

# Rosemount™ 8800D Series Vortex Flowmeter

with FOUNDATION™ Fieldbus





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# Rosemount™ 8800D Vortex Flowmeter

## 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, Emerson Process Management has two toll-free assistance numbers:

Customer Central

Technical support, quoting, and order-related questions.

1-800-522-6277 (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

## 1.1 Using this manual

The sections in this manual provide information on installing, configuring, troubleshooting, and performing other procedures for the Rosemount™ 8800D Vortex Flowmeter with FOUNDATION™ Fieldbus. Specifications and other important information are also included. The sections are organized as follows:

[Section 2: Configuration and Operation](#) describes operation, software functionality, and configuration procedures.

[Section 3: Installation](#) provides assistance in hardware installation and wiring.

[Section 4: Transducer Block](#) provides descriptions of transducer block parameters, errors, and diagnostics.

[Section 5: Resource Block](#) provides descriptions of resource block parameters, errors, and diagnostics.

[Section 6: Analog Input Function Block](#) provides descriptions of analog input function block parameters, errors, and diagnostics.

[Section 7: Troubleshooting](#) provides troubleshooting information for the most common problems that occur during operation. It describes the advanced troubleshooting features provided by the flowmeter and provides the maintenance procedures required to disassemble and re-assemble the hardware components.

[Appendix A: Specifications and Reference Data](#) provides reference and specification data for the flowmeter and its applications.

[Appendix B: Product Certifications](#) provides the available product certifications and hazardous area approvals.

[Appendix C: Electronics Verification](#) provides a procedure for verification of electronic output to assist in meeting the quality standards for ISO 9001-certified manufacturing processes.

## 1.2 FOUNDATION Fieldbus technology

FOUNDATION Fieldbus is an all digital, serial, two-way communication system that interconnects field equipment such as sensors, actuators, and controllers. Fieldbus is a Local Area Network (LAN) with built-in capability to distribute control applications across the network for instruments that are used in both process and manufacturing automation

environments. The fieldbus environment is the base level group of digital networks in the hierarchy of plant networks.

The fieldbus retains the desirable features of the 4–20 mA analog system, including a standardized physical interface to the wire, bus-powered devices on a single pair of wires, and intrinsic safety options. In addition, it enables the following capabilities:

- Increased capabilities due to full digital communications
- Reduced wiring and wire terminations due to multiple devices on one pair of wires
- Increased selection of suppliers due to interoperability
- Reduced loading on control room equipment with the distribution of some control and input/output functions to field devices
- Speed options for process control and manufacturing applications.

## 1.3 System description

The Rosemount 8800D Vortex Flowmeter with FOUNDATION fieldbus consists of a meter body and transmitter. It measures volumetric flow rate by detecting the vortices created by a fluid passing by the shedder bar.

The meter body is installed in-line with process piping. A sensor is located at the end of the shedder bar and creates an alternating sine wave signal due to the passing vortices. The transmitter measures the frequency of the signal and converts it into a flowrate.

This manual is designed to assist in the installation and operation of the flowmeter.

### WARNING

This product is intended to be used as a flowmeter for liquid, gas, or steam applications. Any use other than for which it was intended may result in serious injury or death.

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# Section 2 Configuration and Operation

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## 2.1 Overview

This section covers operation, software functionality, and configuration procedures for the Rosemount™ 8800D Vortex Flowmeter with FOUNDATION™ Fieldbus. This section is organized by block information. For detailed information about the function blocks used in the flowmeter, refer to the Rosemount FOUNDATION Fieldbus Block [Reference Manual](#).

## 2.2 Safety messages

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

### **⚠ WARNING**

#### **Explosions 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.

## 2.3 User interfaces

The flowmeter has both DD and DTM™-based user interfaces. All device configuration and maintenance tasks can be performed using either communication technology.

Device Descriptors (DDs) and DTM files for Rosemount products are available on the [Emerson Install Kits website](#).

The DD capabilities supported will vary based on host supplier and host revision. Check with the host supplier to determine and obtain the appropriate DD for your situation. The type of DD your host supports may influence navigation between different functions.

## 2.4 Commissioning

Commissioning the flowmeter consists of verifying the transmitter configuration and operation. Typically this should be done before the flowmeter is installed in the application environment. In most cases, the user-supplied variables are pre-configured in the transmitter at the factory, so the meter is ready to use upon arrival at the end user installation.

Configuration may be required if:

- Any configuration variables have changed.
- A replacement transmitter is being installed.

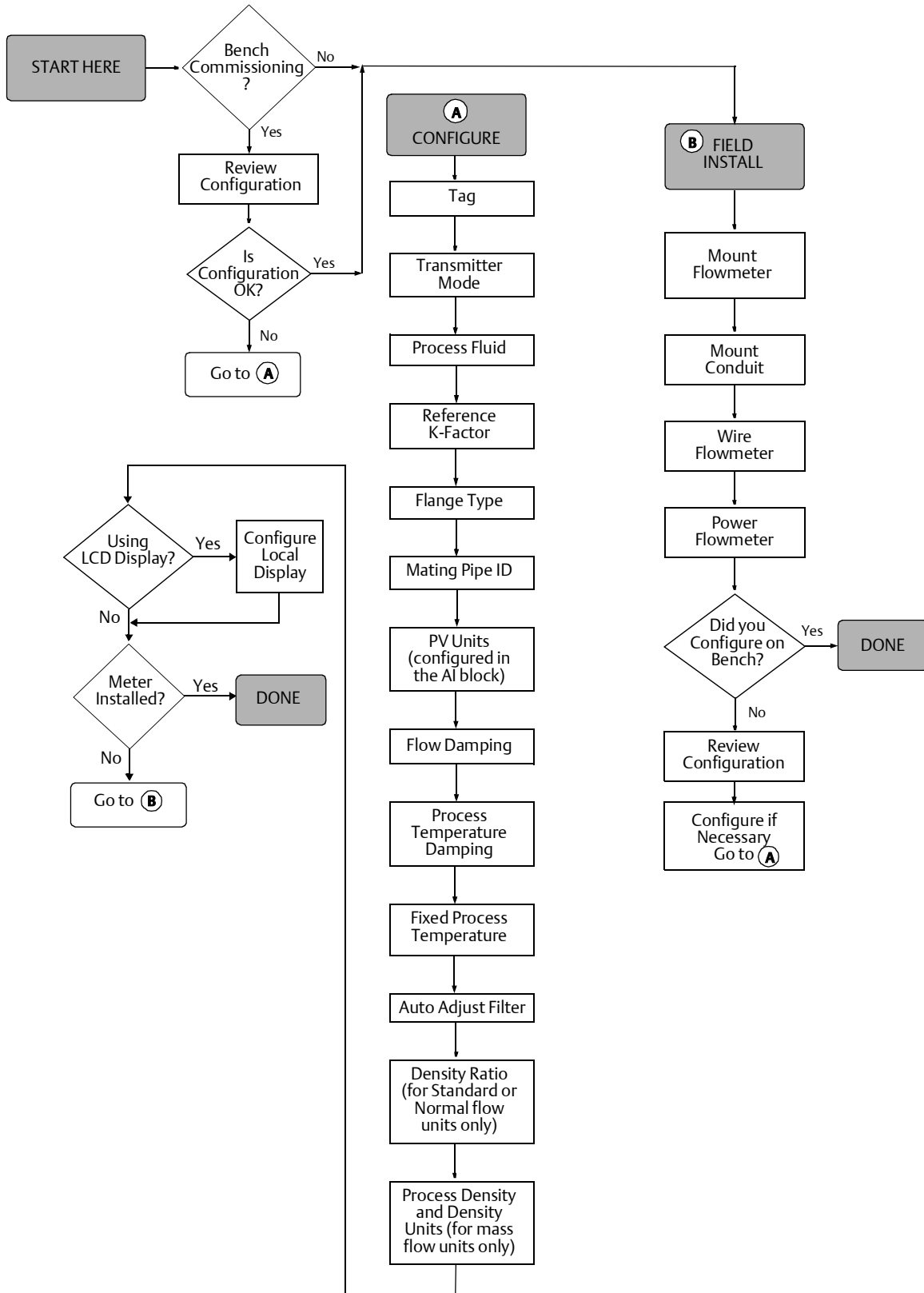
To commission, connect power to the device and connect a Field Communicator or Foundation Fieldbus host system to the signal loop.

1. Verify the device powers up and communicates with the Field Communicator or host system.
2. Verify transmitter configuration parameters. Following are typical parameters to check:
  - Tag
  - Transmitter Mode
  - Process Fluid
  - Reference K-factor
  - Flange Type
  - Mating Pipe ID
  - PV Units (configured in the AI block)

- Flow Damping
  - Fixed Process Temperature
  - Fixed Process Density and Density Units
  - Density Ratio (for Standard or Normal flow units only)
3. If transmitter functional verification is required, refer to [Appendix C: Electronics Verification](#).

The flowchart in [Figure 2-1](#) is a general guide for commissioning and meter installation. It can serve as a checklist to be referenced before and during installation of the flowmeter.

Figure 2-1. General Guide for Commissioning and Meter Installation





## 2.5 General block information

Reference information on the process control function blocks can be found in the Function Block manual document number 00809-0100-4783.

### 2.5.1 Modes of operation

The Resource, Transducer, and all other 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.

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 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

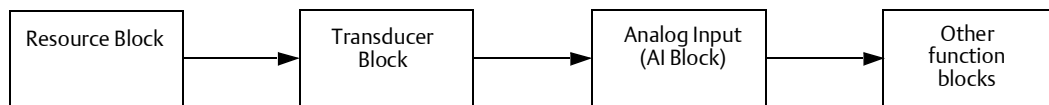
In this mode, variables that are passed out of the block can be manually set for testing or override purposes.

#### 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 flowmeter. For more information, see the Function Block manual, document 00809-0100-4783.

#### Note

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



#### 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.

## 2.5.2 Block instantiation

The Rosemount 8800D Device Revision 10 supports block instantiation. Previous device revisions do not support 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, Analog Input, and PID 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. Refer to your specific host or configuration tool manual for more information.

## 2.6 Resource Block

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

### 2.6.1 FEATURES and FEATURES\_SEL

The `FEATURES` parameter is read only and defines which features are supported by the flowmeter. Below is a list of the `FEATURES` the flowmeter 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 flowmeter does not select any of these features. Choose one or more of the supported features if any.

#### UNICODE

All configurable string variables in the flow meter, 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 flow meter 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.

#### SOFTWARE LOCK and HARDWARE 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.

Table 2-1 displays all possible configurations of the WRITE\_LOCK parameter.

**Table 2-1. 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) <sup>(1)</sup>	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.

## 2.6.2 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.

## 2.6.3 PlantWeb™ alarms

The alarms and recommended actions should be used in conjunction with [Table 7-2](#).

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.

### 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 four 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. NV memory failure
2. Sensor board electronics failure
3. Output board electronics failure
4. Thermocouple failure (MTA only)

#### 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 17. 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.

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

1. Low pass filter over range
2. Low-flow cutoff over range
3. Density calc using fixed temp (MTA only)
4. Trigger over range
5. Electronics temp beyond limit (MTA only)

#### **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 16. 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.

#### **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. Flow simulation mode
2. PWA simulation active
3. Low flow cutoff active
4. Flow signal injection
5. PV range exceeded
6. Sensor range exceeded
7. Process temp above USL (427 °C) (MTA only)
8. Process temp below LSL ( -50 °C) (MTA only)
9. Process temp above sat steam limit (MTA only)
10. Process temp below sat steam limit (MTA only)

#### **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 16. 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**

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 Table 5-1. Reference Index Number 78.

## 2.7 Transducer Block

The Transducer Block contains sensor and process fluid information used by the transmitter for accurate measurements.

## 2.7.1 Parameters

To make parameter changes, the Block Mode must be in the Out of Service (OOS) mode of operation.

The Transducer Block parameters must be correct for an accurate measurement. These parameters are factory configured specifically for the measurement when the transmitter is sized using Rosemount Instrument Toolkit™ program.

## 2.7.2 XMTR\_MODE

Transmitter Mode

Without Temperature Sensor—No process temperature sensor available (Non MTA electronics)

With Temperature Sensor—Process temperature sensor installed (MTA electronics only)

## 2.7.3 PROCESS\_FLUID

Liquid—Process fluid is liquid

Gas/Steam—Process fluid is a gas

T Comp Sat Steam—Temperature Compensated Saturated Steam (MTA electronics only)

## 2.7.4 Reference K\_FACTOR

The factory calibrated K-Factor stamped on the meter body

## 2.7.5 FIXED\_PROC\_TEMPERATURE

Fixed Process Temperature. The operating temperature of the process

## 2.7.6 FIXED\_PROC\_DENSITY

Fixed Process Density. The density of the process fluid at flowing pressure and temperature

## 2.7.7 FLANGE\_TYPE

The flange rating and type to match the vortex meter body

## 2.7.8 PIPE\_INSIDE\_DIAMETER

The inside diameter (I.D.) of the mating pipe where the meter body is installed.

## 2.7.9 DAMPING

The flow damping value. Default is 2 seconds. Valid range is 0.2 to 255 seconds.

## 2.7.10 FILTER\_AUTO\_ADJUST

Optimize Signal Processing based on the density of the process fluid. Select the incremental value equal to or less than the process fluid density.

### 2.7.11 PRIMARY\_VALUE\_RANGE

Range of the flow measurement. The units match the XD\_SCALE units from the AI Block assigned to Flow

### 2.7.12 SENSOR\_RANGE

Range the meter is capable of measuring. The maximum measurable flow rate the vortex meter will measure

The units match the XD\_SCALE units from the AI Block assigned to Flow

### 2.7.13 SECONDARY\_VALUE

The shedding frequency measured by the vortex sensor in units of Hz

### 2.7.14 INSTALLATION\_EFFECTS

Installation Effect correction factor. Use when the meter is installed in less than ideal piping configuration. See Installation Effects document 00816-0100-3250 for details.

Valid range -1.5 to 1.5

### 2.7.15 PROCESS\_DENSITY\_RATIO

Density Ratio = Density at flowing P and T/Density at Standard P and T

The transmitter only uses density ratio when the flow output is in Standard or Normal units.

Examples of Standard unit: Standard Cubic Feet per Minute, SCFM

Example of Normal unit: Normal Cubic Meters per hour, NCMH

### 2.7.16 METER\_DISPLAY

Data displayed locally on LCD display.

The following measurements can be displayed on the flowmeter LCD display:

- Flow
- Transducer Percent Range—Percent range of maximum accurate flow
- Process Temperature—MTA electronics only
- Process Density—MTA electronics only
- Shedding Frequency
- Electronics Temperature—MTA electronics only
- Integrator Block Out—Totalized flow from Vortex meter Integrator Block

### 2.7.17 PROC\_TEMP\_DAMP

Process Temperature Damping. Only vortex meters with the MTA option measure process temperature.

The units are seconds, default is 2 seconds. Valid range is 0.4 to 32 seconds.



## 2.7.18 VEL\_MEAS\_BASE

Velocity Measurement Base. The velocity calculation can be based on the Mating Pipe inside diameter or the Meter body inside diameter. Default is the Mating pipe ID.

## 2.7.19 TC\_FAILURE\_MODE

Thermocouple Failure Mode. The MTA optioned meters measure process temperature with a thermocouple. If the thermocouple fails, the transmitter will indicate the failed sensor input. There are two options available for the transmitter operation after the sensor fails.

Sensor Failure; Status is BAD—Mass Flow measurement status is BAD.

Use Fixed Temp; Status is UNCERTAIN—Mass Flow calculation uses fixed temperature values when calculating density and status of measurement is UNCERTAIN .

## 2.7.20 LFC\_RESPONSE

Low Flow Cutoff Response. The flow measurement will be 0 when the measured flow is less than the Low Flow Cutoff.

The transition from the flow measurement down to 0 flow can be Damped or Stepped.

Damped will transition to 0 flow based on the Damping setting.

Stepped will transition to 0 flow as soon as the Low Flow Cutoff activates.

## 2.7.21 CALC\_PROC\_DENSITY

Calculated Process Density. The MTA optioned transmitters calculate the density of Saturated Steam based on the process temperature measurement.

The Calculated Process Density is used to determine the Mass Flow rate of saturated steam.

## 2.7.22 PROC\_TEMP\_RANGE

MTA option only. Process Temperature Range.

The process temperature range is the minimum and maximum temperature of the vortex sensor.

The Units will match the XD\_SCALE units of the AI Block assigned to Process Temperature

## 2.7.23 ELEC\_TEMP\_RANGE

MTA option only. Electronics Temperature Range.


The electronics temperature range is the minimum and maximum temperature rating for the electronic components.

The Units will match the XD\_SCALE units of the AI Block assigned to Electronics Temperature.

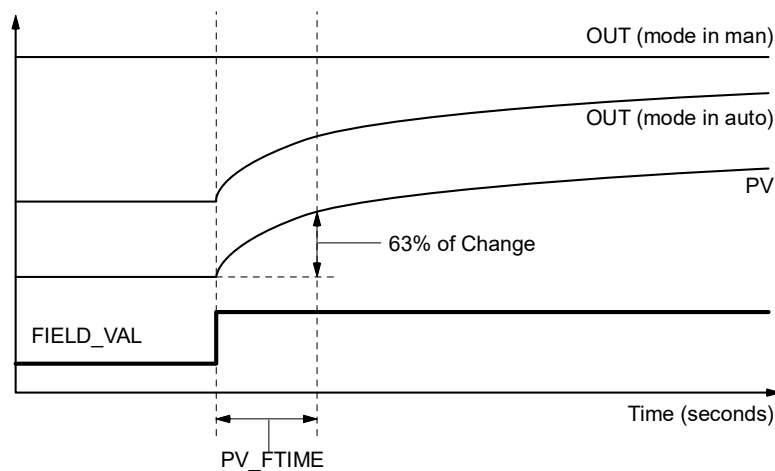
## 2.8 Analog Input (AI) Function Block

For information on the Analog Input (AI) Function Block, refer to [Section 6](#).


### 2.8.1 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 2-2. Analog Input PV\_FTIME Filtering**



### 2.8.2 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 flow measurement is close to zero.

**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.

### 2.8.3 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

## 2.8.4 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.

## 2.8.5 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.

### Note

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

## 2.8.6 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.

## 2.9 Flow simulation

The electronics is capable of internally generating a flow signal that may be used to simulate a sensor signal. The simulated signal amplitude is based on the transmitter required minimum process density. The simulated signal can be a constant frequency or the simulated signal can be a varying frequency to represent a ramping flow rate.

Simulating the flow signal requires the simulate ENABLE jumper on the transmitter electronics board to be in the 'ON' position. The transmitters are shipped with the jumper in the 'OFF' position.

### 2.9.1 Using transducer block parameters

#### SIMULATION\_CONTROL

Sim Disabled—Normal operation, no simulated flow signal.

Sim—Internal Generator—The internal frequency generator will produce the frequency signal.

Sim—External Generator—An External Frequency generator can be connected to Freq In and Ground connections on the electronics board.

#### SIMULATION\_UNITS

PV Engineering Units—Simulated flow will be in engineering units.

PV Percent of Range—Simulated flow will be in percentage of Primary Value flow range.

#### SIMULATION\_HIGH\_POINT

High simulation value in engineering units or percentage.

#### SIMULATION\_LOW\_POINT

Low simulation value in engineering units or percentage.

#### SIMULATION\_RAMP\_PERIOD

The time, in seconds, between low and high simulation points.

### 2.9.2 Configuration software

Configuration Software, such as AMS™ Wireless Configurator, simplifies the simulation process.

### AMS Revision 12 with Rosemount 8800D Device Revision 9

Set Target Mode to Out of Service by unchecking Auto and checking Out of Service boxes.

Set the simulation values as desired and return the mode to Auto.

The flow value will be simulated until the simulation is disabled. Simulation is also disabled with a power cycle.

### Device Revision 10

The Device Rev 10 interface steps through the simulation configuration after clicking the 'Simulate Flow' button. Follow the steps for the desired flow simulation.

## 2.10 Device capabilities

### 2.10.1 Link active scheduler

The flowmeter can be designated to act as the Backup Link Active Scheduler (BLAS) in the event that the LAS is disconnected from the segment. As the backup LAS, the flowmeter 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 flowmeter.
2. To activate the LAS capability, write 0x02 to the BOOT\_OPERAT\_FUNCTIONAL\_CLASS object (Index 605). To deactivate, write 0x01.
3. Restart the processor.

### 2.10.2 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.

**Table 2-2. Network Parameters and Values**

<b>Network parameter</b>	<b>Value</b>
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 = 15 ms  
PID = 20 ms  
Arithmetic = 20 ms  
Integrator = 25 ms

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## Section 3 Installation

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### 3.1 Overview

This section provides installation instructions for the Rosemount™ 8800D Vortex Flowmeter. Dimensional drawings for each variation and mounting configuration are included in [Appendix A: Specifications and Reference Data](#).

### 3.2 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Refer to the following safety messages before performing any operation in this section.

#### **⚠ WARNING**

This product is intended to be used as a flowmeter for liquid, gas, or steam applications. Any use other than for which it was intended may result in serious injury or death.

#### **Explosions could result in death or serious injury.**

- Do not remove the transmitter cover in explosive atmospheres when the circuit is live.
- Before connecting a FOUNDATION™ Fieldbus-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

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

- Make sure only qualified personnel perform the installation.
-

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## 3.3 Environmental considerations

Avoid excessive vibration, heat, and magnetic interference to ensure maximum flowmeter life and proper operation. Typical problem areas include:

- *High-vibration lines* with integrally mounted electronics. Ensure the meter and surrounding piping is properly supported.
- *Warm-climate installations in direct sunlight, and outdoor installations in cold climates.*
- *Steam lines with improper insulation or flowmeter orientation.* Follow the proper insulation and orientation procedures described in this manual.
- *High intensity electromagnetic and electrostatic fields.* Although the signal-conditioning functions reduce susceptibility to extraneous noise, some environments are more harsh than others. Avoid placing the flowmeter or its wiring close to devices that produce magnetic fields. Such devices include electric welding equipment, large electric motors and transformers, and communication transmitters.

## 3.4 Meter body installation tasks

The installation tasks include detailed mechanical and electrical installation procedures. For a general guide to meter installation, refer to [Figure 2-1](#) on page 6.

### 3.4.1 Handling

Handle all parts carefully to prevent damage. Whenever possible, transport the system to the installation site in the original shipping containers. Keep the shipping plugs in the conduit connections until you are ready to connect and seal them.

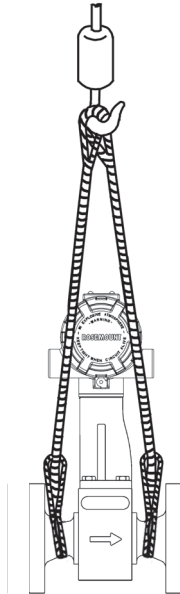
**Note**

Do not lift the flowmeter by the transmitter. Lift the meter by the meter body. Lifting supports can be tied around the meter body as shown in [Figure 3-1](#).

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Figure 3-1. Lifting Supports



### 3.4.2 Flow direction

Mount the meter body so the arrow, shown on the meter body, points in the direction of flow.

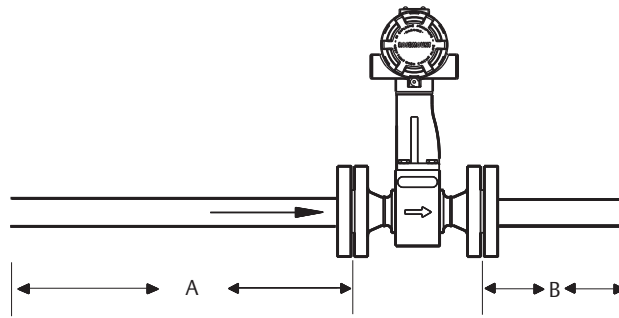
### 3.4.3 Upstream/downstream piping

Allow enough straight pipe both upstream and downstream of the meter body to ensure a non-skewed, symmetrical profile. Ideally, the vortex meter should be installed with a minimum of 35 straight pipe diameters (D) upstream and 10 straight pipe diameters (D) downstream as shown in [Figure 3-2](#). However, it can be installed with a minimum of 10 straight pipe diameters upstream and 5 straight pipe diameters downstream as shown in [Figure 3-3](#).

Rated accuracy is based on the number of pipe diameters from an upstream disturbance. An additional 0.5% shift in K-factor may be introduced between 10 D and 35 D, depending on disturbance.

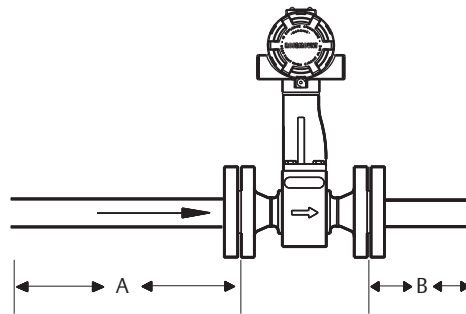
For more information on installation effects, see Technical Data Sheet 00816-0100-3250.

Figure 3-2. Ideal Installation



- A. 35 diameters (D) upstream
- B. 10 diameters (D) downstream

Figure 3-3. Acceptable Installation



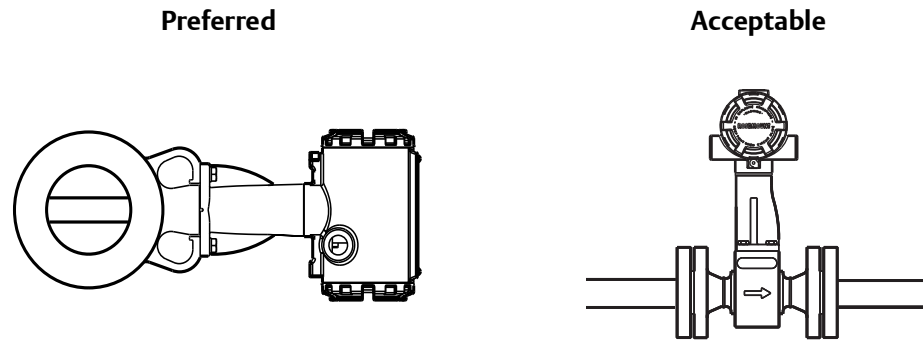
- A. 10 diameters (D) upstream
- B. 5 diameters (D) upstream

## 3.4.4 Flowmeter orientation

### Horizontal installation

For horizontal installation, the preferred orientation is to have the electronics installed to the side of the pipe as shown in [Figure 3-4](#). In liquid applications, this ensures any entrained air or solids do not strike the shedding bar and disrupt the shedding frequency. In gas or steam applications, this ensures that any entrained liquid (such as condensate) or solids do not strike the shedder bar and disrupt the shedding frequency.

Figure 3-4. Horizontal Installation

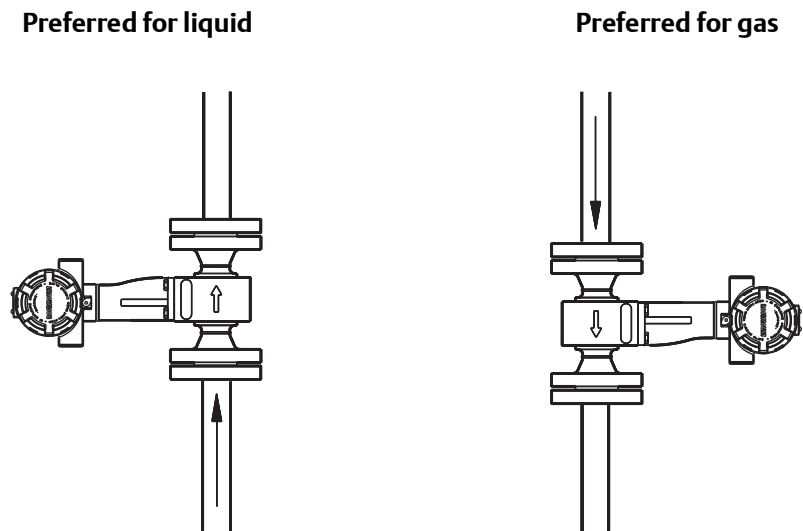


**Vertical installation**

Vertical installation allows upward process liquid flow and is generally preferred. Upward flow ensures the meter body always remains full and that any solids in the fluid are evenly distributed.

The vortex meter can be mounted in the vertical down position when measuring gas or steam flows. See Figure 3-5. This type of application should be strongly discouraged for liquid flows, although it can be done with proper piping design.

Figure 3-5. Vertical Installation



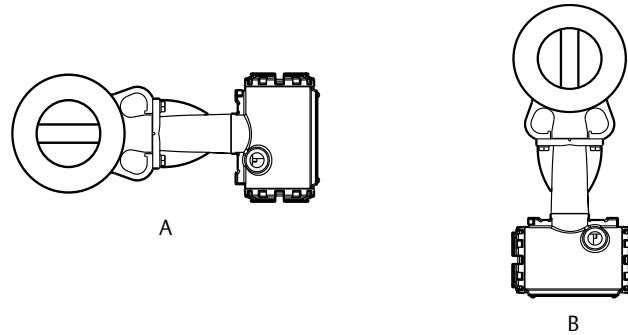
**Note**

To ensure the meter body remains full, avoid downward vertical liquid flows where back pressure is inadequate.

### 3.4.5 High-temperature installations

Install the meter body so the electronics are positioned to the side of the pipe or below the pipe, as shown in [Figure 3-6](#). Insulation may be required around the pipe to maintain a temperature below 185 °F (85 °C).

**Figure 3-6. Examples of High-Temperature Installations**

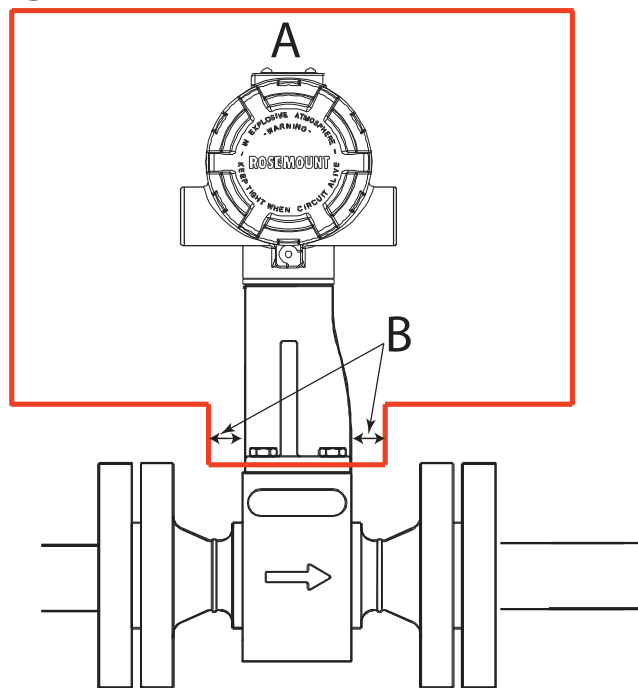


- A. The meter body installed with the electronics to the side of the pipe (preferred orientation).
- B. The meter body installed with the electronics below the pipe (acceptable orientation).

#### Important

When insulation is used, install it around the pipe and meter body only. The support tube bracket and electronic transmitter should not be insulated. See [Figure 3-7](#).

**Figure 3-7. Insulation**

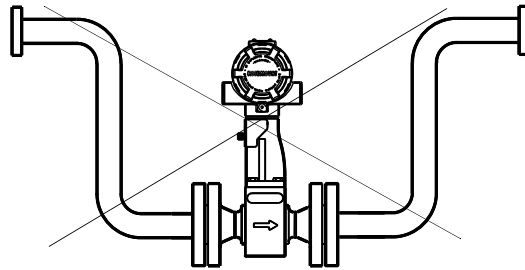


- A. Do not insulate within the RED area.
- B. 1 in. (25 mm) minimum

### 3.4.6 Steam installations

For steam applications, avoid installations such as the one shown in Figure 3-8 below. Such installations may cause a water-hammer condition at start-up due to trapped condensate. The high force from the water hammer can overstress the sensing mechanism and cause permanent damage to the sensor.

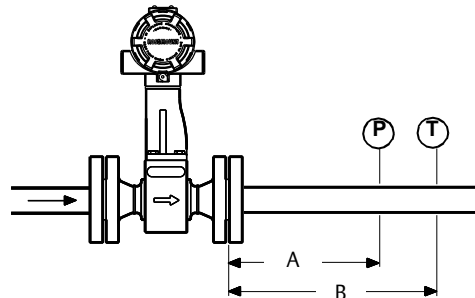
**Figure 3-8. Installation Type to Avoid for Steam Applications**



#### Pressure and temperature transmitter location

When using pressure and temperature transmitters in conjunction with the flowmeter for compensated mass flows, install the transmitter downstream of the flowmeter. See Figure 3-9.

**Figure 3-9. Pressure and Temperature Transmitter Location**



- A. Four diameters downstream
- B. Six diameters downstream

NOTE: The MTA option can be purchased for an integral temperature measurement and mass flow temperature compensation for saturated steam only.

### 3.4.7 Conduit connections

The electronics housing has two ports for 1/2–14 NPT or M20 ? 1.5 conduit connections. Unless marked otherwise conduit entries in the housing are 1/2 NPT. These connections are made in a conventional manner in accordance with local or plant electrical codes. Be sure to properly seal unused ports to prevent moisture or other contamination from entering the terminal block compartment of the electronics housing. Additional conduit entry types are available via adapters.

**Note**

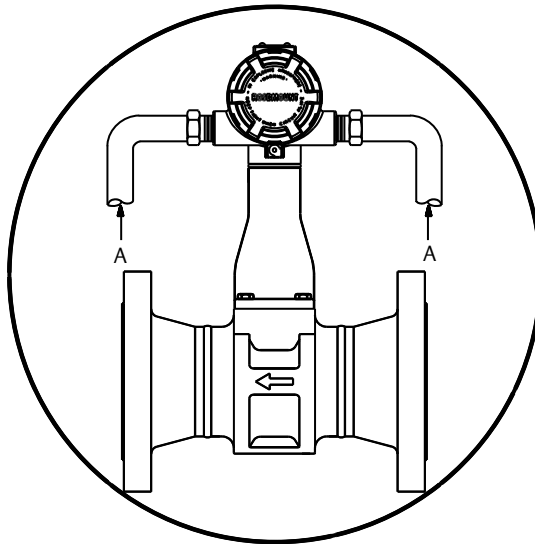
In some applications it may be necessary to install conduit seals and arrange for conduits to drain to prevent moisture from entering the wiring compartment. Should not be removed when circuit live or in explosive atmosphere.

### 3.4.8 High-point installation

Prevent condensation in any conduit from flowing into the housing by mounting the flowmeter at a high point in the conduit run. If the flowmeter is mounted at a low point in the conduit run, the terminal compartment could fill with fluid.

If the conduit originates above the flowmeter, route conduit below the flowmeter before entry. In some cases a drain seal may need to be installed.

**Figure 3-10. Proper Conduit Installation with the Flowmeter**



A. Conduit line

**Note**

In some applications it may be necessary to install conduit seals and arrange for conduits to drain to prevent moisture from entering the wiring compartment. These should not be removed when the circuit is live or in explosive atmosphere.

## 3.5 Hazardous locations

The flowmeter has an explosion-proof housing and circuitry suitable for intrinsically safe and non-incendive operation. Individual transmitters are clearly marked with a tag indicating the certifications they carry. To maintain certified ratings for installed transmitters, install in accordance with all applicable installation codes and approval drawings. For specific approval categories, refer to [Appendix B: Product Certifications](#).

### 3.5.1 Cable gland

If you are using cable gland instead of conduit, follow the cable gland manufacturer's instructions for preparation and make the connections in a conventional manner in accordance with local or plant electrical codes. Be sure to properly seal unused ports to prevent moisture or other contamination from entering the terminal block compartment of the electronics housing.

### 3.5.2 Gaskets

The flowmeter requires gaskets supplied by the user. Be sure to select gasket material that is compatible with the process fluid and pressure ratings of the specific installation.

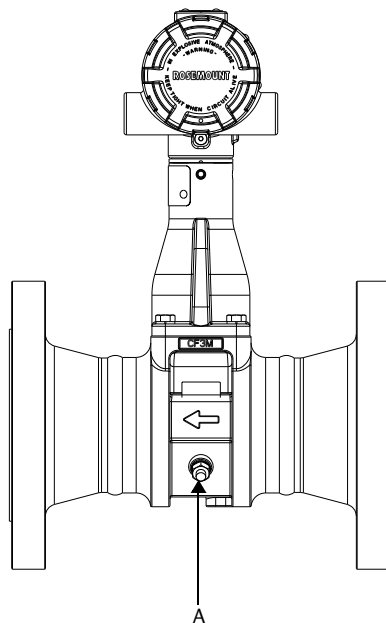
**Note**

Ensure the inside diameter of the gasket is larger than the inside diameter of the flowmeter and adjacent piping. If gasket material extends into the flow stream, it will disturb the flow and cause inaccurate measurements.

### 3.5.3 Meter body grounding

Typically the meter body will be earth grounded once it is installed in the pipe. However, the meter body does have a ground lug bolt that can be used for attaching a grounding strap. Attach one end of the grounding strap to the grounding bolt and the other end to a suitable earth ground.

**Figure 3-11. Ground Lug Bolt**



A. Ground lug bolt

**Note**

A grounding strap is specifically required if using the transient protection terminal block (Option Code T1). Always ground the meter per the local electrical code.

### 3.5.4 Flange bolts

Install the flowmeter between two conventional pipe flanges, as shown in Figure 3-12 and Figure 3-13 on page 33. Figure 3-6, Figure 3-2, and Figure 3-3 list the recommended minimum stud bolt lengths for wafer-style meter body size and different flange ratings.

**Table 3-1. Minimum Recommended Stud Bolt Lengths for Wafer Installation with ASME B16.5 (ANSI) Flanges**

Line size	Minimum recommended stud bolt lengths (in Inches) for each flange rating		
	Class 150	Class 300	Class 600
½-inch	6.00	6.25	6.25
1-inch	6.25	7.00	7.50
1½-inch	7.25	8.50	9.00
2-inch	8.50	8.75	9.50
3-inch	9.00	10.00	10.50
4-inch	9.50	10.75	12.25
6-inch	10.75	11.50	14.00
8-inch	12.75	14.50	16.75

**Table 3-2. Minimum Recommended Stud Bolt Lengths for Wafer Installation with DIN Flanges**

Line size	Minimum recommended stud bolt lengths (in mm) for each flange rating			
	PN 16	PN 40	PN 64	PN 100
DN 15	160	160	170	170
DN 25	160	160	200	200
DN 40	200	200	230	230
DN 50	220	220	250	270
DN 80	230	230	260	280
DN 100	240	260	290	310
DN 150	270	300	330	350
DN 200	320	360	400	420



**Table 3-3. Minimum Recommended Stud Bolt Lengths for Wafer Installation with JIS Flanges**

Line size	Minimum recommended stud bolt lengths (in mm) for each flange rating		
	JIS 10k	JIS 16k and 20k	JIS 40k
15mm	150	155	185
25mm	175	175	190
40mm	195	195	225
50mm	210	215	230
80mm	220	245	265
100mm	235	260	295
150mm	270	290	355
200mm	310	335	410

### 3.5.5 Wafer-style flowmeter alignment and mounting

Center the wafer-style meter body inside diameter with respect to the inside diameter of the adjoining upstream and downstream piping, which will ensure the flowmeter achieves its specified accuracy.

Alignment rings are provided with each wafer-style meter body for centering purposes. Complete the following steps to align the meter body for installation. Refer to [Figure 3-12](#) on page 32.

1. Place the alignment rings over each end of the meter body.
2. Insert the studs for the bottom side of the meter body between the pipe flanges.
3. Place the meter body (with alignment rings) between the flanges. Make sure the alignment rings are properly placed onto the studs. Align the studs with the markings on the ring that correspond to the flange you are using. If a spacer is used, refer to [Table 3-4](#) for Rosemount 8800A lay length.

**Note**

Align the flowmeter so the electronics are accessible, the conduits drain, and the flowmeter is not subject to direct heat.

