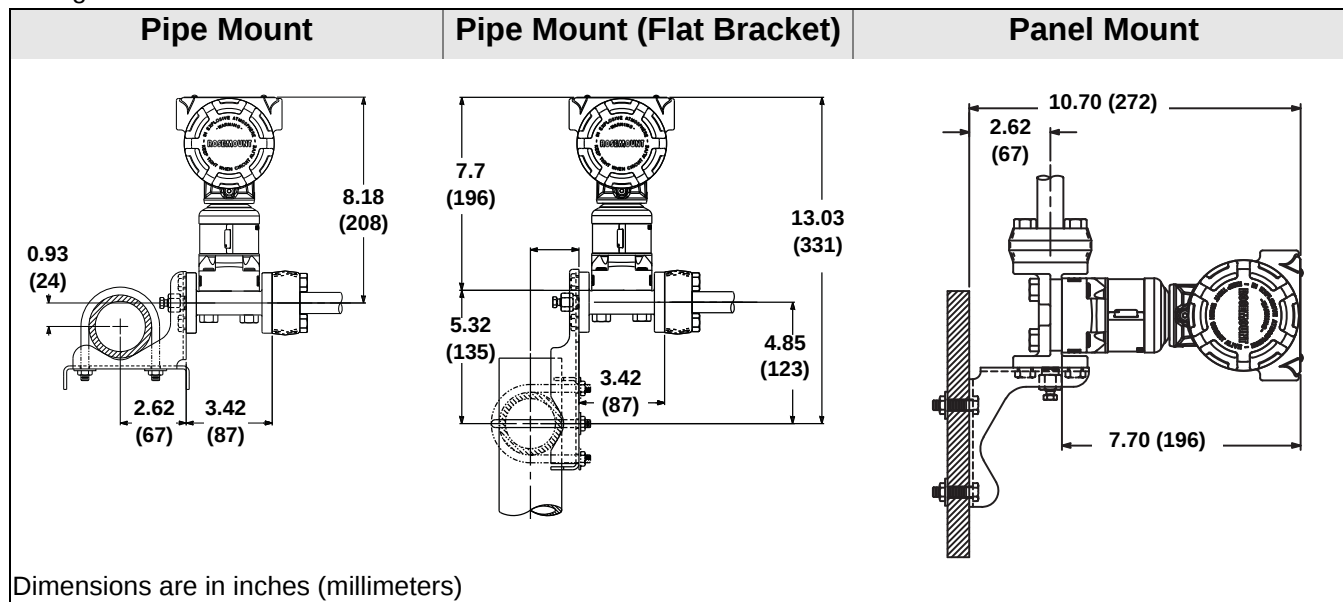


Figure B-6. In-Line Mounting
Configurations (B4 Bracket)

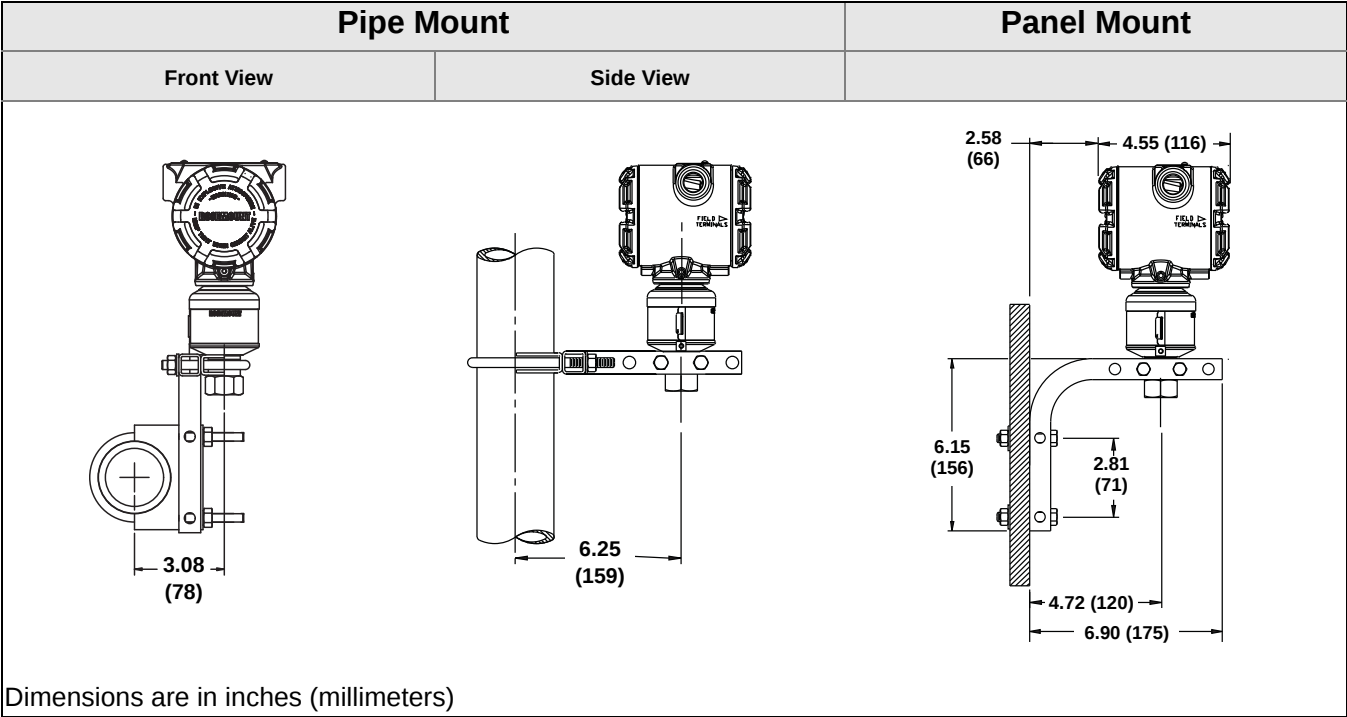
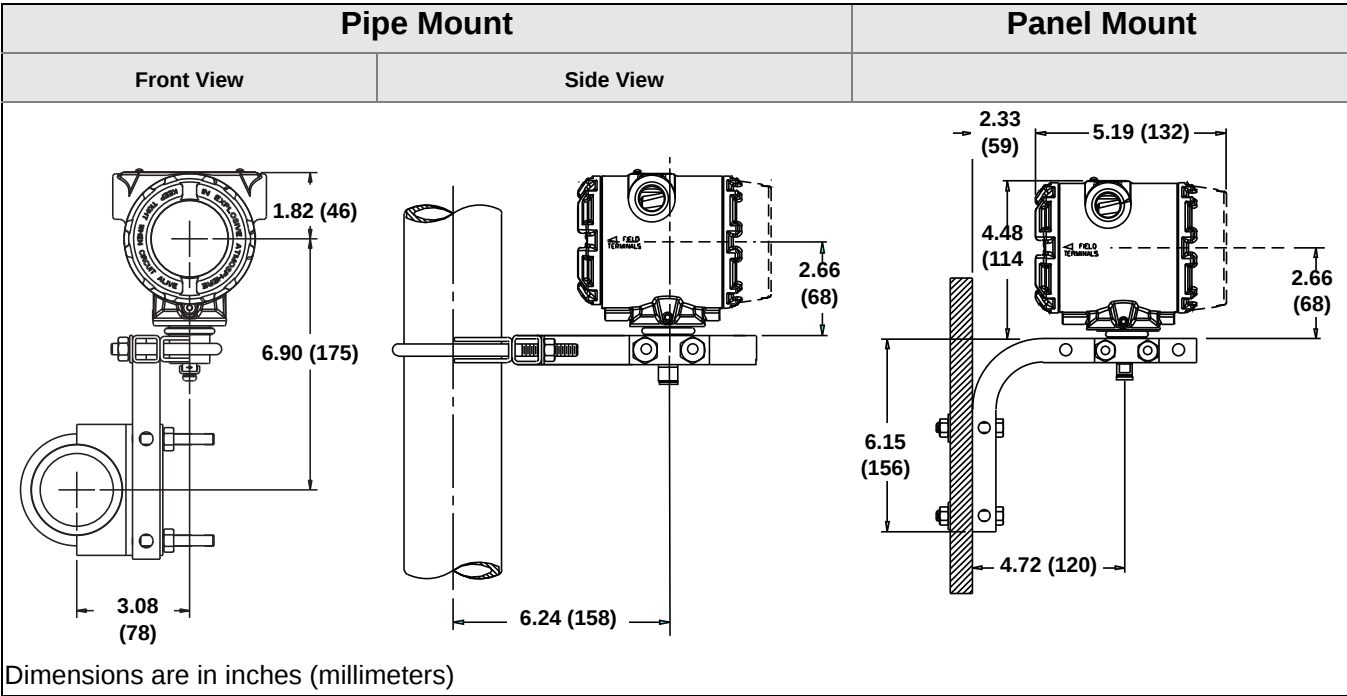
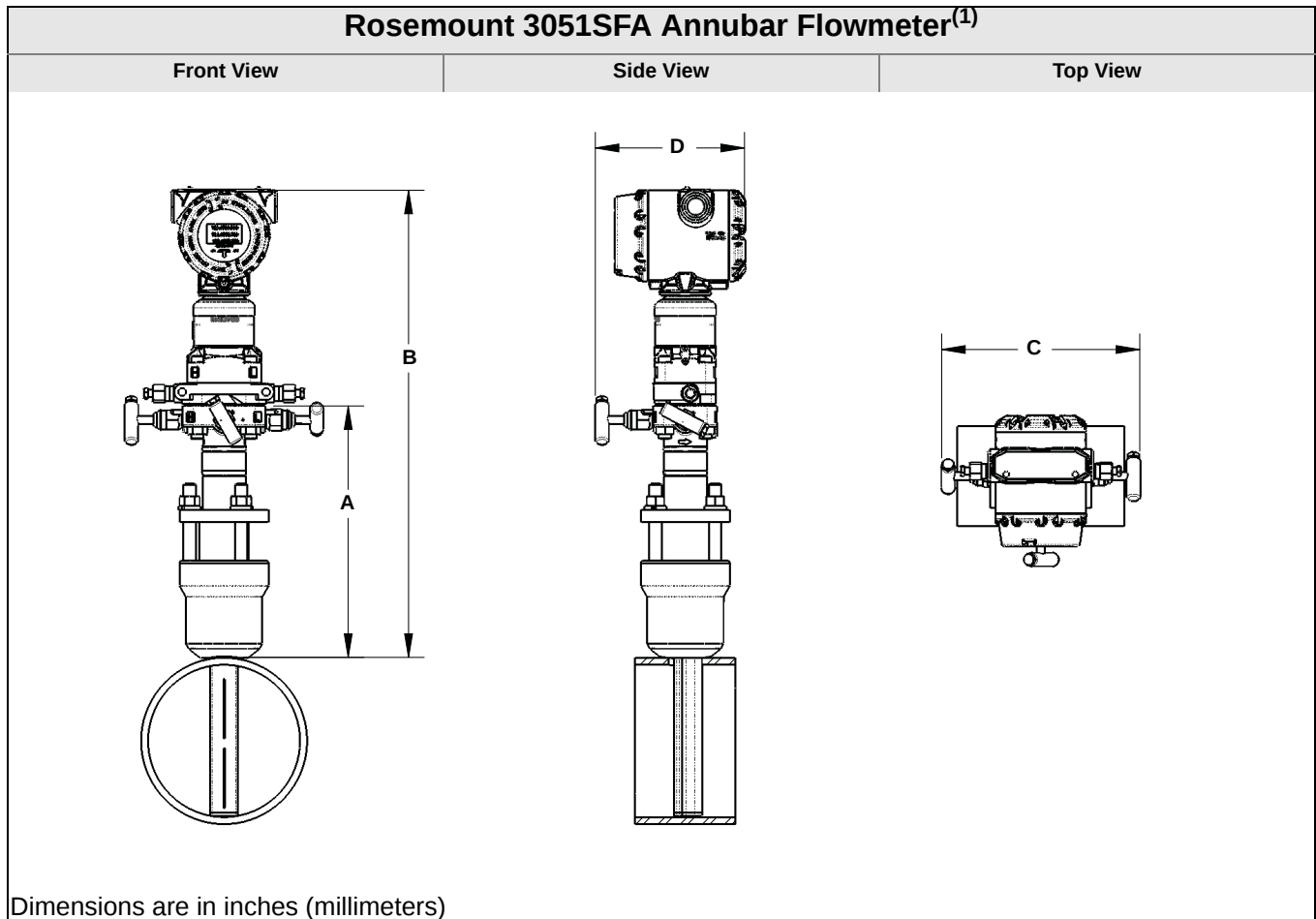


Figure B-7. Remote Display
Mounting Configurations (B4
Bracket)



Rosemount 3051S

Figure B-8. Rosemount
3051SFA Annubar Flowmeter



(1) The Pak-Lok Annubar model is available up to 600# ANSI (1440 psig at 100 °F (99 bar at 38 °C)).

Table 1. 3051CFA Annubar Flowmeter Dimensional Data

Sensor Size	A (Max)	B (Max)	C (Max)	D (Max)
1	7.50 (190.5)	16.03 (407.2)	9.00 (228.6)	6.90 (175.3)
2	9.25 (235.0)	17.78 (451.6)	9.00 (228.6)	6.90 (175.3)
3	12.00 (304.8)	20.53 (521.5)	9.00 (228.6)	6.90 (175.3)
Dimensions are in inches (millimeters)				

Figure B-9. Rosemount
3051SFC Compact Orifice
Flowmeter

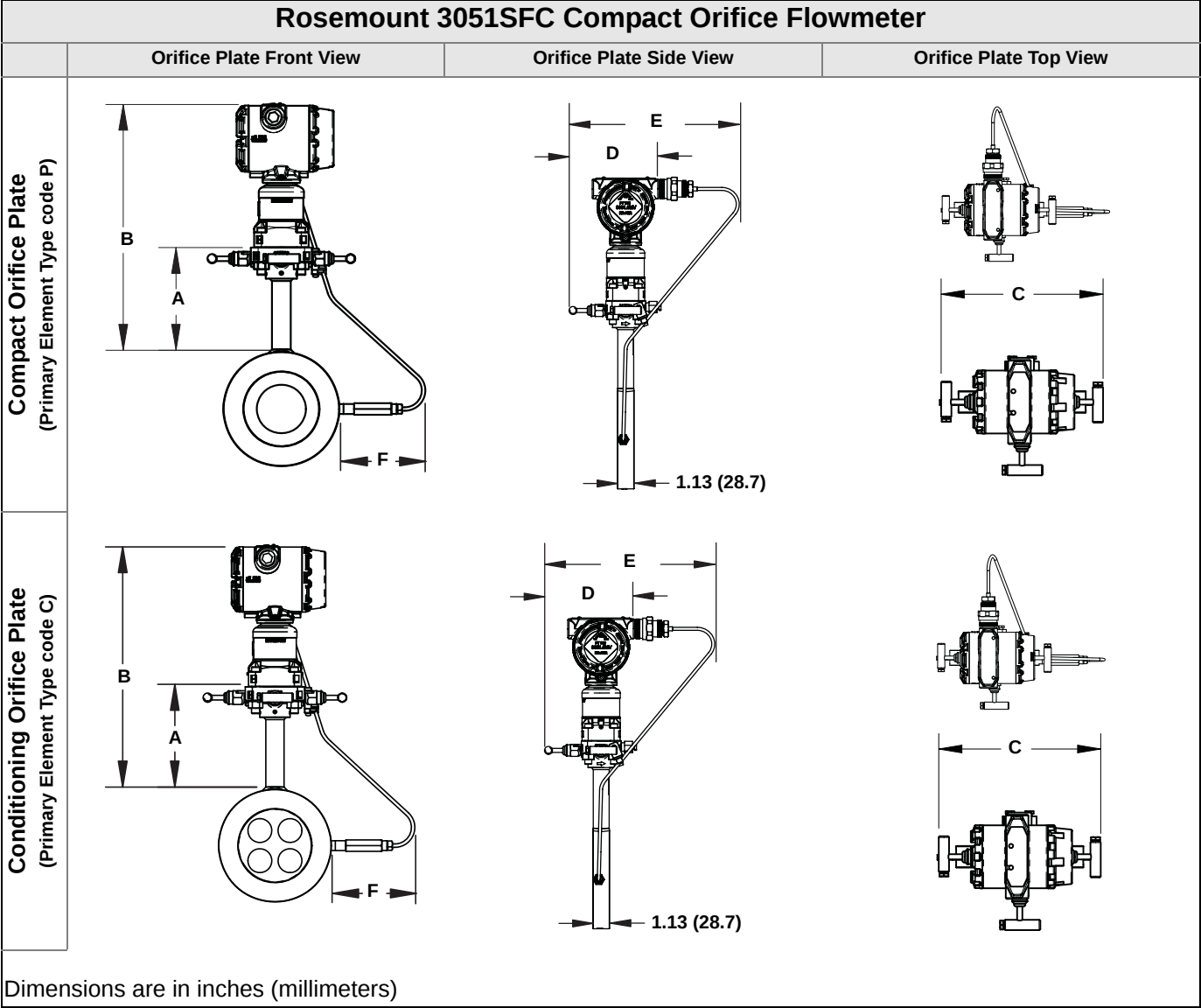


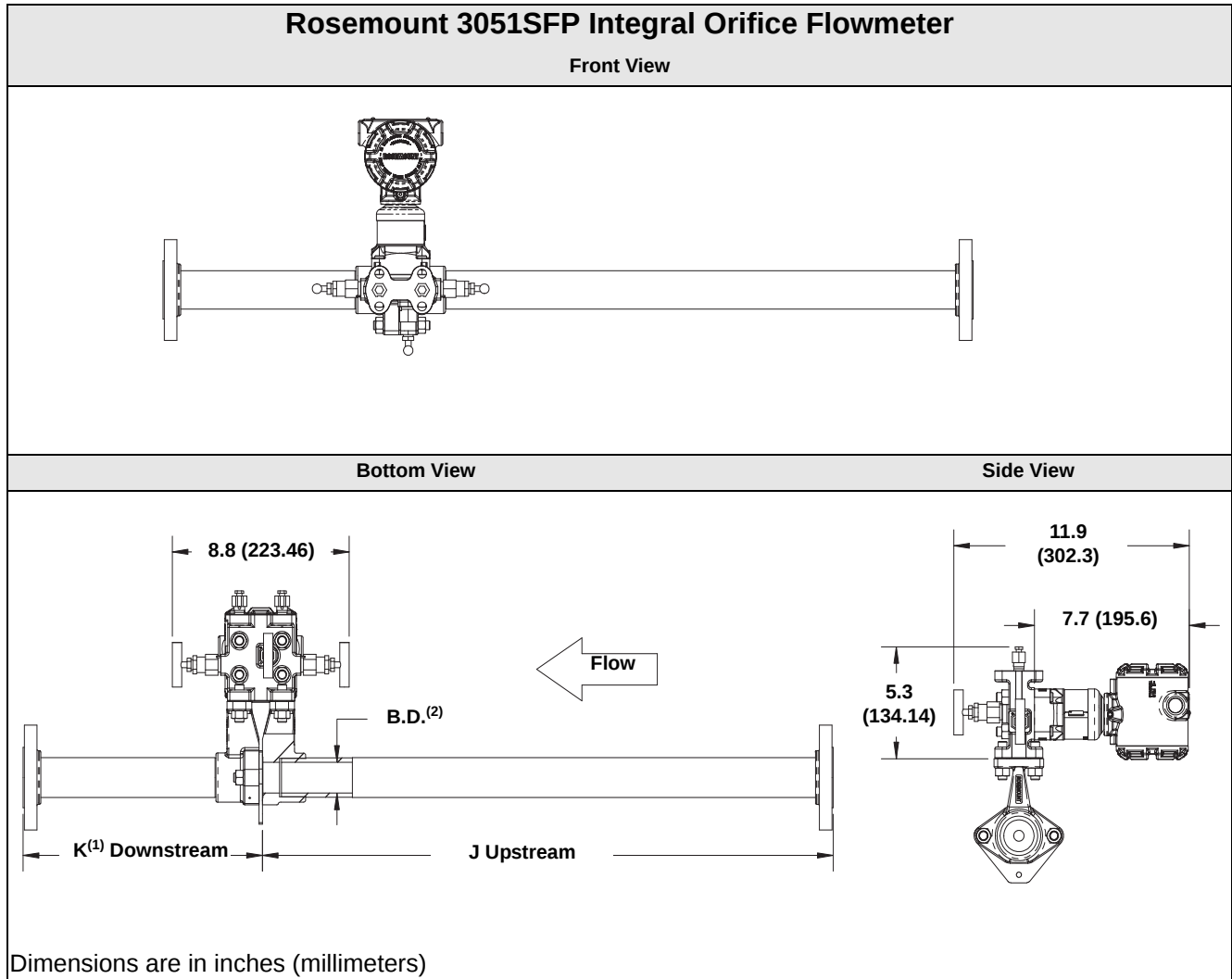
Table 2. Dimensional Drawings⁽¹⁾

Primary ⁽¹⁾ Element Type	A	B	Transmitter Height	C	D	E	F
Type P and C	5.62 (143)	Transmitter Height + A	7.70 (196)	7.75 (197) - closed 8.25 (210) - open	6.00 (152) - closed 6.25 (159) - open	10.2 (257.8) - closed 10.4 (264.2) - open	Max of 6.7 (71)

(1) Measurement in inches (millimeters).

Rosemount 3051S

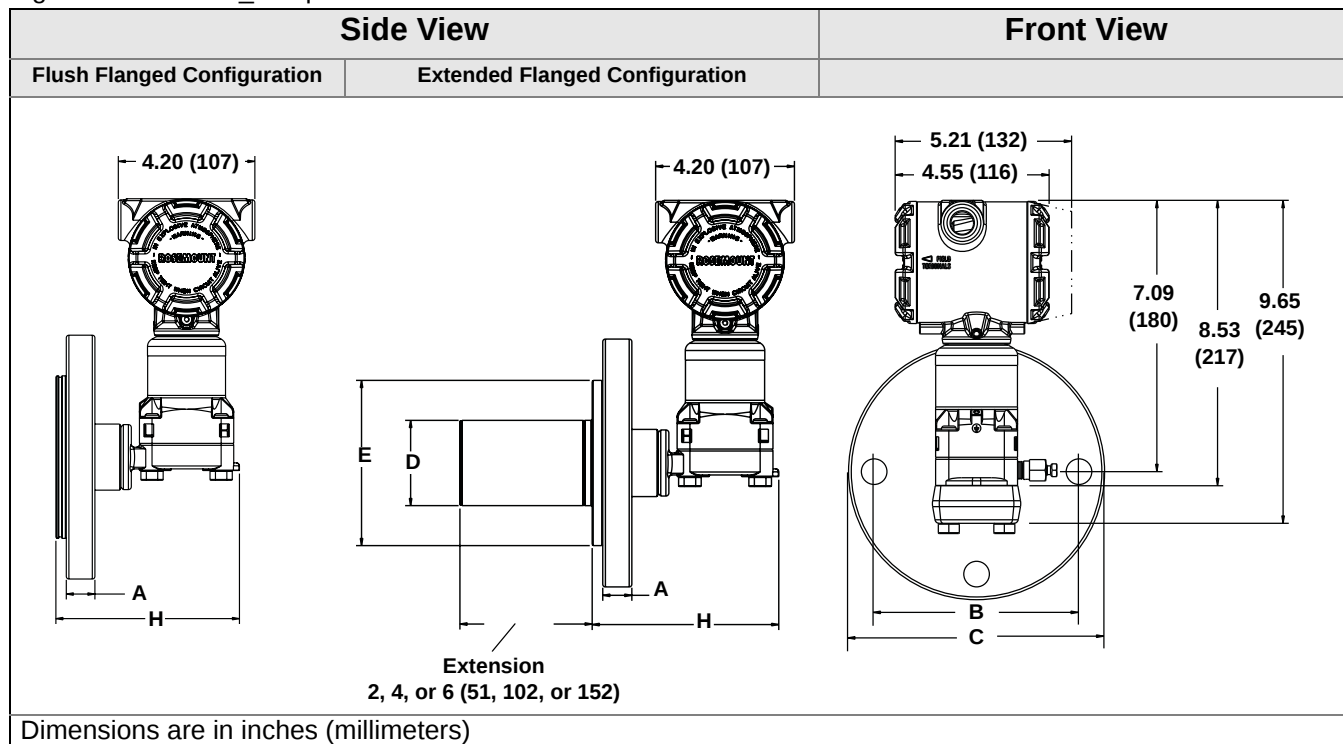
Figure B-10. Rosemount
3051SFP Integral Orifice
Flowmeter



Dimension	Line Size		
	1/2-in. (15 mm)	1-in. (25 mm)	1 1/2-in. (40 mm)
J (Beveled/Threaded pipe ends)	12.54 (318.4)	20.24 (514.0)	28.44 (722.4)
J (RF slip-on, RTJ slip-on, RF-DIN slip on)	12.62 (320.4)	20.32 (516.0)	28.52 (724.4)
J (RF 150#, weld neck)	14.37 (364.9)	22.37 (568.1)	30.82 (782.9)
J (RF 300#, weld neck)	14.56 (369.8)	22.63 (574.7)	31.06 (789.0)
J (RF 600#, weld neck)	14.81 (376.0)	22.88 (581.0)	31.38 (797.1)
K (Beveled/Threaded pipe ends)	5.74 (145.7)	8.75 (222.2)	11.91 (302.6)
K (RF slip-on, RTJ slip-on, RF-DIN slip on) ⁽¹⁾	5.82 (147.8)	8.83 (224.2)	11.99 (304.6)
K (RF 150#, weld neck)	7.57 (192.3)	10.88 (276.3)	14.29 (363.1)
K (RF 300#, weld neck)	7.76 (197.1)	11.14 (282.9)	14.53 (369.2)

(1) Downstream length shown here includes plate thickness of 0.162-in. (4.11 mm).

Figure B-11. 3051S_L Liquid



Level Transmitter

Class	Pipe Size	Flange Thickness A	Bolt Circle Diameter B	Outside Diameter C	No. of Bolts	Bolt Hole Diameter	Extension Diameter ⁽¹⁾ D	E	H
ASME B16.5 (ANSI) 150	2 (51)	0.69 (18)	4.75 (121)	6.0 (152)	4	0.75 (19)	N/A	3.6 (92)	5.65 (143)
	3 (76)	0.88 (22)	6.0 (152)	7.5 (191)	4	0.75 (19)	2.58 (66)	5.0 (127)	5.65 (143)
	4 (102)	0.88 (22)	7.5 (191)	9.0 (229)	8	0.75 (19)	3.5 (89)	6.2 (158)	5.65 (143)
ASME B16.5 (ANSI) 300	2 (51)	0.82 (21)	5.0 (127)	6.5 (165)	8	0.75 (19)	N/A	3.6 (92)	5.65 (143)
	3 (76)	1.06 (27)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)	5.65 (143)
	4 (102)	1.19 (30)	7.88 (200)	10.0 (254)	8	0.88 (22)	3.5 (89)	6.2 (158)	5.65 (143)
ASME B16.5 (ANSI) 600	2 (51)	1.00 (25)	5.0 (127)	6.5 (165)	8	0.75 (19)	N/A	3.6 (92)	7.65 (194)
	3 (76)	1.25 (32)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)	7.65 (194)
DIN 2501 PN 10–40	DN 50	20 mm	125 mm	165 mm	4	18 mm	N/A	4.0 (102)	5.65 (143)
DIN 2501 PN 25/40	DN 80	24 mm	160 mm	200 mm	8	18 mm	66 mm	5.4 (138)	5.65 (143)
	DN 100	24 mm	190 mm	235 mm	8	22 mm	89 mm	6.2 (158)	5.65 (143)
DIN 2501 PN 10/16	DN 100	20 mm	180 mm	220 mm	8	18 mm	89 mm	6.2 (158)	5.65 (143)

(1) Tolerances are 0.040 (1.02), –0.020 (0.51).

ACCESSORIES

Rosemount Engineering Assistant (EA) Software Packages

The Rosemount Engineering Assistant software supports flow configuration for the 3051S MultiVariable and 3051S FOUNDATION fieldbus. 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, 800MHz personal computer or above
- 512 MB RAM
- 350 MB of available hard disk space
- Microsoft® Windows™ 2000 or XP Professional

Engineering Assistant Software Packages

Code	Product Description
EA	Engineering Assistant Software Program
Code	Software Media
2	EA Rev. 5 (Compatible with 3095, 3051S FOUNDATION fieldbus, and 333)
3	EA Rev. 6 (Compatible with 3051SMV only)
Code	Language
E	English
Code	Modem and Connecting Cables
0	None
H	Serial Port HART Modem and Cables
B	USB Port HART Modem and Cables
C	FOUNDATION fieldbus PCM-CIA Interface Card and Cables
Code	License
N1	Single PC license
N2	Site license
Typical Model Number: EA 2 E 0 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
FOUNDATION fieldbus PCM-CIA Interface Card and Cables Only	03095-5108-0001
Long-life Power Module for Wireless option	00753-9220-0001

⁽¹⁾ Supported by Snap-On EA with AMS Device Manager version 6.2 or higher.

ORDERING INFORMATION

Table B-1. 3051S Series Coplanar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model	Transmitter Type					
3051S	Scalable Pressure Transmitter					
Performance Class						
Standard					Standard	
1	Ultra: 0.025 percent span accuracy, 200:1 rangedown, 10-yr stability, 12-yr limited warranty				★	
3 ⁽¹⁾	Ultra for Flow: 0.04 percent reading accuracy, 200:1 turndown, 10-yr stability, 12-yr ltd warranty				★	
2	Classic: 0.055 percent span accuracy, 100:1 rangedown, 5-yr stability				★	
Connection Type						
Standard					Standard	
C	Coplanar				★	
Measurement Type ⁽²⁾						
Standard					Standard	
D	Differential				★	
G	Gage				★	
Expanded						
A	Absolute					
Pressure Range						
	Differential	Gage	Absolute			
Standard					Standard	
1A	-25 to 25 inH ₂ O (-62,2 to 62,2 mbar)	-25 to 25 inH ₂ O (-62,2 to 62,2 mbar)	0 to 30 psia (0 to 2,06 bar)		★	
2A	-250 to 250 inH ₂ O (-623 to 623 mbar)	-250 to 250 inH ₂ O (-623 to 623 mbar)	0 to 150 psia (0 to 10,34 bar)		★	
3A	-1000 to 1000 inH ₂ O (-2,5 to 2,5 bar)	-393 to 1000 inH ₂ O (-0,98 to 2,5 bar)	0 to 800 psia (0 to 55,2 bar)		★	
4A	-300 to 300 psi (-20,7 to 20,7 bar)	-14.2 to 300 psig (-0,98 to 21 bar)	0 to 4000 psia (0 to 275,8 bar)		★	
5A	-2000 to 2000 psi (-137,9 to 137,9 bar)	-14.2 to 2000 psig (-0,98 to 137,9 bar)	N/A		★	
Expanded						
0A ⁽³⁾	-3 to 3 inH ₂ O (-7,47 to 7,47 mbar)	N/A	0 to 5 psia (0 to 0,34 bar)			
Isolating Diaphragm						
Standard					Standard	
2 ⁽⁴⁾	316L SST				★	
3 ⁽⁴⁾	Alloy C-276				★	
Expanded						
4	Alloy 400					
5 ⁽⁵⁾	Tantalum					
6	Gold-Plated Alloy 400 (includes Graphite-Filled PTFE o-ring)					
7	Gold-plated 316L SST					
Process Connection		Size	Material Type ⁽⁶⁾			
			Flange Material	Drain Vent	Bolting	
Standard						Standard
000	None					★
A11 ⁽⁷⁾	Assemble to Rosemount 305 Integral Manifold					★
A12 ⁽⁷⁾	Assemble to Rosemount 304 or AMF Manifold and SST traditional flange					★
B11 ⁽⁷⁾⁽⁸⁾⁽⁹⁾	Assemble to one Rosemount 1199 Diaphragm Seal					★
B12 ⁽⁷⁾⁽⁸⁾⁽⁹⁾	Assemble to two Rosemount 1199 Diaphragm Seals					★
C11 ⁽⁷⁾	Assemble to Rosemount 405 Primary Element					★
D11 ⁽⁷⁾	Assemble to Rosemount 1195 integral orifice and Rosemount 305 Integral Manifold					★
EA2 ⁽⁷⁾	Assemble to Rosemount Annubar [®] Primary Element with Coplanar flange		SST	316 SST		★

Rosemount 3051S

Table B-1. 3051S Series Coplanar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

EA3 ⁽⁷⁾	Assemble to Rosemount Annubar Primary Element with Coplanar flange		Cast C-276	Alloy C-276		★
EA5 ⁽⁷⁾	Assemble to Rosemount Annubar Primary Element with Coplanar flange		SST	Alloy C-276		★
E11	Coplanar flange	1/4-18 NPT	CS	316 SST		★
E12	Coplanar flange	1/4-18 NPT	SST	316 SST		★
E13 ⁽⁴⁾	Coplanar flange	1/4-18 NPT	Cast C-276	Alloy C-276		★
E14	Coplanar flange	1/4-18 NPT	Cast Alloy 400	Alloy 400/K-500		★
E15 ⁽⁴⁾	Coplanar flange	1/4-18 NPT	SST	Alloy C-276		★
E16 ⁽⁴⁾	Coplanar flange	1/4-18 NPT	CS	Alloy C-276		★
E21	Coplanar flange	RC 1/4	CS	316 SST		★
E22	Coplanar flange	RC 1/4	SST	316 SST		★
E23 ⁽⁴⁾	Coplanar flange	RC 1/4	Cast C-276	Alloy C-276		★
E24	Coplanar flange	RC 1/4	Cast Alloy 400	Alloy 400/K-500		★
E25 ⁽⁴⁾	Coplanar flange	RC 1/4	SST	Alloy C-276		★
E26 ⁽⁴⁾	Coplanar flange	RC 1/4	CS	Alloy C-276		★
F12	Traditional flange	1/4-18 NPT	SST	316 SST		★
F13 ⁽⁴⁾	Traditional flange	1/4-18 NPT	Cast C-276	Alloy C-276		★
F14	Traditional flange	1/4-18 NPT	Cast Alloy 400	Alloy 400/K-500		★
F15 ⁽⁴⁾	Traditional flange	1/4-18 NPT	SST	Alloy C-276		★
F22	Traditional flange	RC 1/4	SST	316 SST		★
F23 ⁽⁴⁾	Traditional flange	RC 1/4	Cast C-276	Alloy C-276		★
F24	Traditional flange	RC 1/4	Cast Alloy 400	Alloy 400/K-500		★
F25 ⁽⁴⁾	Traditional flange	RC 1/4	SST	Alloy C-276		★
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	316 SST		★
G12	Vertical mount level flange	2-in. ANSI class 300	SST	316 SST		★
G21	Vertical mount level flange	3-in. ANSI class 150	SST	316 SST		★
G22	Vertical mount level flange	3-in. ANSI class 300	SST	316 SST		★
G31	Vertical mount level flange	DIN- DN 50 PN 40	SST	316 SST		★
G41	Vertical mount level flange	DIN- DN 80 PN 40	SST	316 SST		★
Expanded						
F32	Bottom vent traditional flange	1/4-18 NPT	SST	316 SST		
F42	Bottom vent traditional flange	RC 1/4	SST	316 SST		
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	
Transmitter Output						
Standard						Standard
A	4-20 mA with digital signal based on HART® protocol					★
F ⁽¹⁰⁾	FOUNDATION™ fieldbus protocol					★
X ⁽¹¹⁾	Wireless (Requires wireless options and wireless PlantWeb housing)					★
Housing Style			Material⁽⁶⁾	Conduit Entry Size		
Standard						Standard
00	None (SuperModule spare part, order output code A)					★
1A	PlantWeb housing		Aluminum	1/2-14 NPT		★
1B	PlantWeb housing		Aluminum	M20 x 1.5		★
1J	PlantWeb housing		SST	1/2-14 NPT		★
1K	PlantWeb housing		SST	M20 x 1.5		★
5A	Wireless PlantWeb housing		Aluminum	1/2-14 NPT		★
5J	Wireless PlantWeb housing		SST	1/2-14 NPT		★
2A	Junction Box housing		Aluminum	1/2-14 NPT		★
2B	Junction Box housing		Aluminum	M20 x 1.5		★
2J	Junction Box housing		SST	1/2-14 NPT		★
2E	Junction Box Housing with output for remote display and interface		Aluminum	1/2-14 NPT		★
2F	Junction Box Housing with output for remote display and interface		Aluminum	M20 x 1.5		★
2M	Junction Box Housing with output for remote display and interface		SST	1/2-14 NPT		★
7J ⁽¹²⁾	Quick Connect (A size Mini, 4-pin male termination)		SST			★

Table B-1. 3051S Series Coplanar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Expanded				
1C	PlantWeb housing	Aluminum	G ^{1/2}	
1L	PlantWeb housing	SST	G ^{1/2}	
2C	Junction Box housing	Aluminum	G ^{1/2}	
2G	Junction Box Housing with output for remote display and interface	Aluminum	G ^{1/2}	

Wireless Options (Requires option code X and wireless PlantWeb housing)

Update Rate				
Standard				Standard
WA	User Configurable Update Rate			★
Operating Frequency and Protocol				
Standard				Standard
3	2.4 GHz DSSS, WirelessHART™			★
Omnidirectional Wireless Antenna				
Standard				Standard
WK	Long Range, Integral Antenna			★
WM	Extended Range, Integral Antenna			★
SmartPower™				
Standard				Standard
1 ⁽¹³⁾	Power Module Adapter, Intrinsically Safe (Power Module separate)			★

Other Options (Include with selected model number)

PlantWeb Control Functionality				
Standard				Standard
A01 ⁽¹⁴⁾	FOUNDATION™ fieldbus Advanced Control Function Block Suite			★
PlantWeb Diagnostic Functionality				
Standard				Standard
D01 ⁽¹⁴⁾	FOUNDATION™ fieldbus Diagnostics Suite			★
DA2 ⁽¹⁴⁾⁽¹⁵⁾	Advanced HART® Diagnostics Suite			★
PlantWeb Enhanced Measurement Functionality				
Standard				Standard
H01 ⁽¹⁴⁾⁽¹⁶⁾	FOUNDATION™ fieldbus Fully Compensated Mass Flow Block			★
Mounting Bracket ⁽¹⁷⁾				
Standard				Standard
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				
Standard				Standard
C1 ⁽¹⁸⁾	Custom software configuration (Requires Configuration Data Sheet)			★
C2	Custom flow configuration (Requires H01 and Configuration Data Sheet)			★
Gage Pressure Calibration				
Standard				Standard
C3	Gage pressure calibration on Rosemount 3051S_CA4 only			★
Alarm Limit				
Standard				Standard
C4 ⁽¹⁴⁾⁽¹⁸⁾	NAMUR alarm and saturation levels, high alarm			★
C5 ⁽¹⁴⁾⁽¹⁸⁾	NAMUR alarm and saturation levels, low alarm			★
C6 ⁽¹⁴⁾⁽¹⁸⁾	Custom alarm and saturation signal levels, high alarm (Requires C1 and Configuration Data Sheet)			★
C7 ⁽¹⁴⁾⁽¹⁸⁾	Custom alarm and saturation signal levels, low alarm (Requires C1 and Configuration Data Sheet)			★
C8 ⁽¹⁴⁾⁽¹⁸⁾	Low alarm (standard Rosemount alarm and saturation levels)			★

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Table B-1. 3051S Series Coplanar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Hardware Adjustments		
Standard		Standard
D1 ⁽¹⁴⁾⁽¹⁸⁾⁽¹⁹⁾	Hardware adjustments (zero, span, alarm, security)	★
Process Adapters		
Standard		Standard
D2 ⁽¹⁷⁾	1/2-14 NPT process adapters	★
Expanded		
D9 ⁽¹⁷⁾	RC 1/2 SST process adapters	
Custody Transfer		
Standard		Standard
D3 ⁽²⁰⁾	Measurement Canada Accuracy Approval	★
External Ground Screw Assembly		
Standard		Standard
D4	External ground screw assembly	★
Drain/Vent Valve		
Standard		Standard
D5 ⁽¹⁷⁾	Delete transmitter drain/vent valves (install plugs)	★
Expanded		
D7 ⁽¹⁷⁾	Coplanar flange without drain/vent ports	
Conduit Plug		
Standard		Standard
DO ⁽²¹⁾	316 SST Conduit Plug	★
Product Certifications⁽²²⁾		
Standard		Standard
E1	ATEX Flameproof	★
I1	ATEX Intrinsic Safety	★
IA	ATEX FISCO Intrinsic Safety (FOUNDATION™ fieldbus protocol only)	★
N1	ATEX Type n	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
ND	ATEX Dust	★
E4	TIIS Flameproof	★
I4 ⁽²³⁾	TIIS Intrinsic Safety	★
E5	FM Explosion-proof, Dust Ignition-proof	★
I5	FM Intrinsically Safe, Division 2	★
IE	FM FISCO Intrinsically Safe (FOUNDATION™ fieldbus protocol only)	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
E6 ⁽²⁴⁾	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
I6	CSA Intrinsically Safe	★
IF	CSA FISCO Intrinsically Safe (FOUNDATION™ fieldbus protocol only)	★
K6 ⁽²⁴⁾	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
E7	IECEX Flameproof, Dust Ignition-proof	★
I7	IECEX Intrinsic Safety	★
IG	IECEX FISCO Intrinsic Safety (FOUNDATION™ fieldbus protocol only)	★
N7	IECEX Type n	★
K7	IECEX Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n	★
E2	INMETRO Flameproof	★
I2	INMETRO Intrinsic Safety	★
K2	INMETRO Flameproof, Intrinsic Safety	★
E3	China Flameproof	★
I3	China Intrinsic Safety	★
KA ⁽²⁴⁾	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB ⁽²⁴⁾	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD ⁽²⁴⁾	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe	★
Sensor Fill Fluid		
Standard		Standard
L1 ⁽²⁵⁾	Inert sensor fill fluid	★

Table B-1. 3051S Series Coplanar Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

O-Ring		
Standard		Standard
L2	Graphite-filled PTFE o-ring	★
Bolting Material		
Standard		Standard
L4 ⁽¹⁷⁾	Austenitic 316 SST bolts	★
L5 ⁽⁴⁾⁽¹⁷⁾	ASTM A 193, Grade B7M bolts	★
L6 ⁽¹⁷⁾	Alloy K-500 bolts	★
L7 ⁽⁴⁾⁽¹⁷⁾	ASTM A453, Class D, Grade 660 bolts	★
L8 ⁽¹⁷⁾	ASTM A193, Class 2, Grade B8M bolts	★
Display Type⁽²⁶⁾		
Standard		Standard
M5	PlantWeb LCD Display	★
M7 ⁽¹⁴⁾⁽²⁷⁾⁽²⁸⁾	Remote mount LCD display and interface, PlantWeb housing, no cable, SST bracket	★
M8 ⁽¹⁴⁾⁽²⁷⁾	Remote mount LCD display and interface, PlantWeb housing, 50 ft. (15 m) cable, SST bracket	★
M9 ⁽¹⁴⁾⁽²⁷⁾	Remote mount LCD display and interface, PlantWeb housing, 100 ft. (31 m) cable, SST bracket	★
Hydrostatic Testing		
Expanded		
P1 ⁽²⁹⁾	Hydrostatic testing with certificate	
Special Cleaning		
Expanded		
P2 ⁽¹⁷⁾	Cleaning for special services	
P3 ⁽¹⁷⁾	Cleaning for less than 1PPM chlorine/fluorine	
Bolting Material		
Standard		Standard
P9	4500 psig (310 bar) static pressure limit (Rosemount 3051S_CD only)	★
P0 ⁽³⁰⁾	6092 psig (420 bar) static pressure limit (Rosemount 3051S2CD only)	★
Calibration Data Certification		
Standard		Standard
Q4	Calibration certificate	★
QP	Calibration certificate and tamper evident seal	★
Material Traceability Certification		
Standard		Standard
Q8	Material traceability certification per EN 10204 3.1.B	★
Quality Certification for Safety		
Standard		Standard
QS ⁽¹⁴⁾⁽¹⁸⁾	Prior-use certificate of FMEDA Data	★
QT ⁽³¹⁾	Safety-certified to IEC 61508 with certificate of FMEDA data	★
Terminal Blocks		
Standard		Standard
T1 ⁽³²⁾	Transient terminal block	★
Drinking Water Approval		
Standard		Standard
DW ⁽³³⁾	NSF Drinking Water Approval	★
Surface Finish Certification		
Standard		Standard
Q16	Surface finish certification for sanitary remote seals	★
Toolkit Total System Performance Reports		
Standard		Standard
QZ	Remote Seal System Performance Calculation Report	★
Conduit Electrical Connector		
Standard		Standard
GE ⁽³⁴⁾	M12, 4-pin, Male Connector (eurofast [®])	★
GM ⁽³⁴⁾	A size Mini, 4-pin, Male Connector (minifast [®])	★
Typical Model Number: 3051S1CD 2A 2 E12 A 1A DA1 B4 M5		

- (1) This option is only available with range codes 2A and 3A, 316L SST or Alloy C-276 isolating diaphragm and silicone fill fluid.
- (2) Performance Class code 3 is available with Measurement Type code D only.
- (3) 3051S_CD0 is only available with traditional flange, 316L SST diaphragm material, and Bolting option L4.
- (4) 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.
- (5) Tantalum diaphragm material is only available for ranges 2A - 5A, differential and gage.
- (6) 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.
- (7) "Assemble to" items are specified separately and require a completed model number. Process connection option codes B12, C11, D11, EA2, EA3, and EA5 are only available on differential Measurement Type, code D.
- (8) Consult an Emerson Process Management representative for performance specifications.
- (9) Not available with performance class code 3.
- (10) Requires PlantWeb housing.
- (11) Available approvals are FM Intrinsically Safe, Division 2 (option code I5), CSA Intrinsically Safe (option code I6), ATEX Intrinsic Safety (option code I1), and IECEx Intrinsic Safety (option code I7).
- (12) Available with output code A only. Available approvals are FM Intrinsically Safe, Division 2 (option code I5), ATEX Intrinsic Safety (option code I1), or IECEx Intrinsic Safety (option code I7). Contact an Emerson Process Management representative for additional information.
- (13) Long-Life Power Module must be shipped separately, order Part #00753-9220-0001.
- (14) Not available with output code X.
- (15) Requires PlantWeb housing and output code A. Includes Hardware Adjustments as standard.
- (16) Requires Rosemount Engineering Assistant to configure.
- (17) Not available with process connection option code A11.
- (18) Not available with output code F.
- (19) Not available with housing style codes 00, 2E, 2F, 2G, 2M, 5A, 5J, or 7J.
- (20) Requires PlantWeb housing and Hardware Adjustments option code D1. Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative for additional information.
- (21) Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
- (22) Valid when SuperModule Platform and housing have equivalent approvals.
- (23) Only available with output code X.
- (24) Not available with M20 or G ½ conduit entry size.
- (25) Only available on differential and gage measurement types. Silicone fill fluid is standard.
- (26) Not available with Housing code 7J.
- (27) Not available with output code F, option code DA1, or option code QT.
- (28) See the 3051S Reference Manual (document number 00809-0100-4801) for cable requirements. Contact an Emerson Process Management representative for additional information.
- (29) P1 is not available with 3051S_CA0.
- (30) Requires 316L SST, Alloy C-276, or Gold-plated 316L SST diaphragm material, assemble to Rosemount 305 integral manifold or DIN-compliant traditional flange process connection, and bolting option L8. Limited to Pressure Range (Differential), ranges 2A - 5A.
- (31) Not available with output code F or X. Not available with housing code 7J.
- (32) Not available with Housing code 00, 5A, 5J, or 7J.
- (33) Requires 316L SST diaphragm material, glass-filled PTFE O-ring (standard), and Process Connection code E12 or F12.
- (34) Not available with Housing code 00, 5A, 5J, or 7J. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Division 2 (option code I5) or FM FISCO Intrinsically Safe (option code IE), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

Table B-2. 3051S Series In-Line Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Model	Transmitter Type			
3051S	Scalable Pressure Transmitter			
Performance Class				
Standard			Standard	
1	Ultra: 0.025 percent span accuracy, 200:1 rangedown, 10-yr stability, 12-yr limited warranty		★	
2	Classic: 0.055 percent span accuracy, 100:1 rangedown, 5-yr stability		★	
Connection Type				
Standard			Standard	
T	In-Line		★	
Measurement Type				
Standard			Standard	
G	Gage		★	
A	Absolute		★	
Pressure Range				
	Gage	Absolute		
Standard			Standard	
1A	-14.7 to 30 psi (-1,0 to 2,1 bar)	0 to 30 psia (2,1 bar)	★	
2A	-14.7 to 150 psi (-1,0 to 10,3 bar)	0 to 150 psia (10,3 bar)	★	
3A	-14.7 to 800 psi (-1,0 to 55 bar)	0 to 800 psia (55 bar)	★	
4A	-14.7 to 4000 psi (-1,0 to 276 bar)	0 to 4000 psia (276 bar)	★	
5A	-14.7 to 10000 psi (-1,0 to 689 bar)	0 to 10000 psia (689 bar)	★	
Isolating Diaphragm				
Standard			Standard	
2 ⁽¹⁾	316L SST		★	
3 ⁽¹⁾	Alloy C-276		★	
Process Connection				
Standard			Standard	
A11 ⁽²⁾	Assemble to Rosemount 306 Integral Manifold		★	
B11 ⁽²⁾⁽³⁾	Assemble to one Rosemount 1199 Diaphragm Seal		★	
E11	1/2–14 NPT female		★	
G11	G1/2 A DIN 16288 male (Range 1-4 only)		★	
Expanded				
F11	Non-threaded instrument flange (I-flange) (Range 1-4 only)			
Transmitter Output				
Standard			Standard	
A	4–20 mA with digital signal based on HART® protocol		★	
F ⁽⁴⁾	FOUNDATION™ fieldbus protocol		★	
X ⁽⁵⁾	Wireless (Requires wireless options and wireless PlantWeb housing)		★	
Housing Style		Material ⁽⁶⁾	Conduit Entry Size	
Standard				Standard
00	None (SuperModule spare part, order output code A)			★
1A	PlantWeb housing	Aluminum	1/2–14 NPT	★
1B	PlantWeb housing	Aluminum	M20 x 1.5	★
1J	PlantWeb housing	SST	1/2–14 NPT	★
1K	PlantWeb housing	SST	M20 x 1.5	★
5A	Wireless PlantWeb housing	Aluminum	1/2–14 NPT	★
5J	Wireless PlantWeb housing	SST	1/2–14 NPT	★
2A	Junction Box housing	Aluminum	1/2–14 NPT	★
2B	Junction Box housing	Aluminum	M20 x 1.5	★
2J	Junction Box housing	SST	1/2–14 NPT	★
2E	Junction Box Housing with output for remote display and interface	Aluminum	1/2–14 NPT	★
2F	Junction Box Housing with output for remote display and interface	Aluminum	M20 x 1.5	★
2M	Junction Box Housing with output for remote display and interface	SST	1/2–14 NPT	★
7J ⁽⁷⁾	Quick Connect (A size Mini, 4-pin male termination)	SST		★

Rosemount 3051S

Table B-2. 3051S Series In-Line Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Expanded				
1C	PlantWeb housing	Aluminum	G ^{1/2}	
1L	PlantWeb housing	SST	G ^{1/2}	
2C	Junction Box housing	Aluminum	G ^{1/2}	
2G	Junction Box Housing with output for remote display and interface	Aluminum	G ^{1/2}	

Wireless Options (Requires option code X and wireless PlantWeb housing)