4. Place the remaining studs between the pipe flanges.
5. Tighten the nuts in the sequence shown in [Figure 3-14](#) on page 34.
6. Check for leaks at the flanges after tightening the flange bolts.

**Note**

The required bolt load for sealing the gasket joint is affected by several factors, including operating pressure and gasket material, width, and condition. A number of factors also affect the actual bolt load resulting from a measured torque, including condition of bolt threads, friction between the nut head and the flange, and parallelism of the flanges. Due to these application-dependent factors, the required torque for each application may be different. Follow the guidelines outlined in ASME PCC-1 for proper bolt tightening. Make sure the flowmeter is centered between flanges of the same nominal size as the flowmeter.

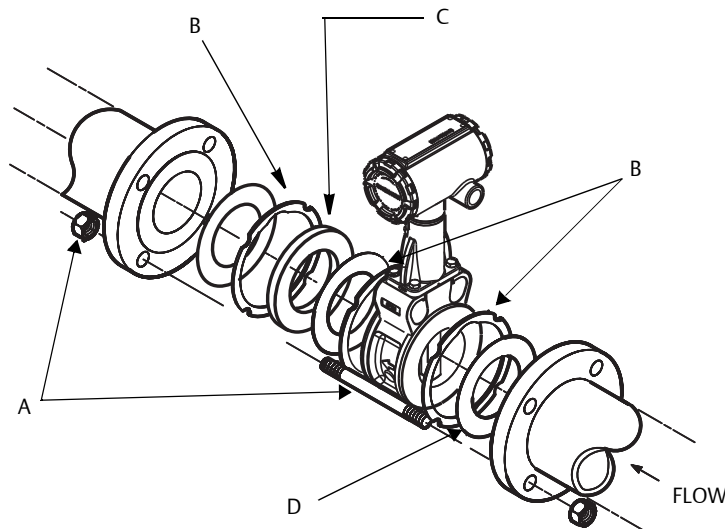
**Spacers**

Spacers are available with the flowmeter to maintain the Rosemount 8800A flowmeter dimensions. If a spacer is used, it should be downstream of the meter body. The spacer kit comes with an alignment ring for ease of installation. Gaskets should be placed on each side of the spacer.

**Table 3-4. Spacer Dimensions for Rosemount 8800A Lay Length**

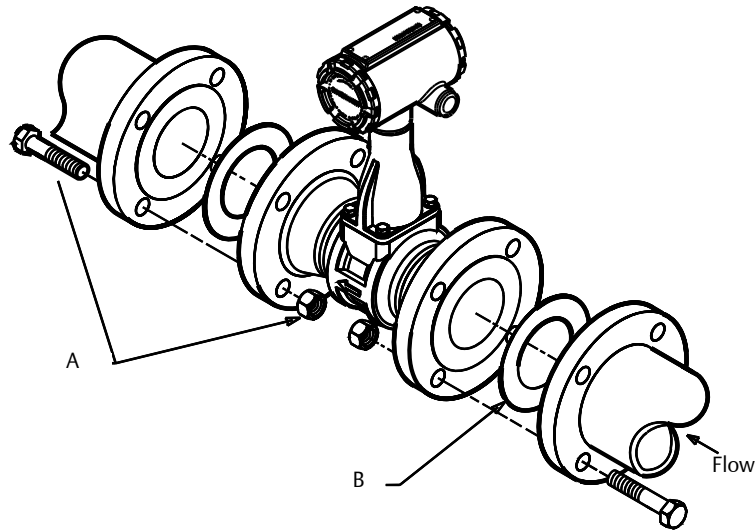
Line size	Dimensions inch (mm)
1.5 (40)	0.47 (11,9)
2 (50)	1.17 (29,7)
3 (80)	1.27 (32,3)
4 (100)	0.97 (24,6)

**Figure 3-12. Wafer-Style Flowmeter Installation with Alignment Rings**



- A. Installation studs and nuts (supplied by customer)
- B. Alignment rings
- C. Spacer (for Rosemount 8800D flowmeter to maintain Rosemount 8800A dimensions)
- D. Gaskets (supplied by customer)

**Figure 3-13. Flanged-Style Flowmeter Installation**



- A. Installation bolts and nuts (supplied by customer)
- B. Gaskets (supplied by customer)

### 3.5.6 Flanged-style flowmeter mounting

Physical mounting of a flanged-style flowmeter is similar to installing a typical section of pipe. Conventional tools, equipment, and accessories (such as bolts and gaskets) are required. Tighten the nuts following the sequence shown in [Figure 3-14](#).

#### Note

The required bolt load for sealing the gasket joint is affected by several factors, including operating pressure and gasket material, width, and condition. A number of factors also affect the actual bolt load resulting from a measured torque, including condition of bolt threads, friction between the nut head and the flange, and parallelism of the flanges. Due to these application-dependent factors, the required torque for each application may be different. Follow the guidelines outlined in ASME PCC-1 for proper bolt tightening. Make sure the flowmeter is centered between flanges of the same nominal size as the flowmeter.

#### Insert integral temperature sensor (MTA option only)

The MTA option equips the vortex meter with a Type N Thermocouple. The transmitter uses the process temperature measurement to compensate for changes in fluid density. Saturated steam mass flow rate, liquid mass flow, and corrected volumetric flow can all take advantage of the dynamic density corrections for increased accuracy.

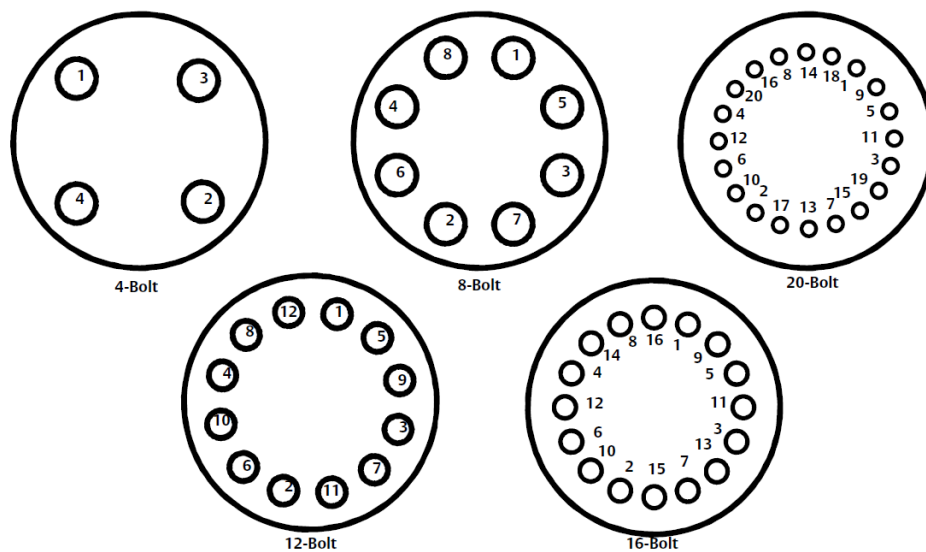
The temperature sensor is coiled and attached to the electronics bracket. Remove the styrofoam around sensor and insert temperature sensor into the hole at the bottom of the meter body. There is no need to remove the opposite end from the electronics. Tighten with  $\frac{1}{2}$ -in. open-end wrench approximately  $\frac{3}{4}$  turns past finger tight.

Meter body should be insulated to achieve stated temperature accuracy. Insulation should extend to the end of the bolt on the bottom of the meter body and should leave at least 1-in. (25 mm) of clearance around the electronics bracket. The electronics bracket and electronics housing should not be insulated.

**⚠ CAUTION**

Do not loosen or remove the temperature connection at the electronics when the housing integrity needs to be maintained.

Figure 3-14. Flange Bolt Torquing Sequence



### 3.5.7 Remote electronics

If you order one of the remote electronics options (options R10, R20, R30, or RXX), the flowmeter assembly will be shipped in two parts:

1. The meter body with an adapter installed in the support tube and an interconnecting coaxial cable attached to it.
2. The electronics housing installed on a mounting bracket.

If you order the armored remote electronics options, follow the same instructions as for the standard remote cable connection with the exception that the cable may not need to be run through conduit. Armored includes the glands.

## Mounting

Mount the meter body in the process flow line as described earlier in this section (see “Vertical installation” on page 25). Mount the bracket and electronics housing in the desired location. The housing can be repositioned on the bracket to facilitate field wiring and conduit routing.

## Cable connections

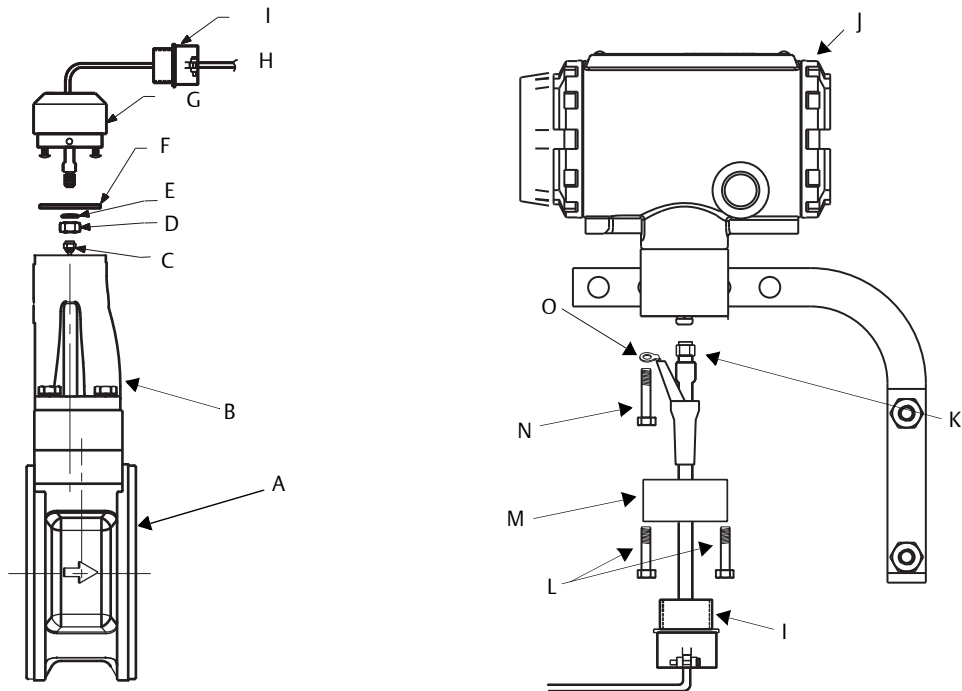
Refer to the following instructions and [Figure 3-15](#) to connect the loose end of the coaxial cable to the electronics housing.

1. If you plan to run the coaxial cable in conduit, carefully cut the conduit to the desired length to provide for proper assembly at the housing. A junction box may be placed in the conduit run to provide a space for extra coaxial cable length.
2. Slide the conduit adapter or cable gland over the loose end of the coaxial cable and fasten it to the adapter on the meter body support tube. Refer to [Figure 3-15](#).
3. If using conduit, route the coaxial cable through the conduit.
4. Place a conduit adapter or cable gland over the end of the coaxial cable.
5. Remove the housing adapter from the electronics housing.
6. Slide the housing adapter over the coaxial cable.
7. Remove one of the four housing base screws.
8. Attach and securely tighten the coaxial cable nut to the connection on the electronics housing.
9. Attach the coaxial cable ground connection round lug to the housing via the housing base ground screw. Use the 1 $\frac{1}{2}$ -inch screw to go through the round lug and attach to the housing base.
10. Align the housing adapter with the housing and attach with three screws.
11. Tighten the conduit adapter or cable gland to the housing adapter.

## **⚠ CAUTION**

To prevent moisture from entering the coaxial cable connections, install the interconnecting coaxial cable in a single dedicated conduit run and use sealed cable glands at both ends of the cable.

Figure 3-15. Remote Electronics Installation



- A. Meter body
- B. Support tube
- C. Sensor cable nut
- D. Nut
- E. Washer
- F. Union
- G. Meter adapter
- H. Coaxial cable

- I. ? NPT conduit adapter or cable gland (supplied by customer)
- J. Electronics housing
- K. Coaxial cable nut
- L. Housing adapter screws
- M. Housing adapter
- N. Housing base screw
- O. Ground connection

### 3.5.8 Calibration

The flowmeters are wet-calibrated at the factory and need no further calibration during installation. The calibration factor (K-factor) is stamped on each meter body and is entered into the electronics.

## 3.6 Electronics considerations

Both integral and remote mounted electronics require input power at the electronics. For remote mount installations, mount the electronics against a flat surface or on a pipe that is up to two inches in diameter.

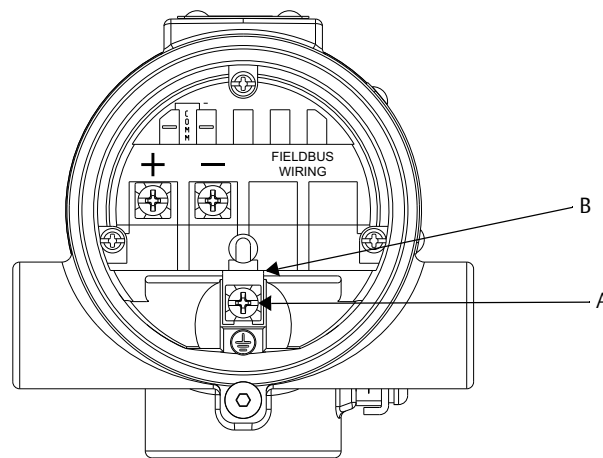
Remote mounting hardware includes an L bracket that is stainless steel and one stainless steel u-bolt. See Figure 3-15 on page 36 for dimensional information.

### 3.6.1 Grounding the transmitter case

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

- Internal ground connection—The internal ground connection screw is inside the FIELD TERMINALS side of the electronics housing. See [Figure 3-16](#). This screw is identified by a ground symbol ( $\oplus$ ), and is standard on all flowmeters.
- If using a transient terminal block, the ground tab must be secured beneath the internal ground screw.

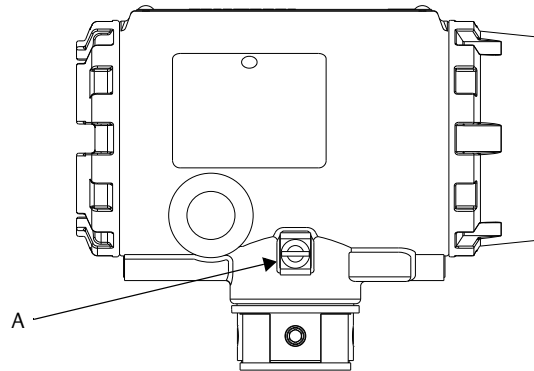
**Figure 3-16. Internal Ground Screw Connection**



- A. Internal ground screw connection
- B. Transient terminal block ground tab

- External ground assembly—This assembly is located on the outside of the electronics housing and is included with the optional transient protection terminal block (Option Code T1). This allows for a grounding strap to be run directly from the transmitter housing to earth ground. See [Figure 3-17](#). The external ground assembly can also be ordered with the transmitter (Option Code V5) and is automatically included with certain hazardous area approvals.

Figure 3-17. External Ground Connection



A. External ground connection

**Note**

Grounding the transmitter case using the threaded conduit connection may not provide a sufficient ground. The transient protection terminal block (Option Code T1) does not provide transient protection unless the transmitter case is properly grounded. See “[Transient protection](#)” on page 111 for transient terminal block grounding. Use the above guidelines to ground the transmitter case. Do not run the transient protection ground wire with signal wiring as the ground wire may carry excessive electric current if a lightning strike occurs.

### 3.6.2 Commissioning tag

The flowmeters are supplied with a removable commissioning tag that contains both the Device ID and a space to record the device tag. The Device ID is a unique code that identifies a particular device in the absence of a device tag. The device tag is used as an operational identification for the device and is usually 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 and a physical location. For each device on the segment, the installer should note the physical location in both places on the removable commissioning tag and tear off the bottom portion. The bottom portion of the tags can be used for commissioning the segment in the control system.



### 3.6.3 FOUNDATION™ Fieldbus transmitter power requirement

9–30 Vdc/18 mA	I.S. INSTALLATIONS
9–17.5 Vdc/18 mA	FISCO
9–32 Vdc/18 mA	ALL OTHERS

#### **⚠ CAUTION**

Improper supply voltage can damage the transmitter. Do not exceed 32 Vdc at the transmitter terminals. Do not apply alternating current line voltage to the transmitter terminals.

### 3.6.4 Power conditioning

Each fieldbus power supply requires a power conditioner to decouple the power supply output from the fieldbus wiring segment.

### 3.6.5 Field wiring

- ⚠ All power to the transmitter is supplied over the segment wiring. Use shielded, twisted pair for best results. For new installations or to get maximum performance, twisted pair cable designed especially for fieldbus should be used. [Table 3-5](#) lists the cable characteristics and ideal specifications.

**Table 3-5. Ideal Cable Specifications for Fieldbus Wiring**

Characteristic	Ideal specification
Impedance	100 Ohms ± 20 % at 31.25 kHz
Wire size	18 AWG (0,8 mm <sup>2</sup> )
Shield coverage	90 %
Attenuation	3 db/km
Capacitive unbalance	2 nF/km

#### **Note**

The number of devices on a fieldbus segment is limited by the power supply voltage, the resistance of the cable, and the amount of current drawn by each device.

#### **Transmitter wiring connection**

#### **Note**

Users should follow local wiring practices and codes when installing the transmitter.

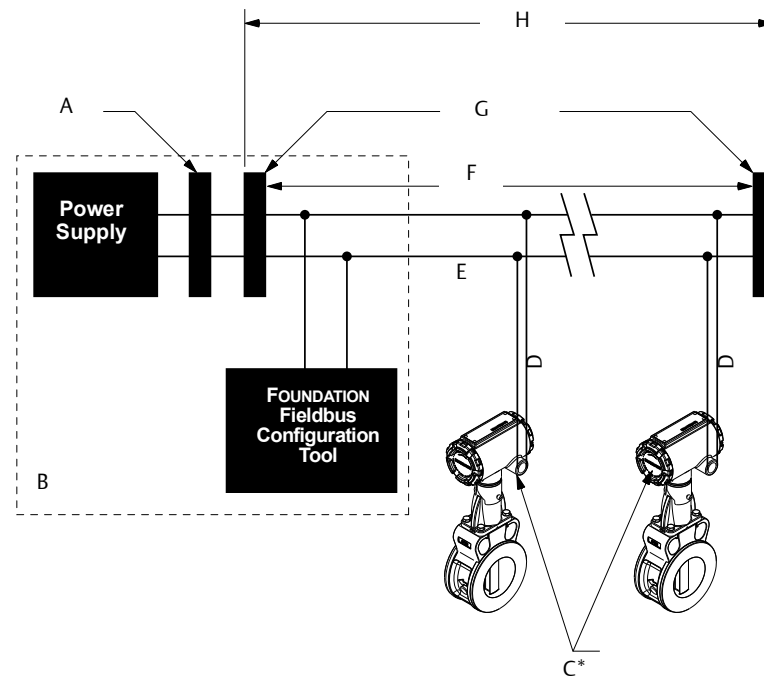
To make the transmitter wiring connection, remove the FIELD TERMINALS end cover on the electronics housing. Connect the power leads to the positive (+) and negative (–) terminals. The power terminals are polarity insensitive: the polarity of the DC power leads does not matter when connecting to the power terminals.

- ⚠ See “Safety Messages” on page 2-1 for complete warning

When wiring to screw terminals, crimped lugs are recommended. Tighten the terminals to ensure adequate contact. No additional power wiring is required.

⚠ Both transmitter covers must be fully engaged to meet explosion proof requirements. Do not remove the transmitter covers in an explosive atmosphere when the transmitter is powered.

**Figure 3-18. Flowmeter Field Wiring**



- A. Integrated power conditioner and filter
  - B. The power supply, filter, first terminator, and configuration tool are typically located in the control room.
  - C. Devices 1 through 16\*
  - D. Spur
  - E. Trunk
  - F. Fieldbus segment
  - G. Terminators
  - H. 6234 ft (1900 m) max (depending upon cable characteristics)
- \* Intrinsically safe installations may allow fewer devices per I.S. barrier.

## 3.6.6 Hardware configuration

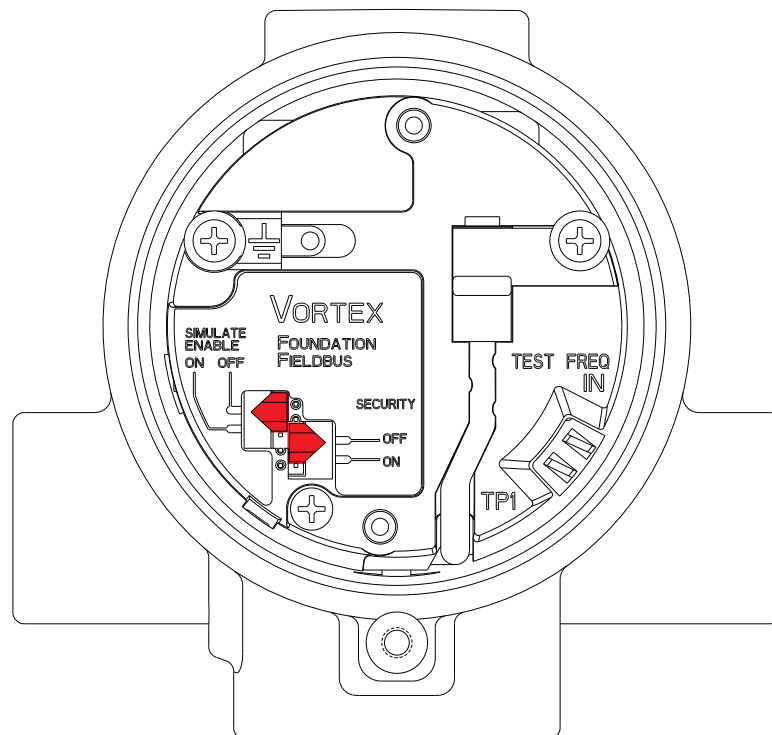
The hardware jumpers on the flowmeter enable you to set the fieldbus simulate enable and transmitter security (see [Figure 3-19](#)). To access the jumpers, remove the electronics housing cover from the end of the flowmeter. If the flowmeter does not include an LCD display, the jumpers are accessible by removing the cover on the electronics side. If the flowmeter includes an LCD display option, the fieldbus simulate enable and security jumpers are found on the face of the LCD display (see [Figure 3-20](#)).

### Note

If you will be changing configuration variables frequently, leave the security lockout jumper in the OFF position to avoid exposing the flowmeter electronics to the plant environment.

Set jumpers during the commissioning stage to avoid exposing the electronics to the plant environment.

**Figure 3-19. Fieldbus Simulate Enable and Transmitter Security Jumpers**



## 3.6.7 Simulate enable

The simulate enable jumper is used in conjunction with the Analog Input (AI) function block simulation. The jumper is also used as a lock-out feature for the AI function block. To enable the simulate enable feature, the jumper must transition from OFF to ON *after* power is applied to the transmitter, preventing the transmitter from being accidentally left in simulator mode.

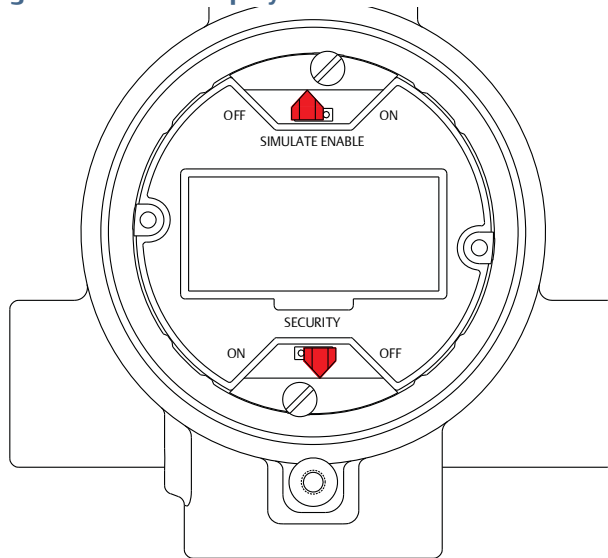
### 3.6.8 Transmitter security

After you configure the transmitter, you may want to protect the configuration data from unwarranted changes. Each transmitter is equipped with a security jumper that can be positioned ON to prevent the accidental or deliberate change of configuration data. The jumper is located on the front side of the electronics module and is labeled SECURITY (see Figure 3-19).

### 3.6.9 LCD display option

If your electronics are equipped with the LCD display (Option M5), the fieldbus simulate enable and transmitter security jumpers are located on the face of the indicator as shown in Figure 3-20.

**Figure 3-20. LCD Display Fieldbus Simulate Enable and Transmitter Security Jumpers**



## 3.7 Transmitter configuration

To complete the installation of the flowmeter, configure the software to meet the requirements of your application. If the flowmeter was pre-configured at the factory, it may be ready to install. If not, refer to [Section 2: Configuration and Operation](#).

## Section 4 Transducer Block

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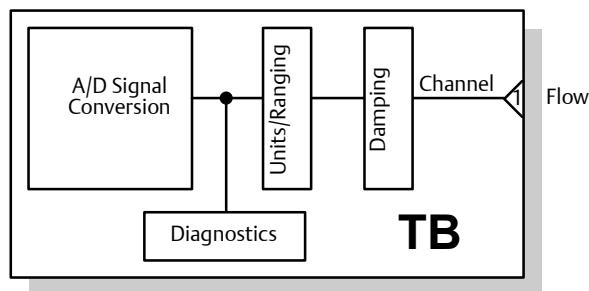
Overview .....	page 35
Parameters and descriptions .....	page 37
Flow units .....	page 45
Transducer block .....	page 46

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### 4.1 Overview

This section contains information on the flowmeter transducer block. Descriptions of all transducer block parameters, errors, and diagnostics are listed. Also, the modes, alarm detection, status handling, application information, and troubleshooting are discussed.

**Figure 4-1. Transducer Block Diagram**



#### 4.1.1 Quick transducer block configuration guide

Proper configuration of the flowmeter is essential for accurate performance. The following is a quick configuration guide for those already familiar with vortex meters, especially the Rosemount™ 8800D Vortex Flowmeter.

For most parameters configured in the flowmeter, the transmitter must perform extensive calculations to derive internal parameters used to accurately measure flow. It is recommended that each parameter in the Transducer Block be configured and sent to the transmitter individually. If too many parameter changes are sent to the transmitter at one time, the transmitter will return an error. The parameters not accepted will have to be re-sent.

##### Configuration order

The Transducer Block parameters can be configured in any order, but the following is a recommended procedure and can also be used as a checklist for configuration items.

1. K Factor
2. Service Type
3. Pipe Inside Diameter
4. Pipe Inside Diameter Units
5. Damping
6. Flange Type
7. Wetted Material
8. Meter Body Number
9. Process Temperature
10. Process Temperature Units
11. Filter Auto Adjust (to approximate process fluid density)
12. Meter Display. (If optional local display is installed.)
13. AI Block - Channel. Set to Flow.
14. AI Block - XD\_SCALE.UNITS\_INDEX. Select engineering units for flow.
15. AI Block - L\_TYPE. Usually set to Direct.

If mass flow engineering units are selected (lb/sec, kg/sec, etc.) then you must configure:

1. Process Density
2. Process Density Units

If Standard/Normal engineering units are selected (Normal m<sup>3</sup>/sec, Standard ft<sup>3</sup>/sec, etc.), and if the requirement is for the transmitter to calculate the Density Ratio according to the ideal gas law, the following must be configured:

1. Base Temperature
2. Base Temperature Units
3. Base Pressure (Absolute)
4. Base Pressure Units
5. Base Compressibility
6. Process Pressure (Absolute)
7. Process Pressure Units
8. Process Compressibility

Or as an alternative, the Process Density Ratio can be configured directly.

Using the Resource Block RESTART parameter, initiate a PROCESSOR restart. When the transmitter comes back on line, verify your configuration. This will ensure that all parameters have been properly stored in nonvolatile memory.

This configuration process will be sufficient for most applications.

## 4.2 Parameters and descriptions

The transducer block parameters, index numbers, and definitions are listed in [Table 4-1](#).

**Table 4-1. Transducer Block Parameters**

Parameter	Index number	Definition
ALERT_KEY	4	The alert key is the identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
BASE_COMPRESSIBILITY	58	Base compressibility is the compressibility of the process fluid at the base temperature and base pressure. It is used to calculate the PROCESS_DENSITY_RATIO and is not limit checked.
BASE_PRESSURE	56	Base pressure is the defined absolute pressure at base conditions. It is usually defined at 1 atmosphere. Base pressure is used to calculate the Process Density Ratio.
BASE_PRESSURE_UNITS	57	The engineering units of base pressure: 1137 = bar (absolute) 1142 = pounds per square inch (absolute) 1545 = Megapascals (absolute) 1547 = Kilopascals (absolute) 1557 = Kilograms per square centimeter (absolute)

Table 4-1. Transducer Block Parameters

Parameter	Index number	Definition
BASE_TEMP_UNITS	55	The engineering units of base temperature: 1001 = °C 1002 = °F  Units of 1000 - Kelvins and 1003 - degrees Rankine are also allowed: 1000 = K 1003 = °R
BASE_TEMPERATURE	54	Base Temperature is the defined temperature at base conditions. Base temperature is used to calculate the Process Density Ratio.
BLOCK_ALM	8	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	6	This parameter reflects the error status of the hardware or software components associated with a block. The parameter is a bit string, so multiple errors may be shown.
CAL_MIN_SPAN	18	CAL_MIN_SPAN is the minimum span that must be used between the calibration high and low points.
CAL_POINT_HI	16	CAL_POINT_HI is the value of the primary value measurement used for the high calibration point.
CAL_POINT_LO	17	CAL_POINT_LO is the value of the primary value measurement used for the low calibration point.
CAL_UNIT	19	CAL_UNIT specifies the units used for the calibration inputs.
CALC_PROC_DENSITY	91	When the Process Fluid is temperature compensated saturated steam, this parameter will report the calculated steam density based on the measured process temperature. The value will be in engineering unit configured in CALC_PROC_DENSITY_UNITS.
CALC_PROC_DENSITY_UNITS	92	Calculated process fluid density engineering units. 1097 = kg/m <sup>3</sup> 1100 = g/cc 1105 = g/liter 1106 = lb/in <sup>3</sup> 1107 = lb/ft <sup>3</sup>
COLLECTION_DIRECTORY	12	The collection directory specifies the number, starting indices, and DD item IDs of the data collections in each transducer within a transducer block.
COMP_D_K_FACTOR	33	This parameter represents the K-factor after it has been compensated for process temperature, materials, installation effects, etc. Units are reflected in K_FACTOR_UNITS.
COPR_DL_DATA	86	For factory use only.
COPR_DL_OPT	85	For factory use only.
COPR_DL_STATUS	84	For factory use only.
DAMPING	30	Damping is the sampling period interval to smooth the flow measurement using a first-order linear filter. Limits are 0.2 to 255 seconds.
ELEC_TEMP_PLOT_LL	100	Electronics Temperature graph plot lower limit which is used in some host graphical displays.
ELEC_TEMP_PLOT_UL	99	Electronics Temperature graph plot upper limit which is used in some host graphical displays.



Table 4-1. Transducer Block Parameters

Parameter	Index number	Definition
ELEC_TEMP_RANGE	108	This parameter reports the measurement range of the electronics temperature sensor (MTA model). Upper sensor range = 90 °C Lower sensor range = -55 °C
ELECTRON_TEMP	107	In an MTA model transmitter the electronics temperature is available. This parameter will report the current temperature of the electronics in engineering units configured in ELECTRON_TEMP_UNITS
ELECTRON_TEMP_UNITS	93	In an MTA model transmitter the electronics temperature is available. This parameter is used to configure the engineering units of the electronics temperature.
ELECTRONICS_STATUS	70	This parameter represents the transducer block electronics status. See 4.2.2: Diagnostics.
FACTORY_INFO_FLOAT	80	For factory use only.
FACTORY_INFO_INDEX	79	For factory use only.
FACTORY_INFO_U16	82	For factory use only.
FACTORY_INFO_U32	83	For factory use only.
FACTORY_INFO_U8	81	For factory use only.
FILTER_AUTO_ADJUST LOW_PASS_CODE	42	Selecting a fluid density close to the process density will adjust the Trigger Level, Low Flow Cutoff, and Low Pass Filter to values that will work well for most applications.
FILTER_RESTORE	43	This parameter will restore the Low Flow Cutoff, Low Pass Filter, and Trigger Level to default configurations base on the mass of air for gas process fluids or the mass of water for liquid process fluids. 1 = Normal state, 2 = Restore filters to defaults.
FIXED_PROC_DENSITY	50	The configured density of the process fluid is used to calculate flow when mass units are selected.
FIXED_PROC_DENSITY_UNITS	51	The engineering units of PROCESS_DENSITY: 1097 = kilograms per cubic meter 1107 = pounds per cubic foot
FIXED_PROC_TEMP_UNITS	53	The engineering units of process temperature: 1001 = °C 1002 = °F
FIXED_PROC_TEMPERATURE	52	Process temperature is the configured temperature of the process fluid, in units of °C or °F. This parameter is used to compensate the K-factor for meter body expansion due to temperature. It is also used to calculate the PROCESS_DENSITY_RATIO.
FLANGE_TYPE	36	Flange type specifies the wafer or the flange construction material (i.e. ASME 150, ASME 300, ASME 600, PN64, JIS 10K, etc.). Flange type is used as an input to the compensated K-factor calculation.
INSTALLATION_EFFECTS	32	An adjustment to the Compensated K-Factor to account for less than ideal upstream piping effects.
K_FACTOR	31	The K-factor is the meter body calibration number. Units are reflected in K_FACTOR_UNITS.
K_FACTOR_UNITS	34	K-factor units are the engineering units to be applied to the K_FACTOR and COMPD_K_FACTOR. 0 = Pulses per gallon
LFC_IN_ENG_UNITS	45	This read-only parameter will indicate Low Flow Cutoff in currently configured engineering units.

Table 4-1. Transducer Block Parameters

Parameter	Index number	Definition
LFC_MINIMUM	87	This parameter is the recommended minimum Low Flow Cutoff setting in Flow engineering units. It is based on the current configuration of the fixed process density and filter trigger level.
LFC_RESPONSE	88	This parameter configures the response of the measured flow when flow enters low flow cutoff. The response can be set to step immediately to zero or to damp to zero using the configured flow damping. 1 = Stepped response, 2 = Damped response.
LINEAR_TYPE	27	This parameter represents the linearization type used to describe the behavior of the sensor output. 1 = linear with input
LOW_FLOW_CUTOFF	43	The low-flow cutoff (LFC) represents the minimum reportable flow rate. For flow below this rate, the flow rate will damp to zero. The rate can be set to 48 discrete values representing vortex shedding frequencies from 0.9 to 4160 Hz.
LOW_PASS_CODE	46	The low pass code setting determines the corner frequency of the digital low pass filter. There are 29 discrete values representing frequencies from 0.1 to 3414 Hz. The code has a range of values from 2 to 30.
MAX_SIM_VALUE	68	This is the maximum simulation value that the internal signal generator can supply. The units for this parameter are determined by the Simulation_Units parameter, either percent of range or currently configured PV Engineering Units.
MEAS_PROC_TEMP	75	The measured process temperature.
MEAS_PROC_TEMP_UNITS	76	The measured process temperature engineering units. 1000 = Kelvins 1001 = °C 1002 = °F 1003 = °R
METER_BODY_NUMBER	40	The meter body number is stamped on a tag attached to the meter body. The meter body construction is used as an input to the compensated K-factor calculation.
METER_DISPLAY	41	This parameter is used to configure the values that will be displayed on the LCD display (if installed). This parameter is a bit string, so more than one item can be selected at a time. Each of the items selected will be displayed for approximately 3 seconds before moving on to the next item.
MFG_PARAM1	71	For factory use only.
MFG_PARAM2	72	For factory use only.
MODE_BLK	5	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 the target may take on Normal: Most common mode for the target
PIPE_ID_UNITS	39	The engineering units of the mating pipe inside diameter: 1013 = mm 1019 = in.
PIPE_INSIDE_DIAM	38	This parameter represents the mating pipe inside diameter. This value is used to calculate velocity flow and as an input to the COMPD_K_FACTOR calculation.
PRIMARY_VALUE	14	Primary value is the value and status of the measurement.
PRIMARY_VALUE_RANGE	15	This parameter represents 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 in displaying the primary value.

Table 4-1. Transducer Block Parameters

Parameter	Index number	Definition
PRIMARY_VALUE_TYPE	13	The primary value type is the type of measurement represented by the primary value. 101 = Volumetric Flow
PROC_DENS_PLOT_LL	98	Process Density graph plot lower limit which is used in some host graphical displays.
PROC_DENS_PLOT_UL	97	Process Density graph plot upper limit which is used in some host graphical displays.
PROC_FLOW_PLOT_LL	102	Process Flow graph plot lower limit which is used in some host graphical displays.
PROC_FLOW_PLOT_UL	101	Process Flow graph plot upper limit which is used in some host graphical displays.
PROC_TEMP_DAMP	74	This parameter is the sampling period interval to smooth the process temperature measurement using a first-order linear filter. Limits are 0.4 to 32 seconds.
PROC_TEMP_LL	96	Process Temperature graph plot lower limit which is used in some host graphical displays.
PROC_TEMP_PLOT_UL	95	Process Temperature graph plot upper limit which is used in some host graphical displays.
PROC_TEMP_RANGE	94	This parameter reports the measurement range of the process temperature sensor (MTA model). Upper sensor range = 427 °C Lower sensor range = -50 °C
PROCESS_COMPRESSIBILITY	61	Process compressibility is the compressibility of the process fluid at the process conditions of pressure and temperature. This value is used to calculate the PROCESS_DENSITY_RATIO and is not limit checked.
PROCESS_DENSITY_RATIO	62	This parameter is the process density ratio used in the conversion to standard cubic feet and normal cubic meters. The ratio can either be entered directly or computed from configured base and process conditions. If entered directly, the PROCESS_PRESSURE parameter will change so that the PROCESS_DENSITY_RATIO computed value is the same as the entered value.
PROCESS_FLUID	35	Process fluid is the type of fluid being measured, either gas/steam, liquid, or temperature-compensated steam. Changing service type will set the following to default values: PV Range 100% Value PV Range 0% Value Sensor Range 100% Value Low-Pass Code Low-Flow Cutoff Trigger level 0 = Uninitialized 1 = Liquid 2 = Gas/Steam 3 = TComp Sat Steam (Temperature compensated saturated steam) MTA models only
PROCESS_PRESSURE	58	Process pressure is the operating pressure of the process fluid upon which the PROCESS_DENSITY_RATIO is calculated.
PROCESS_PRESSURE_UNITS	60	The engineering units of process pressure: 1137 = bar (absolute) 1142 = pounds per square inch (absolute) 1545 = Megapascals (absolute) 1547 = Kilopascals (absolute) 1557 = Kilograms per square centimeter (absolute)

Table 4-1. Transducer Block Parameters

Parameter	Index number	Definition
REQ_PROC_DENSITY	49	This read-only parameter indicates the minimum required process density for proper flow measurement. It is based on the current configuration of the Low Flow Cutoff, Low Pass Filter, and Trigger Level parameters.
SAT_STEAM_ALERT_LL	104	Process temperature lower limit which is used in some hosts to determine when an alert is generated indicating that the Process Temperature is below the saturated steam density calculation limit. The default and minimum value is 80 °C.
SAT_STEAM_ALERT_UL	103	Process temperature upper limit which is used in some hosts to determine when an alert is generated indicating that the Process Temperature is above the saturated steam density calculation limit. The default and maximum value is 320 °C.
SECONDARY_VALUE	28	This parameter represents the secondary value related to the sensor (e.g., Vortex Shedding Frequency).
SECONDARY_VALUE_UNIT	29	The engineering units to be used with SECONDARY_VALUE: 1077 = Hz.
SENSOR_CAL_DATE	25	The last date on which the calibration was performed.
SENSOR_CAL_LOC	24	This parameter specifies the location of the last sensor calibration.
SENSOR_CAL_METHOD	23	The last method used to calibrate the device (e.g., factory calibration or user specific): 103 = factory trim standard calibration
SENSOR_CAL_WHO	26	This parameter specifies the name of the person responsible for the last sensor calibration.
SENSOR_RANGE	21	Sensor range specifies 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. These values represent the nominal high and low range values for the sensor.
SENSOR_SN	22	SENSOR_SN is the serial number of the sensor.
SENSOR_TYPE	20	The type of sensor on input #1: 112 = Vortex
SHEDDING_FREQ_AT_URV	69	This read-only parameter represents the Vortex Shedding Frequency required to generate a flow at 100% of the PV range. It is provided as an aid to the operator simulating flow with an external signal generator.
SIG_STRENGTH_PLOT_LL	106	Signal Strength graph plot lower limit which is used in some host graphical displays.
SIG_STRENGTH_PLOT_UL	105	Signal Strength graph plot upper limit which is used in some host graphical displays.
SIGNAL_STRENGTH	48	This parameter represents the relative sensor signal strength. A properly configured transmitter should have a signal strength value of 4 or greater for all flow rates greater than the low-flow cutoff point.
SIMULATION_CONTROL	67	This parameter is used to control transducer block flow simulation. Simulation can be disabled, enabled using an internal signal generator or enabled for use with an externally-connected signal generator. Acceptable values are: Sim Disabled: Simulation is disabled, normal flow measurement is enabled. Sim-Internal Generator: Simulation is enabled using the internal generator. Sim-External Generator: Simulation is enabled using the external generator.
SIMULATION_HIGH_POINT	64	When flow simulation is enabled in the transducer block, this will configure the high point when the signal is ramping up and down. If equal to SIMULATION_LOW_POINT, a constant value will be simulated.

Table 4-1. Transducer Block Parameters

Parameter	Index number	Definition
SIMULATION_LOW_POINT	65	When flow simulation is enabled in the transducer block, this will configure the low point when the signal is ramping up and down. If equal to SIMULATION_HIGH_POINT, a constant value will be simulated.
SIMULATION_RAMP_PERIOD	66	When flow simulation is enabled, this will configure the time for the signal to ramp from low to high, and from high to low. Units are in seconds.
SIMULATION_UNITS	63	This defines the units used to interpret the Simulation High and Low points. Acceptable values are: 1 = PV Engineering Units: Values are in currently configured engineering units. 2 = PV Percent of Range: Values are a percent of PV Range.
ST_REV	1	This parameter represents 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.
STRATEGY	3	The strategy field can be used to identify groupings of blocks. These data are not checked or processed by the block.
TAG_DESC	2	This parameter specifies the user description of the intended application of the block.
TB_ALERT_SIMULATE	110	This parameter is used to enable or disable alert simulation.
TC_FAILURE_MODE	90	In an MTA model transmitter a thermocouple is used to measure the process temperature and this temperature can be used to calculate the density of a saturated steam process fluid. This parameter defines the actions the transmitter takes when a thermocouple failure is detected. It can continue the density calculation using the configured fixed process temperature or it can report the failure and bad status for the density calculation. 1 = Report failure, 2 = Use the substitute value
TEST_CALC_DENSITY	78	This parameter reports the calculated density from the last commanded test calculation temperature. If no test calculation has been performed since startup it will report a value of zero. This value is reported in the engineering units configured for the Fixed Process Density.
TEST_CALC_TEMP	77	This parameter is used to perform a saturated steam density calculation at a specific temperature. The calculated density can be verified using standard saturated steam tables. This test calculation can only be performed if the Process Fluid is TComp Sat Steam. The test calculation units are specified in TEST_CALC_TEMP_UNITS.
TEST_CALC_TEMP_UNITS	109	Engineering unit for the saturated steam density test calculation temperature.
TRANSDUCER_DIRECTORY	9	The transducer directory specifies the number and starting indices of the transducers in the transducer block.
TRANSDUCER_TYPE	10	The transducer type identifies the transducer that follows.
TRIGGER_LEVEL	47	This parameter is an index that represents a minimum vortex shedding cycle amplitude after filtering. It has a value from 0 to 15, with a default value of 4. Increasing the value will raise the trigger level, requiring a greater sensor signal but decreasing susceptibility to noise. Decreasing the value will lower the trigger level, requiring a lower sensor signal but increasing susceptibility to noise.
UPDATE_EVT	7	This alert is generated by any change to the static data.
VEL_MEAS_BASE	89	This parameter selects the Velocity measurement base. When velocity engineering units are used, this will select whether to measure the velocity through the mating pipe or through the meter body. 1 = Meter Body (spool), 2 = Mating Pipe

**Table 4-1. Transducer Block Parameters**

Parameter	Index number	Definition
WETTED_MATERIAL	37	Construction materials of those items in contact with the process: 2 = 316 SST 3 = Alloy Each material has a different coefficient of expansion. Wetted material is used as an input to the compensated K-factor calculation.
XD_ERROR	11	XD_ERROR is a transducer block alarm subcode.
XMTR_MODE	73	For a transmitter equipped with a thermocouple to measure the process temperature this parameter is used to enable or disable the thermocouple. This allows the use of one electronics board stack spare to replace MTA and non-MTA models. 1 = Thermocouple disabled, 2 = Thermocouple enabled

## 4.2.1 Block/transducer errors

The BLOCK\_ERR conditions are listed in [Table 4-2](#). The XD\_ERROR conditions are listed in [Table 4-3](#). The conditions that are shown in *italics* are inactive for the transducer block and are provided for reference only.

**Table 4-2. BLOCK\_ERR Conditions**

Condition number	Condition name and description
0	<i>Other</i>
1	<i>Block Configuration Error</i>
2	<i>Link Configuration Error</i>
3	Simulate Active
4	<i>Local Override</i>
5	<i>Device Fault State Set</i>
6	Device Needs Maintenance Soon
7	Input Failure/Process Variable Has Bad Status
8	<i>Output Failure</i>
9	<i>Memory Failure</i>
10	<i>Lost Static Data</i>
11	<i>Lost NV Data</i>
12	<i>Readback Check Failed</i>
13	Device Needs Maintenance Now
14	Power Up: The device was just powered-up.

**Table 4-3. XD\_ERR Conditions**

Condition number	Condition name and description
15	Out of Service: The actual mode is out of service.
16	Unspecified error: An unidentified error occurred.
17	General Error: A general error that cannot be specified below occurred.
18	Calibration Error: An error occurred during calibration of the device, or a calibration error was detected during normal operations.
19	Configuration Error: An error occurred during configuration of the device, or a configuration error was detected during normal operations.
20	Electronics Failure: An electrical component failed.
21	Mechanical Failure: A mechanical component failed.
22	I/O Failure: An I/O failure occurred.
23	Data Integrity Error: Data stored in the device are no longer valid due to a nonvolatile memory checksum failure, a data verify after write failure, etc.
24	Software Error: The software has detected an error due to an improper interrupt service routine, an arithmetic overflow, a watchdog time-out, etc.
25	Algorithm Error: The algorithm used in the transducer block produced an error due to overflow, data reasonableness failure, etc.

## 4.2.2 Diagnostics

In addition to the BLOCK\_ERR and XD\_ERROR parameters, more detailed information on the measurement status can be obtained through the TB\_ELECTRONICS\_STATUS. Table 4-4 lists the potential errors and the possible corrective actions for the given values.

**Table 4-4. Transducer Block Status Definitions (TB\_ELECTRONICS\_STATUS)**

Value	Name and description	LCD display indication (if any)	Corrective actions
0x00000002	SW_DETECTED_ERR: The device software has detected a software (typically math) error.	FAULT SFTWR	Restart the transmitter. <sup>(1)</sup>
0x00000004	COPROCESSOR_ERR: The coprocessor has detected a math or instruction error.	FAULT COPRO	Restart the transmitter. <sup>(1)</sup>
0x00000010	INTERRUPT_ERROR: The transducer block has detected that the coprocessor ASIC has stopped generating flow data interrupts.	FAULT ASIC	Restart the transmitter. <sup>(1)</sup>
0x00000020	COPROC_RAM_ERR: The coprocessor has detected a RAM error at startup.	FAULT RAM	Restart the transmitter. <sup>(1)</sup>
0x00000040	COPROC_ROM_ERR: The coprocessor has detected a ROM error at startup.	FAULT ROM	Restart the transmitter. <sup>(1)</sup>

**Table 4-4. Transducer Block Status Definitions (TB\_ELECTRONICS\_STATUS)**

0x00000100	TRIGGER_OVERRANGE: The transducer has detected that the configuration for the filter trigger level is out of range.		Verify the filter trigger level configuration. Default value is 4.
0x00000200	LOW_PASS_OVERRANGE: The transducer has detected that the configuration for the low pass filter is out of range.		Verify the low-pass filter configuration.
0x00000400	LOW_FLOW_CUT_OVERRANGE: The transducer has detected that the configuration for the low-flow cutoff is out of range.		Verify the low-flow cutoff configuration. Optimize filters.
0x00000800	SD2_COMM_ERR: There has been a communications error detected in on-board messaging.	FAULT SDCOM	Restart the transmitter. <sup>(1)</sup>
0x00001000	SD2_RESET: An ASIC on the sensor board has reset.	FAULT SDPLS	Voltage at the transmitter terminals should be greater than or equal to 9 VDC. Restart the transmitter. <sup>(1)</sup>
0x00002000	SENSOR_PWR_FAIL: The sensor board power has failed.	FAULT SPOWR	Voltage at the transmitter terminals should be greater than or equal to 9 VDC.
0x00004000	TC_OPEN: An open circuit has been detected on the thermocouple used to measure the process temperature.	FAULT TC	Check the thermocouple connection to the transmitter housing. Replace the thermocouple.
0x00008000	COPR_COEFF_BAD: The thermocouple math coefficients used to calculate process temperature are corrupt or invalid.	FAULT COEFF	Replace the transmitter.
0x00100000	AMBIENT_TEMP_ALARM: The temperature of the transmitter electronics is beyond operating limits.	FAULT TEMP	Change the ambient temperature around the transmitter housing. Remount the transmitter in a different orientation or consider a remote mount transmitter.
0x00200000	FIXED_TEMP_ACTIVE: An open thermocouple has been detected and the transmitter is configured to use the Fixed Process Temperature as a substitute for the measured process temperature.		Check the thermocouple connection to the transmitter housing. Replace the thermocouple.
0x00400000	PT_GT_DENSITY_CALC: The measured process temperature is above the limits for temperature compensated density calculations.	FAULT PT>CF	Density calculation is limited to the density calculated at the upper limit. Verify the measured process temperature.
0x00800000	PT_LT_DENSITY_CALC: The measured process temperature is below the limits for temperature compensated density calculations.	FAULT PT<CF	Density calculation is limited to the density calculated at the lower limit. Verify the measured process temperature.
0x01000000	PT_GT_USL: The measured process temperature is greater than the upper temperature sensor limit.	FAULT PT>SL	The process temperature measurement may not be accurate. <sup>(2)</sup>
0x02000000	PT_LT_LSL: The measured process temperature is less than the lower temperature sensor limit.	FAULT PT<SL	The process temperature measurement may not be accurate. <sup>(2)</sup>



**Table 4-4. Transducer Block Status Definitions (TB\_ELECTRONICS\_STATUS)**

0x04000000	FLOW_SIGNAL_INJECT: The transducer block is receiving its flow signal from an external signal generator.	SEnSOr OFFLN	Informational only.
0x08000000	FLOW_EMULATION_MODE: The transducer block is receiving its flow signal from the internal signal generator.	SIGnAL SIMUL	Informational only.
0x10000000	SENSOR_OVERRANGE: The transducer has detected a flow level that exceeds the upper sensor range. The status associated with the primary value (PV) and secondary value (SV) should also be BAD.	FAULT PV>SL	Verify process fluid configuration. Reduce flow to prevent damage to the sensor.
0x20000000	PV_OVERRANGE: The transducer has detected a flow level that exceeds the PV upper range. The status associated with the PV and SV should also be UNCERTAIN. The flow is still measurable, but accuracy is not guaranteed.		Reduce flow below the PV upper range value.
0x40000000	IN_LOW_FLOW_CUTOFF: The transducer has detected that the flow has dropped below the configured low-flow cutoff value. The reported flow value will now damp to zero.		Informational only.

1. If a transmitter power reset does not clear the error message, the electronics will need to be replaced.
2. If the process temperature exceeds the specified limits of the temperature sensor, the indicated process temperature may not be within the rated specifications of  $\pm 2.2^\circ\text{F}$  ( $1.2^\circ\text{C}$ ).

### 4.2.3 Alarm detection

Alarms are not generated by the transducer block. By correctly handling the status of the channel values, the down stream block (AI) will generate the necessary alarms for the measurement. The error that generated the alarm can be determined by looking at BLOCK\_ERR and XD\_ERROR.

### 4.2.4 Status handling

Normally, the status of the output channels reflects the status of the measurement value, the operating condition of the measurement electronics card, and any active alarm condition. In Auto mode, Primary\_Value reflects the value and status quality of the output channels.

## 4.2.5 Error conditions

Symptom	Possible causes	Corrective action
Mode will not leave out of service (OOS)	Target mode not set	Set target mode to something other than OOS.
	Resource block	The actual mode of the resource block is OOS. See 5.2.2: Modes for corrective action.
PV or SV is BAD.	Measurement	See 4.2.2: Diagnostics. Flow is above SENSOR_RANGE.EU100.
PV or SV is UNCERTAIN.	Measurement	Flow is above PRIMARY_VALUE_RANGE.EU100 or flow is being simulated in the transducer block.

## 4.3 Flow units

The flow units are configured in the AI block. If Standard or Normal flow units are selected, the density ratio must be entered in the transducer block in order for the conversion to take place. If mass units are selected, the process density must be entered.

### 4.3.1 Standard/normal flow units

The flowmeter allows you to measure standard or normal flow units (SCFM, SCFH, NCMM, NCMH, NCMD). Configure the software in one of two ways:

1. Enter the density ratio to convert from actual flow rate to standard flow rate.
2. Enter the process and base conditions. (The flowmeter electronics will then calculate the density ratio for you.)

See Density Ratio and Process and Base Conditions below for definitions.

#### Note

Be careful to calculate and enter the correct conversion factor. Standard flow is calculated with the conversion factor you enter. Any error in the factor entered will result in an error in the standard flow measurement. If pressure and temperature change over time, use actual volumetric flow units. The flowmeter does not compensate for changing temperature and pressure.

## 4.4 Transducer Block

The Transducer Block contains the actual flow measurement data. The data include information about sensor type, engineering units, digital filter settings, damping, and diagnostics.

### 4.4.1 Process Variables (PV)

#### PV value

PV Value is the actual measured flow rate in the line. On the bench, the value should be zero. Check the units of the value to make sure they are configured correctly. The unit configuration is contained in the AI block.

#### Sensor serial number

This parameter can be entered by the user to be the serial number of the unit or any other number they would like to insert.

#### Sensor range

The Sensor Range is the entire flow range of the vortex meter. This includes the range that is out of the accuracy specification. If the range is between the PV Range and the Sensor Range, the status of the value is UNCERTAIN. If the Sensor Range is exceeded, the status goes to BAD and OUT OF SERVICE.

#### PV range

The PV Range is the range of the flowmeter that can be met with stated accuracy.

### 4.4.2 Basic setup

#### Pipe I.D.

The Pipe I.D. (inside diameter) of the pipe adjacent to the flowmeter (mating pipe) can cause entrance effects that may alter flowmeter readings. You must specify the exact inside diameter of the pipe to correct for these effects. Enter the appropriate value for this variable.

#### Process fluid

The flowmeter can be used for liquid or gas applications, but it must be configured specifically for the application. The standard flow meter can be configured for a liquid process fluid or a gas process fluid which includes steam. The MTA model which is capable of measuring process fluid temperature can also be configured for temperature compensated saturated steam. This model is capable of dynamically calculating the density of the saturated steam process fluid and using that density in mass flow measurements. If the flowmeter is not configured for the proper process fluid, readings will be inaccurate. Select the proper Process Fluid for your application:

- Liquid
- Gas/Steam
- Temperature compensated saturated steam (MTA model only)

### Process temperature

Process Temperature and Temperature Units are needed for the electronics to compensate for thermal expansion of the flowmeter as the process temperature differs from the reference temperature. Process temperature is the temperature of the liquid or gas/steam in the line during flowmeter operation.

### Process density

Process Density and Density Units are required if you have designated mass units for your flow rate units. For liquid and gas/steam process fluids, the process density is used for the conversion from volumetric units to mass units. For example, if you have set flow units to kg/sec rather than gal/sec, a density is required to convert the measured volumetric flow into the desired mass flow.

For MTA models, Process Density and Density Units are important when measuring temperature compensated saturated steam. The Process Density must be set to a nominal process fluid density so that other parameters such as PV range, Sensor Limits and Recommended Minimum Low Flow Cutoff can be accurately calculated in flow units. If the actual process density changes frequently, it may be necessary to set the process density to the highest expected value. This will allow for the required Sensor Limits of the meter.

#### Note

The user-entered process density value can also be used as a reference value for optimizing the digital “signal processing” filters. When optimizing the filters, always select a density value from the list of choices nearest and below the actual process density.

### Damping

Damping changes the response time of the flowmeter to smooth variations in output readings caused by rapid changes in input. The default damping is 2.0 seconds. This can be reset to any value between 0.2 and 255 seconds.

The MTA model flowmeter has the additional capability of providing the measured process temperature. A separate damping for this measurement is provided and can be configured from 0.4 to 32.0 seconds.

## 4.4.3 Flow units

### Density ratio

Density Ratio is used to convert the actual volumetric flow to standard/normal volumetric flow rates based on the following equations:

$$\text{Conversion factor} = \frac{\text{density at actual (flowing) conditions}}{\text{density at standard (base) conditions}}$$
$$\text{Conversion factor} = \frac{T_b \times P_f \times Z_b}{T_f \times P_b \times Z_f}$$

This value must be entered if using Standard or Normal units (SCFM, SCFH, NCMH, NCMH, NCMD). These units are configured in the AI block. The density ratio can also be calculated by entering the process and base conditions as described below (The flowmeter electronics will then calculate the density ratio for you.)

### Process conditions

Used to calculate the density ratio. Refer to the equation listed under Density Ratio.

### Process temperature

Process Temperature is the absolute temperature  $T_f$  at actual (flowing) conditions in degrees Rankine or Kelvin. The flowmeter electronics will convert from degrees Fahrenheit or degrees Celsius to degrees Rankine or Kelvin respectively.

### Process pressure

Process Pressure is the absolute pressure  $P_f$  at actual (flowing) conditions in psia or KPa absolute. The flowmeter will convert from the pressures in absolute for the calculation.

### Process compressibility

Process Compressibility is the compressibility  $Z_f$  at actual (flowing) conditions (dimensionless).

### Base conditions

Base Conditions is used to calculate the density ratio. Refer to the equation listed under Density Ratio.

### Base temperature

Base Temperature is the absolute temperature  $T_b$  at standard (base) conditions in degrees Rankine or Kelvin. The flowmeter electronics will convert from degrees Fahrenheit or degrees Celsius to degrees Rankine or Kelvin respectively.

### Base pressure

Base Pressure is the absolute pressure  $P_b$  at standard (base) conditions in psia or KPa absolute. The flowmeter will convert from the pressures in absolute for the calculation.

### Base compressibility

Base Compressibility is the compressibility  $Z_b$  at standard (base) conditions (dimensionless).

## 4.4.4 Sensor

### Pipe I.D.

The Pipe I.D. (inside diameter) of the pipe adjacent to the flowmeter (mating pipe) can cause entrance effects that may alter flowmeter readings. Specify the exact inside diameter of the pipe to correct for these effects. Enter the appropriate value for this variable.

### Process fluid

The flowmeter can be used for liquid or gas applications, but it must be configured specifically for the application. The standard flow meter can be configured for a liquid process fluid or a gas process fluid which includes steam. The MTA model which is capable of measuring process fluid temperature can also be configured for temperature compensated saturated steam. This model is capable of dynamically calculating the density of the saturated steam process fluid and using that density in mass flow measurements. If the flowmeter is not configured for the proper process fluid, readings will be inaccurate. Select the proper Process Fluid for your application:

- Liquid
- Gas/Steam
- Temperature compensated saturated steam (MTA model only)

### Reference K-Factor

The Reference K-factor is a calibration number assigned at the factory. It is located on the meter body tag. It should only be changed if the meter body is replaced.

### Installation effects

Installation Effects enables you to compensate the flowmeter for installation effects. See reference graphs located in Technical Data Sheet (document number 00816-0100-3250) for the percent of K-factor shift based on entrance effects of upstream disturbances. This value can be set between +1.5% to -1.5%.

### Compensated K-factor

The Compensated K-factor is based on the reference K-factor as compensated for the given process temperature, wetted materials, body number and pipe I.D. Compensated K-factor is an informational variable that is calculated by the electronics of your flowmeter.

### Meter body number

The Meter Body Number is a factory set configuration variable that stores the body number of your particular flowmeter and the type of construction. The meter body number is found to the right of the body number on the meter body tag, which is attached to the support tube of the meter body.

The format of this variable is a number followed by an alpha numeric character. The number designates the body number. The alpha numeric character designates the meter body type. There are three options for the alpha numeric character:

1. None – Indicates welded meter construction
2. A – Indicates welded meter construction
3. B – Indicates cast construction

### Process temperature

Process Temperature and Temperature Units are needed for the electronics to compensate for thermal expansion of the flowmeter as the process temperature differs from the reference temperature. Process temperature is the temperature of the liquid or gas/steam in the line during flowmeter operation.

### Wetted material

Wetted Material is a factory set configuration that reflects the construction of your flowmeter:

- 316 SST
- Nickel Alloy-C
- Carbon Steel
- Super Duplex

### Flange type

Flange Type enables you to specify the type of flange on the flowmeter for later reference. This variable is preset at the factory but can be changed if necessary.

Wafer	ASME 150
ASME 150 Reducer	ASME 300
ASME 300 Reducer	ASME 600
ASME 600 Reducer	ASME 900
ASME 900 Reducer	ASME 1500
ASME 1500 Reducer	ASME 2500
ASME 2500 Reducer	PN10
PN10 Reducer	PN16
PN16 Reducer	PN25
PN25 Reducer	PN40
PN40 Reducer	PN64
PN64 Reducer	PN100
PN100 Reducer	PN160
PN160 Reducer	PN250
PN250 Reducer	JIS 10K
JIS 10K Reducer	JIS 16K/20K
JIS 16K/20K Reducer	JIS 40K
JIS 40K Reducer	Special

## 4.4.5 Filtering

### Flow rate value

Flow Rate Value is the actual measured flow rate in the line. On the bench, the value should be zero. Check the units of the value to make sure they are configured correctly. The unit configuration is contained in the AI block.

### Shedding frequency

Shedding Frequency is a direct indication of the shedding “vortices” across the shedder bar.

### Sensor signal strength

Sensor Signal Strength is a variable that indicates the flow signal strength. This value indicates if there is enough flow signal strength for the meter to work properly. For accurate flow measurement, ideally the value should be greater than 4.0. Values greater than 4.0 will allow increased filtering for noisy applications. Values less than 4.0 may indicate applications with very low densities and/or applications with excessive filtering.

### Lowpass corner

The Lowpass Corner filter sets the low-pass corner frequency to minimize the effects of high frequency noise. It is factory set based on line size and service type. Adjustments may be required only if there are problems.

### Low flow cutoff

The Low Flow Cutoff enables adjustment of the filter for noise at no flow. It is set at the factory to handle most applications, but certain applications may require adjustment either to expand measurability or to reduce noise. It also includes a dead band such that once flow goes below the cutoff value, output does not return to the normal flow range until flow goes above the dead band.

### Filter trigger level

Filter Trigger Level is configured to reject noise within the flow range while allowing normal amplitude variation of the vortex signal. Signals of amplitude lower than the Filter Trigger Level setting are filtered out. The default factory setting of “4” is optimized to work best with most applications.

### Filter auto adjust

The Filter Auto Adjust is a function that can be used to optimize the range of the flowmeter based on the density of the fluid. The electronics uses process density to calculate the minimum measurable flow rate, while retaining at least a 4.0 signal strength value.

### Required process density

The Required Process Density is calculated from the filter settings. It is the process density that is required to obtain an adequate sensor signal.



## 4.4.6 Display

The Local Display Function on the flowmeter selects which variables are shown on the optional (M5) local display. The flow transmitter with the ability to measure process temperature (MTA) has additional display options as noted. Choose from the following variables:

- Flow
- Percent of Range
- Process Temperature (MTA Only)
- Process Density (MTA and Saturated Steam Only)
- Shedding Frequency
- Electronics Temperature (MTA Only)
- Integrator Block Output

## 4.4.7 Modes

### Target mode

The transducer block supports two modes of operation as defined by the MODE\_BLK Parameter:

- Automatic (Auto)—The channel outputs reflect the analog input measurement.
- Out of Service (OOS)—The block is not processed. Channel outputs are not updated and the status is set to Bad: Out of Service for each channel. The BLOCK\_ERR parameter shows Out of Service. In this mode, you can make changes to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

### Flow simulation

Flow Simulation enables you to check the electronics functionality. This can be verified with the Flow Simulation Internal and Flow Simulation External method. See [C.2: Electronics verification](#).

### Flow

Flow shows the flow value in current engineering units for the flow simulation.

### Shedding frequency (secondary value)

Shedding Frequency (Secondary Value) shows the shedding frequency for the flow simulation.

### Shedding frequency at URV

Shedding Frequency at URV gives the shedding frequency corresponding to your upper range value.

### Simulation control

Simulation Control allows you to configure your flow simulation using internal or external simulation.

### **Sim disable**

Sim Disable allows you to exit the flow simulation mode (internal or external) and return you to normal operation mode.

### **Sim - internal generator**

The Sim - Internal Generator function will automatically disconnect the sensor and enable you to select the configuration of the internal simulate (fixed or varied).

### **Sim - external generator**

Sim - External Generator flow allows you to disconnect the sensor electronically so an external frequency source can be used.

### **Simulation units**

The flow simulation can be performed as either a percent of range or flow rate in current engineering units.

### **Simulation ramp period**

The Simulation Ramp period can be entered in seconds from a minimum of 0.5 seconds to a maximum of 32,000 seconds.

# Section 5 Resource Block

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## 5.1 Overview

This section contains information on the flowmeter resource block. Descriptions of all resource block parameters, errors, and diagnostics are included. Also the modes, alarm detection, status handling, Virtual Communication Relationships (VCRs), and troubleshooting are discussed.

### 5.1.1 Definition

The resource block defines the physical resources of the device, including type of measurement, memory, etc. The resource block also handles functionality, such as shed times, that is common across multiple blocks. The block has no linkable inputs or outputs and it performs memory-level diagnostics.

## 5.2 Parameters and descriptions

Table 5-1 lists all of the configurable parameters of the resource block, including the descriptions and index numbers for each parameter.

**Table 5-1. Resource Block Parameters**

Parameter	Index number	Description
ACK_OPTION	38	ACK_OPTION is a selection of whether alarms associated with the function block will be automatically acknowledged.
ADVISE_ACTIVE	92	Enumerated list of advisory conditions within a device. All open bits are free to be used as appropriate for each specific device. This parameter is the Read Only copy of FD_MAINT_ACTIVE & FD_CHECK_ACTIVE.
ADVISE_ALARM	81	Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.
ADVISE_ENABLE	90	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. This parameter is the Read Only copy of FD_MAINT_MAP & FD_CHECK_MAP.

Table 5-1. Resource Block Parameters

Parameter	Index number	Description
ADVISE_MASK	91	Mask of Advisory Alarm. Corresponds bit for bit to the ADVISE_ACTIVE. A bit on means that the failure is masked out from alarming. This parameter is the Read Only copy of FD_MAINT_MASK & FD_CHECK_MASK.
ADVISE_PRI	89	Designates the alarming priority of the ADVISE_ALM.
ALARM_SUM	37	This parameter shows the current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block. The two resource block alarms are write alarm and block alarm.
ALERT_KEY	04	ALERT_KEY shows the identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
BLOCK_ALM	36	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	This parameter reflects the error status of the hardware or software components associated with a block. It is a bit string, so multiple errors may be shown.
CLR_FSTATE	30	Writing a Clear to this parameter will clear the device FAULT_STATE if the field condition has cleared.
COMPATIBILITY_REV	67	This parameter is optionally used when replacing field devices. The correct usage of this parameter presumes the COMPATIBILITY_REV value of the replacing device should be equal or lower than the DEV_REV value of the replaced device.
CONFIRM_TIME	33	This parameter represents the minimum time between retries of alert reports.
CYCLE_SEL	20	This parameter is used to select the block execution method for this resource. The flowmeter supports the following executions: Scheduled: Blocks are only executed based on the schedule in FB_START_LIST. Block Execution: A block may be executed by linking to another block's completion.
CYCLE_TYPE	19	This parameter identifies the block execution methods available for this resource.
DD_RESOURCE	09	This string identifies the tag of the resource that contains the device description for this resource.
DD_REV	13	DD_REV is a revision of the DD associated with the resource—used by an interface device to locate the DD file for the resource.
DEV_OPTIONS	72	Indicates which miscellaneous and diagnostic device licensing options are enabled. It also indicates Transducer options.
DEV_REV	12	DEV_REV specifies the manufacturer revision number associated with the resource—used by an interface device to locate the DD file for the resource.
DEV_STRING	71	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.
DEV_TYPE	11	DEV_TYPE specifies the manufacturer's number associated with the resource—used by interface devices to locate the DD file for the resource.
DOWNLOAD_MODE	75	Gives access to the boot block code for over the wire downloads.

Table 5-1. Resource Block Parameters

Parameter	Index number	Description
FAILED_ACTIVE	84	Enumerated list of failure conditions within a device. All open bits are free to be used as appropriate for each specific device. This parameter is the Read Only copy of FD_FAIL_ACTIVE.
FAILED_ALARM	79	Alarm indicating a failure within a device which makes the device non-operational.
FAILED_ENABLE	82	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. This parameter is the Read Only copy of FD_FAIL_MAP.
FAILED_MASK	83	Mask of Failure Alarm. Corresponds bit for bit to the FAILED_ACTIVE. A bit on means that the failure is masked out from alarming. This parameter is the Read Only copy of FD_FAIL_MASK.
FAILED_PRI	77	Designates the alarming priority of the FAILED_ALM and also used as switch between FD and legacy PWA. If value is greater than or equal to 1 then PWA alerts will be active in device else device will have FD alerts.
FAULT_STATE	28	Condition set by loss of communication to an output block, fault promoted to an output block or physical contact. When FAULT_STATE condition is set, then output function blocks will perform their FAULT_STATE actions.
FD_CHECK_ACTIVE	46	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown
FD_CHECK_ALARM	58	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.
FD_CHECK_MAP	50	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the four alarm categories.
FD_CHECK_MASK	54	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to '1' will mask i.e. inhibit the broadcast of a condition, and a bit equal to '0' will unmask i.e. allow broadcast of a condition.
FD_CHECK_PRI	62	This parameter allows the user to specify the priority of this alarm category.
FD_EXTENDED_ACTIVE	65	An optional parameter or parameters to allow the user finer detail on conditions causing an active condition in the FD_*_ACTIVE parameters.
FD_EXTENDED_MAP	66	An optional parameter or parameters to allow the user finer control on enabling conditions contributing to the conditions in FD_*_ACTIVE parameters.
FD_FAIL_ACTIVE	43	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.
FD_FAIL_ALARM	55	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.
FD_FAIL_MAP	47	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the four alarm categories.

Table 5-1. Resource Block Parameters

Parameter	Index number	Description
FD_FAIL_MASK	51	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to '1' will mask i.e. inhibit the broadcast of a condition, and a bit equal to '0' will unmask i.e. allow broadcast of a condition.
FD_FAIL_PRI	59	This parameter allows the user to specify the priority of this alarm category.
FD_MAINT_ACTIVE	45	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.
FD_MAINT_ALARM	57	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.
FD_MAINT_MAP	49	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the four alarm categories.
FD_MAINT_MASK	53	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to '1' will mask i.e. inhibit the broadcast of a condition, and a bit equal to '0' will unmask i.e. allow broadcast of a condition.
FD_MAINT_PRI	61	This parameter allows the user to specify the priority of this alarm category.
FD_OFFSPEC_ACTIVE	44	This parameter reflects the error conditions that are being detected as active as selected for this category. It is a bit string, so that multiple conditions may be shown.
FD_OFFSPEC_ALARM	56	This parameter is used primarily to broadcast a change in the associated active conditions, which are not masked, for this alarm category to a Host System.
FD_OFFSPEC_MAP	48	This parameter maps conditions to be detected as active for this alarm category. Thus the same condition may be active in all, some, or none of the four alarm categories.
FD_OFFSPEC_MASK	52	This parameter allows the user to suppress any single or multiple conditions that are active, in this category, from being broadcast to the host through the alarm parameter. A bit equal to '1' will mask i.e. inhibit the broadcast of a condition, and a bit equal to '0' will unmask i.e. allow broadcast of a condition.
FD_OFFSPEC_PRI	60	This parameter allows the user to specify the priority of this alarm category.
FD_RECOMMEN_ACT	64	This parameter is a device enumerated summarization of the most severe condition or conditions detected. The DD help should describe by enumerated action, what should be done to alleviate the condition or conditions. 0 is defined as Not Initialized, 1 is defined as No Action Required, all others defined by manufacturer.
FD_SIMULATE	63	This parameter allows the conditions to be manually supplied when simulation is enabled. When simulation is disabled both the diagnostic simulate value and the diagnostic value track the actual conditions. The simulate jumper is required for simulation to be enabled and while simulation is enabled the recommended action will show that simulation is active.
FD_VER	42	This parameter's value equals to the value of the major version of the Field Diagnostics specification that this device was designed to.
FEATURES	17	This parameter is used to show supported resource block options.

Table 5-1. Resource Block Parameters

Parameter	Index number	Description
FEATURES_SEL	18	This parameter is used to show selected resource block options. The flowmeter supports the following options: Unicode: Tells host to use unicode for string values Reports: Enables alarms; must be set for alarming to work Software Lock: Software write locking enabled but not active; WRITE_LOCK must be set to activate. Hardware Lock: Hardware write locking enabled but not active; WRITE_LOCK follows the status of the security switch.
FINAL_ASSY_NUM	74	The same final assembly number placed on the neck label.
FREE_SPACE	24	FREE_SPACE is the percent of memory available for further configuration (zero in a preconfigured device).
FREE_TIME	25	FREE_TIME is the percent of the block processing time that is free to process additional blocks.
GRANT_DENY	14	This parameter represents options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block (not used by device).
HARD_TYPES	15	This parameter represents the types of hardware available as channel numbers. This parameter is limited to scalar (i.e., analog) inputs.
HARDWARE_REVISION	68	Manufacturer hardware revision.
HEALTH_INDEX	76	The value of HEALTH_INDEX parameter shall be set based on the active FD alarms or PWA alarms. HEALTH_INDEX will show 100 if target mode of block is OOS or there are no active alarms in device.
ITK_VER	41	Major revision number of the interoperability test case used in certifying this device as interoperable. The format and range are controlled by the FieldComm Foundation.
LIM_NOTIFY	32	This parameter represents the maximum number of unconfirmed alert notify messages allowed.
MAINT_ACTIVE	88	Enumerated list of maintenance conditions within a device. All open bits are free to be used as appropriate for each specific device This parameter is the Read Only copy of FD_OFFSPEC_ACTIVE.
MAINT_ALARM	80	Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.
MAINT_ENABLE	86	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. This parameter is the Read Only copy of FD_OFFSPEC_MAP.
MAINT_MASK	87	Mask of Maintenance Alarm. Corresponds bit for bit to the MAINT_ACTIVE. A bit on means that the failure is masked out from alarming. This parameter is the Read Only copy of FD_OFFSPEC_MASK.
MAINT_PRI	85	Designates the alarming priority of the MAINT_ALM
MANUFAC_ID	10	MANUFAC_ID is the manufacturer identification number used by an interface device to locate the DD file for the resource (001151 for Rosemount).
MAX_NOTIFY	31	MAX_NOTIFY is the maximum number of unconfirmed alert notify messages possible.
MEMORY_SIZE	22	This parameter represents the available configuration memory in the empty resource. Check MEMORY_SIZE before attempting a download.
MIN_CYCLE_T	21	MIN_CYCLE_T represents the time duration of the shortest cycle interval of which the resource is capable.

Table 5-1. Resource Block Parameters

Parameter	Index number	Description
MODE_BLK	05	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 the target mode may take on Normal: Most common mode for the actual
NV_CYCLE_T	23	NV_CYCLE_T represents the interval between writing copies of NV parameters to nonvolatile memory (zero means never).
OUTPUT_BOARD_SN	73	Output board serial number.
PD_TAG	70	PD tag description of device.
RECOMMENDED_ACTION	78	Enumerated list of recommended actions displayed with a device alert.
RESTART	16	RESTART allows a manual restart to be initiated. Several degrees of restart are possible: 1 Run: Nominal state when not restarting 2 Restart resource: Not used 3 Restart with defaults: Set parameters to default values (see START_WITH_DEFAULTS below for which parameters are set). 4 Restart processor: Does a warm start of CPU
RS_STATE	07	RS_STATE represents the state of the function block application state machine.
SAVE_CONFIG_BLOCKS FD_MAINT_ALARM	57	This parameter represents the number of EEPROM blocks that have been modified since the last burn. This value will count down to zero when the configuration is saved.
SET_FSTATE	29	Allows the FAULT_STATE condition to be manually initiated by selecting Set.
SHED_RCAS	26	SHED_RCAS represents the time duration at which to give up on computer writes to function block RCAs locations.
SHED_ROUT	27	SHED_ROUT represents the time duration at which to give up on computer writes to function block ROut locations.
SOFTWARE_REV	69	Manufacturer software revision.
ST_REV	01	ST_REV is 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.
STRATEGY	03	The strategy field can be used to identify grouping of blocks. These data are not checked or processed by the block.
TAG_DESC	02	TAG_DESC is the user description of the intended application of the block.
TEST_RW	08	TEST_RW is a parameter for a host to use to test reading and writing (not used by the device at all).
UPDATE_EVT	35	This alert is generated by any change to the static data.
WRITE_ALM	40	This alert is generated if the write lock parameter is cleared.
WRITE_LOCK	34	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.
WRITE_PRI	39	This parameter specifies the priority of the alarm generated by clearing the write lock.



## 5.2.1 Block errors

Table 5-2 lists conditions reported in the BLOCK\_ERR parameter. Conditions in *italics* are inactive for the resource block and are given here only for your reference.

**Table 5-2. BLOCK\_ERR Conditions**

Condition number	Condition name and description
0	<i>Other</i>
1	Block Configuration Error: A feature in FEATURES_SEL is set that is not supported by FEATURES or an execution cycle in CYCLE_SEL is set that is not supported by CYCLE_TYPE.
2	Link Configuration Error: A link used in one of the function blocks is improperly configured.
3	Simulate Active: The simulation jumper is in place. Simulate active is not an indication that the I/O blocks are using simulated data.
4	<i>Local Override</i>
5	<i>Device Fault State Set</i>
6	<i>Device Needs Maintenance Soon</i>
7	<i>Input failure/process variable has bad status</i>
8	<i>Output Failure: The output is bad based primarily upon a bad input.</i>
9	Memory Failure: A memory failure has occurred in FLASH, RAM, or EEROM memory.
10	Lost Static Data: Static data that are stored in nonvolatile memory have been lost.
11	Lost NV Data: Nonvolatile data that are stored in nonvolatile memory have been lost.
12	<i>Readback Check Failed</i>
13	Device Needs Maintenance Now
14	Power Up: The device was just powered-up.
15	Out of Service: The actual mode is out of service.

## 5.2.2 Modes

The resource block supports two modes of operation as defined by the MODE\_BLK parameter:

- Automatic (Auto) The block is processing its normal background memory checks.
- Out of Service (OOS) The block is not processing its tasks. When the resource block is in OOS, all blocks within the resource (device) are forced into OOS. The BLOCK\_ERR parameter shows OUT OF SERVICE. In this mode, you can make changes to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

## 5.2.3 Alarm detection

A block alarm will be generated whenever the BLOCK\_ERR has an error bit set. The types of block error for the resource block are defined above (see Table 5-2).