Update Rate				
Standard				Standard
WA	User Configurable Update Rate			★
Operating Frequency and Protocol				
Standard				Standard
3	2.4 GHz DSSS, WirelessHART™			★
Omnidirectional Wireless Antenna				
Standard				Standard
WK	Long Range, Integral Antenna			★
WM	Extended Range, Integral Antenna			★
SmartPower™				
Standard				Standard
1 ⁽⁸⁾	Power Module Adapter, Intrinsically Safe (Power Module separate)			★

Other Options (Include with selected model number)

PlantWeb Control Functionality				
Standard				Standard
A01 ⁽⁹⁾	FOUNDATION™ fieldbus Advanced Control Function Block Suite			★
PlantWeb Diagnostic Functionality				
Standard				Standard
D01 ⁽⁹⁾	FOUNDATION™ fieldbus Diagnostics Suite			★
DA2 ⁽⁹⁾⁽¹⁰⁾	Advanced HART® Diagnostics Suite			★
Mounting Bracket ⁽¹¹⁾				
Standard				Standard
B4	Bracket, all SST, 2-in. pipe and panel			★
Software Configuration				
Standard				Standard
C1 ⁽¹²⁾	Custom software configuration (Requires Configuration Data Sheet)			★
Alarm Limit				
Standard				Standard
C4 ⁽⁹⁾⁽¹²⁾	NAMUR alarm and saturation levels, high alarm			★
C5 ⁽⁹⁾⁽¹²⁾	NAMUR alarm and saturation levels, low alarm			★
C6 ⁽⁹⁾⁽¹²⁾	Custom alarm and saturation signal levels, high alarm (Requires C1 and Configuration Data Sheet)			★
C7 ⁽⁹⁾⁽¹²⁾	Custom alarm and saturation signal levels, low alarm (Requires C1 and Configuration Data Sheet)			★
C8 ⁽⁹⁾⁽¹²⁾	Low alarm (standard Rosemount alarm and saturation levels)			★
Hardware Adjustments				
Standard				Standard
D1 ⁽⁹⁾⁽¹²⁾⁽¹³⁾	Hardware adjustments (zero, span, alarm, security)			★
Custody Transfer				
Standard				Standard
D3 ⁽¹⁴⁾	Measurement Canada Accuracy Approval			★
External Ground Screw Assembly				
Standard				Standard
D4	External ground screw assembly			★
Conduit Plug				
Standard				Standard
DO ⁽¹⁵⁾	316 SST Conduit Plug			★
Product Certifications ⁽¹⁶⁾				
Standard				Standard
E1	ATEX Flameproof			★
I1	ATEX Intrinsic Safety			★
IA	ATEX FISCO Intrinsic Safety (FOUNDATION™ fieldbus protocol only)			★

Table B-2. 3051S Series In-Line Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

N1	ATEX Type n	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
ND	ATEX Dust	★
E4	TIIS Flameproof	★
I4 ⁽¹⁷⁾	TIIS Intrinsic Safety	★
E5	FM Explosion-proof, Dust Ignition-proof	★
I5	FM Intrinsically Safe, Division 2	★
IE	FM FISCO Intrinsically Safe (FOUNDATION™ fieldbus protocol only)	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
E6 ⁽¹⁸⁾	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
I6	CSA Intrinsically Safe	★
IF	CSA FISCO Intrinsically Safe (FOUNDATION™ fieldbus protocol only)	★
K6 ⁽¹⁸⁾	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
E7	IECEX Flameproof, Dust Ignition-proof	★
I7	IECEX Intrinsic Safety	★
IG	IECEX FISCO Intrinsic Safety (FOUNDATION™ fieldbus protocol only)	★
N7	IECEX Type n	★
K7	IECEX Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n	★
E2	INMETRO Flameproof	★
I2	INMETRO Intrinsic Safety	★
K2	INMETRO Flameproof, Intrinsic Safety	★
E3	China Flameproof	★
I3	China Intrinsic Safety	★
KA ⁽¹⁸⁾	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB ⁽¹⁸⁾	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD ⁽¹⁸⁾	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe	★
Sensor Fill Fluid		
Standard		Standard
L1 ⁽¹⁹⁾	Inert sensor fill fluid	★
Display Type⁽²⁰⁾		
Standard		Standard
M5	PlantWeb LCD Display	★
M7 ⁽⁹⁾⁽²¹⁾⁽²²⁾	Remote mount LCD display and interface, PlantWeb housing, no cable, SST bracket	★
M8 ⁽⁹⁾⁽²¹⁾	Remote mount LCD display and interface, PlantWeb housing, 50 ft. (15 m) cable, SST bracket	★
M9 ⁽⁹⁾⁽²¹⁾	Remote mount LCD display and interface, PlantWeb housing, 100 ft. (31 m) cable, SST bracket	★
Hydrostatic Testing		
Expanded		
P1	Hydrostatic testing with certificate	
Special Cleaning		
Expanded		
P2 ⁽¹¹⁾	Cleaning for special services	
P3 ⁽¹¹⁾	Cleaning for less than 1PPM chlorine/fluorine	
Calibration Data Certification		
Standard		Standard
Q4	Calibration certificate	★
QP	Calibration certificate and tamper evident seal	★
Material Traceability Certification		
Standard		Standard
Q8	Material traceability certification per EN 10204 3.1.B	★
Quality Certification for Safety		
Standard		Standard
QS ⁽⁹⁾⁽¹²⁾	Prior-use certificate of FMEDA Data	★
QT ⁽²³⁾	Safety-certified to IEC 61508 with certificate of FMEDA data	★
Terminal Blocks		
Standard		Standard
T1 ⁽²⁴⁾	Transient terminal block	★

Rosemount 3051S

Table B-2. 3051S Series In-Line Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Drinking Water Approval		
Standard		Standard
DW ⁽²⁵⁾	NSF Drinking Water Approval	★
Surface Finish Certification		
Standard		Standard
Q16	Surface finish certification for sanitary remote seals	★
Toolkit Total System Performance Reports		
Standard		Standard
QZ	Remote Seal System Performance Calculation Report	★
Conduit Electrical Connector		
Standard		Standard
GE ⁽²⁶⁾	M12, 4-pin, Male Connector (eurofast®)	★
GM ⁽²⁶⁾	A size Mini, 4-pin, Male Connector (minifast®)	★
Typical Model Number: 3051S1TG 2A 2 E11 A 1A DA1 B4 M5		

- (1) 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.
- (2) "Assemble to" items are specified separately and require a completed model number.
- (3) Consult an Emerson Process Management representative for performance specifications.
- (4) Requires PlantWeb housing.
- (5) Available approvals are FM Intrinsically Safe, Division 2 (option code I5), CSA Intrinsically Safe (option code I6), ATEX Intrinsic Safety (option code I1), and IECEx Intrinsic Safety (option code I7).
- (6) 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.
- (7) Available with output code A only. Available approvals are FM Intrinsically Safe, Division 2 (option code I5), ATEX Intrinsic Safety (option code I1), or IECEx Intrinsic Safety (option code I7). Contact an Emerson Process Management representative for additional information.
- (8) Long-Life Power Module must be shipped separately, order Part #00753-9220-0001.
- (9) Not available with output code X.
- (10) Requires PlantWeb housing and output code A. Includes Hardware Adjustments as standard.
- (11) Not available with process connection option code A11.
- (12) Not available with output code F.
- (13) Not available with housing style codes 00, 01, 2E, 2F, 2G, 2M, 5A, 5J, or 7J.
- (14) Requires PlantWeb housing and Hardware Adjustments option code D1. Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative for additional information.
- (15) Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
- (16) Valid when SuperModule Platform and housing have equivalent approvals.
- (17) Only available with output code X.
- (18) Not available with M20 or G ½ conduit entry size.
- (19) Silicone fill fluid is standard.
- (20) Not available with Housing code 7J.
- (21) Not available with output code F, option code DA1, or option code QT.
- (22) See the 3051S Reference Manual (document number 00809-0100-4801) for cable requirements. Contact an Emerson Process Management representative for additional information.
- (23) Not available with output code F or X. Not available with housing code 7J.
- (24) Not available with Housing code 00, 5A, 5J, or 7J.
- (25) Requires 316L SST diaphragm material and Process Connection code E11 or G11.
- (26) Not available with Housing code 00, 5A, 5J, or 7J. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Division 2 (option code I5) or FM FISCO Intrinsically Safe (option code IE), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

Table B-3. Rosemount 3051S Scalable Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Model	Transmitter Type			
Standard				Standard
3051S	Scalable Liquid Level Transmitter			★
Performance Class				
Standard				Standard
1	Ultra: 0.065% span accuracy, 100:1 rangedown, 12-year limited warranty			★
2	Classic: 0.065% span accuracy, 100:1 rangedown			★
Connection Type				
Standard				Standard
L	Level			★
Measurement Type				
Standard				Standard
D	Differential			★
G	Gage			★
A	Absolute			★
Pressure Range				
	Differential (LD)	Gage (LG)	Absolute (LA)	
Standard				Standard
2A	-250 to 250 inH ₂ O (-623 to 623 mbar)	-250 to 250 inH ₂ O (-623 to 623 mbar)	0 to 150 psia (10 bar)	★
3A	-1000 to 1000 inH ₂ O (-2,5 to 2,5 bar)	-393 to 1000 inH ₂ O (-0,98 to 2,5 bar)	0 to 800 psia (55 bar)	★
4A	-300 to 300 psi (-20,7 to 20,7 bar)	-14.2 to 300 psig (-0,98 to 21 bar)	0 to 4000 psia (276 bar)	★
5A	-2000 to 2000 psi (-137,9 to 137,9 bar)	-14.2 to 2000 psig (-0,98 to 137,9 bar)	N/A	★
Code	Output			
Standard				Standard
A	4-20 mA with digital signal based on HART® protocol			★
F ⁽²⁾	FOUNDATION™ fieldbus protocol			★
X ⁽³⁾	Wireless (Requires wireless options and wireless PlantWeb housing)			★
Code	Housing Style	Material ⁽⁴⁾	Conduit Entry	
Standard				Standard
00	None (SuperModule spare part, order output code A)			★
1A	PlantWeb housing	Aluminum	1/2–14 NPT	★
1B	PlantWeb housing	Aluminum	M20 x 1.5	★
1J	PlantWeb housing	SST	1/2–14 NPT	★
1K	PlantWeb housing	SST	M20 x 1.5	★
2A	Junction Box housing	Aluminum	1/2–14 NPT	★
2B	Junction Box housing	Aluminum	M20 x 1.5	★
2E	Junction Box housing with output for remote interface	Aluminum	1/2–14 NPT	★
2F	Junction Box housing with output for remote interface	Aluminum	M20 x 1.5	★
2J	Junction Box housing	SST	1/2–14 NPT	★
2M	Junction Box housing with output for remote interface	SST	1/2–14 NPT	★
5A	Wireless PlantWeb housing	Aluminum	1/2–14 NPT	★
5J	Wireless PlantWeb housing	SST	1/2–14 NPT	★
7J ⁽⁶⁾	Quick Connect (A size Mini, 4-pin male termination)	SST		★

Rosemount 3051S

Table B-3. Rosemount 3051S Scalable Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Expanded				
1C	PlantWeb housing	Aluminum	G ^{1/2}	
1L	PlantWeb housing	SST	G ^{1/2}	
2C	Junction Box housing	Aluminum	G ^{1/2}	
2G	Junction Box housing with output for remote interface	Aluminum	G ^{1/2}	
Seal System Type				
Standard				Standard
1	Direct-mount seal system			★
High Pressure Side Extension (between transmitter flange and seal)				
Standard				Standard
0	Direct-Mount (No Extension)			★
Sensor Module Configuration (Low Side)				
Standard				Standard
1 ⁽¹⁾	Tuned-System, One Capillary Remote Seal (Requires 1199 model number, see Table 7 on page Pressure-27 of the DP Level PDS (00813-0100-4016) for seal information)			★
2	316L SST isolator / SST transmitter flange			★
3	Alloy C-276 isolator / SST transmitter flange			★
Capillary Length				
Standard				Standard
0	None			★
Seal Fill Fluid (High Side)		Temperature Limits (Ambient temperature of 70° F (21° C))		
Standard				Standard
A	Syltherm XLT	-102 to 293 °F (-75 to 145 °C)		★
C	Silicone 704	32 to 401 °F (0 to 205 °C)		★
D	Silicone 200	-49 to 401 °F (-45 to 205 °C)		★
H	Inert (Halocarbon)	-49 to 320 °F (-45 to 160 °C)		★
G	Glycerine and Water	5 to 203 °F (-15 to 95 °C)		★
N	Neobee M-20	5 to 401 °F (-15 to 205 °C)		★
P	Propylene Glycol and Water	5 to 203 F (-15 to 95 °C)		★
Process Connection Style ⁽²⁾				
Standard				Standard
EF	Extended Flanged Seal			★
FF	Flush Flanged Seal			★
Process Connection Size (High Side) ⁽³⁾				
	Flush Flanged Seal	Extended Flanged Seal		
Standard				Standard
G	2-in./DN 50	—		★
7	3-in.	3-in./DN 80, 2.58-in. diaphragm		★
J	DN 80	—		★
9	4-in./DN 100	4-in./DN 100, 3.5-in. diaphragm		★
Flange Rating (High Side)				
Standard				Standard
1	ANSI/ASME B16.5 Class 150			★
2	ANSI/ASME B16.5 Class 300			★
4	ANSI/ASME B16.5 Class 600			★
G	PN 40 per EN 1092-1			★
E	PN 10/16 per EN 1092-1, Available with DN 100 only			★
Isolator, Flange Material (High Side) ⁽⁴⁾				
	Flush Flanged Seal Isolator	Extended Flanged Seal Isolator and Wetted Parts	Flange Material ⁽⁵⁾⁽⁶⁾	
Standard				Standard
CA	316L SST	316L SST	CS	★

Table B-3. Rosemount 3051S Scalable Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

DA	316L SST	316L SST	SST	★
CB	Alloy C-276	Alloy C-276	CS	★
DB	Alloy C-276	Alloy C-276	SST	★
CC	Tantalum - seam welded ⁽⁷⁾	—	CS	★
DC	Tantalum - seam welded ⁽⁷⁾	—	SST	★
Lower Housing Material for FF, Extension Length for EF (High Side)⁽⁸⁾				
	Flush Flanged Seal	Extended Flanged Seal		
Standard				Standard
0	None	—		★
2	—	2-in. (50 mm)		★
4	—	4-in. (100 mm)		★
6	—	6-in. (150 mm)		★
A	316 SST	—		★
B	Alloy C-276	—		★
D	Carbon Steel	—		★
Flushing Connection Quantity and Size (Lower Housing, High Side)				
	Flush Flanged Seal	Extended Flanged Seal		
Standard				Standard
0	None	None		★
1	1 (1/4 - 18 NPT)	—		★
3	2 (1/4 - 18 NPT)	—		★
7	1 (1/2 - 14 NPT)	—		★
9	2 (1/2 - 14 NPT)	—		★

Wireless Options (Requires option code X and wireless PlantWeb housing)

Wireless Update Rate		
Standard		Standard
WA	User Configurable Update Rate	★
Operating Frequency and Protocol		
Standard		Standard
3	2.4 GHz DSSS, WirelessHART™	★
Omnidirectional Wireless Antenna		
Standard		Standard
WK	Long Range, Integral Antenna	★
WM	Extended Range, Integral Antenna	★
SmartPower™		
Standard		Standard
1 ⁽⁹⁾	Power Module Adapter, Intrinsically Safe (Power Module separate)	★

Options (Include with selected model number)

Diaphragm Thickness		
Expanded		
SC	0.006-in. (150 μm) available with 316L SST and Alloy C-276	
Flushing Plug, Vent/Drain Valve		
Standard		Standard
SD	Alloy C-276 plug(s) for flushing connection(s)	★
SG	316 SST plug(s) for flushing connection(s)	★
SH	316 SST vent/drain for flushing connection(s)	★

Rosemount 3051S

Table B-3. Rosemount 3051S Scalable Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Gasket Material		
Standard		Standard
SJ	PTFE gasket (for use with flushing connection ring)	★
Expanded		
SN	Grafoil® gasket (for use with flushing connection ring)	
Code Conformance		
Standard		Standard
ST	Wetted Materials Compliance to NACE MRO175/ISO 15156, MRO103	★
PlantWeb Control Functionality		
Standard		Standard
A01 ⁽¹²⁾	FOUNDATION™ fieldbus Advanced Control Function Block Suite	★
PlantWeb Diagnostic Functionality		
Standard		Standard
D01 ⁽¹²⁾	FOUNDATION™ fieldbus Diagnostics Suite	★
DA2 ⁽¹⁰⁾⁽¹²⁾	Advanced HART® Diagnostics Suite	★
Special Configuration		
Standard		Standard
C1 ⁽¹¹⁾	Custom software configuration (Requires Configuration Data Sheet)	★
Gage Pressure Calibration		
Standard		Standard
C3	Gage Pressure Calibration (3051SxLA4 only)	★
Alarm Limit		
Standard		Standard
C4 ⁽¹¹⁾⁽¹²⁾	NAMUR alarm and saturation levels, high alarm	★
C5 ⁽¹¹⁾⁽¹²⁾	NAMUR alarm and saturation levels, low alarm	★
C6 ⁽¹¹⁾⁽¹²⁾	Custom alarm and saturation signal levels, high alarm (Requires C1 and Configuration Data Sheet)	★
C7 ⁽¹¹⁾⁽¹²⁾	Custom alarm and saturation signal levels, low alarm (Requires C1 and Configuration Data Sheet)	★
C8 ⁽¹¹⁾⁽¹²⁾	Low alarm (standard Rosemount alarm and saturation levels)	★
Hardware Adjustments		
Standard		Standard
D1 ⁽¹¹⁾⁽¹²⁾⁽¹³⁾	Hardware adjustments (zero, span, alarm, security)	★
Process Adapters		
Standard		Standard
D2	1/2-14 NPT process adapters	★
Expanded		
D9	RC 1/2 SST process adapters	
Custody Transfer		
Standard		Standard
D3 ⁽¹⁴⁾	Measurement Canada Accuracy Approval	★
External Ground Screw Assembly		
Standard		Standard
D4	External ground screw assembly	★
Drain/Vent Valve		
Standard		Standard
D5	Delete transmitter drain/vent valves (install plugs)	★
Conduit Plug		
Standard		Standard
D0 ⁽¹⁵⁾	316 SST Conduit Plug	★
Product Certifications⁽¹⁶⁾		
Standard		Standard
E1	ATEX Flameproof	★

Table B-3. Rosemount 3051S Scalable Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

E2	INMETRO Flameproof	★
E3	China Flameproof	★
E4	TIIS Flameproof	★
E5	FM Explosion-proof, Dust Ignition-proof	★
E6 ⁽¹⁷⁾	CSA Explosion-proof, Dust Ignition-proof, Division 2	★
E7	IECEx Flameproof, Dust Ignition-proof	★
I1	ATEX Intrinsic Safety	★
I2	INMETRO Intrinsic Safety	★
I3 ⁽²⁰⁾	China Intrinsic Safety	★
I4 ⁽¹⁸⁾	TIIS Intrinsic Safety	★
I5	FM Intrinsically Safe, Division 2	★
I6	CSA Intrinsically Safe	★
I7	IECEx Intrinsic Safety	★
IA	ATEX FISCO Intrinsic Safety (FOUNDATION™ fieldbus protocol only)	★
IE	FM FISCO Intrinsically Safe (FOUNDATION™ fieldbus protocol only)	★
IF	CSA FISCO Intrinsically Safe (FOUNDATION™ fieldbus protocol only)	★
IG	IECEx FISCO Intrinsic Safety (FOUNDATION™ fieldbus protocol only)	★
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust	★
K2	INMETRO Flameproof, Intrinsic Safety	★
K5	FM Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K6 ⁽²⁴⁾	CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
K7	IECEx Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n	★
KA ⁽²⁴⁾	ATEX and CSA Flameproof, Intrinsically Safe, Division 2	★
KB ⁽²⁴⁾	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2	★
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2	★
KD ⁽²⁴⁾	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe	★
N1	ATEX Type n	★
N7	IECEx Type n	★
ND	ATEX Dust	★
Sensor Fill Fluid		
Standard		Standard
L1 ⁽¹⁹⁾	Inert sensor fill fluid	★
O-Ring		
Standard		Standard
L2	Graphite-filled PTFE o-ring	★
Bolting Material		
Standard		Standard
L4	Austenitic 316 SST bolts	★
L5 ⁽²⁰⁾	ASTM A193, Grade B7M bolts	★
L6	Alloy K-500 bolts	★
L7 ⁽²⁰⁾	ASTM A453, Class D, Grade 660 bolts	★
L8	ASTM A193, Class 2, Grade B8M bolts	★
Display Type⁽²¹⁾		
Standard		Standard
M5	PlantWeb LCD Display	★
M7 ⁽¹²⁾⁽²²⁾⁽²³⁾	Remote mount LCD display and interface, PlantWeb housing, no cable, SST bracket	★
M8 ⁽¹²⁾⁽²²⁾	Remote mount LCD display and interface, PlantWeb housing, 50 ft. (15 m) cable, SST bracket	★
M9 ⁽¹²⁾⁽²²⁾	Remote mount LCD display and interface, PlantWeb housing, 100 ft. (31 m) cable, SST bracket	★
Hydrostatic Testing		
Expanded		
P1	Hydrostatic testing with certificate	

Rosemount 3051S

Table B-3. Rosemount 3051S Scalable Liquid Level Transmitter Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Hydrostatic Testing		
Expanded		
P2	Cleaning for special services	
P3	Cleaning for less than 1PPM chlorine/fluorine	
Calibration Data Certification		
Standard		Standard
Q4	Calibration certificate	★
QP	Calibration certificate and tamper evident seal	★
Material Traceability Certification		
Standard		Standard
Q8	Material traceability certification per EN 10204 3.1	★
Quality Certification for Safety		
Standard		Standard
QS ⁽¹¹⁾⁽¹²⁾	Prior-use certificate of FMEDA data	★
QT ⁽²⁴⁾	Safety certified to IEC 61508 with certificate of FMEDA data	★
Transient Terminal Block		
Standard		Standard
T1 ⁽²⁵⁾	Transient terminal block	★
Toolkit Total System Performance Reports		
Standard		Standard
QZ	Remote Seal System Performance Calculation Report	★
Conduit Electrical Connector		
Standard		Standard
GE ⁽²⁶⁾	M12, 4-pin, Male Connector (eurofast®)	★
GM ⁽²⁶⁾	A size Mini, 4-pin, Male Connector (minifast®)	★
Typical Model Number for EF seal: 3051S2LD 2A A 1A 1 0 2 0 D EF 7 1 DA 2 0		

- (1) With option code 1, user must select Seal Location option code M in Table 7 on page Pressure-27 of the DP Level PDS (00813-0100-4016).
- (2) Requires PlantWeb housing.
- (3) Available approvals are FM Intrinsically Safe, Division 2 (option code I5), CSA Intrinsically Safe (option code I6), ATEX Intrinsic Safety (option code I1), and IECEx Intrinsic Safety (option code I7).
- (4) Material specified is cast as follows: CF-3M is the cast version of 316L SST. For housing, material is aluminum with polyurethane paint.
- (5) Available with output code A only. Not available with approvals. See Rosemount 753R Product Data Sheet, 00813-0100-4379, to specify Web-Based Monitoring Indicator. Does not integrate into plant host systems.
- (6) Available with output code A only. Available approvals are FM Intrinsically Safe, Division 2 (option code I5), ATEX Intrinsic Safety (option code I1), or IECEx Intrinsic Safety (option code I7). Contact an Emerson Process Management representative for additional information.
- (7) Not recommended for use with spiral wound metallic gaskets (see 1199 product data sheet, document 00813-0100-4016 for additional options).
- (8) Standard gasket for lower housing consists of non-asbestos fiber.
- (9) Long-life Power Module must be shipped separately, order Part No. 00753-9220-0001.
- (10) Requires PlantWeb housing and output code A. Includes Hardware Adjustments as standard.
- (11) Not available with output code F.
- (12) Not available with output code X.
- (13) Not available with housing style codes 00, 2E, 2F, 2G, 2M, 5A, 5J, or 7J.
- (14) Requires PlantWeb housing and Hardware Adjustments option code D1. Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative for additional information.
- (15) Transmitter is shipped with 316 SST conduit plug (uninstalled) in place of standard carbon steel conduit plug.
- (16) Valid when SuperModule Platform and housing have equivalent approvals.
- (17) Not available with M20 or G ½ conduit entry size.
- (18) Only available with output code X.
- (19) Only available on differential and gage measurement types. Silicone fill fluid is standard.
- (20) 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.
- (21) Not available with Housing 7J.
- (22) Not available with output code F, option code DA1, or option code QT.
- (23) See the 3051S Reference Manual (document number 00809-0100-4801) for cable requirements. Contact an Emerson Process Management representative for additional information.
- (24) Not available with output code F or X. Not available with housing code 01 or 7J.
- (25) Not available with Housing code 00, 5A, or 7J.
- (26) Not available with Housing code 00, 5A, or 7J. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Division 2 (option code I5) or FM FISCO Intrinsically Safe (option code IE), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