A write alarm is generated whenever the WRITE\_LOCK parameter is cleared. The priority of the write alarm is set in the following parameter:

- WRITE\_PRI

Alarms are grouped into five levels of priority as shown in Table 5-3.

**Table 5-3. Alarm Priority**

Priority number	Priority description
0	The priority of an alarm condition changes to 0 after the condition that caused the alarm is corrected.
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, but does not require operator attention (such as diagnostics and system alerts).
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.

## 5.2.4 Status handling

There are no status parameters associated with the resource block.

## 5.2.5 VCR

The number of configurable VCRs is 19. The parameter is not contained or viewable within the resource block, but it does apply to all blocks.

## 5.2.6 Troubleshooting

Refer to Table 5-4 to troubleshoot any problems that you encounter.

**Table 5-4. Troubleshooting**

Symptom	Possible causes	Corrective action
Mode will not leave OOS.	Target mode not set	Set target mode to something other than OOS.
	Memory failure	BLOCK_ERR will show the lost NV Data or Lost Static Data bit set. Restart the device by setting RESTART to processor. If the block error does not clear, call the factory.
Block alarms will not work.	Features	FEATURES_SEL does not have Alerts enabled. Enable the Alerts bit.
	Notification	LIM_NOTIFY is not high enough. Set equal to MAX_NOTIFY.
	Status options	STATUS_OPTS has Propagate Fault Forward bit set, which should be cleared to cause an alarm to occur.

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# Section 6 Analog Input Function Block

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## 6.1 Overview

This section provides descriptions of analog input function block parameters and the engineering units that are supported by the flowmeter.

## 6.2 Analog Input (AI) Function Block

The Analog Input (AI) Function Block processes the measurement from the Transducer Block and makes it available to other function blocks. The output from the AI Block is in engineering units and contains a status indicating the quality of the measurement. There is one AI Block for each measurement performed by the transmitter.

### 6.2.1 Configure the AI Block

 A minimum of four parameters are required to configure the AI Block:

- CHANNEL
- L\_TYPE
- XD\_SCALE
- OUT\_SCALE

Refer to [Table 6-2](#) for analog input function block system parameters. Refer to [Table 6-3](#) for supported engineering units.

#### CHANNEL

Select the channel that corresponds to the desired sensor measurement. Refer to [Table 6-1](#).

**Table 6-1. I/O Channel Definitions**

Channel	Description
1	Flow
2	Signal strength
3	Electronics temperature
4	Process temperature
5	Process density

#### Note

Channels 3 through 5 are available only on meters with the MTA option.

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## L\_TYPE

The L\_TYPE parameter defines the relationship of the sensor measurement to the desired output of the AI block. 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. This is the most common configuration for the Vortex flow measurement. The Vortex meter is a linear meter.

### Indirect

Select indirect when the desired output is a calculated measurement based on the sensor measurement. 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. Indirect square root should not be used with the Vortex meter.

## 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

XD\_Scale 0% = 0

XD\_Scale 100% = desired upper range value

XD\_Scale units = desired flow units. See [Table 6-3](#) for supported engineering units.

### Note

XD\_Scale units are written to transducer block units.

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### 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.

Table 6-2. 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	None 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.

Table 6-2. Analog Input Function Block System Parameters

Parameter	Index No.	Available values	Units	Default	Read/Write	Description
CHANNEL	15	1 = Flow 2 = Signal strength 3 = Electronics temp. <sup>(1)</sup> 4 = Process temp. <sup>(1)</sup> 5 = Process density <sup>(1)</sup>	None	AI1=1 (Flow) AI2=2 (Signal Strength) AI3, AI4, AI5=0 (Uninitialized)	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	Uninitialized	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	Uninitialized	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 <sup>(2)</sup>	Out_Scale <sup>(2)</sup>	+ infinity	Read and Write	The setting for the alarm limit used to detect the HI HI alarm condition.
HI_HI_PRI	25	0 – 15	None	0	Read and Write	The priority of the HI HI alarm.
HI_LIM	28	Out_Scale <sup>(2)</sup>	Out_Scale <sup>(2)</sup>	+ infinity	Read and Write	The setting for the alarm limit used to detect the HI alarm condition.
HI_PRI	27	0 – 15	None	0	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.
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	Uninitialized	Read only	The LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.

Table 6-2. Analog Input Function Block System Parameters

Parameter	Index No.	Available values	Units	Default	Read/Write	Description
LO_LIM	30	Out_Scale <sup>(2)</sup>	Out_Scale <sup>(2)</sup>	- infinity	Read and Write	The setting for the alarm limit used to detect the LO alarm condition.
LO_LO_ALM	36	Not applicable	None	Uninitialized	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 <sup>(2)</sup>	Out_Scale <sup>(2)</sup>	- infinity	Read and Write	The setting for the alarm limit used to detect the LO LO alarm condition.
LO_LO_PRI	31	0 – 15	None	0	Read and Write	The priority of the LO LO alarm.
LO_PRI	29	0 – 15	None	0	Read and Write	The priority of the LO alarm.
LOW_CUT	17	> = 0	Out_Scale <sup>(2)</sup>	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 <sup>(2)</sup> ± 10%	Out_Scale <sup>(2)</sup>	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 <sup>(2)</sup>	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.

Table 6-2. Analog Input Function Block System Parameters

Parameter	Index No.	Available values	Units	Default	Read/Write	Description
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.
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	Refer to Table 6-3.			When the engineering units of the XD_SCALE are selected, this will cause the engineering units of the PRIMARY_VALUE_RANGE in the transducer block to change to the same units.

1. MTA models only
2. Assume that when L\_Type = Direct, the user configures Out\_Scale which is equal to XD\_Scale.



Table 6-3. Engineering Units Supported by Flowmeter

Channel 1		
Flow units	Unit description	Local meter display
ft <sup>3</sup> /d	Actual Cubic Feet per day	ACFD
CFH	Actual Cubic Feet per hour	ACFH
CFM	Actual Cubic Feet per minute	ACFM
ft <sup>3</sup> /d	Cubic Feet per day	ACFD
CFH	Cubic Feet per hour	ACFH
CFM	Cubic Feet per minute	ACFM
g/h	Grams per hour	G/H
g/min	Grams per minute	G/M
g/s	Grams per sec	G/S
ImpGal/d	Imperial Gallons per day	IGAL/D
ImpGal/h	Imperial Gallons per hour	IGAL/H
ImpGal/min	Imperial Gallons per minute	IGAL/M
ImpGal/s	Imperial Gallons per second	IGAL/S
kg/d	Kilogram per day	KG/D
kg/h	Kilogram per hour	KG/H
kg/min	Kilogram per minute	KG/MIN
kg/s	Kilogram per second	KG/S
L/d	Liters per day	L/D
L/min	Liters per minute	L/MIN
L/h	Liters per hour	L/H
L/s	Liters per second	L/S

lb/d	Pounds per day	LB/D
lb/h	Pounds per hour	LB/H
lb/min	Pounds per minute	LB/MIN
lb/s	Pounds per second	LB/S
m <sup>3</sup> /d	Cubic Meters per day	ACMD
m <sup>3</sup> /h	Cubic Meters per hour	ACMH
m <sup>3</sup> /min	Cubic Meters per minute	ACMM
Mm <sup>3</sup> /d	Million Actual Cubic Meters per day	MACM/D
Nm <sup>3</sup> /d	Normal Cubic Meters per day	NCMD
Nm <sup>3</sup> /h	Normal Cubic Meters per hour	NCMH
Nm <sup>3</sup> /min	Normal Cubic Meters per minute	NCMM
SBBL/d	Standard Barrels per day	SBBL/D
SBBL/h	Standard Barrels per hour	SBBL/H
SBBL/min	Standard Barrels per minute	SBBL/M
SBBL/s	Standard Barrels per seconds	SBBL/S
SCFH	Standard Cubic Feet per hour	SCFH
SCFM	Standard Cubic Feet per minute	SCFM
SGAL/d	Standard US Gallons per day	SGAL/D
SGAL/h	Standard US Gallons per	SGAL/H
SGAL/min	Standard US Gallons per minute	SGAL/M

Channel 1 (continued)		
Flow units	Unit description	Local meter display
SGAL/s	Standard US Gallons per second	SGAL/S
Sm <sup>3</sup> /d	Standard Cubic Meters per day	SCMD
Sm <sup>3</sup> /h	Standard Cubic Meters per hour	SCMH
Sm <sup>3</sup> /min	Standard Cubic Meters per minute	SCMM
Sm <sup>3</sup> /s	Standard Cubic Meters per second	SCMS
t/d	Metric ton per day	TON/D
t/h	Metric ton per hour	TON/H
t/min	Metric ton per minute	TON/M
Ston/d	Short ton per day	STON/D
Ston/h	Short ton per hour	STON/H
Ston/min	Short ton per minute	STON/M
bbl/d	US Barrels per day	BBL/D
bbl/h	US Barrels per hour	BBL/H
bbl/min	US Barrels per minute	BBL/M

Channel 2		
Channel 2 =Signal Strength and is a unit-less number. It cannot be displayed on the local meter display (LCD display).		
Channels 3 and 4		
Temperature	Unit description	Local meter display
K	Kelvin	PT K / ET K
°C	Degrees Celsius	PT °C / ET °C
°F	Degrees Fahrenheit	PT °F / ET °F
°R	Degrees Rankine	PT °R / ET °R
Channel 5		
Density	Unit description	Local meter display
kg/m <sup>3</sup>	Kilograms per cubic meter	KG/ACM
g/cm <sup>3</sup>	grams per cubic	G/CC
g/L	grams per liter	G/L
lb/in <sup>3</sup>	pounds per cubic inch	LB/CIN
lb/ft <sup>3</sup>	pounds per cubic foot	LB/ACF

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# Section 7 Troubleshooting

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## 7.1 Overview

This section provides troubleshooting information for the most common problems that occur during operation. It describes the advanced troubleshooting features provided by the flowmeter, and provides the maintenance procedures required to disassemble and re-assemble the hardware components.

## 7.2 Safety messages

Instructions and procedures in this section may require special precautions to insure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operations in this section.

### **▲ WARNING**

#### **Explosions could result in death or serious injury.**

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

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

- Make sure only qualified personnel perform the installation.

#### **The sensor cavity could contain line pressure if an abnormal failure has occurred inside the meter body.**

- De-pressurize flow line before removing the sensor nut.
-

## 7.3 Troubleshooting tables

The symptoms of metering problems include:

- Expected flow in pipe does not match the transmitter flow reading.
- Flow in pipe but transmitter indicates zero flow.
- No flow in pipe but transmitter indicates some flow.

### Note

The flowmeter sensor is extremely reliable and should not have to be replaced. Please consult the factory before removing the sensor.

---

Some user problems are listed in [Table 7-1](#), along with potential causes of the problem and suggested corrective actions.

The transmitter status definitions are listed in [Table 7-2](#).

Table 7-1. Basic Troubleshooting

Symptom	Corrective action
<p>Expected flow in pipe does not match the transmitter flow reading</p>	<p><b>Basics</b></p> <ul style="list-style-type: none"> <li>■ Check and verify configuration parameters in this order: K-factor, process fluid, transmitter mode, fixed process temperature, fixed process density, density ratio, pipe diameter, trigger level, low-flow cutoff, and low-pass corner frequency.</li> <li>■ Check sizing. Make sure the predicted flow is within the measurable flow limits.</li> <li>■ See <a href="#">Appendix C: Electronics verification</a> for electronics verification procedure.</li> </ul> <p><b>Possible application problems</b></p> <ul style="list-style-type: none"> <li>■ If the process is air or a gas and when reading in standard or normal units, verify the density ratio is correct. Also verify the process density is correct and the signal processing filters are optimized for the process density.</li> <li>■ Check signal_strength in the Transducer Block. Signal_strength should ideally be greater than or equal to 4 to indicate a sufficient flow signal.</li> <li>■ If using a remote mount installation, verify that no 50Hz or 60Hz interference is coupling in to the flow meter and being interpreted as flow. Verify the remote sensor cable is connected properly.</li> <li>■ If the process is a liquid, check for flashing or cavitation. This will cause the flow reading to be erratic. Check the line temperature and pressure. If possible, increase back pressure.</li> <li>■ Where applicable, verify viscosity and specific gravity requirements for the line size.</li> </ul> <p><b>All installations</b></p> <ul style="list-style-type: none"> <li>■ Verify any valve(s) in series with the meter are operating properly.</li> <li>■ Verify there are no parallel bypass lines running flow.</li> </ul> <p><b>Pipe/line vibration</b></p> <ul style="list-style-type: none"> <li>■ Add support to the process piping as near the meter as possible. This will help to dampen vibration at the meter.</li> <li>■ If the vibration frequency is “in band” with the flow signal, it may be possible to adjust the signal processing filters, specifically the low flow cutoff point to ignore the vibration.</li> <li>■ Rotate the meter body 90 degrees.</li> </ul>

Table 7-1. Basic Troubleshooting

Symptom	Corrective action
Flow in pipe but transmitter indicates zero flow	<p><b>Basics</b></p> <ul style="list-style-type: none"> <li>■ Check to make sure that the meter is installed with the arrow in the direction of flow.</li> <li>■ Check and verify configuration parameters in this order: K-factor, process fluid, transmitter mode, fixed process temperature, fixed process density, density ratio, pipe diameter, trigger level, low-flow cutoff, and low-pass corner frequency.</li> <li>■ Check sizing. Make sure the predicted flow is within the measurable flow limits.</li> <li>■ See <a href="#">Appendix C: Electronics verification</a> for electronics verification procedure.</li> </ul> <p><b>Possible application problems</b></p> <ul style="list-style-type: none"> <li>■ Check signal_strength in the Transducer Block. Signal_strength should ideally be greater than or equal to 4 to indicate a sufficient flow signal. If the number is below 4, verify the “process density” is correct and the signal processing filters are optimized for the process density. If the signal_strength is “zero” refer to the <a href="#">Vortex sensor and remote sensor cable</a> section below.</li> <li>■ If the filters are set correctly and the signal strength is still weak (less than 4), it is possible the actual flow is below the low flow cutoff setting. Lower the low_flow_cutoff and/or the trigger. Monitor the signal strength again to see if it has increased.</li> <li>■ For liquid applications with the meter installed horizontally, verify the pipe is full.</li> </ul> <p><b>Vortex sensor and remote sensor cable</b></p> <ul style="list-style-type: none"> <li>■ If using a remote mount installation, inspect the black coaxial remote sensor cable for cracks, cuts or other physical damage. If the cable is visibly damaged it should be replaced. Note: The Vortex remote mount sensor cable is NOT field repairable.</li> <li>■ Disconnect the remote sensor cable at the transmitter. Using an ohmmeter on its highest range, measure the insulation resistance of the remote sensor cable by measuring between the center conductor and the outer conductor. It should be greater than 1 MΩ. If not, disconnect the remote sensor cable at the flow sensor. Measure the cable again and see if the insulation resistance is greater than 1 MΩ. Refer to <a href="#">Figure 7-17</a> and <a href="#">Table 7-3 on page 107</a> for detailed cable troubleshooting. If less than 1 MΩ, the cable should be replaced. If it measures 1 MΩ or greater, then measure the flow sensor resistance at the sensor SMA connector. It should read greater than 1 MΩ resistance between the center conductor and the outer metal jacket. If not, the sensor is defective and should be replaced.</li> <li>■ If the Vortex sensor has been damaged by “water hammer” it may not be sitting on the meter body post properly. The only way to verify this is to remove the sensor. See <a href="#">7.5.4: Replacing the sensor</a>.</li> </ul> <p><b>Electronics</b></p> <ul style="list-style-type: none"> <li>■ See <a href="#">Appendix C: Electronics verification</a> for electronics verification procedure.</li> </ul>

Table 7-1. Basic Troubleshooting

Symptom	Corrective action
<p>No flow in pipe but transmitter indicates some flow</p>	<p><b>Basics</b></p> <ul style="list-style-type: none"> <li>■ Check and verify configuration parameters in this order: K-factor, process fluid, transmitter mode, fixed process temperature, fixed process density, density ratio, pipe diameter, trigger level, low-flow cutoff, and low-pass corner frequency.</li> <li>■ Check sizing; make sure the predicted flow is within the measurable flow limits.</li> </ul> <p><b>Pipe/line vibration</b></p> <p>In many cases if the Vortex transmitter indicates some flow when there is no actual flow, it is due to pipe or line vibration. If there is obvious vibration, follow these recommendations:</p> <ul style="list-style-type: none"> <li>■ Add support to the process piping as near the meter as possible. This will help to dampen vibration at the meter.</li> <li>■ If the vibration frequency is “in band” with the flow signal, it may be possible to adjust the signal processing filters—specifically the “low flow cutoff” point—to ignore the vibration.</li> <li>■ Rotate the meter body 90 degrees.</li> </ul> <p><b>50/60 Hz Measurement</b></p> <ul style="list-style-type: none"> <li>■ Verify that no 50Hz or 60Hz interference is coupling in to the flow meter and being interpreted as flow. Verify the remote sensor cable is properly earth grounded.</li> <li>■ If the remote sensor cable runs near other cables carrying large AC currents, separate the cables. The Vortex sensor cable should not be placed near other cables carrying high current.</li> <li>■ Lastly, if feasible, integrally mount the electronics to the meter body to see if the problem goes away.</li> </ul> <p><b>Application Problems</b></p> <ul style="list-style-type: none"> <li>■ Verify any valve or valves in series with the meter are closed entirely.</li> <li>■ Check if any pump pulsations are disturbing flow.</li> </ul>

**Table 7-2. Transducer Block Status Definitions (TB\_ELECTRONICS\_STATUS)**

Value	Name and description	LCD display indication (if any)	Corrective actions
0x00000002	SW_DETECTED_ERR: The device software has detected a software (typically math) error.	FAULT SFTWR	Restart the transmitter. <sup>(1)</sup>
0x00000004	COPROCESSOR_ERR: The coprocessor has detected a math or instruction error.	FAULT COPRO	Restart the transmitter. <sup>(1)</sup>
0x00000010	INTERRUPT_ERROR: The transducer block has detected that the coprocessor ASIC has stopped generating flow data interrupts.	FAULT ASIC	Restart the transmitter. <sup>(1)</sup>
0x00000020	COPROC_RAM_ERR: The coprocessor has detected a RAM error at startup.	FAULT RAM	Restart the transmitter. <sup>(1)</sup>
0x00000040	COPROC_ROM_ERR: The coprocessor has detected a ROM error at startup.	FAULT ROM	Restart the transmitter. <sup>(1)</sup>
0x00000100	TRIGGER_OVERRANGE: The transducer has detected that the configuration for the filter trigger level is out of range.		Verify the filter trigger level configuration. Default value is 4.
0x00000200	LOW_PASS_OVERRANGE: The transducer has detected that the configuration for the low pass filter is out of range.		Verify the low-pass filter configuration.
0x00000400	LOW_FLOW_CUT_OVERRANGE: The transducer has detected that the configuration for the low-flow cutoff is out of range.		Verify the low-flow cutoff configuration. Optimize filters.
0x00000800	SD2_COMM_ERR: There has been a communications error detected in on-board messaging.	FAULT SDCOM	Restart the transmitter. <sup>(1)</sup>
0x00001000	SD2_RESET: An ASIC on the sensor board has reset.	FAULT SDPLS	Voltage at the transmitter terminals should be greater than or equal to 9 VDC. Restart the transmitter. <sup>(1)</sup>
0x00002000	SENSOR_PWR_FAIL: The sensor board power has failed.	FAULT SPOWR	Voltage at the transmitter terminals should be greater than or equal to 9 VDC.
0x00004000	TC_OPEN: An open circuit has been detected on the thermocouple used to measure the process temperature.	FAULT TC	Check the thermocouple connection to the transmitter housing. Replace the thermocouple.
0x00008000	COPR_COEFF_BAD: The thermocouple math coefficients used to calculate process temperature are corrupt or invalid.	FAULT COEFF	Replace the transmitter.
0x00100000	AMBIENT_TEMP_ALARM: The temperature of the transmitter electronics is beyond operating limits.	FAULT TEMP	Change the ambient temperature around the transmitter housing. Remount the transmitter in a different orientation or consider a remote mount transmitter.



**Table 7-2. Transducer Block Status Definitions (TB\_ELECTRONICS\_STATUS)**

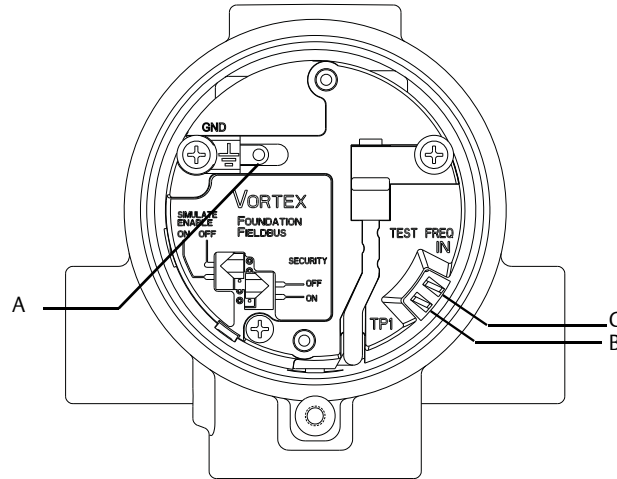
0x00200000	FIXED_TEMP_ACTIVE: An open thermocouple has been detected and the transmitter is configured to use the Fixed Process Temperature as a substitute for the measured process temperature.		Check the thermocouple connection to the transmitter housing. Replace the thermocouple.
0x00400000	PT_GT_DENSITY_CALC: The measured process temperature is above the limits for temperature compensated density calculations.	FAULT PT>CF	Density calculation is limited to the density calculated at the upper limit. Verify the measured process temperature.
0x00800000	PT_LT_DENSITY_CALC: The measured process temperature is below the limits for temperature compensated density calculations.	FAULT PT<CF	Density calculation is limited to the density calculated at the lower limit. Verify the measured process temperature.
0x01000000	PT_GT_USL: The measured process temperature is greater than the upper temperature sensor limit.	FAULT PT>SL	The process temperature measurement may not be accurate. <sup>(2)</sup>
0x02000000	PT_LT_LSL: The measured process temperature is less than the lower temperature sensor limit.	FAULT PT<SL	The process temperature measurement may not be accurate. <sup>(2)</sup>
0x04000000	FLOW_SIGNAL_INJECT: The transducer block is receiving its flow signal from an external signal generator.	SEnSOr OFFLN	Informational only.
0x08000000	FLOW_EMULATION_MODE: The transducer block is receiving its flow signal from the internal signal generator.	SIGnAL SIMUL	Informational only.
0x10000000	SENSOR_OVERRANGE: The transducer has detected a flow level that exceeds the upper sensor range. The status associated with the primary value (PV) and secondary value (SV) should also be BAD.	FAULT PV>SL	Verify process fluid configuration. Reduce flow to prevent damage to the sensor.
0x20000000	PV_OVERRANGE: The transducer has detected a flow level that exceeds the PV upper range. The status associated with the PV and SV should also be UNCERTAIN. The flow is still measurable, but accuracy is not guaranteed.		Reduce flow below the PV upper range value.
0x40000000	IN_LOW_FLOW_CUTOFF: The transducer has detected that the flow has dropped below the configured low-flow cutoff value. The reported flow value will now damp to zero.		Informational only.

1. If a transmitter power reset does not clear the error message, the electronics will need to be replaced.
2. If the process temperature exceeds the specified limits of the temperature sensor, the indicated process temperature may not be within the rated specifications of  $\pm 2.2$  °F (1.2 °C).

## 7.4 Advanced troubleshooting

The flowmeter electronics provides several advanced troubleshooting features. These features enhance your ability to look inside the electronics and can be helpful for troubleshooting. As shown in [Figure 7-1](#), there are several test points located on the electronics.

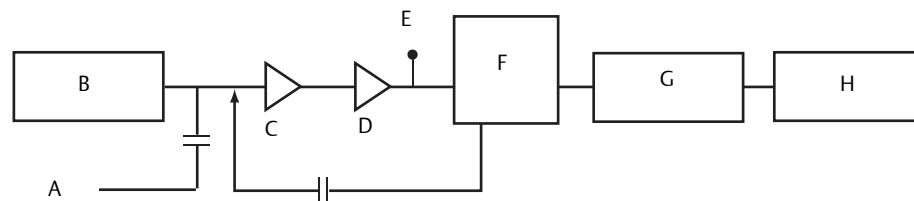
**Figure 7-1. Electronics Test Points**



- A. Ground
- B. TP1
- C. Test Freq IN

The electronics is capable of internally generating a flow signal that may be used to simulate a sensor signal. For instructions on how to perform an electronics verification, refer to [Appendix C: Electronics Verification](#).

**Figure 7-2. Signal Flow**



- A. External test frequency Input
- B. Sensor
- C. Charge amplifier
- D. Amplifier/low-pass filter
- E. TP1
- F. A-to-D converter/internal frequency generator
- G. Digital filter
- H. Microprocessor

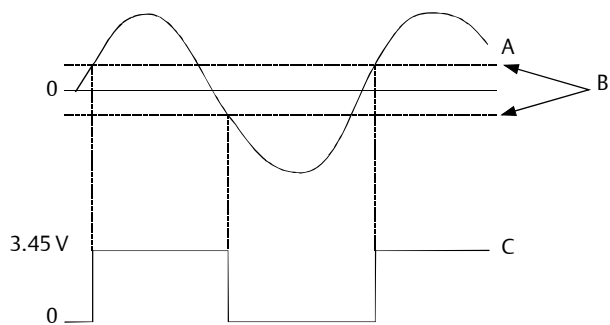
## 7.4.1 TP1

TP1 is the vortex shedding signal after it has gone through the charge amplifier and low pass filter stages and into the input of the sigma delta A-to-D converter ASIC in the electronics. The signal strength at this point will be in the mV to Volt range.

TP1 is easily measured with standard equipment.

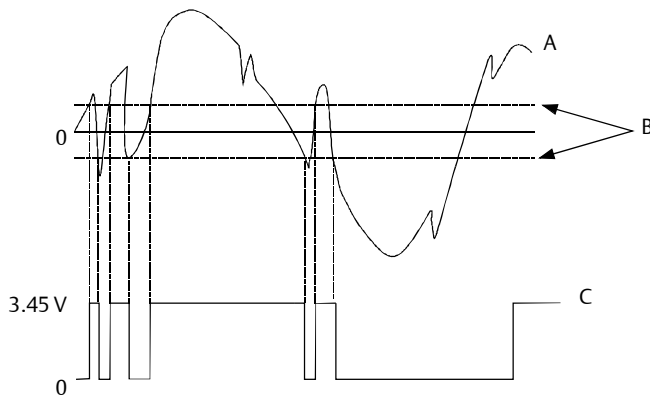
Figures 7-3, 7-4, and 7-5 show ideal (clean) waveforms and waveforms that may cause the output to be inaccurate. Please consult the factory if the waveform you detect is not similar in principle to these waveforms.

**Figure 7-3. Clean Signals**



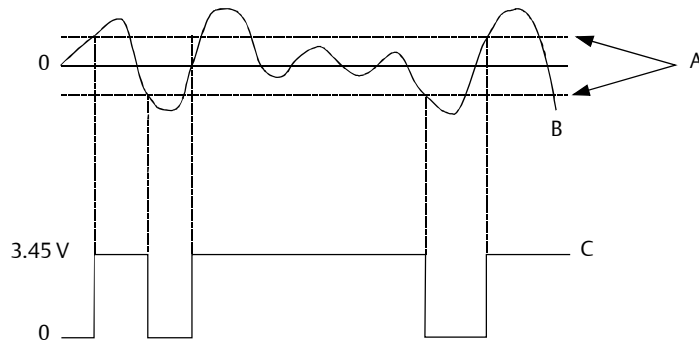
- A. Vortex signal (TP1)
- B. Trigger level
- C. Shedding frequency output

**Figure 7-4. Noisy Signals**



- A. Vortex signal (TP1)
- B. Trigger level
- C. Shedding frequency output

Figure 7-5. Improper Sizing/Filtering



- A. Trigger level
- B. Vortex signal (TP1)
- C. Shedding frequency output

## 7.5 Hardware maintenance

The flowmeter has no moving parts and requires a minimum amount of scheduled maintenance. The transmitter features a modular design for easy maintenance. If you suspect a malfunction, check for an external cause before performing the diagnostics presented below.

The following procedures will help you disassemble and assemble the flowmeter.

### Note

Use only the procedures and new parts specifically referenced in this manual. Unauthorized procedures or parts can affect product performance and the output signal used to control a process, and may render the instrument dangerous. Direct any questions concerning these procedures or parts to Emerson.

### Note

Flowmeters should not be left in service once they have been determined to be inoperable.

### ⚠ Note

Process should be vented before the meter body is removed from service for disassembly.

### 7.5.1 Replacing the FOUNDATION Fieldbus terminal block in the housing

To replace the FOUNDATION Fieldbus field terminal block in the housing, you will need a small, screwdriver. Use the following procedure to replace the terminal block in the housing of the flowmeter.

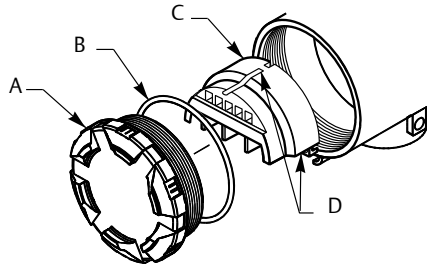
⚠ See “Safety messages” on page 81 for complete warning

### Removing the terminal block



1. Turn off the electric power to the flowmeter.
2. Unscrew the cover.

**Figure 7-6. FOUNDATION Fieldbus Terminal Block Assembly**



- A. Cover
- B. O-ring
- C. Terminal block
- D. Captive screws (3)

3. Disconnect the wires from the field terminals. Be sure to secure them out of the way.
4. Loosen the captive screws.
5. Pull outward on the block to remove it from the housing.

### Installing the terminal block

1. Align the terminal block over the captive screw holes in the terminal block side of the electronics housing.
2. Slowly press the terminal block into place. Do not force the block into the housing. Check the screw alignment if it does not glide into place.
3. Tighten the three captive screws to anchor the terminal block.
4. Connect the wires to the appropriate field terminals.
5. If you have the transient option (Option T1), reinstall the tighten the transient ground screw.
6. Screw on and tighten the cover.

## 7.5.2 Replacing the FOUNDATION Fieldbus electronics boards

The flowmeter electronics boards may need to be replaced if they have been damaged or otherwise become dysfunctional. Use the following procedures to replace electronics boards in the flowmeter. You will need a small Phillips-head screwdriver and a pliers.

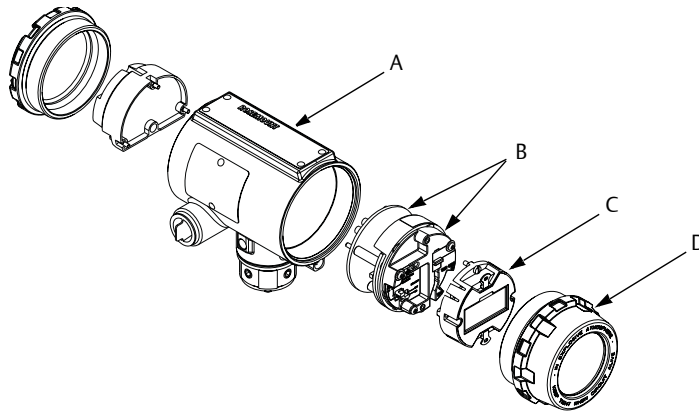
### Note

The electronics boards are electrostatically sensitive. Be sure to observe handling precautions for static-sensitive components.

### Remove the electronics boards

1. ⚠ Turn off the electric power to the flowmeter.
2. Unscrew and remove the electronics board compartment cover. If the transmitter has the LCD display option, the cover will have a glass window.

Figure 7-7. Electronics Board Assembly



- A. Transmitter housing
- B. Electronics boards
- C. LCD display
- D. Electronics board compartment cover

3. If the meter has the LCD display option, loosen the two retaining screws. Remove the LCD display and the 10-pin header connector from the electronics board.
4. Loosen the three captive screws that anchor the electronics.
5. Use a pliers or a small flathead screwdriver to carefully remove the sensor cable clip from the electronics.
6. Remove thermocouple if the MTA option is installed (requires a 2.5 mm hex wrench).
7. Use the handle molded into the black plastic cover of the electronics boards to slowly pull the boards out of the housing.

⚠ See “Safety messages” on page 81 for complete warning

### Install the electronics boards

1. Verify that power to the flowmeter is off.
2. Align the sockets on the bottom of the two electronics boards over the pins protruding from the bottom of the housing cavity.
3. Carefully guide the sensor cable through the notches on the edge of the circuit boards.
4. Slowly press the boards into place. Do not force the boards down. Check the alignment if they do not glide into place.
5. Use care to insert sensor cable clip into the electronics board.
6. Tighten the three captive screws to anchor the two electronics boards. Ensure that the SST washer is under the screw in the 2 o'clock position.
7. Reinsert jumpers into proper location.
8. If the meter has the LCD display option, insert the 10-pin header connector into the LCD display board.
  - a. Remove jumpers from the electronics board.
  - b. Put the connector through the bezel on the electronics board.
  - c. Carefully press the LCD display onto the electronics board.
  - d. Tighten the two screws that retain the LCD display.
  - e. Insert the alarm and security jumpers in the correct location.
9. Replace the electronics board compartment cover.


## 7.5.3 Replacing the FOUNDATION Fieldbus electronics housing

The flowmeter electronics housing can be replaced easily when necessary. Use the following procedure:

### Tools needed

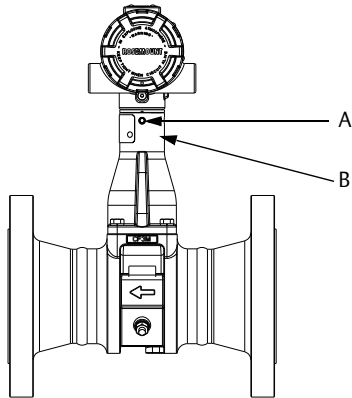
- $\frac{5}{32}$  in. (4 mm) hex wrench
- $\frac{5}{16}$  in. (8 mm) open-end wrench
- Screwdriver to disconnect wires
- Tools to disconnect conduit (if applicable)

### Removing the electronics housing

-  1. Turn off the electric power to the flowmeter.
2. Disconnect the power wires and conduit (if applicable) from the housing.
3. Use the  $\frac{5}{32}$  in. (4 mm) hex wrench to loosen the housing rotation screws (at the base of the electronics housing) by turning the screws clockwise (inward) until they clear the support tube. See [Figure 7-8](#).

 See “Safety messages” on page 81 for complete warning

Figure 7-8. Loosening the Housing Rotation Screws



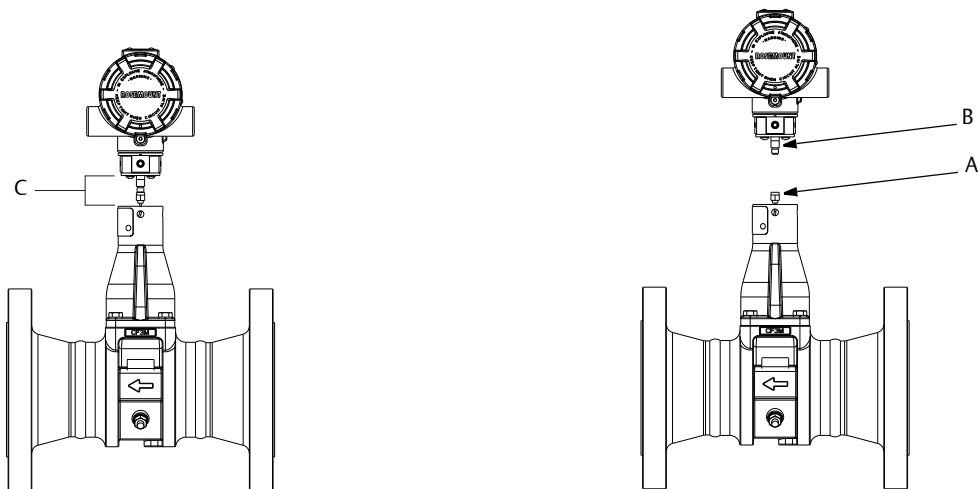
- A. Housing rotation screws
- B. Support tube

4. Slowly pull the electronics housing no more than 1.5 in. from the top of the support tube. See Figure 7-9.

**Note**

When the housing sensor header and sensor cable nut are connected, do not pull the housing more than 1.5 in. (40 mm) from the top of the support tube. Damage to the sensor cable may occur if the sensor cable is stressed.

Figure 7-9. Removing Electronics Housing



- A. Sensor cable nut—SMA connector
- B. Housing sensor header
- C. 1.5 in. maximum (40mm) while sensor cable is connected to the sensor header

5. Loosen the sensor cable nut from the housing sensor header with a  $\frac{5}{16}$  in. open-end wrench. See Figure 7-9.



### Installing the FOUNDATION Fieldbus electronics housing

1. Verify that power to the flowmeter is off.
2. Screw the sensor cable onto the base of the housing.
3. Tighten the sensor cable with a  $\frac{5}{16}$  in. open-end wrench.
4. Place the electronics housing into the top of the support tube.
5. Tighten the housing rotation screws with a  $\frac{5}{32}$  in. (4 mm) hex wrench. Turn counterclockwise to tighten.
6. Connect the power wires and any conduit.
7. Apply power.

## 7.5.4 Replacing the sensor

The sensor for the flowmeter is a sensitive instrument that should not be removed unless there is a problem with it. If you must replace the sensor, follow these procedures closely. The flowmeter sensor is extremely reliable, so it ordinarily does not need to be replaced. Please consult the factory before removing the sensor.

### Note

Be sure to fully check all other troubleshooting possibilities before removing the sensor.

Do not remove the sensor unless it is determined that a problem exists with the sensor itself. The sensor may not fit on the post if it is removed and replaced more than two or three times, or replaced incorrectly.

Also, please note that the sensor is a complete assembly and cannot be further disassembled.

### Tools needed

- $\frac{5}{32}$ -inch (4 mm) hex wrench
- $\frac{5}{16}$ -inch open end wrench
- $\frac{7}{16}$ -inch open end wrench
- $\frac{3}{4}$ -inch open end wrench (for 3- and 4-inch [80 and 100 mm] SST wafers)
- $1\frac{1}{8}$ -inch open end wrench (for all other models)
- Suction or compressed air device
- Small, soft bristle brush
- Cotton swabs
- Appropriate cleaning liquid: water or cleaning agent

## 7.5.5 Replacing the sensor: removable and integral support tubes

The following procedure applies to flowmeters equipped with a removable support tube.

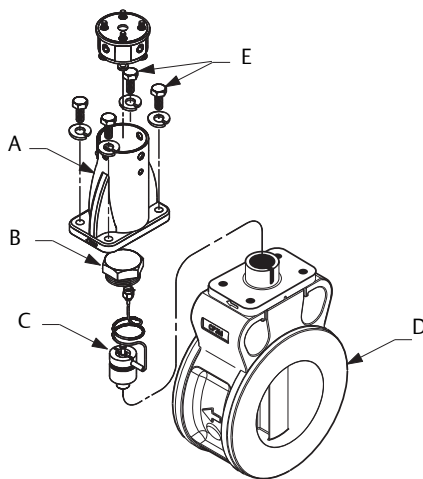
**Note**  
⚠ Sensor cavity could contain line pressure if an abnormal failure has occurred inside the meter body. See “Safety messages” on page 81 on for complete warning information.

1. If the meterbody is not a CriticalProcess™ Vortex (CPA Option) proceed to step 6.
2. Welded onto the side of the meter body is a valve. Move any nearby equipment from the line of sight of the valve tube, if possible. Protect other equipment with shielding, cover or other type of protection.
3. Position all personnel away from the line of sight of the valve tube.

**Note**  
There are numerous tube fittings that could connect to the tube if there is a need to drain away process material. The tube on the valve has a  $\frac{3}{16}$ -in. OD with a 0.035” wall thickness.

4. Using a  $\frac{7}{16}$ -in. (11-mm) open end wrench, slowly loosen the valve nut. Back out the nut until it stops. There is a set screw which prevents the nut from being completely removed.
5. Process fluid venting from the valve tube indicates that there is process fluid in the sensor cavity.
  - a. If there is no process fluid in the sensor cavity, continue to [Step 7](#).
  - b. If there is process fluid in the sensor cavity, immediately re-tighten the valve nut until process fluid stops venting. Do NOT tighten any further. STOP and contact your Rosemount Sales Representative. The meterbody will need to be replaced.
6. De-pressurize the flow line.
7. Remove the electronics housing (see “Replacing the FOUNDATION Fieldbus electronics housing” on page 93).
8. Loosen the four support tube anchor bolts with a  $\frac{7}{16}$ -in. open end wrench. See [Figure 7-10](#).

**Figure 7-10. Removable Support Tube Assembly**



A. Removable support tube

- B. Sensor nut
  - C. Sensor
  - D. Meter body
  - E. Anchor bolts
- 

9. Remove the support tube.
10. Loosen and remove the sensor nut from the sensor cavity with a 1<sup>1</sup>/<sub>8</sub>-inch (28-mm) open end wrench. (Use a <sup>3</sup>/<sub>4</sub>-in. (19-mm) open end wrench for 3- and 4-in. (80 and 100 mm) SST wafers.)
11. Lift the sensor from the sensor cavity. Be very careful to lift the sensor straight up. Do not rock, twist, or tilt the sensor during removal; this will damage the engagement diaphragm.
12. If the CriticalProcess™ Vortex flowmeter (CPA) option is present, tighten the valve to ensure it is closed after the new Vortex sensor is installed. It is recommended that the nut be torqued to 50 in-lbs (5.7 N-m). Over tightening the valve nut could compromise its ability to seal.

### Cleaning the sealing surface

Before installing a sensor in the meter body, clean the sealing surface by completing the following procedure. The metal o-ring on the sensor is used to seal the sensor cavity in the event that process fluid should corrode through the meter body and enter the sensor cavity. Be sure not to scratch or otherwise damage any part of the sensor, sensor cavity, or sensor nut threads. Damage to these parts may require replacement of the sensor or meter body, or may compromise the safety of the sealing surfaces.

#### Note

If you are installing a sensor that has been used before, clean the metal o-ring on the sensor using the following procedure. If you are installing a newly purchased sensor, cleaning the O-ring is not necessary.

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1. Use a suction or compressed air device to remove any loose particles from the sealing surface and other adjacent areas in the sensor cavity.

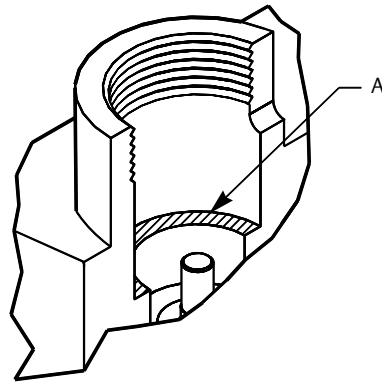
#### Note

Do not scratch or deform any part of the sensor, sensor cavity, or sensor nut threads.

---

2. Carefully brush the sealing surface clean with a soft bristle brush.
3. Moisten a cotton swab with an appropriate cleaning liquid.
4. Wipe the sealing surface. Repeat several times if necessary with a clean cotton swab until there is minimal dirt residue picked up by the cotton swab.

Figure 7-11. O-Ring Sealing Surface in Sensor Cavity



A. Sealing surface

### Sensor installation

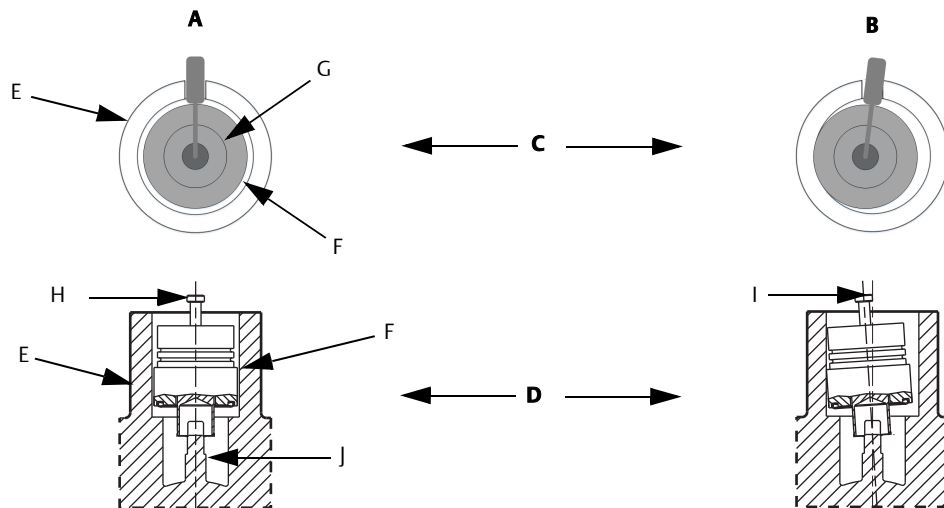
1. Carefully place sensor over the post in the sensor cavity.

#### Note

If the meter body is at an elevated temperature, let the sensor rest on the post to warm up before proceeding to the next step.

2. Insure that the sensor is centered on the post. See view “A” in Figure 7-12 for an example of improper installation and view “B” in Figure 7-12 for an example of proper installation.

Figure 7-12. Sensor Installation

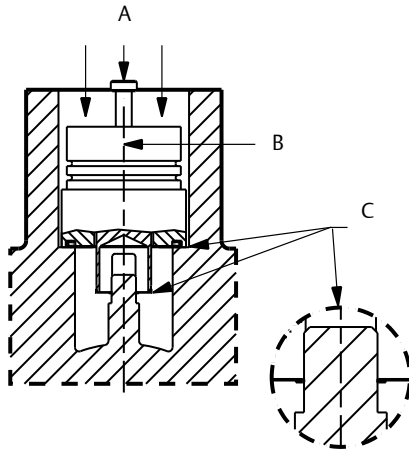


- A. Proper alignment
- B. Improper alignment
- C. Top view of sensor cavity
- D. Side view of sensor cavity
- E. Sensor cavity outer wall
- F. Sensor cavity inner wall
- G. Sensor
- H. Sensor centerline is properly aligned with flowmeter centerline.
- I. Sensor centerline is improperly aligned with flowmeter centerline: Damage to sensor will occur.

J. Sensor post

3. The sensor should remain as close to vertical as possible when applying force to seat it. See [Figure 7-13](#).

**Figure 7-13. Sensor Installation—Applying Force**



- A. Apply force with hand until sensor is seated.
- B. Sensor centerline must be aligned with flowmeter centerline
- C. Sensor properly seated

4. Manually push down on the sensor by applying equal pressure for engagement onto the post.
5. Screw the sensor nut into the sensor cavity. Tighten the nut with a 1<sup>1</sup>/<sub>8</sub>-inch open end torque wrench to 32 ft-lbs (43.4 N-m). Use a 3<sup>3</sup>/<sub>4</sub>-inch open end wrench for 3- and 4-inch (80 and 100 mm) SST wafers.

**Note**

The sensor nut must be tightened to 32 ft-lbs (43.4 N-m) for accurate flowmeter operation.

6. Replace the support tube.
7. Tighten the four bolts that anchor the support tube in place with a 7<sup>7</sup>/<sub>16</sub>-in. open end wrench.
8. Install the flowmeter electronics housing (see [page 93](#)).

## 7.5.6 Remote electronics procedures

If the flowmeter electronics housing is mounted remotely, some replacement procedures are different than for the flowmeter with integral electronics. The following procedures are exactly the same:

- Replacing the Field Terminal Block (see [page 90](#)).
- Replacing the Electronics Boards (see [page 92](#)).
- Replacing the Sensor (see [page 95](#)).

### Disconnecting the coaxial cable at the meter

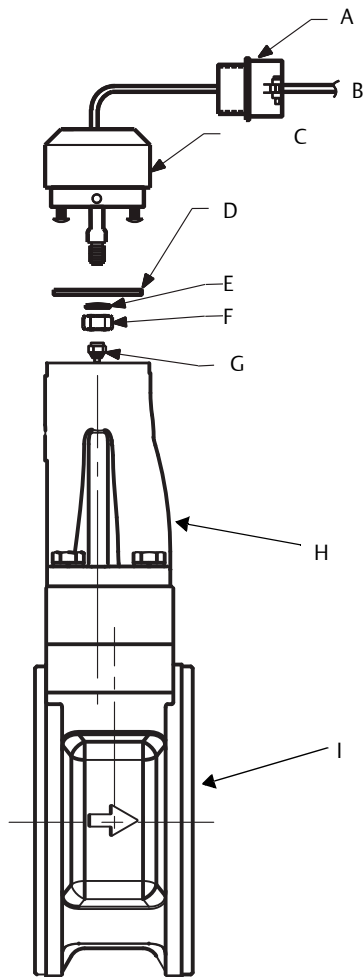
To disconnect the coaxial cable from the meter body and electronics housing, use the following procedure.

1. Loosen the three housing rotation screws at the base of the electronics housing with a  $\frac{5}{32}$ -in. hex wrench by turning the screws clockwise (inward) until they will clear the bracket. See Figure 7-14.
2. Slowly pull the meter adapter no more than 1.5-in. (40 mm) from the top of the support tube.
3. Loosen and disconnect the sensor cable nut from the union using a  $\frac{5}{16}$ -in. open end wrench.

#### Note

Do not pull the adaptor more than 1.5 inches (40 mm) from the top of the support tube. Damage to the sensor may occur if the sensor cable is stressed.

Figure 7-14. Coaxial Cable Connections



- A. NPT conduit adapter or cable gland (supplied by customer)  
B. Coaxial cable  
C. Meter adapter

D. Union  
E. Washer  
F. Nut  
G. Sensor cable nut  
H. Support tube  
I. Meter body

---

### Detaching the meter adapter

The above instructions will provide access to the meter body. Use the following steps if it is necessary to remove the coaxial cable:

1. Loosen and remove the two screws that hold the union onto the meter adapter and pull the union away from the adapter.
2. Loosen and remove the sensor cable nut from the other end of the union.
3. Loosen and disconnect the conduit adapter or cable gland from the meter adapter.

### Attaching the meter adapter

1. If you are using a conduit adapter or cable gland, slide it over the plain end of the coaxial cable (the end without a ground wire).
2. Slide the meter adapter over the coaxial cable end.
3. Use a  $\frac{5}{16}$ -in. (8 mm) open end wrench to securely tighten the sensor cable nut onto one end of the union.
4. Place the union onto the two screws extending out of the meter adapter and tighten the two screws.

### Connecting the coaxial cable at the meter body

1. Pull the sensor cable out of the support tube slightly and securely tighten the sensor cable nut onto the union.

#### Note

Do not stretch the sensor cable over 1.5 inches (40 mm) beyond the top of the support tube. Damage to the sensor may occur if the sensor cable is stressed.

2. Place the meter adapter into the top of the support tube and line up the screw holes.
3. Use a hex wrench to turn the three adapter screws counterclockwise (outward) to engage the support tube.
4. Tighten the conduit adapter or cable gland into the meter adapter.

## 7.5.7 Coaxial cable at the electronics housing

### Removing the coaxial cable from the electronics housing

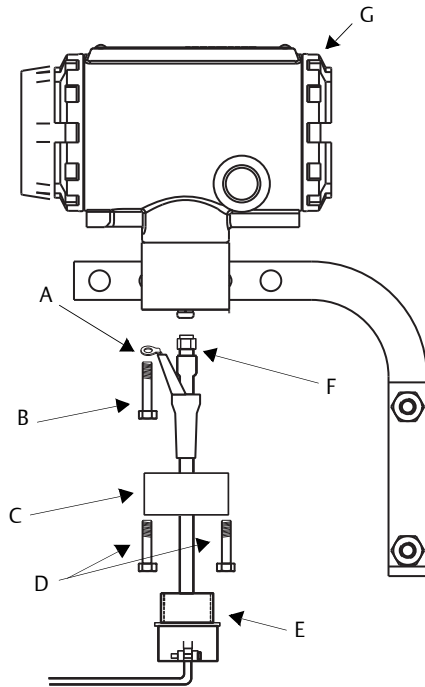
1. Loosen the two housing screws from the housing adapter.
2. Remove the housing adapter from the housing.
3. Loosen and remove the coaxial cable nut from the base of the electronics housing.
4. Remove the coaxial cable ground connection from the housing base by loosening the housing base screw that is connecting it to the housing base.
5. Loosen the conduit adapter (or cable gland) from the housing adapter.



### Removing the coaxial cable

1. Remove the coaxial cable ground wire from the housing adapter

**Figure 7-15. Remote Electronics Exploded View**



- A. Ground connection
- B. Housing base screw
- C. Housing adapter
- D. Housing adapter screws
- E. Conduit adapter (optional—supplied by customer)
- F. Coaxial cable nut
- G. Electronics housing

2. Loosen the conduit adapter (or cable gland) from the housing adapter.

### Attaching the coaxial cable

1. Route the coaxial cable through the conduit (if you are using conduit).
2. Place a conduit adapter over the end of the coaxial cable.
3. Remove the housing adapter from the electronics housing (if attached).
4. Slide the housing adapter over the coaxial cable.
5. Remove one of the four housing base screws that is in closest proximity to the ground connection.
6. Re-install the housing base screw by passing it through the ground connection.
7. Attach and securely tighten the coaxial cable nut to the connection on the electronics housing.
8. Align the housing adapter with the housing base and attach with the two housing adapter screws.
9. Tighten the conduit adapter to the housing adapter.

## 7.5.8 Changing the FOUNDATION Fieldbus housing orientation

The entire electronics housing may be rotated in 90° increments for easy viewing. Use the following steps to change the housing orientation:

1. Loosen the three housing rotation set screws at the base of the electronics housing with a  $\frac{5}{32}$ -in. hex wrench by turning the screws clockwise (inward) until they will clear the support tube.
2. Slowly pull the electronics housing out of the support tube.
3. Unscrew the sensor cable from the housing with a  $\frac{5}{16}$ -in. open end wrench.

#### Note

Do not pull the housing more than 1.5 in. (40 mm) from the top of the support tube until the sensor cable is disconnected. Damage to the sensor may occur if this sensor cable is stressed.

4. Rotate the housing to the desired orientation.
5. Hold it in this orientation while you screw the sensor cable onto the base of the housing.

#### Note

Do not rotate the housing while the sensor cable is attached to the base of the housing. Doing so will stress the cable and may damage the sensor.

6. Place the electronics housing into the top of the support tube.
7. Use a hex wrench to turn the three housing rotation screws counterclockwise to engage the support tube.
8. Tighten the screw on the access cover.

## 7.5.9 Temperature sensor replacement (MTA option only)

Replacement of the temperature sensor should only be necessary in the event of a failure.

### Removal

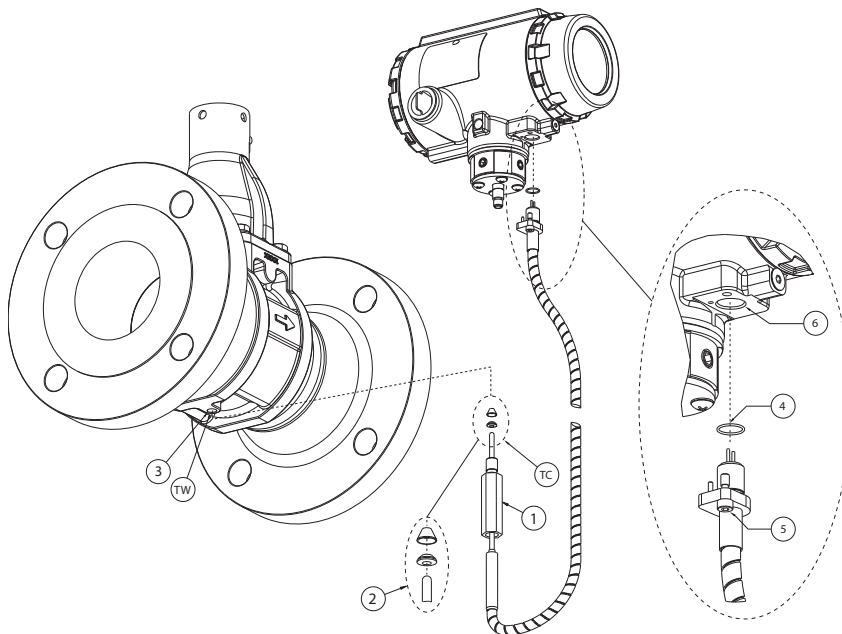
Use the following procedure to remove a temperature sensor. Refer to [Figure 7-16](#).

### Note

Use plant approved procedure for removing a temperature sensor from a thermowell.

1. Turn off power to the flowmeter.
2. Loosen the thermocouple bolt (1) with a 7-in. open end wrench.

**Figure 7-16. Thermocouple Assembly**



3. Carefully remove the temperature sensor from the meter body.
4. Using a 2.5mm hex wrench, loosen the hex socket screw (5) at the electronics housing.
5. Carefully disengage the connector from the electronics housing (6).

---

### Installation

Use the following procedure to install a temperature sensor. Refer to [Figure 7-16](#).

1. Slide the thermocouple bolt (1) over the thermocouple (TC).
2. Place the 2 part ferrule (2) over the end tip of the thermocouple (TC).
3. Insert the thermocouple in to the thermowell hole (TW) on the bottom side of the meter body.

### Important!

Carefully push the thermocouple in to the thermowell completely. This is critical to get the proper insertion depth.

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4. Thread the thermocouple bolt into the hole.
5. When the thermocouple bolt is hand tight, mark the position of the bolt in relation to the meter body (The mark will help determine rotations).
6. Using a  $1/2$ -in. wrench, turn the bolt clockwise  $3/4$  turn to seat the ferrule.

### Note

After completing the above step, the ferrule and thermocouple bolt will be permanently installed on the thermocouple.

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7. Verify the rubber O-ring is installed on the electronics connection end of the thermocouple.
8. Verify the 2.5mm hex head screw is installed.
9. Insert the electronics end connector into the transmitter housing.
10. Tighten the screw with a 2.5mm hex bit to secure the connection.

### Important!

Do not over tighten hex screw.

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## 7.5.10 Troubleshooting a remote mount cable

Troubleshooting a remote mount transmitter and meter body is very similar to troubleshooting an integral mount flowmeter, with the exception of the remote mount cable. The transmitter, meter body, and sensor evaluation are exactly the same as described in earlier sections.

Here are some common things to look for with the remote cable:

- Physical damage to the cable

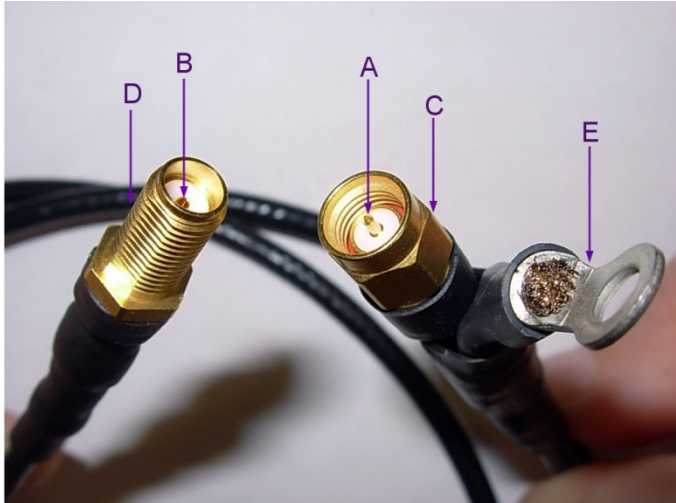
Visually inspect the cable for obvious damage. Cuts, abrasions, loose or broken connectors are common with cables that have been installed in the field.

- Electrical fault(s) with the cable

A common problem can be a cable installed in the field that is exposed to the elements. It can absorb moisture and thus lower its insulation resistance. Measure

for shorts, opens, and low IR (insulation resistance) as shown in Figure 7-17 and Table 7-3.

**Figure 7-17. Remote Mount Cable Test Points**



**Table 7-3. Test Points**

<b>PINS</b>	<b>DC resistance</b>	<b>Comments</b>
A to B	0.3 to 5 ohms	Depends on cable length
C to D	0.3 to 5 ohms	Depends on cable length
C to E	0.3 to 5 ohms	Depends on cable length
D to E	0.3 to 5 ohms	Depends on cable length
A to C,D or E	Greater than 1 MΩ	If cable has absorbed moisture. It will lower the IR
B to C,D or E	Greater than 1 MΩ	If cable has absorbed moisture. It will lower the IR
<b>PINS</b>	<b>Capacitance</b>	<b>Comments</b>
A to B	25 pfd/ft	Depends on measuring device used.

---

## 7.6 Return of material

To expedite the return process, call the Rosemount North American Response Center at 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 name of the process material to which the product was last exposed.

### Caution

People who handle products exposed to a hazardous substance can avoid injury if they are informed 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.

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The Rosemount North American Response Center will detail the additional information and procedures necessary to return goods exposed to hazardous substances.

### Toll-free assistance numbers

Within the United States, Emerson™ Process Management has two toll-free assistance numbers:

Technical support, quoting, and order-related questions:

1-800-522-6277 (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.

# Appendix A Specifications and Reference Data

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Functional specifications .....	page 109
Performance specifications .....	page 112
Physical specifications .....	page 113
Dimensional drawings .....	page 116

## A.1 Specifications

The following specifications are for the Rosemount 8800D, Rosemount 8800DR, Rosemount 8800DD, and Rosemount 8800DW flowmeters, except where noted.

## A.2 Functional specifications

### Process fluids

Liquid, gas, and steam applications. Fluids must be homogeneous and single-phase.

### Line sizes

#### Wafer

1/2, 1, 1 1/2, 2, 3, 4, 6, and 8 inches  
(DN 15, 25, 40, 50, 80, 100, 150, and 200)

#### Flanged and dual-sensor style

1/2, 1, 1 1/2, 2, 3, 4, 6, 8, 10, and 12 inches  
(DN 15, 25, 40, 50, 80, 100, 150, 200, 250, and 300)

#### Reducer

1, 1 1/2, 2, 3, 4, 6, 8, 10, and 12 inches  
(DN 25, 40, 50, 80, 100, 150, 200, 250, and 300)

### Pipe schedules

Process piping Schedules 10, 40, 80, and 160.

### Note

The appropriate bore diameter of the process piping must be entered using the Field Communicator or AMS Device Manager. Meters will be shipped from the factory at the Schedule 40 default value unless otherwise specified.

### Measurable flow rates

Capable of processing signals from flow applications which meet the sizing requirements below.

To determine the appropriate flowmeter size for an application, process conditions must be within the Reynolds number and velocity limitations for the desired line size provided in Table A-1, Table A-2, and Table A-3.

### Note

To assist in sizing the flowmeter, contact your local Rosemount sales representative to obtain a copy of Instrument Toolkit™, which contains a vortex sizing module for calculating valid flowmeter sizes based on user-supplied application information.

The Reynolds number equation shown below combines the effects of density ( $\rho$ ), viscosity ( $\mu_{cp}$ ), pipe inside diameter ( $D$ ), and flow velocity ( $V$ ).

$$R_D = \frac{VD\rho}{\mu_{cp}}$$

**Table A-1. Minimum Measurable Meter Reynolds Numbers**

Meter sizes (inches/DN)	Reynolds number limitations
1/2 through 4/15 through 100	5000 minimum
6 through 12/150 through 300	

**Table A-2. Minimum Measurable Meter Velocities<sup>(1)</sup>**

	Feet per Second	Meters per Second
Liquids <sup>(2)</sup>	$\sqrt{36/\rho}$	$\sqrt{54/\rho}$
Gases <sup>(2)</sup>	$\sqrt{36/\rho}$	$\sqrt{54/\rho}$

The  $\rho$  is the process fluid density at flowing conditions in lb/ft<sup>3</sup> for ft/s and kg/m<sup>3</sup> for m/s

1. Velocities are referenced to schedule 40 pipe.
2. This minimum measurable meter velocity is based on default filter settings.

**Table A-3. Maximum Measurable Meter Velocities<sup>(1)</sup>  
(Use the smaller of the two values)**

	Feet per Second	Meters per Second
Liquids	$\sqrt{90,000/\rho}$ or 30	$\sqrt{134,000/\rho}$ or 9.1
Gases <sup>(2)</sup>	$\sqrt{90,000/\rho}$ or 300	$\sqrt{134,000/\rho}$ or 91.1

The  $\rho$  is the process fluid density at flowing conditions in lb/ft<sup>3</sup> for ft/s and kg/m<sup>3</sup> for m/s

1. Velocities are referenced to schedule 40 pipe.
2. Accuracy limitations for gas and steam for Dual-style meters (1/2-in. to 4-in.): max velocity of 100 ft/s (30.5 m/s).

**Process temperature limits**

**Standard**

-40 to 450 °F (-40 to 232 °C)

**Extended**

-330 to 800 °F (-200 to 427 °C)

**Severe**

-330 to 842 °F (-200 to 450 °C)

- -157 to 800 °F (-105 to 427 °C) for European Pressure Equipment Directive (PED), consult factory for lower operating temperatures.
- The flowtube and sensor, in remote mount configurations, is functionally rated to 842 °F (450 °C) process temperature. Process temperature may be further restricted depending on hazardous area options and PED certificates. Consult applicable certificates for particular installation limits.

**Multivariable (MTA option)**

-50 to 800 °F (-45 to 427 °C)

- Use above 450 °F (232 °C) requires Extended Sensor

**Output signal**

Completely digital output with FOUNDATION™ Fieldbus communication (ITK 6.0 compliant).

**FOUNDATION™ Fieldbus transmitter power requirement**

9–30 Vdc/18 mA	I.S. INSTALLATIONS
9–17.5 Vdc/18 mA	FISCO
9–32 Vdc/18 mA	ALL OTHERS

**Power consumption**

Based on maximum ratings=600 mWatts

**Ambient temperature limits**

**Operating**

-58 to 185 °F (-50 to 85 °C)

-4 to 185 °F (-20 to 85 °C) for flowmeters with local indicator

**Storage**

-58 to 250 °F (-50 to 121 °C)

-50 to 185 °F (-46 to 85 °C) for flowmeters with local indicator

**Pressure limits**

**Flange style meter**

Rated for ASME B16.5 (ANSI) Class 150, 300, 600, 900, and 1500, EN 1092-1, PN 10, 16, 25, 40, 63, 100, and 160, and JIS 10K, 20K, and 40K

**Reducer style meter**

Rated for ASME B16.5 (ANSI) Class 150, 300, 600, and 900, EN 1092-1, PN 10, 16, 25, 40, 63, 100, and 160.

**Dual sensor style meter**

Rated for ASME B16.5 (ANSI) Class 150, 300, 600, 900, and 1500, EN 1092-1, PN 10, 16, 25, 40, 63, 100, and 160, and JIS 10K, 20K, and 40K

**Wafer style meter**

Rated for ASME B16.5 (ANSI) Class 150, 300, and 600, EN 1092-1, PN 10, 16, 25, 40, 63, and 100, and JIS 10K, 20K, and 40K

**Note**

All wafer style meters are pressure rated and labeled at 1500 PSI / 10.34 MPa at 100 °F / 38 °C regardless of alignment ring size code ordered.

**Weld-end style meter**

W1 Welds to Schedule 10 mating pipe  
Max Working Pressure 720 psig (4.96 MPa-g)

W4 Welds to Schedule 40 mating pipe  
Max Working Pressure 1440 psig (9.93 MPa-g)

W8 Welds to Schedule 80 mating pipe  
Max Working Pressure 2160 psig (14.9 MPa-g)

W9 Welds to Schedule 160 mating pipe  
Max Working Pressure 3600 psig (24.8 Mpa-g)



**Note**

1-in. (25 mm), and 1.5-in. (40 mm) weld to Schedule 80 mating pipe

**Optional LCD display**

The optional LCD display is capable of displaying:

FOUNDATION Fieldbus
Flow
Percent of Range
Process Temperature (MTA only)
Process Density (MTA only)
Shedding Frequency
Electronics Temperature (MTA only)
Integrator Output

If more than one item is selected, the display will scroll through all items selected.

**Enclosure rating**

FM Type 4X; CSA Type 4X; IP66

**Damping**

Flow Damping adjustable between 0.2 and 255 seconds.

Process Temperature Damping adjustable between 0.4 and 32.0 seconds (MTA Option Only).

**Response time**

Three vortex shedding cycles or 300 ms, whichever is greater, maximum required to reach 63.2% of actual input with the minimum damping (0.2 seconds).

**Turn-on time**

**FOUNDATION Fieldbus**

Less than six (6) seconds plus the response time to rated accuracy from power up (less than 8 seconds with the MTA Option).

**Transient protection**

The optional transient terminal block prevents damage to the flowmeter from transients induced by lightning, welding, heavy electrical equipment, or switch gears. The transient protection electronics are located in the terminal block.

The transient terminal block meets the following specifications:

- IEEE C62.41 - 2002 Category B
- 3 kA crest (8 X 20 μs)
- 6 kV crest (1.2 X 50 μs)
- 6 kV/0.5 kA (0.5 μs, 100 kHz, ring wave)

**Security lockout**

When the security lockout jumper is enabled, the electronics will not allow you to modify parameters that affect flowmeter output.

**Humidity limits**

Operates in 0–95% relative humidity under non-condensing conditions (tested to IEC 60770, Section 6.2.11).

**Flow calibration**

Meter bodies are flow-calibrated and assigned a unique calibration factor (K-factor) at the factory. The calibration factor is entered into the electronics, enabling interchangeability of electronics and/or sensors without calculations or compromise in accuracy of the calibrated meter body.

**Flow calibration information**

Flowmeter calibration and configuration information is provided with every flowmeter. For a certified copy of flow calibration data, Option Q4 must be ordered in the model number.

**Permanent pressure loss**

The approximate permanent pressure loss (PPL) from the flowmeter is calculated for each application in the Vortex sizing software available from your local Rosemount representative. The PPL is determined using the equation:

$$PPL = \frac{A \times \rho_f \times Q^2}{D^4}$$

where:

- PPL = Permanent Pressure Loss (psi or kPa)
- Where:
- ρ<sub>f</sub> = Density at operating conditions (lb/ft<sup>3</sup> or kg/m<sup>3</sup>)
- Q = Actual volumetric flow rate (Gas = ft<sup>3</sup>/min or m<sup>3</sup>/hr; Liquid = gal/min or l/min)
- D = Flowmeter bore diameter (in. or mm)
- A = Constant depending on meter style, fluid type and flow units. Determined per Table A-4.

**Table A-4. Determining the PPL**

Meter style	English units		SI units	
	A <sub>Liquid</sub>	A <sub>Gas</sub>	A <sub>Liquid</sub>	A <sub>Gas</sub>
8800DF/W	$3.4 \times 10^{-5}$	$1.9 \times 10^{-3}$	0.425	118
8800DR	$3.91 \times 10^{-5}$	$2.19 \times 10^{-3}$	0.489	136
8800DD <sup>(1)</sup>	$6.12 \times 10^{-5}$	$3.42 \times 10^{-3}$	0.765	212

1. For all 6-in. thru 12-in. line sizes A is the same for Rosemount 8800DD and 8800DF

**Minimum downstream pressure (liquids)**

Flow metering conditions that would allow cavitation, the release of vapor from a liquid, should be avoided. This flow condition can be avoided by remaining within the proper flow range of the meter and by following appropriate system design.

For some liquid applications, incorporation of a back pressure valve should be considered. To prevent cavitation, the minimum downstream pressure should be:

$$P = 2.9 \cdot \Delta P + 1.3 \cdot P_v \text{ or } P = 2.9 \cdot \Delta P + p_v + 0.5 \text{ psia (3.45 kPa) (use the smaller of the two results)}$$

$P$  = Line pressure five pipe diameters downstream of the meter (psia or kPa abs)

$\Delta P$  = Pressure loss across the meter (psi or kPa)

$P_v$  = Liquid vapor pressure at operating conditions (psia or kPa abs)

**A.3 Performance specifications**

The following performance specifications are for all Rosemount models except where noted. Digital performance specifications applicable to Fieldbus output.

**Flow accuracy**

Includes linearity, hysteresis, and repeatability.

**Liquids—for Reynolds Numbers over 20000**

$\pm 0.65\%$  of rate  
Note: The accuracy for the Rosemount 8800DR, line sizes 6 to 12 inch (150 to 300mm), is  $\pm 1.0\%$  of rate.

**Gas and steam—for Reynolds Numbers over 15,000**

$\pm 1.0\%$  of rate  
Note: The accuracy for the Rosemount 8800DR, line sizes 6 to 12 inch (150 to 300mm), is  $\pm 1.35\%$  of rate.  
Accuracy limitations for gas and steam:

- for 1/2- and 1-in. (DN 15 and DN 25): max velocity of 220 ft/s (67.06 m/s)
- for Dual-style meters (1/2-in. to 4 in.): max velocity of 100 ft/s (30.5 m/s)

**Note**

As the meter Reynolds Numbers decreases below the stated limit to 10,000 the accuracy error band will increase linearly to  $\pm 2.0\%$ . For Reynolds Numbers down to 5,000 the accuracy error band will increase linearly from  $\pm 2.0\%$  to  $\pm 6.0\%$ .

**Process temperature accuracy**

2.2° F (1.2° C) or 0.4% of reading (in °C), whichever is greater.

**Mass flow accuracy for temperature compensated mass flow**

2.0% of rate (Typical)

**Repeatability**

$\pm 0.1\%$  of actual flow rate

**Stability**

$\pm 0.1\%$  of rate over one year

**Process temperature effect**

Automatic K-factor correction with user-entered process temperature.

Table A-5 indicates the percent change in K-factor per 100 °F (55.5 °C) in process temperature from reference temperature of 77 °F (25 °C).

**Table A-5. Percent Change in K-factor**

Material	Percent change in K-Factor per 100 °F (55.5 °C)
316L @ < 77 °F (25 °C)	+ 0.23
316L @ > 77 °F (25 °C)	- 0.27
Nickel alloy C < 77 °F (25 °C)	+ 0.22
Nickel alloy C > 77 °F (25 °C)	- 0.22

**Ambient temperature effect****Digital Fieldbus signal**

No effect

**Vibration effect**

An output with no process flow may be detected if sufficiently high vibration is present.

The meter design will minimize this effect, and the factory settings for signal processing are selected to eliminate these errors for most applications.

If an output error at zero flow is still detected, it can be eliminated by adjusting the low flow cutoff, trigger level, or low-pass filter.

As the process begins to flow through the meter, most vibration effects are quickly overcome by the flow signal.

**Integral SST housing**

At or near the minimum liquid flow rate in a normal pipe mounted installation, the maximum vibration should be 0.044-in. (1,11 mm) double amplitude displacement or  $1/3$  g acceleration, whichever is smaller. At or near the minimum gas flow rate in a normal pipe mounted installation, the maximum vibration should be 0.022-in. (0,55 mm) double amplitude displacement or  $1/6$  g acceleration, whichever is smaller.

**Mounting position effect**

Meter will meet accuracy specifications when mounted in horizontal, vertical, or inclined pipelines. Best practice for mounting in a horizontal pipe is to orient the shedder bar in the horizontal plane. This will prevent solids in liquid applications and liquid in gas/steam applications from disrupting the shedding frequency.

**EMI/RFI Effect**

Meets EMC requirements to EU Directive 2004/108/EC.

**FOUNDATION™ Fieldbus**

No affect on the values that are being given if using FOUNDATION™ Fieldbus. Tested per EN61326.

**Magnetic-field interference**

No effect on accuracy at 30 A/m (rms). Tested per EN 61326.

**Series mode noise rejection**

No effect on accuracy at 1 V rms 60 Hz. Meets IEC 60770-1984, Section 6.2.4.2

**Common mode noise rejection**

No effect on accuracy at 250 V rms, 60 Hz. According to FF-830-PS-2.0 test case 8.2.

**Power supply effect**

No effect on accuracy.

## A.4 Physical specifications

**NACE® compliance**

Materials of Construction meet NACE material recommendations per MR0175/ISO15156 for use in H2S containing environments in oil field production. Materials of construction also meet NACE recommendations per MR0103-2003 for corrosive petroleum refining environments. MR0103 compliance requires Q25 option in model code.

**Note**

Certificate of compliance for MR0175/ISO15156 requires Q15 as a separate line item.

**Electrical connections**

$1/2$  – 14 NPT, PG 13.5, or M20 3 1.5 conduit threads; screw terminals provided for Fieldbus connections; communicator connections permanently fixed to terminal block.

**Non-wetted materials****Housing**

Low-copper aluminum (FM Type 4X, CSA Type 4X, IP66)

Optional SST housing

**Paint**

Polyurethane

**Cover O-rings**

Buna-N

**Flanges**

316/316L lap joint

**Temperature sensor (MTA option)**

Type-N Thermocouple

**Process-wetted materials**

**Wetted material selection**

Ensure that the process fluid is compatible with the meter body wetted materials when specifying the Rosemount 8800D Vortex Flowmeter. Corrosion will shorten the life of the meter body. Because of the wide variety of processes and applications, it is impossible to guarantee material compatibility in a given process without performing corrosion tests under actual operating conditions. Therefore, the final decision of material selection resides with the end user.

**Note**

For accurate material identification, perform a Positive Material Identification (PMI) test on a machined surface.

**Meter body**

- CF-3M cast stainless steel
- N06022 wrought nickel alloy and CW2M cast nickel alloy
- 6A Duplex stainless steel
- WCB or LCC cast carbon steel

**Flanges**

- 316/316L stainless steel
- Nickel alloy N06022 Weld Neck
- A105N forged carbon steel
- LF2 forged carbon steel
- UNS S32760 wrought duplex stainless steel

**Collars**

- Nickel alloy N06022
- 316/316L stainless steel

**Surface finish of flanges and collars**

- Standard: To the requirements of the applicable flange standard
- Smooth: 63 to 125  $\mu$ m inches
- (1.6 to 3.1 m meters) Ra roughness

**Process connections**

Mounts between the following flange configurations:

- ASME B16.5 (ANSI): Class 150, 300, 600, 900, 1500
- DIN: PN 10, 16, 25, 40, 64, 100, 160
- JIS: 10K, 20K, and 40K
- Weld-end: Schedule 10, 40, 80, and 160

**Mounting**

**Integral (standard)**

Electronics are mounted on meter body.

**Remote (optional)**

Electronics may be mounted remote from the meter body. Interconnecting coaxial cable available in nonadjustable 10, 20, and 30 ft (3,0, 6,1, and 9,1 m) lengths. Consult factory for non-standard lengths up to 75 ft (22,9 m). Remote mounting hardware includes a polyurethane painted, carbon steel pipe mount bracket with one carbon steel u-bolt.

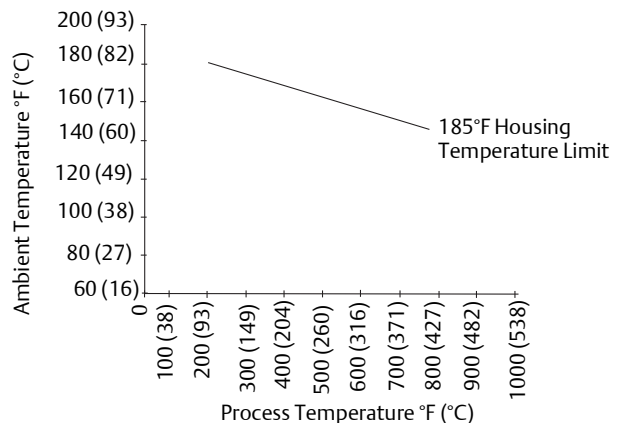
Armored remote cables are also available in lengths of 10, 20, 33, 50 and 75 feet. The armored remote option comes standard with an aluminum gland to connect the cable to the meter and electronics. A stainless steel gland is provided when ordered in conjunction with a stainless steel electronics housing.