Table B-4. Rosemount 300S Series Housing Kit

Model			
300S	Housing Kit for Rosemount 3051S Coplanar, In-Line, and Liquid Level Transmitters		
Code	Housing Style	Material ⁽¹⁾	Conduit Entry
1A	PlantWeb housing	Aluminum	1/2–14 NPT
1B	PlantWeb housing	Aluminum	M20 x 1.5 (CM20)
1C	PlantWeb housing	Aluminum	G 1/2
1J	PlantWeb housing	SST	1/2–14 NPT
1K	PlantWeb housing	SST	M20 x 1.5 (CM20)
1L	PlantWeb housing	SST	G 1/2
2A	Junction Box housing	Aluminum	1/2–14 NPT
2B	Junction Box housing	Aluminum	M20 x 1.5 (CM20)
2C	Junction Box housing	Aluminum	G 1/2
2J	Junction Box housing	SST	1/2–14 NPT
2E	Junction Box housing with output for remote interface	Aluminum	1/2–14 NPT
2F	Junction Box housing with output for remote interface	Aluminum	M20 x 1.5 (CM20)
2G	Junction Box housing with output for remote interface	Aluminum	G 1/2
2M	Junction Box housing with output for remote interface	SST	1/2–14 NPT
3A	Remote mount display and interface housing	Aluminum	1/2–14 NPT
3B	Remote mount display and interface housing	Aluminum	M20 x 1.5 (CM20)
3C	Remote mount display and interface housing	Aluminum	G 1/2
3J	Remote mount display and interface housing	SST	1/2–14 NPT
7J ⁽²⁾	Quick Connect (A size Mini, 4-pin male termination)	SST	
Code	Output		
A	4-20 mA with digital signal based on HART protocol		
F ⁽³⁾	FOUNDATION fieldbus protocol		
Code	Options		
PlantWeb Control Functionality			
A01 ⁽⁴⁾	FOUNDATION fieldbus Advanced Control Function Block Suite		
PlantWeb Diagnostic Functionality			
D01 ⁽⁴⁾	FOUNDATION fieldbus Diagnostics Suite		
DA1 ⁽⁵⁾	HART Diagnostics Suite		
Special Configuration (Hardware)			
D1 ⁽⁶⁾	Hardware adjustments (zero, span, alarm, security) <i>Note: Not available with Housing Style codes 2E, 2F, 2G, 2M, 3A, 3B, 3C, 3J, or 7J.</i>		
Product Certifications			
E1	ATEX Flameproof		
I1	ATEX Intrinsic Safety		
IA	ATEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only		
N1	ATEX Type n		
K1	ATEX Flameproof, Intrinsic Safety, Type n, Dust (combination of E1, I1, N1, and ND)		
ND	ATEX Dust		
E5	FM Explosion-proof, Dust Ignition-proof		
I5	FM Intrinsically Safe, Division 2		
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only		
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		
IF	CSA FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only		
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		
IG	IECEX FISCO Intrinsic Safety; for FOUNDATION fieldbus protocol only		
N7	IECEX Type n		
K7	IECEX Flameproof, Dust Ignition-proof, Intrinsic Safety, Type n (combination of E7, I7, and N7)		
E2	INMETRO Flameproof		
I2	INMETRO Intrinsic Safety		
K2	INMETRO Flameproof, Intrinsic Safety		

Rosemount 3051S

KA	ATEX and CSA Flameproof, Intrinsically Safe, Division 2 (combination of E1, E6, I1, and I6) <i>Note: Only available on Housing Style codes IA, IJ, 2A, 2J, 2E, 2M, 3A, or 3J.</i>
KB	FM and CSA Explosion-proof, Dust Ignition-proof, Intrinsically Safe, Division 2 (combination of E5, E6, I5, and I6) <i>Note: Only available on Housing Style codes IA, IJ, 2A, 2J, 2E, 2M, 3A, or 3J.</i>
KC	FM and ATEX Explosion-proof, Intrinsically Safe, Division 2 (combination of E5, E1, I5, and I1) <i>Note: Only available on Housing Style codes IA, IJ, 2A, 2J, 2E, 2M, 3A, or 3J.</i>
KD	FM, CSA, and ATEX Explosion-proof, Intrinsically Safe (combination of E5, E6, E1, I5, I6, and I1) <i>Note: Only available on Housing Style codes IA, IJ, 2A, 2J, 2E, 2M, 3A, or 3J.</i>
Digital Display⁽⁷⁾	
M5	PlantWeb LCD Display
M7 ⁽⁸⁾	Remote mount LCD display and interface, no cable; PlantWeb housing, SST bracket, requires 4-20 mA / HART output <i>Note: See the 3051S Reference Manual (document number 00809-0100-4801) for cable requirements. Contact an Emerson Process Management representative for additional information.</i>
M8 ⁽⁸⁾⁽⁹⁾	Remote mount LCD display and interface, 50 ft. (15 m) cable; SST bracket, requires 4-20 mA / HART output
M9 ⁽⁸⁾⁽⁹⁾	Remote mount LCD display and interface, 100 ft. (31 m) cable; SST bracket, requires 4-20 mA / HART output
Terminal Blocks	
T1 ⁽¹⁰⁾	Transient terminal block
T2 ⁽¹¹⁾	Terminal block with WAGO® spring clamp terminals
T3 ⁽¹¹⁾	Transient terminal block with WAGO spring clamp terminals
Conduit Electrical Connector	
GE ⁽¹²⁾	M12, 4-pin, Male Connector (<i>eurofast</i> ®)
GM ⁽¹²⁾	A size Mini, 4-pin, Male Connector (<i>minifast</i> ®)
Typical Model Number: 300S 1A A E5	

(1) Material specified is cast as follows: CF-3M is the cast version of 316L SST. For housing, material is aluminum with polyurethane paint.

(2) Available with output code A only. Not available with approvals. Contact an Emerson Process Management representative for additional information.

(3) Requires PlantWeb housing.

(4) Requires PlantWeb housing and output code F.

(5) Requires PlantWeb housing and output code A. Includes Hardware Adjustments as standard.

(6) Not available with output code F.

(7) Not available with Housing code 7J.

(8) Not available with output code F or option code DA1. Only available on Housing Style codes 3A, 3B, 3C, or 3J.

(9) Cable supplied is Belden 3084A, rated for ambient temperatures up to 167°F (75°C).

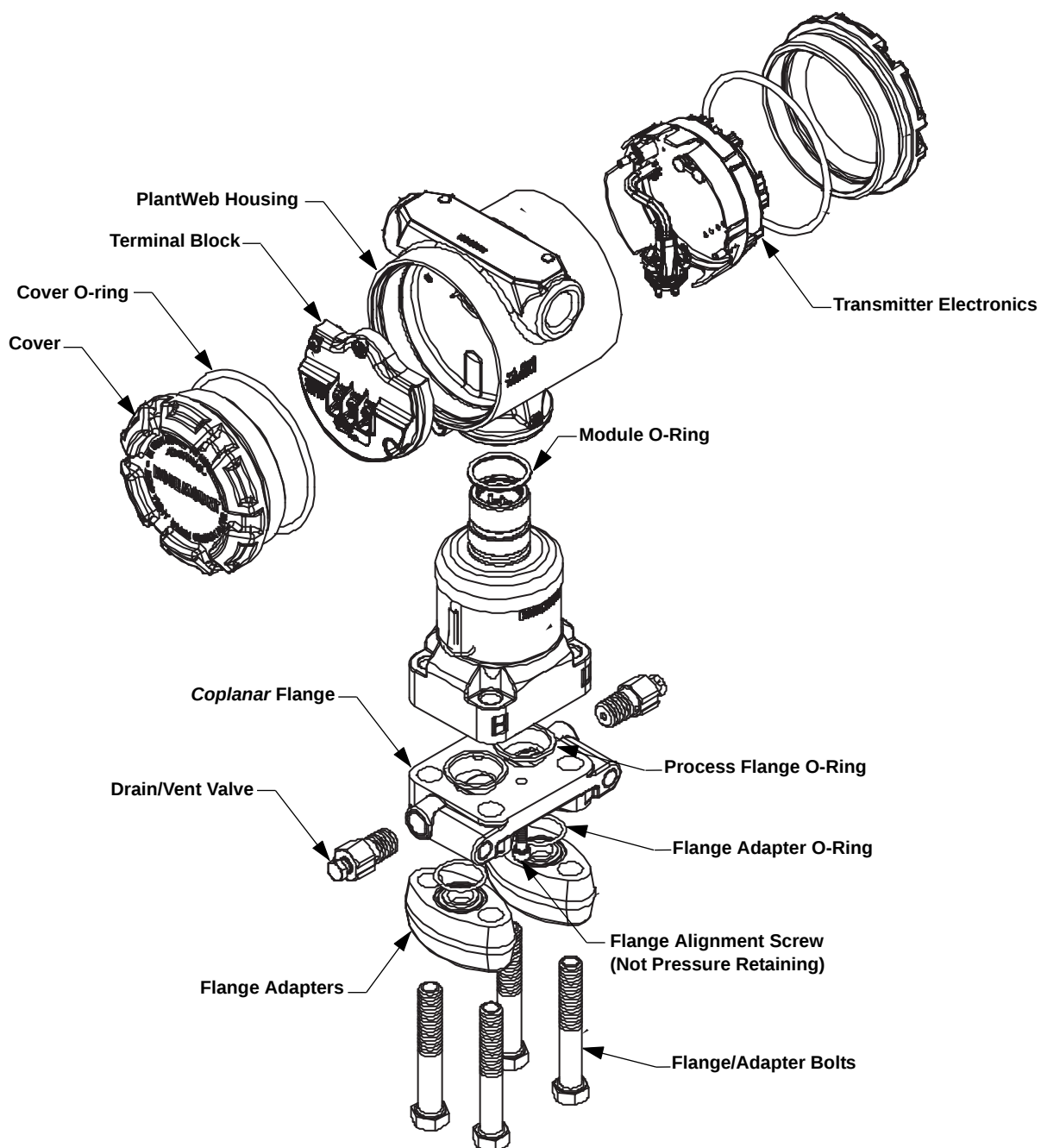
(10) Not available with Housing code 3A, 3B, 3C, 3J, or 7J.

(11) Available with output code A and PlantWeb housing only.

(12) Not available with Housing code 7J. Available with Intrinsically Safe approvals only. For FM Intrinsically Safe, Division 2 (option code I5) or FM FISCO Intrinsically Safe (option code IE), install in accordance with Rosemount drawing 03151-1009 to maintain outdoor rating (NEMA 4X and IP66).

EXPLODED VIEW DIAGRAM

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



SPARE PARTS

See Rosemount 3051S_C, 3051S_T & 3051S_L ordering tables in Appendix B (B-33, B-39, and B-43 respectively) for ordering spare sensor modules.	
- Typical Model Number 3051S1CD2A2000A00	
Electronics Board Assembly Hardware (PlantWeb® Housing)	
LCD/Housing Interface Assemblies for Hart Output	
Standard Interface	03151-9010-0001
Hardware Adjustment Kit	03151-9015-0001
Adjustment Interface	
Adjustment Module	
Adjustment Interface	03151-9017-0001
Adjustment Module	03151-9019-0001
Remote Meter Interface	03151-9023-0001
Fieldbus Output (Includes A01 and D01 PlantWeb Functionality)	
FOUNDATION™ fieldbus Upgrade Kit (Standard)	03151-9021-0021
FOUNDATION fieldbus Output Electronics	
Standard Dual Compartment Terminal Block	
FOUNDATION fieldbus Upgrade Kit (with Transient Protection)	03151-9021-0022
FOUNDATION fieldbus Output Electronics	
Transient Dual Compartment Terminal Block	
FOUNDATION fieldbus Upgrade Kit (FISCO)	03151-9021-0023
FOUNDATION fieldbus Output Electronics	
FISCO Dual Compartment Terminal Block	
FOUNDATION fieldbus Output Electronics	03151-9020-0001
HART Advanced Diagnostics Electronics	
HART Advanced Diagnostics Upgrade Kit	03151-9070-0001
Miscellaneous	
PlantWeb housing header cable o-ring (package of 12)	03151-9011-0001
Electrical Housing, Terminal Blocks	
See Rosemount 300S Series Housing "Kit" in Appendix B, page B-49 for ordering spare housings.	
- Typical Model Number 300S1AAE5	
PlantWeb Housing Terminal Block, HART (4-20 mA)	
Standard Dual Compartment Terminal Block Assembly	03151-9005-0001
Transient Dual Compartment Terminal Block Assembly (Option T1)	03151-9005-0002
PlantWeb Housing Terminal Block, Fieldbus	
Standard Dual Compartment Terminal Block Assembly	03151-9005-0021
Transient Dual Compartment Terminal Block Assembly (Option T1)	03151-9005-0022
FISCO Dual Compartment Terminal Block Assembly	03151-9005-0023
Junction Box Terminal Block, HART (4-20 mA)	
Standard Junction Box Terminal Block Assembly	03151-9000-1001
Transient Junction Box Terminal Block Assembly (Option T1)	03151-9000-1002
Junction Box Terminal Block, HART (4-20 mA) with Adjustment	
Standard Junction Box Terminal Block Assembly, Switch	03151-9000-2001
Transient Junction Box Terminal Block Assembly, Switch (Option T1)	03151-9000-2002
Alarm/Security Jumper with O-ring	03151-9001-0001
Remote Meter Terminal Blocks	
PlantWeb Housing 7-Position Remote Communications Terminal Block Assembly	03151-9006-0101
Junction Box Remote Communications Standard Terminal Block Assembly	03151-9000-1010
Junction Box Remote Communications Transient Terminal Block Assembly	03151-9000-1011

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
Flanges	Part Number
Differential Coplanar Flange	
Nickel-plated Carbon Steel	03151-9200-0025
316 SST	03151-9200-0022
Alloy C-276	03151-9200-0023
Alloy 400	03151-9200-0024
Gage/Absolute Coplanar Flange	
Nickel-plated Carbon Steel	03151-9200-1025
316 SST	03151-9200-1022
Alloy C-276	03151-9200-1023
Alloy 400	03151-9200-1024
Coplanar Flange Alignment Screw (package of 12)	03151-9202-0001
Traditional Flange	
316 SST	03151-9203-0002
Alloy C-276	03151-9203-0003
Alloy 400	03151-9203-0004
Level Flange, Vertical Mount	
2 in., Class 150, SST	03151-9205-0221
2 in., Class 300, SST	03151-9205-0222
3 in., Class 150, SST	03151-9205-0231
3 in., Class 300, SST	03151-9205-0232
DIN, DN 50, PN 40	03151-9205-1002
DIN, DN 80, PN 40	03151-9205-1012
Flange Adapter Kits (Each kit contains adapters, bolts, and o-ring for one DP transmitter or two GP/AP transmitters.)	
Differential Flange Adapter Kits	
CS Bolts, Glass Filled PTFE O-Rings	
SST Adapters	03031-1300-0002
Alloy C-276 Adapters	03031-1300-0003
Alloy 400 Adapters	03031-1300-0004
Ni Plated CS Adapters	03031-1300-0005
SST Bolts, Glass Filled PTFE O-Rings	
SST Adapters	03031-1300-0012
Alloy C-276 Adapters	03031-1300-0013
Alloy 400 Adapters	03031-1300-0014
Ni Plated CS Adapters	03031-1300-0015
CS Bolts, Graphite PTFE O-Rings	
SST Adapters	03031-1300-0102
Alloy C-276 Adapters	03031-1300-0103
Alloy 400 Adapters	03031-1300-0104
Ni Plated CS Adapters	03031-1300-0105
SST Bolts, Graphite PTFE O-Rings	
SST Adapters	03031-1300-0112
Alloy C-276 Adapters	03031-1300-0113
Alloy 400 Adapters	03031-1300-0114
Ni Plated CS Adapters	03031-1300-0115

Flange Adapter Union	Part Number
Nickel-plated Carbon Steel	03151-9259-0005
316 SST	03151-9259-0002
Alloy C-276	03151-9259-0003
Alloy 400	03151-9259-0004
Drain/Vent Valve Kits (each kit contains parts for one transmitter)	Part Number
Differential Drain/Vent Kits	
316 SST Valve Stem and Seat Kit	03151-9268-0022
Alloy C-276 Valve Stem and Seat Kit	03151-9268-0023
Alloy 400 Valve Stem and Seat Kit	03151-9268-0024
316 SST Ceramic Ball Drain/Vent Kit	03151-9258-0122
Alloy C-276 Ceramic Ball Drain/Vent Kit	03151-9268-0123
Alloy 400 Ceramic Ball Drain/Vent Kit	03151-9268-0124
Gage/Absolute Drain/Vent Kits	
316 SST Valve Stem and Seat Kit	03151-9268-0012
Alloy C-276 Valve Stem and Seat Kit	03151-9268-0013
Alloy 400 Valve Stem and Seat Kit	03151-9268-0014
316 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 Meter)	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
In-line Bracket Kit	
B4 Bracket, SST, 2-in. pipe mount, SST bolts	03151-9270-0002
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
Bolt Kits	
COPLANAR FLANGE	
Flange Bolt Kit {44 mm (1.75 in.)}	
Carbon Steel (set of 4)	03151-9280-0001
316 SST (set of 4)	03151-9280-0002
ANSI/ASTM-A-193-B7M (set of 4)	03151-9280-0003
Alloy 400 (set of 4)	03151-9280-0004

Flange/Adapter Bolt Kit {73 mm (2.88 in.)}	
Carbon Steel (set of 4)	03151-9281-0001
316 SST (set of 4)	03151-9281-0002
ANSI/ASTM-A-193-B7M (set of 4)	03151-9281-0003
Alloy 400 (set of 4)	03151-9281-0004
Manifold/Flange Kit {57 mm (2.25 in.)}	
Carbon Steel (set of 4)	03151-9282-0001
316 SST (set of 4)	03151-9282-0002
ANSI/ASTM-A-193-B7M (set of 4)	03151-9282-0003
Alloy 400 (set of 4)	03151-9282-0004
TRADITIONAL FLANGE	
Differential Flange and Adapter Bolt Kit	
Carbon Steel (set of 8)	03151-9283-0001
316 SST (set of 8)	03151-9283-0002
ANSI/ASTM-A-193-B7M (set of 8)	03151-9283-0003
Alloy 400 (set of 8)	03151-9283-0004
Gage/Absolute Flange and Adapter Bolt Kit	
Carbon Steel (set of 6)	03151-9283-1001
316 SST (set of 6)	03151-9283-1002
ANSI/ASTM-A-193-B7M (set of 6)	03151-9283-1003
Alloy 400 (set of 6)	03151-9283-1004
Manifold/Traditional Flange Bolts	
Carbon Steel	Use bolts supplied with manifold
316 SST	Use bolts supplied with manifold
LEVEL FLANGE, VERTICAL MOUNT	
Flange Bolt Kit (Each kit contains bolts for one transmitter)	
Carbon Steel (set of 4)	03151-9285-0001
316 SST (set of 4)	03151-9285-0002
Meters	Part Number
Indicating Meter for Plantweb Aluminum Housing	
Meter Kit: LCD assembly, 4-pin interconnection header and aluminum meter cover assembly	03151-9193-0001
Meter Only: LCD assembly, 4-pin interconnection header	03151-9193-0002
Cover Assembly Kit: aluminum meter cover assembly	03151-9193-0003
Indicating Meter for Plantweb 316L SST Housing	
Meter Kit: LCD assembly, 4-pin interconnection header, 316L SST meter cover assembly	03151-9193-0004
Meter Only: LCD assembly, 4-pin interconnection header	03151-9193-0002
Cover Assembly Kit: 316L SST meter cover assembly	03151-9193-0005

Appendix C Product Certifications

Approved Manufacturing Locations	page C-1
Ordinary Location Certification for FM	page C-1
European Directive Information	page C-1
Hazardous Locations Certifications	page C-2
Installation Drawings	page C-8
European ATEX Directive Information	page C-41
CENELEC/KEMA Flameproof	page C-43

This section contains hazardous location certifications for 3051S HART protocol.

APPROVED MANUFACTURING LOCATIONS

Rosemount Inc. — Chanhassen, Minnesota USA
Emerson Process Management GmbH & Co. — Wessling, Germany
Emerson Process Management Asia Pacific Private Limited — Singapore
Beijing Rosemount Far East Instrument Co., LTD — Beijing, China
Emerson Process Management LTDA — Sorocaba, Brazil
Emerson Process Management (India) Pvt. Ltd. — Daman, India

ORDINARY LOCATION CERTIFICATION FOR FM

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

EUROPEAN DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

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

Models 3051S_CA4; 3051S_CD2, 3, 4, 5; (also with P9 option) Pressure Transmitters — QS
Certificate of Assessment -

EC No. 59552-2009-CE-HOU-DNV, Module H Conformity Assessment

All other Model 3051S Pressure Transmitters

— Sound Engineering Practice

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

Primary Elements, Flowmeter

— See appropriate Primary Element QIG

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

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

Radio and Telecommunications Terminal Equipment Directive (R&TTE)(1999/5/EC)

Emerson Process Management complies with the R&TTE Directive.

HAZARDOUS LOCATIONS CERTIFICATIONS

North American Certifications

FM Approvals

- E5** Explosion-proof for Class I, Division 1, Groups B, C, and D, T5 ($T_a = 85^\circ\text{C}$); Dust Ignition-proof for Class II and Class III, Division 1, Groups E, F, and G, T5 ($T_a = 85^\circ\text{C}$); hazardous locations; enclosure Type 4X, conduit seal not required when installed according to Rosemount drawing 03151-1003.
- I5/IE** Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D, T4 ($T_a = 70^\circ\text{C}$ for output options A or X; $T_a = 60^\circ\text{C}$ for output option F); Class II, Division 1, Groups E, F, and G; Class III, Division 1; Class I, Zone 0 AEx ia IIC T4 ($T_a = 70^\circ\text{C}$ for output options A or X; $T_a = 60^\circ\text{C}$ for output option F) when connected in accordance with Rosemount drawing 03151-1006; Non-Incendive for Class I, Division 2, Groups A, B, C, and D; T4 ($T_a = 70^\circ\text{C}$ for output options A or X; $T_a = 60^\circ\text{C}$ for output option F) Enclosure Type 4X
For entity parameters see control drawing 03151-1006.

Canadian Standards Association (CSA)

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

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

European Certifications

I1/IA ATEX Intrinsic Safety

Certificate No.: BAS01ATEX1303X  II 1G

Ex ia IIC T4 ($T_a = -60^\circ\text{C}$ to 70°C) -HART/Remote Display/Quick Connect/HART Diagnostics

Ex ia IIC T4 ($T_a = -60^\circ\text{C}$ to 70°C) -FOUNDATION fieldbus

Ex ia IIC T4 ($T_a = -60^\circ\text{C}$ to 40°C) -FISCO

 1180

Input Parameters

Loop / Power	Groups
$U_i = 30\text{ V}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$U_i = 17.5\text{ V}$	FISCO
$I_i = 300\text{ mA}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$I_i = 380\text{ mA}$	FISCO
$P_i = 1.0\text{ W}$	HART / Remote Display / Quick Connect / HART Diagnostics
$P_i = 1.3\text{ W}$	FOUNDATION fieldbus
$P_i = 5.32\text{ W}$	FISCO
$C_i = 30\text{ nF}$	SuperModule Platform
$C_i = 11.4\text{ nF}$	HART / HART Diagnostics / Quick Connect
$C_i = 0$	FOUNDATION fieldbus / Remote Display / FISCO
$L_i = 0$	HART / FOUNDATION fieldbus/ FISCO / Quick Connect / HART Diagnostics
$L_i = 60\text{ }\mu\text{H}$	Remote Display
RTD Assembly (3051SFx Option T or R)	
$U_i = 5\text{ Vdc}$	
$I_i = 500\text{ mA}$	
$P_i = 0.63\text{ W}$	

Special conditions for safe use (x)

1. The apparatus, excluding the Types 3051 S-T and 3051 S-C (In-line and Coplanar SuperModule Platforms respectively), is not capable of withstanding the 500V test as defined in Clause 6.3.12 of EN 60079-11. This must be considered during installation.
2. The terminal pins of the Types 3051 S-T and 3051 S-C must be protected to IP20 minimum.

N1 ATEX Type n
Certificate No.: BAS01ATEX3304X  II 3 G
Ex nL IIC T5 ($T_a = -40\text{ °C TO } 70\text{ °C}$)
 $U_i = 45\text{ Vdc max}$
 $C_i = 11.4\text{ nF}$
 $L_i = 0$
For remote display, $C_i = 0$, $L_i = 60\text{ }\mu\text{H}$
IP66


Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500V insulation test required by Clause 6.8.1 of EN 60079-15.
This must be taken into account when installing the apparatus.

NOTE

RTD Assembly is not included with the 3051SFx Type n Approval.

ND ATEX Dust
Certificate No.: BAS01ATEX1374X  II 1 D
Ex tD A20 T105°C ($-20\text{ °C} \leq T_{amb} \leq 85\text{ °C}$)
 $V_{max} = 42.4\text{ volts max}$
 $A = 22\text{ mA}$
IP66
 1180

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 range of the apparatus and capable of withstanding a 7J impact test.
4. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure. (The 3051S SuperModule must be properly assembled to the 3051S housing to maintain ingress protection.)

E1 ATEX Flameproof
Certificate No.: KEMA00ATEX2143X  II 1/2 G
Ex d IIC T6 ($-50\text{ °C} \leq T_{amb} \leq 65\text{ °C}$)
Ex d IIC T5 ($-50\text{ °C} \leq T_{amb} \leq 80\text{ °C}$)
 $V_{max} = 42.4\text{ V}$
 1180

Special conditions for safe use (x)

1. Appropriate ex d blanking plugs, cable glands, and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. The 3051S does not comply with the requirements of EN 60079-1 Clause 5.2, Table 2 for all joints. Contact Emerson Process Management for information on the dimensions of flameproof joints.

Japanese Certifications

E4 TIIS Flameproof
Ex d IIC T6

Certificate	Description
TC15682	Coplanar with Junction Box Housing
TC15683	Coplanar with PlantWeb Housing
TC15684	Coplanar with PlantWeb Housing and LCD Display
TC15685	In-Line SST with Junction Box Housing
TC15686	In-Line Alloy C-276 with Junction Box Housing
TC15687	In-Line SST with PlantWeb Housing
TC15688	In-Line Alloy C-276 with PlantWeb Housing
TC15689	In-Line SST with PlantWeb Housing and LCD Display
TC15690	In-Line Alloy C-276 with PlantWeb Housing and LCD Display
TC17102	Remote Display
TC17099	3051SFA/C/P SST/Alloy C-276 with PlantWeb Housing and LCD Display
TC17100	3051SFA/C/P SST/Alloy C-276 with PlantWeb Housing and Remote Display
TC17101	3051SFA/C/P SST/Alloy C-276 with Junction Box Housing

China (NEPSI) Certifications

I3 China Intrinsic Safety, Dust Ignition-proof
 Certificate No. (manufactured in Chanhassen, MN): GYJ081078
 Certificate No. (manufactured in Beijing, China): GYJ06367
 Certificate No. (manufactured in Singapore): GYJ06365
 Certificate No. (3051SFx RTC, BMMC, SMMC): GYJ071293
 Ex ia IIC T4
 DIP A21 T_A T4 IP66

NOTE

Refer to Appendix B of the 3051S Reference Manual (document number 00809-0100-4801) for Special Conditions for Safe Use.