**Temperature limitations for integral mounting**

The maximum process temperature for integral mount electronics is dependent on the ambient temperature where the meter is installed. The electronics must not exceed 185°F (85°C). The following is for reference, please note that the pipe was insulated with 3 inches of ceramic fiber insulator.

**Figure A-1. Rosemount 8800 Vortex Flowmeter Ambient/Process Temperature Limits**

**Shows combinations of ambient and process temperatures needed to remain at or below 185°F (85°C) housing temperature**



Meter and pipe insulated with 3 inches of ceramic fiber insulation. Horizontal Pipe and Vertical meter position.

**Pipe length requirements**

The vortex meter may be installed with a minimum of ten diameters (D) of straight pipe length upstream and five diameters (D) of straight pipe length downstream.

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Rated Accuracy is based on the number of pipe diameter from an upstream disturbance. No K-factor correction is required if the meter is installed with 35 D upstream and 10 D downstream. The value of the K-factor may shift up to 0.5% when the upstream straight pipe length is between 10D and 35D. This effect can be corrected for in the electronics transmitter.

Refer to the Rosemount Vortex Installation Effects [Technical Data Sheet](#) for K-factor correction data.

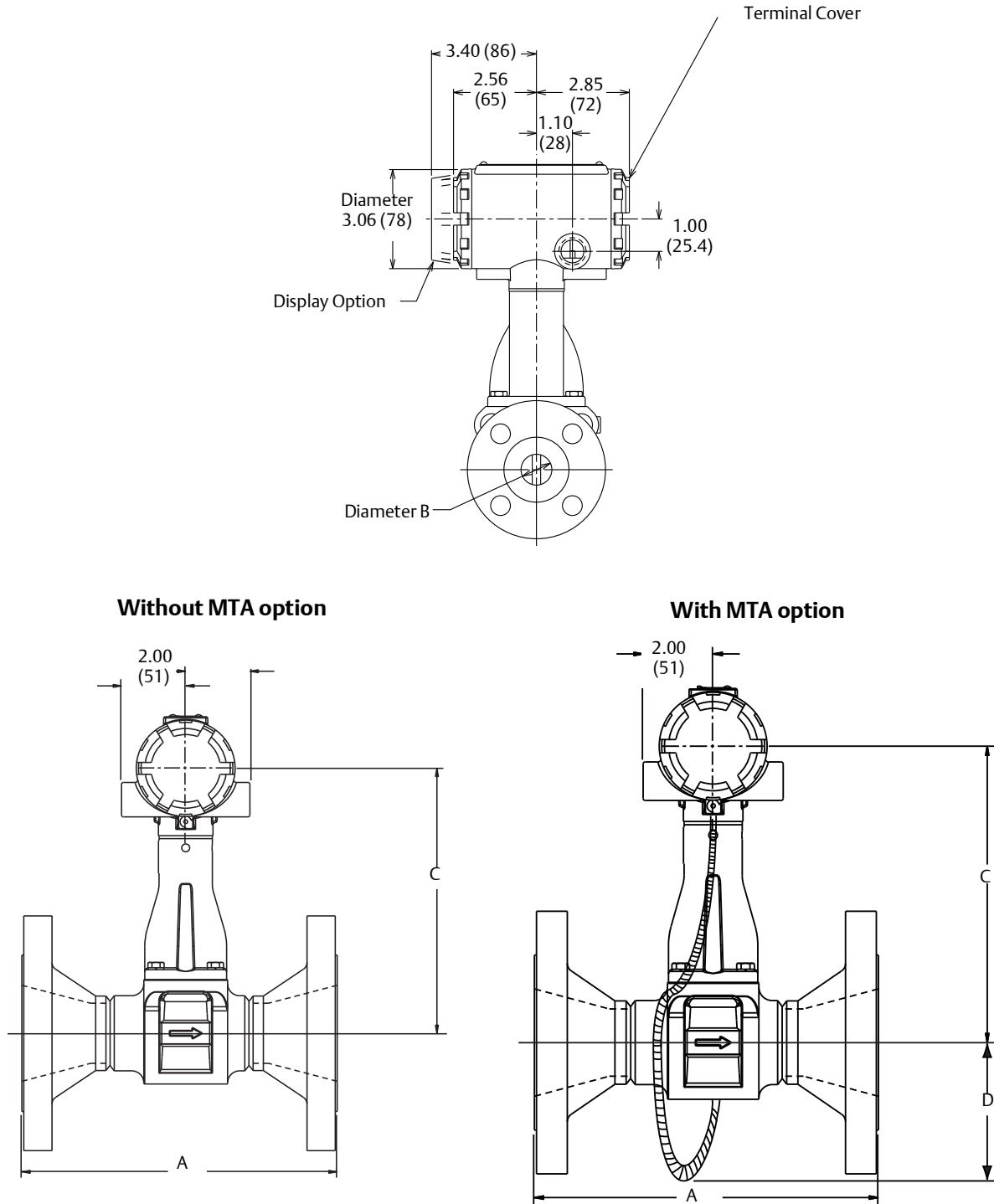
### **Tagging**

The flowmeter will be tagged at no charge, according to customer requirements. All tags are stainless steel. The standard tag is permanently attached to the flowmeter. Character height is 1/16-inch (1,6 mm).

A wired-on tag is available on request. Wire on tags can contain five lines with up to 28 characters per line.

## A.5 Dimensional drawings

Figure A-2. Flanged-Style Flowmeter (1/2-through 2-in./15 through 300 mm Line Sizes)



Dimensions are in inches (millimeters).

**Table A-6. Flanged-Style Flowmeter (1/2-through 2-in./15 through 50 mm Line Sizes)**

Nominal size inch (mm)	Flange rating	Face-to-face A Inch (mm)	A-ANSI RTJ Inch (mm)	Diameter B Inch (mm)	C Inch (mm)	Weight lb (kg)
1/2 (15)	Class 150	6.8 (173)	N/A	0.54 (13,7)	7.6 (193)	9.1 (4,1)
	Class 300	7.2 (183)	7.6 (193)	0.54 (13,7)	7.6 (193)	10.4 (4,7)
	Class 600	7.7 (196)	7.6 (193)	0.54 (13,7)	7.6 (193)	10.8 (4,9)
	Class 900	8.3 (211)	8.3 (211)	0.54 (13,7)	7.6 (193)	15.3 (6,9)
	PN 16/40	6.1 (155)	N/A	0.54 (13,7)	7.6 (193)	10.4 (4,7)
	PN 100	6.6 (168)	N/A	0.54 (13,7)	7.6 (193)	12.4 (5,6)
1 (25)	JIS 10K/20K	6.3 (160)	N/A	0.54 (13,7)	7.6 (193)	10.2 (4,6)
	JIS 40K	7.3 (185)	N/A	0.54 (13,7)	7.6 (193)	13.7 (6,2)
	Class 150	7.5 (191)	8.0 (203)	0.95 (24,1)	7.7 (196)	12.3 (5,6)
	Class 300	8.0 (203)	8.5 (216)	0.95 (24,1)	7.7 (196)	15.0 (6,8)
	Class 600	8.5 (216)	8.5 (216)	0.95 (24,1)	7.7 (196)	15.8 (7,2)
	Class 900	9.4 (239)	9.4 (239)	0.95 (24,1)	7.7 (196)	24.1 (11,1)
1 1/2 (40)	Class 1500	9.4 (239)	9.4 (239)	0.95 (24,1)	7.7 (196)	24.4 (11,1)
	PN 16/40	6.2 (157)	N/A	0.95 (24,1)	7.7 (196)	13.6 (6,2)
	PN 100	7.7 (196)	N/A	0.95 (24,1)	7.7 (196)	19.6 (8,9)
	PN 160	7.7 (196)	N/A	0.95 (24,1)	7.7 (196)	19.6 (8,9)
	JIS 10K/20K	6.5 (165)	N/A	0.95 (24,1)	7.7 (196)	14.0 (6,3)
	JIS 40K	7.8 (198)	N/A	0.95 (24,1)	7.7 (196)	17.7 (7,9)
2 (50)	Class 150	8.2 (208)	8.7 (221)	1.49 (37,8)	8.1 (206)	17.6 (8,0)
	Class 300	8.7 (221)	9.2 (234)	1.49 (37,8)	8.1 (206)	23.0 (10,4)
	Class 600	9.3 (236)	9.3 (236)	1.49 (37,8)	8.1 (206)	25.5 (11,6)
	Class 900	10.3 (262)	10.3 (262)	1.49 (37,8)	8.1 (206)	36.6 (16,6)
	Class 1500	10.3 (262)	10.3 (262)	1.49 (37,8)	8.1 (206)	36.6 (16,6)
	PN 16/40	6.9 (175)	N/A	1.49 (37,8)	8.1 (206)	19.4 (8,8)
2 1/2 (50)	PN 100	8.2 (208)	N/A	1.49 (37,8)	8.1 (206)	28.0 (12,7)
	PN 160	8.4 (213)	N/A	1.49 (37,8)	8.1 (206)	29.5 (13,4)
	JIS 10K/20K	7.3 (185)	N/A	1.49 (37,8)	8.1 (206)	18.6 (8,4)
	JIS 40K	8.4 (213)	N/A	1.49 (37,8)	8.1 (206)	25.5 (11,6)
	Class 150	9.2 (234)	9.7 (246)	1.92 (48,8)	8.5 (216)	22.0 (10,0)
	Class 300	9.7 (246)	10.4 (264)	1.92 (48,8)	8.5 (216)	26.1 (11,8)
3 (50)	Class 600	10.5 (267)	10.6 (269)	1.92 (48,8)	8.5 (216)	29.8 (13,5)
	Class 900	12.7 (323)	12.9 (328)	1.92 (48,8)	8.5 (216)	59.5 (27,0)
	Class 1500	12.7 (323)	12.9 (328)	1.79 (45,5)	8.5 (216)	59.5 (27,0)
	PN 16/40	8.0 (203)	N/A	1.92 (48,8)	8.5 (216)	23.2 (10,5)
	PN 63/64	9.1 (231)	N/A	1.92 (48,8)	8.5 (216)	30.8 (13,9)
	PN 100	9.6 (244)	N/A	1.92 (48,8)	8.5 (216)	36.5 (16,6)
4 (50)	PN 160	10.2 (259)	N/A	1.92 (48,8)	8.5 (216)	38.8 (17,6)
	JIS 10K	7.7 (195)	N/A	1.92 (48,8)	8.5 (216)	19.5 (8,8)
	JIS 20K	8.3 (210)	N/A	1.92 (48,8)	8.5 (216)	20.4 (9,3)
	JIS 40K	9.8 (249)	N/A	1.92 (48,8)	8.5 (216)	28.5 (12,9)

**Table A-7. Flanged-Style Flowmeter (3-through 6-in./80 through 150mm Line Sizes) (refer to Figure A-2)**

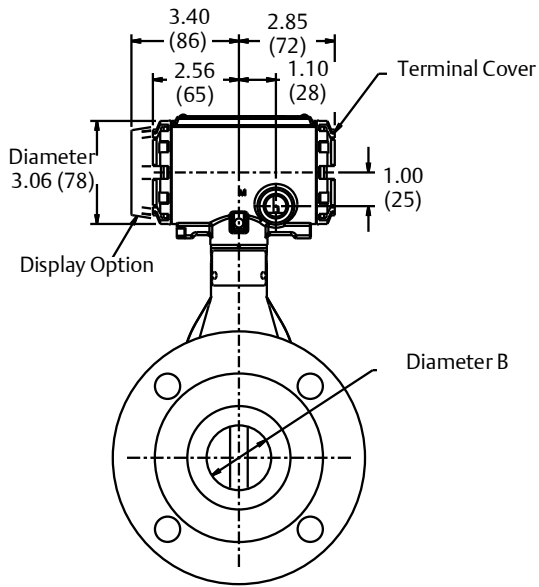
Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
3 (80)	Class 150	9.9 (251)	10.4 (264)	2.87 (72,9)	9.1 (231)	37.2 (16,9)
	Class 300	10.6 (269)	11.2 (284)	2.87 (72,9)	9.1 (231)	46.5 (21,1)
	Class 600	11.4 (290)	11.5 (292)	2.87 (72,9)	9.1 (231)	52.6 (23,8)
	Class 900	12.9 (328)	13.0 (330)	2.87 (72,9)	9.1 (231)	76.1 (34,5)
	Class 1500	14.1 (358)	14.2 (361)	2.60 (66)	9.1 (231)	108.9 (49,4)
	PN 16/40	8.9 (226)	N/A	2.87 (72,9)	9.1 (231)	36.6 (16,6)
	PN 63/64	10.0 (254)	N/A	2.87 (72,9)	9.1 (231)	45.3 (20,6)
	PN 100	10.5 (267)	N/A	2.87 (72,9)	9.1 (231)	54.7 (24,8)
	PN 160	11.1 (282)	N/A	2.87 (72,9)	9.1 (231)	59.6 (27,0)
	JIS 10K	7.9 (201)	N/A	2.87 (72,9)	9.1 (231)	28.0 (12,7)
	JIS 20K	9.3 (236)	N/A	2.87 (72,9)	9.1 (231)	35.4 (16,1)
	JIS 40K	11.0 (279)	N/A	2.87 (72,9)	9.1 (231)	50.3 (22,8)
	4 (100)	Class 150	10.3 (262)	10.8 (274)	3.79 (96,3)	9.6 (244)
Class 300		11.0 (279)	11.6 (295)	3.79 (96,3)	9.6 (244)	71.5 (32,4)
Class 600		12.8 (325)	12.9 (328)	3.79 (96,3)	9.6 (244)	97.5 (44,2)
Class 900		13.8 (351)	13.9 (353)	3.79 (96,3)	9.6 (244)	120.8 (54,8)
Class 1500		14.5 (368)	14.6 (371)	3.40 (86,4)	9.6 (244)	162.6 (73,8)
PN 16		8.4 (213)	N/A	3.79 (96,3)	9.6 (244)	40.4 (18,3)
PN 40		9.4 (239)	N/A	3.79 (96,3)	9.6 (244)	49.5 (22,4)
PN 63/64		10.4 (264)	N/A	3.79 (96,3)	9.6 (244)	62.5 (28,3)
PN 100		11.3 (287)	N/A	3.79 (96,3)	9.6 (244)	78.9 (35,8)
PN 160		12.1 (307)	N/A	3.79 (96,3)	9.6 (244)	86.2 (39,1)
JIS 10K		8.7 (220)	N/A	3.79 (96,3)	9.6 (244)	37.5 (17,0)
JIS 20K		8.7 (220)	N/A	3.79 (96,3)	9.6 (244)	45.4 (20,6)
JIS 40K		11.8 (300)	N/A	3.79 (96,3)	9.6 (244)	75.8 (34,4)
6 (150)	Class 150	11.6 (295)	12.1 (307)	5.7 (144,8)	10.8 (274)	81 (37)
	Class 300	12.3 (312)	13.0 (330)	5.7 (144,8)	10.8 (274)	120 (55)
	Class 600	14.3 (363)	14.4 (366)	5.7 (144,8)	10.8 (274)	187 (55)
	Class 900	16.1 (409)	16.2 (411)	5.14 (130,6)	10.8 (274)	277.9 (126,0)
	Class 1500	18.6 (472)	18.8 (478)	5.14 (130,6)	10.8 (274)	375.8 (170,4)
	PN 16	8.9 (226)	N/A	5.7 (144,8)	10.8 (274)	66 (30)
	PN 40	10.5 (267)	N/A	5.7 (144,8)	10.8 (274)	86 (39)
	PN 63/64	12.1 (307)	N/A	5.7 (144,8)	10.8 (274)	130 (59)
	PN 100	13.6 (345)	N/A	5.7 (144,8)	10.8 (274)	160 (73)
	JIS 10K	10.6 (270)	N/A	5.7 (144,8)	10.8 (274)	70 (32)
	JIS 20K	10.6 (270)	N/A	5.7 (144,8)	10.8 (274)	88 (40)
	JIS 40K	14.2 (361)	N/A	5.7 (144,8)	10.8 (274)	166 (75)



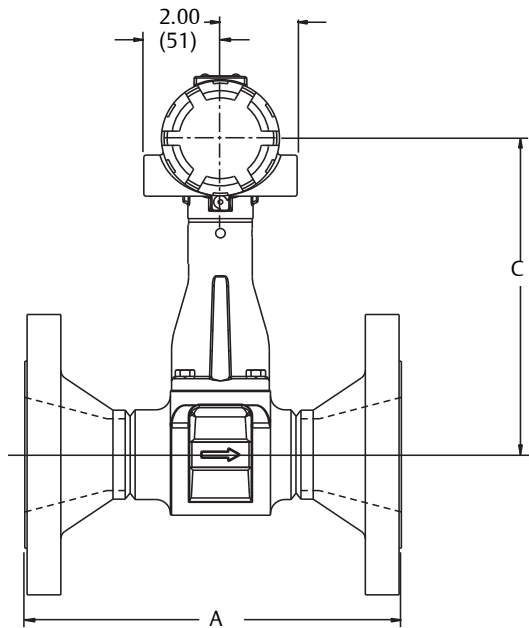
**Table A-8. Flanged-Style Flowmeter (8-through 12-in./200 through 300mm Line Sizes) (refer to Figure A-2)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)	
8 (200)	Class 150	13.5 (343)	14.0 (356)	7.55 (191,8)	11.7 (297)	141.6 (64,2)	
	Class 300	14.3 (363)	14.9 (378)	7.55 (191,8)	11.7 (297)	198.7 (90,1)	
	Class 600	16.5 (419)	16.7 (424)	7.55 (191,8)	11.7 (297)	298.6 (135,4)	
	Class 900	18.8 (478)	18.9 (480)	6.62 (168,1)	11.7 (297)	479.2 (217,4)	
	Class 1500	22.8 (579)	23.2 (589)	6.62 (168,1)	11.7 (297)	652.4 (295,9)	
	PN 10	10.4 (264)	N/A	7.55 (191,8)	11.7 (297)	110.5 (50,1)	
	PN 16	10.4 (264)	N/A	7.55 (191,8)	11.7 (297)	109.4 (49,6)	
	PN 25	11.8 (300)	N/A	7.55 (191,8)	11.7 (297)	137.7 (62,5)	
	PN 40	12.5 (318)	N/A	7.55 (191,8)	11.7 (297)	156.5 (71,0)	
	PN 63/64	14.2 (361)	N/A	7.55 (191,8)	11.7 (297)	217.1 (98,5)	
	PN 100	15.8 (401)	N/A	7.55 (191,8)	11.7 (297)	282.7 (128,2)	
	JIS 10K	12.2 (310)	N/A	7.55 (191,8)	11.7 (297)	110.1 (49,9)	
	JIS 20K	12.2 (310)	N/A	7.55 (191,8)	11.7 (297)	134.5 (61,0)	
	JIS 40K	16.5 (419)	N/A	7.55 (191,8)	11.7 (297)	255.7 (116)	
	10 (250)	Class 150	14.5 (368)	15.0 (381)	9.56 (243)	12.8 (325)	197.7 (89,7)
Class 300		15.8 (401)	16.4 (417)	9.56 (243)	12.8 (325)	286.2 (129,8)	
Class 600		19.0 (483)	19.2 (488)	9.56 (243)	12.8 (325)	477.9 (219,9)	
PN 10		11.9 (302)	N/A	9.56 (243)	12.8 (325)	157.1 (71,3)	
PN 16		12.0 (305)	N/A	9.56 (243)	12.8 (325)	161.9 (73,5)	
PN 25		13.5 (343)	N/A	9.56 (243)	12.8 (325)	198.6 (90,1)	
PN 40		14.8 (376)	N/A	9.56 (243)	12.8 (325)	246.8 (111,9)	
PN 63/64		16.4 (417)	N/A	9.56 (243)	12.8 (325)	308.2 (139,8)	
PN 100		18.9 (480)	N/A	9.56 (243)	12.8 (325)	445.2 (201,9)	
JIS 10K		14.5 (368)	N/A	9.56 (243)	12.8 (325)	174.5 (79,1)	
JIS 20K		14.5 (368)	N/A	9.56 (243)	12.8 (325)	221.8 (100,6)	
JIS 40K		18.1 (460)	N/A	9.56 (243)	12.8 (325)	378.5 (171,7)	
12 (300)		Class 150	16.8 (427)	17.3 (439)	11.38 (289)	13.7 (348)	297.5 (134,9)
		Class 300	18.0 (457)	18.6 (472)	11.38 (289)	13.7 (348)	415.7 (188,6)
		Class 600	20.5 (521)	20.6 (523)	11.38 (289)	13.7 (348)	595.4 (270,1)
	PN 10	13.1 (333)	N/A	11.38 (289)	13.7 (348)	204.1 (92,6)	
	PN 16	13.9 (353)	N/A	11.38 (289)	13.7 (348)	224.6 (101,9)	
	PN 25	15.0 (381)	N/A	11.38 (289)	13.7 (348)	269.4 (122,2)	
	PN 40	16.8 (427)	N/A	11.38 (289)	13.7 (348)	347.9 (157,8)	
	PN 63/64	18.8 (478)	N/A	11.38 (289)	13.7 (348)	431.2 (195,6)	
	PN 100	21.2 (538)	N/A	11.38 (289)	13.7 (348)	644.1 (292,2)	
	JIS 10K	15.7 (399)	N/A	11.38 (289)	13.7 (348)	222.9 (101,1)	
	JIS 20K	15.7 (399)	N/A	11.38 (289)	13.7 (348)	284.2 (128,9)	
	JIS 40K	19.6 (498)	N/A	11.38 (289)	13.7 (348)	493.8 (224,0)	

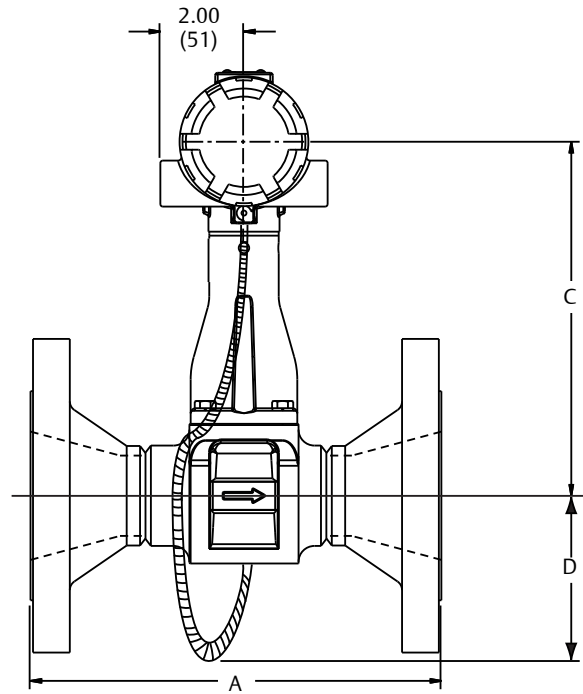
**Figure A-3. Rosemount 8800DR Reducer™ Vortex Flowmeter (1-through 12-in./25 through 300 mm Line Sizes)**



**Without MTA option**



**With MTA option**



Dimensions are in inches (millimeters).

**Table A-9. Reducer Flowmeter (1-through 3in./25 through 80 mm Line Sizes)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A-ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
1 (25)	Class 150	7.5 (191)	8.0 (203)	0.54 (13,7)	7.6 (193)	11.56 (5,24)
	Class 300	8.0 (203)	8.5 (216)	0.54 (13,7)	7.6 (193)	14.22 (6,45)
	Class 600	8.5 (216)	8.5 (216)	0.54 (13,7)	7.6 (193)	15.11 (6,85)
	Class 900	9.4 (239)	9.4 (239)	0.54 (13,7)	7.6 (193)	20.70 (9,40)
	PN 16/40	6.2 (157)	N/A	0.54 (13,7)	7.6 (193)	12.64 (5,73)
	PN 100	7.7 (196)	N/A	0.54 (13,7)	7.6 (193)	18.44 (8,36)
1 1/2 (40)	Class 150	8.2 (208)	8.7 (221)	0.95 (24,1)	7.7 (196)	15.81 (7,17)
	Class 300	8.7 (221)	9.2 (234)	0.95 (24,1)	7.7 (196)	21.20 (9,62)
	Class 600	9.3 (236)	9.3 (236)	0.95 (24,1)	7.7 (196)	23.77 (10,78)
	Class 900	10.3 (262)	10.3 (262)	0.95 (24,1)	7.7 (196)	34.98 (15,87)
	PN 16/40	6.9 (175)	N/A	0.95 (24,1)	7.7 (196)	17.50 (7,94)
	PN 100	8.2 (208)	N/A	0.95 (24,1)	7.7 (196)	26.20 (11,88)
2 (50)	Class 150	9.2 (234)	9.7 (246)	1.49 (37,8)	8.1 (206)	22.61 (10,26)
	Class 300	9.7 (246)	10.4 (264)	1.49 (37,8)	8.1 (206)	26.76 (12,14)
	Class 600	10.5 (267)	10.6 (269)	1.49 (37,8)	8.1 (206)	30.59 (13,88)
	Class 900	12.7 (323)	12.9 (328)	1.49 (37,8)	8.1 (206)	60.76 (27,56)
	PN 16/40	8.0 (203)	N/A	1.49 (37,8)	8.1 (206)	23.52 (10,67)
	PN 63/64	9.1 (231)	N/A	1.49 (37,8)	8.1 (206)	31.28 (14,19)
3 (80)	Class 150	9.9 (251)	10.4 (264)	1.92 (48,8)	8.5 (216)	33.15 (15,04)
	Class 300	10.6 (269)	11.2 (284)	1.92 (48,8)	8.5 (216)	42.66 (19,35)
	Class 600	11.4 (290)	11.5 (292)	1.92 (48,8)	8.5 (216)	49.46 (22,43)
	Class 900	12.9 (328)	13.0 (330)	1.92 (48,8)	8.5 (216)	73.28 (33,24)
	PN 16/40	8.9 (226)	N/A	1.92 (48,8)	8.5 (216)	33.30 (15,10)
	PN 63/64	10.0 (254)	N/A	1.92 (48,8)	8.5 (216)	42.45 (19,25)
3 (80)	PN 100	10.5 (267)	N/A	1.92 (48,8)	8.5 (216)	52.21 (23,68)
	PN 160	11.1 (282)	N/A	1.92 (48,8)	8.5 (216)	57.94 (26,28)

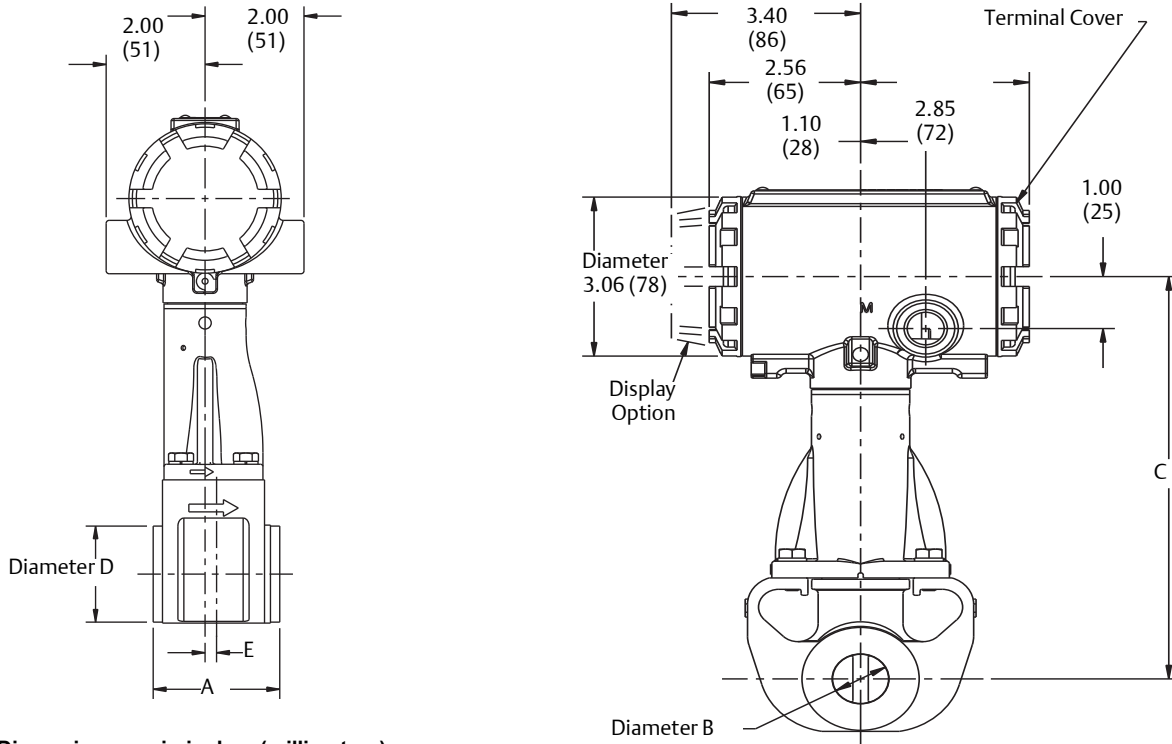
**Table A-10. Reducer Flowmeter (4-through 12-in./100 through 300mm Line Sizes) (refer to Figure A-3)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
4 (100)	Class 150	10.3 (262)	10.8 (274)	2.87 (72,9)	9.1 (231)	46.33 (21,01)
	Class 300	11.0 (279)	11.6 (295)	2.87 (72,9)	9.1 (231)	67.04 (30,41)
	Class 600	12.8 (325)	12.9 (328)	2.87 (72,9)	9.1 (231)	94.26 (42,76)
	Class 900	13.8 (351)	13.9 (353)	2.87 (72,9)	9.1 (231)	118.04 (53,54)
	PN 16	8.4 (213)	N/A	2.87 (72,9)	9.1 (231)	36.36 (16,49)
	PN 40	9.4 (239)	N/A	2.87 (72,9)	9.1 (231)	45.89 (20,81)
	PN 63/64	10.4 (264)	N/A	2.87 (72,9)	9.1 (231)	59.72 (27,09)
	PN 100	11.3 (287)	N/A	2.87 (72,9)	9.1 (231)	76.73 (34,80)
	PN 160	12.1 (307)	N/A	2.87 (72,9)	9.1 (231)	84.73 (38,43)
6 (150)	Class 150	11.6 (295)	12.1 (307)	3.79 (96,3)	9.6 (244)	70.27 (31,87)
	Class 300	12.3 (312)	13.0 (330)	3.79 (96,3)	9.6 (244)	113.09 (51,30)
	Class 600	14.3 (363)	14.4 (366)	3.79 (96,3)	9.6 (244)	185.13 (83,97)
	Class 900	16.1 (409)	16.2 (411)	3.79 (96,3)	9.6 (244)	246.33 (111,73)
	PN 16	8.9 (226)	N/A	3.79 (96,3)	9.6 (244)	59.20 (26,85)
	PN 40	10.5 (267)	N/A	3.79 (96,3)	9.6 (244)	81.94 (37,17)
	PN 63/64	12.1 (307)	N/A	3.79 (96,3)	9.6 (244)	125.36 (56,86)
	PN 100	13.6 (345)	N/A	3.79 (96,3)	9.6 (244)	162.29 (73,61)
	PN 160	14.7 (373)	N/A	3.79 (96,3)	9.6 (244)	187.91 (85,23)
8 (200)	Class 150	13.5 (343)	14.0 (356)	5.70 (144,8)	10.8 (274)	124 (56)
	Class 300	14.3 (363)	14.9 (378)	5.70 (144,8)	10.8 (274)	186 (84)
	Class 600	16.5 (419)	16.7 (424)	5.70 (144,8)	10.8 (274)	295 (134)
	PN 10	10.4 (264)	N/A	5.70 (144,8)	10.8 (274)	91 (41)
	PN 16	10.4 (264)	N/A	5.70 (144,8)	10.8 (274)	91 (41)
	PN 25	11.8 (300)	N/A	5.70 (144,8)	10.8 (274)	124 (56)
	PN 40	12.5 (318)	N/A	5.70 (144,8)	10.8 (274)	145 (66)
	PN 63/64	14.2 (361)	N/A	5.70 (144,8)	10.8 (274)	211 (96)
	PN 100	15.8 (401)	N/A	5.70 (144,8)	10.8 (274)	283 (128)
10 (250)	Class 150	14.5 (368)	15.0 (381)	7.55 (191,8)	11.7 (297)	182.45 (82,76)
	Class 300	15.8 (401)	16.4 (417)	7.55 (191,8)	11.7 (297)	281.66 (127,76)
	Class 600	19.0 (483)	19.2 (488)	7.55 (191,8)	11.7 (297)	489.89 (222,21)
	PN 10	11.9 (302)	N/A	7.55 (191,8)	11.7 (297)	138.63 (62,88)
	PN 16	12.0 (305)	N/A	7.55 (191,8)	11.7 (297)	148.58 (67,39)
	PN 25	13.5 (343)	N/A	7.55 (191,8)	11.7 (297)	191.00 (86,64)
	PN 40	14.8 (376)	N/A	7.55 (191,8)	11.7 (297)	245.85 (111,52)
	PN 63/64	16.4 (417)	N/A	7.55 (191,8)	11.7 (297)	314.13 (142,49)
	PN 100	18.9 (480)	N/A	7.55 (191,8)	11.7 (297)	463.49 (210,24)
12 (300)	Class 150	16.8 (427)	17.3 (439)	9.56 (242,8)	12.8 (325)	281.98 (127,90)
	Class 300	18.0 (457)	18.6 (472)	9.56 (242,8)	12.8 (325)	412.18 (186,96)
	Class 600	20.5 (521)	20.6 (523)	9.56 (242,8)	12.8 (325)	609.89 (296,64)
	PN 10	13.1 (333)	N/A	9.56 (242,8)	12.8 (325)	188.28 (85,40)
	PN 16	13.9 (353)	N/A	9.56 (242,8)	12.8 (325)	211.79 (96,07)
	PN 25	15.0 (381)	N/A	9.56 (242,8)	12.8 (325)	262.45 (119,05)

**Table A-10. Reducer Flowmeter (4-through 12-in./100 through 300mm Line Sizes) (refer to Figure A-3)**

	PN 40	16.8 (427)	N/A	9.56 (242,8)	12.8 (325)	349.92 (158,72)
	PN 63/64	18.8 (478)	N/A	9.56 (242,8)	12.8 (325)	444.21 (201,49)
	PN 100	21.2 (538)	N/A	9.56 (242,8)	12.8 (325)	672.07 (304,85)

**Figure A-4. Wafer-Style (1/2-through 8 in./15 through 200 mm Line Sizes)**



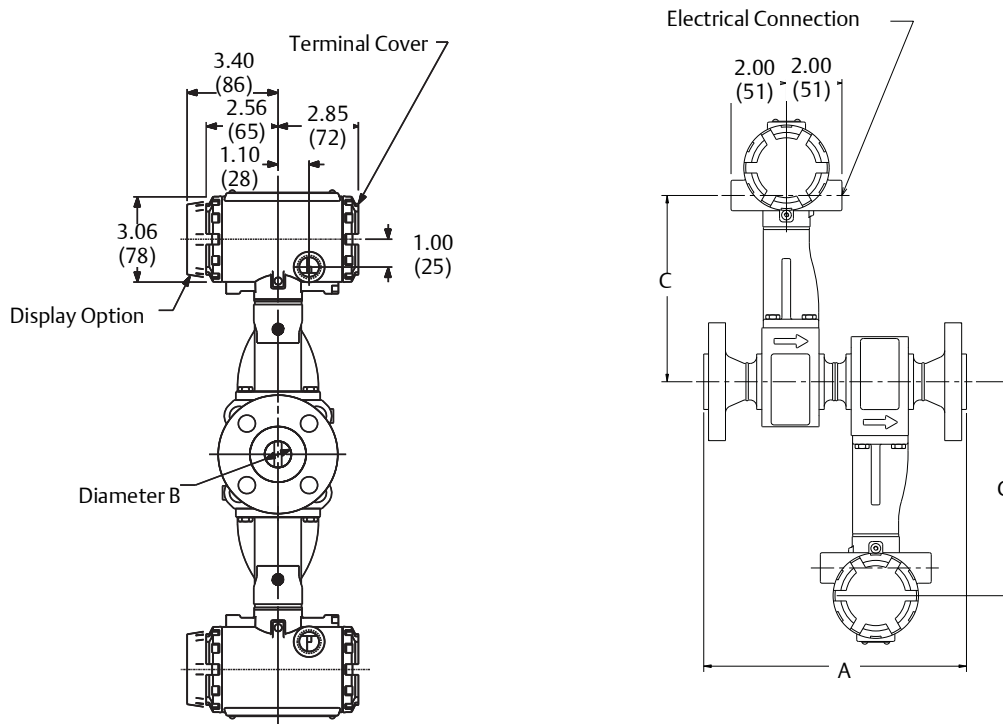
Dimensions are in inches (millimeters).  
Electronics housing may be rotated in 90 degree increments.

**Table A-11. Rosemount 8800D Vortex Wafer-Style Meter**

Nominal size inch (mm)	Face-to-face A inch (mm)	Diameter B inch (mm)	C inch (mm)	E inch (mm)	Weight lb (kg) <sup>(1)</sup>
1/2 (15)	2.56 (65)	0.52 (13,2)	7.63 (194)	0.17 (4,3)	6.8 (3,1)
1 (25)	2.56 (65)	0.95 (24,1)	7.74 (197)	0.23 (5,9)	7.4 (3,4)
1 1/2 (40)	2.56 (65)	1.49 (37,8)	8.14 (207)	0.18 (4,6)	10.0 (4,5)
2 (50)	2.56 (65)	1.92 (49)	8.85 (225)	0.12 (3)	10.6 (4,8)
3 (80)	2.56 (65)	2.87 (73)	9.62 (244)	0.25 (6)	13.6 (6,2)
4 (100)	3.42 (87)	3.79 (96)	10.48 (266)	0.44 (11)	21.4 (9,7)
6 (150)	5.00 (127)	5.70 (145)	10.29 (261)	0.30 (7,6)	36 (16)
8 (200)	6.60 (168)	7.55 (192)	11.22 (285)	0.70 (17,8)	62 (28)

1. Add 0.2 lb (0,1 kg) for display option.

**Figure A-5. Vortex Dual-Sensor Style Flowmeter (1/2-in (15 mm) through 4-in. (100 mm) Line Sizes)**



Dimensions are in inches (millimeters).

**Table A-12. Vortex Dual-Sensor Style Flowmeter (1/2-through 4-in./15 through 80 mm Line Sizes)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
? (15)	Class 150	11.9 (302)	N/A	0.54 (13,7)	7.6 (193)	16.2 (7,4)
	Class 300	12.3 (312)	12.7 (323)	0.54 (13,7)	7.6 (193)	17.4 (7,9)
	Class 600	12.8 (325)	12.7 (323)	0.54 (13,7)	7.6 (193)	17.9 (8,1)
	Class 900	13.4 (340)	13.4 (340)	0.54 (13,7)	7.6 (193)	22.7 (10,3)
	PN 16/40	11.2 (284)	N/A	0.54 (13,7)	7.6 (193)	17.4 (7,9)
	PN 100	11.7 (297)	N/A	0.54 (13,7)	7.6 (193)	19.4 (8,8)
	JIS 10K/20K	11.4 (290)	N/A	0.54 (13,7)	7.6 (193)	17.3 (7,8)
	JIS 40K	12.4 (315)	N/A	0.54 (13,7)	7.6 (193)	20.8 (9,4)

**Table A-12. Vortex Dual-Sensor Style Flowmeter (1/2-through 4-in./15 through 80 mm Line Sizes)**

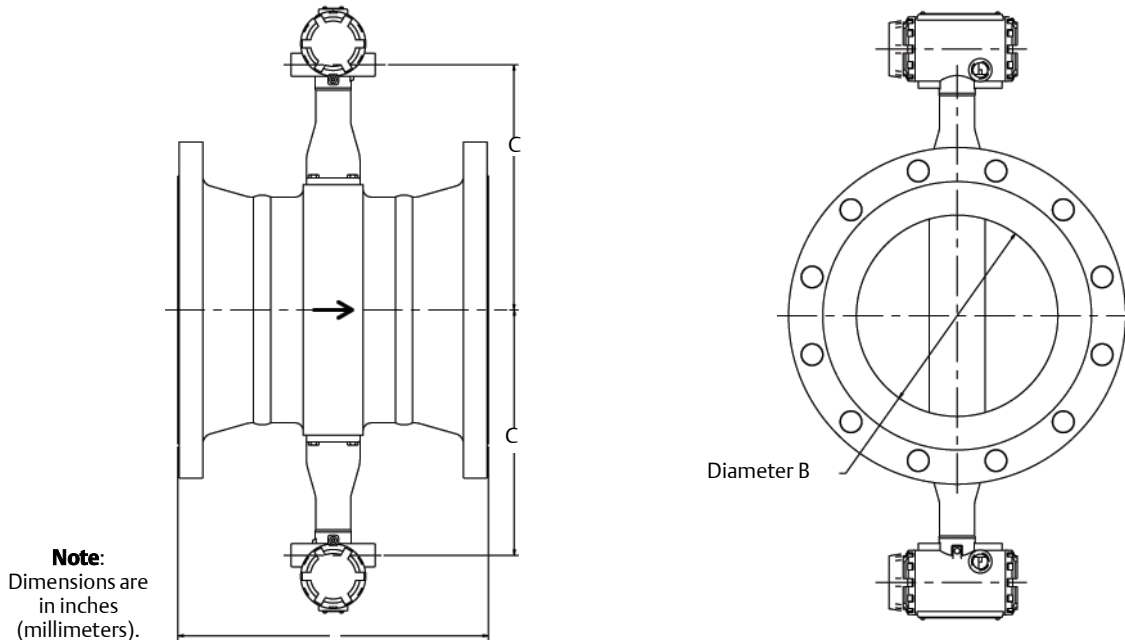
Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
1 (25)	Class 150	15.0 (381)	15.6 (396)	0.95 (24,1)	7.7 (196)	20.7 (9,4)
	Class 300	15.6 (396)	16.1 (409)	0.95 (24,1)	7.7 (196)	23.3 (10,6)
	Class 600	16.1 (409)	16.1 (409)	0.95 (24,1)	7.7 (196)	24.2 (11,0)
	Class 900	16.9 (429)	16.9 (429)	0.95 (24,1)	7.7 (196)	32.8 (14,9)
	Class 1500	16.9 (429)	16.9 (429)	0.95 (24,1)	7.7 (196)	32.8 (14,9)
	PN 16/40	13.8 (351)	N/A	0.95 (24,1)	7.7 (196)	21.9 (9,9)
	PN 100	15.3 (389)	N/A	0.95 (24,1)	7.7 (196)	28.0 (12,7)
	PN 160	15.3 (389)	N/A	0.95 (24,1)	7.7 (196)	28.0 (12,7)
	JIS 10K/20K JIS 40K	14.0 (356) 15.4 (391)	N/A N/A	0.95 (24,1) 0.95 (24,1)	7.7 (196) 7.7 (196)	22.3 (10,1) 26.08 (11,8)
1 1/2 (40)	Class 150	11.3 (287)	11.8 (300)	1.49 (37,8)	8.1 (206)	27.0 (12,3)
	Class 300	11.8 (300)	12.3 (312)	1.49 (37,8)	8.1 (206)	32.4 (14,7)
	Class 600	12.4 (315)	12.4 (315)	1.49 (37,8)	8.1 (206)	34.8 (15,8)
	Class 900	13.4 (340)	13.4 (340)	1.49 (37,8)	8.1 (206)	45.9 (20,8)
	Class 1500	13.4 (340)	13.4 (340)	1.49 (37,8)	8.1 (206)	45.9 (20,8)
	PN 16/40	9.9 (251)	N/A	1.49 (37,8)	8.1 (206)	28.7 (13,0)
	PN 100	11.3 (287)	N/A	1.49 (37,8)	8.1 (206)	37.4 (17,0)
	PN 160	11.4 (290)	N/A	1.49 (37,8)	8.1 (206)	38.8 (17,6)
	JIS 10K/20K JIS 40K	10.3 (262) 11.5 (292)	N/A N/A	1.49 (37,8) 1.49 (37,8)	8.1 (206) 8.1 (206)	27.9 (12,6) 34.9 (15,8)
2 (50)	Class 150	13.0 (330)	13.5 (343)	1.92 (48,8)	8.5 (216)	31.9 (14,5)
	Class 300	13.5 (343)	14.0 (356)	1.92 (48,8)	8.5 (216)	35.9 (16,3)
	Class 600	14.3 (363)	14.3 (363)	1.92 (48,8)	8.5 (216)	39.4 (17,9)
	Class 900	16.5 (419)	16.7 (424)	1.92 (48,8)	8.5 (216)	69.1 (31,4)
	Class 1500	15.6 (396)	15.7 (399)	1.67 (42,4)	8.5 (216)	72.4 (32,9)
	PN 16/40	11.8 (300)	N/A	1.92 (48,8)	8.5 (216)	32.8 (14,9)
	PN 63/64	12.9 (328)	N/A	1.92 (48,8)	8.5 (216)	40.4 (18,3)
	PN 100	13.4 (340)	N/A	1.92 (48,8)	8.5 (216)	46.2 (20,9)
	PN 160	13.9 (353)	N/A	1.92 (48,8)	8.5 (216)	48.4 (21,9)
JIS 10K JIS 20K JIS 40K	11.5 (292) 12.0 (305) 13.6 (345)	N/A N/A N/A	1.92 (48,8) 1.92 (48,8) 1.92 (48,8)	8.5 (216) 8.5 (216) 8.5 (216)	29.1 (13,2) 30.0 (13,6) 38.1 (13,6)	
3 (80)	Class 150	14.3 (363)	14.8 (376)	2.87 (72,9)	9.1 (231)	50.6 (23,0)
	Class 300	15.0 (381)	15.7 (399)	2.87 (72,9)	9.1 (231)	59.9 (27,2)
	Class 600	15.8 (401)	15.9 (404)	2.87 (72,9)	9.1 (231)	65.9 (29,9)
	Class 900	17.3 (439)	17.4 (442)	2.87 (72,9)	9.1 (231)	88.4 (40,8)
	Class 1500	18.5 (470)	18.7 (475)	2.60 (66,0)	9.1 (231)	123.8 (56,2)
	PN 16/40	13.4 (340)	N/A	2.87 (72,9)	9.1 (231)	50.0 (22,7)
	PN 63/64	14.5 (367)	N/A	2.87 (72,9)	9.1 (231)	58.7 (26,6)
	PN 100	14.9 (378)	N/A	2.87 (72,9)	9.1 (231)	68.0 (30,9)
	PN 160	15.6 (396)	N/A	2.87 (72,9)	9.1 (231)	73.4 (33,3)
	JIS 10K JIS 20K JIS 40K	12.3 (312) 13.7 (348) 15.5 (394)	N/A N/A N/A	2.87 (72,9) 2.87 (72,9) 2.87 (72,9)	9.1 (231) 9.1 (231) 9.1 (231)	41.4 (18,8) 48.8 (22,1) 63.7 (28,9)

**Table A-12. Vortex Dual-Sensor Style Flowmeter (1/2-through 4-in./15 through 80 mm Line Sizes)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
4 (100)	Class 150	15.2 (386)	15.7 (399)	3.79 (96,3)	9.6 (244)	69.7 (31,6)
	Class 300	16.0 (406)	16.6 (422)	3.79 (96,3)	9.6 (244)	88.9 (40,8)
	Class 600	17.7 (450)	17.9 (454)	3.79 (96,3)	9.6 (244)	116 (52,5)
	Class 900	18.7 (475)	18.9 (480)	3.79 (96,3)	9.6 (244)	139 (63,1)
	Class 1500	20.0 (509)	20.2 (512)	3.40 (86,4)	9.6 (244)	184 (83,3)
	PN 16	13.3 (338)	N/A	3.79 (96,3)	9.6 (244)	58.7 (26,6)
	PN 40	14.4 (366)	N/A	3.79 (96,3)	9.6 (244)	67.8 (30,8)
	PN 63/64	15.4 (391)	N/A	3.79 (96,3)	9.6 (244)	80.8 (36,7)
	PN 100	16.3 (414)	N/A	3.79 (96,3)	9.6 (244)	97.2 (44,1)
	PN 160	17.1 (434)	N/A	3.79 (96,3)	9.6 (244)	104 (47,4)
	JIS 10K	13.6 (345)	N/A	3.79 (96,3)	9.6 (244)	55.8 (25,3)
	JIS 20K	13.6 (345)	N/A	3.79 (96,3)	9.6 (244)	63.8 (28,9)
	JIS 40K	16.8 (427)	N/A	3.79 (96,3)	9.6 (244)	94.2 (42,7)



**Figure A-6. Vortex Dual-Sensor Style Flowmeter (6-in. (150 mm) through 12-in. (300 mm) Line Sizes)**



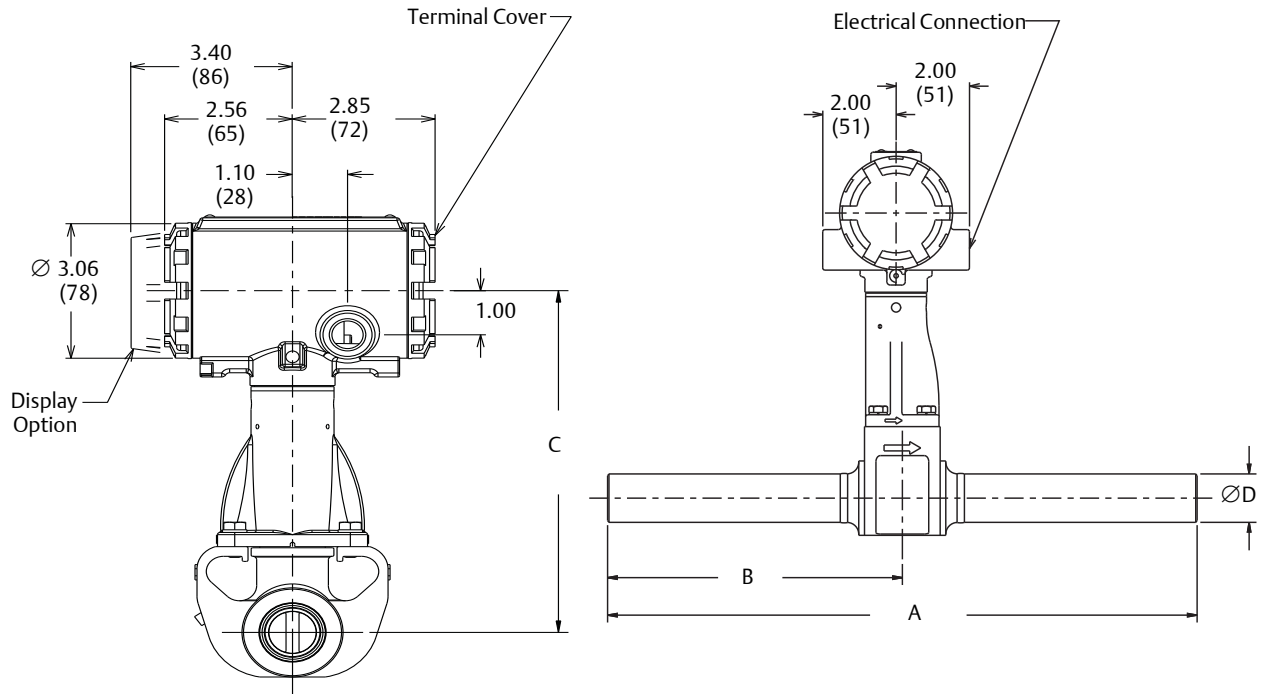
**Table A-13. Vortex Dual-Sensor Style Flowmeter (6- through 12-in./100 through 300 mm Line Sizes)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
6 (150)	Class 150	11.6 (295)	12.1 (307)	5.7 (144,8)	10.8 (274)	85 (39)
	Class 300	12.3 (312)	13.0 (330)	5.7 (144,8)	10.8 (274)	124 (57)
	Class 600	14.3 (363)	14.4 (366)	5.7 (144,8)	10.8 (274)	191 (87)
	Class 900	16.1 (409)	16.2 (411)	5.14 (130,6)	10.8 (274)	282 (128)
	Class 1500	18.6 (472)	18.8 (478)	5.14 (130,6)	10.8 (274)	380 (173)
	PN 16	8.9 (226)	N/A	5.7 (144,8)	10.8 (274)	70 (32)
	PN 40	10.5 (267)	N/A	5.7 (144,8)	10.8 (274)	90 (41)
	PN 63/64	12.1 (307)	N/A	5.7 (144,8)	10.8 (274)	134 (61)
	PN 100	13.6 (345)	N/A	5.7 (144,8)	10.8 (274)	164 (75)
	JIS 10K	10.6 (269)	N/A	5.7 (144,8)	10.8 (274)	74 (34)
	JIS 20K	10.6 (269)	N/A	5.7 (144,8)	10.8 (274)	92 (42)
	JIS 40K	14.2 (361)	N/A	5.7 (144,8)	10.8 (274)	170 (77)

**Table A-13. Vortex Dual-Sensor Style Flowmeter (6- through 12-in./100 through 300 mm Line)**

Nominal size inch (mm)	Flange rating	Face-to-face A inch (mm)	A ANSI RTJ inch (mm)	Diameter B inch (mm)	C inch (mm)	Weight lb (kg)
8 (200)	Class 150	13.5 (343)	14.0 (356)	7.55 (191,8)	11.7 (297)	146 (66)
	Class 300	14.3 (363)	14.9 (378)	7.55 (191,8)	11.7 (297)	203 (92)
	Class 600	16.5 (419)	16.7 (424)	7.55 (191,8)	11.7 (297)	303 (138)
	Class 900	18.8 (478)	18.9 (480)	6.62 (168,1)	11.7 (297)	484 (220)
	Class 1500	22.8 (580)	23.2 (589)	6.62 (168,1)	11.7 (297)	657 (299)
	PN 10	10.4 (264)	N/A	7.55 (191,8)	11.7 (297)	115 (52)
	PN 16	10.4 (264)	N/A	7.55 (191,8)	11.7 (297)	114 (52)
	PN 25	11.8 (300)	N/A	7.55 (191,8)	11.7 (297)	142 (65)
	PN 40	12.5 (318)	N/A	7.55 (191,8)	11.7 (297)	161 (73)
	PN 63/64	14.2 (361)	N/A	7.55 (191,8)	11.7 (297)	221 (101)
	PN 100	15.8 (401)	N/A	7.55 (191,8)	11.7 (297)	287 (130)
	JIS 10K	12.2 (310)	N/A	7.55 (191,8)	11.7 (297)	114 (52)
	JIS 20K	12.2 (310)	N/A	7.55 (191,8)	11.7 (297)	139 (63)
	JIS 40K	16.5 (419)	N/A	7.55 (191,8)	11.7 (297)	260 (118)
	10 (250)	Class 150	14.5 (368)	15.0 (381)	9.56 (243)	12.8 (325)
Class 300		15.8 (401)	16.4 (417)	9.56 (243)	12.8 (325)	290 (132)
Class 600		19.1 (485)	19.2 (488)	9.56 (243)	12.8 (325)	482 (219)
PN 10		11.9 (302)	N/A	9.56 (243)	12.8 (325)	161 (73,2)
PN 16		12.1 (307)	N/A	9.56 (243)	12.8 (325)	166 (75,4)
PN 25		13.5 (343)	N/A	9.56 (243)	12.8 (325)	203 (92,0)
PN 40		14.8 (376)	N/A	9.56 (243)	12.8 (325)	251 (114)
PN 63/64		16.4 (417)	N/A	9.56 (243)	12.8 (325)	312 (142)
PN 100		18.9 (480)	N/A	9.56 (243)	12.8 (325)	450 (204)
JIS 10K		14.6 (371)	N/A	9.56 (243)	12.8 (325)	179 (81,1)
JIS 20K		14.6 (371)	N/A	9.56 (243)	12.8 (325)	226 (103)
JIS 40K		18.1 (460)	N/A	9.56 (243)	12.8 (325)	383 (174)
12 (300)	Class 150	16.8 (427)	17.3 (439)	11.38 (289)	13.7 (348)	302 (137)
	Class 300	18.0 (457)	18.7 (475)	11.38 (289)	13.7 (348)	420 (191)
	Class 600	20.5 (521)	20.7 (526)	11.38 (289)	13.7 (348)	600 (272)
	PN 10	13.2 (335)	N/A	11.38 (289)	13.7 (348)	208 (94,5)
	PN 16	13.9 (353)	N/A	11.38 (289)	13.7 (348)	229 (104)
	PN 25	15.0 (381)	N/A	11.38 (289)	13.7 (348)	274 (124)
	PN 40	16.9 (429)	N/A	11.38 (289)	13.7 (348)	352 (160)
	PN 63/64	18.8 (478)	N/A	11.38 (289)	13.7 (348)	435 (198)
	PN 100	21.2 (538)	N/A	11.38 (289)	13.7 (348)	648 (294)
	JIS 10K	15.7 (399)	N/A	11.38 (289)	13.7 (348)	227 (103)
	JIS 20K	15.7 (399)	N/A	11.38 (289)	13.7 (348)	288 (131)
	JIS 40K	19.7 (500)	N/A	11.38 (289)	13.7 (348)	498 (226)

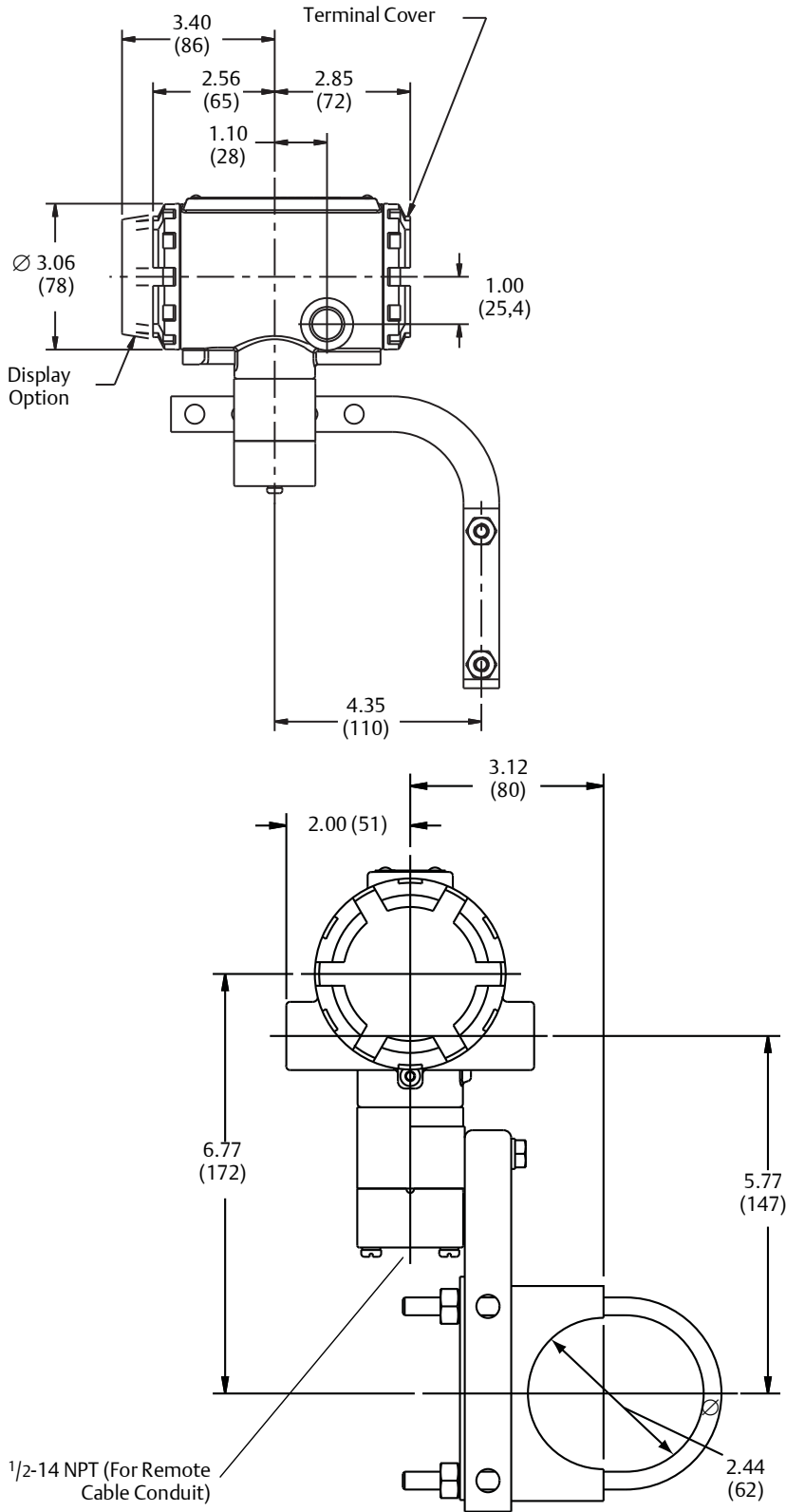
**Figure A-7. Vortex Weld-End Style Flowmeter (1/2 through 4-in. (15 through 100 mm) Line Sizes)**



**Table A-14. Vortex Weld-End Style Flowmeter (1/2 through 4-in. (15 through 100 mm) Line Sizes)**

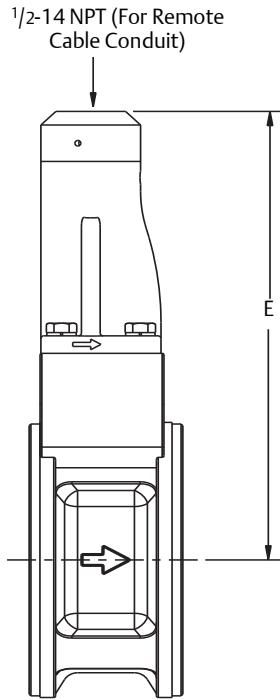
Nominal size in. (mm)	A in. (mm)	B in. (mm)	C $\pm$ 0.20 in. (5.1 mm)	Diameter D $\pm$ 0.031 in. (0.79 mm)
0.5	16.0 (406)	8.0 (203)	7.63 (194)	0.840 (21,34)
1	16.0 (406)	8.0 (203)	7.74 (197)	1.315 (33,40)
1.5	16.0 (406)	8.0 (203)	8.14 (207)	1.900 (48,26)
2	16.0 (406)	8.0 (203)	8.49 (216)	2.375 (60,33)
3	16.0 (406)	8.0 (203)	9.05 (230)	3.500 (88,90)
4	16.0 (406)	8.0 (203)	9.60 (244)	4.500 (114,30)

**Figure A-8. Remote Mount Transmitters**



**Note:**  
Consult factory for SST installation.  
Dimensions are in inches (millimeters).

**Figure A-9. Remote Mount Wafer-Style Flowmeters (1/2-through 8-inch/15 through 200 mm Line Sizes)**

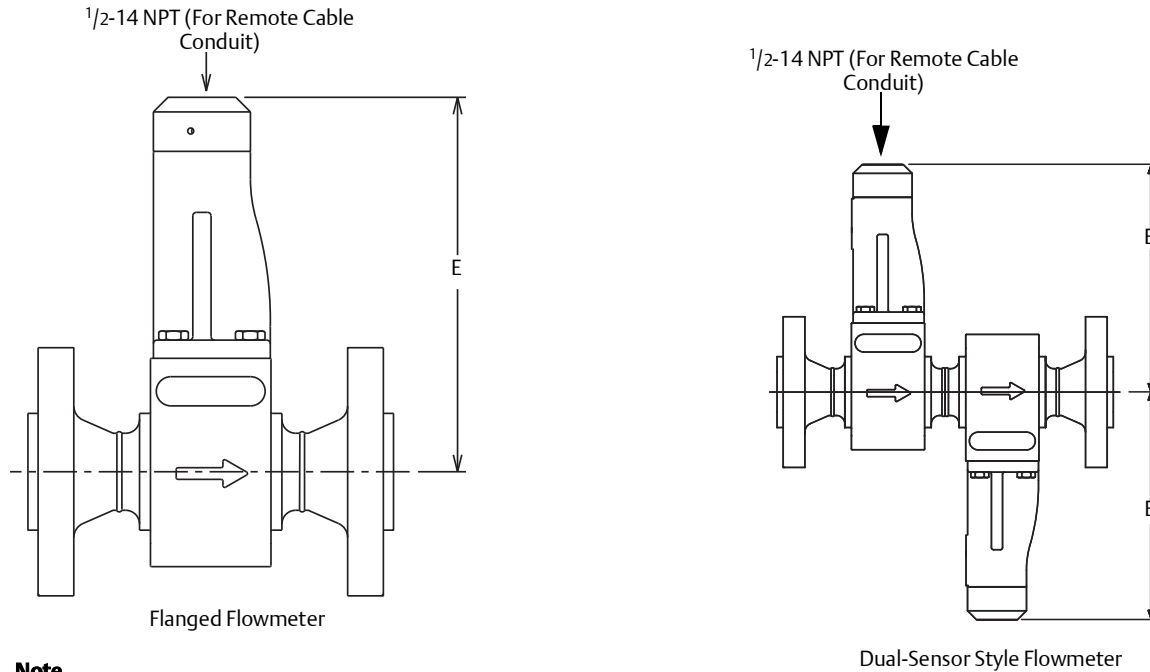


**Note:**  
 Dimensions are in inches (millimeters).

**Table A-15. Rosemount 8800D Wafer-Style Meter**

Nominal size inch (mm)	E Wafer style inch (mm)
1/2 (15)	6.3 (160)
1 (25)	6.5 (165)
1 1/2 (40)	6.7 (191)
2 (50)	7.5 (191)
3 (80)	8.3 (211)
4 (100)	9.2 (234)
6 (150)	9.5 (241)
8 (200)	10.4 (264)

**Figure A-10. Flanged-and Dual Sensor Flanged-Style Remote Mount Flowmeters (1/2-through 12-inch/15 through 300 mm Line Sizes)**



**Note**  
Dimensions are in inches (millimeters).

**Table A-16. Remote Mount, Flanged-and Dual Sensor Flowmeter Dimensions**

Nominal size inch (mm)	E flange style inch (mm)
1/2 (15)	6.4 (162)
1 (25)	6.5 (165)
1 1/2 (40)	6.8 (173)
2 (50)	7.2 (183)
3 (80)	7.8 (198)
4 (100)	8.3 (211)
6 (150)	9.5 (241)
8 (200)	10.4 (264)
10 (250)	11.4 (290)
12 (300)	12.3 (313)

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# Appendix B      Product Certifications

For detailed approval certification information and installation drawings, please see document number 00825-VA00-0011: *Rosemount™ 8800D Series Vortex Flow Meter Approval Document*.





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# Appendix C      Electronics Verification

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## C.1      Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Refer to the following safety messages before performing any operation in this section.

### **⚠ WARNING**

#### **Explosions could result in death or serious injury.**

- Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
- Before connecting a FOUNDATION™ Fieldbus-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.

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

- Make sure only qualified personnel perform the installation.

---

### **⚠ CAUTION**

Remove power before removing the electronics housing.

---

## C.2 Electronics verification

Electronics verification is a means to verify the transmitter is operating properly. Using either an internally generated sine wave signal or an externally supplied sine wave signal, the transmitter flow measurement can be verified. Electronics verification can be performed either while the device is online under normal operating conditions or while the device is offline or on the bench.

The verification procedure requires a FOUNDATION Fieldbus-compliant host or Field communicator. It is not required to physically disconnect the flow sensor during flow simulation. While in simulation mode, the transmitter is capable of electrically isolating the sensor signal from the simulation signal.

### Note

The flow sensor is not used during flow simulation. It can be left connected to the transmitter, or if a user chooses can be physically disconnected. To manually disconnect the sensor for precautionary measures, see [“Replacing the sensor” on page 95](#) for details.

Electronics verification of the transmitter can be performed by two different methods.

1. Flow simulation mode—internal signal generator
2. Flow simulation mode—external signal generator

All flow simulation is controlled inside the transducer block. The control parameters are as follows:

### Simulation Control

- Sim Disabled
- Sim Internal Generator
- Sim External Generator

### Simulation Units

- Percent Of Range
- Engineering Units

### Simulation Low Point

### Simulation High Point

### Simulation Ramp Period

When the transmitter is in flow simulation mode, the Host system will indicate the following:

- In the transducer block under the MODE\_BLK parameter, BLOCK\_ERR should indicate SimulationActive.
- In the AI block, the OUT parameter should have a STATUS of Uncertain:SubstituteValue:Constant.

### Note

On an MTA transmitter where the process fluid is set to TComp Saturated Steam, the compensated mass flow uses a calculated density derived from the measured process temperature. A flow simulation can be performed if the process temperature is at its normal operating value. Conversely, if the temperature sensor is at a temperature grossly different than the normal temperature, ambient for example, the calculated density and compensated mass flow will be inaccurate. In such cases, change the process fluid to gas/steam which will use a fixed process density value to simulate mass flow.

## C.2.1 Electronics verification using internal flow simulation

In internal flow simulation mode, the flowmeter is capable of simulating either a fixed flow rate or a varying ramped flow rate. The amplitude of the simulated signal is based on the minimum required process density for the given line size and service type. Either fixed or varying flow simulation will effectively disconnect the flow sensor from the electronics charge amplifier input and replace it with the simulated signal. See [Figure 7-2 on page 88](#).

## C.2.2 Internal flow simulation—fixed flow rate

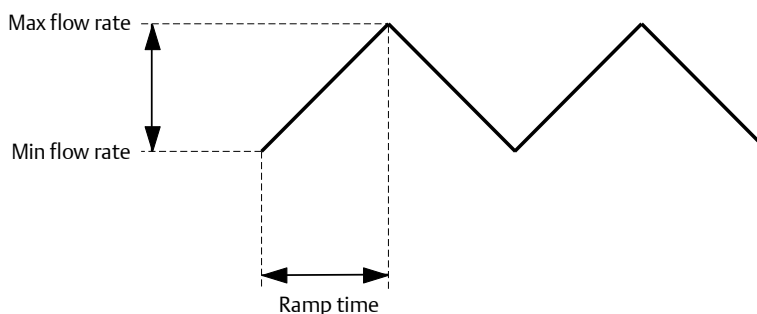
1. Set Simulation Control to Sim Internal Generator.
2. Select Simulation Units as either percent of range or engineering units.
3. Set the simulation Low Point and Simulation High Point to the same flow rate value.

## C.2.3 Internal flow simulation—varying flow rate

1. Set Simulation Control to Sim Internal Generator.
2. Select Simulation Units as either percent of range or engineering units.
3. Set the Simulation Low Point. The simulation lowest flow rate.
4. Set the Simulation High Point. The simulation highest flow rate.
5. Set the Simulation Ramp Period. Entered in seconds.

The profile of the varying flow simulation signal is a sine wave that linearly increases and decreases in frequency based on the ramp period. [Figure C-9](#) illustrates how the flow is varied.

**Figure C-9. Profile of Varying Flow Simulation Signal**



## C.2.4 Exiting flow simulation

Under Simulation Control, select Sim Disabled. Cycling power will also return the transmitter to normal operation.

## C.2.5 Electronics verification using an external frequency generator

The internal frequency source on the flowmeter is not NIST traceable. As such, it may be necessary or preferred to use an external frequency source for electronics verification. The following steps are required to perform this operation.

Tools needed:

- FOUNDATION Fieldbus-compliant host or Field Communicator
- Sinewave/function generator

Use the following procedure:

1. If removing the electronics housing, refer to [“Removing the electronics housing” on page 93](#).
2. Remove the electronics compartment cover.
3. If applicable, remove the LCD display.
4. Establish communication to the device using a FOUNDATION Fieldbus-compliant host or Field Communicator.
5. In the Transducer Block, set the Simulation Control to Sim External Generator. This is important if the meter is online because it will electrically disconnect the flow sensor from the electronics. This will eliminate any confusion as to what signal (flow sensor or external source) the electronics is processing.
6. Use one of the following methods to properly insert the external flow signal:
  - If the electronics are connected to the flow sensor body, connect the external frequency source to the TEST FREQ IN and the ground tab shown in [Figure C-10](#).
  - If the electronics have been removed from the flow sensor body, connect the external frequency source to TEST FREQ IN and the external threads of the sensor header as shown in [Figure C-11](#).
  - Alternatively, if the electronics have been removed from the flow sensor body, the external frequency source can be input as shown in [Figure C-12](#).

Figure C-10. Test Frequency Input Using the Ground Tab

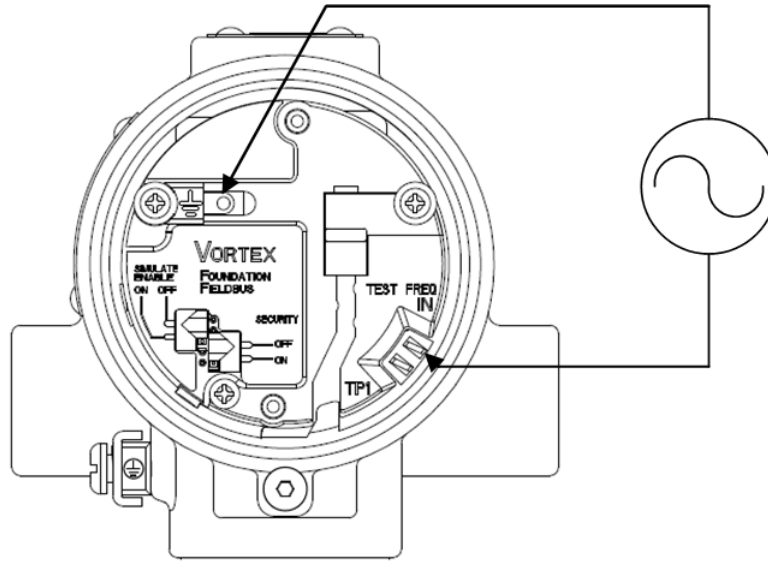


Figure C-11. Test Frequency Input Using External Threads of Sensor Header

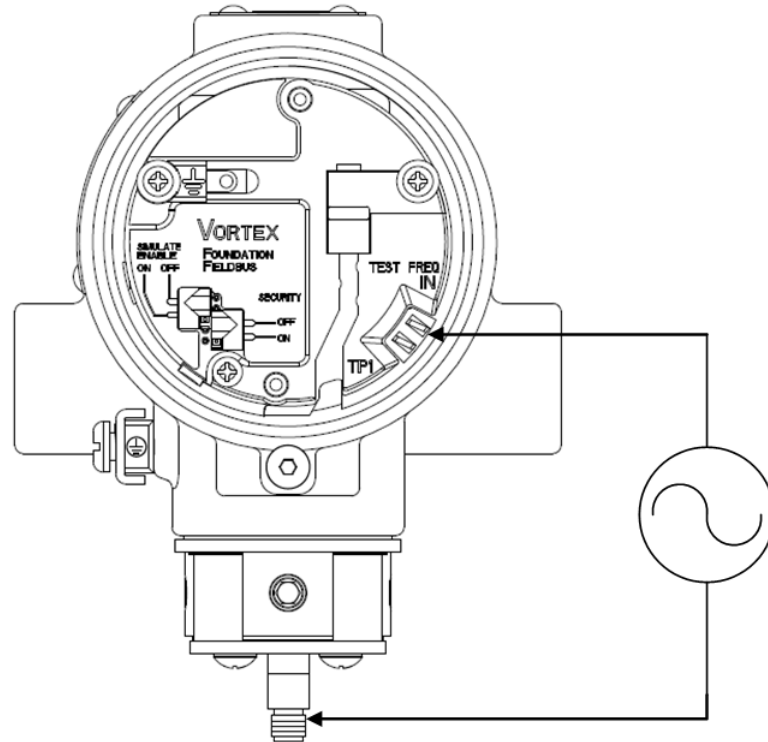
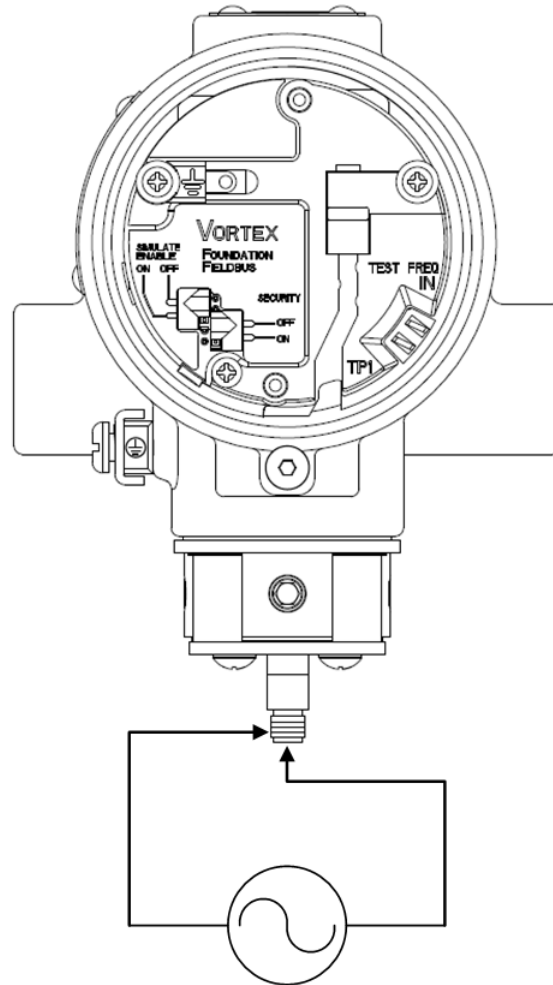


Figure C-12. Using Sensor Header with External Frequency Source



7. Set the sinewave wave amplitude to 2Vpp. Note: The amplitude may need to be higher for larger line sizes and/or high density liquids.
8. Select the desired frequency(s).
9. Monitor the Flow reading on the Fieldbus host system or Field Communicator.
10. To end the external flow simulation, in the Transducer Block set the Simulation Control to "Sim Disabled".
11. If applicable, reinstall the LCD display and fully tighten all screws.
12. Install and tighten the electronics compartment cover.

## C.2.6 Calculating output variables with known input frequency

Use the following equations with a known input frequency for verification of a flow rate. Select the proper equation depending on whether you are verifying a flow rate or a mass flow rate.

### To verify a volume flow rate

Perform the following calculation to verify a volume flow rate for a given frequency and K-factor (compensated).

#### Conditions

- Q = flow rate
- F = frequency, measured in Hz
- K = K-factor (compensated)
- $C_x$  = the unit conversion (see Table C-1 on page 156)

#### Equation

$$Q = \frac{F}{K \times C_x}$$

### To verify a standard or normal flow rate

Perform the following calculation to verify a standard or normal flow rate for a given frequency and K-factor (compensated).

#### Conditions

- Q = flow rate
- F = frequency, measured in Hz
- K = K-factor (compensated)
- $C_x$  = the unit conversion (see Table C-1 on page 156)

#### Equation

$$Q = F \times \frac{\text{Density Ratio}}{K \times C_x}$$

### To verify a mass flow rate

Perform the following calculation to verify a mass flow rate for a given frequency and K-factor (compensated).

#### Conditions

- M = flow rate
- F = frequency, measured in Hz
- K = K-factor (compensated)
- $\rho$  = density at operating conditions
- C = the unit conversion

**Equation**

$$M = \frac{F}{K/\rho \times C}$$

**Conditions**

- $C_x$  = the unit conversion using density ( $\rho$ ) (see Table C-1 on page 156)

**Equation**

$$M = \frac{F}{K \times C_x}$$

**Unit conversion table (user units to gal/s)**

Use the following table to assist with calculated frequencies when using user-defined units.