Input Parameters

Loop / Power	Groups
$U_i = 30\text{ V}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$I_i = 300\text{ mA}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$P_i = 1.0\text{ W}$	HART / Remote Display / Quick Connect / HART Diagnostics
$P_i = 1.3\text{ W}$	FOUNDATION fieldbus
$C_i = 38\text{ nF}$	SuperModule Platform
$C_i = 11.4\text{ nF}$	HART / HART Diagnostics / Quick Connect
$C_i = 0$	FOUNDATION fieldbus / Remote Display
$L_i = 0$	HART / FOUNDATION fieldbus / Quick Connect / HART Diagnostics
$L_i = 60\text{ }\mu\text{H}$	Remote Display
RTD Assembly (3051SFx Option T or R)	
$U_i = 5\text{ Vdc}$	
$I_i = 500\text{ mA}$	
$P_i = 0.63\text{ W}$	

- E3** China Flameproof, Dust Ignition-proof
Certificate No. (manufactured in Chanhassen, MN): GYJ091035
Certificate No. (manufactured in Beijing, China): GYJ06366
Certificate No. (manufactured in Singapore): GYJ06364
Certificate No. (3051SFx RTC, BMMC, SMMC): GYJ071086
Ex d IIB+H₂ T3~T5
DIP A21 T_A T3~T5 IP66

NOTE

Refer to Appendix B of the 3051S Reference Manual (document number 00809-0100-4801) for Special Conditions for Safe Use.

INMETRO Certifications

- I2** Brazilian Approval (INMETRO Approval) - Intrinsic Safety
Certificate number: CEPEL-EX-0722/05X
(manufacturing in Chanhassen, MN and Singapore)
Certificate number: CEPEL-EX-1414/07X
(manufacturing in Brazil)
INMETRO Marking: BR-Ex ia IIC T4 IP66W

Special conditions for safe use (x)

The apparatus, excluding the Types 3051S-T and 3051S-C (In-line and Coplanar SuperModule Platforms respectively), is not capable of withstanding the 500V test as defined in Clause 6.3.12 of IEC60079-11. This must be considered during installation.

- E2** Brazilian Approval (INMETRO Approval) - Flameproof
Certificate number: CEPEL-EX-140/2003X
(manufacturing in Chanhassen, MN and Singapore)
Certificate number: CEPEL-EX-1413/07X
(manufacturing in Brazil)
INMETRO Marking: BR-Ex d IIC T5/T6 IP66W

Special conditions for safe use (x)

1. This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.
2. For ambient temperature above 60 °C, cable wiring must have minimum isolation temperature of 90 °C, to be in accordance to equipment operation temperature.
3. The accessory of cable entries or conduit must be certified as flameproof and needs to be suitable for use conditions.
4. Where electrical entry is via conduit, the required sealing device must be assembled immediately close to enclosure.

IECEx Certifications

- E7** IECEx Flameproof and Dust (each listed separately)

IECEx Flameproof
Certificate No.: IECExKEM08.0010X
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
V_{max} = 42.4V

Special conditions for safe use (x)

1. Appropriate ex d blanking plugs, cable glands, and wiring needs to be suitable for a temperature of 90 °C.
2. This device contains a thin wall diaphragm. Installation, maintenance and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for maintenance shall be followed in detail to assure safety during its expected lifetime.
3. The 3051S does not comply with the requirements of IEC 60079-1 Clause 5.2, Table 2 for all joints. Contact Emerson Process Management for information on the dimensions of flameproof joints.

IECEX Dust

Certificate No. IECExBAS09.0014X

Ex tD A20 T105°C (-20°C ≤ Tamb ≤ 85°C)

Vmax = 42.4 V

A = 22 mA

IP66

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 range of the apparatus and capable of withstanding a 7J impact test.
4. The 3051S must be securely screwed in place to maintain the ingress protection of the enclosure. (The 3051S SuperModule must be properly assembled to the 3051S housing to maintain ingress protection.)

I7/IG IECEx Intrinsic Safety

Certificate No.: IECExBAS04.0017X

Ex ia IIC T4 (Ta = -60 °C to 70 °C) -HART/Remote Display/Quick Connect/HART Diagnostics

Ex ia IIC T4 (Ta = -60 °C to 70 °C) -FOUNDATION fieldbus

Ex ia IIC T4 (Ta = -60 °C to 40 °C) -FISCO

IP66

Input Parameters

Loop / Power	Groups
$U_i = 30 \text{ V}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$U_i = 17.5 \text{ V}$	FISCO
$I_i = 300 \text{ mA}$	HART / FOUNDATION fieldbus/ Remote Display / Quick Connect / HART Diagnostics
$I_i = 380 \text{ mA}$	FISCO
$P_i = 1.0 \text{ W}$	HART / Remote Display / Quick Connect / HART Diagnostics
$P_i = 1.3 \text{ W}$	FOUNDATION fieldbus
$P_i = 5.32 \text{ W}$	FISCO
$C_i = 30 \text{ nF}$	SuperModule Platform
$C_i = 11.4 \text{ nF}$	HART / HART Diagnostics / Quick Connect
$C_i = 0$	FOUNDATION fieldbus / Remote Display / FISCO
$L_i = 0$	HART / FOUNDATION fieldbus/ FISCO / Quick Connect / HART Diagnostics
$L_i = 60 \mu\text{H}$	Remote Display
RTD Assembly (3051SFx Option T or R)	
$U_i = 5 \text{ Vdc}$	
$I_i = 500 \text{ mA}$	
$P_i = 0.63 \text{ W}$	

Special conditions for safe use (x)

1. The 3051S HART 4-20 mA, 3051S FOUNDATION fieldbus, 3051S Profibus and 3051S FISCO are not capable of withstanding the 500V test as defined in clause 6.3.12 of IEC 60079-11. This must be taken into account during installation.
2. The terminal pins of the Types 3051S-T and 3051S-C must be protected to IP20 minimum.

N7 IECEx Type n

Certificate No.: IECExBAS04.0018X
Ex nC IIC T4 ($T_a = -40 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$)
 $U_i = 45 \text{ Vdc MAX}$
IP66

Special conditions for safe use (x)

The apparatus is not capable of withstanding the 500 V insulation test required by Clause 8 of IEC 60079-15.

Combinations of Certifications

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

- K1** Combination of E1, I1, N1, and ND
- 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, I6 and E6
- KC** Combination of E5, E1, I5 and I1
- KD** Combination of E5, I5, E6, I6, E1, and I1

INSTALLATION DRAWINGS

Factory Mutual (FM)

REVISIONS					
ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AA	NEW RELEASE	RTC1009618	P.C.S.	9/11/00
	AB	ADD 3051S_L AND TRADITIONAL HOUSING	RTC1015145	B.L.H.	4/7/03

NOTES:

1. WIRING METHOD SUITABLE FOR CLASS I, DIV 1 or CLASS I, ZONE 1 WITH ANY LENGTH.
2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250 VAC.
3. ALL CONDUIT THREADS TO BE ASSEMBLED WITH FIVE FULL THREADS MINIMUM.
4. COMPONENTS REQUIRED TO BE APPROVED MUST BE APPROVED FOR GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.
5. 3051SC, 3051ST OR 3051SL SENSOR MODULE MUST BE INSTALLED WITH FM FLAMEPROOF / EXPLOSIONPROOF APPROVED 300S1, 300S2 OR 300S4 HOUSING ATTACHED TO MEET FLAMEPROOF / EXPLOSIONPROOF INSTALLATION REQUIREMENTS.
6. INSTALLATION TO BE IN ACCORDANCE WITH THE LATEST EDITION OF NATIONAL ELECTRICAL CODE (NFPA 70).
7. 300S1, 300S2 OR 300S4 HOUSING MUST BE INSTALLED WITH FM FLAMEPROOF / EXPLOSIONPROOF APPROVED 3051SC, 3051ST OR 3051SL SENSOR MODULE ATTACHED TO MEET FLAMEPROOF / EXPLOSIONPROOF INSTALLATION REQUIREMENTS.
8. UNUSED CONDUIT ENTRY MUST BE CLOSED WITH SUITABLE BLANKING ELEMENT.

CAD Maintained, (Pro/E)

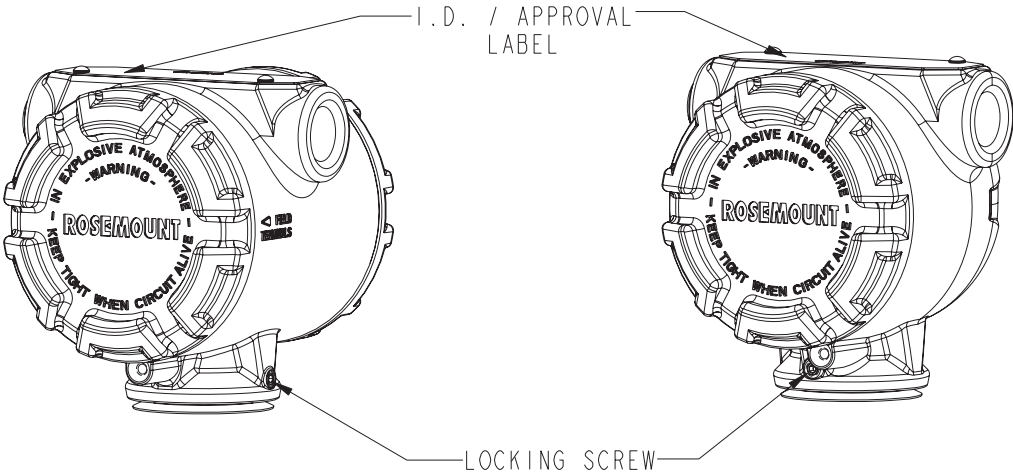
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125 -TOLERANCES- .X ± .1 [2,5] .XX ± .02 [0,5] .XXX ± .010 [0,25] FRACTIONS ANGLES ± 1/32 ± 2° DO NOT SCALE PRINT	CONTRACT NO.		 ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA	
	DR. <i>Myles Lee Miller</i>	8/28/00		
	CHK'D	.	MODEL 3051 / 300 EXPLOSIONPROOF / FLAMEPROOF INSTALLATION DRAWING, FM	
	APP'D <i>Paul C. Sundet</i>	9/11/00		
	APP'D GOVT.		SIZE A	FSCM NO.
SCALE		1 : 4	WT.	SHEET 1 OF 3

REVISIONS					
ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AB				

COMPONENT IDENTIFICATION

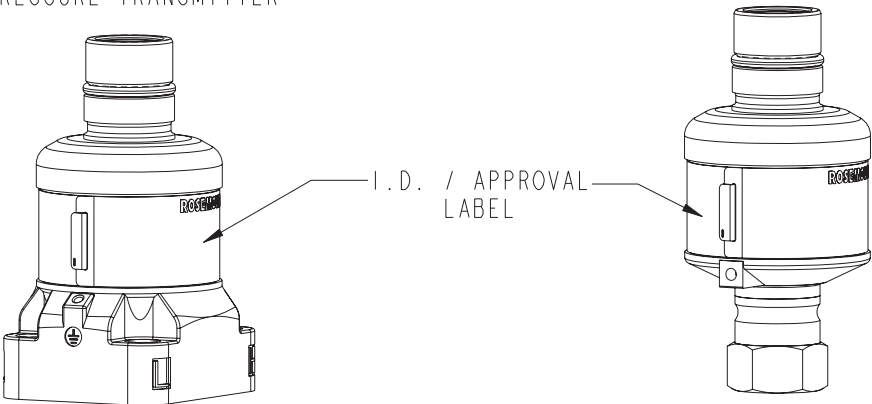
300S1____, PLANTWEB
300S4____, TRADITIONAL
(DUAL COMPARTMENT HOUSING)

300S2____
JUNCTION BOX HOUSING
(SINGLE COMPARTMENT)



3051S_C____
3051S_L____
SCALABLE COPLANAR
PRESSURE TRANSMITTER

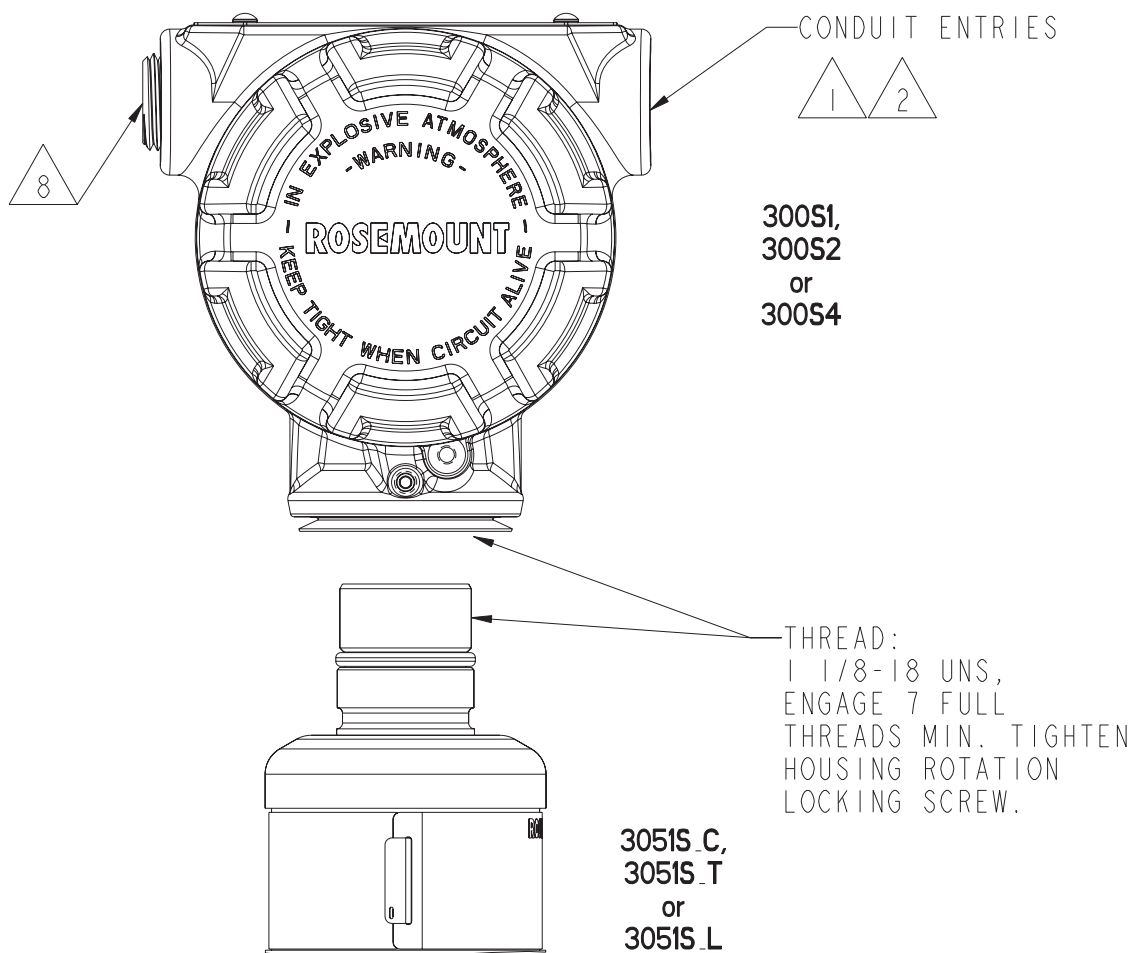
3051S_T____
SCALABLE IN-LINE
PRESSURE TRANSMITTER



Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD Maintained, (Pro/E)		
DR. Myles Lee Miller	8/28/00	SIZE A	FSCM NO	DWG NO.	03151-1003
ISSUED		SCALE 1:2	WT.	SHEET 2	OF 3

REVISIONS					
ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AB				

HOUSING TO MODULE ASSEMBLY



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DR. <i>Myles Lee Miller</i>	8/28/00	SIZE A	FSCM NO.	DWG NO.	03151-1003
ISSUED		SCALE 1 : 4	WT.	SHEET 3	OF 3

Reference Manual

00809-0200-4801, Rev CA

July 2010

Rosemount 3051S

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY	REVISIONS				
	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AL	ADD QUICK CONNECT	RTC1017568	B.L.H.	5/15/04
	AM	ADD DIAGNOSTICS FEATURE BOARD	RTC1020856	J.D.V.	3/23/06
	AN	REMOVE T5	RTC1024820	H.G.	10/23/07

ENTITY APPROVALS FOR MODELS 3051S & 300S

OUTPUT CODE A & B (4-20 mA HART) I.S. SEE SHEETS 2-5
 REMOTE DISPLAY (4-20 mA HART) I.S. SEE SHEET 6
 OUTPUT CODE F/W (FIELD BUS/PROFIBUS) I.S. SEE SHEET 7
 FISCO SEE SHEETS 8-9
 ALL OUTPUT CODES NONINCENDIVE SEE SHEET 10

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 ANGLES ± 1/32 ± 2° DO NOT SCALE PRINT	CONTRACT NO.	 ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA	
	DR. Myles Lee Miller 2/23/01	TITLE INDEX OF I.S. & NONINCENDIVE F.M. FOR 3051S	
	CHK'D		
	APP'D. Paul C. Sundet 3/9/01	SIZE A	FSCM NO.
	APP'D. GOVT.	DWG NO. 03151-1006	
		SCALE N/A	WT. _____
		SHEET 1 OF	11

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

ENTITY CONCEPT APPROVALS

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

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

FOR OUTPUT CODE 'A' MODEL 3051S SUPERMODULE 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 $P_{MAX} = 1.0 \text{ WATT}$	$(\frac{V_t \times I_t}{4})$ or $(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
$C_i = 38nF$	C_a IS GREATER THAN 38nF
$L_i = 0$	L_a IS GREATER THAN 0 H
T4 ($T_a = -50^\circ C$ to $+70^\circ C$)	

FOR OUTPUT CODE 'A' MODEL 300S JUNCTION BOX,
300S PLANTWEB HOUSING, OR 3051S QUICK CONNECT 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 $P_{MAX} = 1.0 \text{ WATT}$	$(\frac{V_t \times I_t}{4})$ or $(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
$C_i = 11.4nF$	C_a IS GREATER THAN 11.4nF
$L_i = 2.4 \mu H$	L_a IS GREATER THAN 2.4 μH
T4 ($T_a = -50^\circ C$ to $+70^\circ C$)	

FOR OUTPUT CODE 'A' WITH HART DIAGNOSTICS SUITE
AND MODEL 300S PLANTWEB HOUSING 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 $I_{MAX} = 240mA$	I_o , I_t or I_{sc} IS LESS THAN OR EQUAL TO 240mA
P_i or $P_{MAX} = 1.0 \text{ WATT}$	$(\frac{V_t \times I_t}{4})$ or $(\frac{V_{oc} \times I_{sc}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
$C_i = 11.4nF$	C_a IS GREATER THAN 11.4nF
$L_i = 0$	L_a IS GREATER THAN 0
T4 ($T_a = -50^\circ C$ to $+70^\circ C$)	

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR. **Myles Lee Miller**

SIZE
A

DWG NO.

03151-1006

ISSUED

SCALE N/A

WT.

SHEET

2 OF 11

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

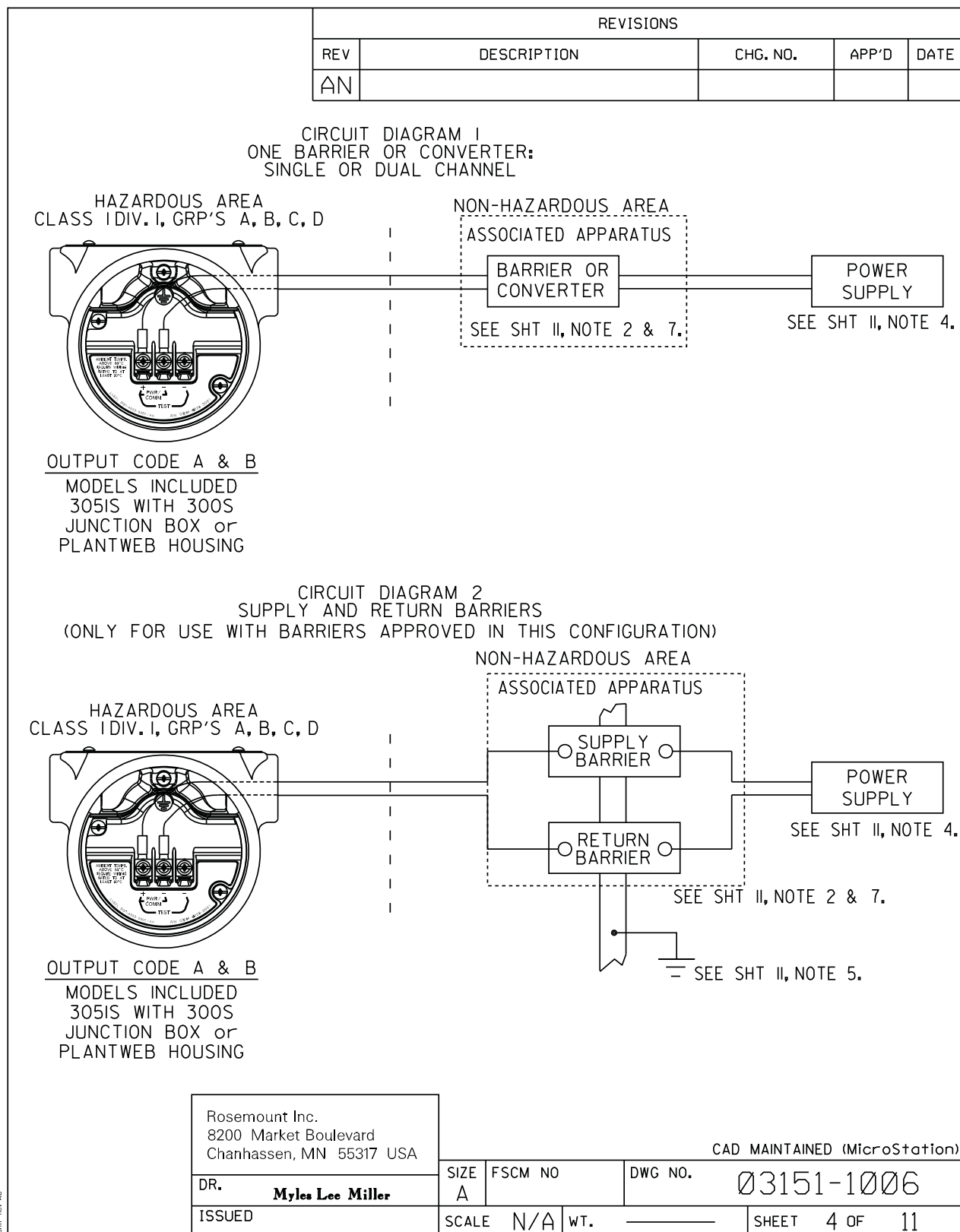
FOR OUTPUT CODE 'B' (SAFETY CERTIFIED) MODEL 300S CLASS I, DIV. 1, GROUPS A, B, C AND D

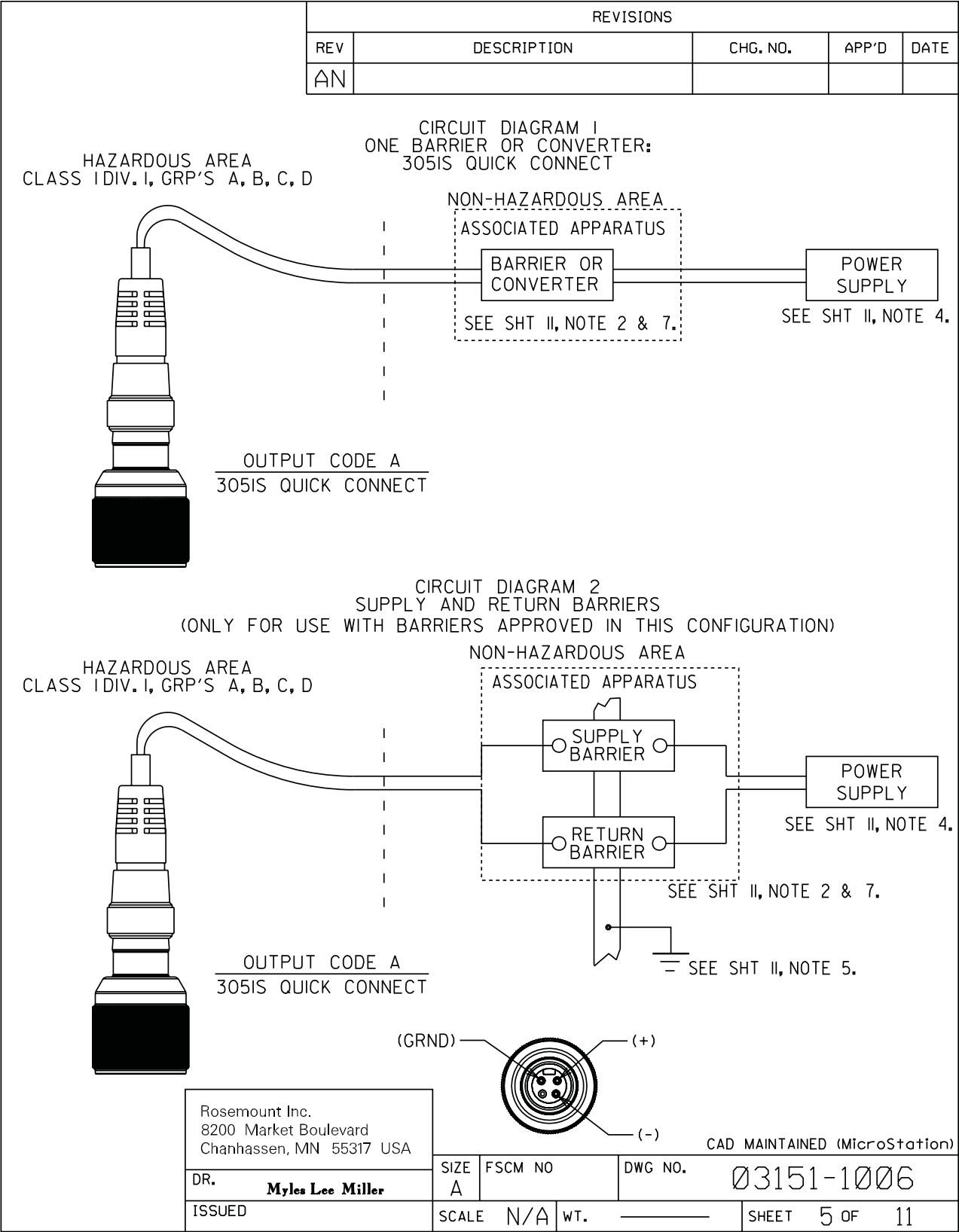
U_1 or $V_{MAX} = 30V$	U_o, V_T or V_{OC} IS LESS THAN OR EQUAL TO 30V
I_1 or $I_{MAX} = 240mA$	I_o, I_T or I_{SC} IS LESS THAN OR EQUAL TO 240mA
P_1 or $P_{MAX} = 1.0 \text{ WATT}$	$(\frac{V_T \times I_T}{4})$ or $(\frac{V_{oc} \times I_{os}}{4})$ IS LESS THAN OR EQUAL TO 1.0 WATT
$C_1 = 11.4nF$	C_A IS GREATER THAN 11.4nF
$L_1 = 570\mu H$	L_A IS GREATER THAN 570 μH
T_4 ($T_a = -50^\circ C$ to $+70^\circ C$)	

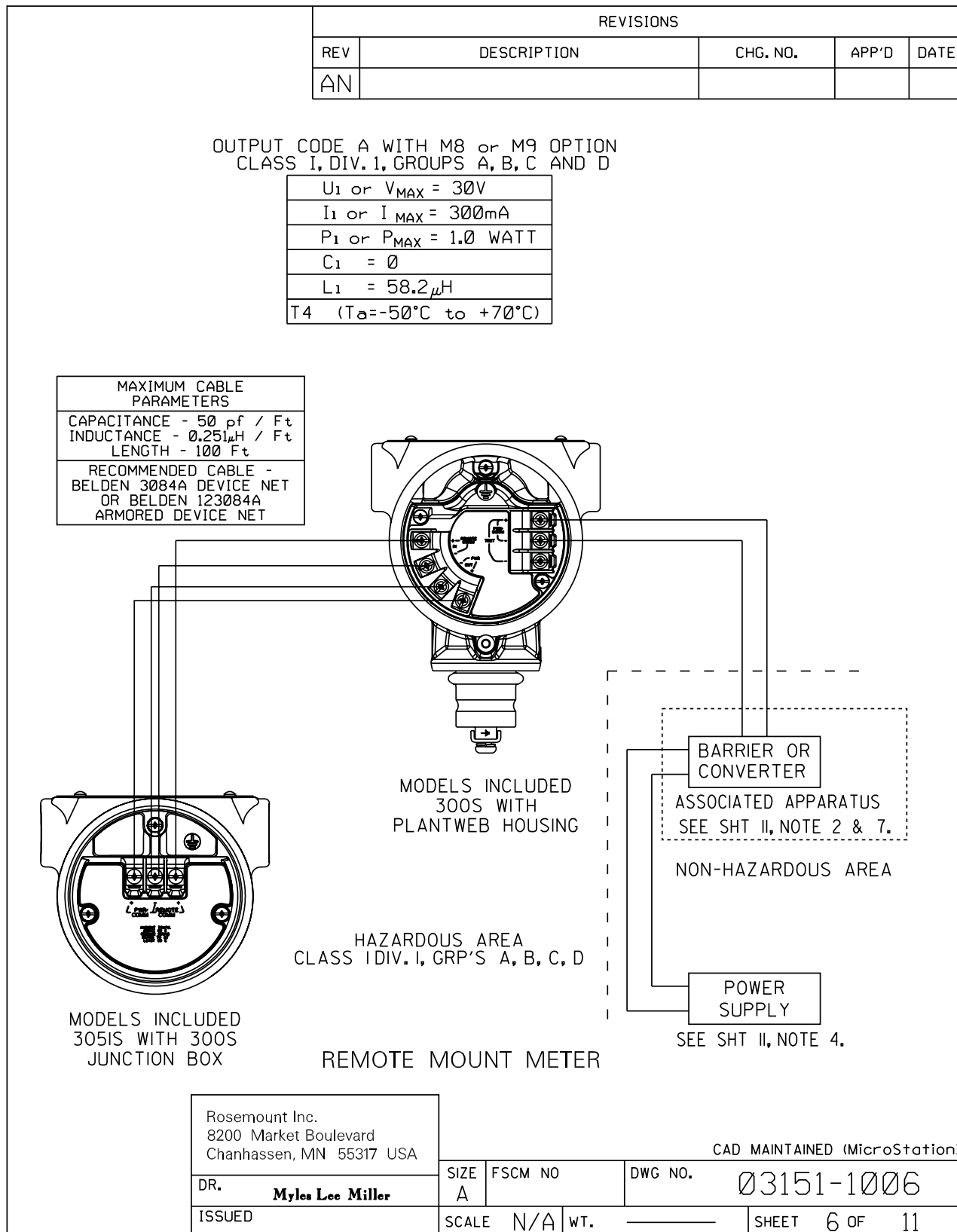
Rosemount Inc.
8200 Market Boulevard
Chanhasen, MN 55317 USA

CAD MAINTAINED (MicroStation)

DR.	Myles Lee Miller	SIZE A	FSCM NO	DWG NO.	03151-1006
ISSUED		SCALE	N/A	WT.	—
				SHEET	3 OF 11







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

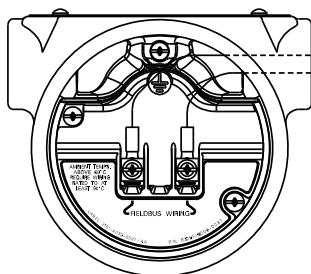
FOR OUTPUT CODE F or W (MODEL 300S)

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

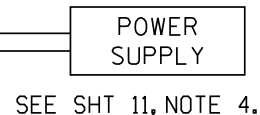
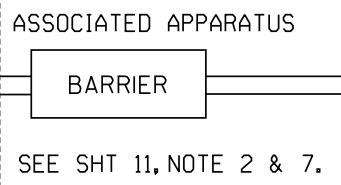
U_i OR $V_{MAX} = 30V$	$U_o, V_T, \text{ OR } V_{OC}$ IS LESS THAN OR EQUAL TO 30V
I_i OR $I_{MAX} = 300mA$	$I_o, I_T, \text{ OR } I_{SC}$ IS LESS THAN OR EQUAL TO 300mA
P_i OR $P_{MAX} = 1.3 \text{ WATT}$	$P_i (\frac{V_T \times I_T}{4})$ OR $(\frac{V_{OC} \times I_{SC}}{4})$ IS LESS THAN OR EQUAL TO 1.3 WATT
$C_i = 0\mu f$	C_A IS GREATER THAN $0\mu f$
$L_i = 0\mu H$	L_A IS GREATER THAN $0\mu H$
$T_4 (T_a = -50^\circ C \text{ TO } +60^\circ C)$	

CIRCUIT DIAGRAM 1
ONE BARRIER OR CONVERTER:
SINGLE OR DUAL CHANNEL

HAZARDOUS AREA
CLASS I, DIV. 1, GRP'S A, B, C, D



NON-HAZARDOUS AREA



OUTPUT CODE F or W
MODELS INCLUDED
3051S WITH 300S
PLANTWEB HOUSING

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)		
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1006	
ISSUED	SCALE N/A	WT.	SHEET 7 OF 11	

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

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 FIELD BUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 μ H RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELD BUS 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 50 μ A FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELD BUS CIRCUIT REMAINS PASSIVE.

THE CABLE USED TO INTERCONNECT DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

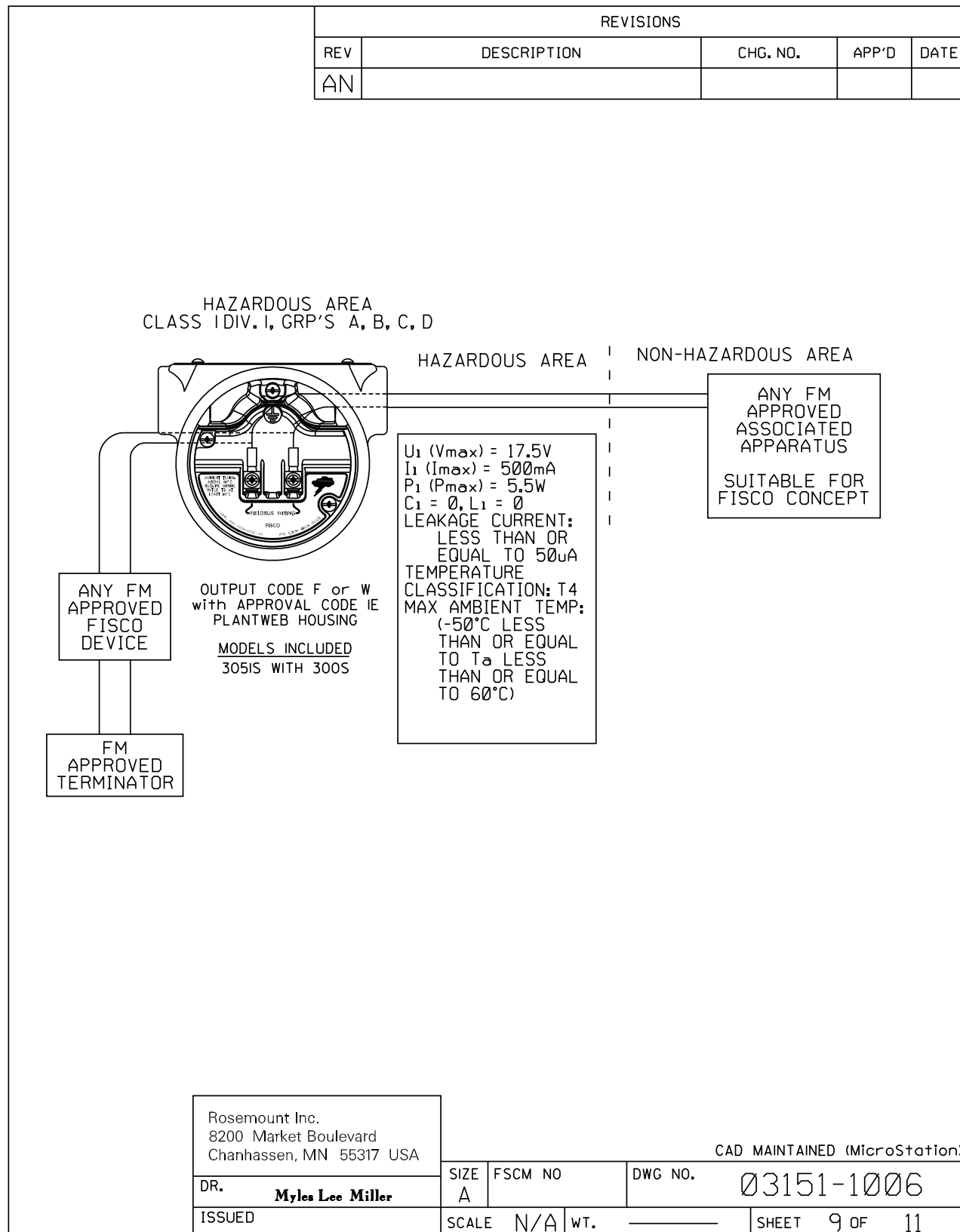
Loop Resistance R' :	15.....150 Ohm/km
Inductance per unit length L' :	0.4.....1 mH/km
Capacitance per unit length C' :	80.....200 nF
$C' = C' \text{ line/line} + 0.5C' \text{ line/screen}$, if both lines are floating, or	
$C' = C' \text{ line/line} + C' \text{ line/screen}$, if the screen is connected to one line	
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:

$R = 90.....1000\Omega$	$C = 0.....2.2\mu F$
-------------------------	----------------------

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 PERMITTED. THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)		
DR.	Myles Lee Miller	SIZE A	FSCM NO.	DWG NO. 03151-1006
ISSUED		SCALE N/A	WT. _____	SHEET 8 OF 11



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

NON-CLASSIFIED LOCATION

APPROVED NONINCENDIVE SUPPLY

V_{oc}
 C_a
 L_a

SEE SHT 11,
NOTES 2, 4, & 11

HAZARDOUS (CLASSIFIED) LOCATION
CLASS I, DIV. 2, GRP'S A, B, C, D

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

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

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

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

(D)

(D)

(D)

(D)

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

IN NORMAL OPERATION

DEVICES CONTROL THROUGH-CURRENT

PARAMETERS (NON-INCENDIVE FIELD WIRING)	DEVICE	ROSEMOUNT 3051S/300S					
		3051S 4-20mA / HART	MODEL 300S REMOTE METER	3051S QUICK CONNECT OR 300S OUTPUT CODE 'A' 4-20mA / HART	MODEL 300S HART DIAGNOSTICS OUTPUT CODE 'A' 4-20mA / HART	300S OUTPUT CODE 'B' (SAFETY CERTIFIED) 4-20mA / HART	FIELDBUS (F or W)
V_{max}		42.4v	42.4v	42.4v	42.4v	42.4v	35v
Maximum normal operating current		22mA	22mA	22mA	22mA	22mA	27mA
C_i		38nF	0nF	11.4nF	11.4nF	11.4nF	0uF
L_i		0uH	58.2uH	2.4uH	0uH	570uH	0uH

$I_{maxN} \geq I_{qN} + I_{signalN}$

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

I_{max} for an individual device = $I_q + I_{signal}$

I_q = Quiescent current through device
(Maximum quiescent current for the device)

I_{signal} = Signaling current through device
(Protocol may limit signaling to one device at a time)

Operating $I_{max} = I_{q1} + I_{q2} + \dots + I_{qN} + I_{signal\ max}$

$I_{signal\ max} = \text{Max. of } (I_{signal1}, I_{signal2}, \dots, I_{signalN})$

TEMP CODE: T4 ($T_a = -50^\circ\text{C}$ TO $+70^\circ\text{C}$)

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA

DR. **Myles Lee Miller**

ISSUED

SIZE A	FSCM NO	DWG NO. 03151-1006
SCALE N/A	WT.	SHEET 10 OF 11

CAD MAINTAINED (MicroStation)

Reference Manual

00809-0200-4801, Rev CA

July 2010

Rosemount 3051S

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

NOTES:

1. NO REVISION TO THIS DRAWING WITHOUT PRIOR FACTORY MUTUAL 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 BARRIER 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 OHM.
6. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA-RP12.6 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).
7. THE ASSOCIATED APPARATUS MUST BE FACTORY MUTUAL APPROVED.
8. WARNING - SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC AND NON-INCENDIVE SAFETY.
9. ASSOCIATED APPARATUS MUST MEET THE FOLLOWING PARAMETERS:
Uo or Voc or Vt LESS THAN or EQUAL TO U_i (V_{max})
Io or Isc or It LESS THAN or EQUAL TO I_i (I_{max})
Po or P_{max} LESS THAN or EQUAL TO P_i (P_{max})
Ca IS GREATER THAN or EQUAL THE SUM OF ALL Ci's PLUS C_{able}
La IS GREATER THAN or EQUAL THE SUM OF ALL Li's PLUS L_{able}
10. WARNING - TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)		
DR.	Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1006
ISSUED		SCALE N/A	WT. _____	SHEET 11 OF 11

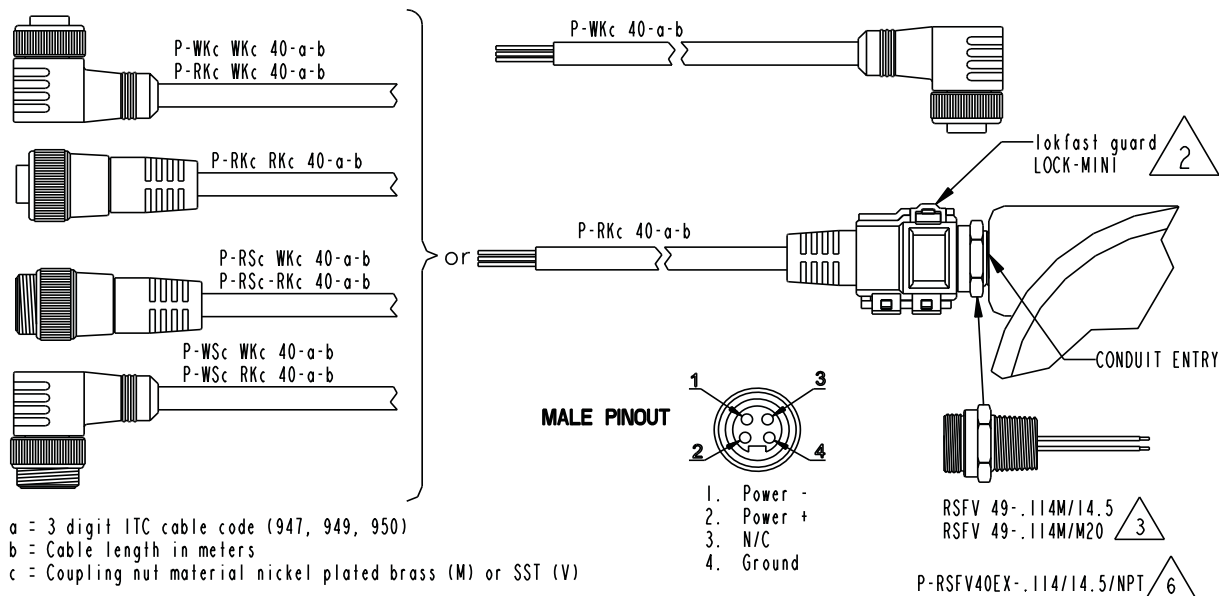
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.	REVISIONS				
	REV	DESCRIPTION	ECO NO.	APP'D	DATE
	AB	ADD NOTES 5 & 6	RTC1027013	T.T.S.	10/15/08

NOTES:

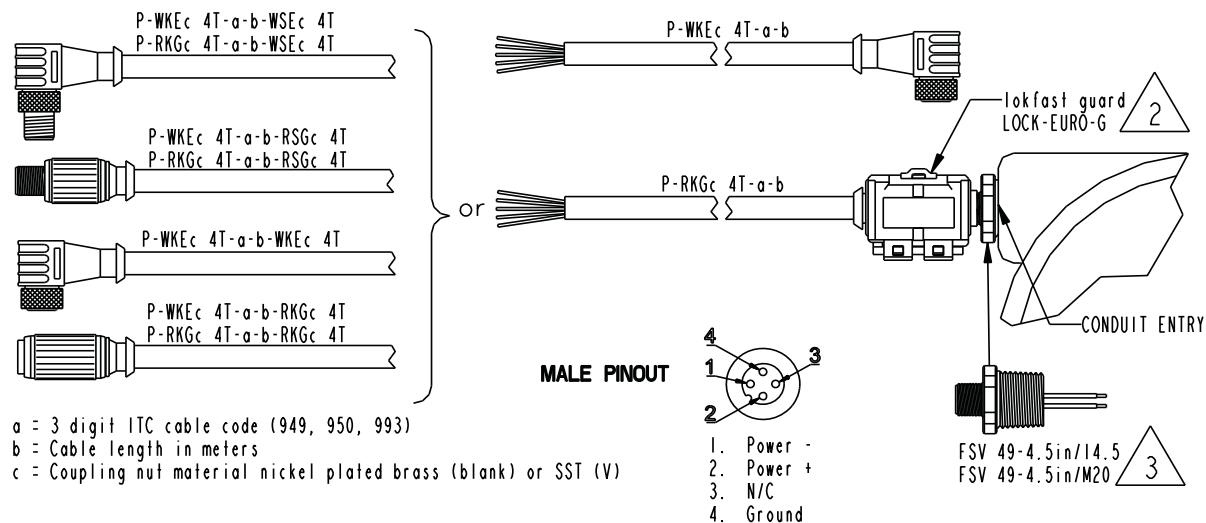
1. USE TURCK CORDSETS AS SPECIFIED IN THIS DRAWING WITH
GE / GM OPTION TO ENSURE OUTDOOR RATING (NEMA 4X or IP66).
2. LOK-FAST GUARD IS REQUIRED FOR CLASS 1 DIVISION 2
INSTALLATIONS.
3. (X)XXV 49-.114M/14.5 IS INSTALLED INTO 1/2-14 NPT
CONDUIT ENTRY THREADS. (X)XXV 49-.114M/M20 IS
INSTALLED INTO CM20 CONDUIT ENTRY THREADS.
4. eurofast® AND minifast® ARE REGISTERED TRADEMARKS OF TURCK INC.
5. SEE TURCK CONTROL DRAWING QCF-00147 (FM) OR NI-2.404 (CSA) FOR
GUIDANCE ON INSTALLATION OF CORDSETS IN HAZARDOUS LOCATIONS.
6. RECEPTACLE REQUIRED FOR USE WITH EQUIPMENT APPROVED AS
EXPLOSION-PROOF FOR CLASS 1, DIV 1 LOCATIONS.

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 ANGLES ± 1/32 ± 2° DO NOT SCALE PRINT	  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	AB
CAD MAINTAINED, (PRO/E)					SHEET 1 OF 3

GM OPTION WITH 4 - 20 mA / HART OUTPUT
A-SIZE MINI (minifast®), 4-PIN CONNECTION

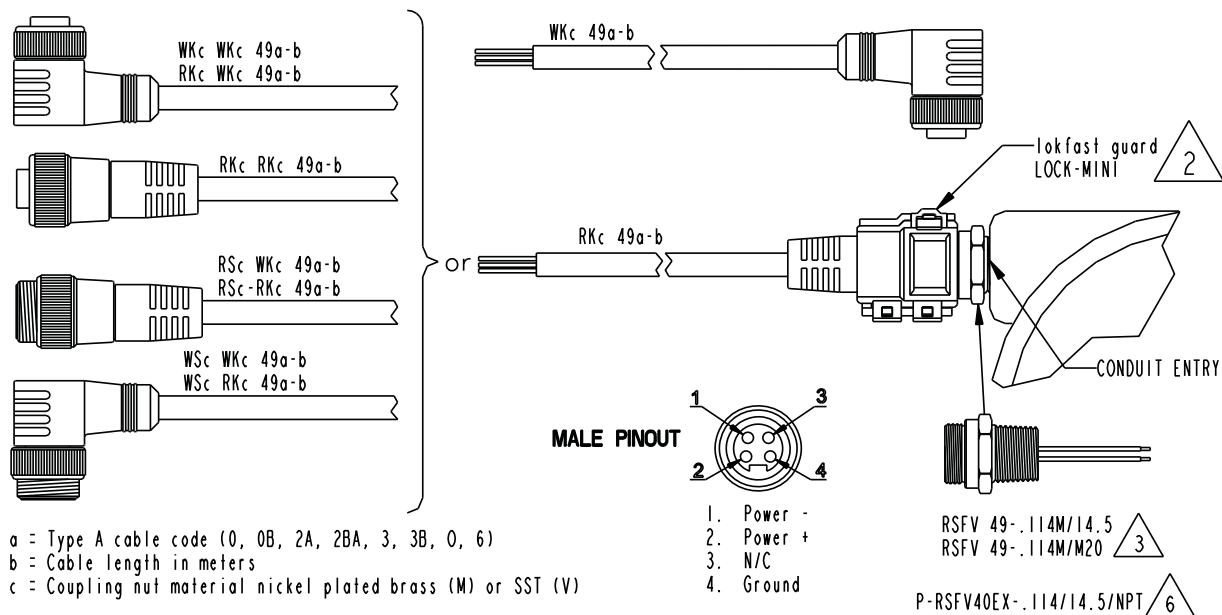


GE OPTION WITH 4 - 20 mA / HART OUTPUT
M12 (eurofast®), 4-PIN CONNECTION

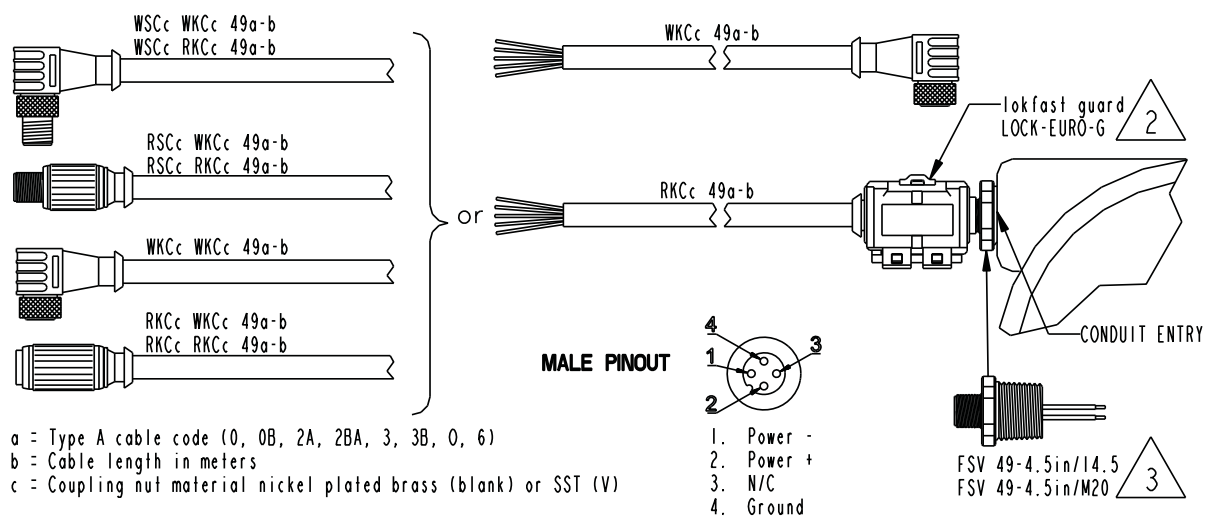


		ROSEMOUNT® 8200 Market Boulevard Chanhassen, MN 55317 USA	
SIZE A	DRAWING NO.	03151-1009	REV AB
CAD Maintained, (Pro/E)		SHEET 2 OF 3	

GM OPTION WITH FOUNDATION FIELDBUS
A-SIZE MINI (minifast®), 4-PIN CONNECTION



GE OPTION WITH FOUNDATION FIELDBUS
M12 (eurofast®), 4-PIN CONNECTION



		ROSEMOUNT® 8200 Market Boulevard Chanhassen, MN 55317 USA	
SIZE A	DRAWING NO.	03151-1009	REV AB
CAD Maintained, (Pro/E)		SHEET 3 OF 3	

Canadian Standards
Association (CSA)

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.	REVISIONS					
	ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
		AD	ADD NOTE 9	RTC1018745	B.L.H.	12/6/04
		AE	ADD NOTE 10 for DUAL SEAL	RTC1025955	T.T.S.	4/23/08
		AF	CORRECT TYPO IN NOTE 10	RTC1026088	T.T.S.	4/30/08

NOTES:

1. WIRING METHOD SUITABLE FOR CLASS I, DIV I WITH ANY LENGTH.
2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT GENERATING MORE THAN 250 VAC.
3. ALL CONDUIT THREADS TO BE ASSEMBLED WITH FIVE FULL TAPERED THREADS MINIMUM.
4. COMPONENTS REQUIRED TO BE APPROVED MUST BE APPROVED FOR GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.
5. 3051SC, 3051ST OR 3051SL SENSOR MODULE MUST BE INSTALLED WITH CSA FLAMEPROOF / EXPLOSIONPROOF APPROVED 300S1, 300S2 OR 300S4 HOUSING ATTACHED TO MEET FLAMEPROOF / EXPLOSIONPROOF INSTALLATION REQUIREMENTS. MINIMUM OF 7 FULL THREADS ENGAGED AND LOCKED IN PLACE. SEE PAGE 3.
6. INSTALLATION TO BE IN ACCORDANCE WITH THE LATEST EDITION OF CANADIAN ELECTRICAL CODE.
7. 300S1, 300S2 OR 300S4 HOUSING MUST BE INSTALLED WITH CSA FLAMEPROOF / EXPLOSIONPROOF APPROVED 3051SC, 3051ST OR 3051SL SENSOR MODULE ATTACHED TO MEET FLAMEPROOF / EXPLOSIONPROOF INSTALLATION REQUIREMENTS. MINIMUM OF 7 FULL THREADS ENGAGED AND LOCKED IN PLACE. SEE PAGE 3.
8. UNUSED CONDUIT ENTRY MUST BE CLOSED WITH SUITABLE BLANKING ELEMENT.
9. TEMPERATURE CODE T5, Tambient = -50°C to 85°C.
10. 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.