**Table C-1. Unit Conversions.**

$C_x$	Units (act)	Conversion factor
C <sub>1</sub>	gal/s	1.00000E+00
C <sub>2</sub>	gal/m	1.66667E-02
C <sub>3</sub>	gal/h	2.77778E-04
C <sub>4</sub>	Impgal/s	1.20095E+00
C <sub>5</sub>	Impgal/m	2.00158E-02
C <sub>6</sub>	Impgal/h	3.33597E-04
C <sub>7</sub>	l/s	2.64172E-01
C <sub>8</sub>	l/m	4.40287E-03
C <sub>9</sub>	l/h	7.33811E-05
C <sub>10</sub>	m <sup>3</sup> /m	4.40287E-00
C <sub>11</sub>	m <sup>3</sup> /h	7.33811E-02
C <sub>12</sub>	ft <sup>3</sup> /m	1.24675E-01
C <sub>13</sub>	ft <sup>3</sup> /h	2.07792E-03
C <sub>14</sub>	bbl/h	1.16667E-02
C <sub>15</sub>	kg/s	$C_{10}^{360}/\rho$
C <sub>16</sub>	kg/h	$C_{11}/\rho$
C <sub>17</sub>	lb/h	$C_{13}/\rho$
C <sub>18</sub>	shTon/h	$C_{17}/2000$
C <sub>19</sub>	mTon/h	$C_{16}/1000$
C <sub>20</sub>	SPECIAL	$C_x/(\text{special units conversion factor})$

$\rho$ =operating density



## C.3 Examples

The following examples illustrate the calculations that may be necessary for your application. The first set of two examples is in English units. The second set of two examples is in SI units.

### C.3.1 English units

#### Example 1

In this application, an input frequency of 75 Hz represents a flow rate of 417.1 gpm:

#### Given

- Q = flow rate
- F = frequency: 75 Hz
- K = K-factor (compensated): 10.79 (via fieldbus configuration tool)
- $C_x = C_2$ 
  - $C_2 = 1.66667E-02$  (from Table C-1 on page 156)

#### Other conditions

- Fluid = water
- Line size = 3 in.
- Line pressure = 100 psig
- Operating temperature = 75 °F

#### Equation

$$Q = \frac{F}{K \times C_x}$$

#### Calculations

$$Q = \frac{75}{10.79 \times 0.0166667}$$

$$Q = 417.1 \text{ gal/m}$$

### Example 2

In this application, an input frequency of 400 Hz represents a flow rate of 19,271.2 lb/h.

#### Given

- M = mass flow rate
- F = frequency: 400 Hz
- K = K-factor (compensated): 10.678 (via fieldbus configuration tool)
- $C_x = C_{17}$
- $C_{17} = C_{13}/\rho$  (from Table C-1 on page 156)
- $\rho$  = density: 1.078 lb/ft<sup>3</sup>

#### Other conditions

- Fluid = saturated steam
- Line size = 3 in.
- Line pressure = 500 psia
- Operating temperature = 467 °F
- Viscosity = 0.017 cP

#### Equation

$$M = \frac{F}{K \times C_x}$$

#### Calculations

$$M = \frac{400}{10.678 \times C_{17}}$$

$$M = \frac{400}{10.678 \times (C_{13}/\rho)}$$

$$M = \frac{400}{10.678 \times (0.00207792/1.078)}$$

$$M = \frac{400}{10.678 \times 0.0019276}$$

$$M = 19,271.2 \text{ lb/h}$$

## C.3.2 SI units

### Example 1

In this application, an input frequency of 80 Hz represents a flow rate of 1,686.8 lpm.

#### Given

- $Q$  = flow rate
- $F$  = frequency: 80 Hz
- $K$  = K-factor (compensated): 10.772 (via fieldbus configuration tool)
- $C_x = C_8$ 
  - $C_8 = 4.40287E-03$  (from Table C-1 on page 156)

#### Other conditions

- Fluid = water
- Line size = 80 mm
- Line pressure = 700 kPag
- Operating temperature = 60 °C

#### Equation

$$Q = \frac{F}{K \times C_x}$$

#### Calculations

$$Q = \frac{80}{10.772 \times C_8}$$

$$Q = \frac{80}{10.772 \times 0.00440287}$$

$$Q = 1,686.8 \text{ lpm}$$

### Example 2

In this application, an input frequency of 650 Hz represents a flow rate of 3,446.4 kg/hr.

#### Given

- $M$  = mass flow rate
- $F$  = frequency: 650.00 Hz
- $K$  = K-factor (compensated): 10.715 (via fieldbus configuration tool)
- $C_x = C_{16}$ 
  - $C_{16} = C_{11}/\rho$  (from Table C-1 on page 156)
- $\rho$  = density: 4.169 lb/m<sup>3</sup> (operating)

### Other conditions

- Fluid = saturated steam
- Line size = 80 mm
- Line pressure = 700 kPag
- Operating temperature = 170 °C
- Viscosity = 0.015 cP

### Equation

$$M = \frac{F}{K \times C_x}$$

### Calculations

$$M = \frac{650}{10.715 \times C_{16}}$$

$$M = \frac{650}{10.715 \times (C_{11}/\rho)}$$

$$M = \frac{650}{10.715 \times (0.733811/4.169)}$$

$$M = \frac{650}{10.715 \times 0.017602}$$

$$M = 3,446.4 \text{ kg/h}$$

---

# Appendix D Alerts

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---

## D.1 Alerts

### Note

See “Alert configuration NE107 and PlantWeb” on page 168 for Alert Configuration.

---

The Rosemount™ 8800 Rev 10 (and later) Flow Transmitter announces alerts as either PlantWeb™ or NE107 Status Signals. All alerts are configured, masked, and mapped as NE 107 Status Signals. If the control host is DeltaV version 11.5 or older, alerts are automatically announced as PlantWeb Alerts. No user configuration is needed for this conversion.

The alerts and recommended actions should be used in conjunction with [Section 7: Troubleshooting](#). See [Section 5: Resource Block](#) for more information on resource block parameters.

The Resource Block will act as a coordinator for alerts. Depending on user configuration each device will have either three or four alert Parameters. If PlantWeb alerts are announced, the three alert parameters will be (FAILED\_ALARM, MAINT\_ALARM, and ADVISE\_ALARM). If NE107 alerts are announced, the four alert parameters called status signals will be (FD\_FAIL\_ACTIVE, FD\_OFFSPEC\_ACTIVE, FD\_MAINT\_ACTIVE, and FD\_CHECK\_ACTIVE).

### Note

NE107 alerts and PlantWeb Alerts announce the same diagnostics and display the same recommended actions. The only difference in the alerts reported is the parameters or status signals used to announce the alert conditions. The default factory configuration has NE107 alerts enabled. A device will report either NE 107 status signals or PlantWeb alerts, but not both at the same time.

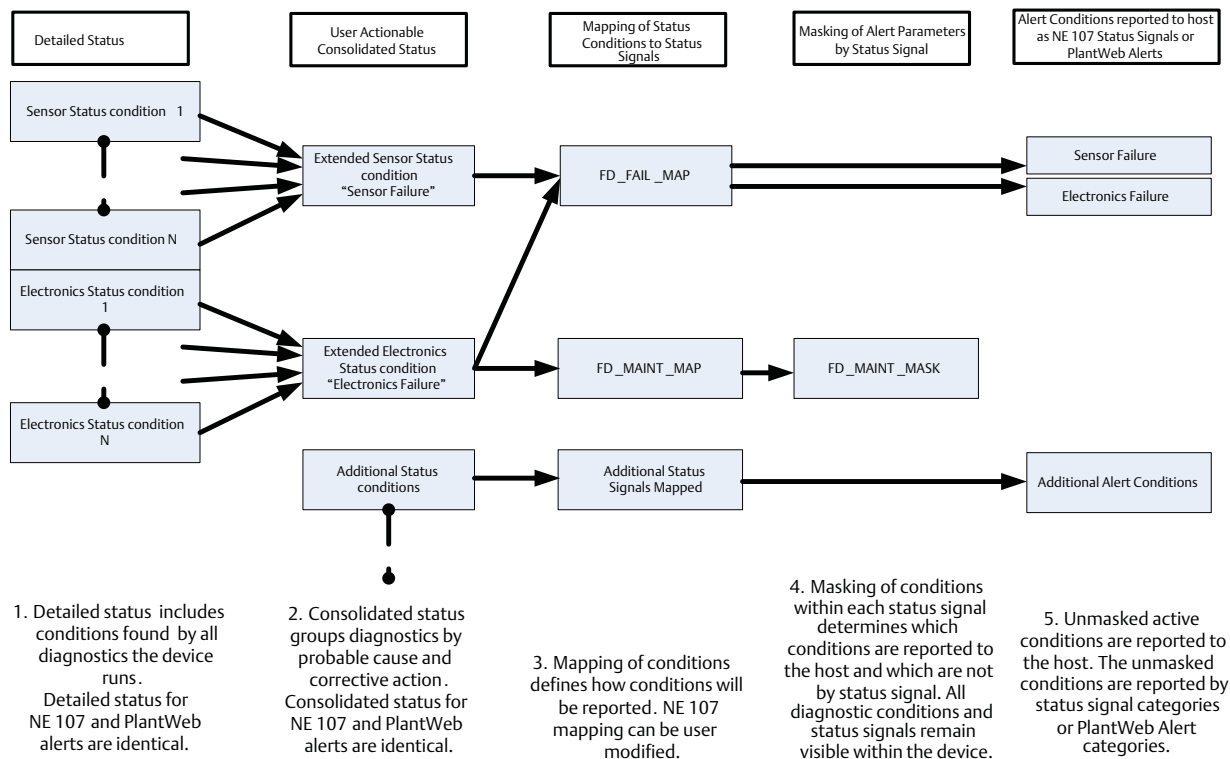
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### Alerts processing within the device

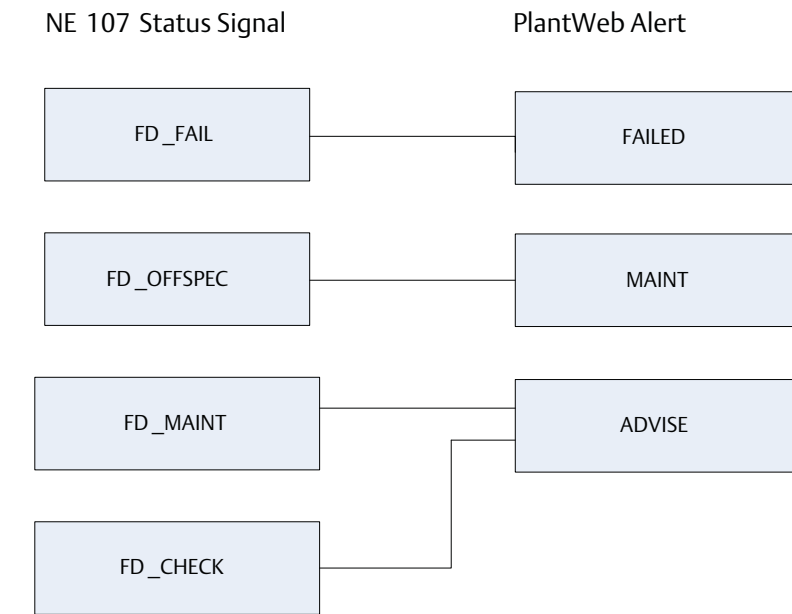
1. Diagnostics perform comprehensive checks and update status within the device. These status conditions allow the user to troubleshoot probable causes and take corrective actions.
2. The status conditions are then mapped into four status signals that can be used for annunciation on the segment to the host.
3. Before annunciation, a check is made to determine if the user has masked any alert parameters. Any masked parameters will not be annunciated to the host, but will be visible using the device DD or DTM.
4. Unmasked alert conditions are annunciated by the appropriate status signal to the host.

PlantWeb Alerts and NE107 alerts are both processed using the steps described previously, and annunciate the same consolidated status parameters.

Figure D-1. NE107 Alert Processing Diagram



**Figure D-2. NE 107 Status Signal to PlantWeb Alert Mapping**



### The alert priority enumeration value

Alerts have priorities that determine if they occur, and where and how they are annunciated.

NE107 status signals and PlantWeb alerts use the same priorities and annunciate the same ways.

0 = Alerts will not occur. If there is an existing alert and the priority is changed from a number greater than zero to zero, it will clear. Active device diagnostics are still shown within the Device Description even if the alert has been cleared.

1 = The associated alert is not sent as a notification. If the priority is above 1, then the alert must be reported.

2 = Reserved for alerts that do not require the attention of a plant operator, e.g. diagnostic and system alerts. Block alert, error alert, and update event have a fixed priority of 2.

3-7 = Increasing higher priorities - advisory alerts.

8-15 = Increasing higher priority - critical alerts.

PlantWeb Alert priorities are configured using DeltaV.

---

## NE107 alerts overview

### NE107 alert parameters

NE107 has four alert status signals. They are in order from highest to lowest priority:

1. FD\_FAIL\_ACTIVE
2. FD\_OFFSPEC\_ACTIVE
3. FD\_MAINT\_ACTIVE
4. FD\_CHECK\_ACTIVE

Any of the alert conditions can be user configured to annunciate as any of the four status signals. Individual alert conditions can also be mapped into multiple status signals.

### Alert parameter definitions and factory defaults

#### Note

All alert conditions are factory assigned to appropriate status signals. Change the parameter assignment of individual alert conditions only if needed.

---

Devices are shipped from the factory with all applicable alerts enabled. The factory default alert conditions reported in each status signal are:

1. FD\_FAIL\_ACTIVE
  - a. Electronics failure
  - b. Open Thermocouple (MTA only)

A FD\_FAIL\_ACTIVE status signal indicates a failure within a device that will make the device or some part of the device non-operational. This implies that the process variable may no longer be available and the device is in need of immediate repair.

2. FD\_OFFSPEC\_ACTIVE
  - a. The Low Pass filter setting is out of range.
  - b. The filter Low Flow Cutoff setting is out of range.
  - c. The filter Trigger Level setting is out of range.
  - d. The configured fixed temperature is being used in density calculations (MTA only)
  - e. The ambient temperature is out of range (MTA only)

A FD\_OFFSPEC\_ACTIVE status signal indicates that the device is experiencing configuration, flow or temperature conditions that are outside the device operating range. This implies that the process variable may no longer be accurate. It also implies that if the condition is ignored, the device may eventually fail.



3. FD\_MAINT\_ACTIVE

- a. Flow is simulated by an external signal source.
- b. Flow is simulated using the internal signal generator.
- c. Flow is below the Low Flow Cutoff setting.
- d. Flow is above the PV range limit.
- e. Flow is above the Sensor range limit.
- f. The measured process temperature is above the sensor limit (MTA only).
- g. The measured process temperature is below the sensor limit (MTA only).
- h. The measured process temperature is above the limit for density calculations (MTA only).
- i. The measured process temperature is below the limit for density calculations (MTA only).

A FD\_MAINT\_ACTIVE status signal indicates the device is still functioning but an abnormal process or device condition exists. The device should be checked to determine the type of abnormal condition and recommended actions to resolve it.

4. FD\_CHECK\_ACTIVE

- a. Function check

A FD\_CHECK\_ACTIVE status signal indicates a transducer block is not in “AUTO” mode. This may be due to configuration or maintenance activities.

**Mapping alert conditions**

Any of the alert conditions can be mapped into any of the NE107 status signals. This is done using the following parameters.

- 1. FD\_FAIL\_MAP assigns a condition to FD\_FAIL\_ACTIVE
- 2. FD\_OFFSPEC\_MAP assigns a condition to FD\_OFFSPEC\_ACTIVE
- 3. FD\_MAINT\_MAP assigns a condition to FD\_MAINT\_ACTIVE
- 4. FD\_CHECK\_MAP assigns a condition to FD\_CHECK\_ACTIVE

---

### Masking alert conditions

Any combination of status signals can be masked. When a status signal is masked, it will not be annunciated to the host system but will still be active in the device and viewable in the device DD or DTM. The recommended action, FD\_RECOMMEN\_ACT will continue to show the recommended action for the most severe condition or conditions detected as determined by the status signal priority. This allows maintenance personnel to view and correct device conditions without annunciating the conditions to operational staff. They are masked using the following parameters:

1. FD\_FAIL\_MASK to mask FD\_FAIL\_ACTIVE status signals
2. FD\_OFFSPEC\_MASK to mask FD\_OFFSPEC\_ACTIVE status signals
3. FD\_MAINT\_MASK to mask FD\_MAINT\_ACTIVE status signals
4. FD\_CHECK\_MASK to mask FD\_CHECK\_ACTIVE status signals

If a consolidated diagnostic condition is configured to annunciate in multiple status signal categories it can be masked in one or several status signal categories, but left active and annunciate in others. This provides significant flexibility but can lead to confusion when responding to alerts. Generally alert conditions are assigned to only a single status signal.

### Alert priorities

NE107 alerts can have any of 16 different condition priorities ranging from the lowest priority of 0 to the highest priority of 15. This is done using the following parameters.

1. FD\_FAIL\_PRI to specify the priority of FD\_FAIL\_ACTIVE status signals
2. FD\_OFFSPEC\_PRI to specify the priority FD\_OFFSPEC\_ACTIVE status signals
3. FD\_MAINT\_PRI to specify the priority FD\_MAINT\_ACTIVE status signals
4. FD\_CHECK\_PRI to specify the priority FD\_CHECK\_ACTIVE status signals

### Note

FOUNDATION™ Fieldbus standards require that NE 107 alert priority is set to zero for all status signals at manufacturing.

Zero priority behavior shows any active device diagnostics in the DD or DTM but alerts are not generated based on the diagnostic conditions or published on the bus.

An alert priority of 2 or higher is required for every status signal category where status signals are to be published on the bus.

Check with your host provider to determine the alarm priorities assigned to each status signal category by your host. Manual configuration may be required.

DeltaV™ assigns a priority of two or higher. The priority is based on status signal category. The status signal priority determines the behavior of both real and simulated alerts.

---

## D.2 PlantWeb alerts overview

Alerts are generated, mapped, and masked as NE 107 Status Signals. If PlantWeb alerts are required the NE 107 Status Signals are automatically converted to PlantWeb Alerts for annunciation and display. PlantWeb alerts have three alert parameters. They are in order from highest to lowest priority:

1. FAILED\_ALM
2. MAINT\_ALM
3. ADVISE\_ALM

The eight alert conditions are factory configured to annunciate as one of the three specific alert parameters.

### PlantWeb alert parameter conditions and factory defaults

Devices are shipped from the factory with all applicable alerts enabled. The alert conditions reported in each parameter are:

1. FAILED\_ALM
  - a. Electronics failure
  - b. Open Thermocouple (MTA only)

A FAILED\_ALM indicates a failure within a device that will make the device or some part of the device non-operational. This implies that the process variable may no longer be available and the device is in need of immediate repair.

2. MAINT\_ALM
  - a. Flow is simulated by an external signal source.
  - b. Flow is simulated using the internal signal generator.
  - c. Flow is below the Low Flow Cutoff setting.
  - d. Flow is above the PV range limit.
  - e. Flow is above the Sensor range limit.
  - f. The measured process temperature is above the sensor limit (MTA only).
  - g. The measured process temperature is below the sensor limit (MTA only).
  - h. The measured process temperature is above the limit for density calculations (MTA only).
  - i. The measured process temperature is below the limit for density calculations (MTA only).

A MAINT\_ALM indicates that the device is experiencing pressure or temperature conditions that are outside the device operating range. This implies that the process variable may no longer be accurate. It also implies that if the condition is ignored the device will eventually fail. The device should be checked to determine the type of abnormal condition and recommended actions to resolve it.

3. ADVISE\_ALM
  - a. The Low Pass filter setting is out of range.
  - b. The filter Low Flow Cutoff setting is out of range.
  - c. The filter Trigger Level setting is out of range.
  - d. The configured fixed temperature is being used in density calculations (MTA only)
  - e. The ambient temperature is out of range (MTA only)
  - f. Function check

An ADVISE\_ALM indicates a transducer block is not in “Auto” mode. This may be due to configuration or maintenance activities. It can also indicate an abnormal process or device condition exists. The device should be checked to determine the type of abnormal condition and recommended actions to resolve it.

#### PlantWeb alert priorities

PlantWeb alert priorities are configured in DeltaV. PlantWeb Alerts can have any of 16 different condition priorities ranging from the lowest priority of 0 to the highest priority of 15. This is done using the following parameters.

1. FAILED\_PRI to specify the priority of FAILED\_ALM
2. MAINT\_PRI to specify the priority of MAINT\_ALM
3. ADVISE\_PRI to specify the priority of ADVISE\_ALM

PlantWeb alert priority is configured using DeltaV and is not part of the Device Description functionality.

## D.3 Alert configuration NE107 and PlantWeb

The objective of alerts is to inform users of conditions of interest, and guide the user to effective corrective actions. The Rosemount 8800 Rev 10 (and later) Flow Transmitter with FOUNDATION Fieldbus communications provides alerts in both NE107 format and PlantWeb Alerts format. The detailed diagnostics performed and the consolidated status which is annunciated are the same for both NE107 and PlantWeb Alerts.

#### Note

Alerts are located in the Resource block. For block oriented user interfaces, configure NE107 and PlantWeb alerts, alert suppression, and alert simulation in the Resource Block.

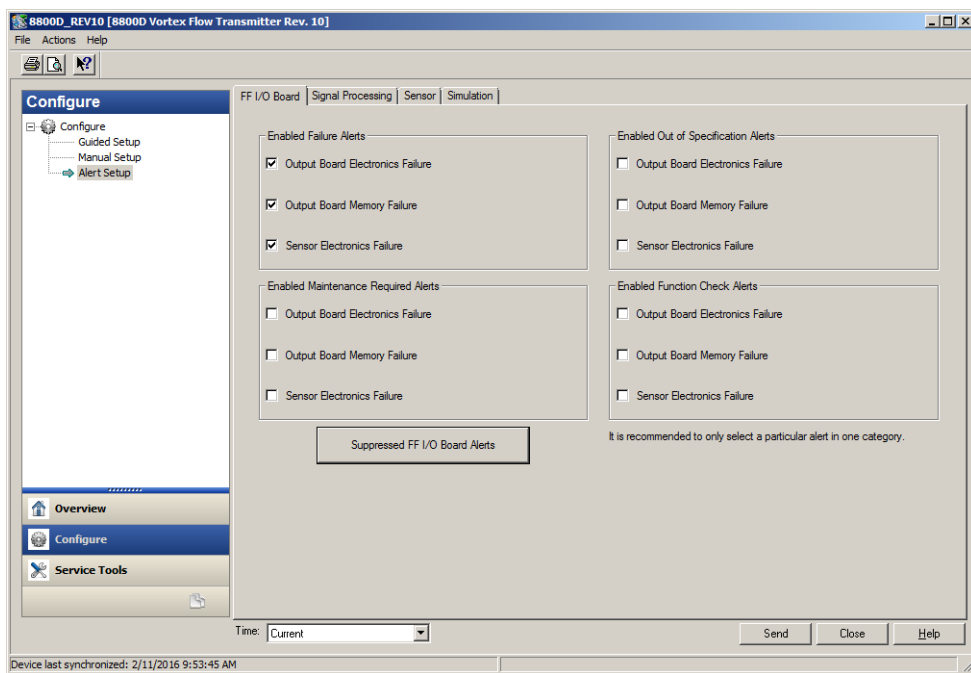
Menu Navigation: <Configure>, <Alert Setup>, <Device Alerts OR Process Alerts OR Diagnostic Alerts>

FF I/O Board, Signal Processing, and Sensor are configured the same way. One example will be shown.

## NE107 Alerts category configuration

NE107 alerts are divided into FF I/O Board, Signal Processing, and Sensor. Each alert type has a dedicated configuration screen, and a dedicated Suppress Alerts screen. The FF I/O Board Screen is used here. See “Alerts” on page 161 for more information on the conditions of each. The alerts are categorized as Failure alerts, Out of Specification alerts, Maintenance - Required alerts, and Function Check alerts. Each category contains the same list of Device Alerts and check boxes. Alerts are assigned to a category by checking the check box next to the alert. This activates the alert in that category. Alerts can be assigned to more than a single category by checking the same alert check box in multiple categories. This is not recommended as alarms can proliferate increasing the complexity of alarm management and delaying corrective action. Use of the factory default alert categories is recommended.

Figure D-3. Configure Alert Setup—FF I/O Board Screen



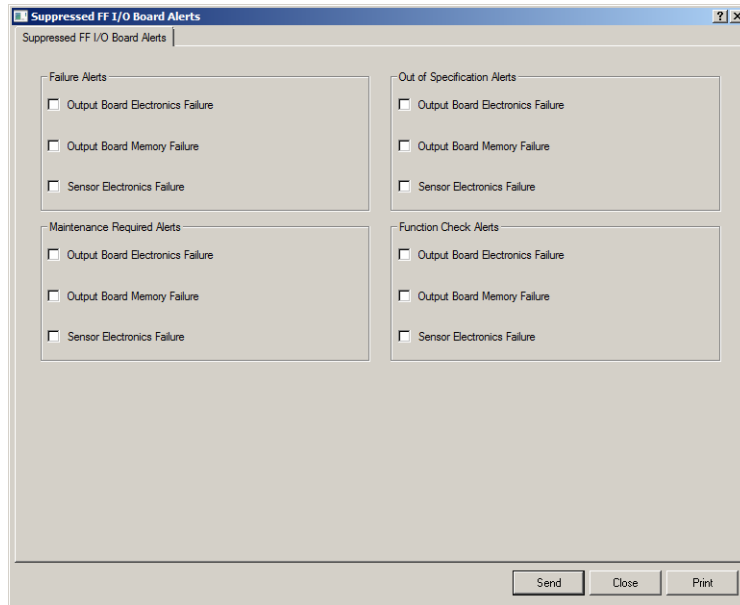
The screen shown in Figure D-3 is where the alerts are assigned by checking the box next to the desired alert in the desired category.

## Alerts suppression

Menu Navigation: <Configure>, <Alert Setup>, <Device Alerts OR Process Alerts OR Diagnostic Alerts>

Once alerts have been configured they can be suppressed. To suppress alerts click on the Suppressed FF I/O Boards Alerts button on the configuration screen. Alerts can be suppressed by checking the check box next to the alert. To stop suppressing an alert, click on the checked box suppressing the alert.

Figure D-4. Suppressed FF I/O Board Alerts Screen



The screen shown in [Figure D-4](#) is where alerts are suppressed by checking the box next to the alert to be suppressed.

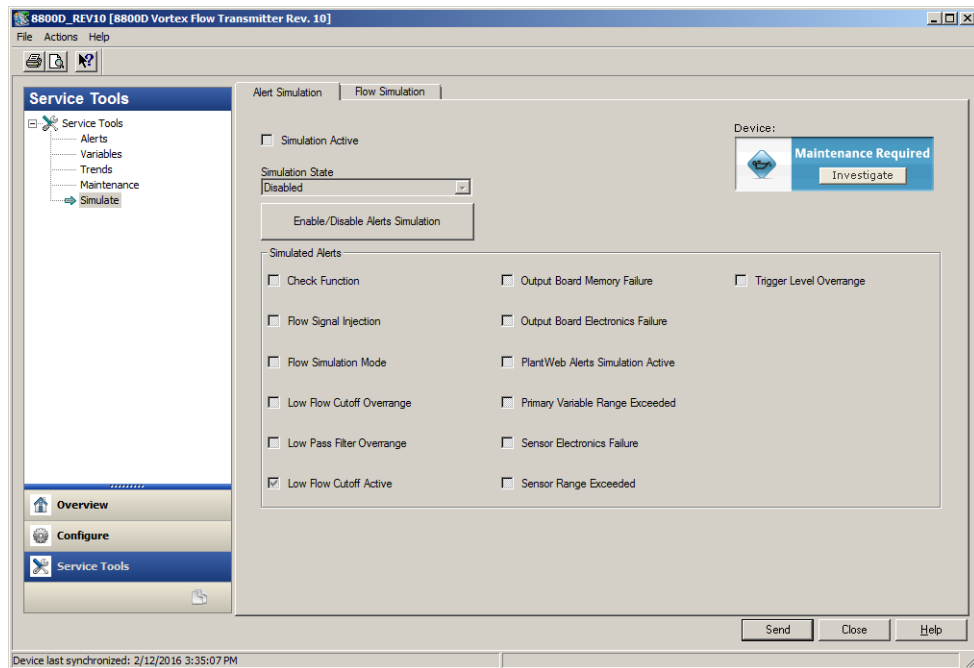
## D.4 Alert simulation

Alert Simulation provides the capability to simulate configured NE107 or PlantWeb alerts. NE107 Alerts and PlantWeb Alerts show the same consolidated status derived from the same diagnostics, so the single alert simulation is used for both. Alerts simulation is typically used for training or to verify alert configuration.

To enable alert simulation:

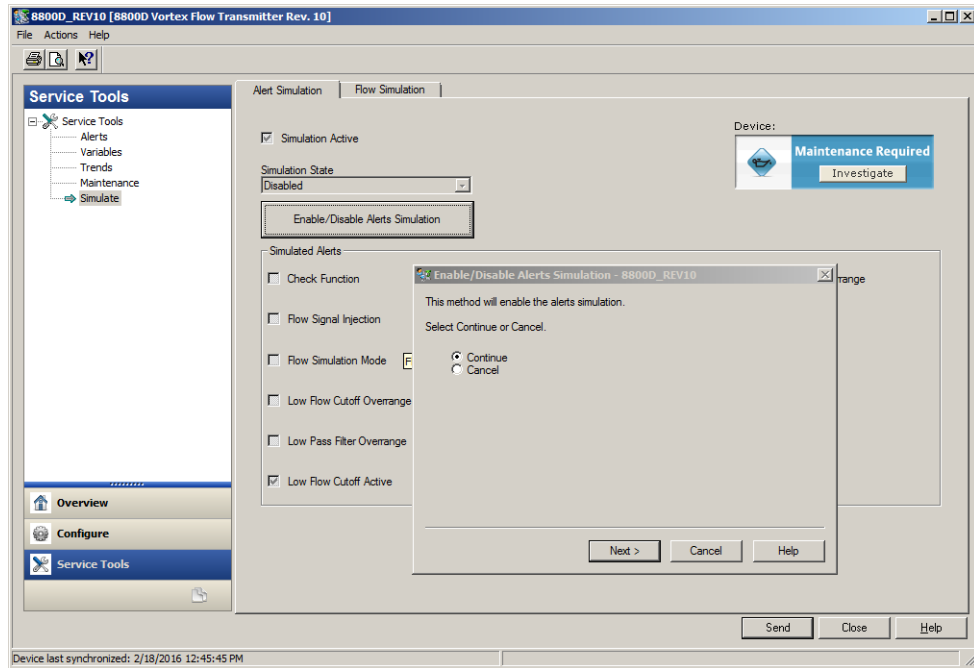
1. Ensure the simulate enable jumper is in the ON position as described in “Simulate enable” on page 41.
2. Navigate to **Service Tools > Simulate**.

The *Enable/Disable Alerts Simulation* screen displays.



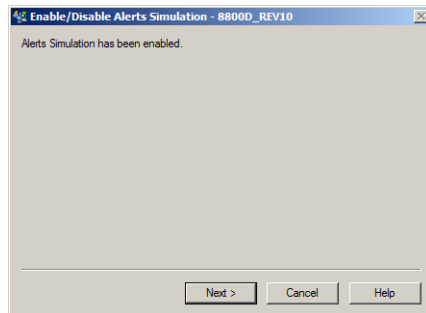
3. Select the **Enable/Disable Alerts Simulation** button.

The *Enable/Disable Alerts Simulation* confirmation window displays.



4. Select **Next** to enable alerts simulation.

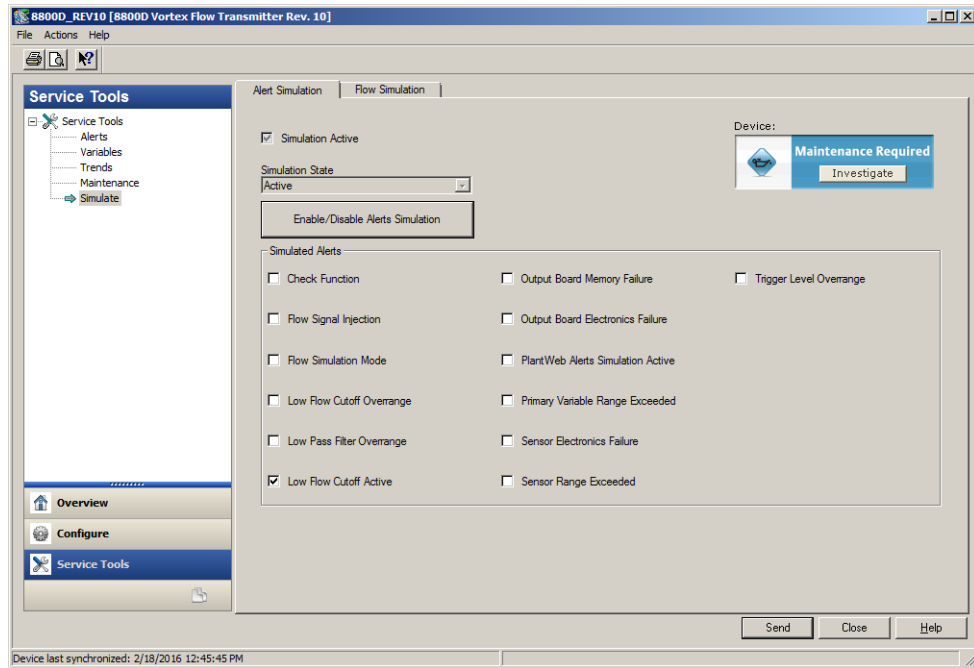
The *Alerts Simulation enabled confirmation* displays.



5. Select **Next**.



The *Enable/Disable Alerts Simulation* screen displays.



With alert simulation enabled:

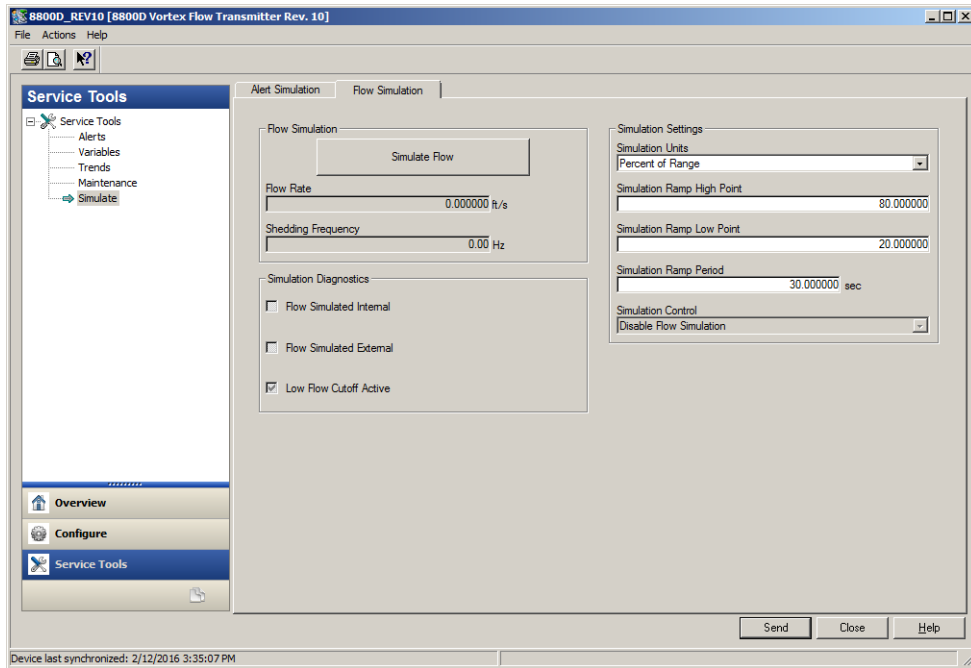
- The *Simulation Active* checkbox is checked to indicate the simulate enable jumper is in the ON position.
- The *Simulation State* displays Active.
- The *Simulated Alerts* checkboxes are no longer grayed out.

Once alert simulation is active, individual alerts can be simulated by checking the check box next to the desired alert condition. The device status indication located on the upper right corner of the screen will change to show the device status associated with the simulated alert. The simulated status will be displayed everywhere device status is displayed.

To view flow simulation settings:

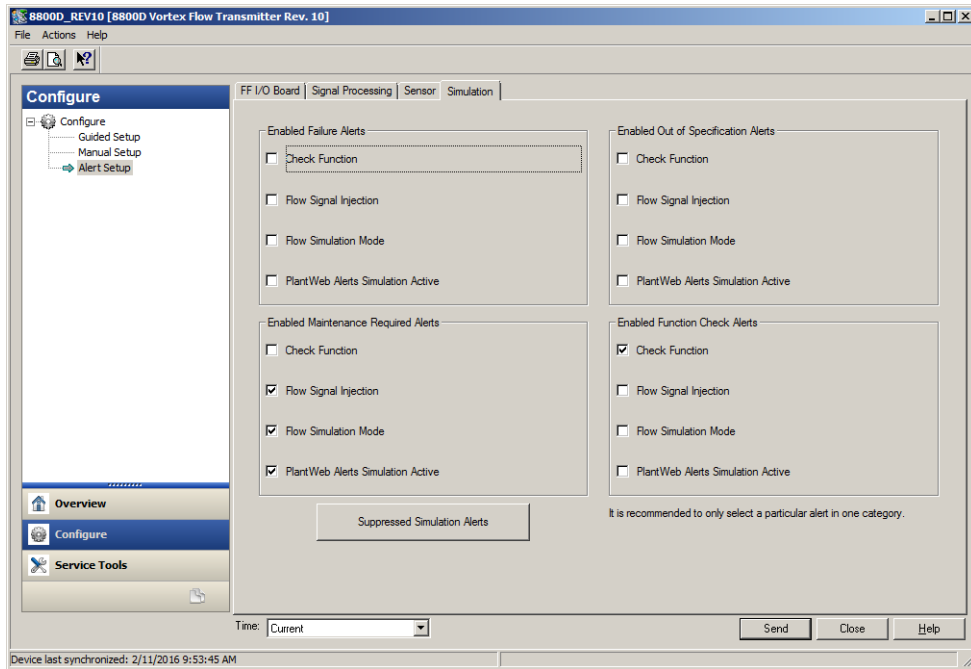
1. Navigate to **Service Tools > Simulate**.
2. Select the **Flow Simulation** tab.

The Enable/Disable Alerts Simulation screen displays.



To configure alert simulation:

1. Navigate to **Configure >Alert Setup**.
2. Select the **Simulation** tab. The *Simulation* tab displays.



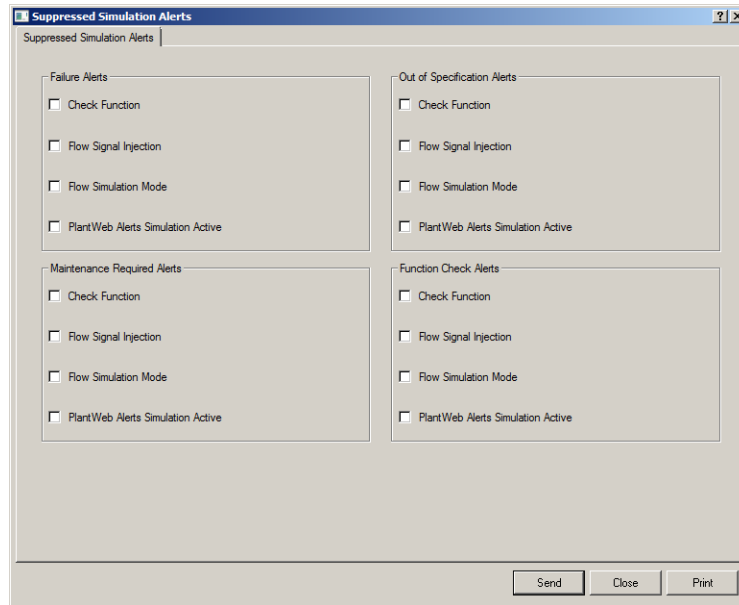
3. Select the alerts you wish to simulate by checking the check box next to the desired alert condition.

### Note

It is strongly recommended to only select one alert in each category. Selecting multiple alerts in a category will result in an overabundance of alerts at the control system.

To suppress alerts:

1. From the **Simulation** tab, select the **Suppressed Simulation Alerts** button. The *Suppressed Simulation Alerts* screen displays.



The *Suppressed Simulation Alerts* screen allows suppression of simulation alerts.

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