CAD Maintained, (Pro/E)

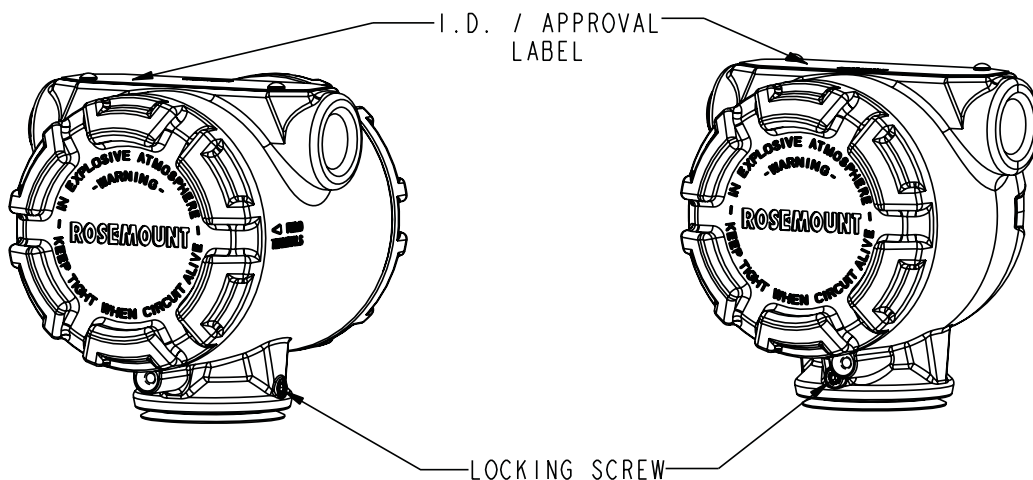
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES (mm). REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125	CONTRACT NO.		 ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA			
	DR. <i>Myles Lee Miller</i>	8/28/00	TITLE MODEL 3051 / 300 EXPLOSIONPROOF / FLAMEPROOF INSTALLATION DRAWING, CSA			
	CHK'D . .					
	APP'D Paul C. Sundet	10/19/00				
	-TOLERANCES-			SIZE A	FSCM NO.	DRAWING NO. 03151-1013
.X ± .1 [2,5] .XX ± .02 [0,5] .XXX ± .010 [0,25]						
FRACTIONS ± 1/32	ANGLES ± 2°					
DO NOT SCALE PRINT	APP'D GOVT.		SCALE 1 : 4	WT.	SHEET 1 OF 3	

REVISIONS					
ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AF				

COMPONENT IDENTIFICATION

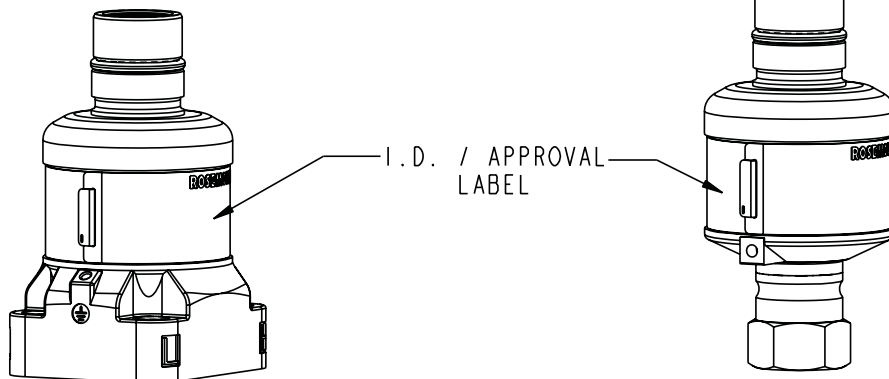
300S1_----, PLANTWEB
300S4_----, TRADITIONAL
(DUAL COMPARTMENT HOUSING)

300S2_----
JUNCTION BOX HOUSING
(SINGLE COMPARTMENT)

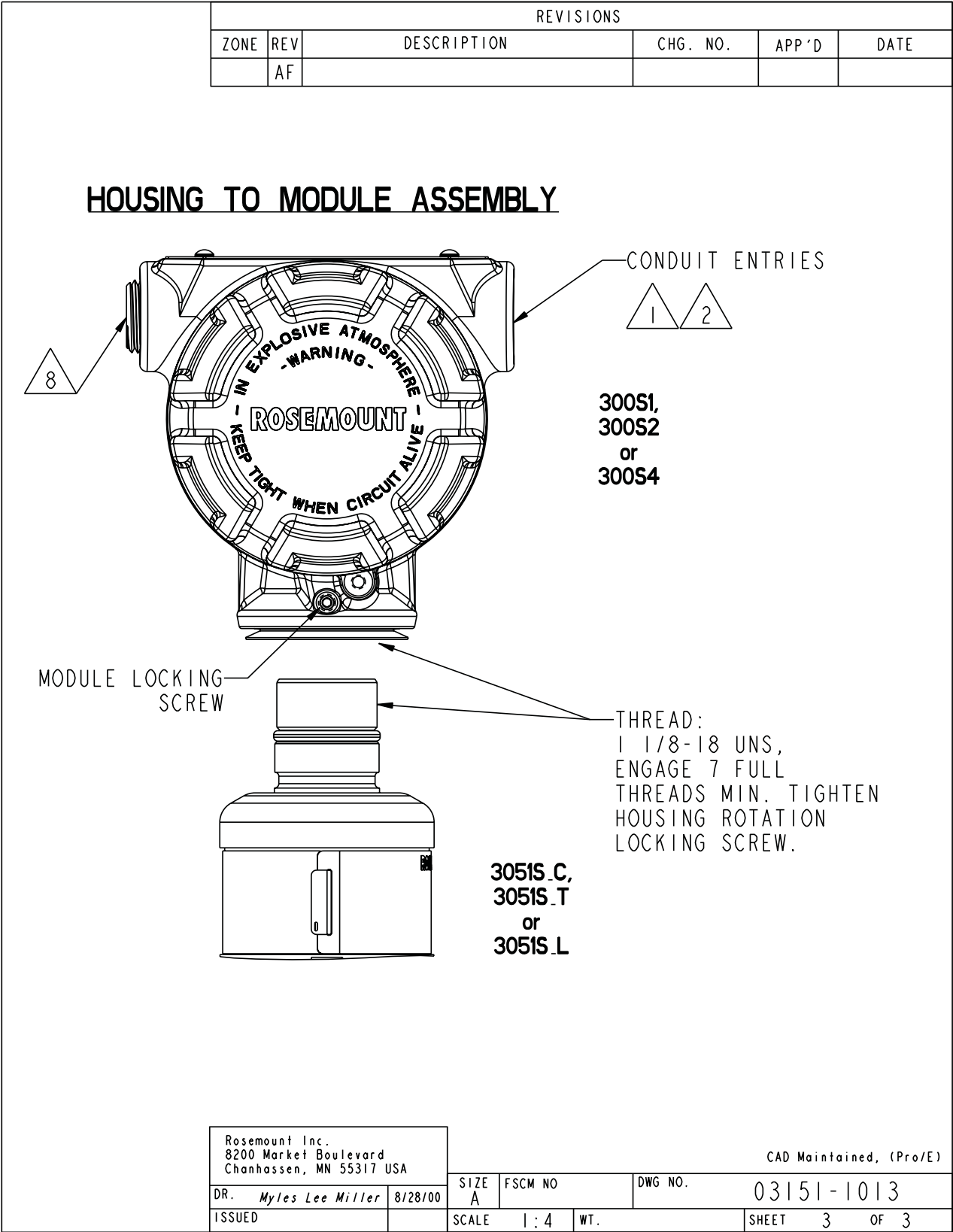


3051S_C_----
3051S_L_----
SCALABLE COPLANAR
PRESSURE TRANSMITTER

3051S_T_----
SCALABLE IN-LINE
PRESSURE TRANSMITTER



Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA			CAD Maintained, (Pro/E)		
DR. <i>Myles Lee Miller</i>	8/28/00	SIZE A	FSCM NO.	DWG NO.	03151-1013
ISSUED		SCALE	1:2	WT.	SHEET 2 OF 3



CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY	REVISIONS				
	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
	AJ	ADD QUICK CONNECT	RTC1020189	T.S.	8/31/05
	AK	ADD DIAGNOSTICS FEATURE BOARD	RTC1020856	J.D.V.	3/23/06
	AL	ADD NOTE 7 FOR DUAL SEAL	RTC1025955	T.T.S.	4/23/08
	AM	CORRECT TYPE IN NOTE 7	RTC1026088	T.T.S.	4/30/08
APPROVALS FOR OUTPUT CODES A,B,F,W I.S. ENTITY PARAMETERS SHEETS 2-3 OUTPUT CODES A,B (4-20 mA HART) I.S. SEE SHEETS 4-7 REMOTE METER (4-20 mA HART) I.S. SEE SHEET 6 OUTPUT CODE F/W (FIELD BUS) I.S. SEE SHEET 8 FISCO SEE SHEETS 9-10 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	CONTRACT NO.		 ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA		
	DR.	Myles Lee Miller	3/7/01	TITLE INDEX OF I.S. CSA FOR 3051S	
	CHK'D				
	APP'D.	Paul C. Sundet	8/6/01		
			SIZE A	FSCM NO	DWG NO. 03151-1016
DO NOT SCALE PRINT		APP'D. GOVT.	SCALE N/A	WT. _____	SHEET 1 OF 10

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

ENTITY CONCEPT APPROVALS

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

FOR OUTPUT CODE A MODEL 3051S
CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$C_I = 38nF$	C_A IS GREATER THAN 38nF + C_{cable}
$L_I = 0$	L_A IS GREATER THAN 0 H + L_{cable}

FOR OUTPUT CODE A WITH MODEL 300S JUNCTION BOX, 300S PLANTWEB HOUSING, OR 3051S QUICK CONNECT CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$C_I = 11.4nF$	C_A IS GREATER THAN 11.4nF + C_{cable}
$L_I = 2.4\mu H$	L_A IS GREATER THAN 2.4μH + L_{cable}

FOR OUTPUT CODE A WITH REMOTE METER CONFIGURATION (OPTION CODES M8 or M9)
CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$C_I = 0nF$	C_A IS GREATER THAN C_{cable}
$L_I = 58.2\mu H$	L_A IS GREATER THAN 58.2μH + L_{cable}

FOR OUTPUT CODE A WITH HART DIAGNOSTICS SUITE AND MODEL 300S PLANTWEB HOUSING
CLASS I, DIV. 1, GROUPS A, B, C AND D

$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$C_I = 11.4nF$	C_A IS GREATER THAN 11.4nF + C_{cable}
$L_I = 0$	L_A IS GREATER THAN 0 H + L_{cable}

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. 03151-1016
ISSUED		SCALE N/A	WT. _____ SHEET 2 OF 10

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

FOR OUTPUT CODE B (SAFETY CERTIFIED SIS) WITH MODEL 300S PLANTWEB HOUSING
CLASS I, DIV. 1, GROUPS A, B, C AND D

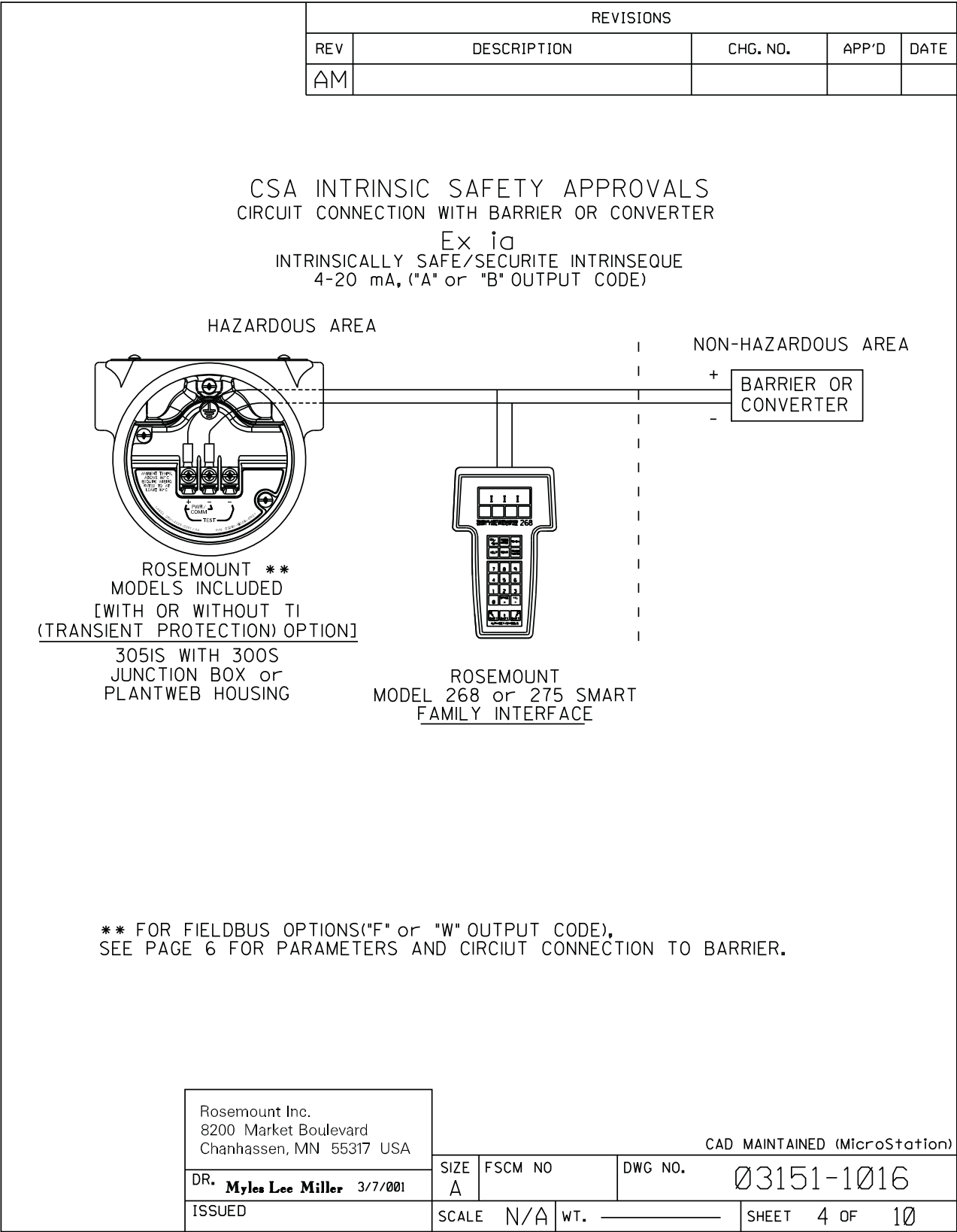
$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$C_1 = 11.4nF$	C_A IS GREATER THAN $11.4nF + C_{cable}$
$L_1 = 570\mu H$	L_A IS GREATER THAN $570\mu H + L_{cable}$

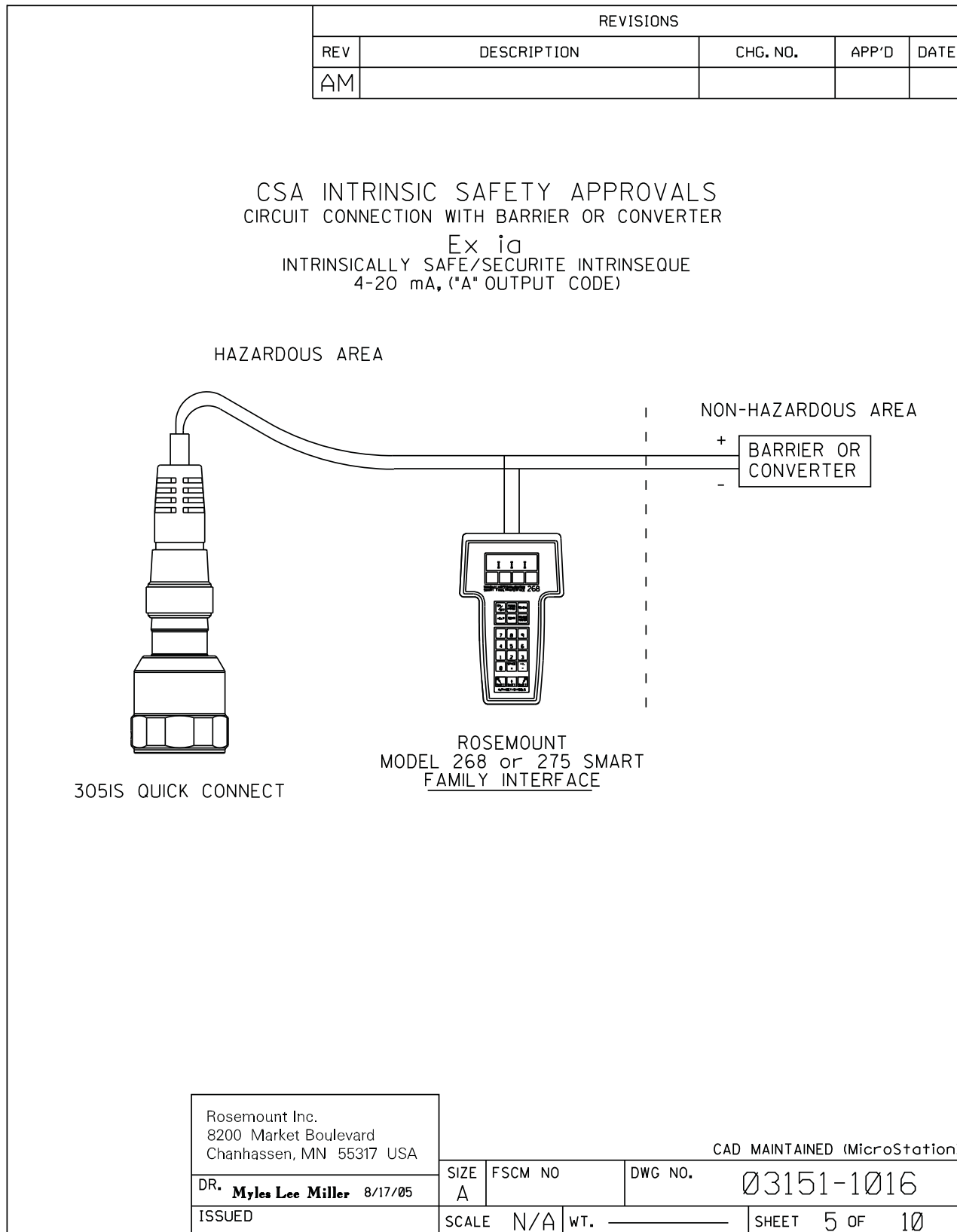
FOR OUTPUT CODE F or W WITH MODEL 300S PLANTWEB HOUSING
CLASS I, DIV. 1, GROUPS A, B, C AND D

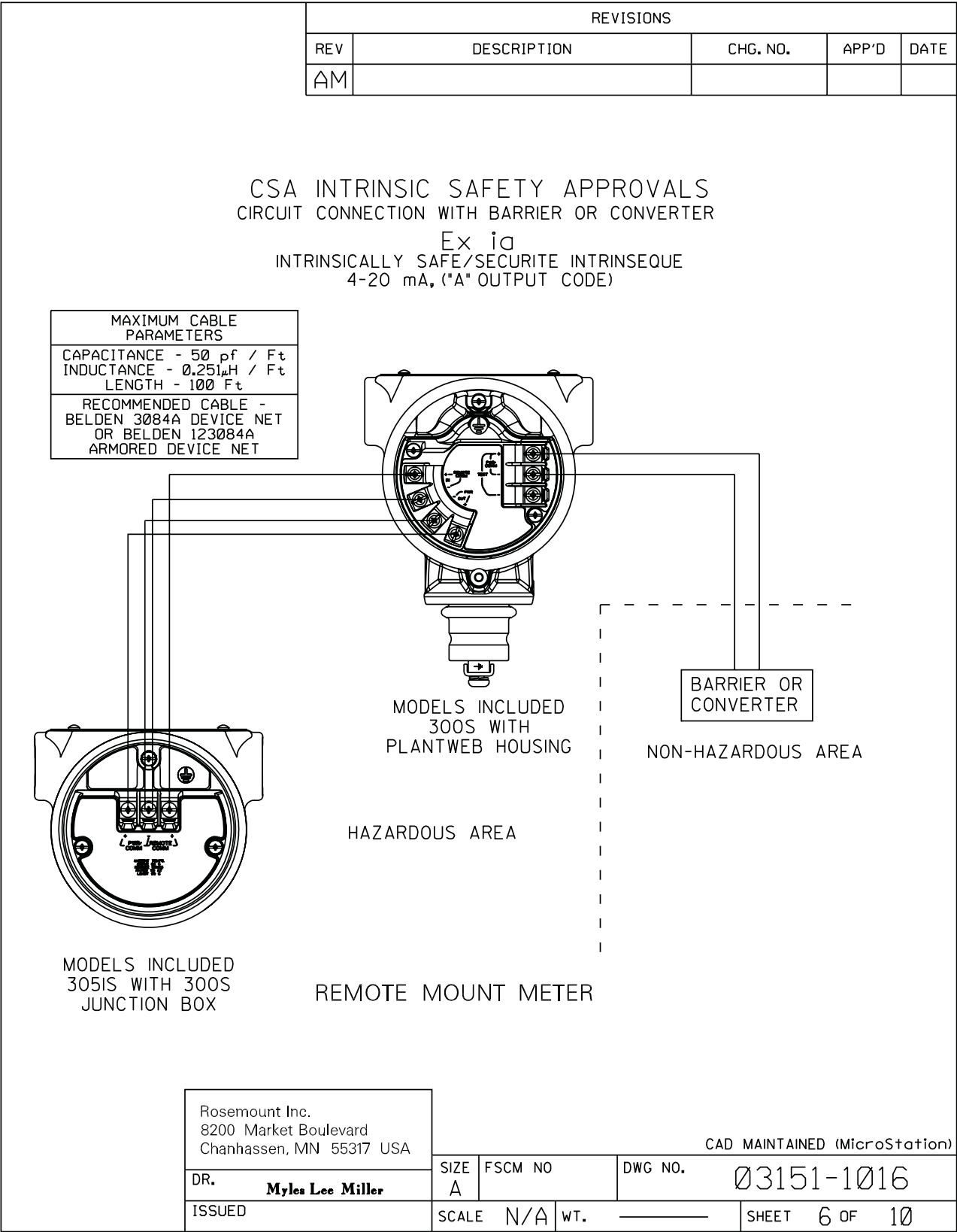
$V_{MAX} = 30V$	V_{OC} IS LESS THAN OR EQUAL TO 30V
$I_{MAX} = 300mA$	I_{SC} IS LESS THAN OR EQUAL TO 300mA
$C_1 = 0\mu f$	C_A IS GREATER THAN $0\mu f + C_{cable}$
$L_1 = 0\mu H$	L_A IS GREATER THAN $0\mu H + L_{cable}$

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

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)		
DR.	Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1016
ISSUED		SCALE N/A	WT. _____	SHEET 3 OF 10







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

4-20 mA, ("A" or "B" OUTPUT CODE)

DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV.I
CSA APPROVED SAFETY BARRIER	30 V OR LESS * 330 OHMS OR MORE * 28 V OR LESS 300 OHMS OR MORE 25 V OR LESS 200 OHMS OR MORE * 22 V OR LESS 180 OHMS OR MORE	GROUPS A, B, C, D
FOXBORO CONVERTER 2AI-I2V-CGB, 2AI-I3V-CGB, 2AS-I3I-CGB, 3A2-I2D-CGB, 3A2-I3D-CGB, 3AD-I3I-CGB, 3A4-I2D-CGB, 2AS-I2I-CGB, 3F4-I2DA		GROUPS B, C, D
CSA APPROVED SAFETY BARRIER	30 V OR LESS 150 OHMS OR MORE	GROUPS C, D

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)	
		SIZE A	FSCM NO DWG NO. 03151-1016
DR. Myles Lee Miller		SCALE N/A	WT. _____
ISSUED		SHEET 7 OF 10	

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

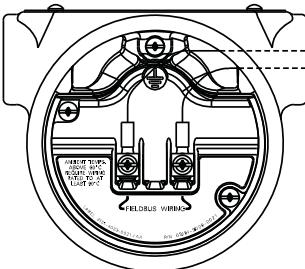
FIELDBUS, ("F" or "W" OUTPUT CODE)

DEVICE	PARAMETERS	APPROVED FOR CLASS I, DIV. I
CSA APPROVED SAFETY BARRIER	30 V OR LESS	GROUPS A, B, C, D
	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	

CSA INTRINSIC SAFETY APPROVALS
CIRCUIT CONNECTION WITH BARRIER OR CONVERTER

Ex ia
INTRINSICALLY SAFE/SECURITE INTRINSEQUE
FIELDBUS, ("F" or "W" OUTPUT CODE)

HAZARDOUS AREA



ROSEMOUNT **
MODELS INCLUDED
[WITH OR WITHOUT TI
(TRANSIENT PROTECTION) OPTION]
3051S WITH 300S
PLANTWEB HOUSING

NON-HAZARDOUS AREA

+

-

BARRIER OR
CONVERTER

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.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)	
DR. Myles Lee Miller	SIZE A	FSCM NO	DWG NO. Ø3151-1Ø16
ISSUED	SCALE N/A	WT. _____	SHEET 8 OF 10

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

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 (V_{max}), THE CURRENT (I_{max}), AND THE POWER (P_{max}) WHICH AN INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE CONSIDERING FAULTS, MUST BE EQUAL OR GREATER THAN VOLTAGE (V_{oc}), AND CURRENT (I_{sc}) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (C_1) AND THE INDUCTANCE (L_1) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELD BUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 μ H RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELD BUS SYSTEM. THE VOLTAGE (V_{oc}) 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 50 μ A FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELD BUS 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.....1000hm	C = 0.....2.2uF
-------------------	-----------------

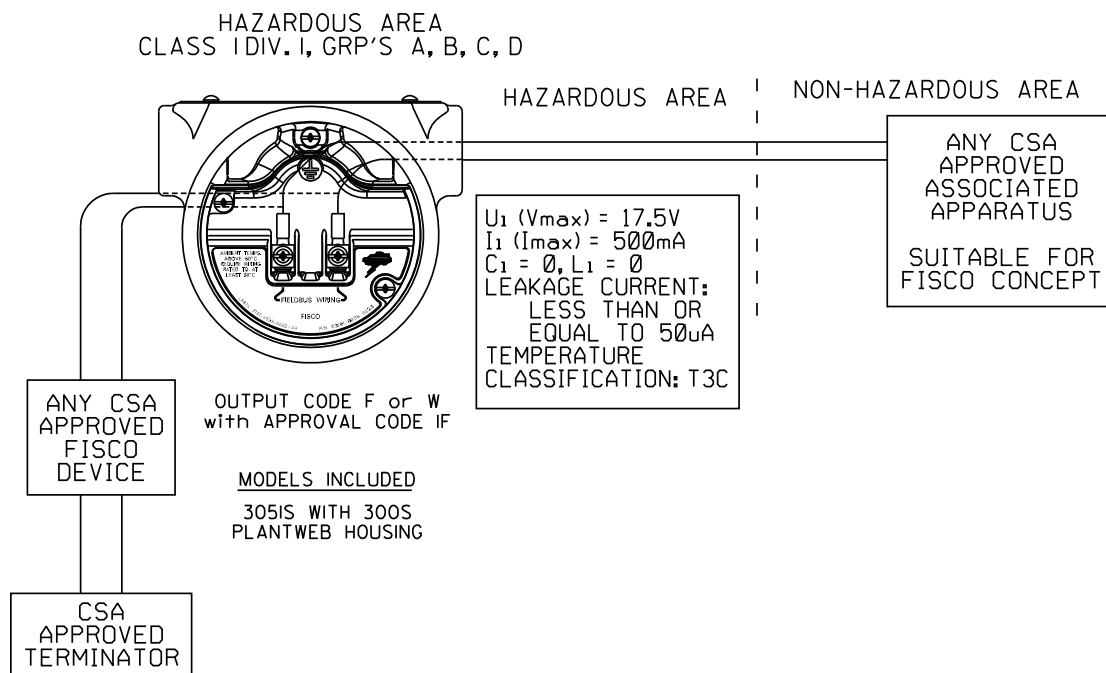
ONE OF THE ALLOWED TERMINATIONS MIGHT ALREADY BE INTEGRATED IN THE ASSOCIATED APPARATUS. THE NUMBER OF PASSIVE APPARATUS CONNECTED TO THE BUS SEGMENT IS NOT LIMITED DUE TO I. S. REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF TRUNK AND ALL SPUR CABLES) OF CABLE IS PERMITTED. THE INDUCTANCE AND THE CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD MAINTAINED (MicroStation)		
DR.	Myles Lee Miller	SIZE A	FSCM NO	DWG NO. 03151-1016
ISSUED		SCALE N/A	WT. _____	SHEET 9 OF 10

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

NOTES:

1. APPROVED ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. CSA APPROVED ASSOCIATED APPARATUS MUST MEET THE FOLLOWING PARAMETERS:
 V_{oc} LESS THAN OR EQUAL TO (V_{max}) AND I_{sc} LESS THAN OR EQUAL TO (I_{max}) .
3. THE MAXIMUM NON-HAZARDOUS AREA VOLTAGE MUST NOT EXCEED 250V.
4. THE INSTALLATION MUST BE IN ACCORDANCE WITH CANADIAN ELECTRICAL
5. CAUTION: USE ONLY SUPPLY WIRES SUITABLE FOR 5°C ABOVE SURROUNDING 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.



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				SHEET	10 OF 10

KEMA

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.	REVISIONS					
	ZONE	REV	DESCRIPTION	CHG. NO.	APP'D	DATE
		AB	ADD 3051SL AND TRADITIONAL HOUSING	RTC1015145	B.L.H.	4/7/03
		AC	UPDATE NOTE 8	RTC1025701	T.T.S.	3/5/08
		AD	UPDATE NOTE 8 AND THREAD DESCRIPTION	RTC1026395	T.T.S.	6/30/08

NOTES:

1. WIRING METHOD SUITABLE FOR CATEGORY 2,
(ZONE 1) WITH ANY LENGTH.
2. TRANSMITTER MUST NOT BE CONNECTED TO EQUIPMENT
GENERATING MORE THAN 250 VAC.
3. ALL CONDUIT THREADS TO BE ASSEMBLED WITH FIVE FULL
THREADS MINIMUM.
4. COMPONENTS REQUIRED TO BE APPROVED MUST BE APPROVED
FOR GAS GROUP APPROPRIATE TO AREA CLASSIFICATION.
5. 3051SC, 3051ST OR 3051SL SENSOR MODULE MUST BE INSTALLED WITH
CENELEC FLAMEPROOF APPROVED 300S1, 300S2 OR 300S4 HOUSING
ATTACHED TO MEET FLAMEPROOF INSTALLATION REQUIREMENTS.
6. INSTALLATION TO BE IN ACCORDANCE WITH APPLICABLE LOCAL
REQUIREMENTS.
7. 300S1, 300S2 OR 300S4 HOUSING MUST BE INSTALLED WITH CENELEC
FLAMEPROOF APPROVED 3051SC, 3051ST OR 3051SL SENSOR MODULE
ATTACHED TO MEET FLAMEPROOF INSTALLATION REQUIREMENTS.
8. UNUSED CONDUIT ENTRY MUST BE CLOSED WITH A EN/IEC 60079-1
FLAMEPROOF APPROVED BLANKING ELEMENT.

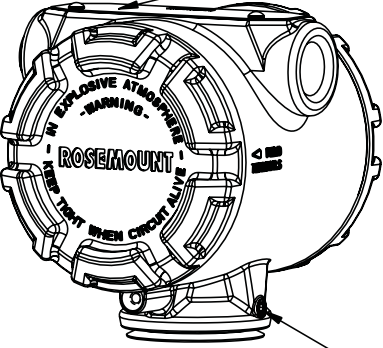
CAD Maintained, (Pro/E)

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 ANGLES ± 1/32 ± 2° DO NOT SCALE PRINT	CONTRACT NO.		 ROSEMOUNT® 8200 Market Boulevard • Chanhassen, MN 55317 USA	
	DR. <i>Myles Lee Miller</i>	8/28/00		
	CHK'D			
	APP'D <i>Paul C. Sundet</i>	9/11/00		
		SIZE A	FSCM NO.	DRAWING NO. 03151-1023
APP'D GOVT.	SCALE 1 : 4	WT.	SHEET 1 OF 3	

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

COMPONENT IDENTIFICATION

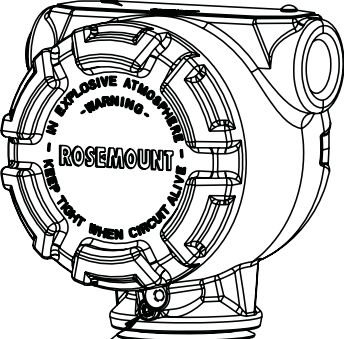
300S1----, PLANTWEB
300S4----, TRADITIONAL
(DUAL COMPARTMENT HOUSING)



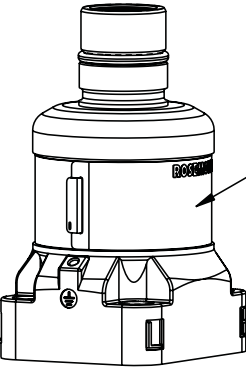
I.D. / APPROVAL LABEL

LOCKING SCREW

300S2----
JUNCTION BOX HOUSING
(SINGLE COMPARTMENT)

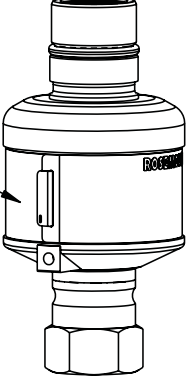


3051S_C----
3051S_L----
SCALABLE COPLANAR
PRESSURE TRANSMITTER



I.D. / APPROVAL LABEL

3051S_T----
SCALABLE IN-LINE
PRESSURE TRANSMITTER



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DR. *Myles Lee Miller* 8/28/00

ISSUED

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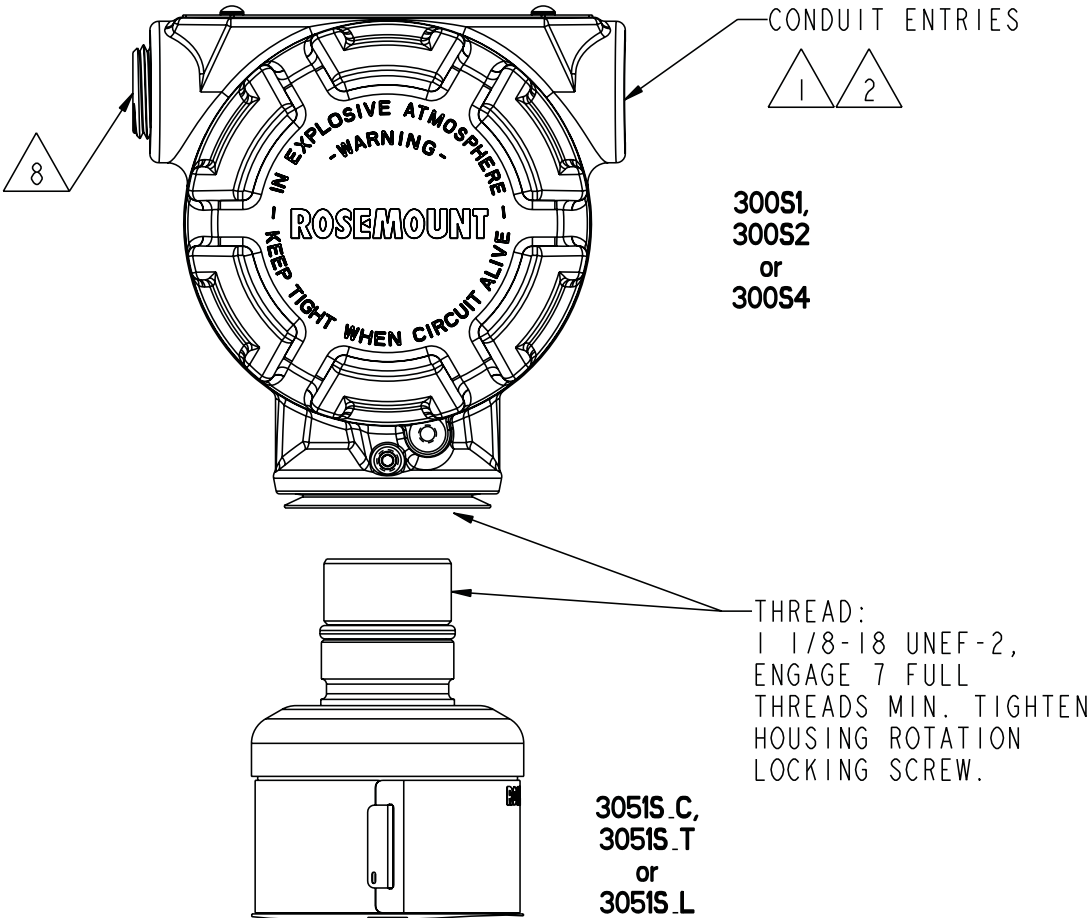
SIZE A FSCM NO. DWG NO. 03151-1023

SCALE 1:2 WT. SHEET 2 OF 3

Form Rev AC

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

HOUSING TO MODULE ASSEMBLY



300S1,
300S2
or
300S4

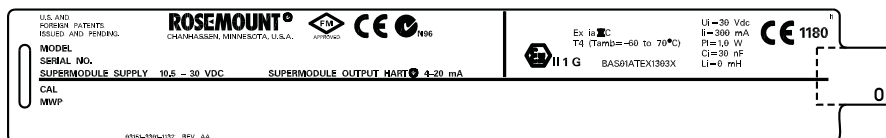
3051S.C,
3051S.T
or
3051S.L

Rosemount Inc. 8200 Market Boulevard Chanhassen, MN 55317 USA		CAD Maintained, (Pro/E)			
		SIZE A	FSCM NO	DWG NO. 03151-1023	
DR. Myles Lee Miller	8/28/00	SCALE 1:4	WT.	SHEET 3	OF 3

EUROPEAN ATEX DIRECTIVE INFORMATION

CENELEC/BASEEFA

Rosemount 3051S pressure transmitters that have the following label attached, have been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19–April–1994.



The following information is provided as part of the labeling of the transmitter:

Name and address of the manufacturer (any of the following):

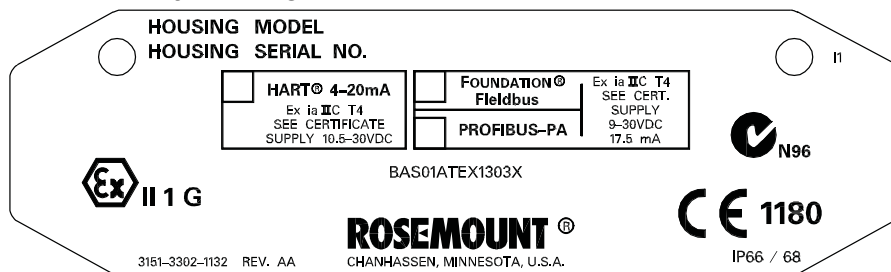
- Rosemount USA
- Rosemount Germany
- Rosemount Singapore



- Complete model number
- The serial number of the device
- Year of construction
- Marking for intrinsic safety protection:
 - Ex ia IIC T4 (T_{amb} = -60 to 70 °C)
 - Ui = 30 V dc, Ii = 300 mA, Pi = 1.0 W, Ci = 30 nF, Li = 0 mH
 - BASEEFA ATEX certificate number: BAS01ATEX1303X



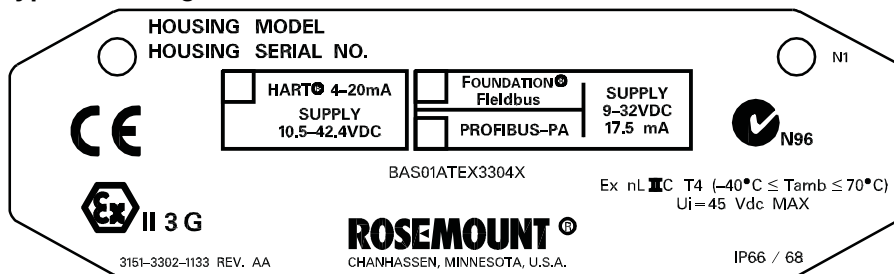
Intrinsic Safety housing label



- Marking for intrinsic safety protection:
 - Ex ia IIC T4 (See Certificate)
 - BASEEFA ATEX certificate number: BAS01ATEX1303X

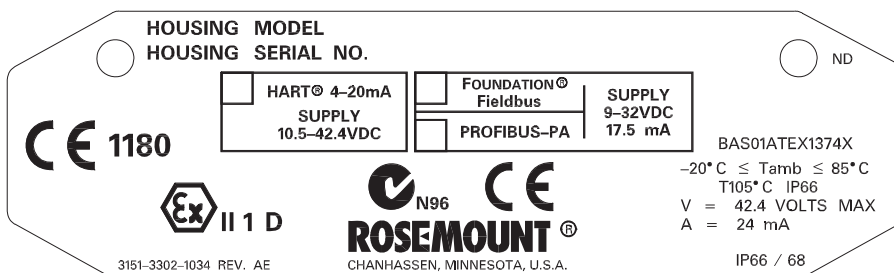


Type n housing label



- Marking for type n protection:
Ex nAnL IIC T4 ($-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 70^{\circ}\text{C}$)  II 3 G
Ui = 45 Vdc MAX
BASEEFA ATEX certificate number: BAS01ATEX3304X

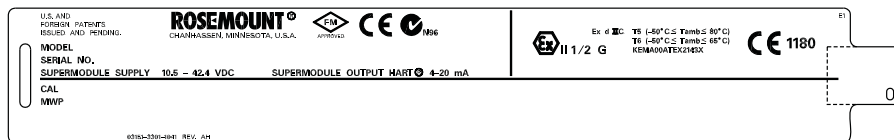
Dust housing label



- Marking for dust protection:
 $-20^{\circ}\text{C} \leq T_{\text{amb}} \leq 85^{\circ}\text{C}$
T105°C
IP66
V = 42.4 VOLTS MAX
A = 24 mA
BASEEFA ATEX certificate number: BAS01ATEX1374X

CENELEC/KEMA FLAMEPROOF

The Rosemount 3051S and 300S pressure transmitters that have the following label attached, have been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19–April–1994.



The following information is provided as part of the labeling of the transmitter:

Name and address of the manufacturer (any of the following):

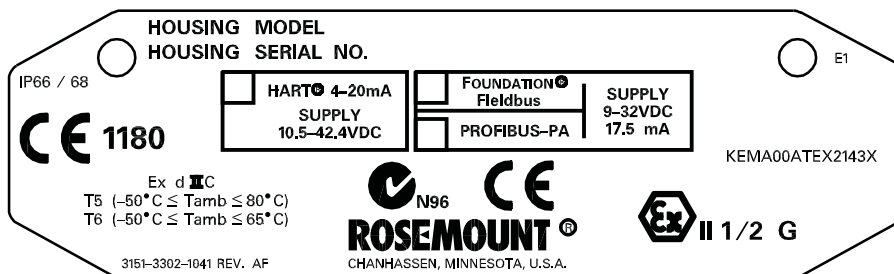
- Rosemount USA
- Rosemount Germany
- Rosemount Singapore



- Complete model number
- The serial number of the device
- Year of construction
- Marking for flameproof protection:
Ex d IIC T6 ($T_{amb} = -50$ to 65 °C)
Ex d IIC T5 ($T_{amb} = -50$ to 80 °C)
ATEX certificate number: KEMA00ATEX2143X



Housing Label



- Marking for flameproof protection:
Ex d IIC T6 ($T_{amb} = -50$ to 65 °C)
Ex d IIC T5 ($T_{amb} = -50$ to 80 °C)
ATEX certificate number: KEMA00ATEX2143X



Appendix D

3051S FOUNDATION fieldbus
Revision 23 Release

New Function Blocks	page D-1
New Functionality	page D-2

NEW FUNCTION
BLOCKS

Compensated Mass Flow Transducer Block

This block has all the functionality of the 3095 MultiVariable Mass Flow transmitter with its fully compensated real-time mass flow calculation. It uses the 3095 Engineering Assistant configuration package that contains a built in property data base with 110 fluids/gases and over 25 different primary elements to configure the flow calculation. The block can receives Line Pressure and Temperature measurements from separate Pressure and Temperature transmitters on the segment.

It also supports fixed static pressure and/or process temp values, entered by the operator.

The Mass flow value can be displayed on the LCD and can be totaled in the Integrator Block.

Analog Output Blocks

Two Analog Output Blocks are used bring in the static pressure and temperature variables needed to calculate mass flow.

Control Selector

The Control Selector is designed to select one of two or three inputs for control. The selection can be the highest, middle, or lowest. The inputs are normally connected to the outputs of PID or other function blocks. The block is configured to use one of the inputs to control its output. The other two inputs can be configured to override the selected input if the process conditions so require.

Output Splitter

The output splitter is designed to split the output of one PID or other control blocks so it can control two valves or actuators. Although there are many uses for the block, the example below is controlling the temperature inside a reactor with exothermic reaction. In order to start the reaction, the reactants have to be heated. The controller signal is split in a way to have the heating fluid valve controlling the temperature while the cooling valve remains closed. When the reaction starts, heat is liberated and the heating valve is closed. The coolant valve takes over. The block allows different combinations of actions.

Multiple Analog Input

A MAI block was added to publish statistical data from the Advanced Diagnostic Block.

NEW FUNCTIONALITY

PID with Auto Tuner

This block has now been improved to include an auto-tune function.

Advanced Diagnostic Block

The Statistical Process Monitoring with continuous update of mean and standard deviation at sensor update rate – Previous to Revision 23, SPM values, Mean and Standard Deviation, could be viewed but not connected to a control strategy. With the addition of the MAI Block and one extra AI block all the values can be connected to other Function Blocks, in the field devices or in the DCS. A rolling average of value is also now available out of the SPM function. This rolling average is the value of the variable updates during one macro cycle.

Live software download support

Fieldbus devices can be upgraded, in the field, with an upgraded version of software. As there are many new diagnostics and functions in development, this is a very important feature. The process to download the new software was proprietary in the past. The Foundation has now come out with a “Common Software Download Specification” specification for software download from any host. The 3051S complies with the CSDS standard and categorized as a Class 1 device which means the device remains fully functional while the new firmware is being downloaded. Other classes (2&3) require the transmitter to be offline and possibly disruptive to download software.

Sensor transducer block now complies with Standard with the recent Pressure Calibration profile

Calibrating a FF transmitter can be a cumbersome task. It requires a sequence of operations that must be followed properly or the device may not operate with the proper accuracy. Unfortunately different suppliers took different approaches on how to get this done and calibrator companies have been reluctant to make FF calibrators. The Foundation has since developed a standard for sensor transducer blocks which now comply with. This change does not affect our calibration methods, it will just make it easier for calibrator companies to enter the market.

Resource block with Health Index

The Resource Block now publishes the Health Index of the transmitter. The Health Index is a number from 0 to 100 and is calculated by using the all the Alarms, Alerts, and block statuses of the transmitter. The number reflects the transmitter health

NV memory metering

The most common types of Non Volatile memory have a limit for the number of writes that can be performed in a certain memory position. If this limit is exceeded, the memory is damaged. In normal operation conditions, the number of writes during the transmitter life is well below the limit. But some users may use non conventional configuration techniques that write continuously to the memory. A typical example is to write the alarm limits every control cycle. The NV metering algorithm limits the rate of writes, protecting the memory against excessive writes and alarms if the rate exceeds the tolerated rate.

Revised function blocks (comply w/ most recent ITK)

The Arithmetic, Characterizer and Integrator blocks had small changes made to them to bring them in compliance to ITK 5.0 (One of the first devices to pass this level).

Sensor status remains Uncertain when reading is beyond the sensor limits (increased robustness)

Previous to this release when a pressure went beyond the sensor limits the pressure status would go to BAD. For example; on a range 2 coplanar transmitter the published upper sensor limit is 250in H₂O although it will still accurately read up to 277 inH₂O and then continue to read much higher but without much accuracy. In the previous release once the pressure went about 277 inH₂O the status went to BAD which could initialize a safety action. Due to customer demand, if the pressure goes above 277 inH₂O the status now goes to uncertain which allows the operator to determine whether that pressure is bad or not.

The status does go to Bad when the absolute limit of the sensor is reached.

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Rosemount 3051S

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Reference Manual

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